1963 Oldsmobile
Service Manual

1963 OLDSMOBILE

SERVICE MANUAL

FOREWORD

This manual is compiled to provide service procedures, adjustments and specifications for the 1963 Oldsmobiles. An Understanding of the material contained herein and in monthly issues of the Oldsmobile Service Guild and Dealer Technical Information Bulletins, issued when necessary, will assist service personnel in properly maintaining the quality to which Oldsmobile cars are built.

SERVICE DEPARTMENT

OLDSMOBILE DIVISION

GENERAL MOTORS CORPORATION

LANSING, MICHIGAN

Litho in U.S.A.
GMP B-35671

GENERAL INFORMATION

CONTENTS OF SECTION 1

1963 MODEL IDENTIFICATION

A four digit number, called the car series and body style designation number, identifies any car as to series and style. Reading from left to right, the digits represent the following:

First and second digits: Series Designation.
Third and fourth digits: Body Style.

Example: The number 3235 identifies a car as an 88 Fiesta sedan. Note that "32" identifies the car as an 88 and that "35" represents a Fiesta sedan.

BODY AND STYLE NUMBERS

On the full size car, the body and style numbers are stamped on a plate which is located under the hood below the left windshield wiper transmission. (Fig. 1-1)

On F-85 series, the body and style numbers are stamped on a plate which is located under the hood and mounted on the cowl. (Fig. 1-1)

This plate shows:

1. Year and Style Number of Body
2. Body Number
3. Trim Number
4. Paint Number (Color Specification Number)

All Fisher Body numbers are prefixed by letters indicating the plant at which the body was assembled.

LA - Lansing	BC - South Gate
BA - Doraville	BW - Wilmington
BK - Kansas City	BT - Arlington
BL - Linden	

Fiesta sedan bodies are made by the Ionia

1963 MODEL DESIGNATION

Series	Body Description	Designation Series Style
F-85	4 Door Sedan	3019
	2 Door Pillar Coupe	3027
	4 Door Station Wagon (2-Seat)	3035
F-85 Deluxe	2 Door Pillar Coupe	3117
	4 Door Sedan	3119
	4 Door Station Wagon (2-Seat)	3135
	2 Door Hardtop Coupe	3147
	2 Door Convertible Coupe	3167
Dynamic "88"	4 Door Station Wagon (2-Seat)	3235
	4 Door Hardtop Sedan	3239
	2 Door Station Wagon (3-Seat)	3245
	2 Door Hardtop Coupe	3247
	2 Door Convertible Coupe	3267
	4 Door Pillar Sedan	3269
Super "88"	4 Door Station Wagon (2-Seat)	3535
	4 Door Hardtop Sedan	3539
	2 Door Hardtop Coupe	3547
	4 Door Pillar Sedan	3569
Starfire	2 Door Hardtop Coupe	3657
	2 Door Convertible Coupe	3667
"98"	4 Door Pillar Sedan	3819
	4 Door (6W) Hardtop Sedan	3829
	4 Door (4W) Hardtop Sedan	3839
	2 Door Hardtop Coupe-Bench Seat	3847
	2 Door Hardtop Coupe-Bucket Seats	3947

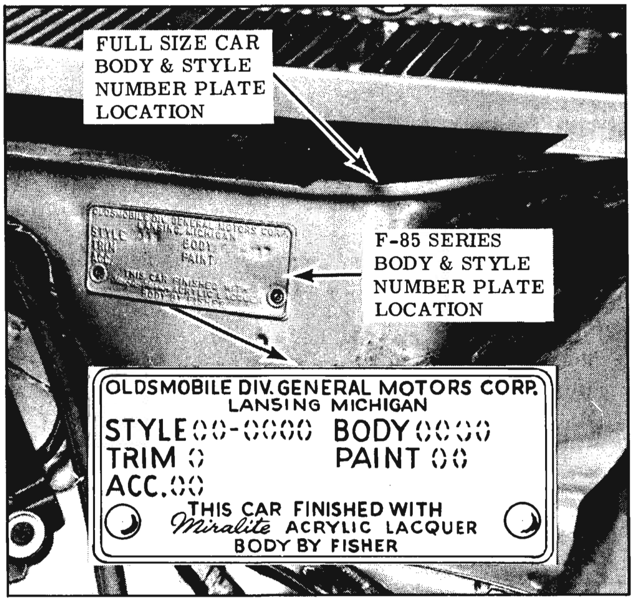


Fig. 1-1 Body and Style Number Location

manufacturing Division of the Mitchell-Bentley Corporation. The body and style number plate is similar to the Fisher Body plate as shown in Fig. 1-1.

NOTE: WHEN WRITING SERVICE ORDERS, PREPARING A.F.A.'s OR CORRESPONDENCE, IT IS VERY IMPORTANT THAT ALL LETTERS AND NUMBERS BE INCLUDED FOR CORRECT BODY IDENTIFICATION.

VEHICLE IDENTIFICATION NUMBER PLATE

The 1963 vehicle identification number plate is located on the left front door pillar as illustrated in Fig. 1-2. Each identification number is prefixed by three numbers and a letter. The first two numbers (63) indicate the year (1963). The third number designates the series.

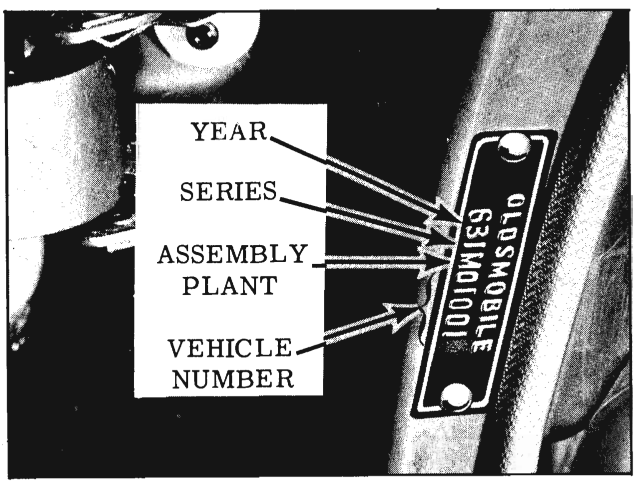


Fig. 1-2 Vehicle Identification Number Plate

0 - F-85 - Standard (30 Series)
1 - F-85 - Deluxe (31 Series)
2 - 88 (32 Series)
5 - Super 88 (35 Series)
6 - Starfire (36 Series)
8 - 98 (38 Series)
9 - 98 (39 Series)

The letter in the identification number indicates the assembly plant at which the car was built. "M" indicates a Lansing-built car. "A" an Atlanta-built car, etc. (See STARTING VEHICLE IDENTIFICATION NUMBER CHART.)

NOTE: ALWAYS SHOW COMPLETE ENGINE UNIT AND VEHICLE IDENTIFICATION NUMBER IN REPORTS AND CORRESPONDENCE.

ENGINE UNIT NUMBER (For Manufacture and Service Use)

On Full Size Cars, the engine unit number is stamped on the left cylinder head. (Fig. 1-3) On the F-85 Series this number is stamped on the front of right hand cylinder head. (Fig. 1-4)

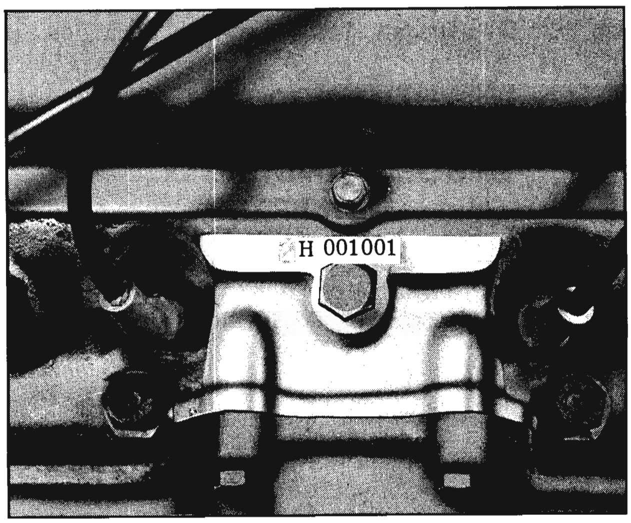


Fig. 1-3 Engine Unit Number Location (Full Size Car)

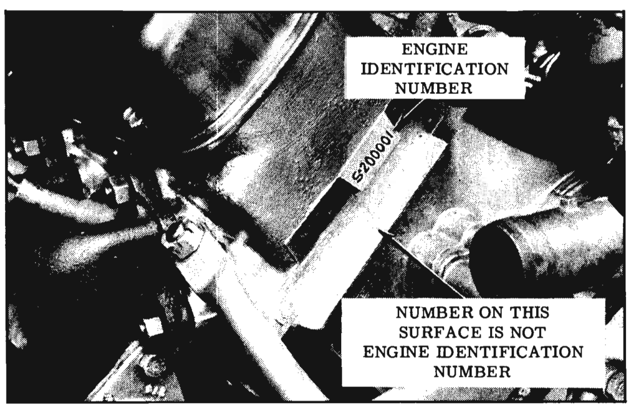


Fig. 1-4 Engine Unit Number Location (F-85)

STARTING VEHICLE IDENTIFICATION NUMBERS

Series	Built at Lansing, Michigan	Built at Atlanta, Georgia	Built at Kansas City, Kansas	Built at Linden, New Jersey	Built at South Gate, California	Built at Wilmington, Delaware	Built at Arlington, Texas
F-85 (30) Standard	630M01001	None	630K01001	None	630C01001	None	None
F-85 (31) Deluxe	631M01001	None	631K01001	None	631C01001	None	None
"88" (32)	632M01001	632A01001	632K01001	632L01001	632C01001	632W01001	632T01001
Super "88" (35)	635M01001	635A01001	635K01001	635L01001	635C01001	635W01001	635T01001
Starfire (36)	636M01001	636A01001	636K01001	636L01001	636C01001	636W01001	636T01001
"98" (38)	638M01001	638A01001	638K01001	638L01001	638C01001	638W01001	638T01001
"98" (39)	639M01001	639A01001	639K01001	639L01001	639C01001	639W01001	639T01001

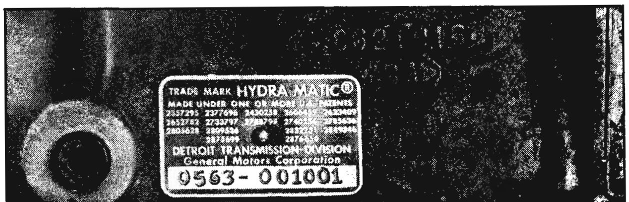
ENGINE IDENTIFICATION

Series	Engine Unit Numbers			Engine Color	Carburetor Type	Head Gasket Thickness	Compression Ratio
	Prefix Code Letter	Starting Unit No.	Suffix Code Letter				
3000 & 3100	S	200001	-	Alum.	2 bbl.	.020"	8.75:1
3000 & 3100 Export-Low Comp.	S	200001	E	Alum.	2 bbl.	.020"	8.25:1
3117 & 3167 High Comp.	S	200001	G	Alum.	4 bbl.	.020"	*10.75:1 10:25:1
3117 & 3167 Export-Low Comp.	S	200001	H	Alum.	4 bbl.	.020"	8.5 :1
3147	S	200001	T	Alum.	1 bbl.	.020"	10.25:1
*High compression ratio F-85 4 bbl. engines with Hydra-Matic Transmissions ONLY							
3200 Std. Comp.	H	001001	-	Red	2 bbl.	.020"	10.25:1
3200 Export-Low Comp.	H	001001	E	Green	2 bbl.	.040"	8.3 :1
3200 Domestic-Low Comp.	H	001001	L	Green	2 bbl.	.020"	8.75:1
3200-3500-3800 Std. Comp.	J	001001	-	Red	4 bbl.	.020"	10:25:1
3500 - 3800 Export-Low Comp.	J	001001	E	Green	4 bbl.	.040"	8.3 :1
3600 - 3900	J	001001	S	Red	4 bbl.	.020"	10.5 :1

For engine usage, refer to ENGINE IDENTIFICATION CHART.

TRANSMISSION SERIAL NUMBER

On F-85 Series, the Hydra-Matic serial number plate is attached to the right side of the transmission case, above the filler tube boss. (Fig. 1-5)

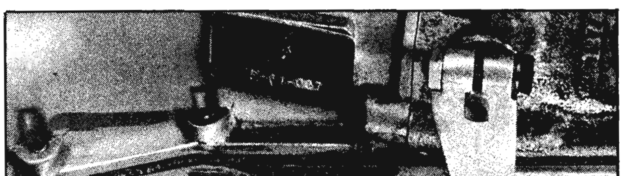


PREFIX "O" ON A DARK GREEN PLATE (0563-1001)	2 BBL. CARBURETOR (STEERING COLUMN SHIFT) 3000 AND 3100 SERIES
PREFIX "OD" ON A RED PLATE (OD563-1001)	4 BBL. CARBURETOR (STEERING COLUMN SHIFT) 3100 SERIES
PREFIX "OE" ON A PINK PLATE (OE563-1001)	4 BBL. CARBURETOR (CONSOLE SHIFT) 3100 SERIES
PREFIX "OX" ON AN ALUMINUM PLATE (OX563-1001)	TURBO-ROCKET (CONSOLE SHIFT) 3147 SERIES

Fig. 1-5 Hydra-Matic Serial Number (F-85)

On Full Size Cars, the Hydra-Matic serial number is attached to the left side of the transmission case.

The starting serial number (63-1001) is prefixed by code letters to indicate transmission usage. (Fig. 1-6)



Prefix "O" on a Black Plate (063-1001)	2 Bbl. Carb. Low Comp. & Export 3200 Series
Prefix "OC" on an Aluminum Plate (OC63-1001)	2 Bbl. Carb. Std. Compression 3200 Series
Prefix "OA" on a Dark Brown Plate (OA63-1001)	4 Bbl. Carb. Std. Compression 3200, 3500 & 3800 Series
Prefix "OB" on a Yellow Plate (OB63-1001)	4 Bbl. Carb. Std. Compression 3600 & 3900 Series
Prefix "OCH" (H. Duty) on a Taffy Tan Plate (OCH63-1001)	2 & 4 Bbl. Carb. All Except 3600 & 3900 Series

Fig. 1-6 Hydra-Matic Serial Number (Full Size Car)

NOTE: ALWAYS INCLUDE THE TRANSMISSION SERIAL NUMBER IN CORRESPONDENCE CONCERNING HYDRA-MATIC TRANSMISSIONS.

Synchromesh transmissions have a code number stamped on the case which indicates the date the unit was built.

REAR AXLE RATIOS

On F-85 Series, the rear axle ratio and date code is stamped on the right side of the housing cover.

The number or numbers following ratio code show day of year the unit was built.

EXAMPLE: A-204 = 3.08 Ratio Built on July 22

Cars with anti-spin differential will also have an ⊗ behind the date code plus an anti-spin lubrication tag attached to the filler plug. (Fig. 1-7)

On Full Size cars, the axle ratio number is stamped on the carrier casting lower locating boss. (Fig. 1-8)

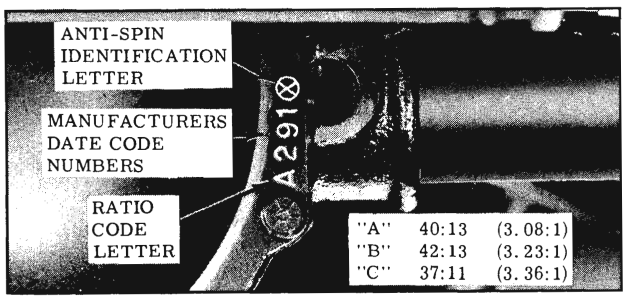
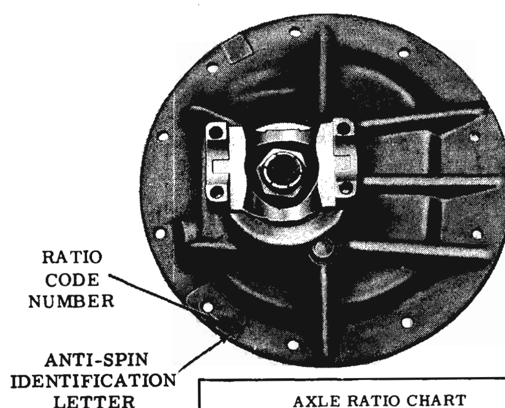


Fig. 1-7 Axle Ratio Code (F-85)



AXLE RATIO CHART	
CODE	RATIO
2	43:16 (2.69:1)
3	41:16 (2.56:1)
7	43:15 (2.87:1)
8	41:12 (3.42:1)
9	42:13 (3.23:1)
0	40:13 (3.08:1)

Fig. 1-8 Axle Ratio Code (Full Size Car)

Anti-spin differentials also have an "L" stamped next to the ratio code number and have the lubrication tag attached by a carrier to axle housing nut.

STARTING CAR WITH BATTERY FAILURE

Hydra-Matic

For safety reasons, the Hydra-Matic transmission is designed so that in the event of battery failure the engine cannot be started by pushing the car. To start a car when the battery has failed, use an auxiliary battery with jumper cables.

Synchromesh

To start the engine by pushing the car, move the gearshift lever to high gear, depress the clutch pedal and turn on ignition switch. When the vehicle reaches a speed of 10 m.p.h., release the clutch pedal slowly.

TOWING PRECAUTIONS

Always place a wooden 4" x 4" adjacent to the bumper back bars and frame cross member and a rubber mat or other suitable protector between the bumper and the tow chains or cables to prevent distortion and/or marring of the bumpers. For front end lift, place the chains or cables around the ends of the frame side rails at both sides. All models can be towed without disconnecting the propeller shaft except in the case of transmission or propeller shaft failures, the propeller shaft must be disconnected from the differential and wired to the exhaust pipe or the car must be towed with the rear wheels off the ground. If the propeller shaft is disconnected and the "U" joint bearing retaining strap is broken, wrap tape around the bearing caps to prevent loss. When towing with rear wheels off the ground, the steering wheel must be centered and held in position by a steering wheel holding clamp or by tying it to the window division channel. Tire to ground clearance should not exceed 6 inches while towing the car and "SPEED SHOULD NOT EXCEED 30 M.P.H.

HOISTING THE CAR

When supporting car on a floor jack or floor stands, the car should be supported at the suspension points only. Under no condition should the car be supported at the extreme ends of frame or on the frame side rail(s).

When using a frame contact type lift, position the contact pads to lift the frame rail at points shown in Figs. 1-9 and 1-10.

The car should not be lifted at the front or rear bumper with anything other than the bumper jack provided with the car.

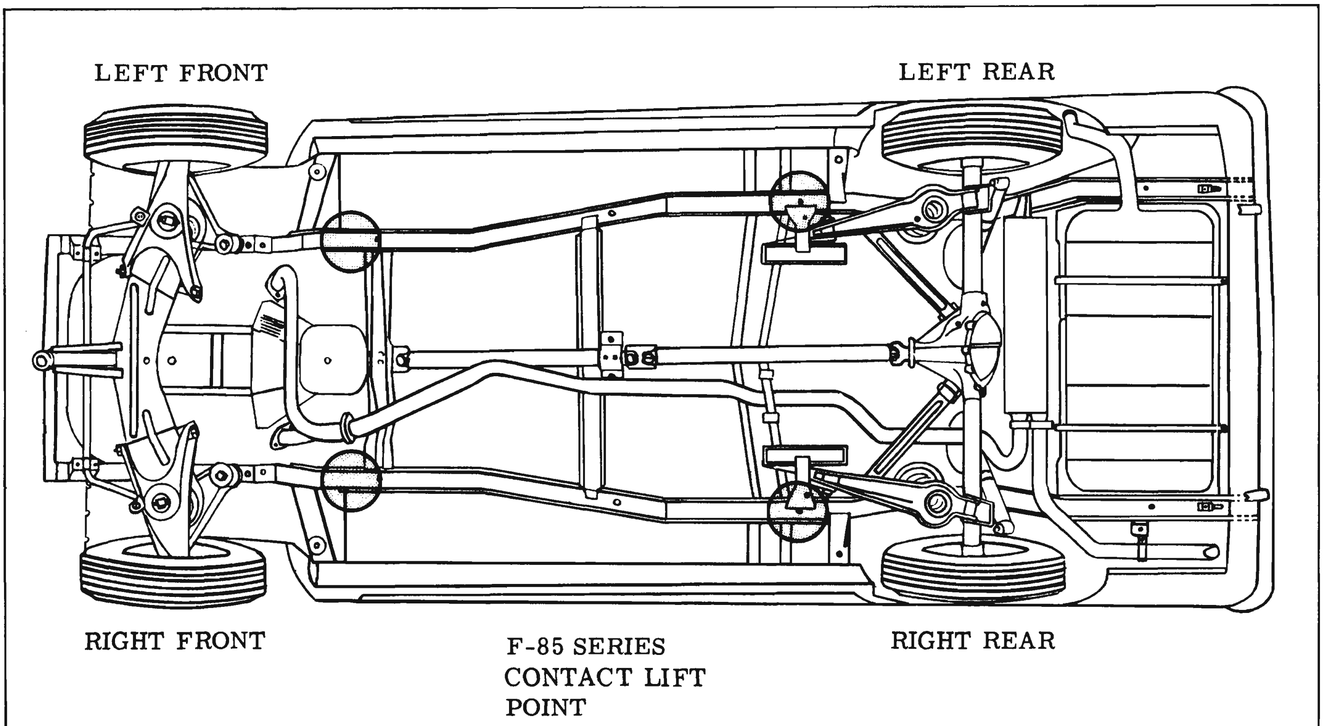


Fig. 1-9 Frame Lift Points (F-85)

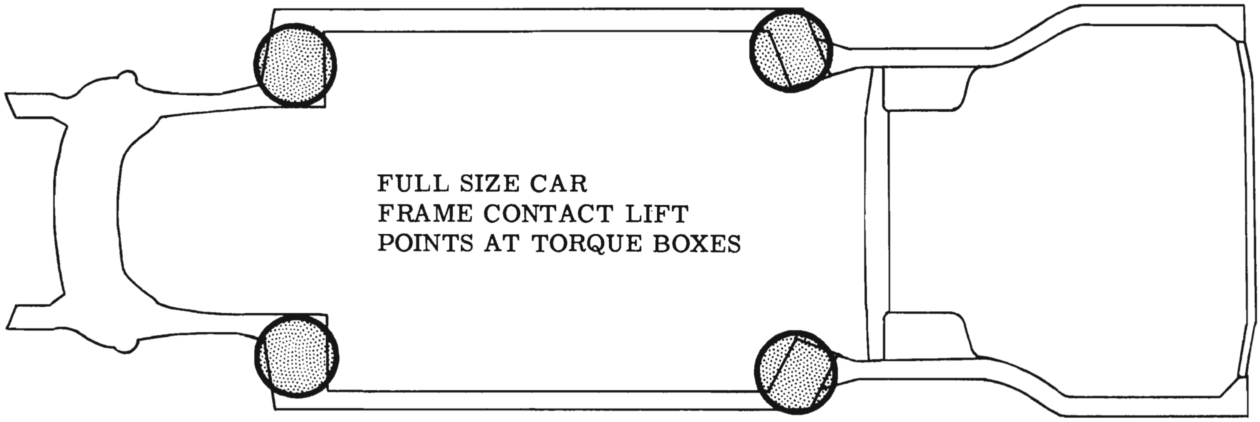


Fig. 1-10 Frame Lift Points (Full Size Car)

CAPACITIES

Item	F-85 Series	Full Size Car
Differential	2 Pts.	5 Pts.
Engine Crankcase Only, Drain and Refill	4 Qts.	4 Qts.
Engine Crankcase, Drain and Refill and Filter Change	5 Qts.	5 Qts.
Cooling System*		
With Air Conditioning	12-1/2 Qts.	22 Qts.
Without Air Conditioning	12 Qts.	20-1/4 Qts.
Gasoline Tank	16 Gal.	21 Gal.
Synchromesh Transmission - 3-Speed	2 Pts.	2-1/2 Pts.
- 4-Speed	2-1/2 Pts.	
Hydra-Matic Transmission		
Without Removing Oil Pan	4 Qts.	5-1/2 Qts.
With Oil Pan Removed	5 Qts.	6-1/2 Qts.
After Complete Overhaul	7 Qts.	9 Qts.
Power Steering		
Complete System	1 Qt.	1-3/4 Qts.
Pump Only	1 Pt.	1 Qt.

*Without Heater - Subtract - 1-1/2 Qts. on F-85 Series
Subtract - 1 Qt. on Full Size Car

RECOMMENDED TIRE PRESSURE

F-85 Series	6.50 x 13 6.00 x 15		6.50 x 14	
	Front p.s.i.	Rear p.s.i.	Front p.s.i.	Rear p.s.i.
Coupe and Sedan	*22	22	22	22
Station Wagon	*22	**24	22	22
Convertible	24	22	24	22
Jetfire	24	22	24	22

Full Size Cars	Front p.s.i.	Rear p.s.i.
Sedans and Convertibles		
88, S88 and Starfire with 8.00 x 14 Tires	24	22
88, S88 and Starfire with 8.50 x 14 Tires	22	22
88, S88 and Starfire with Air Conditioning	24	22
Starfire with 9.00 x 14 Tires	22	22
98 with 8.50 x 14 Tires or 9.00 x 14 Tires	22	22
Station Wagons		
88 and S88 with 8.00 x 14 Tires	24	**24
88 and S88 with 8.50 x 14 Tires	22	**24

*Increase to 24 p.s.i. on Air Conditioning
**For Station Wagons - When carrying heavy loads for an appreciable distance, it is recommended that rear tire pressure be increased 4 pounds to improve steering characteristics.

GENERAL SPECIFICATIONS

Series	F-85 (3000 & 3100)	"88" (3200)	Super 88 & Starfire (3500 & 3600)	"98" (3800 & 3900)
Wheel Base	112"	123"	123"	126"
Overall Length	192.4"	214.4"	214.4"	221.5"
Overall Width	73.7"	77.9"	77.9"	77.9"
Overall Height*	52.6"	56.3"	56.3"	56.3"
Tread Width				
Front	56"	62.2"	62.2"	62.2"
Rear	56"	61.0"	61.0"	61.0"
Engine Displacement	215 Cu. In.	394.1 Cu. In.	394.1 Cu. In.	394.1 Cu. In.
Compression Ratio	See Engine Identification Chart			

*Full Size Car - With 5 passenger load and 8.00 x 14 Tires
*F-85 Series - With 4 passenger load and 6.50 x 13 Tires

PERIODIC MAINTENANCE

CONTENTS OF SECTION 2

LUBRICATION CHART

ENGINE OIL CHANGE

It is recommended that an oil which, according to the label on the can, is (1) "intended for service MS" and (2) "Passes car makers' tests" or "Meets General Motors Standard GM-4745M".

The proper oil viscosity to use depends on the prevailing atmospheric temperature. The following chart will serve as a guide in selecting the proper oil viscosity.

Anticipated Lowest Temperatures	Use SAE Viscosity Number
Above Freezing (+32°F.)	SAE 10W-30, SAE 20 SAE 20W
Below Freezing (+32°F.) and above 0°F.	SAE 5W-20 SAE 10W
Below 0°F.	SAE 5W-20, SAE 5W

RECOMMENDED OIL CHANGE INTERVAL

Oil should be changed every 60 days or 6,000 miles, whichever comes first. This interval applies to the initial change as well as subsequent oil changes and is not dependent upon prevailing daylight temperature.

IMPORTANT: Certain driving conditions such as dust storms, and frequent driving on dusty roads, necessitate more frequent oil changes. If the car has been driven in a dust or sand storm, the oil and oil filter should be changed as soon as possible.

SERVICE AT TIME OF ENGINE OIL CHANGE INTERVAL OR AS INDICATED

1. Engine Oil - Drain and Refill with MS oil of proper viscosity.
2. Crankcase Breather and F-85 Choke Air Inlet Pipe Filter

   At every other oil change, more often under dusty conditions, remove filter element, wash in kerosene, dip in SAE 10W-30 oil and squeeze to remove excess oil.
3. Positive Crankcase Ventilation Valve

   At every 12,000 miles (or at the oil change period nearest to this interval), wash positive crankcase ventilation valve in kerosene and blow out hoses.

CHECK FLUID LEVEL—REPLENISH

4. Differential
   Anti-Spin . . . . Special Lubricant Part No. 531536.
   Conventional . . . . SAE 90 Multi-Purpose Lubricant meeting military specification MIL-L-2105B or lubricant Part Number 531536.
5. Brake Master Cylinder . . . GM Brake Fluid No. 11.
6. Hydra-Matic . . . . GM Hydra-Matic Fluid type "A" Suffix "A".

LUBRICATION CHART (Cont'd.)

7. Synchromesh Transmission . . . . SAE 80 Multi-Purpose Gear Lubricant.
8. Steering Gear (Power) . . . GM Hydra-Matic Fluid.
9. Steering Gear (Manual) . . . SAE 80 Multi-Purpose Gear Lubricant
10. Battery . . . . Distilled Water.
11. Radiator . . . . Inhibited Year Around Coolant or Water.

13. Linkage Pivot Points For Throttle, Transmission (HT & SM), Clutch and Parking Brake (Including felt washers at each end of the clutch release bellcrank, and the clutch pedal bellcrank). Lubricate at each oil change interval with SAE 10W-30 engine oil.

14. BODY LUBRICATION—CHECK AND LUBRICATE AS REQUIRED (Wipe Off Old Lubricant)

Gas Tank Filler Door Hinge - SAE 10W-30 engine oil.

Door Lock Striker Teeth - Light coat of stick type lubricant.

Rotary Lock - Drop or two of SAE 10W-30 oil on lock pivot. Light coat of stick type lubricant on surface of lock housing.

Door Hinge and Hold Open Assembly - Thin film of Lubriplate on friction surfaces. A drop of SAE 10W-30 oil on all pivot points.

Door Jamb Switch - Apply a thin coat of No. 630 AAW Lubriplate or equivalent to end surface of switch plunger.

Hood Hinges - SAE 10W-30 oil at pivot points.

Hood Latch - Thin film of Lubriplate on friction surface. A drop of SAE 10W-30 oil on all pivot points.

Rear Compartment Lid and Tail Gate - Apply Lubriplate 630 AAW to bolt at striker contact area.

Rear Compartment Lid Hinges and Torque Rods - Apply Lubriplate 630 AAW to hinges and torque rods at friction points. Apply silicone grease to torque rod silencer.

Tail Gate Hinges - Lubricate pivot points with SAE 10W-30 oil.

Door Bottom Drain Hole Sealing Strip, and Door Bumpers - Thin film of Silicone Weather-strip Grease.

Manual Seat Adjuster - Thin film of Lubriplate 630 AAW on seat tracks.

2, 4 and 6-Way Seats - Thin film of Lubriplate 630 AAW on jack screw.

Folding Top Linkage - Light coat of SAE 10W-30 oil on friction points. Clean and lubricate lift cylinder rods with brake fluid.

EVERY 6,000 MILES

12. Front Suspension & Steering Linkage

    F-85: Lubricate front suspension and steering linkage every 6 months or 6,000 miles, whichever occurs first. Use chassis lubricant which meets GM Standard 4751-M.

    Full Size Car: Once every six months or 6,000 miles, whichever occurs first, the steering linkage (tie rods and tie rod ends) should be lubricated, using a chassis lubricant which meets General Motors Standard 4751-M.

    The ball joint seals should be inspected for damage each six months or 6,000 miles, whichever occurs first.

15. Engine Oil Filter

    The oil filter shall be changed at the engine oil change which comes nearest 6,000 miles or 6 months.

EVERY 12,000 MILES

2. Crankcase Breather and F-85 Choke Air Inlet Filter

    At every other oil change, more often under dusty conditions, remove filter element, wash in kerosene, dip in SAE 10W-30 oil and squeeze to remove excess oil.

3. Positive Crankcase Ventilation Valve

    At every 12,000 miles (or at the oil change period nearest to this interval), wash positive crankcase ventilation valve in kerosene and blow out hoses.

10. Battery

    Clean top of battery and cable terminals. Apply a thin film of petrolatum to battery posts and clamps.

16. Distributor

LUBRICATION CHART (Cont'd.)

Lubricate Breaker Cam - Thin film of cam and ball bearing lubricant. 17. Air Cleaner (Non-Disposable Element Type) At every other oil change, more often under dusty conditions, remove filter element, wash in kerosene, dip in SAE 10W-30 oil and squeeze to remove excess oil. **EVERY 18,000 MILES** 17. Air Cleaner (Disposable Element Type) Replace element. **EVERY 24,000 MILES** 6. Hydra-Matic	Drain and refill with GM Hydra-Matic Fluid Type A. Suffix "A" 18. Speedometer Cable Lubricate lower 2/3 with Speedometer Grease. **EVERY 30,000 MILES** 12. Full Size Car - Ball Joint Lubrication After 30,000 miles, upper and lower ball joints should be serviced (clean and re-lubricate lower ball joints, re-lubricate upper ball joints). Lubricant, Part No. 585617 or equivalent, should be used for ball·joint lubrication. FOR DETAILED RECOMMENDATIONS, REFER TO CORRESPONDING NUMBERS ON FOLLOWING PAGES.

1. ENGINE CRANKCASE OIL

It is recommended that an oil which, according to the label on the can, is (1) "Intended for service MS" and (2) "Passes car makers' tests" or "Meets General Motors Standard, GM-4745M".

The proper oil viscosity to use depends on the prevailing atmospheric temperature.

The following chart will serve as a guide in selecting the proper oil viscosity.

Anticipated Lowest Temperatures	
Above Freezing (+32°F.)	SAE 10W-30, SAE 20 SAE 20W
Below Freezing (+32°F.) and above 0°F.	SAE 5W-20, SAE 10W
Below 0°F.	SAE 5W-20, SAE 5W

Recommended Oil Change Interval

Oil should be changed every 60 days or 6,000 miles, whichever comes first. This interval applies to the initial change as well as subsequent oil changes and is not dependent upon prevailing daylight temperature. An MS oil which meets General Motors Standard GM-4745M was installed in the engine at the factory.

NOTE: SAE 5W oil is not recommended for sustained high speed driving when the temperature is above 60°F.

SAE 30 oil may be used when the prevailing daylight temperature is above 90°F.

Certain driving conditions, such as dust storms and frequent driving on dusty roads, necessitate more frequent oil changes.

If higher detergency is required to reduce varnish and sludge formation, a thoroughly tested and approved concentrate - "High Detergency Concentrate" - is available.

The use of "break-in" oil, "tune-up" compounds, "friction reducing" compounds, etc. in Oldsmobile engines is specifically NOT recommended.

When changing oil, drain the crankcase after the engine has reached normal operating temperature to insure complete removal of the oil. Oil pan drain plug torque is 30 to 45 ft. lbs. on full size car series and 30 to 35 ft. lbs. on F-85 series.

Crankcase Capacity

Oil change only, 4 qts.

Oil change and filter change, 5 qts.

Oil Level (Fig. 2-1)

The engine oil dipstick, located on the left side of the engine, is marked "Full", "Add 1", and

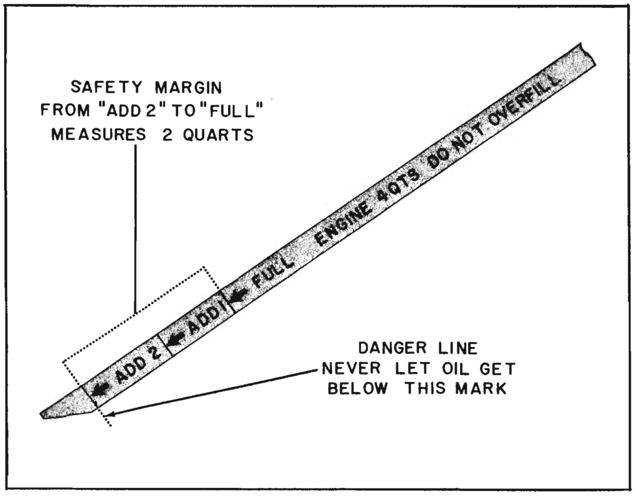


Fig. 2-1 Engine Oil Dipstick

"Add 2". The oil level should be maintained in the safety margin, neither going above the "Full" line nor under the "Add 2" line. The oil level should be checked at every refueling and oil added to maintain the proper level.

2. CRANKCASE BREATHER AND F-85 CHOKE AIR INLET PIPE FILTER

At every other oil change, more often under dusty conditions, remove filter element, wash in kerosene, dip in SAE 10W-30 oil and squeeze to remove excess oil.

F-85 Choke air Inlet Pipe Filter is located above the right hand rocker cover and rearward from the Positive Crankcase Ventilation Valve.

3. POSITIVE CRANKCASE VENTILATION VALVE

At every 12,000 miles (or at the oil change period nearest to this interval), remove the ventilation valve and hoses from engine and clean as follows:

A. Blow compressed air through both hoses.

B. Submerge valve in kerosene, slosh around in fluid. Blow compressed air through small tubing of valve assembly.

C. Clean bleed hole in connector at carburetor with 1/16" diameter wire or drill. It is not necessary to remove connector; however, if carburetor service is performed, clean out hole with kerosene and compressed air.

4. DIFFERENTIAL

Periodic or seasonal lubricant changes are not recommended. If lubricant addition is required, add:

Conventional differential: Special lubricant (Part No. 531536) or SAE 90 Multi-Purpose Gear Lubricant meeting the requirements of military specifications MIL-L-2105B.

Anti-Spin differential: Only special lubricant (Part No. 531536).

IMPORTANT: Use of other than the above mentioned type of lubricant in the Anti-Spin differential may cause chatter. If the wrong type of lubricant is used in the Anti-Spin, it will require draining the differential and installing the recommended lubricant (Part No. 531536). It may be necessary to drive Anti-Spin equipped cars for distances of 50 miles or more to allow the new lubricant to work through the plates before the chatter will disappear.

CAUTION: Always clean dirt or foreign material from around plug opening before removing filler plug.

Capacity of the differential is:

F-85 Series - 2 Pints
Full Size Cars - 5 Pints

5. SERVICE BRAKES

The fluid level in the master cylinder located at the left rear side of the engine compartment should be checked at each engine oil change interval. If necessary to add fluid, use GM Brake Fluid No. 11. On all standard and Moraine Power Brakes, the fluid level must be maintained at 1/4" below the top of the reservoir. On Bendix Power Brakes, fluid level is to be 3/4" below top of reservoir.

CAUTION: Extreme care must be exercised to prevent entry of dirt into the master cylinder.

NOTE: Brake linings should be periodically inspected for wear. The frequency of this inspection depends upon driving conditions such as traffic or terrain, and also the driving techniques of individual owners.

6. HYDRA-MATIC TRANSMISSION

GM Hydra-Matic Fluid

Hydra-Matic fluid is an all season fluid, designed for year-round operation. Only fluid with the following identification on the container should be used: brand name, including the words ". . . . Fluid Type A", plus the mark AQ-ATF and number and a letter "A" embossed on top of can as follows: "AQ-ATF-number-A",

Checking Hydra-Matic Fluid Level (Figs. 2-2 & 2-3)

Fluid level should be checked at the oil filler

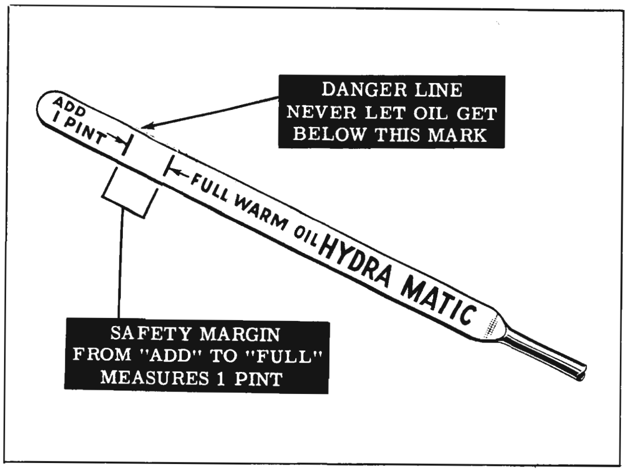


Fig. 2-2 Hydra-Matic Oil Level (F.S.C.)

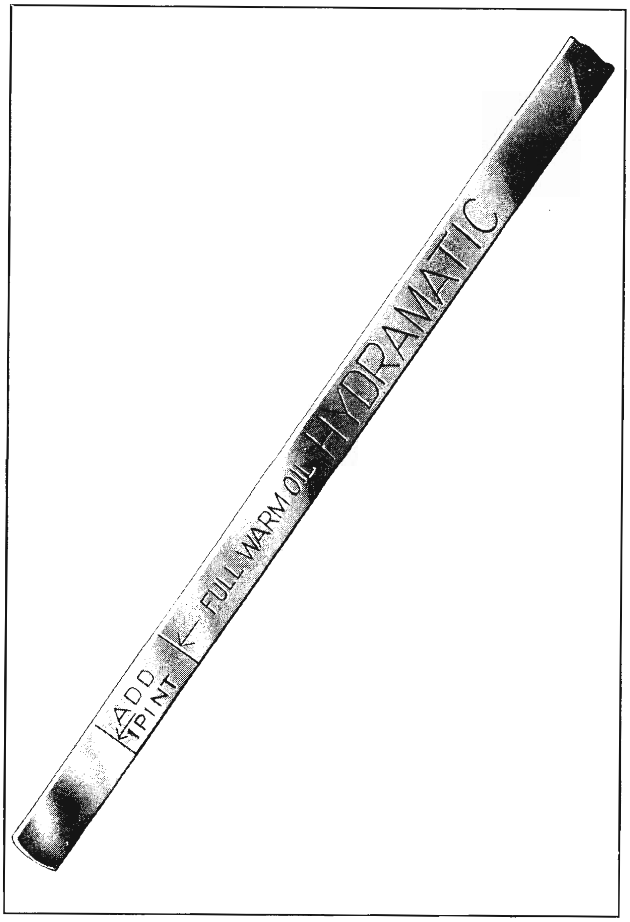


Fig. 2-3 Hydra-Matic Oil Level (F-85)

tube, located at the rear of the right exhaust manifold, at each engine oil change interval. Check must be made with the engine idling and the selector lever in the park position. Fluid level must be maintained at the full mark (transmission warm).

CAUTION: Do not fill above full mark as this will cause foaming and will result in improper operation.

Draining Hydra-Matic Transmission

The Hydra-Matic fluid should be changed every 24,000 miles.

FULL SIZE CAR

A. Remove oil filler pipe from transmission oil pan permitting fluid to drain.

B. Connect filler pipe to oil pan.

C. Add 5 quarts of Hydra Matic fluid to the transmission.

D. Put selector lever in park position and start engine. With engine running add fluid to bring level to "FULL" mark on the dipstick.

NOTE: AFTER FLUID HAS BEEN ADDED AND TRANSMISSION IS WARM, FLUID SHOULD BE CHECKED TO MAKE SURE THAT IT IS AT THE "FULL" MARK ON THE OIL LEVEL DIPSTICK. Approximately 5-1/2 quarts of oil are required to fill the Hydra-Matic transmission after the transmission has been drained. Approximately 6-1/2 quarts will be required to fill the transmission if the oil pan has been removed and drained at the same time that the fluid is changed. Approximately 9 quarts are required after an overhaul.

F-85 SERIES

A. Remove drain plug from transmission oil pan permitting fluid to drain, then replace the plug.

B. Raise hood and remove dipstick.

C. First add 3-1/2 quarts of HM fluid to the transmission.

D. With the selector lever in park position and the car on a level surface, start engine. With engine running, add fluid to bring level to "FULL" mark on the dipstick.

NOTE: Approximately 4 quarts of oil are required to fill the Hydra-Matic transmission after the transmission has been drained. Approximately 5 quarts will be required to fill the transmission if the oil pan has been removed and drained at the same time that the fluid is changed. AFTER FLUID HAS BEEN ADDED AND THE TRANSMISSION IS WARM, LEVEL SHOULD BE CHECKED TO MAKE SURE THAT IT IS AT THE "FULL" MARK ON THE OIL LEVEL DISPTICK. Approximately 7 quarts are required after an overhaul.

7. SYNCHROMESH TRANSMISSION

Remove the filler plug from the transmission case and fill to the level of the opening with SAE 80 Multi-Purpose Gear Lubricant. The lubricant level should be checked at each engine oil change interval. Periodic or seasonal change of lubricant is not recommended.

CAUTION: Always clean dirt or foreign material from around plug before removing.

CAPACITIES OF TRANSMISSIONS ARE AS FOLLOWS:

Full Size Cars . . . . 2-1/2 Pints

F-85 (3 Speed) . . . . 2 Pints
(4 Speed) . . . . 2-1/2 Pints

8. POWER STEERING GEAR AND PUMP

Check at each engine oil change interval and maintain oil level at "full" mark. Oil must be warm when checking oil level. Use Hydra-Matic Transmission Fluid. Power steering gear lubrication is accomplished by the oil supplied to the gear by the power steering pump.

Capacities Of The Power Steering Units Are:

COMPLETE SYSTEM

Full Size Car . . . . 1-3/4 Qts.
F-85 Series . . . . 1 Qt.

PUMP ASSEMBLY

Full Size Car . . . . 1 Qt.
F-85 Series . . . . Approx. 3/4 Qt.

9. MANUAL STEERING GEAR

Check steering gear lubricant level at each engine oil change interval. The necessity for frequent addition of lubricant indicates leakage and the source of leakage must be found and corrected. Use SAE 80 Multi-Purpose Gear Lubricant. Regular or seasonal changes are unnecessary.

10. BATTERY

Check battery liquid level at each engine oil change interval or once a month or more often, when refueling, in hot weather. Level should reach the bottom of the split ring in the vent well.

CAUTION: DO NOT OVERFILL.

Clean top of battery and terminals every 12,000 miles and check tightness of battery hold-down bolt. To properly clean battery:

A. Make sure vent plugs are closed tight.

B. Remove battery cables from battery.

C. Clean battery with a diluted ammonia or soda solution. When the solution stops foaming, rinse with clear water.

D. Clean battery cable clamps with a wire brush and diluted ammonia or soda and rinse with clear water. Apply a thin coating of petrolatum to terminals and clamps, after installing clamps.

11. COOLING SYSTEM

The coolant should be kept at a level below top of filler neck seat as follows:

3/4" - Coolant Cold

1/4" - Coolant Hot

The cooling system should be periodically inspected for leaks and where found, corrected.

The cooling system is designed for use of a highly inhibited "year around" ethylene-glycol solution both summer and winter.

Once a year, the system should be drained completely and refilled using a minimum of five (5) quarts of "year around" ethylene-glycol Part No. 982209 or equivalent ethylene-glycol coolant labeled as meeting specification GM1899-M(CA-1).

On full size car series, if water is installed for warm weather use, it is essential to use a highly effective corrosion inhibitor and water pump lubricant Part No. 985659. If any other inhibitor is used, it must meet GM 1894-M specifications and be identified as such on can label.

In areas where temperature necessitates additional protection, add "year around" ethylene-glycol solution, Part No. 982209 or equivalent, labeled as meeting specification GM 1899-M (CA-1).

The following charts will serve as a guide in servicing the cooling system:

F-85 SERIES

Qts. of Ethylene-Glycol year-around coolant Part No. 982209 or equivalent	5 (min. req.)	6	7
Temperature Protection Point	-12°F	-29°F	-51°F

FULL SIZE CAR SERIES

Qts. of Ethylene-Glycol year-around coolant Part No. 982209 or equivalent		5	6	7	8	9	10	11
Temperature Protection Point	Without Air Conditioning	$10^{o}F$	$4^{o}F$	$-4^{o}F$	$-12^{o}F$	$-23^{o}F$	$-35^{o}F$	$-48^{o}F$
	With Air Conditioning	$12^{o}F$	$8^{o}F$	$1^{o}F$	$-5^{o}F$	$-14^{o}F$	$-23^{o}F$	$-35^{o}F$

12. FRONT SUSPENSION AND STEERING LINKAGE

On F-85 series, the front suspension and steering linkage should be lubricated every 6 months or 6,000 miles, whichever occurs first, using a chassis lubricant which meets General Motors Standard 4751-M.

F-85 lubrication fitting locations are listed below.

Lower Control Arm Pivot Shafts	4 Points
Lower Control Arm Ball Joints	2 Points
Upper Control Arm Pivot Shafts	4 Points
Upper Control Arm Ball Joints	2 Points
Tie Rod Ends	2 Points
Steering Idler Arm Bushing	1 Point
Relay Rod	2 Points

Full Size Car: Once every six months or 6,000 miles, whichever occurs first, the steering linkage (tie rods and tie rod ends) should be lubricated, using a chassis lubricant which meets General Motors Standard 4751-M.

The ball joint seals should be inspected for damage each six months or 6,000 miles, whichever occurs first.

30,000 Mile Ball Joint Lubrication

After 30,000 Miles, upper and lower ball joints should be serviced (clean and re-lubricate lower ball joints, re-lubricate upper ball joints). Lubricant, Part No. 585617 or equivalent, should be used for ball joint lubrication.

Lubricating Full Size Car Ball Joints

Lower Ball Joint

A. Support lower control arm and disconnect ball joint from steering knuckle.

B. Clean exterior of ball joint.

C. For Inland joints, drive seal retaining ring from ball joint and remove seal.

For Saginaw joint, pry garter spring from bottom of seal, then remove garter spring and seal.

NOTE: Inspect seal and retainer or spring; if damaged, use new parts upon reassembly.

CAUTION: Exercise care while performing the following operations to prevent entry of dirt into the ball joints.

D. Clean joint pivot and stud thoroughly and wipe out as much old grease as possible.

E. Remove plug from ball joint cover.

F. Using a hand operated ball type nozzle grease gun, filled with ball joint grease Part No. 585617, lubricate ball joint until clean grease fills the ball joint reservoir.

G. Reinstall plug in ball joint cover, then clean grease from ball joint stud and sealing area with a clean dry cloth.

H. Apply a thin film of ball joint grease to outside area of seal to aid installation of Tool J-8761 (Inland) or garter spring installer J-6119 (Saginaw).

I. The saw tooth area of the seal that fits around the ball stud should be coated with ball joint grease.

J. For Saginaw type, stretch garter spring around Tool J-6119. Do not stretch garter spring any more than necessary when installing on tool. Place seal on ball joint and install garter spring in place.

For Inland type, place seal inside of seal installing Tool J-8761, drive seal onto ball joint. Make sure that seal is driven on squarely without cocking. (For illustrations, refer to Front Suspension Section)

K. Reassemble ball joint stud to steering knuckle. Torque stud nut to 70 ft. lbs. (minimum)

Upper Ball Joint

A. Support lower control arm and disconnect upper ball joint from steering knuckle.

B. Clean exterior of ball joint.

C. Remove plug from ball joint cover.

D. Using a hand operated ball type nozzle grease gun, filled with ball joint grease Part No. 585617, lubricate ball joint until clean grease starts to appear from the seal.

E. Replace plug in ball joint cover.

F. Squeeze out all the grease possible from beneath the seal. Then wipe ball stud with dry clean cloth to remove the grease.

G. Reassemble to steering knuckle and torque to 40 ft. lb. (minimum).

13. LINKAGE PIVOT POINTS FOR THROTTLE, TRANSMISSION (HT & SM) CLUTCH AND PARKING BRAKE

At each engine oil change interval, all friction and bearing surfaces in the linkage for the throttle, transmission (HT & SM) clutch and parking brake should be lubricated with SAE 10W-30 oil. Ball and socket in the throttle linkage should be lubricated with special lubricant, Part No. 567196, only whenever they are disassembled.

14. BODY LUBRICATION

Door Lock Striker

Wipe off dirt and apply a thin coat of stick type lubricant to top surface of lock bolt striker teeth indicated in Fig. 2-4. After lubrication, close

Fig. 2-4 Door Lock Striker Lubrication

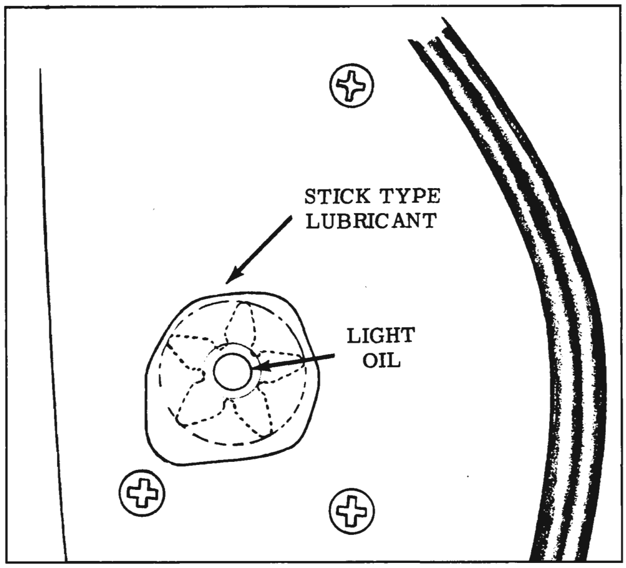


Fig. 2-5 Door Lock Rotary Bolt Lubrication

door several times and remove excess lubricant along the side edge of teeth.

Door Locks

Wipe off dirt and apply a thin coat of stick type lubricant and oil as indicated in Fig. 2-5.

Door Hinge and Hold Open Assembly

Wipe off dirt and apply a light coat of Lubriplate 630 AAW or its equivalent at points indicated in Fig. 2-6 thru 2-9. The hinge pins should be lubricated with SAE 10W-30 oil.

Door Jamb Switch

Apply a thin coat of No. 630 AAW Lubriplate or equivalent to end surface of switch plunger.

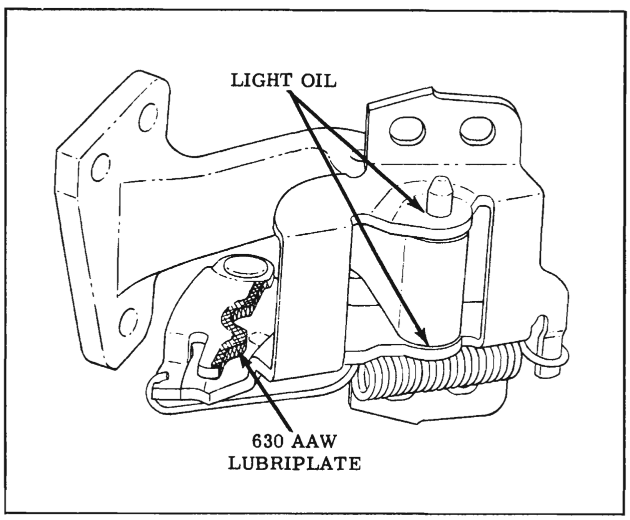


Fig. 2-6 Front Door Hinge (F.S.C.)

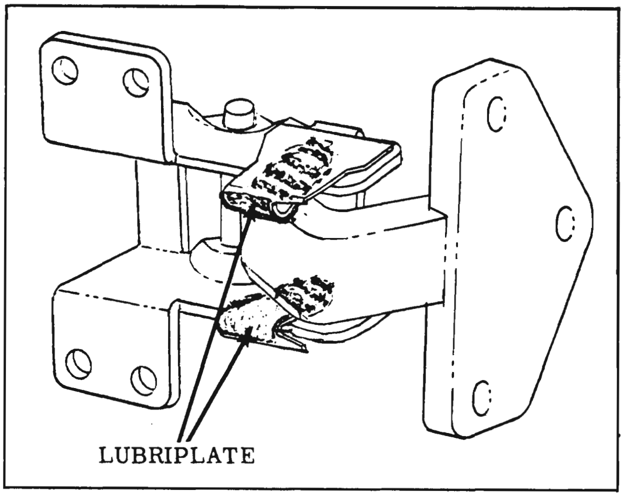


Fig. 2-7 Front Door Hinge (F-85)

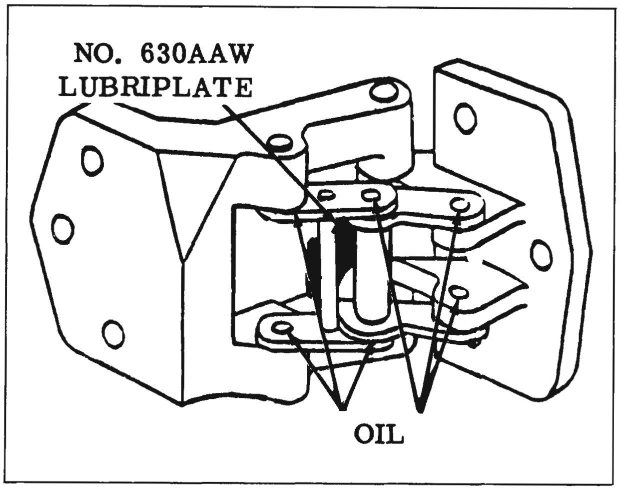


Fig. 2-8 Rear Door Hinge (F.S.C.)

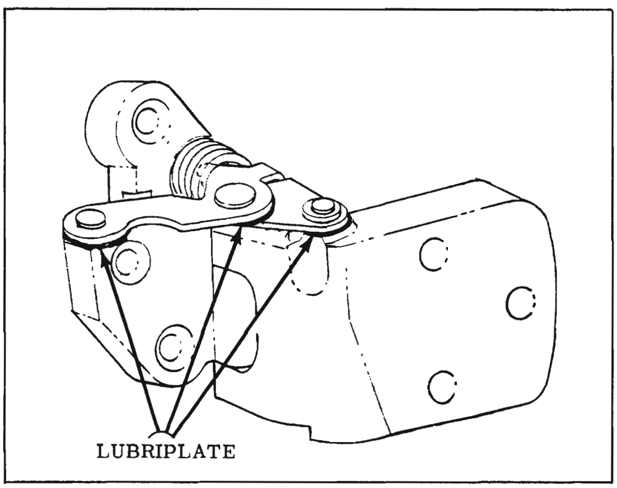


Fig. 2-9 Rear Door Hinge (F-85)

Hood Hinges

SAE 10W-30 oil should be used to lubricate the hood hinges, care being taken not to allow the oil to drop on fenders or other exposed painted surfaces.

Hood Latch

Lubricate the latch pilot bolts and latch locking plates with a thin film of No. 630 AAW Lubriplate. Use a light oil for pivot points.

Gas Tank Filler Door Hinge

Apply a few drops of SAE 10W-30 oil to friction points of door hinge. Work door several times and wipe off excess lubricant.

Rear Compartment Lid and Tail Gate Locks

On rear compartment lid locks, apply a thin film of Lubriplate 630 AAW or its equivalent. (Fig. 2-10)

On tail gate locks, apply a thin film of Lubriplate 630 AAW or its equivalent to the bolt at the striker contact areas.

Rear Compartment and Tail Gate Lock Cylinders

A small quantity of lock lubricant occasionally applied to the lock cylinders will prevent sticking.

Rear Compartment Lid Hinges and Torque Rods

Apply Lubriplate 630 AAW or equivalent to hinges and torque rods at friction points.

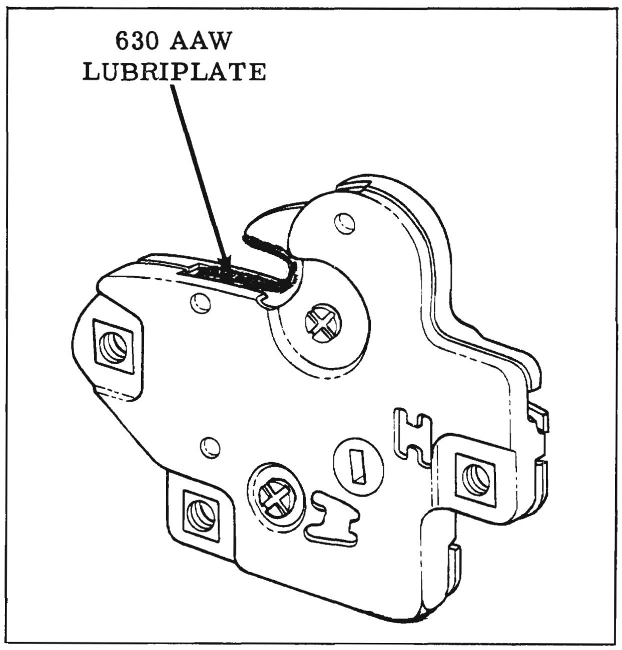


Fig. 2-10 Rear Compartment Lock Bolt

Tail Gate Hinges

The hinges should be lubricated lightly at all pivot points with SAE 10W-30.

Weatherstrip and Door Bumpers

A thin film of silicone lubricant can be used on all weatherstrips, door bumpers, hood and lacings to prevent squeaking.

Front Seat Adjuster Mechanism

MANUAL SEAT

A thin film of Lubriplate 630 AAW or its equivalent should be applied to the seat tracks as needed.

Seat Adjuster Locking Wire Retainer

Wipe off dirt and apply No. 630 AAW Lubriplate or equivalent to frictional area of retainer indicated in Fig. 2-11.

2, 4 and 6-Way Electric Seats

Thoroughly wipe off old lubricant, to clean jack screw. Apply a thin film of Lubriplate 630 AAW or its equivalent to jack screw being careful not to soil seat trim. Operate the seat adjuster to limit of all positions. Apply a small amount of oil to linkage. Wipe off excess lubricant.

Folding Top Linkage (Convertible)

Apply a sparing amount of light oil to bearing points indicated in Fig. 2-12. Wipe off excess lubricant to prevent soiling trim.

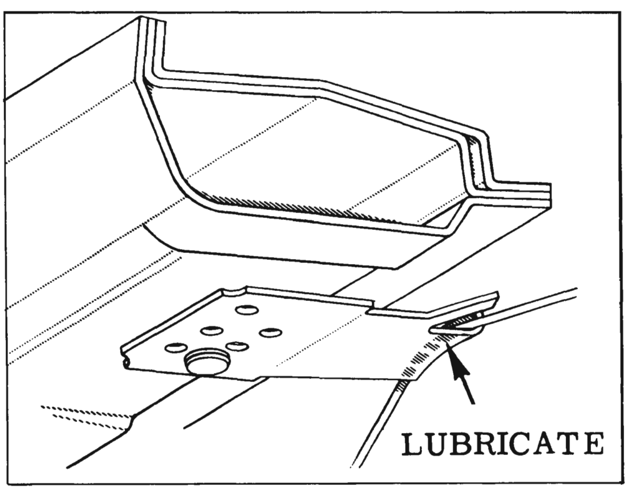


Fig. 2-11 Seat Adjuster Locking Wire Retainer

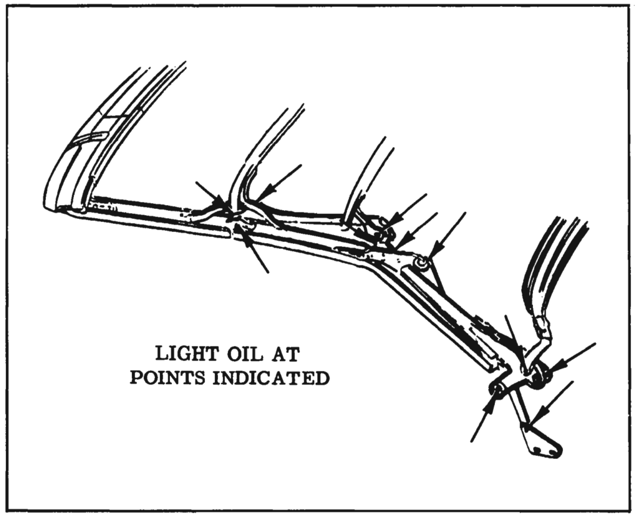


Fig. 2-12 Folding Top Linkage

Folding Top Lift Cylinder Piston Rods

With folding top in raised position, wipe exposed portion of each top lift cylinder piston rod with a cloth dampened with brake fluid to remove any oxidation or accumulated grime. With another clean cloth, apply a light film of brake fluid to the piston rod to act as a lubricant.

NOTE: Use caution so that brake fluid does not come in contact with any painted or trimmed parts of the body.

Sunshade Rod

Remove sunshade from support and apply a thin film of stick type lubricant to end of sunshade rod Fig. 2-13.

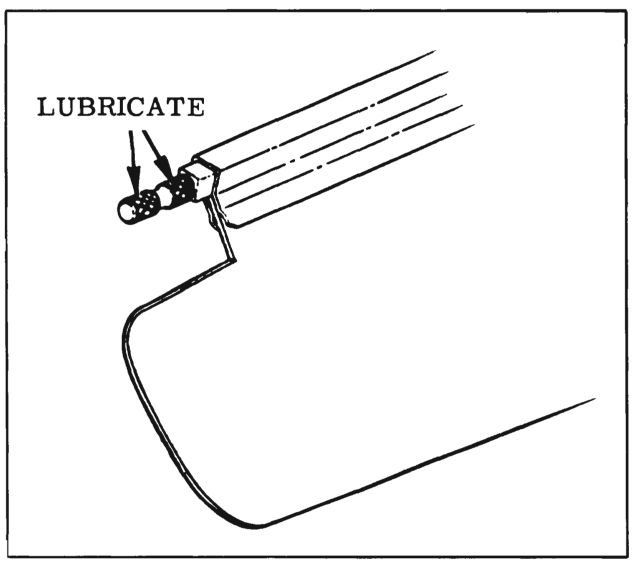


Fig. 2-13 Sunshade Rod

15. OIL FILTER

The full flow oil filter filters 100% of the oil delivered by the oil pump. For this reason, the interval of change is very important. The oil filter shall be changed at the engine oil change which comes nearest 6,000 miles, or 6 months, whichever occurs first. Operating conditions may require more frequent replacement.

Replace Oil Filter as Follows:

A. Loosen filter with wrench, then remove and discard filter.

B. Clean out filter body casting.

C. With a new seal seated on face of new filter, install filter and tighten 15 to 17 ft. lbs.

D. Add oil, start engine and check for leaks.

16. DISTRIBUTOR

The breaker cam should be lubricated with a thin film of Ball Bearing Lubricant every 12,000 miles or whenever the contact assembly is replaced. No other lubrication is required.

17. AIR CLEANER

Non-Disposable Type

At every other oil change, more often under dusty conditions, remove filter element, wash in kerosene, dip in SAE 10W-30 oil and squeeze to remove excess oil.

Disposable Element Type

This air cleaner incorporates a disposable air filter element. The outside surface of the element is covered with a coarse material for primary filtering of large particles. The inner surface is less porous material for filtering fine particles. Soft plastic flanges are used as self contained gaskets which seal the air cleaner body and cover. Therefore, all air must pass through the filter element.

The air filter element should be replaced every 18,000 miles under normal driving conditions, and more frequently under dusty driving conditions. Do not attempt to service the element.

The filter element should be replaced as follows:

A. Remove air cleaner assembly to prevent dirt from falling into carburetor.

B. Remove filter element from air cleaner.

C. Clean dust and dirt from metal surfaces of air cleaner body and install new filter element.

D. Install air cleaner assembly on carburetor.

18. SPEEDOMETER CABLE

The cable should be lubricated every 24,000 miles. Apply a coating of Speedometer Cable Grease to the lower two-thirds of the cable only. This will properly lubricate the upper one-third of the casing giving an even coating of lubricant the full length of the flexible cable, without danger of excess grease working up into the speedometer head.

NOTE: Care must be exercised to prevent entrance of dirt into the speedometer casing.

HYDRA-MATIC

(4-S)

(FULL SIZE CAR)

CONTENTS OF SECTION 3

PERIODIC MAINTENANCE

The fluid level should be checked at every engine oil change interval and should be changed at 24,000 mile intervals. The fluid level should be checked with the selector lever in "Park" position, the engine running at idle speed and the car on a level surface. The oil level indicator and filler tube are located under the hood at the right rear corner of the engine.

Approximately 5-1/2 quarts of oil are required to fill the Hydra-Matic transmission after the transmission has been drained. Approximately 6-1/2 quarts will be required to fill the transmission if the oil pan has been removed and drained at the same time that the fluid is changed. Approximately 9 quarts are required after an overhaul.

When changing the transmission oil, add 5 quarts, start the engine, and add oil to bring fluid level to the "Full" mark on the oil level indicator.

Fluid only with the following identification on the container should be used: brand name, including the words ". . . . Fluid Type A, plus the mark "AQ-ATF" - number and a letter "A" embossed on the top of the can as follows: "AQ-ATF - number - A".

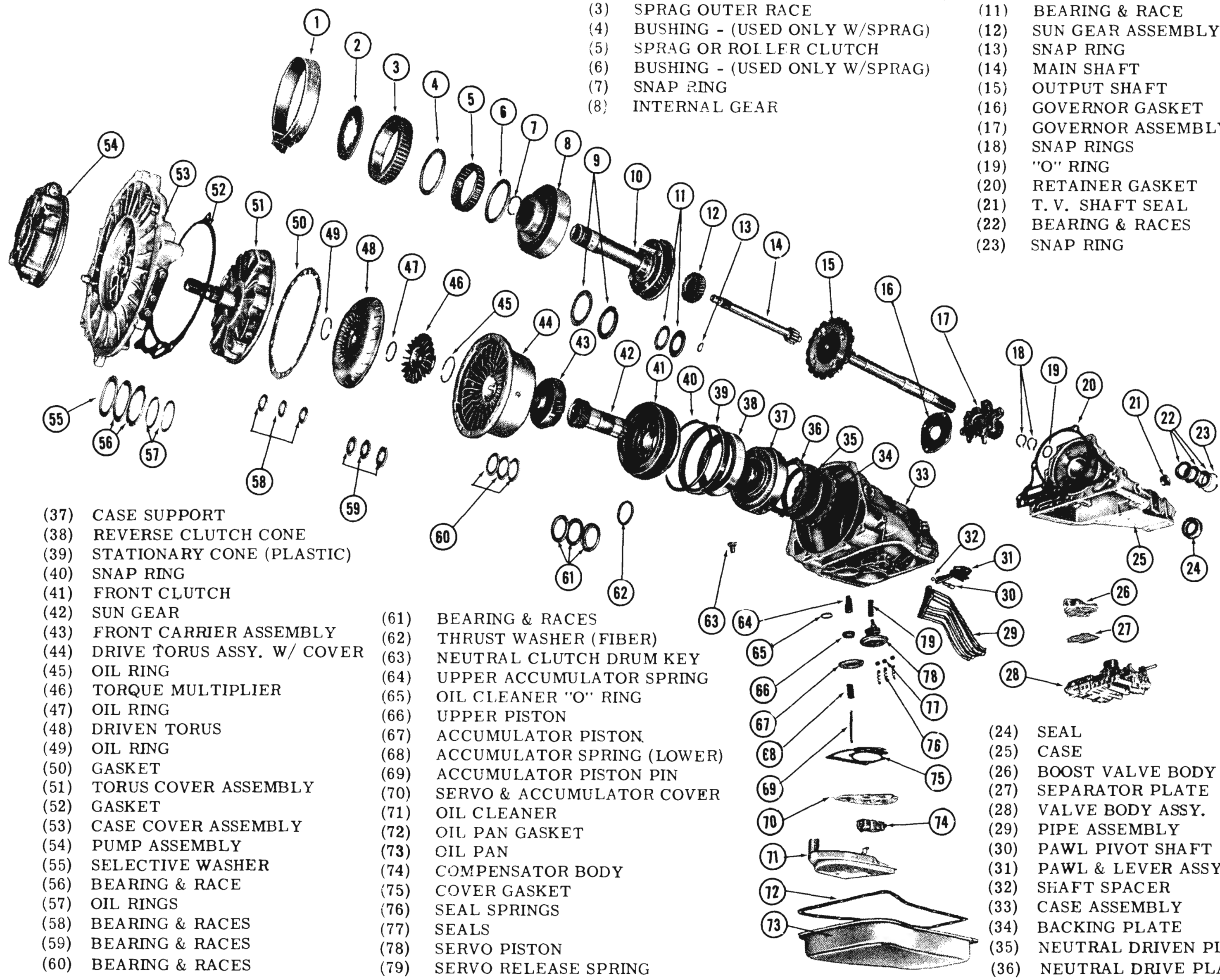
TRANSMISSION OPERATION

OPERATION IN DRIVE RANGE

The transmission offers three selective drive ranges, "D", "S" and "L". In "D" range, the transmission starts in first and shifts automatically to second, third and fourth.

With the selector lever in "S" range, the transmission will shift to third and remain in third until approximately 70 to 82 M.P.H., regardless of throttle opening. This provides additional acceleration for long hills or traffic driving, as well as engine braking power when descending long grades. When car speed reaches approximately 70 to 82 M.P.H. the transmission automatically upshifts to fourth. If the car speed decreases to approximately 65 to 78 M.P.H., the transmission will automatically downshift to third.

With the selector lever in "L" range, the transmission will not shift beyond second regardless of throttle opening or car speed. "L" range is



(1) BAND
(2) RETAINER - (USED ONLY W/SPRAG)
(3) SPRAG OUTER RACE
(4) BUSHING - (USED ONLY W/SPRAG)
(5) SPRAG OR ROLLER CLUTCH
(6) BUSHING - (USED ONLY W/SPRAG)
(7) SNAP RING
(8) INTERNAL GEAR
(9) THRUST BEARING RACE
(10) REAR CARRIER ASSEMBLY
(11) BEARING & RACE
(12) SUN GEAR ASSEMBLY
(13) SNAP RING
(14) MAIN SHAFT
(15) OUTPUT SHAFT
(16) GOVERNOR GASKET
(17) GOVERNOR ASSEMBLY
(18) SNAP RINGS
(19) "O" RING
(20) RETAINER GASKET
(21) T. V. SHAFT SEAL
(22) BEARING & RACES
(23) SNAP RING
(24) SEAL
(25) CASE
(26) BOOST VALVE BODY ASSY.
(27) SEPARATOR PLATE
(28) VALVE BODY ASSY.
(29) PIPE ASSEMBLY
(30) PAWL PIVOT SHAFT
(31) PAWL & LEVER ASSY.
(32) SHAFT SPACER
(33) CASE ASSEMBLY
(34) BACKING PLATE
(35) NEUTRAL DRIVEN PLATE
(36) NEUTRAL DRIVE PLATE
(37) CASE SUPPORT
(38) REVERSE CLUTCH CONE
(39) STATIONARY CONE (PLASTIC)
(40) SNAP RING
(41) FRONT CLUTCH
(42) SUN GEAR
(43) FRONT CARRIER ASSEMBLY
(44) DRIVE TORUS ASSY. W/ COVER
(45) OIL RING
(46) TORQUE MULTIPLIER
(47) OIL RING
(48) DRIVEN TORUS
(49) OIL RING
(50) GASKET
(51) TORUS COVER ASSEMBLY
(52) GASKET
(53) CASE COVER ASSEMBLY
(54) PUMP ASSEMBLY
(55) SELECTIVE WASHER
(56) BEARING & RACE
(57) OIL RINGS
(58) BEARING & RACES
(59) BEARING & RACES
(60) BEARING & RACES
(61) BEARING & RACES
(62) THRUST WASHER (FIBER)
(63) NEUTRAL CLUTCH DRUM KEY
(64) UPPER ACCUMULATOR SPRING
(65) OIL CLEANER "O" RING
(66) UPPER PISTON
(67) ACCUMULATOR PISTON
(68) ACCUMULATOR SPRING (LOWER)
(69) ACCUMULATOR PISTON PIN
(70) SERVO & ACCUMULATOR COVER
(71) OIL CLEANER
(72) OIL PAN GASKET
(73) OIL PAN
(74) COMPENSATOR BODY
(75) COVER GASKET
(76) SEAL SPRINGS
(77) SEALS
(78) SERVO PISTON
(79) SERVO RELEASE SPRING

Fig. 3-1 Hydra-Matic

designed for engine braking when descending steep grades. It may also be used to hold the car in second for maximum pulling power.

PART THROTTLE DOWNSHIFT— FOURTH TO THIRD

A part throttle downshift can be made any time the transmission is in fourth and the car speed is below approximately 35 M.P.H. Since this downshift will occur at part throttle opening, the advantage of third stage power is obtained without a wide open throttle. This feature is desirable in traffic conditions where a wide open throttle would be unnecessary.

FORCED DOWNSHIFTS (Detent)

In "D" range the transmission can be downshifted from fourth to third, and from third to second within set speed ranges. In "S" range a third to second forced downshift can be made within a set speed range. A warning "feel" on the accelerator pedal makes it possible for the driver to obtain full throttle performance with or without downshift, as desired.

CLOSED THROTTLE DOWNSHIFTS

DRIVE RANGE

When the transmission is in fourth "Drive" range and the driver takes his foot off the accelerator, the transmission will automatically downshift from fourth to second at approximately 7 M.P.H.

SUPER RANGE

When the transmission is in fourth "Super Range" (over 75 M.P.H.) and the driver takes his foot off the accelerator, the transmission will automatically downshift from fourth to third at approximately 75 M.P.H. and downshift from third to second at approximately 7 M.P.H.

LOW RANGE

If the car is being driven in "Low" range, the transmission will not upshift to third.

If the car is being driven in "Super" range and the driver moves the selector lever to "Low" range and takes his foot off the accelerator, the transmission will automatically downshift from third to second at approximately 35 M.P.H.

If the car is being driven in "Drive" range (above 75 M.P.H.) and the driver moves the selector lever to "Low" range and takes his foot off the accelerator, the transmission will automatically downshift from fourth to third at approximately 70 M.P.H. and from third to second at approximately 35 M.P.H.

REVERSE

Reverse is accomplished through use of a friction clutch applied by oil pressure and designed for ease in "rocking" the car. A reverse blocker piston prevents movement of the selector lever to the "Reverse" position above 13 M.P.H.

PARKING

The Hydra-Matic indicator has a "Park" (P) position which is desirable for parking and starting the car when on an incline. The engine can also be started with the selector lever in the "Neutral" (N) position.

With the selector lever in "Park" position, a parking pawl engages with lugs on the output shaft flange and locks the output shaft to the transmission case. A detent in the steering column prevents accidental movement of the selector lever to the "Park" position.

STALL TESTING

Under NO condition should the transmission be "stall tested" because the excessive heat developed will damage the unit.

VALVES AND THEIR FUNCTIONS

PRESSURE REGULATOR VALVE

The pressure regulator valve controls line pressure by regulating the output of the pump. This valve is constructed with two areas where pressures can be applied to overcome regulator spring force which in turn either increases or decreases the line pressure. (Fig. 3-2)

THROTTLE VALVE

The throttle valve regulates to obtain a pressure proportional to carburetor opening by the throttle valve spring and T.V. plunger which is operated

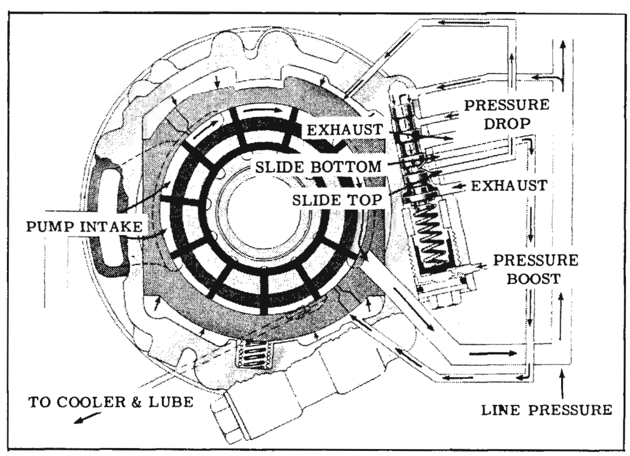


Fig. 3-2 Pressure Regulator Valve and Pump

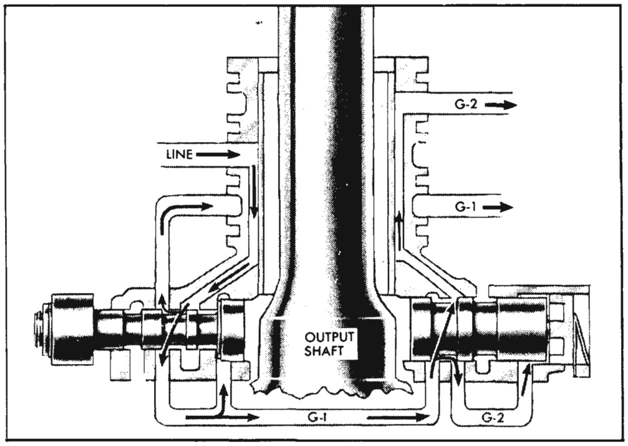


Fig. 3-3 Governor Assembly

mechanically by the throttle linkage. The T.V. pressure decreases when the oil temperature goes below approximately 75°F. This is accomplished by a bimetal thermostatic element which contacts the throttle valve at temperatures less than 75°F, and opposes the force of the regulator spring.

GOVERNOR

The governor contains two valves, of different weight, which rotate with the output shaft permitting each valve to produce a different pressure proportional to the vehicle speed. G-1 pressure operates at low speeds and G-2 pressure at the higher speeds. (Fig. 3-3)

MANUAL VALVE

The manual valve distributes pressures to place the transmission in either neutral, drive range, super range, low range, or reverse. It is controlled mechanically, through linkage, by the selector lever.

2-3 SHIFT VALVE

The 2-3 shift valve provides for the 2-3 and 3-2 shifts and is actuated by T.V. and G-1 governor pressures.

3-4 SHIFT VALVE

The 3-4 shift valve provides the 3-4 and 4-3 shifts and is actuated by T.V. and both G-1 and G-2 governor pressures.

COUPLING FEED LIMIT VALVE

This valve is located in the pump body and provides a direct feed to the coupling from the pump in neutral, first, second and reverse. It is controlled by coupling signal pressure but opens only when coupling signal pressure is greater than 70 psi.

COUPLING EXHAUST VALVES

The coupling exhaust valves are located in the torus cover assembly and they seal the coupling exhaust ports whenever coupling signal pressure is directed to close them.

COUPLING TIMING VALVE

The coupling timing valve controls the exhaust and fill of the coupling. It is controlled by front clutch pressure on the 2-3 shift and delays the exhaust of the coupling until clutch capacity is sufficient to carry the torque. On a 3-4 shift it is controlled by 3-4 pressure and shifts immediately after the 3-4 shift valve.

PRESSURE BOOST VALVE

The pressure boost valve controls the flow of oil to the line boost area of the pressure regulator valve. It is shifted by front clutch pressure and is timed to move after the clutch has assumed the torque.

PRESSURE DROP VALVE

The pressure drop valve controls the flow of oil to the line drop area of the pressure regulator valve. It provides a varying pressure inversely proportional to T.V. pressure which results in a modulated line pressure.

3-2 DOWNSHIFT VALVE

The 3-2 downshift valve regulates the exhaust of the front clutch on throttle 3-2 downshifts. It is designed to gradually release the clutch while the coupling is being filled to prevent a sudden increase in engine RPM.

FRONT CLUTCH EXHAUST VALVE

The front clutch exhaust valve controls the release of the front clutch during a throttle 3-2 downshift. It provides a wide open clutch exhaust when coupling pressure is sufficient.

TV PLUNGER

The T.V. plunger provides the part throttle 4-3 and the detent 4-3 and 3-2 shifts, and also provides accelerator pedal assist. It is operated mechanically by the T.V. linkage.

REVERSE BLOCKER VALVE

The reverse blocker valve prevents a shift into reverse at speeds above 13 M.P.H. It is controlled by G-1 pressure and provides a mechanical stop for the manual linkage.

3-2 CUTOFF VALVE

The 3-2 cutoff valve is controlled by T.V. pressure and shifts at about 28 psi. It provides an immediate exhaust of front clutch oil on closed throttle 3-2 downshifts and provides a source for 3-4 boost pressure on light 3-4 upshifts.

3-4 BOOST VALVE

The 3-4 boost valve provides 3-4 boost pressure on light throttle 3-4 upshifts to momentarily increase pump pressure until the coupling reaches sufficient pressure.

NEUTRAL CLUTCH VALVE

The neutral clutch valve regulates neutral clutch apply oil to satisfy various throttle opening conditions. This results in a slow neutral clutch fill with a light throttle and a quick fill for a heavy throttle, insuring a smooth but firm clutch application under all conditions.

OVERRUN BAND AND SERVO

The overrun band and servo are used to obtain engine braking when coasting in first, second or third with the selector lever in super or low speed range position. To prevent the transmission from overrunning, the overrun band assembly is applied to the rear unit internal gear thus holding the rear internal and front unit sun gears stationary for the desired braking.

An overrun band servo is used to apply and release the overrun band.

FIRST STAGE

Band apply pressure acts against the servo piston moving the piston, servo springs, retainer and piston pin against the release spring to start the application of the band. When the band has been applied to the rear internal gear it begins to offer resistance to the travel of the piston pin.

SECOND STAGE

As band apply pressure continues to build up under the piston, the piston begins to travel up on the piston pin against the force of the servo springs. The piston then moves away from the washer which allows a small portion of the band apply pressure to bleed to exhaust through the bleed hole in the piston. Overrun band apply pressure under the piston then continues to build up at a slower rate and causes a greater force to be applied to the band. (Fig. 3-4)

THIRD STAGE

When the piston travels up far enough to contact the servo spring retainer, the bleed hole is sealed off again. This allows the band apply pressure to

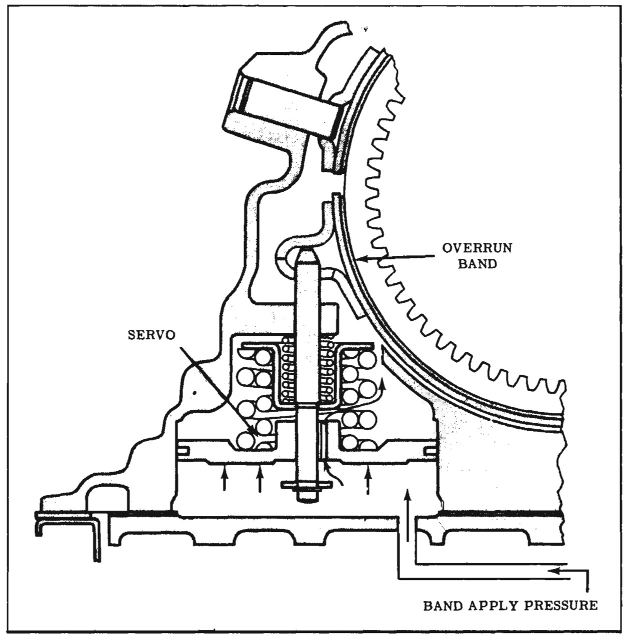


Fig. 3-4 Overrun Band and Servo

build up quickly again and causes the piston to apply its full force directly against the servo spring retainer and piston pin to give the final full apply force.

The design of the servo is such as to provide for a smooth gradual apply of the band under all driving conditions and oil pressures.

COMPENSATOR VALVES (Fig. 3-5)

The compensator valves are regulated by T.V. pressure and supply compensator pressure to control the front clutch accumulator.

3-STAGE COMPENSATOR VALVE ("O", "OC" AND "OCH" TRANSMISSIONS)

The primary and secondary compensator valve regulate drive oil to become compensator pressure. To prevent compensator pressure from exceeding the desired maximum value, orifice T.V.

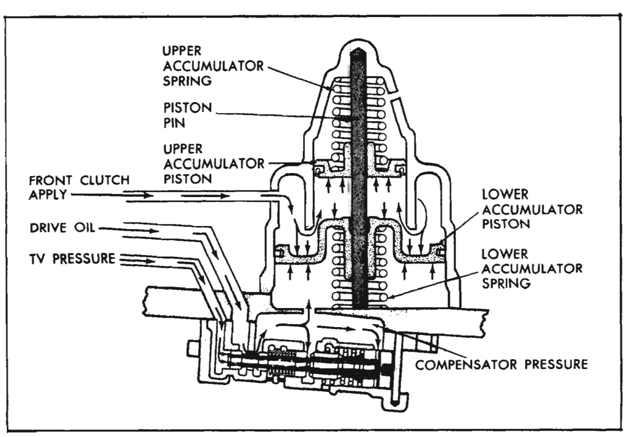


Fig. 3-5 Compensator and Accumulator

pressure acting on the compensator limit valve is allowed to exhaust thus limiting the maximum value of compensator pressure. Compensator pressure is used to control the accumulation rate of the accumulator with different throttle opening for smooth clutch application.

FRONT CLUTCH ACCUMULATOR (Fig. 3-5)

The front clutch accumulator is a cushioning and timing device which enables the front clutch to apply smoothly under all throttle and torque conditions.

When the front clutch is engaging, front clutch apply oil is also directed to the front clutch accumulator. Front clutch oil compresses the pistons against spring pressure, causing the accumulator to absorb an amount of clutch apply oil. During the initial application of the front clutch piston, a comparatively small quantity of clutch apply oil is diverted to the accumulator. When the clutch piston is in its apply position, the accumulator pistons move against spring pressure and the amount of oil absorbed by the accumulator will increase, thereby decreasing the flow to the front clutch. Since the pistons moving against their springs meet increasing resistance to their motion, the oil pressure applying the front clutch increases gradually to provide a smooth application.

When the pistons reach the ends of their strokes, the front clutch pressure rises to main line pressure to insure positive and complete engagement following the shift.

NEUTRAL (ENGINE RUNNING)

COUPLING—FILLED	REVERSE CONE—OFF	SPRAG OR ROLLER CLUTCH—INEFFECTIVE
NEUTRAL CLUTCH—OFF	OVERRUN BAND—OFF	FRONT CLUTCH—OFF

Whenever the engine is running, line pressure is always directed to the:

1. Pressure Regulator
2. Pressure Relief Valve
3. Coupling Feed Limit Valve
4. Throttle Valve
5. Coupling Timing Valve
6. Manual Valve
7. 3-4 Governor Valve
8. Governor Assembly
9. Pressure Boost Valve

BASIC CONTROL

Line pressure through the coupling timing valve is directed into the signal passage. Signal oil closes the coupling exhaust valves and opens the coupling feed limit valve to provide coupling feed oil. Line pressure through the orifice at the coupling timing valve provides an additional source of coupling feed oil to fill the coupling. The neutral clutch is released, therefore the sprag or roller clutch is ineffective.

PRESSURE CONTROL

The pressure relief valve provides for the exhaust of excessive main line pressures at approximately 240 psi. This condition may occur only in the event of a malfunction in the pump or pressure regulator.

Line pressure to the throttle valve is regulated to a variable pressure called T.V. pressure. The throttle valve, which regulates T.V. pressure, is controlled by the T.V. spring and throttle plunger through adjustable linkage from the carburetor throttle. As the throttle is opened, the linkage depresses the throttle plunger to increase the force of the T.V. spring, thus causing the throttle valve to regulate T.V. pressure to a higher value. T.V. pressure is designed to vary in proportion to throttle opening and is used throughout the system to activate or control different valves at various times in relation to throttle opening.

Line pressure through the pressure boost valve enters two passages to become pressure boost and pressure drop signal oil. Pressure boost oil is directed against the boost plug in the pressure regulator to give an increase in line pressure. Pressure drop signal pressure is routed to the pressure drop valve where T.V. pressure acting on the end of the pressure drop valve regulates pressure drop signal oil to a variable decreasing pressure which in turn is applied against the second land of the pressure regulator valve.

At closed throttle, line drop pressure is maximum thus causing the greatest drop in line pressure; at full throttle, line drop pressure is regulated to exhaust resulting in high line pressure. Line pressure is controlled to vary with throttle opening from 132 to 180 psi.

Line pressure directed to the governor will be regulated to become two variable governor pressures; G-1 and G-2.

SUMMARY

The coupling is filled and the neutral clutch is released, thereby causing the transmission to be in neutral.

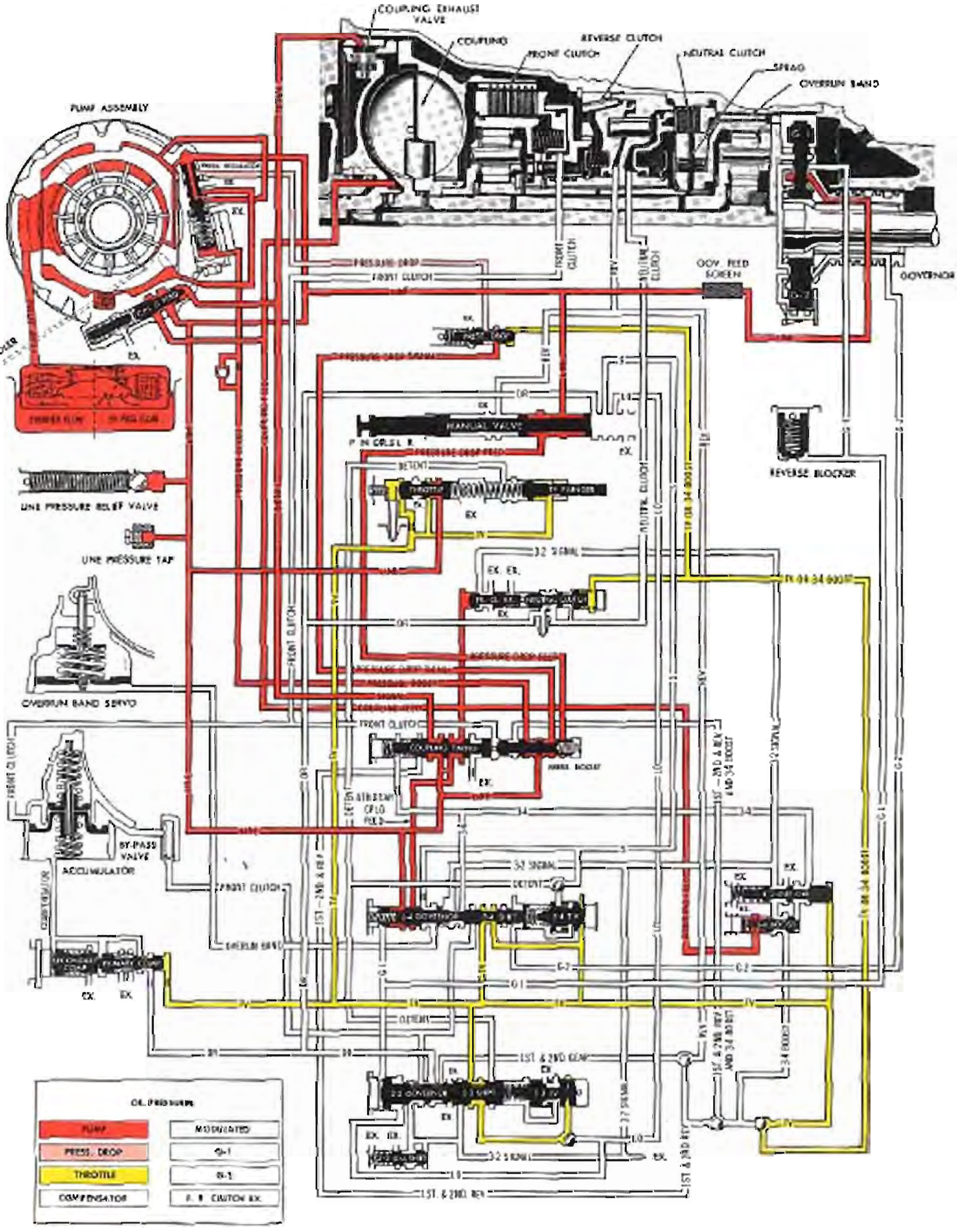


Fig. 3-6 Neutral (Engine Running)

DRIVE RANGE (FIRST STAGE)
RATIO 3.32:1

COUPLING—FILLED	**REVERSE CONE—OFF**	**SPRAG OR ROLLER CLUTCH—EFFECTIVE**
FRONT CLUTCH—OFF	**NEUTRAL CLUTCH—ON**	**OVERRUN BAND—OFF**

When the selector lever is moved to the drive position, the manual valve is repositioned to allow line pressure to enter the drive oil circuit. Drive oil then flows to the following:

1. Neutral Clutch Valve
2. 2-3 Governor Valve
3. Pressure Boost Valve
4. Primary Compensator Valve

BASIC CONTROL

Drive oil to the neutral clutch valve is directed into the neutral clutch apply passage. The neutral clutch valve senses a balance between neutral clutch apply pressure and T.V. plus spring pressure to regulate the flow of neutral clutch apply pressure to insure a smooth but firm clutch application under all throttle conditions. As the neutral clutch applies, the sprag or roller clutch becomes effective for first.

PRESSURE CONTROL

Line pressure will vary from 132 to 180 psi depending on the amount of T.V. pressure or throttle opening.

TIMING CONTROL

Drive oil and T.V. pressure are directed to the primary compensator valve. Drive oil flowing through compensator valves will become regulated to a pressure called compensator. Increasing T.V. pressure (which increases with throttle opening) will cause the compensator to regulate to an increasing value. Compensator pressure is then designed to vary with throttle opening but in such a way as to be proportional to engine torque. Compensator pressure is directed to the accumulator for use during the 2-3 shift.

FAIL SAFE FEATURES

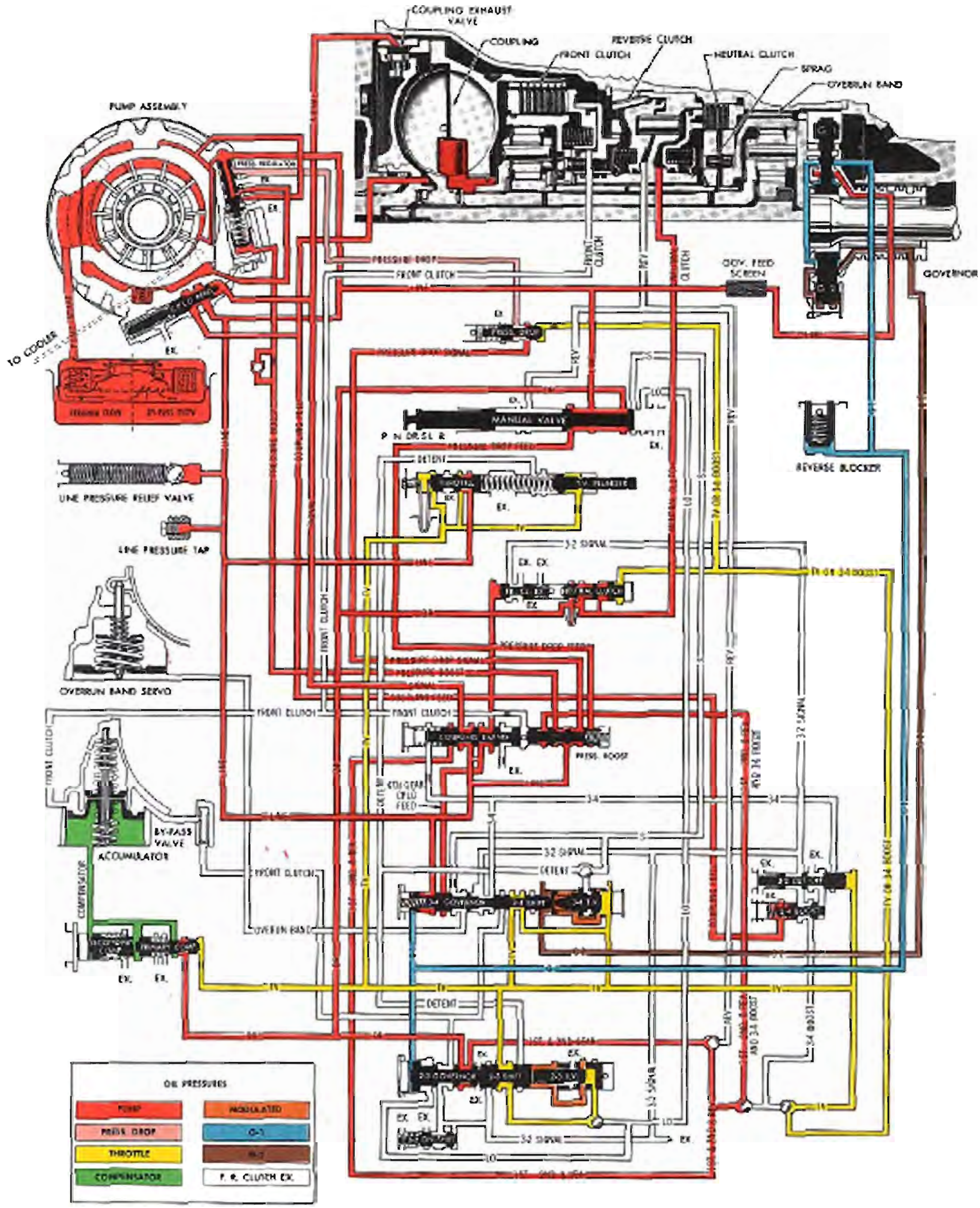
To provide a safety feature, drive oil to the 2-3 shift valve is routed into the first stage passage past two ball-check valves to the pressure boost valve. If for any reason the line boost valve has remained in neutral or third stage position, first stage oil will flow past the pressure boost valve to become line boost oil which is necessary in first.

First stage oil flowing past one ball-check is resting on the coupling timing valve. Again, if for any reason the coupling timing valve should remain in the third stage position, first stage oil will flow past the valve to become coupling signal oil. This insures that the coupling can be filled in first regardless of the position of the coupling timing valve.

SUMMARY

The coupling is filled, the neutral clutch is applied and the sprag or roller clutch is effective, placing the transmission in first.

The reduction in first is due to the 2.933 rear unit gear reduction, times the 1.2 coupling torque multiplication, less the .3 engine torque acting on the output shaft through the accel-a-rotor.



1/3 THROTTLE

Fig. 3-7 Drive Range (First Stage)

DRIVE RANGE (SECOND STAGE)
RATIO 2.933:1

COUPLING—FILLED	**REVERSE CONE—OFF**	**SPRAG OR ROLLER CLUTCH—EFFECTIVE**
FRONT CLUTCH—OFF	**NEUTRAL CLUTCH—ON**	**OVERRUN BAND—OFF**

When the selector lever is moved to the drive position, the manual valve is repositioned to allow line pressure to enter the drive oil circuit. Drive oil then flows to the following:

1. Neutral Clutch Valve
2. 2-3 Governor Valve
3. Pressure Boost Valve
4. Primary Compensator Valve

BASIC CONTROL

Drive oil to the neutral clutch valve is directed into the neutral clutch apply passage. The neutral clutch valve senses a balance between neutral clutch apply pressure and T.V. plus spring pressure to regulate the flow of neutral clutch apply pressure to insure a smooth but firm clutch application under all throttle conditions. As the neutral clutch applies, the sprag or roller clutch becomes effective for first and second.

PRESSURE CONTROL

Pressure control in second is identical to that in first and neutral. Line pressure will vary from 132 to 180 psi depending on the amount of T.V. pressure or throttle opening.

TIMING CONTROL

Drive oil and T.V. pressure are directed on the primary compensator valve. Drive oil flowing through compensator valves will become regulated to a pressure called compensator. Increasing T.V. pressure (which increases with throttle opening) will cause compensator to regulate to an increasing value. Compensator pressure is then designed to vary with throttle opening but in such a way as to be proportional to engine torque. Compensator pressure is directed to the accumulator for use during the 2-3 shift.

FAIL SAFE FEATURES

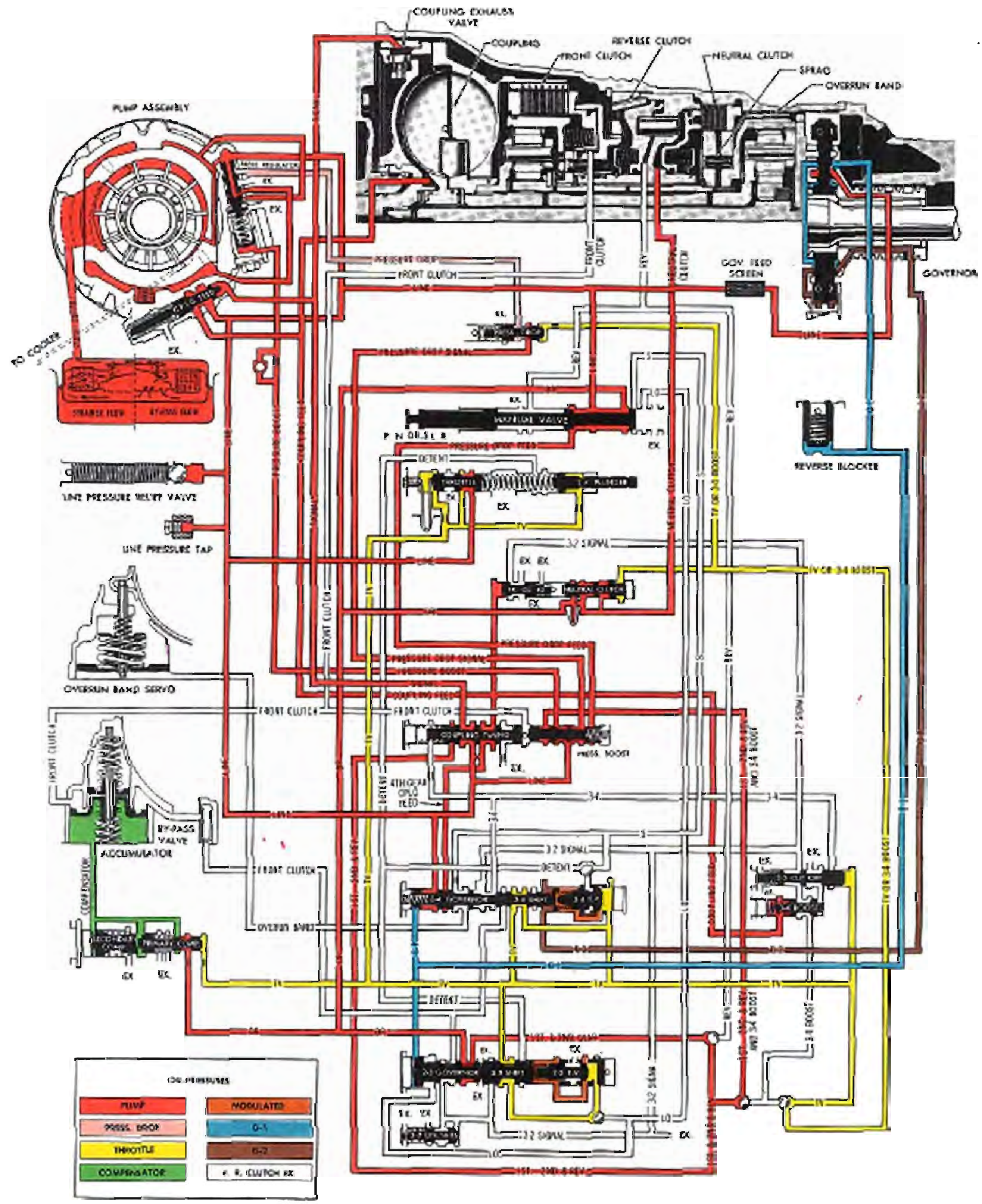
To provide a safety feature, drive oil to the 2-3 shift valve is routed into the first stage passage past two ball-check valves to the pressure boost valve. If for any reason the line boost valve has remained in the neutral or third stage position, second stage oil will flow past the pressure boost valve to become line boost oil which is necessary in second.

Second stage oil flowing past one ball-check is resting on the coupling timing valve. Again, if for any reason the coupling timing valve should remain in the third stage position, second stage oil will flow past the valve to become coupling signal oil. This insures that the coupling can be filled in second regardless of the position of the coupling timing valve.

SUMMARY

The coupling is filled, the neutral clutch is applied and the sprag or roller clutch is effective, placing the transmission in second.

The reduction in second is due to the 2.933:1 rear unit gear reduction only.



1/3 THROTTLE

Fig. 3-8 Drive Range (Second Stage)

DRIVE RANGE (THIRD STAGE)
RATIO 1.56:1

COUPLING—EMPTY	**REVERSE CONE—OFF**	**SPRAG OR ROLLER CLUTCH—EFECTIVE**
CLUTCH—ON	**NEUTRAL CLUTCH—ON**	**OVERRUN BAND—OFF**

As car speed and G-1 pressure increases, the force of G-1 acting on the 2-3 governor valve will overcome the force of the 2-3 shift valve spring, 2-3 T.V. spring, and modulated T.V. pressure. This causes the 2-3 shift valve to open, which allows drive oil to enter the front clutch passage. Simultaneously, T.V. pressure to the 2-3 regulator valve is cut off at the 2-3 shift valve, and second stage oil is exhausted through the 2-3 shift valve.

BASIC CONTROL

Front clutch oil from the 2-3 shift valve then is directed to the following places:

1. 3-4 shift valve for later use and, after passing an orificed one way check valve to the:
2. Front Clutch
3. Front Clutch Accumulator
4. Coupling Timing Valve
5. Pressure Boost Valve

Front clutch oil applies the clutch and moves the coupling timing valve against the spring cutting off line pressure to the signal passage. As signal pressure is cut off, the coupling exhaust valves open, thus allowing the coupling to empty and the coupling feed limit valve to close, cutting off coupling feed pressure to the coupling.

PRESSURE CONTROL

Front clutch oil to the line boost valve overcomes the spring at the opposite end, thus moving the valve to cut off line pressure from entering the pressure boost passage and pressure drop signal passage. Because line drop feed is now directed through the pressure boost valve into the pressure drop signal passage, line pressure will drop to a variable value of 74 to 105 psi. Front clutch oil is used on the pressure boost valve since it is a signal oil which notifies the pressure boost valve that the oil pressure in the clutch itself is sufficiently high to allow the clutch to carry third stage torque. Also, if the line pressure were not kept in a boosted condition temporarily, the neutral clutch would not have sufficient pressure to prevent its slipping before the transmission had completed the shift to third.

TIMING CONTROL

Front clutch oil is directed to the accumulator to provide a cushion for clutch apply pressure. Compensator pressure is also fed to the accumulator to control the amount of cushioning the accumulator will provide according to throttle opening. At light throttle, compensator pressure is low, thus allowing the accumulator to absorb a greater amount of clutch oil for greater cushioning. At heavy throttle, compensator assists the lower accumulator spring in acting against clutch pressure to give a firmer but smooth clutch application. Front clutch oil acting on the coupling timing valve times the movement of the valve and the resulting exhaust of the coupling to coincide with the application of the front clutch.

SUMMARY

The front clutch is applied and the coupling is empty, shifting the transmission into third.

Because the coupling is empty no power is transmitted through the torus members and all torque multiplication in third is due to the 1.56:1 front unit gear ratio.

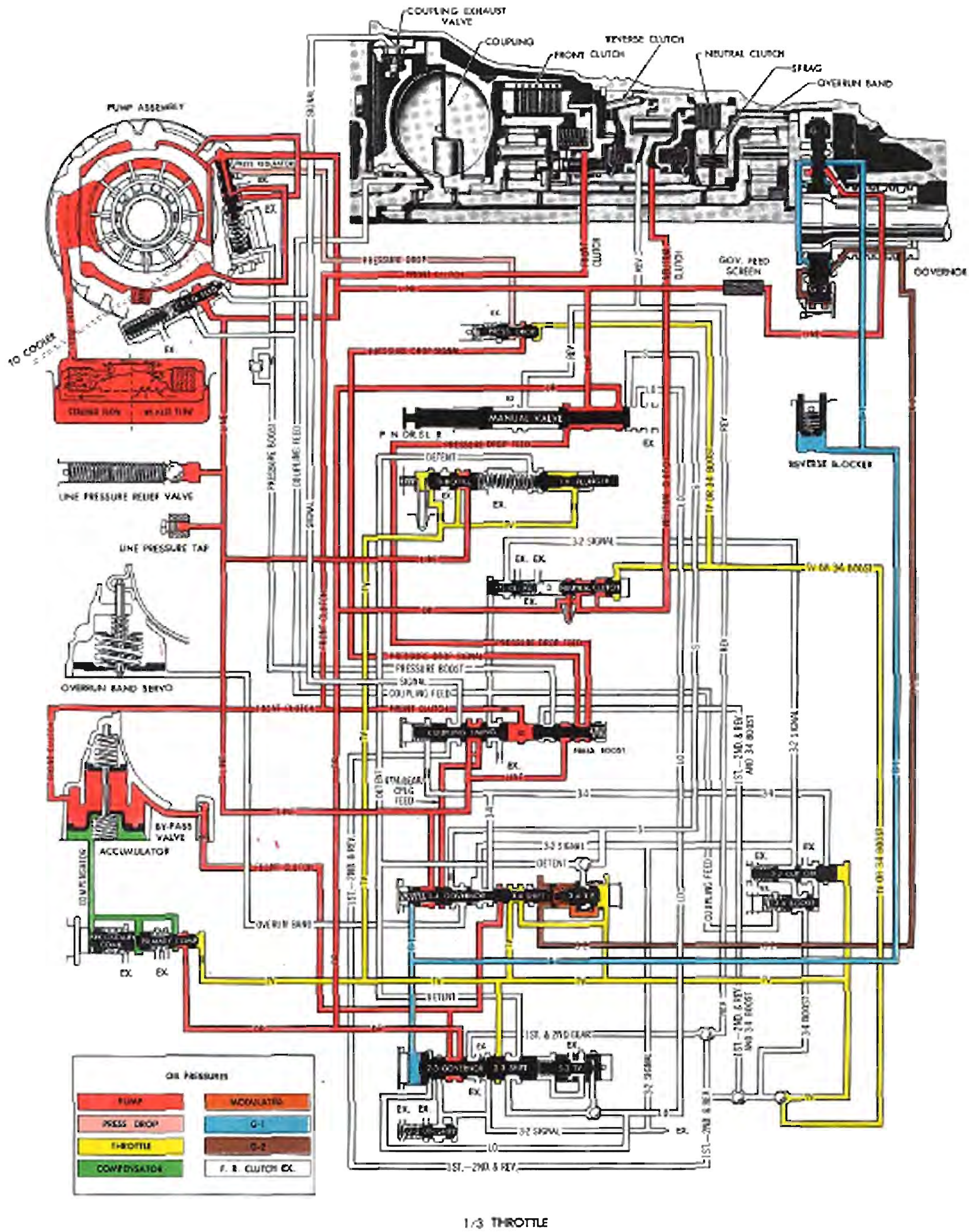


Fig. 3-9 Drive Range (Third Stage)

DRIVE RANGE (FOURTH STAGE)
RATIO 1:1

COUPLING—FILLED **REVERSE CONE—OFF** **SPRAG OR ROLLER CLUTCH—INEFFECTIVE**

FRONT CLUTCH—ON **NEUTRAL CLUTCH—ON** **OVERRUN BAND—OFF**

As car speed increases, G-1 and G-2 pressure and the 3-4 shift valve spring acting on the 3-4 shift valve train will overcome the force of the T.V. regulator spring and modulated pressure on the 3-4 shift valve. The shift valve will then open allowing front clutch pressure and line pressure to enter the 3-4 and 4th stage coupling fill passage. T.V. pressure is now cut off from entering the shift T.V. passage.

BASIC CONTROL

3-4 oil then repositions the coupling timing valve to allow signal pressure to close the coupling exhaust valves and open the coupling feed limit valve to provide coupling fill. Under some throttle conditions signal pressure may not be great enough to open the coupling feed limit valve. In this case all coupling feed pressure comes from the coupling timing valve. Fourth stage coupling feed pressure flows to the coupling timing valve where it provides an additional source for coupling feed pressure.

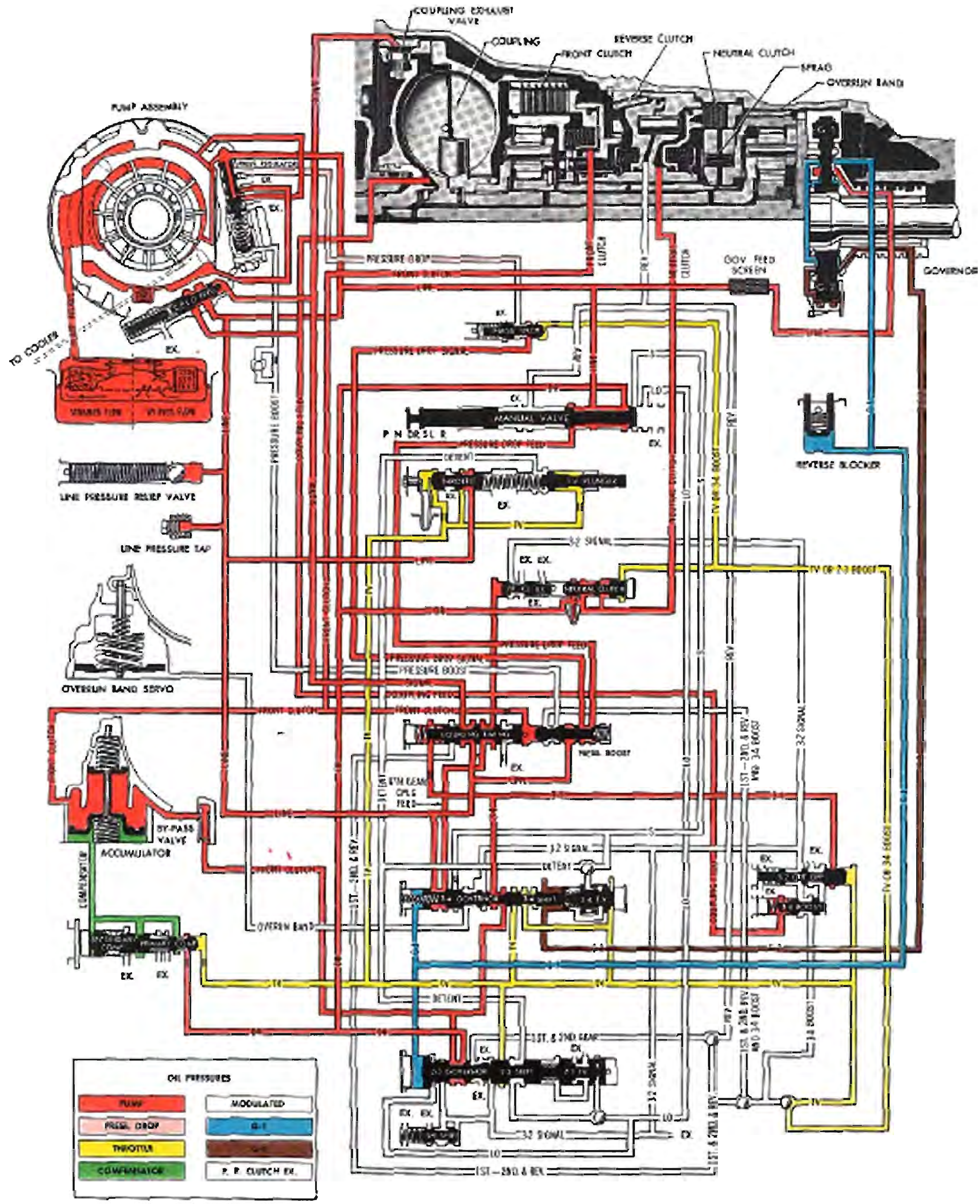
PRESSURE CONTROL

Under most driving conditions line pressure is not changed between third and fourth. However, below approximately 28 psi T.V. pressure, the 3-2 cutoff valve opens against T.V. pressure to allow 3-4 pressure to enter the 3-4 transfer passage. This will cause a temporary boost in line pressure as described under DRIVE RANGE-LIGHT THROTTLE 3-4 UPSHIFT.

SUMMARY

The front clutch remains applied and the coupling is filled.

Both planet carriers and the output shaft are connected, the front sun gear and rear internal gear are connected, and the front internal gear and rear unit sun gear are turning at approximately the same speed, thus the entire train must revolve as a unit in direct drive.



MEDIUM THROTTLE

Fig. 3-10 Drive Range (Fourth Stage)

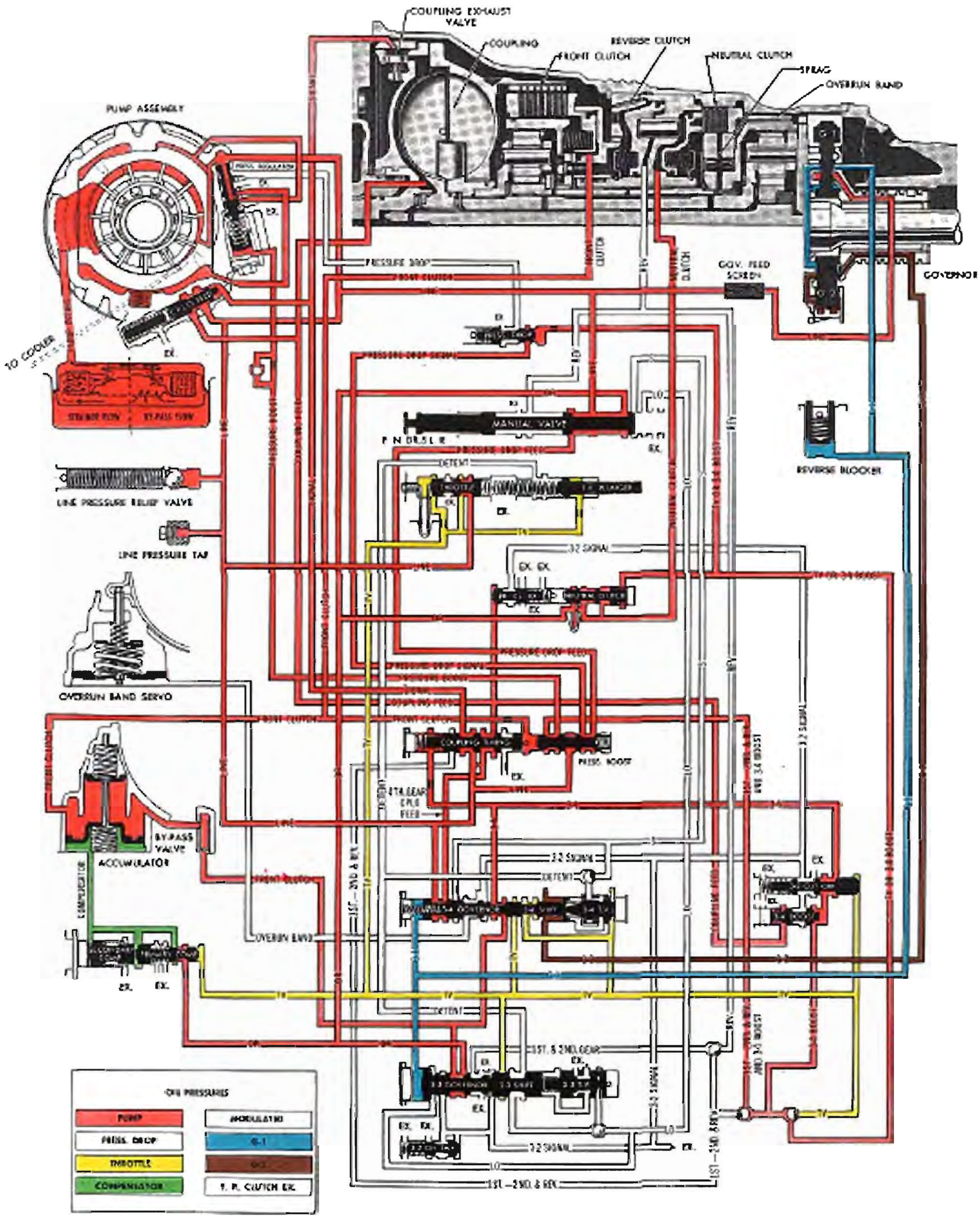
DRIVE RANGE—LIGHT THROTTLE 3-4 UPSHIFT

BASIC CONTROL

The basic control on light throttle 3-4 upshifts is the same as a basic 3-4 upshift.

PRESSURE CONTROL

When a 3-4 upshift is made at throttle positions giving less than approximately 28 psi T.V. pressure, the 3-2 cut off valve is positioned against T.V. pressure by the spring. This allows 3-4 oil to flow past the 3-2 cut off valve, thus opening the 3-4 boost valve against the spring. This allows 3-4 oil to flow into the 3-4 boost passage and in turn past a ball check valve to the pressure drop valve. This closes the pressure drop valve cutting off pressure drop. Simultaneously, 3-4 boost oil flows past another ball check into the 1st, 2nd, Reverse and 3-4 boost passage where it supplies an alternate source for pressure boost. Line pressure is then raised to a sufficient value to provide a fast coupling feed. As the coupling fills and reaches operating pressure, coupling feed pressure acts on the end of the 2-3 boost valve to cut off the source of boost pressure. With 3-4 boost cut off, T.V. pressure is again directed through the ball check valve to control the pressure drop valve. Line pressure will then drop to its normal fourth stage value of 74-105 psi.



(VALVES SHOWN PRIOR TO COUPLING REACHING FULL CHARGE PRESSURE)

Fig. 3-11 Drive Range (Light Throttle 3-4 Upshift)

DRIVE RANGE—4-3 PART THROTTLE DOWNSHIFT

COUPLING—EXHAUSTING

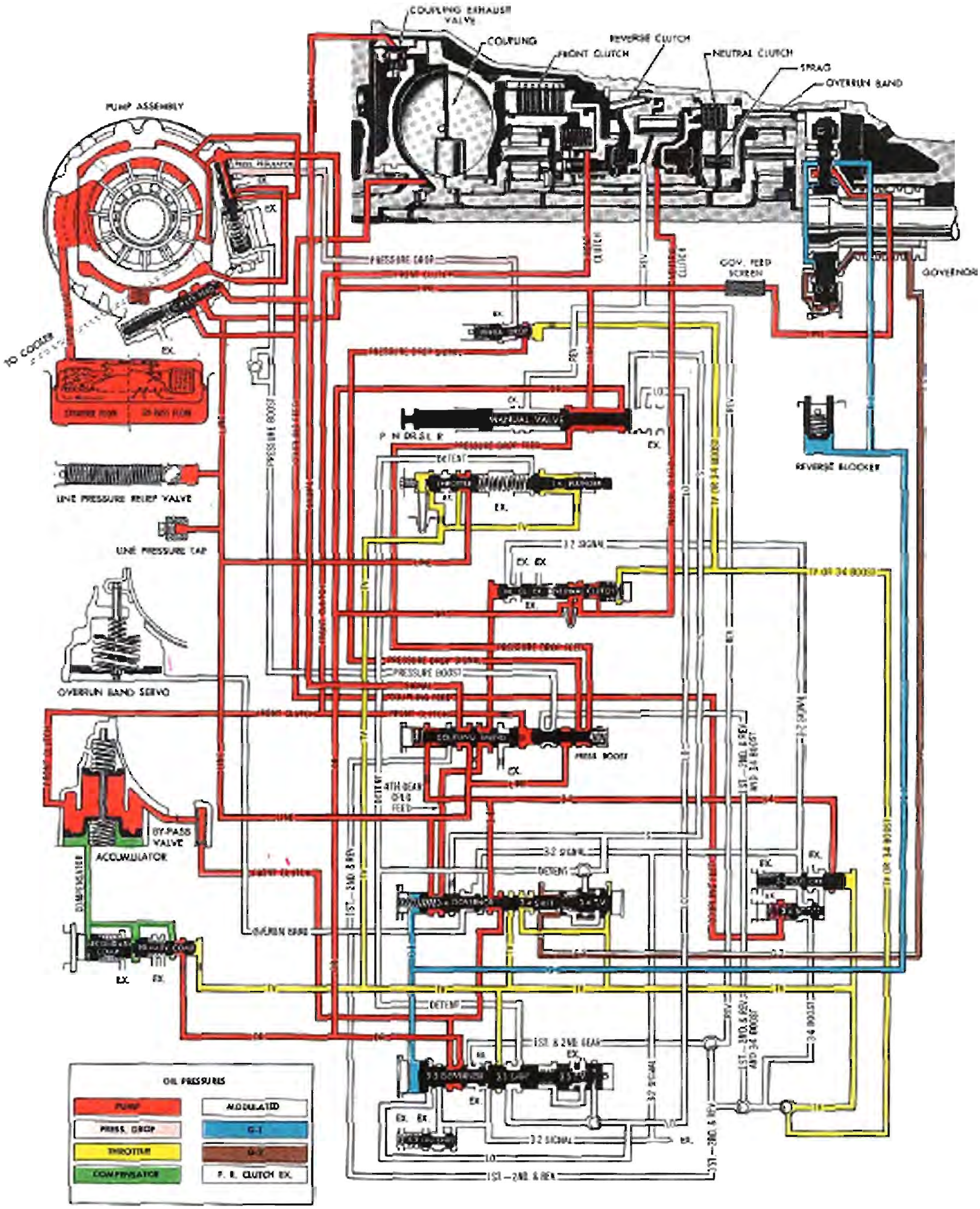
At vehicle speeds below approximately 35 M.P.H. a 4-3 downshift can be obtained by depressing the accelerator a given amount. When the accelerator is depressed sufficiently, T.V. pressure acting behind the large end of the 3-4 T.V. regulator valve is high enough to cause the 3-4 shift valve to close.

BASIC CONTROL

As the 3-4 shift valve closes, 3-4 oil with 4th stage coupling fill oil from the 3-4 shift valve are cut off, thereby causing the coupling to exhaust, shifting the transmission back into third.

PRESSURE CONTROL

The pressure remains the same as in fourth.



(VALVES IN FOURTH PRIOR TO DOWNSHIFT)

Fig. 3-12 Drive Range (4-3 Part Throttle Downshift)

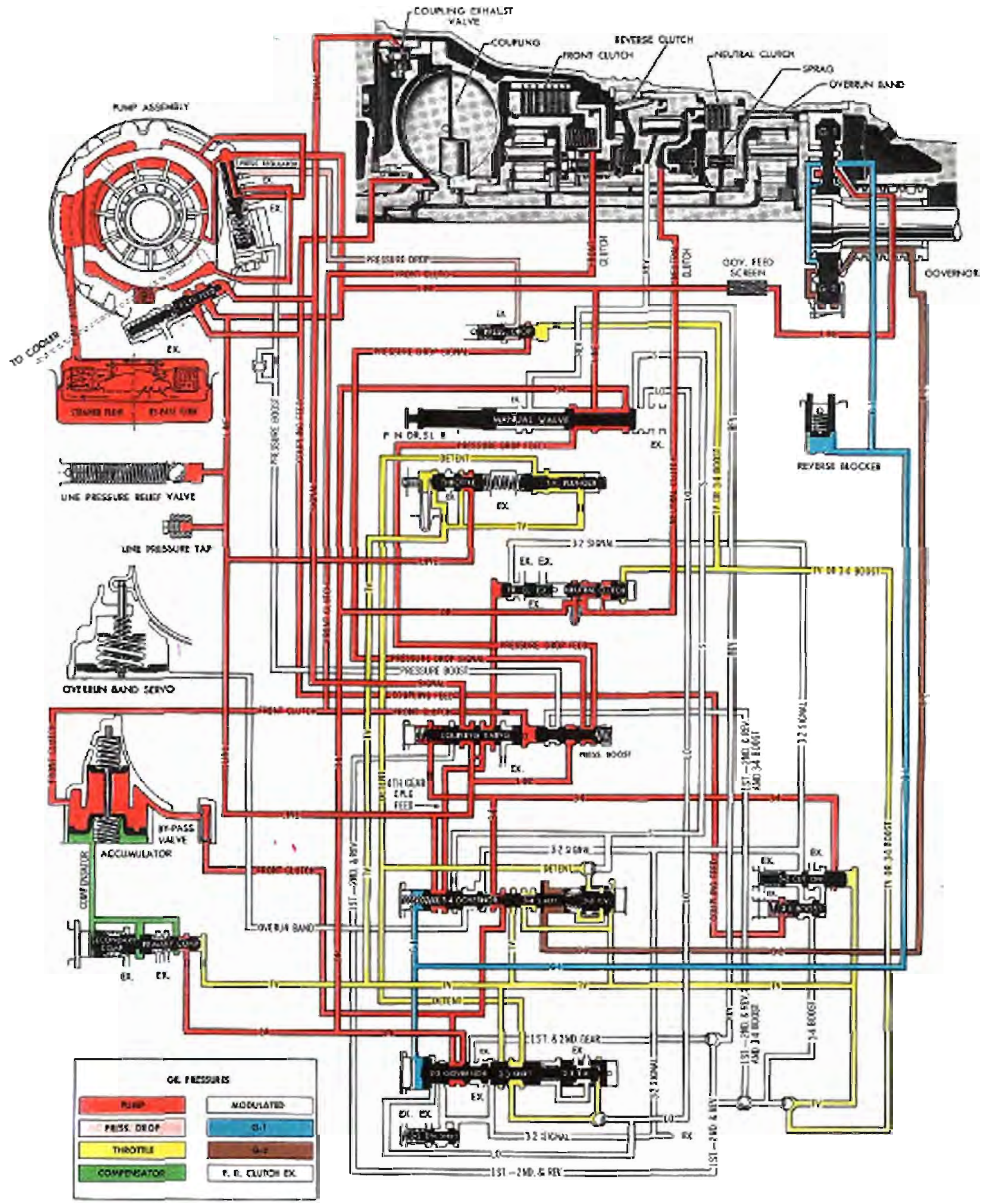
DRIVE RANGE—4-3 DETENT DOWNSHIFT

COUPLING—EXHAUSTING

While operating in fourth at speeds below approximately 65 M.P.H., a forced or detent 4-3 downshift is available. This is accomplished by depressing the accelerator fully past the noticeable stop at full throttle.

As this is done, the T.V. plunger is fully depressed exposing the detent passage to T.V. pressure. Detent pressure which flows past the ball check is directed against the large land of the 3-4 shift valve.

The force, due to pressure detent will overcome the force of G-1 and G-2 pressure and one spring acting in the opposite direction, thereby causing the 3-4 shift valve to close. The transmission will then shift into third.



(VALVES SHOWN IN FOURTH PRIOR TO DOWNSHIFT)

Fig. 3-13 Drive Range (4-3 Detent Downshift)

DRIVE RANGE—3-2 DETENT DOWNSHIFT

COUPLING—FILLING

FRONT CLUTCH—EXHAUSTING

At car speeds below approximately 22 M.P.H. in third, a forced or detent 3-2 downshift can be obtained by depressing the accelerator fully past the detent. This causes the T.V. plunger to open the detent passage to T.V. pressure. Detent pressure then enters the 2-3 shift T.V. passage to act against the 2-3 T.V. valve. This causes the 2-3 shift valve to close against the force of G-1 pressure.

BASIC CONTROL

As the 2-3 shift valve closes, drive oil to the front clutch is cut off and all front clutch pressure in the front clutch and accumulator is compelled to exhaust the 3-2 signal passage. The spring and 3-2 signal pressure repositions the coupling timing valve to provide coupling signal pressure and coupling feed pressure.

PRESSURE CONTROL

Drive oil acting on the pressure boost valve repositions the valve against exhausting front clutch oil to provide both boost pressure and line drop signal with line pressure at 180 psi.

TIMING CONTROL

During a heavy throttle 3-2 downshift, the release of the clutch must be timed to coincide with the filling of the coupling. To accomplish this timing, exhausting front clutch oil or 3-2 signal oil is used as follows:

1. It flows through the closed 3-4 shift valve into the 3-4 passage to rapidly reposition the coupling timing valve for coupling fill.
2. It flows to the 3-2 cut off valve where a rapid exhaust is obtained at light throttles only, but no effect is obtained at heavy throttle 3-2 shifts.
3. It regulates to exhaust through the 3-2 downshift valve to a value that will hold the front clutch torque in third but not in second. This feature permits the front clutch to handle the transmission torque in third until such time that second stage torque is predominate.
4. It rests against the front clutch exhaust valve until such time that coupling pressure attains a sufficient value to handle torque capacity in second. Coupling pressure then opens the front clutch exhaust valve to exhaust all remaining 3-2 signal or front clutch oil.

FAIL SAFE FEATURES

Drive oil flows past the closed 2-3 shift valve into a passage that supplies an auxiliary feed to the coupling timing valve. This oil provides an additional feed for signal oil in the event that the coupling timing valve should hang up in the closed position or is slow to move to the open position.

Drive oil into the second stage passage also flows through the ball check valves and supplies a source for line boost pressure to rapidly fill the coupling prior to the time that the line boost valve has had a chance to be repositioned in the first and second stage position.

DRIVE RANGE—3-2 LIGHT THROTTLE DOWNSHIFT

(Illustration Shows Second Stage Just After The Downshift)

During a light or closed throttle 3-2 downshift, as the 2-3 shift valve closes, drive oil to the front clutch passage is cut off; however, all front clutch pressure in the system is exhausted into the 3-2 signal passage. Because T.V. pressure is slight with light throttle, the 3-2 cut off valve is open to exhaust the 3-2 signal oil. This allows an immediate exhaust of front clutch oil.

Drive oil which formerly applied the front clutch when the 2-3 shift valve was open is not directed into the second stage passage which flows through the ball check valves and supplies a source for pressure boost pressure to rapidly fill the coupling prior to the time that the pressure boost valve has had a chance to be repositioned in the first and second stage position.

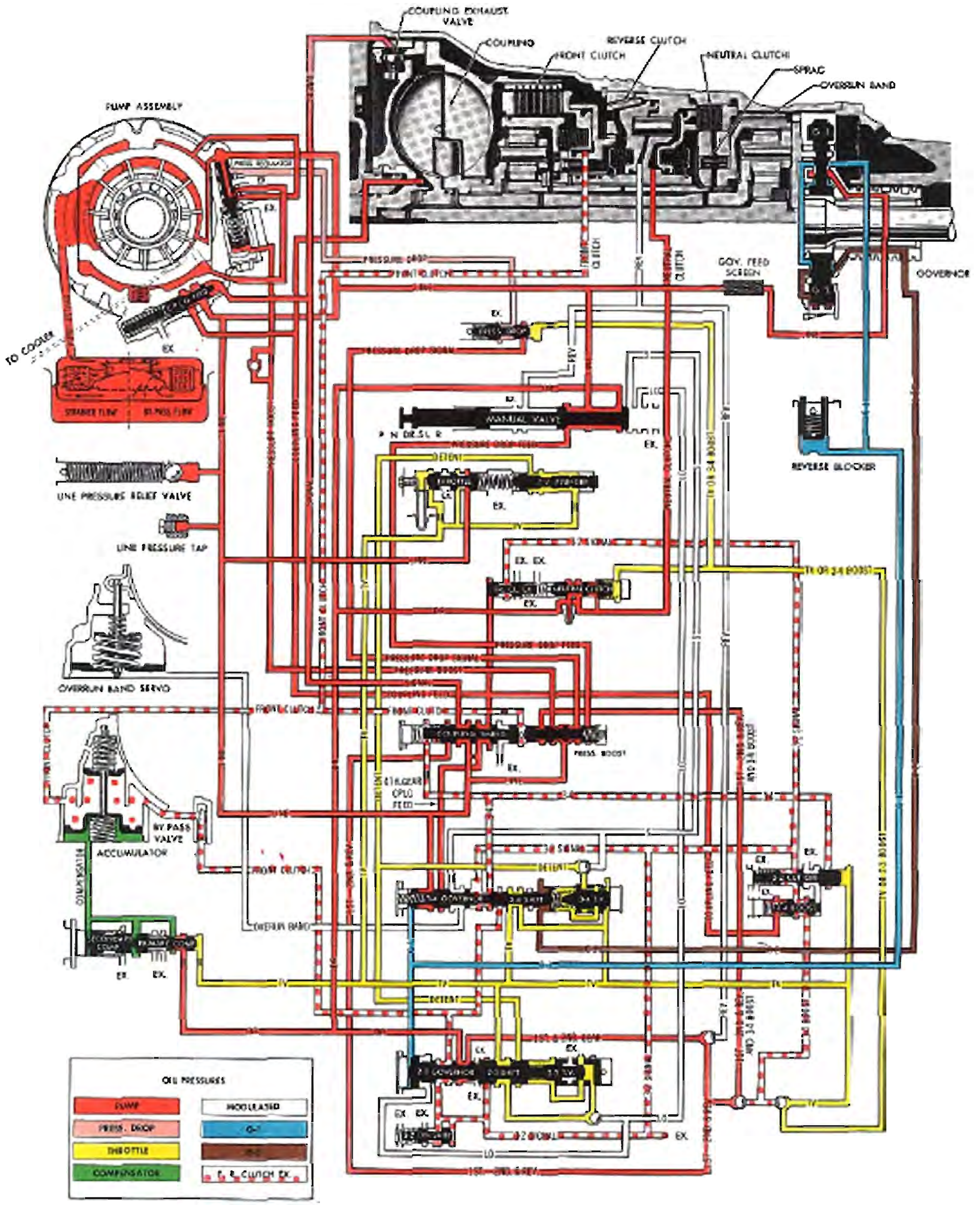


Fig. 3-14 Drive Range (3-2 Detent Downshift)

"S" RANGE—THIRD STAGE

REVERSE CONE—OFF	**SPRAG OR ROLLER CLUTCH—EFFECTIVE**	**NEUTRAL CLUTCH—APPLIED**
COUPLING—EMPTY	**FRONT CLUTCH—APPLIED**	**OVERRUN BAND—ON**

Oil flow in "S" range, third, is primarily identical to that in drive range third, with the following exceptions:

1. Oil Pressure

   When the manual valve is in the "S" position the line drop feed passage is cut off. This stops the source of line drop pressure so that line pressure is constant at approximately 105 psi regardless of throttle opening.

2. "S" Range Pressure

   "S" range pressure from the manual valve performs two functions. First, it is directed through the ball check against the large end of the 3-4 shift valve to prevent a 3-4 shift from normally occurring in "S" range.* Secondly, it is directed through the 3-4 governor valve to apply the overrun servo and band for engine braking in third.

*As a safety feature, it is possible to obtain a 3-4 upshift in "S" range but only above the speed at which the normal drive range through detent 3-4 upshift occurs.

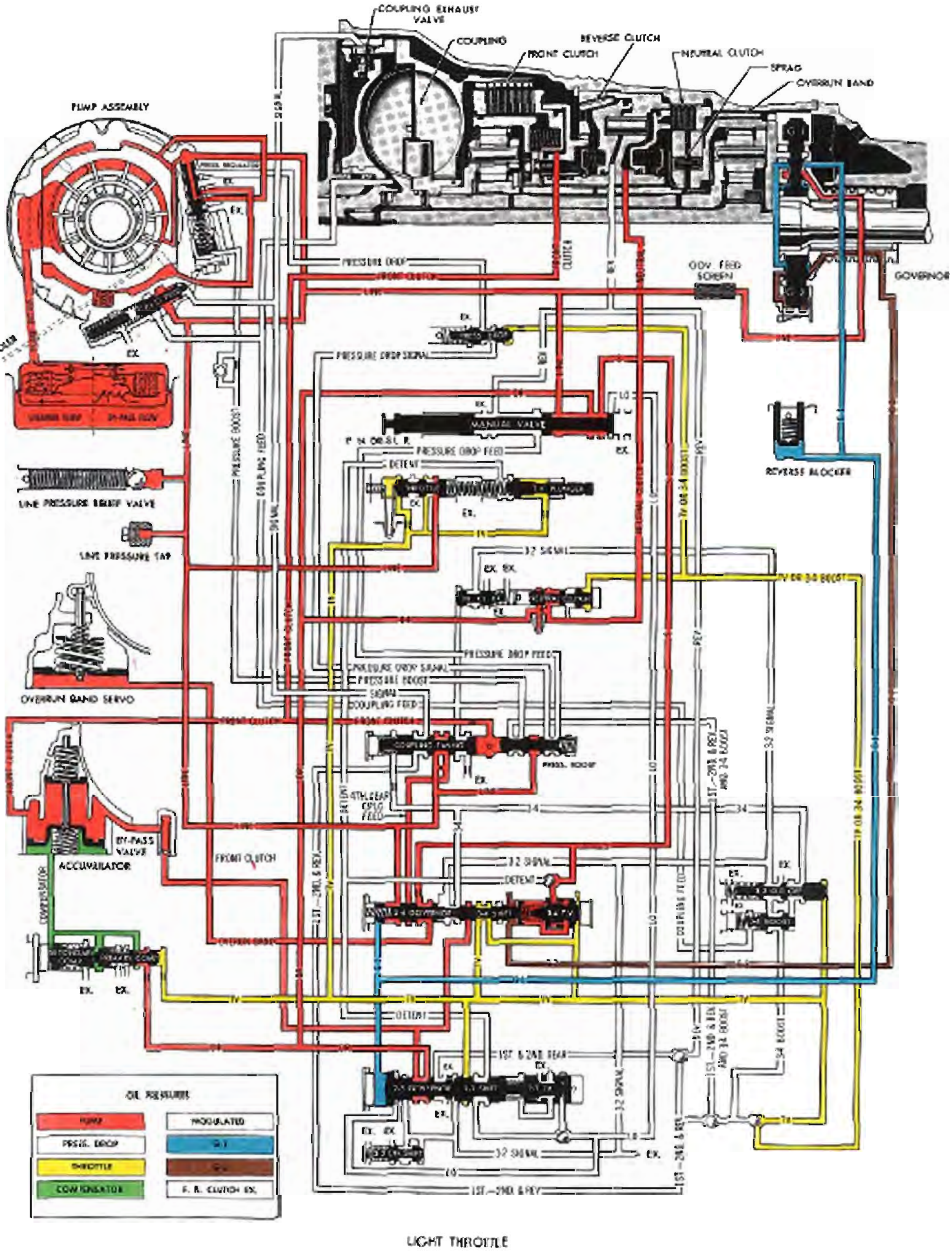


Fig. 3-15 "S" Range (Third Stage)

LOW RANGE—SECOND STAGE

When the selector lever is placed in the "L" position, the Manual Valve is moved to uncover an additional source of pressure, "L" range oil.

"L" range oil is directed in two locations:

1. Against the large end of the 2-3 governor valve to work against the force of G-1 pressure.

2. Through the ball check valve, past the 2-3 T.V. regulator valve to act against the 2-3 shift valve to further assist in keeping the 2-3 shift valve closed against G-1 pressure.

The primary purpose of "L" range oil is to provide a definite means of preventing a 2-3 up-shift from occurring in the "L" range position.

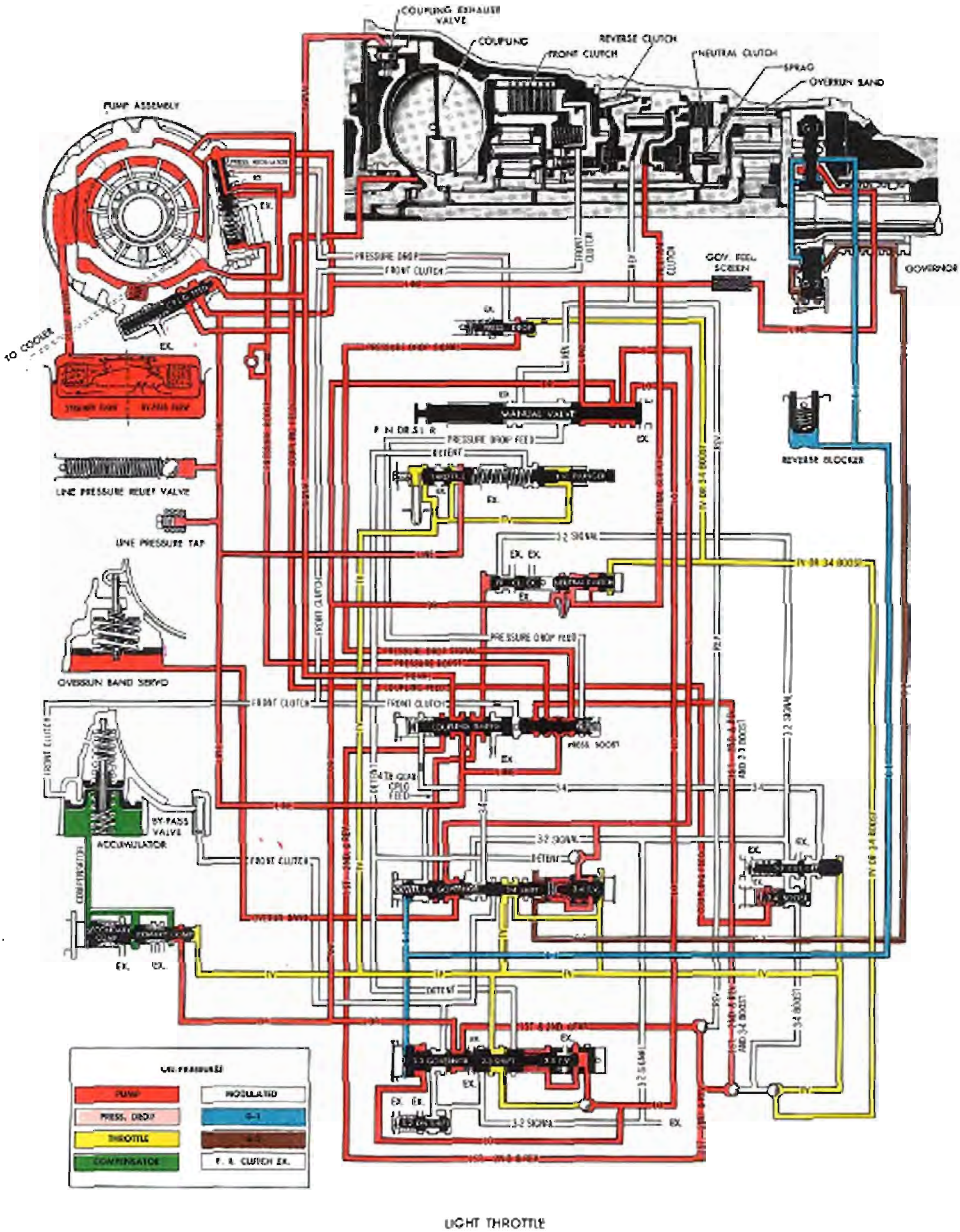


Fig. 3-16 Low Range (Second Stage)

REVERSE
RATIO 3.11:1

COUPLING—FILLED **REVERSE CONE—ON** **SPRAG OR ROLLER CLUTCH—INFFECTIVE**

FRONT CLUTCH—OFF **NEUTRAL CLUTCH—OFF** **OVERRUN BAND—OFF**

When the selector lever is moved to the "R" position, the manual valve is repositioned to exhaust Drive, "S" Range and "L" Range oil. Reverse oil pressure from the manual valve is allowed to enter the control system.

BASIC CONTROL

Reverse pressure applies the reverse cone.

Line pressure, through the coupling timing valve enters the signal passage to close the coupling exhaust valves and open the coupling feed limit valve for coupling fill.

PRESSURE CONTROL

Pressure control in reverse is identical to that obtained in neutral. Line pressure will vary from 132-180 psi depending on T.V. pressure.

FAIL SAFE FEATURES

Reverse pressure is also directed through a ball check valve, to the coupling timing valve, to feed the coupling signal passage if the coupling timing valve should remain in the second stage position.

Line drop feed from the manual valve and reverse pressure through the ball check valves are directed to the pressure boost valve to provide a secondary source for pressure drop and pressure boost if for any reason the pressure boost valve had remained in the third stage positon.

SUMMARY

The total reduction in reverse is due to the 1.2 coupling torque ratio times the 2.49 gear ratio plus the .3 engine torque acting on the accel-a-rotor which results in a 3.11:1 reduction at the output shaft in the reverse direction.

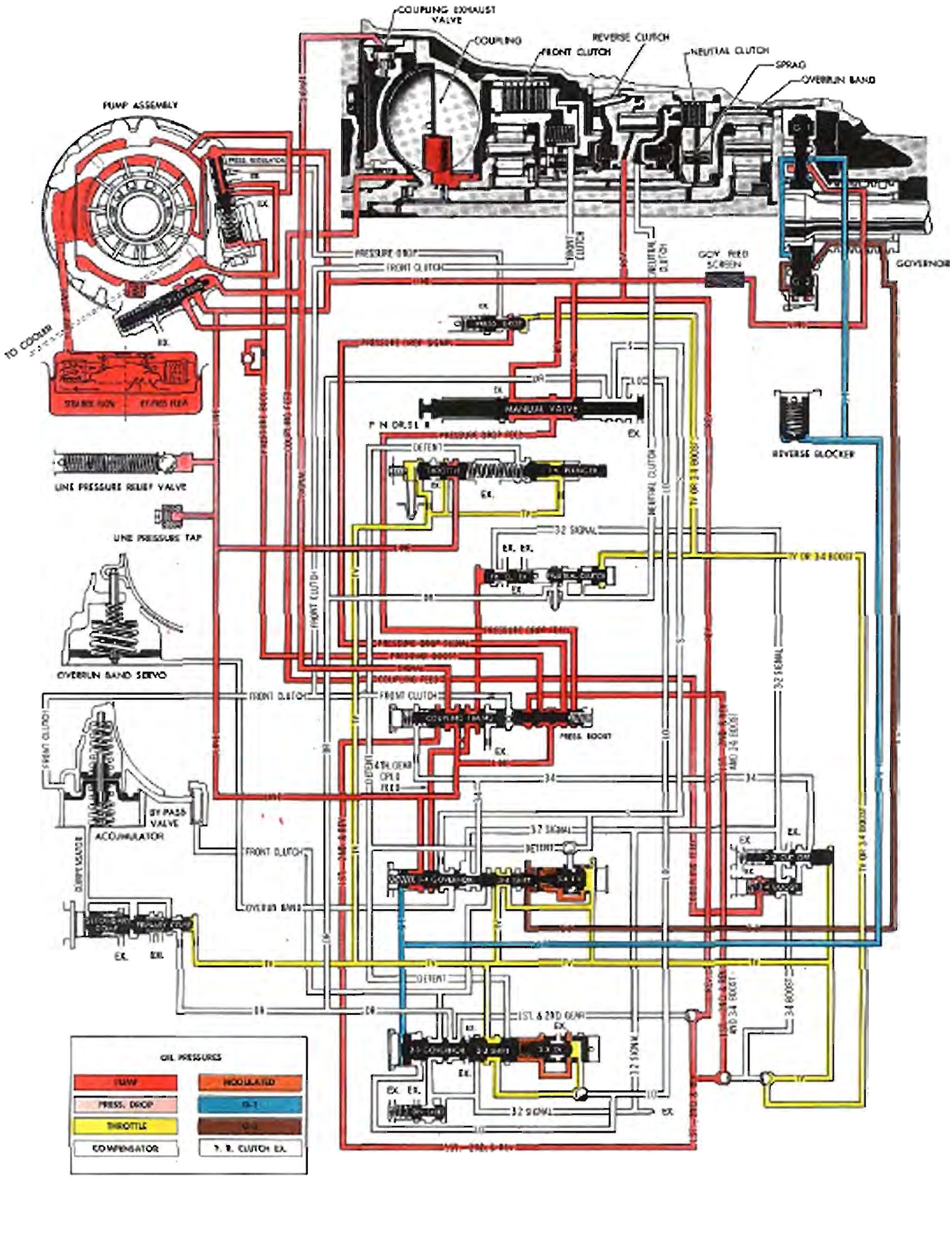


Fig. 3-17 Reverse

OPERATIONS NOT REQUIRING REMOVAL OF TRANSMISSION

Some of the parts and/or units can be removed from the transmission without removing the transmission assembly from the car. The procedures for such operations are not specifically outlined; however, the basic procedure and specifications as outlined under DISASSEMBLY OF THE TRANSMISSION and ASSEMBLY OF THE TRANSMISSION will apply.

UNITS OR PARTS THAT CAN BE READILY REMOVED FROM THE TRANSMISSION ARE:

Oil Pan and Gasket
Outside T.V. and Manual Lever
Manual Shaft Seal
T.V. Shaft Seal
Rear Bearing Retainer Seal

UNITS OR PARTS THAT CAN BE REMOVED AFTER OIL PAN REMOVAL ARE:

Compensator Valve Body
Oil Cleaner
Control Valve Body
Accumulator and Servo
Case to Case Support Seals

UNITS THAT CAN BE REMOVED AFTER OIL PAN AND REAR BEARING RETAINER ASSEMBLY REMOVAL ARE:

Governor
Output Shaft
Rear Thrust Bearing and Races
Bushing Assembly
Parking Linkage

To remove the rear bearing retainer:

1. Disconnect vent pipe from right exhaust manifold, place selector lever in neutral and hoist car.

2. Remove oil filler tube and drain oil.

3. Remove propeller shaft and disconnect T.V. and manual rods from transmission.

4. Remove oil pan and valve body.

5. Remove front engine mount to frame bolts and raise front of engine with Tool J-8568 sufficiently to gain access to the rear bearing retainer to case bolts.

6. Through opening in rear bearing retainer, remove the output shaft attaching bolts. Turn output shaft to expose bolts and engage parking pawl while removing bolts.

7. Pry end of vent pipe from rear bearing retainer and remove rear bearing retainer bolts.

Refer to Page 3-49 for disassembly and assembly.

PARTS THAT CAN BE REMOVED AFTER LOWER HOUSING REMOVAL ARE:

Pipe Assembly (Also Requires Oil Pan Removal)
Coupling Feed Limit Valve
Pressure Regulator Valve

REMOVING THE HYDRA-MATIC TRANSMISSION

1. Disconnect transmission vent pipe from rear of right hand exhaust manifold.

2. Raise car (on hoist), remove oil filler pipe from transmission and drain fluid.

3. Disconnect the manual and throttle rods from transmission and support them away from transmission case.

4. Remove propeller shaft assembly.

5. Install engine support bar. (Fig. 3-18)

6. Remove cross member to frame attaching bolts and cross member.

7. Lower engine (using support bar adjusting screws), NOT TO EXCEED 1-1/2 INCHES, to permit removal of the transmission to flywheel upper housing bolts.

8. Remove engine mount to cross member attaching bolts.

9. Disconnect oil cooler lines from fittings. Cap lines immediately.

10. Pry vent pipe from top of transmission case.

11. Support transmission with unit lift and remove remaining transmission to flywheel housing bolts.

12. Move transmission rearward approximately 1-1/2" to disengage input shaft from damper hub.

13. Lower transmission from car.

INSTALLING THE HYDRA-MATIC TRANSMISSION

To install, reverse the above procedure and include the following:

Lubricate input shaft splines with a thin film of wheel bearing grease.

After transmission is installed, add 5 quarts of Hydra-Matic fluid. Set parking brake, place selector lever in park position, start engine and allow oil to reach operating temperature, then add

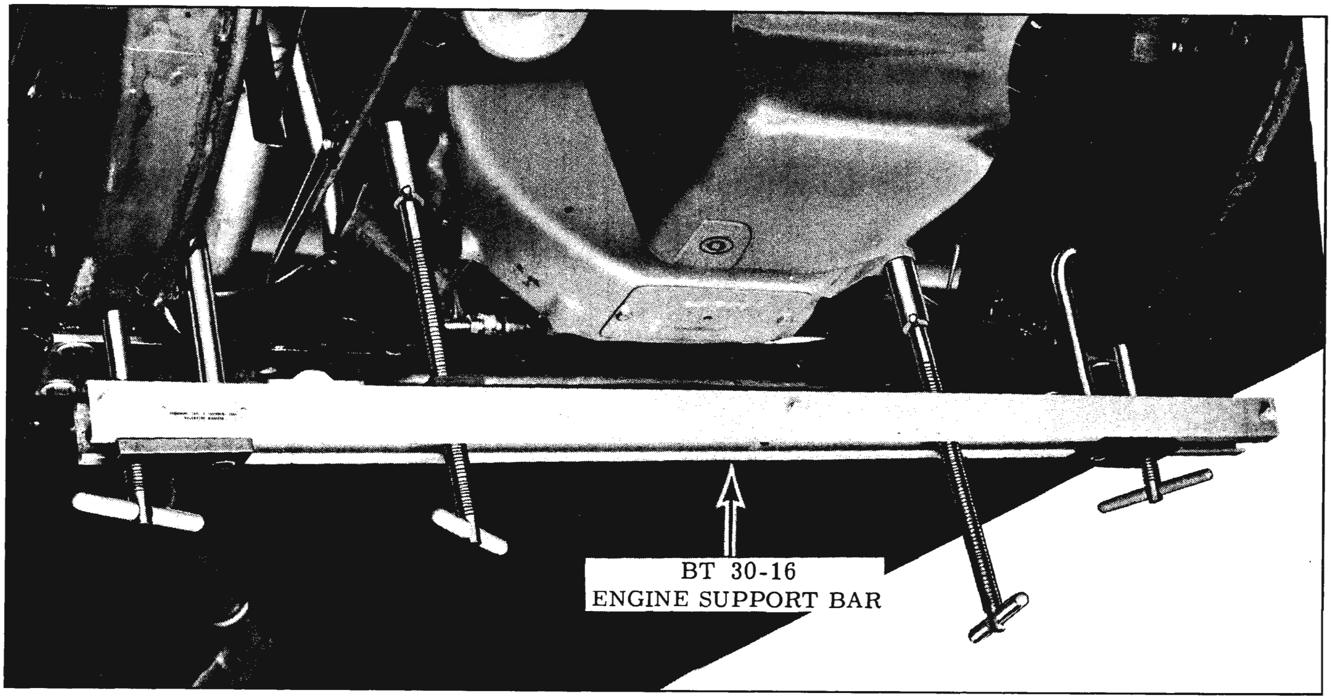


Fig. 3-18 Engine Support Bar

enough fluid to bring level to the "Full" mark on the oil level indicator.

NOTE: Transmission capacity: approximately 6-1/2 quarts (for oil change, pan removed). Approximately 9 quarts (after complete overhaul).

Adjust throttle and manual control linkage. (See MINOR SERVICE ADJUSTMENTS)

NOTE: If pressure regulator valve spring was replaced, it will be necessary to check line pressure. Pressure should be checked with shift selector in "N" or "P", engine running on fast idle and T.V. lever disconnected and held first rearward against its stop, which will give minimum T.V. pressure, and then forward to its stop, which will give maximum T.V. pressure. The correct line pressure is 124-129 psi with minimum T.V. pressure and 176-184 psi with maximum T.V. pressure. If line pressures are not within above limits, it will be necessary to install a new booster plug. Booster plugs can be identified as follows:

A. Lowest pump pressure = "V" groove on end of booster plug.

B. Medium pump pressure = "Bead" on end of booster plug.

C. Highest pump pressure = End of booster plug is plain.

GENERAL SERVICE PRECAUTIONS

When servicing the transmission, it is recommended that upon disassembly of a unit, all parts should be cleaned and inspected as outlined under CLEANING AND INSPECTION, then the unit should be reassembled before disassembly of other units to avoid confusion and interchanging of parts.

1. Before disassembly of the unit, thoroughly clean the exterior.

2. Disassembly and reassembly of the unit and the sub-assemblies must be made on a clean work bench. As in repairing any hydraulically operated unit, cleanliness is of the utmost importance; therefore, the bench, tools, and parts must be kept clean at all times.

3. Before installing cap screws into aluminum parts, ALWAYS DIP SCREWS INTO HYDRA-MATIC OIL to prevent cap screws from galling the aluminum threads and also to prevent the screws from seizing.

4. Always use a torque wrench when installing cap screws into aluminum parts to prevent the possibility of stripping the threads.

5. If taped threads in aluminum parts are stripped or damaged, the part can be made serviceable by the use of Heli-Coils.

6. Seal protecting tools must be used when assembling the units to prevent damage to the seals. The slightest flaw in the sealing surface of the seal can cause an oil leak.

7. The aluminum castings and the valve parts are very susceptible to nicks, burrs, etc., and care should be exercised while handling them.

8. The internal snap rings should be expanded and the external snap rings compressed if they are to be reused. This will insure proper seating when installed. DO NOT REUSE TRU-ARC SNAP RINGS.

9. Replace all "O" rings, gaskets and oil seals that are removed.

10. During assembly of each unit, all internal parts must be lubricated with Hydra-Matic oil.

11. The rear unit steel clutch plates must be installed in an un-nested position. Follow procedure.

12. The Fluid coupling is a balanced unit and if either the drive torus or torus cover are damaged, both units will have to be replaced as a matched assembly.

13. Always assemble the output shaft to the rear planet carrier in the same relative position.

PARTS CLEANING AND INSPECTION

After complete disassembly of a unit, all metal parts should be washed in a clean solvent and dried with compressed air. All oil passages should be blown out and checked to make sure that they are not obstructed. The small passages, such as in the front pump slide, should be checked with tag wire. All parts should be inspected to determine which parts are to be replaced.

The various inspections of parts are as follows:

1. Inspect linkage and pivot points for excessive wear.

2. Bearing and thrust surfaces of all parts should be checked for excessive wear and scoring.

3. Check for broken seal rings, damaged ring lands and damaged threads.

4. Inspect seals and "O" rings.

5. Mating surfaces of castings and end plates should be checked for burrs and irregularities. If a good seal is not apparent, burrs and irregularities may be removed by lapping the surface with crocus cloth. The crocus cloth should be held on a flat surface, such as a piece of plate glass.

6. Castings should be checked for cracks and sand holes.

7. Gear teeth should be checked for chipping, scoring, and excessive wear.

8. Valves should be free of burrs and the shoulders of the valves must be square. Any burrs or irregularities may be removed by honing. Valves should be free to slide in their respective bores.

9. Inspect composition clutch plates for damaged surfaces and loose facings. If flakes of facing material can be removed with the thumbnail, the plates should be replaced; however, composition plate discoloration is not an indication of failure.

10. Inspect steel clutch plates for scored surfaces.

11. Inspect springs for distortion or collapsed coils. Slight wear (bright spots) on the sides of the springs is permissible.

12. When inspecting bushings, fit the mating part into the bushing and observe the amount of looseness. Bushing clearance is excessive if more than .008 of an inch exists when checked with a wire feeler gauge.

13. If the transmission shows evidence that foreign material has circulated throughout the transmission or if the oil cleaner is dirty, the oil cleaner should be discarded and a new one installed upon assembly of the transmission.

TRANSMISSION DISASSEMBLY

CONTROL VALVE BODY, ACCUMULATOR AND SERVO REMOVAL

1. Attach transmission Holding Fixture J-8763 to transmission case.

2. Place transmission and Holding Fixture into Bench Adaptor J-6115-A, then rotate transmission so that oil pan is up. (Fig. 3-19)

3. Remove oil pan and gasket.

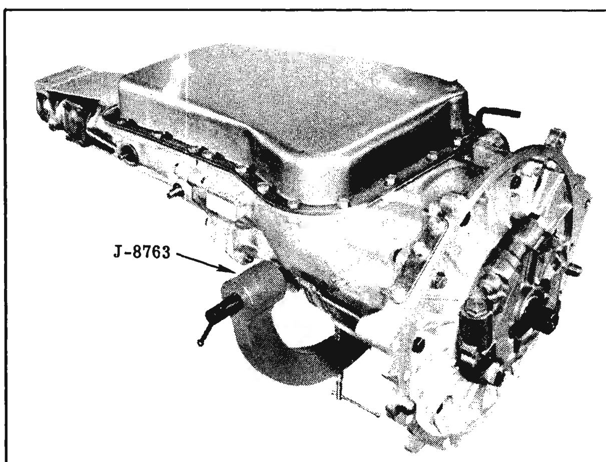


Fig. 3-19 Transmission Holding Fixture

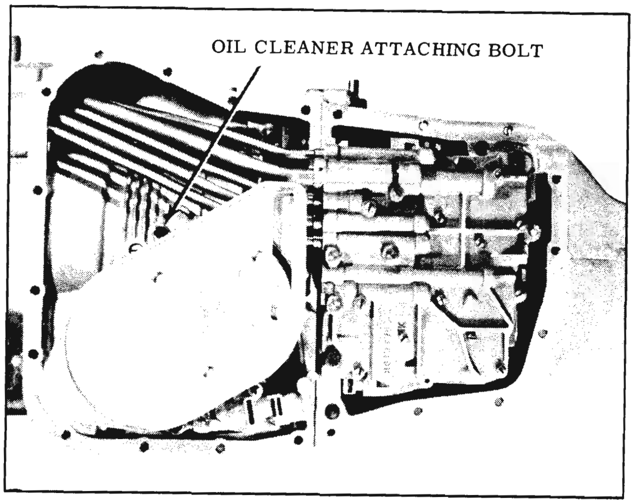


Fig. 3-20 Oil Cleaner

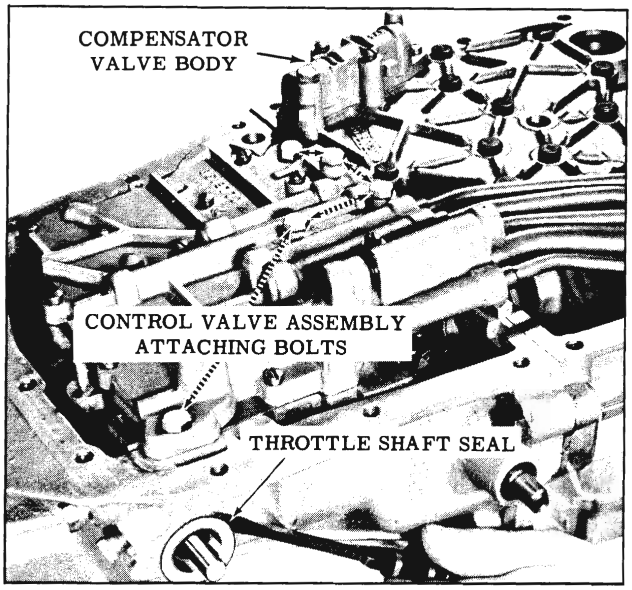


Fig. 3-21 Valve Bodies and Seal

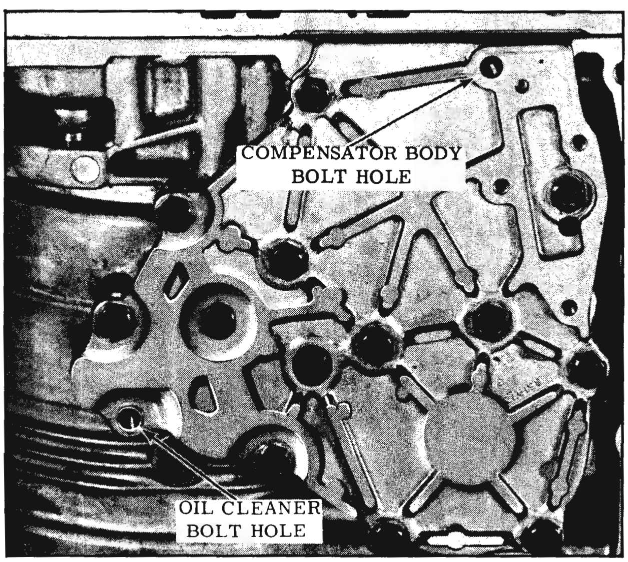


Fig. 3-22 Accumulator and Servo Cover

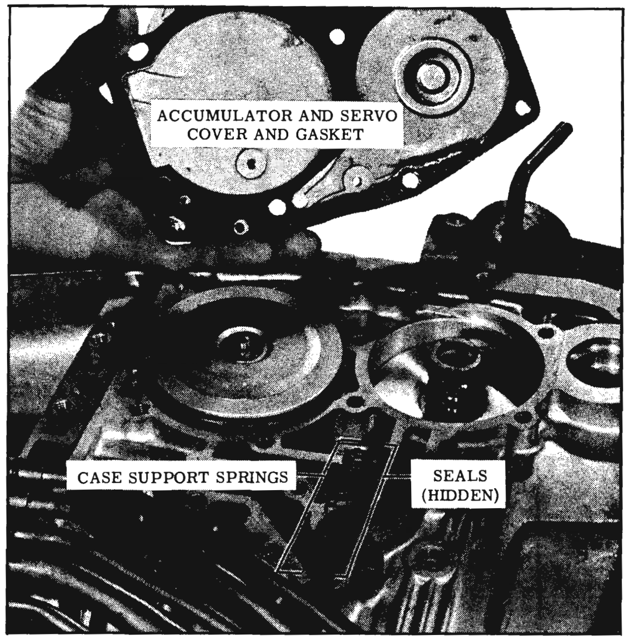


Fig. 3-23 Case Support Springs and Seals

4. Remove oil cleaner attaching bolt and oil cleaner. (Fig. 3-20)

5. Inspect and if necessary, remove the oil cleaner to case seal ring with a small screwdriver.

6. Pry T.V. shaft seal from side of rear bearing retainer. (Fig. 3-21)

7. Remove 5 control valve assembly attaching bolts and carefully remove control valve assembly from the pipe assembly and rear bearing retainer. (Fig. 3-21) DO NOT DROP THE MANUAL VALVE.

8. Remove manual valve from control valve assembly.

9. Remove the compensator valve body assembly from the servo and accumulator cover by removing 1 bolt and 3 screws. (Fig. 3-21)

10. Remove the servo and accumulator cover and gasket by removing the 12 remaining cover bolts. (Fig. 3-22) Cover is under spring tension.

11. Remove the 3 case support springs and seals. (Seals may remain in transmission case). (Fig. 3-23)

12. Remove the servo piston assembly and the servo release spring from bore in case. (Fig. 3-24)

13. Remove the lower accumulator spring and piston. (Fig. 3-24)

14. Remove the accumulator piston pin, then using

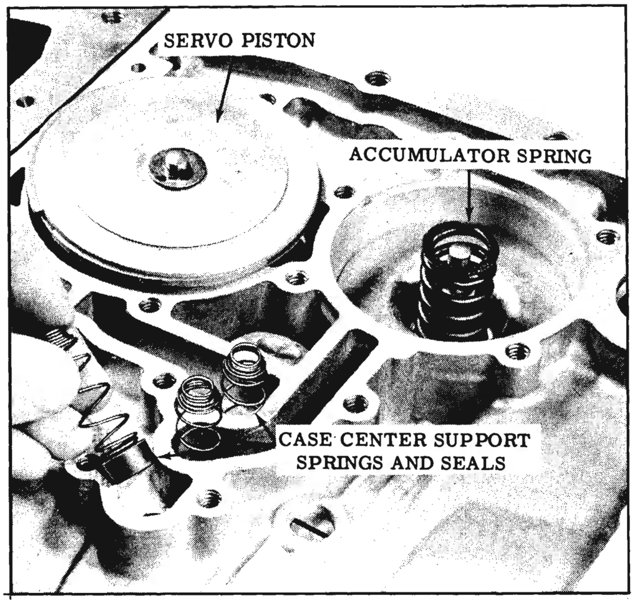


Fig. 3-24 Accumulator and Servo

the stem of the accumulator pin as a tool, remove the upper accumulator piston. (Fig. 3-25)

15. Remove the upper accumulator spring.
16. Remove the ring and seal from the lower and upper accumulator pistons.
17. Remove the pipe assembly attaching bolt, washer and seal from front of case cover and withdraw the pipe assembly and seals from transmission. Multiple seals may have remained in transmission. (Fig. 3-26)

If transmission is not to be disassembled further, refer to Page 3-54 for servicing of the valve

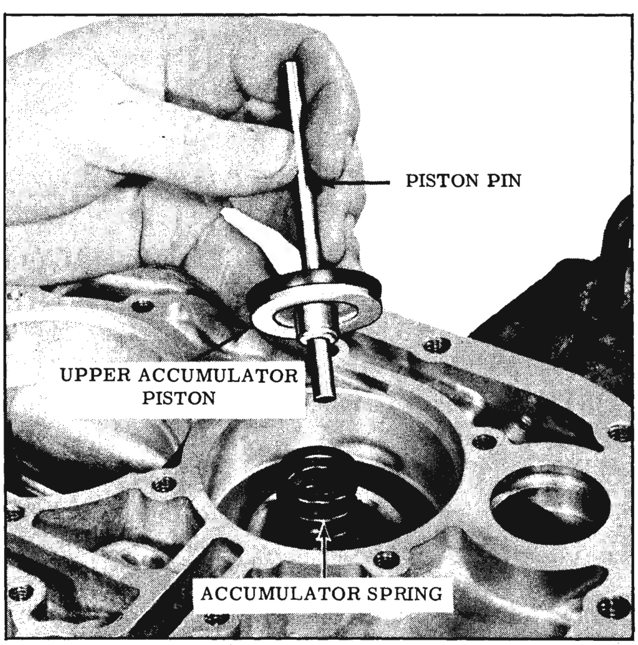


Fig. 3-25 Accumulator Removal

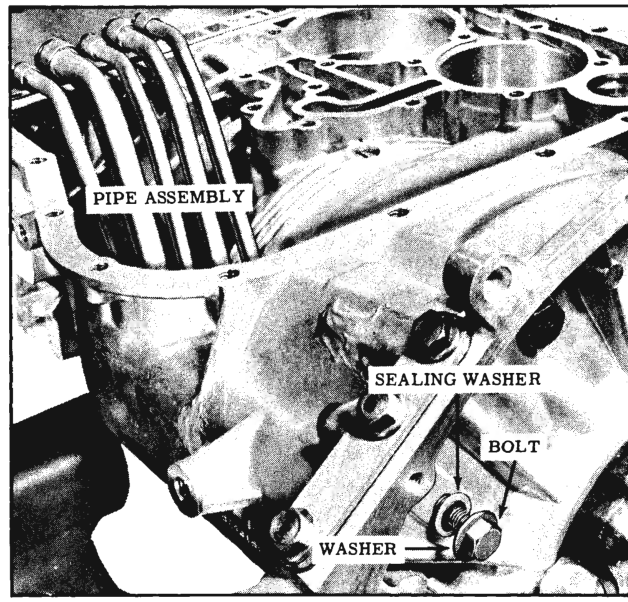


Fig. 3-26 Pipe Assembly Removal

body or Page 3-50 for servicing of the accumulator and servo.

FRONT UNIT END PLAY CHECK

If transmission is to be completely disassembled, measure front unit end play as follows:

1. Remove one case cover to case attaching bolt.
2. Install Tool J-6126 into transmission case. (Fig. 3-27)
3. Assemble Neutral Clutch Retainer J-6135 on the input shaft.
4. Clamp dial indicator on bolt from Tool J-6126

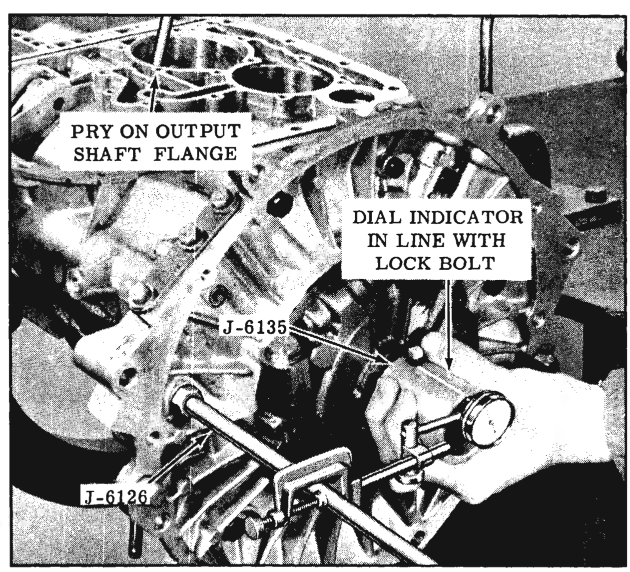


Fig. 3-27 Check End Play

and index indicator with end of Tool J-6135 in line with lock screw on tool.

5. Position a screwdriver through case, BEHIND OUTPUT SHAFT FLANGE and gently pry forward on output shaft to position units forward.

6. At the same time move Tool J-6135 and record end play. (Fig. 3-27)

7. End play should be .005" to .020". Record end play.

8. Remove the tools.

REAR BEARING RETAINER AND GOVERNOR REMOVAL

1. If rear seal replacement is necessary, drive seal from rear bearing retainer using a chisel.

2. Remove the rear bearing retainer cover and gasket by removing the 4 attaching bolts.

3. Rotate the transmission so that the output shaft is up, then remove the rear bearing retainer to case attaching bolts (6 on outside and 2 on inside of rear bearing retainer.) (Fig. 3-28)

4. Reaching through access hole in rear bearing retainer, cut and remove "O" ring from output shaft, unseat the rear output shaft snap ring using Tool J-8872 and move snap ring upward over output shaft "O" ring groove. (Fig. 3-29)

5. Carefully, remove the rear bearing retainer and gasket from output shaft.

   CAUTION: Care should be exercised to prevent manual shaft retainer from falling out of front face of rear bearing retainer.

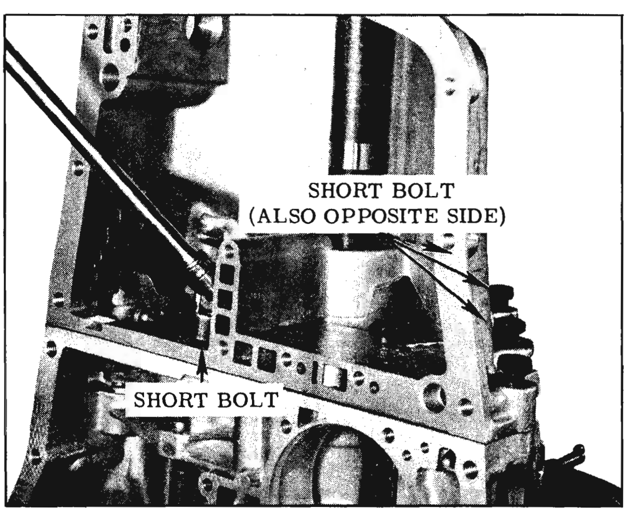


Fig. 3-28 Rear Bearing Retainer Bolts

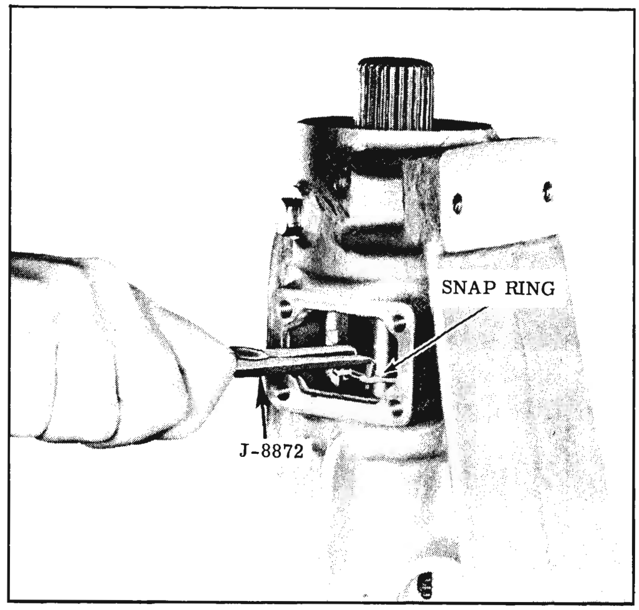


Fig. 3-29 Unseating Snap Ring

6. Remove the dislodged snap ring from rear bearing retainer.

7. Remove the remaining snap ring from the output shaft using Tool J-8872.

8. Remove the 4 governor attaching bolts, governor assembly and gasket from output shaft. (Fig. 3-30)

9. If alignment marks are not visible, mark one dowel pin and nearest tooth on the output shaft flange for ease in re-assembling.

   CAUTION: Do not punch or scratch ground surface on output shaft flange for marking.

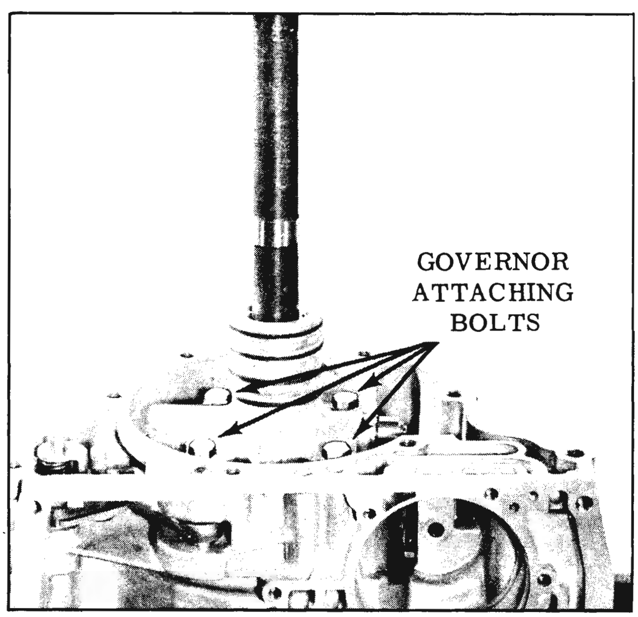


Fig. 3-30 Governor Removal

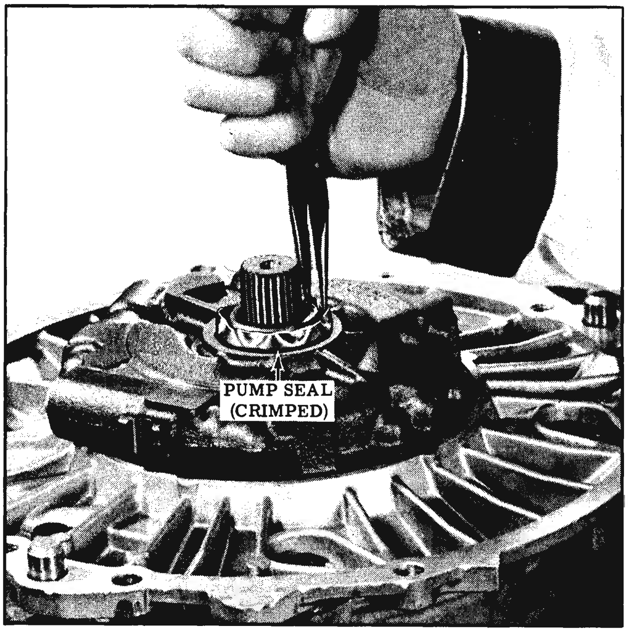


Fig. 3-31 Removing Oil Pump Seal

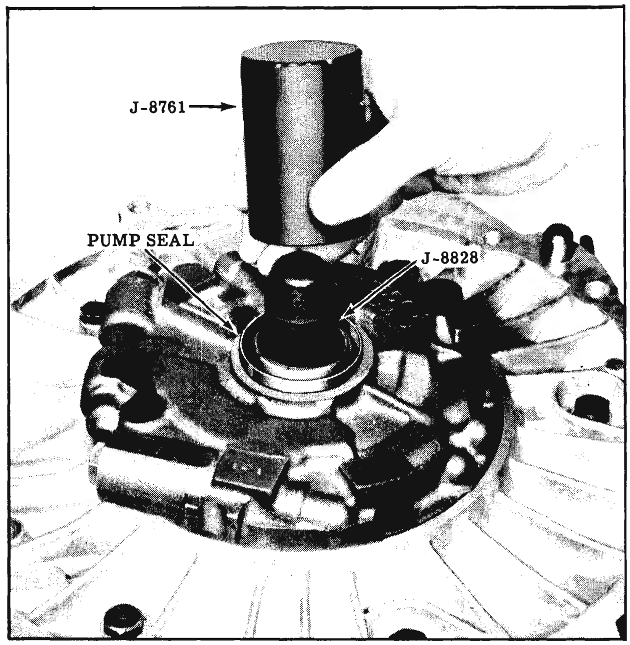


Fig. 3-32 Installing Pump Seal

10. Remove the output shaft assembly from transmission by lifting straight up.

   If transmission is not to be disassembled further, refer to Page 3-46 for servicing of the governor or Page 3-49 for servicing of the rear bearing retainer.

CASE COVER AND FRONT PUMP REMOVAL

1. Rotate the transmission so that the case cover and pump are up.
2. If necessary, remove and discard the pump seal by crimping seal as shown in Fig. 3-31 and withdrawing seal with needle nose pliers.

   NOTE: If transmission is NOT to be disassembled, install seal as follows:

   a. Place Seal Protector J-8828 over input shaft.

   b. Apply seal lubricant Part No. 567196 to the sealing lip of a new seal.

   c. Apply a film of sealer, Part No. 557622 to the outer diameter of the seal.

   d. Install seal using Tool J-8761. (Fig. 3-32)

3. Remove 6 large and 3 small case cover to case attaching bolts.

   NOTE: Two of the small bolts are attached from the case side of the case cover.

4. Install Seal Protector J-8828 over input shaft, if pump seal was not removed.
5. Remove case cover and pump assembly by lifting straight up. Slight tapping with plastic hammer may be necessary.
6. Remove case cover to case gasket and discard.
7. Remove bearing race if it remained on the torus cover.

If transmission is not to be disassembled further, refer to Page 3-41 for servicing of the case cover or Page 3-42 for servicing of the oil pump.

TORUS REMOVAL

1. Install a box end wrench as a holding tool,

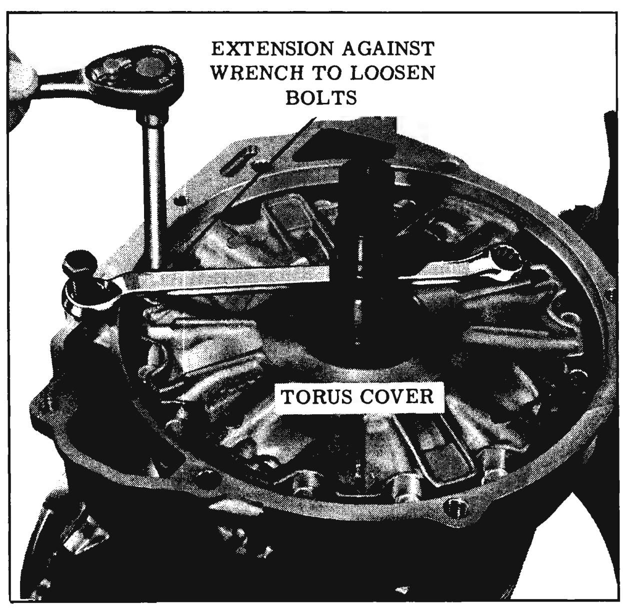


Fig. 3-33 Removing Torus Cover Bolts

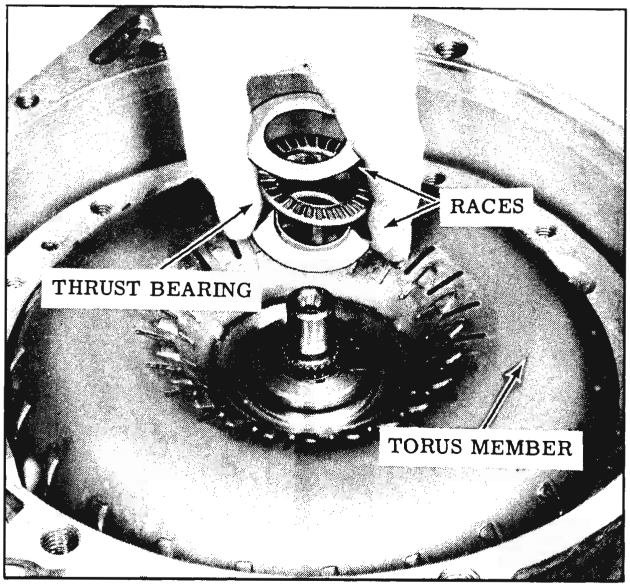


Fig. 3-34 Removing Bearing and Races

using a large case cover attaching bolt. (Fig. 3-33)

2. Completely loosen 12 torus cover attaching bolts and remove the holding wrench.

3. Remove torus cover from torus assembly by lifting input shaft straight up.

4. Remove and DISCARD torus cover to drive torus gasket.

5. Remove race, thrust bearing, and race from either torus cover or torus member. Parts may have remained with either unit. (Fig. 3-34)

6. Rotate transmission to horizontal position with bottom up.

7. From the front of the transmission remove the driven torus member to main shaft Spirolox ring, with a small pointed tool. (Fig. 3-35)

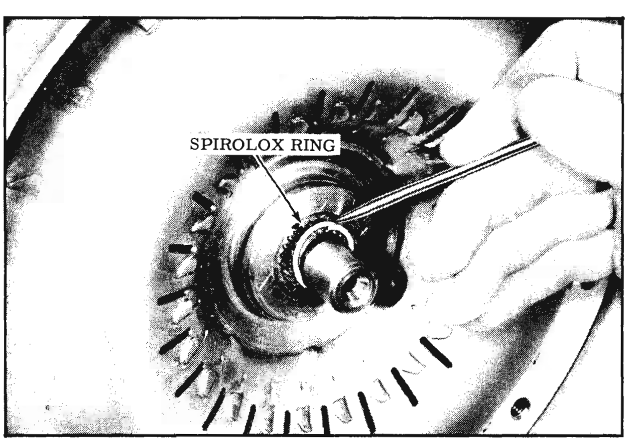


Fig. 3-35 Removing Spirolox Ring

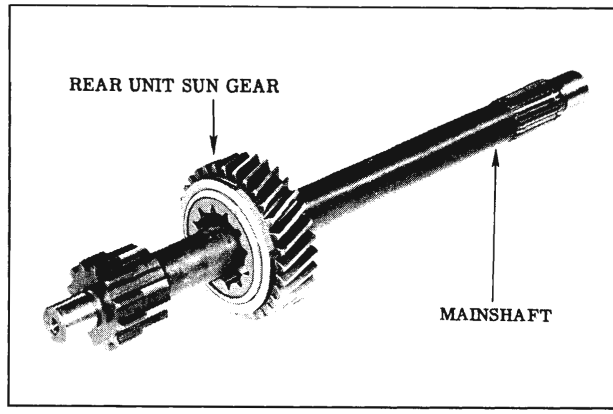


Fig. 3-36 Sun Gear Removal

8. Push main shaft through driven torus member and remove driven torus member.

9. Remove race, thrust bearing and race from drive torus member.

   NOTE: Some of these parts may have been removed with the driven torus member.

10. Remove the mainshaft and sun gear from the rear of the transmission.

11. Remove the bearing and race from the rear carrier.

   NOTE: These parts may have remained with the main shaft.

12. Remove sun gear from main shaft. (Fig. 3-36)

13. From the front of the transmission, remove the drive torus member and accel-a-rotor as a unit. (Fig. 3-37)

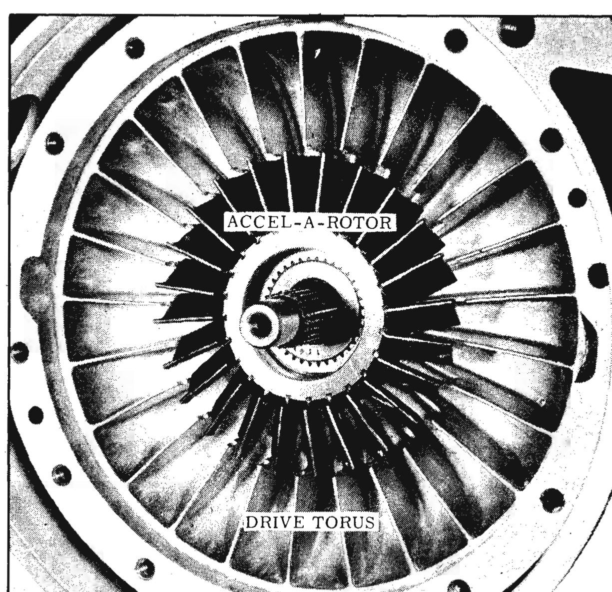


Fig. 3-37 Drive Torus and Accel-A-Rotor

Fig. 3-38 Accel-A-Rotor

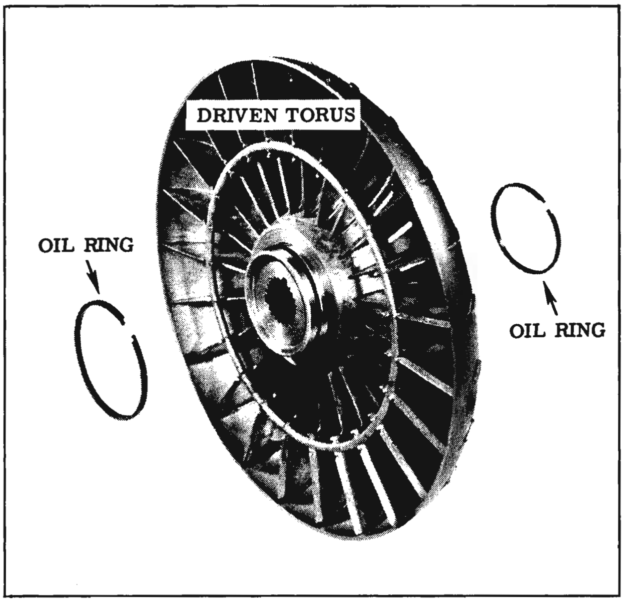


Fig. 3-39 Driven Torus

14. Remove the accel-a-rotor by pushing from rear of the drive torus member.

15. If necessary, remove oil rings from driven torus member and accel-a-rotor (three rings). (Figs. 3-38 and 3-39)

    If transmission is not to be disassembled further, refer to Page 3-46 for servicing of the torus cover.

FRONT AND REAR UNITS REMOVAL

1. Remove front carrier to carrier shaft snap ring. (Fig. 3-40)

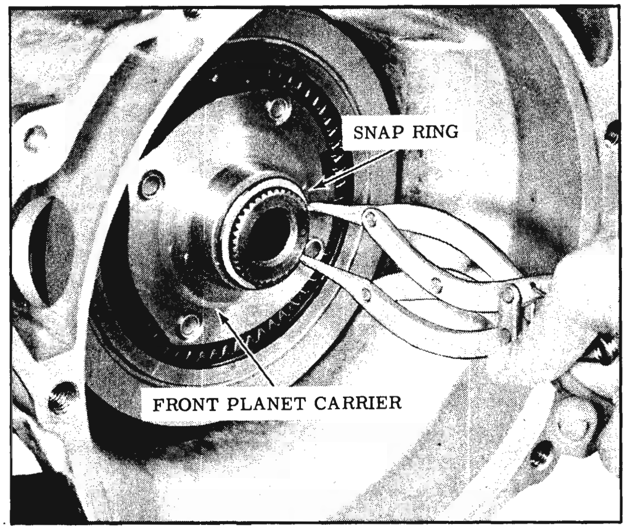


Fig. 3-40 Removing Snap Ring

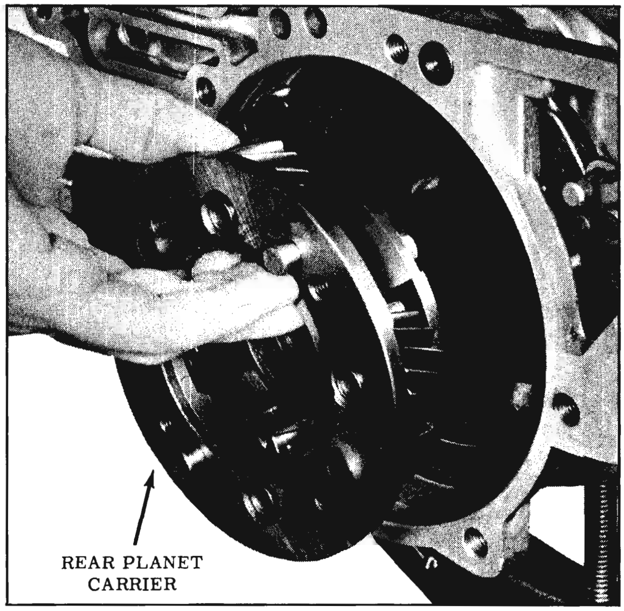


Fig. 3-41 Removing Rear Carrier

2. Remove the front unit carrier assembly.

3. Remove race, thrust bearing and race.

   NOTE: Some of these parts may have remained with the carrier.

4. Remove the rear carrier and shaft assembly from the rear of the transmission. (Fig. 3-41)

5. Remove the thrust bearing and race from the rear unit carrier assembly. (Fig. 3-42)

   NOTE: These parts may have remained with the rear unit internal gear.

6. Make certain parking pawl is disengaged, then remove the rear unit internal gear and clutch assembly. (Fig. 3-43)

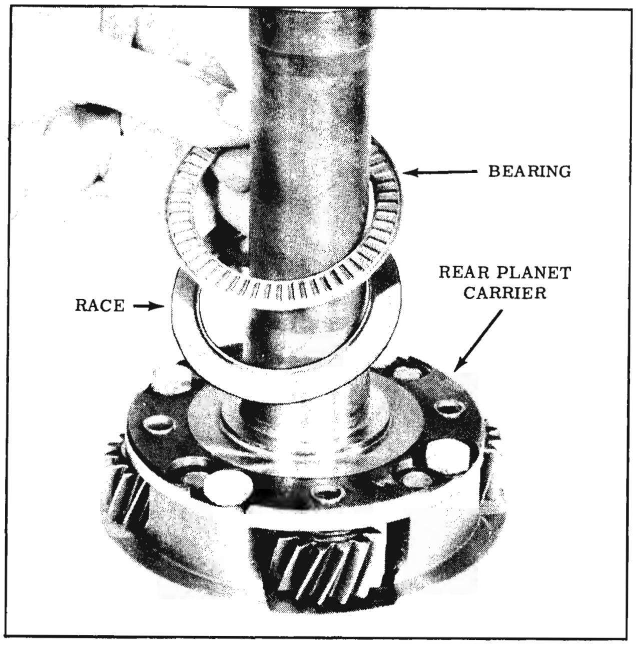


Fig. 3-42 Thrust Bearing and Races

7. Rotate the transmission 90° so that the front of transmission is up.

CAUTION: Transmission parts are loose and will drop out if transmission is not rotated as described.

8. Remove the front unit sun gear assembly, race, thrust bearing and race. (Fig. 3-44)

9. Remove the front unit gear and clutch assembly from the front of transmission.

10. Remove the fiber thrust washer from the front clutch drum. (Fig. 3-45)

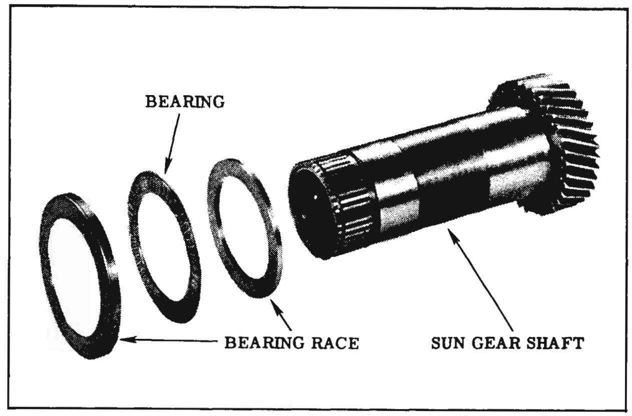


Fig. 3-44 Bearing and Races

NOTE: The bronze thrust washer may have remained on the case support.

11. Remove the reverse stationary cone to case snap ring.

12. Using Reverse Cone Puller, J-8768, remove the reverse cone and reverse stationary cone. Position tool under lugs of reverse cone and pull upward. (Fig. 3-46)

A slide hammer (J-6125) can be used as illustrated.

13. Remove the reverse stationary cone key from case.

14. Remove the reverse and neutral piston and case support assembly.

NOTE: If assembly is tight in case, loosen both holding fixture screws slightly and gently tap case support with soft hammer from rear.

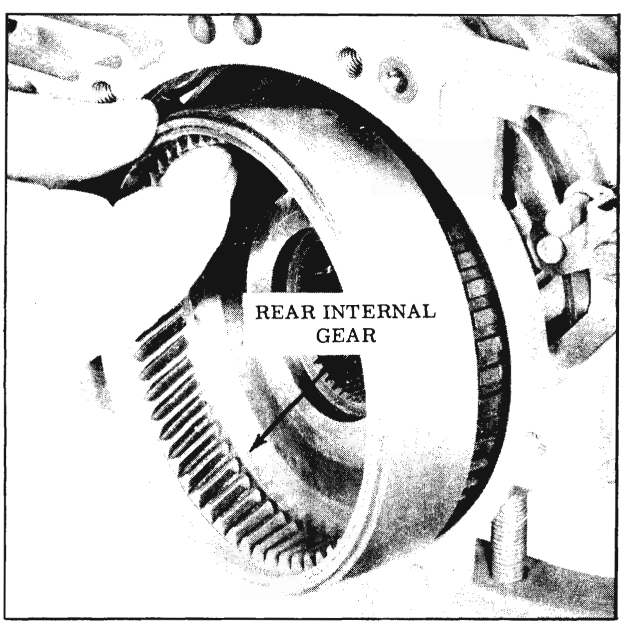


Fig. 3-43 Removing Internal Gear

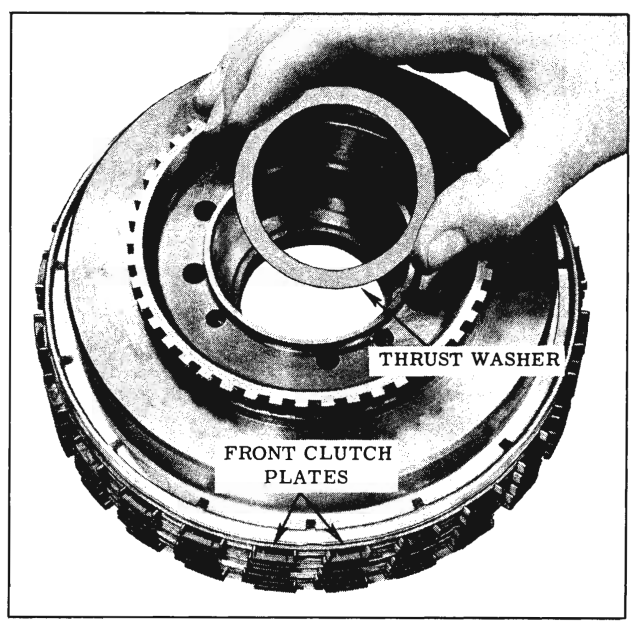


Fig. 3-45 Front Clutch

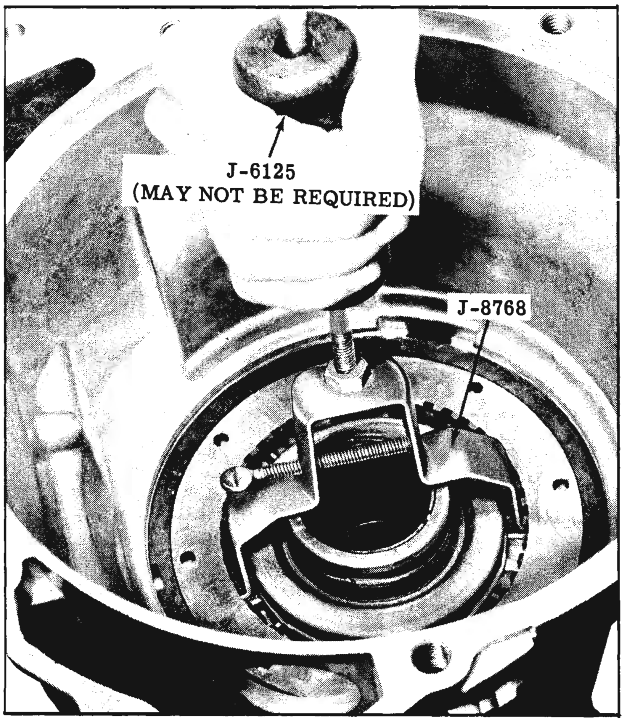


Fig. 3-46 Removing Reverse Cone

15. Remove the case support key from the transmission case. (Fig. 3-47)
16. Remove the neutral clutch plates (4 drive composition and 4 driven steel) and clutch backing plate from transmission case. (Fig. 3-47)
17. Rotate the transmission so that the rear of the case is up.
18. Unhook the band from the anchor and lift upwards to remove. (Fig. 3-48)

If transmission is not to be disassembled further, refer to Page 3-44 for servicing of the reverse and neutral clutch, Page 3-51 for servicing of the front clutch, or Page 3-52 for servicing of the rear internal gear and clutch.

PARKING PAWL LINKAGE REMOVAL

If necessary, remove the parking pawl linkage

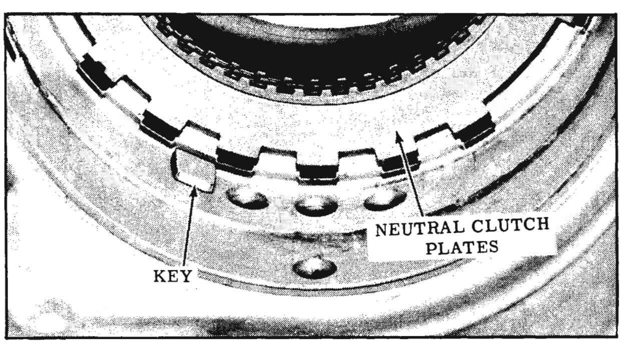


Fig. 3-47 Case Support Key

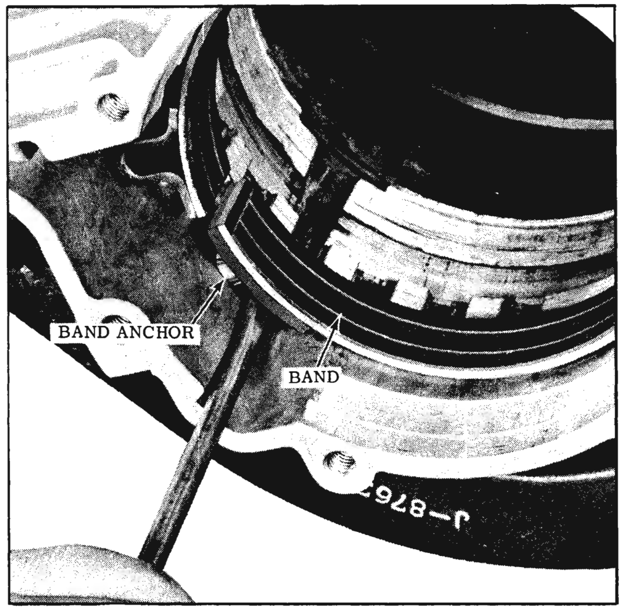


Fig. 3-48 Removing Overrun Band

as follows:

1. While holding parking brake link stop against parking bracket pin, unhook spring from parking lever assembly. (Fig. 3-49 and Fig. 3-50)
2. Remove parking bracket and spring.
3. Remove parking bracket pin.
4. Remove parking pawl shaft and spacer. Spacer might drop from case.
5. Remove parking pawl, link and lever assembly.

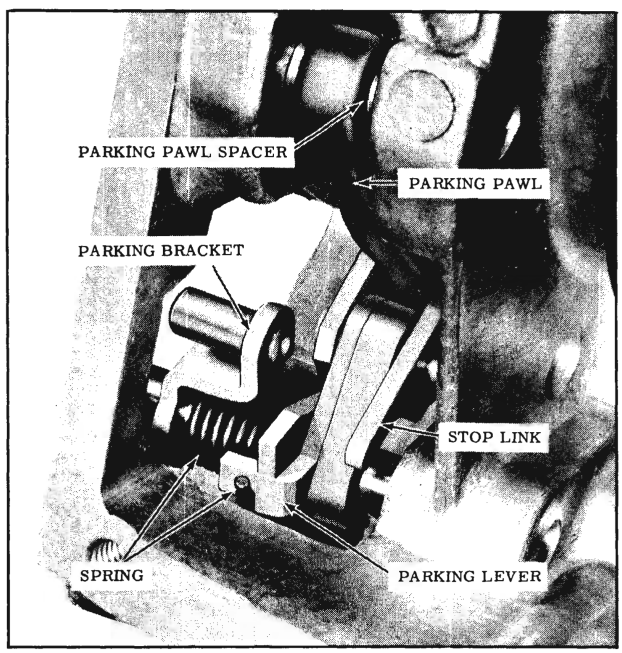


Fig. 3-49 Parking Pawl Linkage

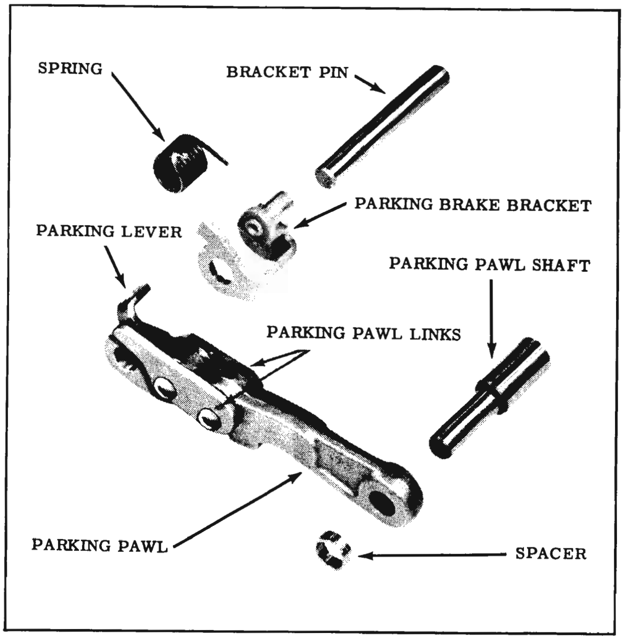


Fig. 3-50 Parking Pawl Assembly

DISASSEMBLY AND ASSEMBLY OF INDIVIDUAL UNITS

CAUTION: Before installing cap screws into aluminum parts, the screws should be dipped into Hydra-Matic oil to prevent galling and/or seizing of threads.

CASE COVER DISASSEMBLY

1. Loosen 6 case cover to pump attaching bolts approximately 4 turns.

2. Support cover so that pump is off bench and gently tap loosened bolts to disengage pump from case cover. (Fig. 3-51)

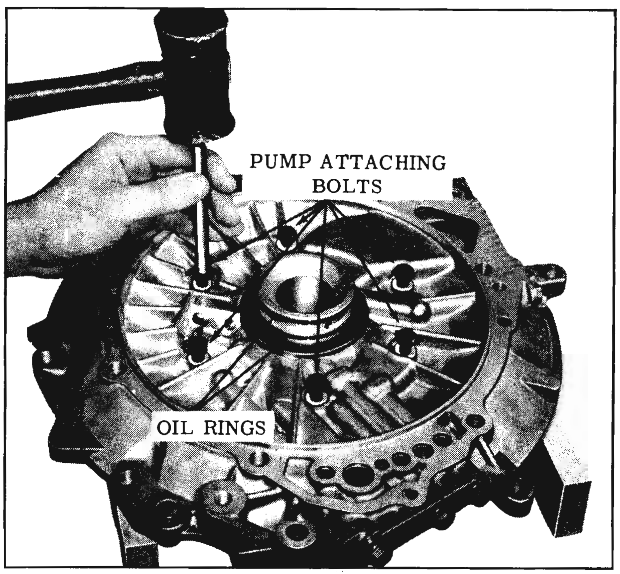


Fig. 3-51 Removing Oil Pump

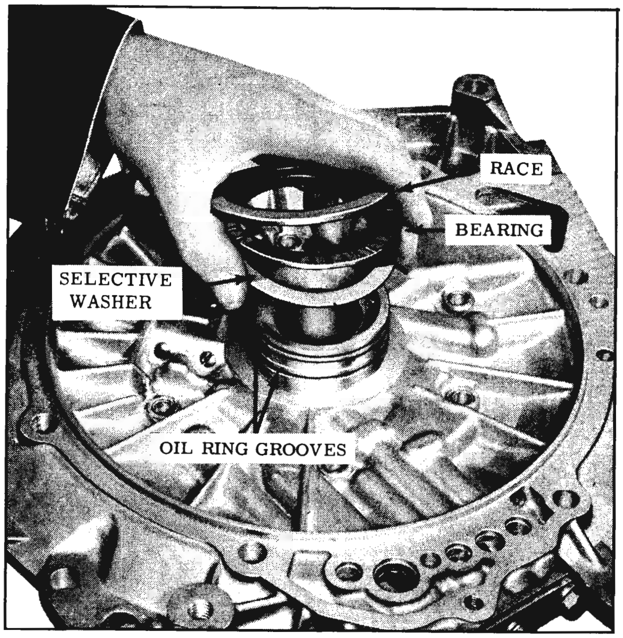


Fig. 3-52 Removing Race, Bearing and Washer

3. Remove 6 bolts from case cover.

4. Remove 2 lock type oil rings from case cover.

5. Remove race, thrust bearing, race and selective washer(s) from case cover. (Fig. 3-52)

6. Remove 3 case cover bolts, plate and gasket and the remaining bolt and seal in the case cover, if necessary for cleaning passages.

ASSEMBLY OF CASE COVER

1. If removed, install case cover plate and gasket with 3 attaching bolts and seal washers.

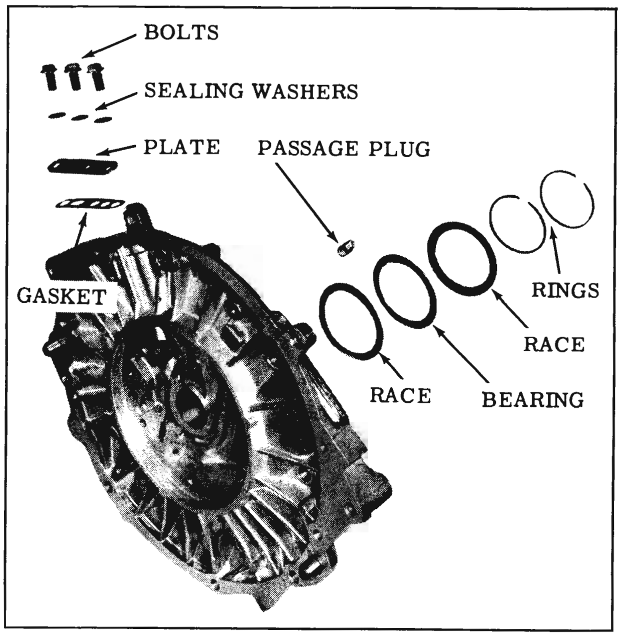


Fig. 3-53 Case Cover Assembly

Torque 18 to 20 ft. lbs. (Fig. 3-53)

2. If removed, install bolt and seal washer in case cover. Torque 18 to 20 ft. lbs.

3. Install selective washer(s) over tower of case cover.

   NOTE: If end-play was incorrect during disassembly, check thickness of old washer, then refer to selective washer chart and install new thrust washer.

4. Install race, thrust bearing and cupped race (cup side down) and retain with petrolatum.

5. Install 2 lock type oil rings on tower.

SELECTIVE THRUST WASHER CHART

PART NO.	THICKNESS	COLOR INDENT.
8620697	.027"-.029"	Bright & Notched
8620698	.036"-.038"	Copper
8620699	.045"-.047"	Black
8620700	.054"-.056"	Bright

PUMP DISASSEMBLY (Fig. 3-54)

1. Inspect and remove "O" ring from pump, if condition indicates replacement is necessary.

2. Remove the pump cover to body attaching screw.

3. Remove the pump cover from the pump and roll pin. Do not pry to remove. Rotating the cover will aid removal. Remove ball check.

4. Remove the top vane ring, rotor, 11 vanes and bottom vane ring.

5. Remove the pump slide by compressing slide against priming springs and lift up on opposite end.

6. Remove the inner and outer priming springs.

7. Remove the coupling feed limit plug and "O" ring.

8. From the same bore remove the coupling limit spring, guide pin and valve.

9. Remove the pressure regulator plug assembly and "O" ring.

10. Remove the booster plug from the pressure regulator plug.

11. Remove the booster plug stop sleeve from pump.

12. Remove the pressure regulator valve spring and valve.

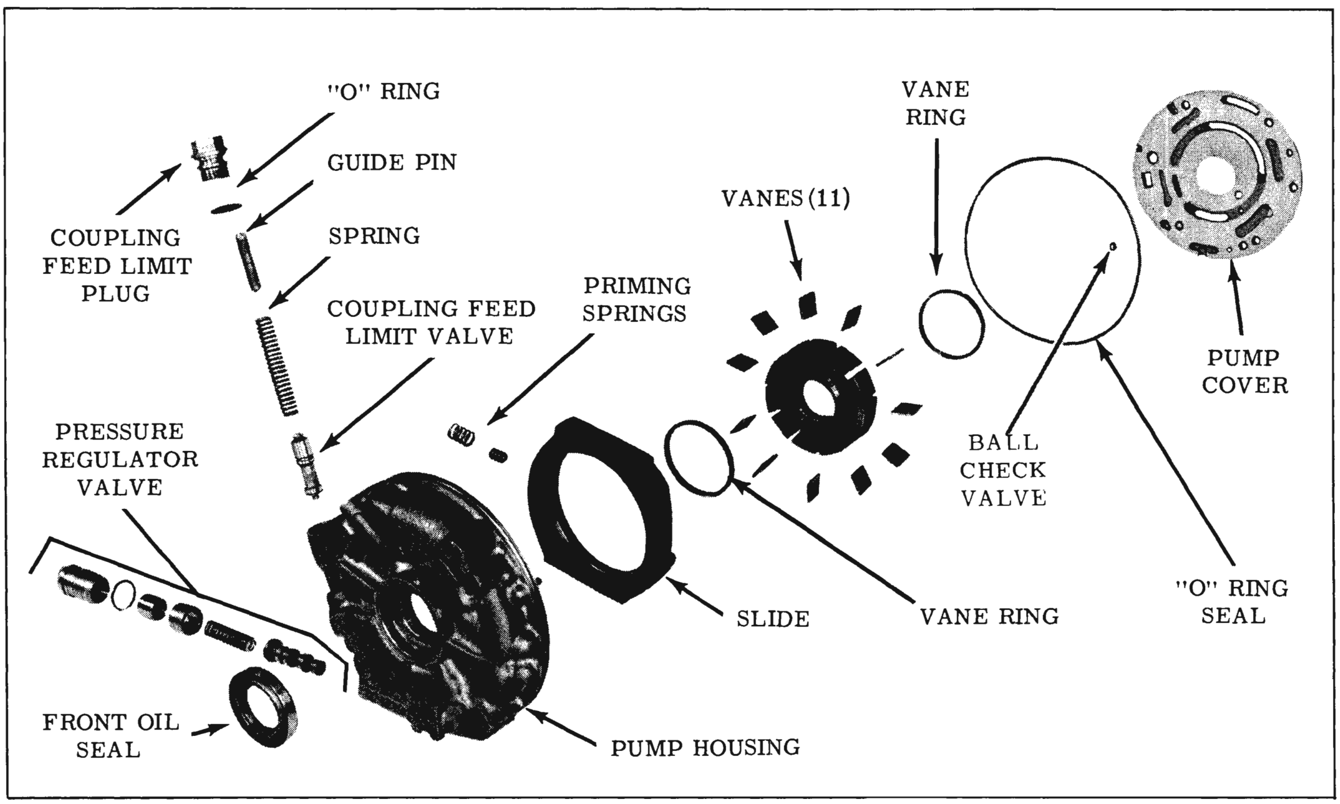


Fig. 3-54 Oil Pump Assembly

13. If necessary, remove rubber cushion from pressure regulator valve.

PUMP ASSEMBLY (Fig. 3-54)

1. Install new cushion on pressure regulator valve if previously removed, and install pressure regulator spring on valve.

   NOTE: If a new pressure regulator spring is installed, it will be necessary to check line pressure after transmission is installed. If line pressure is incorrect, it will be necessary to install a selective booster plug. This information is included in the transmission installation procedure.

2. Install pressure regulator valve and spring in bore of pump.
3. Install pressure regulator booster plug stop into pump, over the spring.
4. Install new "O" ring on pressure regulator plug, if condition warrants.
5. Install booster plug into pressure regulator plug, cup side out.
6. Install plug assembly into pump. Torque 15 to 20 ft. lbs.
7. Install coupling limit valve, spring and pin into pump.
8. Install new "O" ring on coupling feed limit valve plug, if condition warrants.
9. Install coupling feed limit valve plug into pump. Torque 15 to 20 ft. lbs.
10. Install inner and outer pump priming springs into bottom cavity of pump.
11. Assemble slide into pump body by compressing slide against priming springs at lower end until slide can be fully installed into pump. (Fig. 3-55)
12. Install bottom vane ring into pump cavity.
13. Install pump rotor (hub side down) in pump pocket over vane ring.
14. Install 11 vanes into rotor and install ball check. (Fig. 3-56)

    NOTE: Install the vanes so that the ring wear pattern on the edge of the vane is against the guide ring.

15. Install top vane ring on rotor.
16. Install pump cover over roll pin, center cover and torque screw 6 to 8 ft. lbs. (Fig. 3-57)

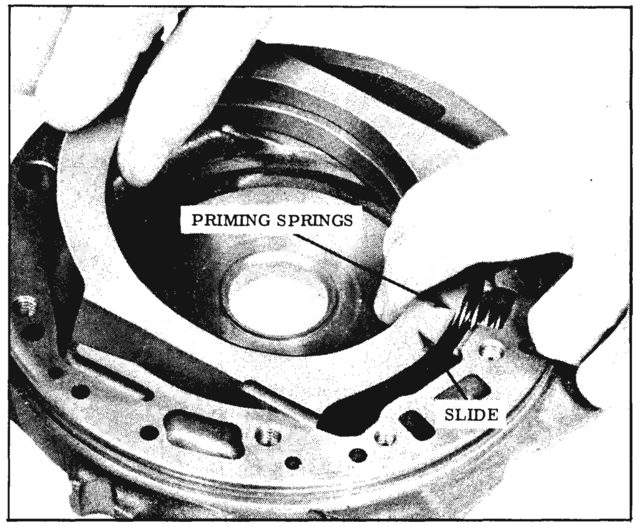


Fig. 3-55 Installing Pump Slide

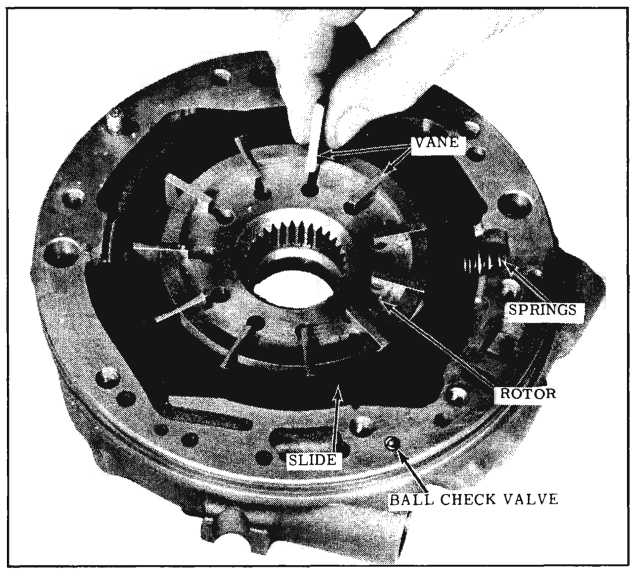


Fig. 3-56 Installing Pump Vanes

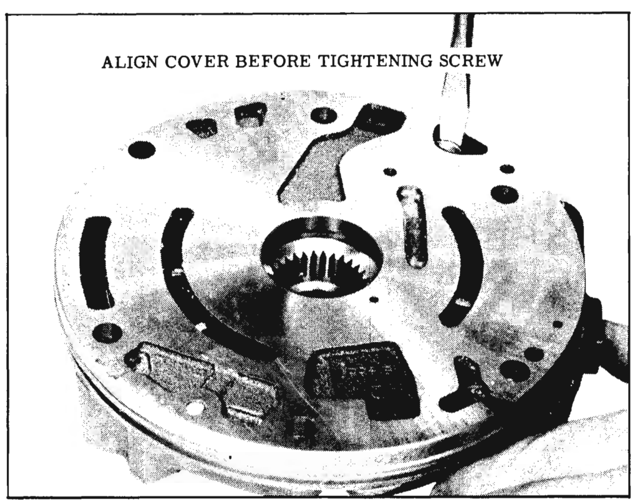


Fig. 3-57 Installing Pump Cover

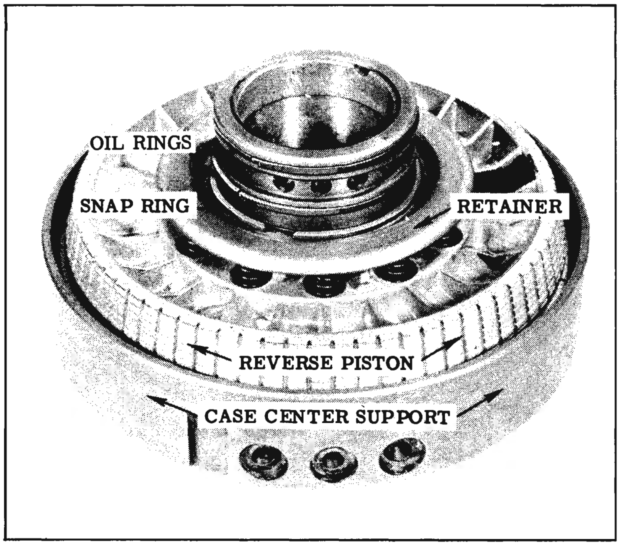


Fig. 3-58 Case Support and Reverse Piston

17. Install "O" ring on pump, if removed.

18. If front seal was removed, install a NEW one as follows:
    a. Apply seal lubricant Part No. 567196 to the sealing lip of a new seal.
    b. Apply a light coat of sealer Part No. 557622 to the outer diameter of the seal.
    c. Position seal into pump and install seal with Tool J-8761.

ASSEMBLY OF PUMP ASSEMBLY TO CASE COVER

1. Position the case cover on the pump, aligning the bolt holes.

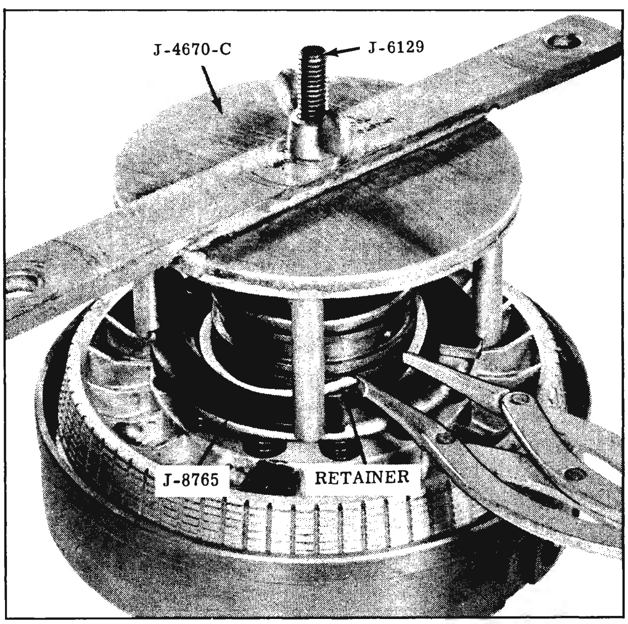


Fig. 3-59 Removing Reverse Release Spring Retainer

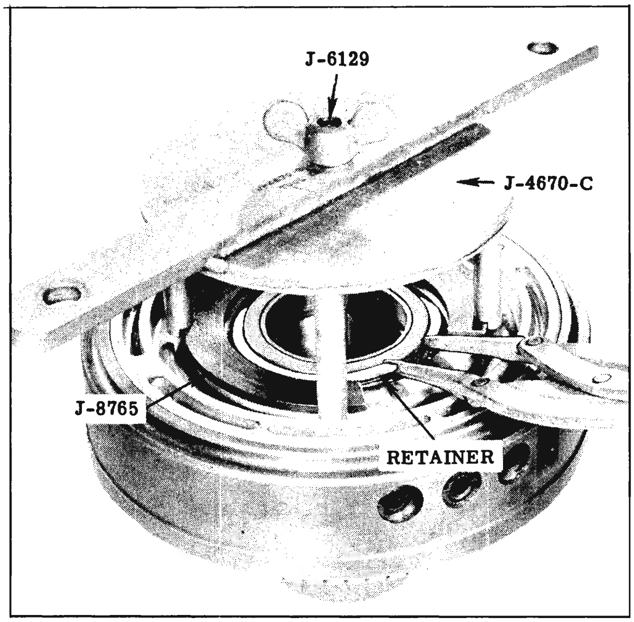


Fig. 3-60 Removing Neutral Clutch Retainer

2. Install 6 case cover to pump attaching bolts, draw the bolts up evenly to properly seat the "O" ring seal in the case cover. Torque 15 to 18 ft. lbs.

If other units are not to be serviced, refer to Page 3-65.

REVERSE AND NEUTRAL CLUTCH DISASSEMBLY

1. Remove 2 oil rings from hub of case support. (Fig. 3-58)

2. Using Tools J-8765, J-6129, and J-4670-C, remove reverse release spring retainer snap ring. (Fig. 3-59)

3. Remove tools from the reverse and neutral clutch assembly.

4. Remove the reverse release spring retainer and 12 release springs.

5. Remove reverse clutch piston. It may be necessary to tap housing to permit removal.

6. Remove inner and outer reverse piston seal rings and discard.

7. Using Tools J-8765, J-6129, and J-4670-C, remove neutral clutch release spring retainer snap ring. (Fig. 3-60) Remove tools.

8. Remove neutral clutch release spring retainer and 16 neutral clutch release springs. Do not mix springs with reverse release springs. (Neutral clutch springs are longer).

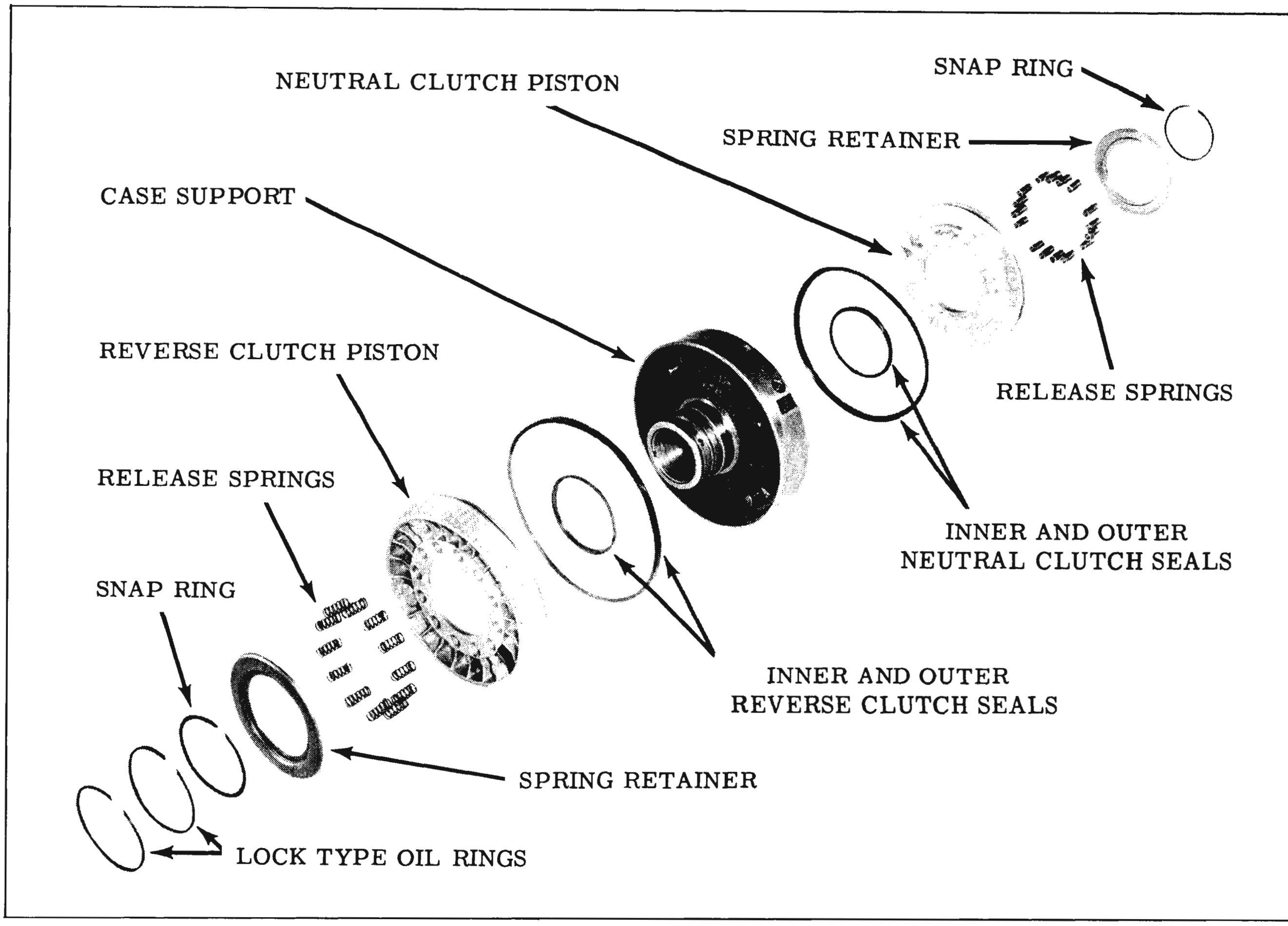


Fig. 3-61 Reverse and Neutral Clutch Assembly

9. Remove neutral clutch piston. It may be necessary to tap housing.

10. Remove inner and outer neutral clutch seal rings and discard.

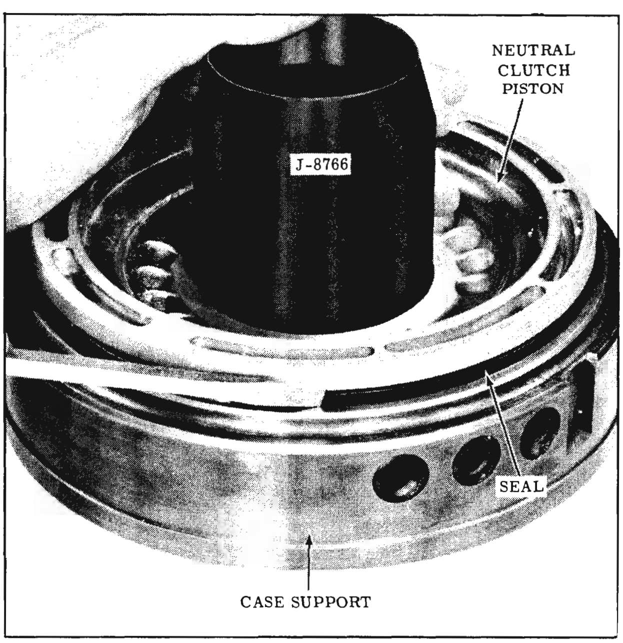


Fig. 3-62 Installing Neutral Clutch Piston

ASSEMBLY OF REVERSE AND NEUTRAL CLUTCH (Fig. 3-61)

1. Install new inner and outer neutral clutch seals. Lip of seals should face the neutral clutch housing.
2. Install Inner Seal Protector J-8766 over neutral clutch hub. (Fig. 3-62)
3. Install neutral clutch piston so that spring pockets are not over web in case support. Use small blade screwdriver to depress lip of seal into case support. Remove seal protector.
4. Install 16 release springs into spring pocket of neutral clutch piston and place spring retainer over spring. (Neutral clutch springs are longer than reverse piston springs.)
5. Using Tools J-8765, J-6129, and J-4670-C, compress neutral clutch release springs and install retainer snap ring. (Fig. 3-60) Remove tools.
6. Install Inner Seal Protector Tool J-8766 over reverse piston hub and install Reverse Outer Seal Protector Tool J-8767 into case support. (Fig. 3-63)

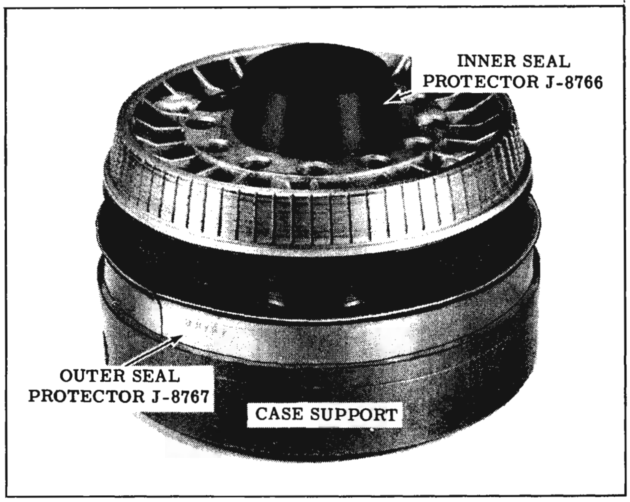


Fig. 3-63 Installing Reverse Piston

7. Install new inner and outer reverse piston seals on reverse piston, lip of seals facing dowel pins.

8. Install reverse piston, aligning piston to index with dowel pins, then remove tools.

9. Install 12 reverse piston release springs into spring pockets.

10. Install reverse piston spring retainer.

11. Using Tools J-8765, J-6129 and J-4670-C, compress release springs. (Fig. 3-59)

12. Install reverse piston spring retainer snap ring and remove tools.

13. Check all springs for proper position in pockets.

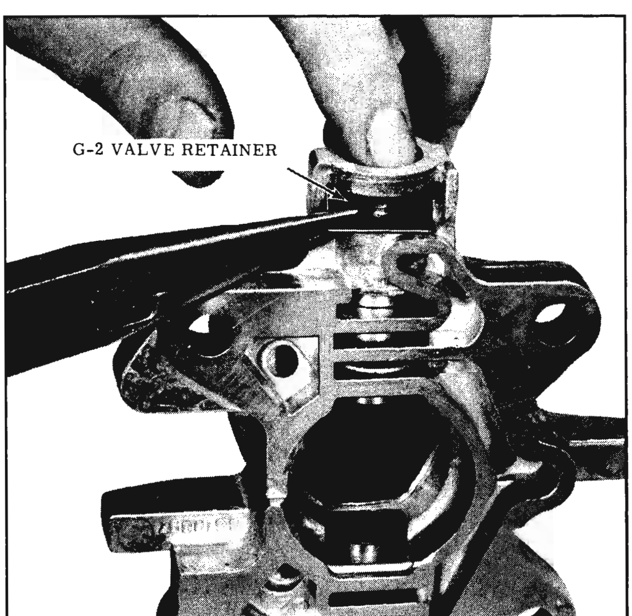


Fig. 3-64 Removing Retainer

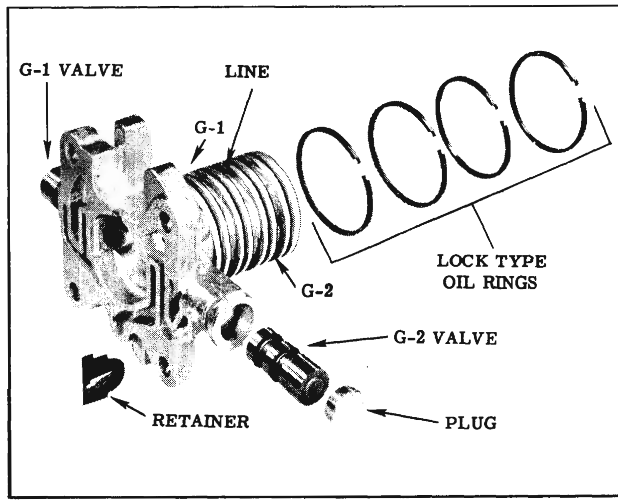


Fig. 3-65 Governor Assembly

14. Install 2 lock type oil rings on hub of case support.

If other units are not to be serviced, refer to Page 3-60.

GOVERNOR DISASSEMBLY

1. Compress tang of G-2 plug retainer and remove. (Fig. 3-64)
2. Remove G-2 plug and G-2 valve.
3. Inspect and remove if necessary, 4 governor lock type oil rings from governor tower.

ASSEMBLY OF GOVERNOR (Fig. 3-65)

1. If removed, install 4 lock type governor oil rings on governor tower.
2. Install G-2 valve (small land first) into governor.
3. Install G-2 plug with the flat side out.
4. Install G-2 plug retainer with tang side out.

If other units are not to be serviced, refer to Page 3-64.

DISASSEMBLY OF TORUS COVER (FIG. 3-66)

1. Inspect and remove if necessary, hook type oil ring from input shaft.

2. Install Exhaust Valve Retaining Tool J-6122-1.

3. Remove torus exhaust valve cover screw with Tool J-8874. An impact wrench will aid removal.

4. Remove exhaust valve cover, steel gasket, valve and spring. Discard the gasket.

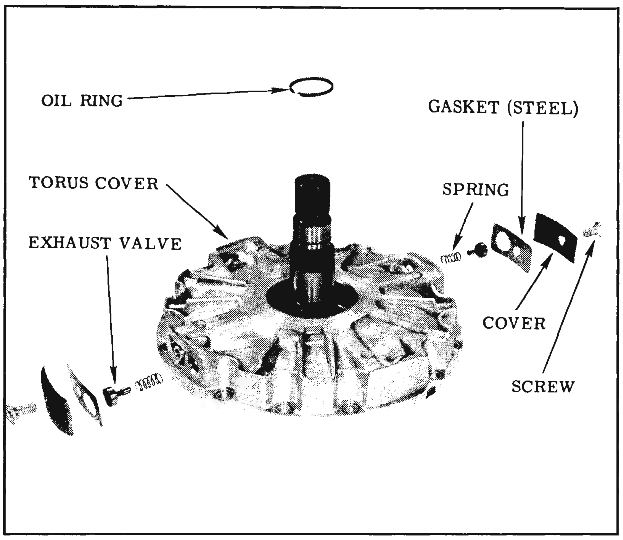


Fig. 3-66 Torus Cover Assembly

5. Repeat operation for second exhaust valve.

ASSEMBLY OF TORUS COVER (Fig. 3-66)

1. Install exhaust valve spring and valve.
2. Install Exhaust Valve Retaining Tool J-6122-1. (Fig. 3-67)
3. Install torus cover exhaust valve gasket and cover. Torque the retaining screw 20 to 25 ft. lbs. using Tool J-8874. (Fig. 3-67)
4. Repeat operation for second exhaust valve.
5. Install lock type oil ring on input shaft, if removed.

If other units are not to be serviced, refer to Page 3-65.

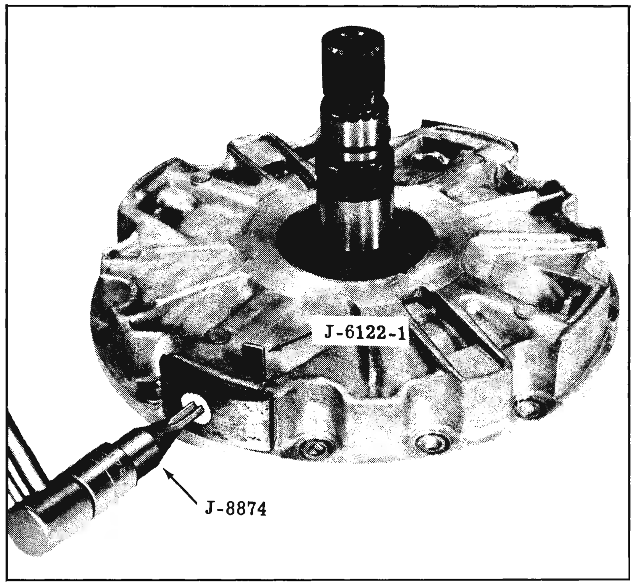


Fig. 3-67 Installing Exhaust Valve Cover

COMPENSATOR VALVE

The "O", "OC", and "OCH" transmissions use a three stage valve and the "OA" and "OB" use a two stage valve, refer to respective procedure.

DISASSEMBLY OF TWO STAGE COMPENSATOR VALVE BODY (Fig. 3-68)

1. Compress compensator plug and remove retaining pin and plug.
2. Remove secondary compensator valve and spring.
3. Remove primary compensator valve and spring.

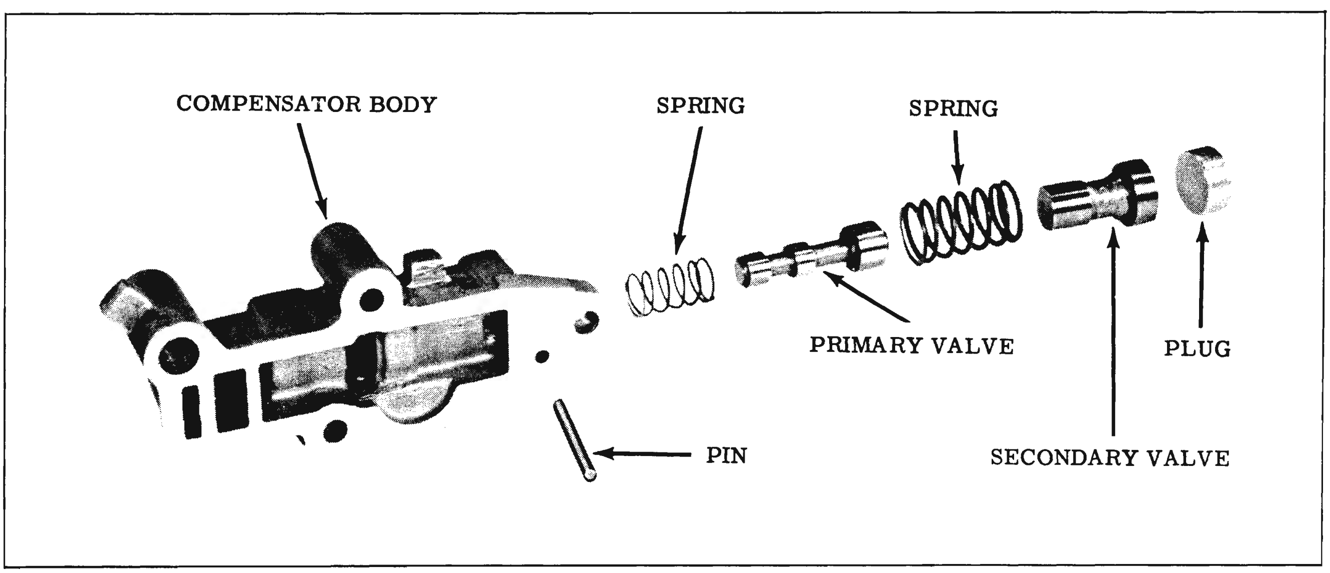


Fig. 3-68 Two Stage Compensator Valve ("OA" & "OB")

ASSEMBLY OF TWO STAGE COMPENSATOR VALVE BODY (Fig. 3-68)

1. Install primary compensator spring on primary compensator valve.
2. Install primary compensator spring and valve (small end first into body).
3. Install secondary compensator spring on secondary compensator valve.
4. Install the secondary spring and valve into compensator body (spring end first).
5. Install compensator plug, compress and install retaining pin.

DISASSEMBLY OF THREE STAGE COMPENSATOR VALVE BODY (Fig. 3-69)

1. Remove the retaining pin from the end of the compensator body.

   CAUTION: The parts are under spring tension.

2. Remove the bore plug, secondary compensator valve and spring and the primary compensator valve and spring.
3. Remove the compensator limit valve retaining ring with a needle nose pliers.
4. Remove the compensator limit valve and spring.

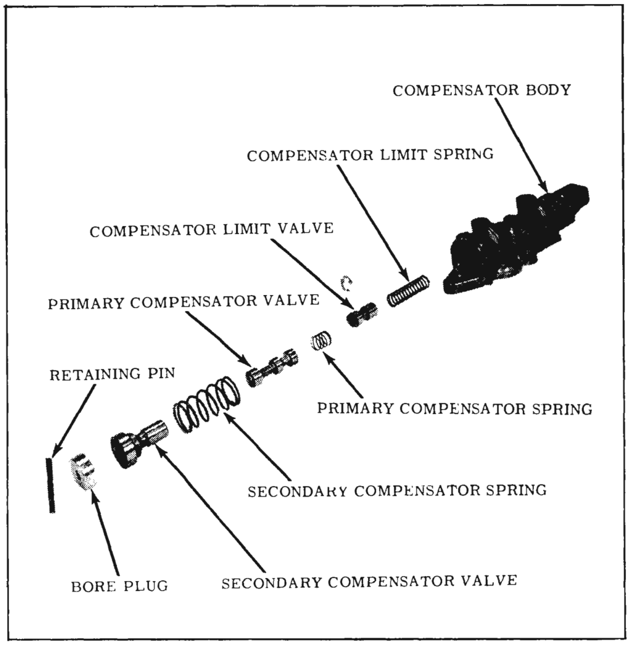


Fig. 3-69 Three Stage Compensator Valve ("O", "OC" & "OCH")

ASSEMBLY OF THREE STAGE COMPENSATOR VALVE BODY

1. Install the compensator limit valve spring.
2. Install the compensator limit valve, straight land first into the body.
3. Compress the valve against the spring and install the retaining ring over the groove in the limit valve.
4. Install the primary compensator spring and

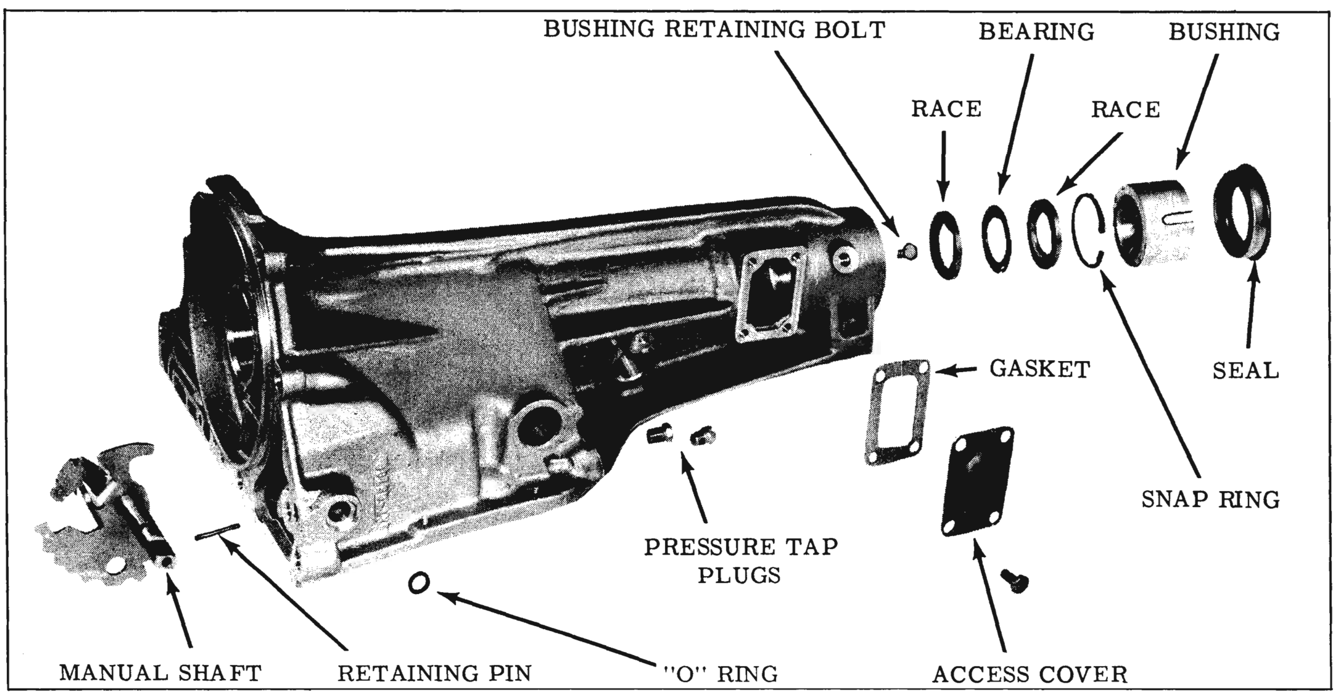


Fig. 3-70 Rear Bearing Retainer

valve (straight land first).

5. Install the secondary compensator spring and valve.
6. Install the bore plug and retaining pin.

If other units are not to be serviced, refer to Page 3-69, Step 14.

DISASSEMBLY AND ASSEMBLY OF REAR BEARING RETAINER (Fig. 3-70)

DISASSEMBLY

1. Using Tool J-8873 remove the rear bearing race to rear bearing retainer snap ring through access hole in retainer.
2. Remove rear race, bearing and front race.
3. Remove inside manual lever and shaft assembly retaining pin from case side of retainer.
4. Pull shaft outward and remove manual shaft "O" ring.
5. Rotate lever and shaft assembly to remove from inside rear bearing retainer.
6. If it is necessary to replace the bushing and sleeve assembly, the rear seal must be removed, then:
   a. Remove the rear bearing retainer bushing and sleeve assembly retaining bolt.
   b. Drive the bushing and sleeve assembly from the rear bearing retainer with a drift.
7. If necessary to replace the "O" ring seal, remove the cap screw and retainer, and withdraw the assembly.

CLEAN AND INSPECT REAR BEARING RETAINER (Fig. 3-71)

ASSEMBLY OF REAR BEARING RETAINER (Fig. 3-70)

1. If removed, install the bushing and sleeve

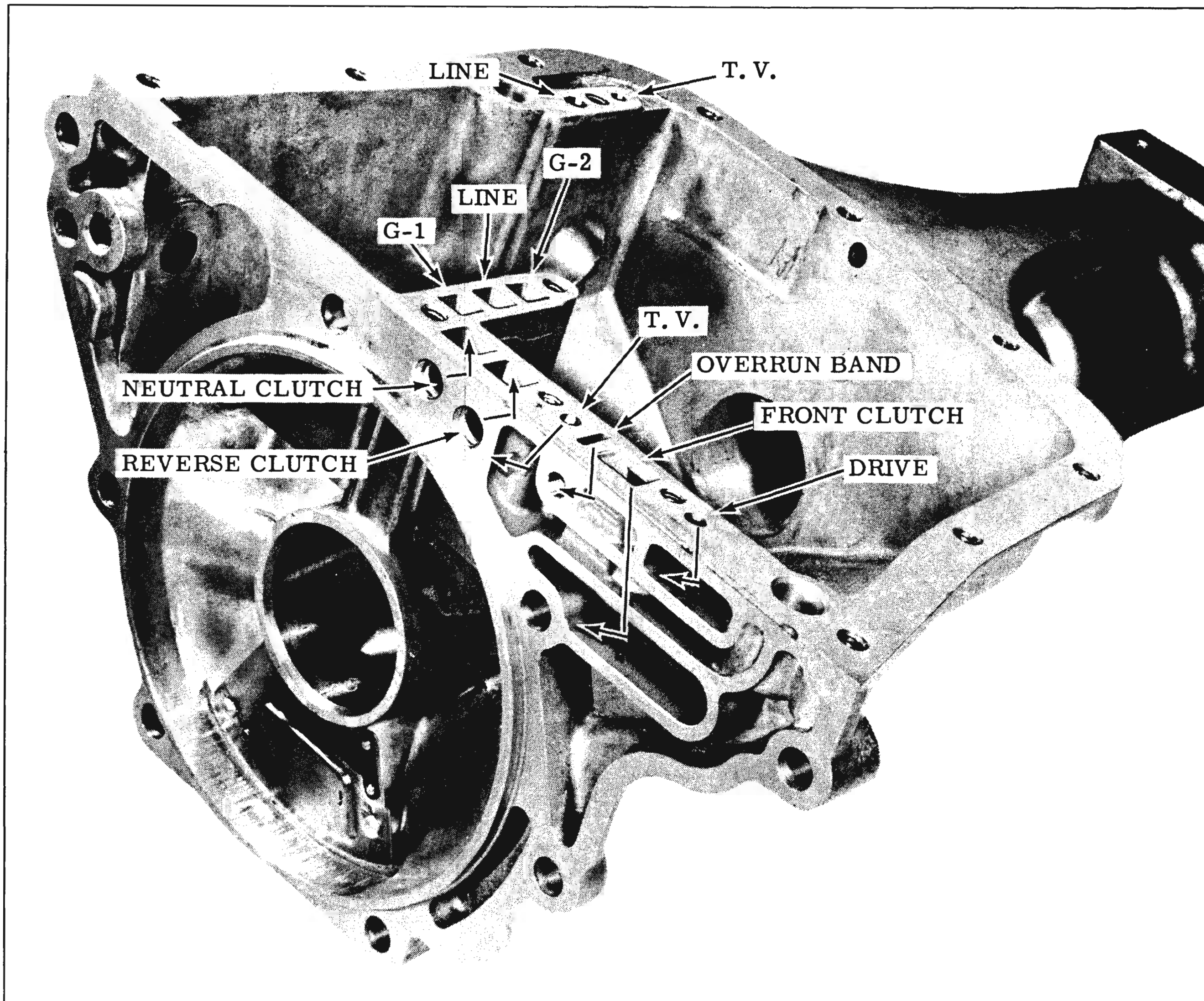


Fig. 3-71 Rear Bearing Retainer Passages

assembly in end of rear bearing retainer with chamfered end first, aligning short slot in bushing with locking screw hole in rear bearing retainer with a drift.

2. If rear seal was removed, coat sealing lip of new seal with lubricant Part No. 567196, coat the outer diameter of seal with sealer, Part No. 557622 and install seal using Tool J-5154.
3. Install bushing lock screw and torque 12 to 15 ft. lbs.
4. Install race, thrust bearing and race into rear bearing retainer through access hole.
5. Install snap ring through access hole of retainer, concave side towards rear (identification side away from race) and align ear of snap ring with top slot in retainer.
6. Install manual lever and shaft assembly into rear bearing retainer.
7. Install manual shaft "O" ring. (Fig. 3-72)
8. Align annular groove in shaft with retainer pin hole then install manual shaft retaining pin.

If other units are not to be serviced, refer to Page 3-64.

ACCUMULATOR PISTONS AND SERVO PISTON ASSEMBLIES

DISASSEMBLY

1. Position Speedometer Gear Puller Adapter

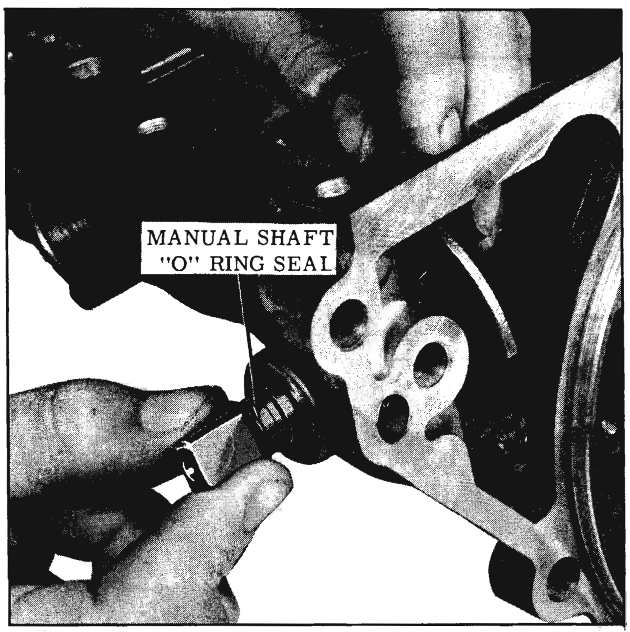


Fig. 3-72 Installing "O" Ring Seal

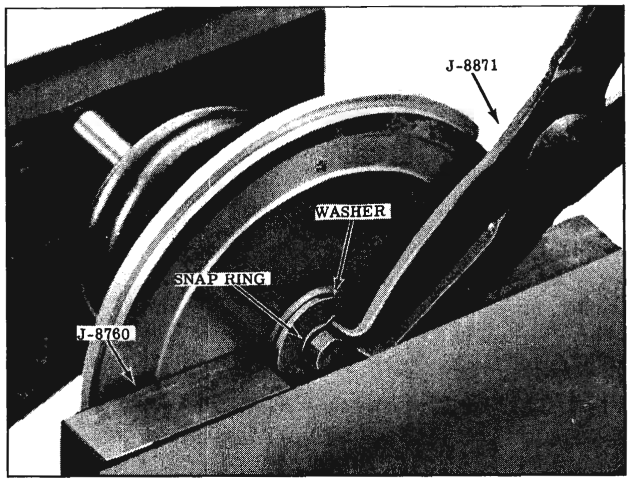


Fig. 3-73 Servo Disassembly

J-8760 against the servo piston and place the piston assembly and spacer between the jaws of a bench vise. (Fig. 3-73)

2. Tighten the vise sufficiently to remove the snap ring.
3. Remove the servo piston to piston pin snap ring and washer.
4. Carefully, remove piston assembly from the vise.
5. Remove the servo piston, springs and retainer.
6. Remove and discard the lip seal from the upper accumulator piston.
7. If necessary, remove piston rings.

ASSEMBLY (Fig. 3-74)

1. Install a new piston seal on the upper accumulator piston, lip facing flat side of piston.

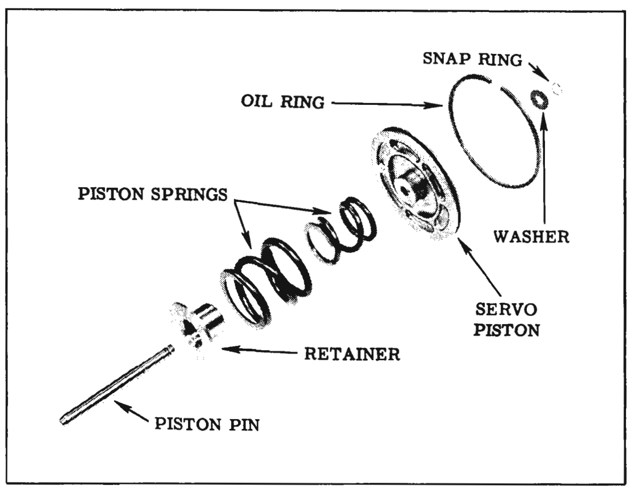


Fig. 3-74 Servo Assembly

2. Install the spring retainer, spring and servo piston over the servo piston pin.

3. Place the assembled servo components with Speedometer Gear Puller Adapter J-8760 against the servo piston into a vise and carefully compress the assembly to allow the flat washer and snap ring to be installed.

4. Install the washer and snap ring.

5. Remove the servo piston assembly and tools from the vise.

6. If removed, install piston rings.

If other units are not to be serviced, refer to Page 3-67.

FRONT CLUTCH (Fig. 3-75)

DISASSEMBLY

1. Remove the bronze thrust washer from the front clutch assembly if it is not removed.

2. Insert 2 studs, Tool J-3387-2 into dowel holes on back side of front clutch assembly.

3. Install front clutch assembly with studs into vise so that studs are retained by the vise jaws. (Fig. 3-75)

4. Remove 4 front internal gear to front clutch housing attaching bolts.

5. Remove assembly from vise, place on bench with internal gear up and gently tap dowel pins with a punch to remove front internal gear from front clutch housing.

6. Remove front internal gear and clutch backing plate.

7. Remove 7 drive and 7 driven front unit clutch plates.

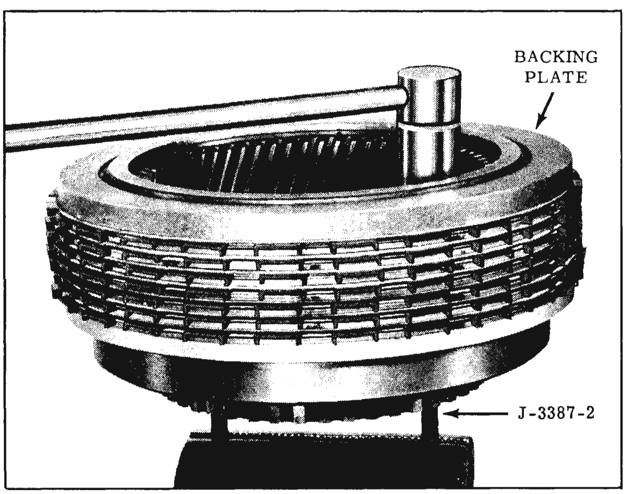


Fig. 3-75 Front Clutch Disassembly

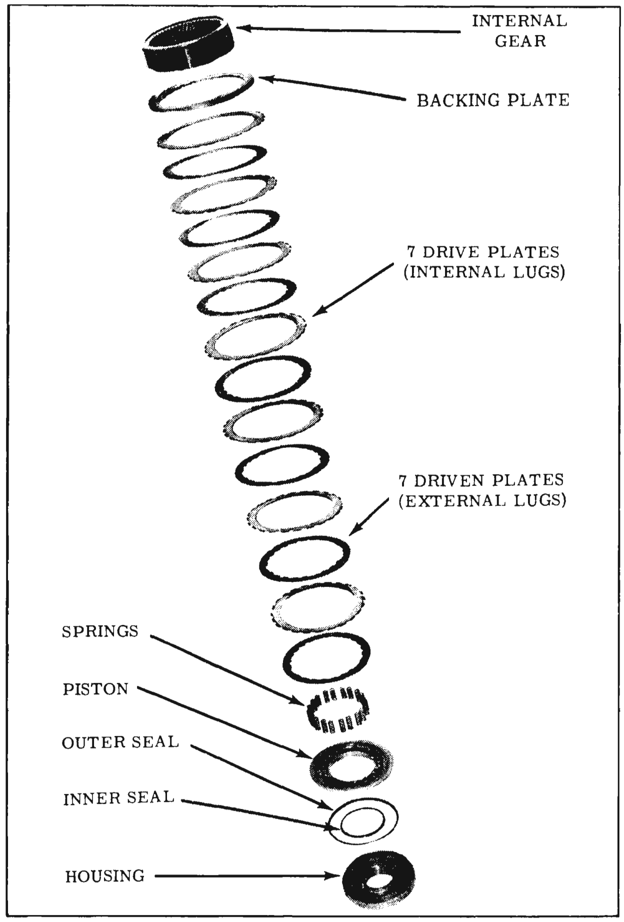


Fig. 3-76 Front Clutch Assembly

8. Remove 20 front clutch release springs.

9. Remove front clutch piston from front clutch housing.

10. Remove front clutch piston outer seal from piston, remove clutch inner piston seal from clutch housing and discard seals.

ASSEMBLY

1. Install new inner piston seal on front clutch housing with lip of seal facing down.

2. Install new outer piston seal on clutch piston with lip facing away from spring pockets.

3. Install clutch housing over clutch piston, carefully rotating assembly while depressing lip of piston seal with a small screwdriver.

4. Install piston release springs (20) into spring pockets in piston.

5. Install front clutch backing plate on front internal gear with undercut facing flange on internal gear.

6. Lubricate clutch plates and install 7 composition drive and 7 steel driven clutch plates

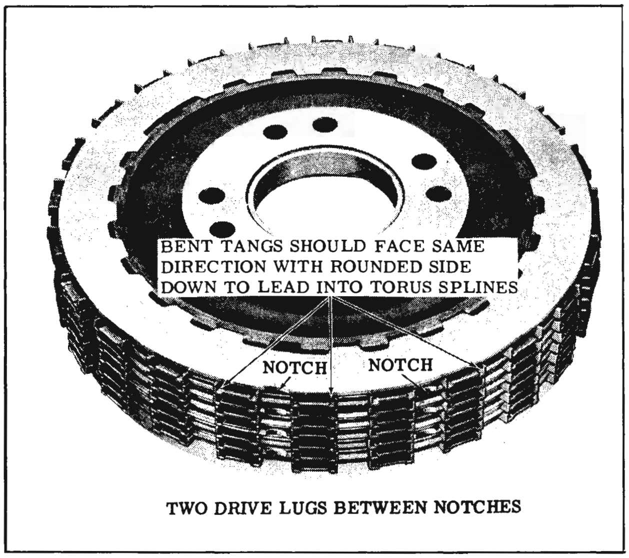


Fig. 3-77 Clutch Plate Alignment

alternately over the front internal gear starting with a composition clutch plate.

NOTE: Composition clutch plate tangs must face toward the front clutch piston housing. The steel clutch plates must be assembled in an un-nested position as follows: (Fig. 3-77)

a. Place a composition plate and the first steel plate over the internal gear noticing the location of the slight half moon notch in the edge of the steel plate.

b. Install another composition plate and then the second steel plate so that the half moon notch is located 2 drive lugs on the internal gear away from the notch in the first steel plate.

c. Continue to alternately install the composition and steel plates so that the notches in the odd numbered steel plates are one above the other and the notches in the even numbered steel plates are one above each other.

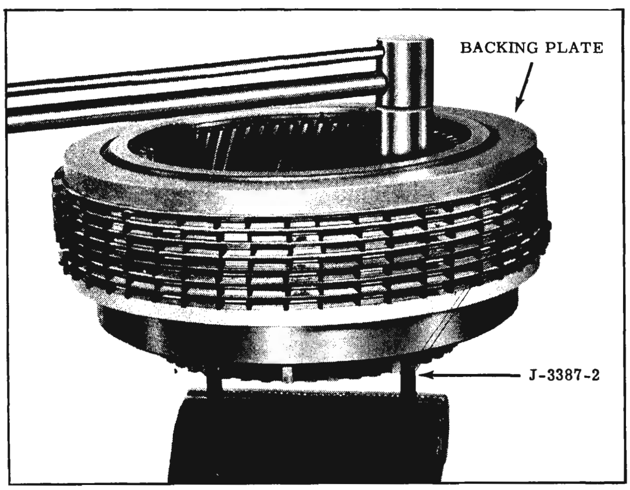


Fig. 3-78 Assembly of Front Clutch

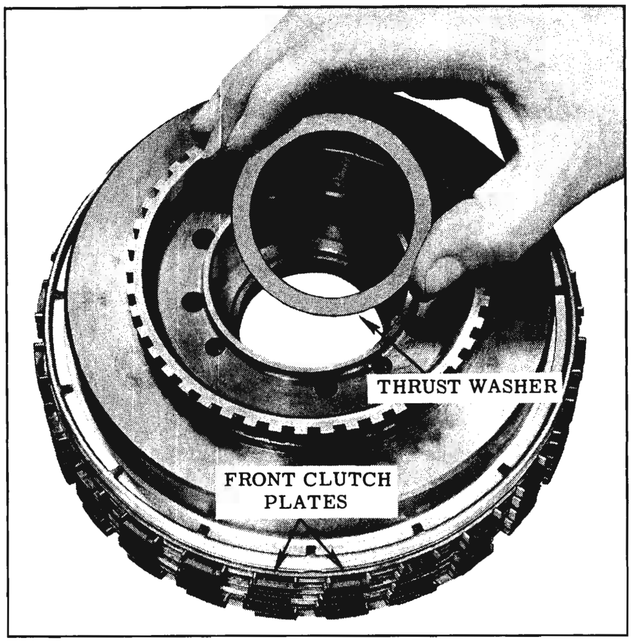


Fig. 3-79 Installing Thrust Washer

7. Position front unit internal gear with plates on clutch release springs, aligning dowels.
8. Loosely install the internal gear front clutch bolts.
9. Insert Tool J-3387-2 into dowel holes in back side of front clutch assembly, then install front clutch assembly with studs into vise so studs are retained by vise jaws. (Fig. 3-78)
10. Tighten bolts snugly and check bottom steel clutch plate for freedom after tightening bolts. Torque the four front unit internal gear to front clutch housing bolts 22 to 27 ft. lbs.

    NOTE: Alternately tighten bolts to properly seat front internal gear on dowels.

11. Install bronze thrust washer into recessed I.D. of front clutch housing bore using petroleum to retain. (Fig. 3-79)

    CAUTION: If new clutch plates were installed, check to see if clutch plates can be moved by the drive lugs. A moderate preloading of clutch plates is satisfactory, however, if drive plates cannot be rotated, it will be necessary to replace the clutch piston.

If other units are not to be serviced, refer to Page 3-62, Step 14.

REAR INTERNAL GEAR AND CLUTCH

Rear internal gears may be equipped with either a sprag or a roller clutch, refer to respective procedures.

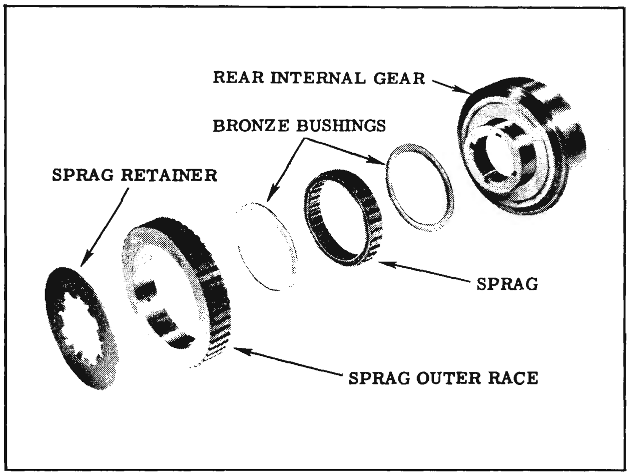


Fig. 3-80 Sprag Assembly

REAR INTERNAL GEAR AND SPRAG (Fig. 3-80)

DISASSEMBLY

1. Remove sprag retainer.
2. Remove sprag outer race from sprag assembly and rear internal gear.
3. Remove the sprag and bushing assembly (2 bronze bushings) from internal gear.

ASSEMBLY

1. Place one bronze bushing over inner race of internal gear with cup side facing up.
2. Place sprag assembly into the sprag outer race.
3. With shoulder side of sprag up, start sprag and outer race over internal gear hub. (Fig. 3-81)

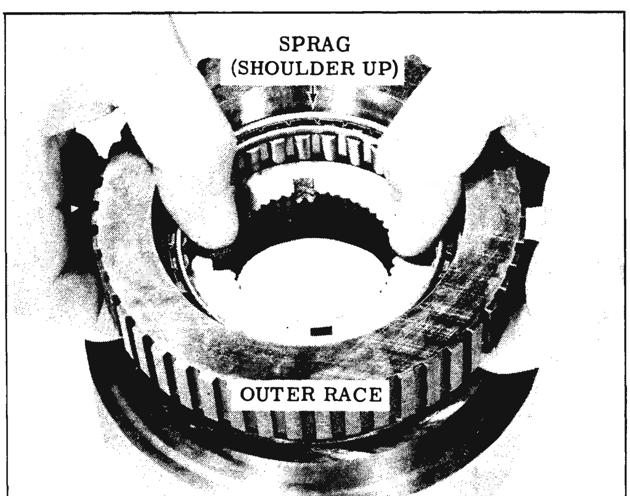


Fig. 3-81 Installing Sprag

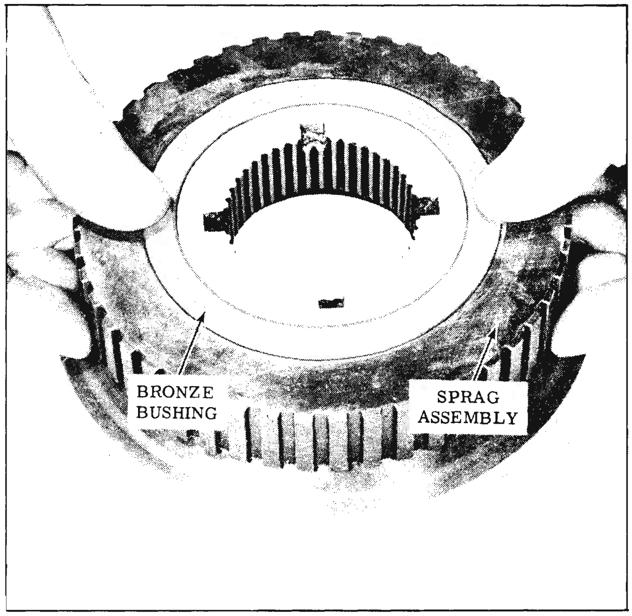


Fig. 3-82 Installing Bushing

4. Press sprag and outer race down against internal gear.
5. Install second bronze bushing, cup side down, against sprag assembly. (Fig. 3-82)
6. Apply petrolatum on sprag retainer and install sprag retainer on internal gear aligning tangs with the internal gear slots. (Fig. 3-83)

   NOTE: Check to make certain sprag assembly is properly installed by rotating outer race counterclockwise. Outer race should not turn clockwise.

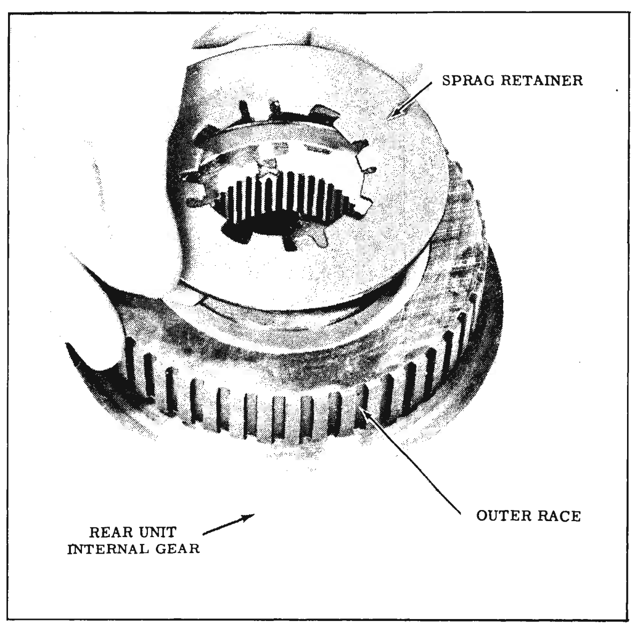


Fig. 3-83 Installing Sprag Retainer

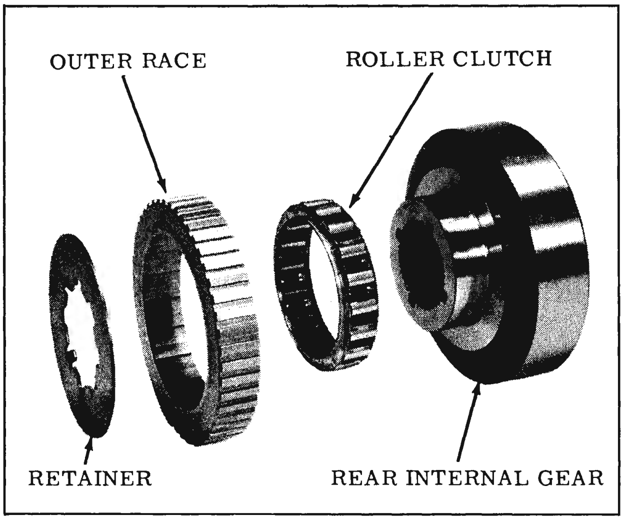


Fig. 3-84 Roller Clutch Assembly

REAR INTERNAL GEAR AND ROLLER CLUTCH (Fig. 3-84)

DISASSEMBLY

1. Remove the roller clutch and outer race from the rear internal gear.

2. Carefully remove the roller clutch assembly from the outer race.

3. Remove the rollers and energizing springs from the cage. (Fig. 3-85)

INSPECTION

1. Inspect the rollers for pits, scratches, pick-up, galling or flat spots.

2. Inspect the energizing springs for distortion, cracks, permanent set or loss of tension.

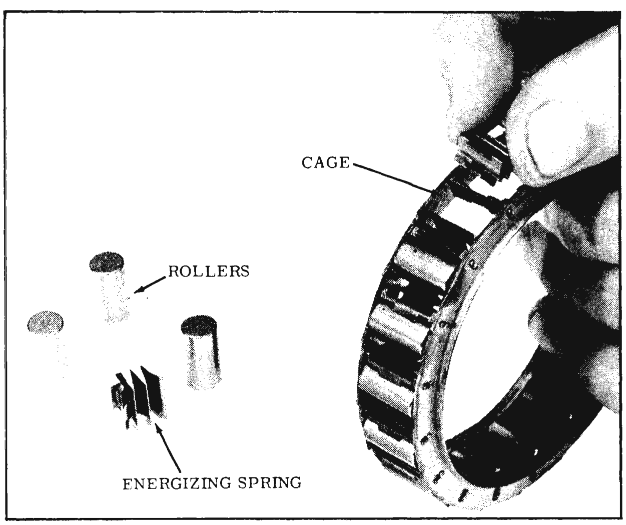


Fig. 3-85 Removing Energizing Spring

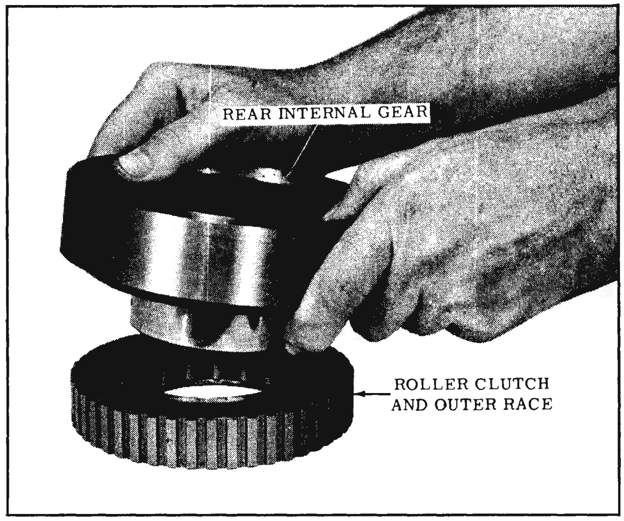


Fig. 3-86 Installing Rear Internal Gear

3. Inspect the outer race for pitting, scratches, cracks, galling or broken ramp corners.

4. Inspect cage for bent or broken struts, broken or distorted corners or teeth.

ASSEMBLY

1. Install the energizing springs on the cage struts with the upper tab on the springs pointing the same direction as the teeth or stops on the clutch cage. Be sure the center spring tab snaps securely over the strut to retain the spring.

2. Install the rollers into cage between the springs in such a way that the upper tab on the spring fits over the roller.

3. Carefully, install the roller clutch assembly into the outer race so that the rollers do not pop out. The teeth or stops on the cage should align with the ramps in the outer race.

4. Place the outer race and roller clutch assembly on the bench with the word "front" on the roller clutch cage facing the bench. (Fig. 3-86)

5. Twist the rear internal gear (counterclockwise) into the roller clutch assembly.

If other units are not to be serviced, refer to Page 3-62, Step 11.

DISASSEMBLY OF 3-4 BOOST BODY (Fig. 3-87)

1. Remove the 3-4 boost body assembly by removing 4 attaching screws. (One screw is located on channel plate side of body).

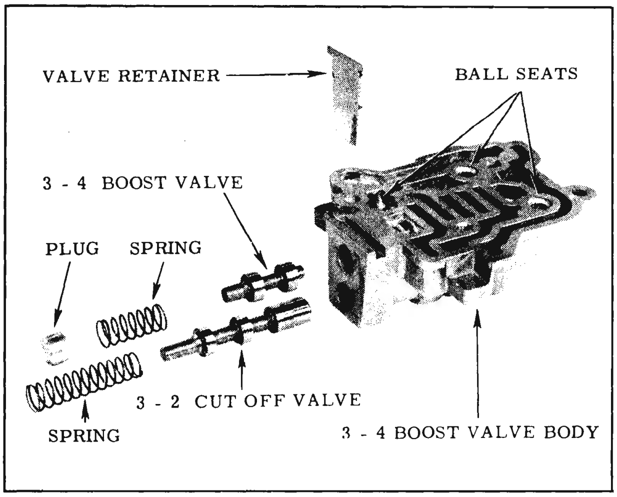


Fig. 3-87 3-4 Boost Body Assembly

CAUTION: The 3-4 boost body contains 3 loose check balls.

2. Remove the 3 check balls and spacer plate from the 3-4 boost body.

3. Remove the retainer from the 3-4 boost body. Retainer is under spring pressure.

4. Remove the 3-2 cut off valve spring, 3-2 cut off valve, 3-4 boost plug, 3-4 boost spring and the 3-4 boost valve.

ASSEMBLY OF 3-4 BOOST BODY (Fig. 3-87)

1. Install the 3-4 boost valve, long stem out, spring and plug in the bore of the boost body nearest the cored face.

2. Compress the 3-4 boost plug against spring tension and partly install the 3-4 boost body retainer.

3. Install the 3-2 cut off valve, stem out, and spring in remaining bore of boost body.

4. Compress the 3-2 cut off valve spring and slide 3-4 boost body retainer over spring.

   NOTE: Leave spacer plate and check balls loose at this time.

If other units are not to be serviced, refer to Page 3-60, Step 5.

DISASSEMBLY AND ASSEMBLY OF CONTROL VALVE ASSEMBLY (Fig. 3-88)

1. Remove channel body from valve body assembly by removing 2 attaching screws from the

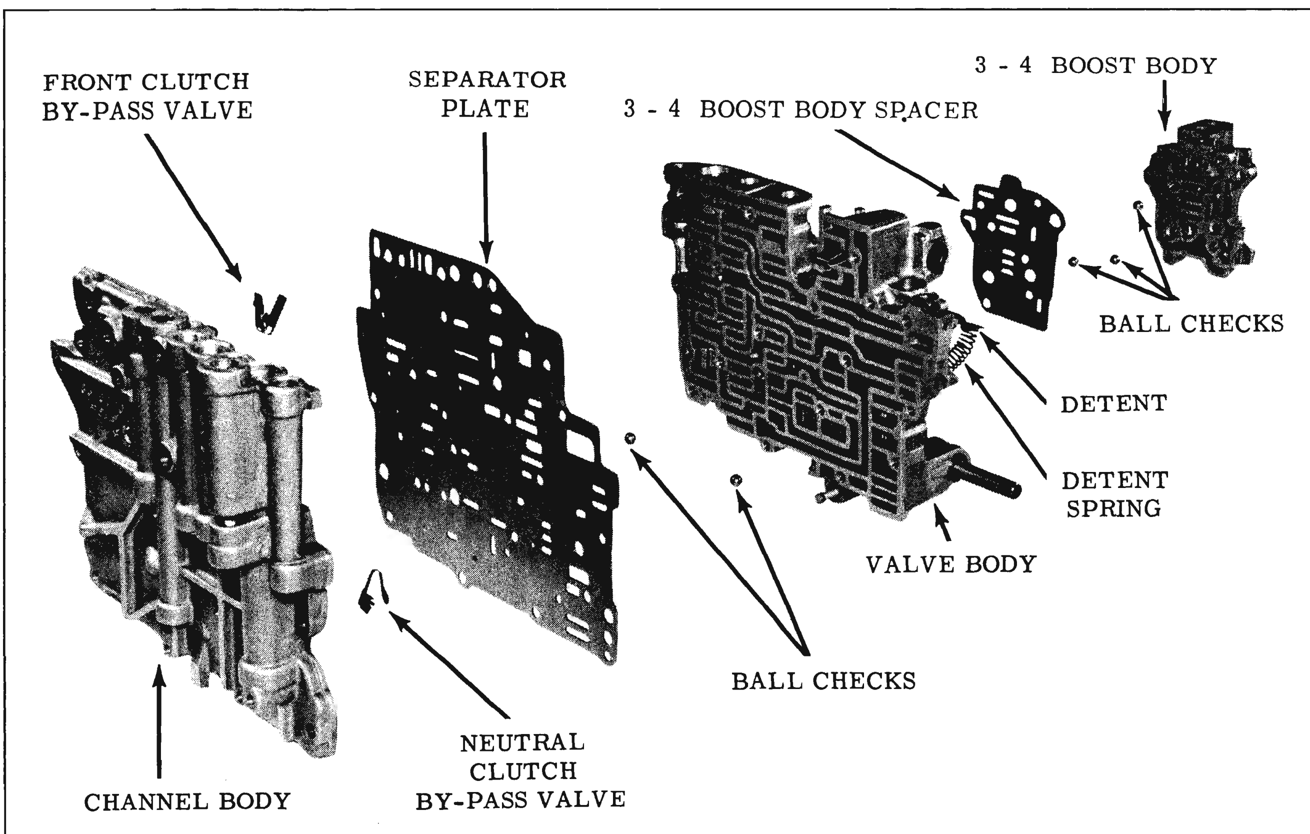


Fig. 3-88 Control Valve Body Assembly

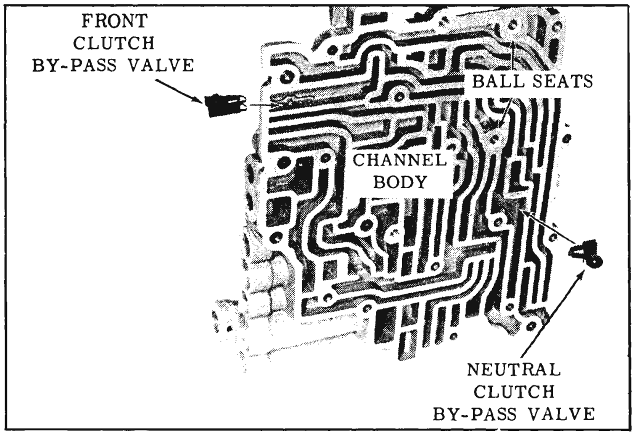


Fig. 3-89 Channel Body

valve body side and 13 screws from the channel body side.

2. Remove neutral clutch by-pass valve and the front clutch by-pass valve from channel body. (Fig. 3-89)

NOTE: Assemble loose parts into channel body after inspection. (Fig. 3-89)

a. Install neutral clutch by-pass valve and front clutch by-pass valve into channel body.

5. Place separator plate on channel body and check alignment of by-pass valves.

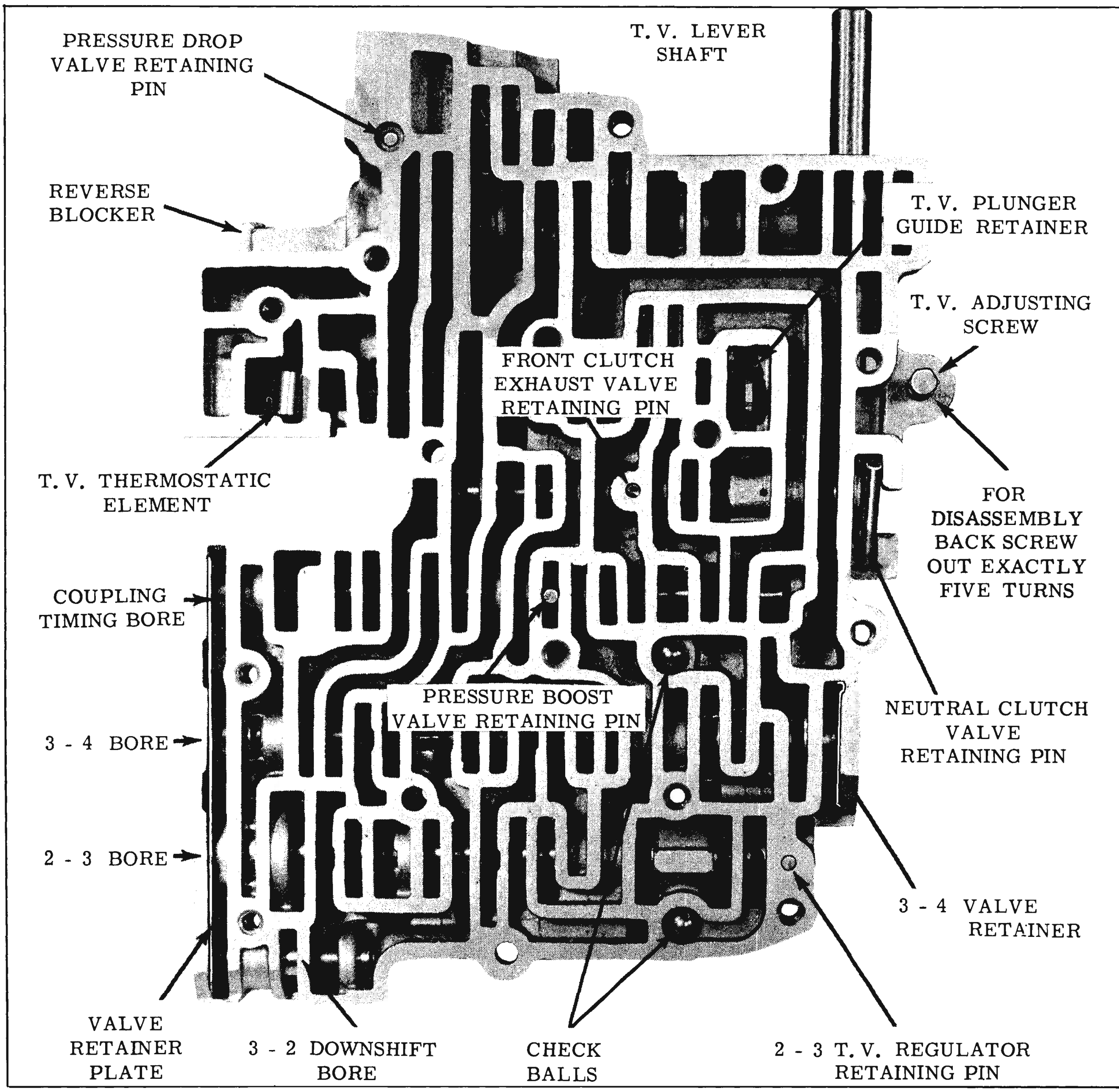


Fig. 3-90 Valve Body

6. Remove 2 check balls and the T.V. thermostatic element. (Fig. 3-90)

7. Remove T.V. plunger guide retainer located in cored passage near T.V. adjusting screw. Position control valve assembly with the cored side up and the T.V. lever positioned on the top right hand side. (Fig. 3-90)

8. Remove multiple valve plug retainer located in lower left hand corner.

   NOTE: Plugs are under spring tension.

9. Remove the 3-2 downshift spring and valve from the lowest bore.

10. Remove the valve bore plug, by threading a valve body attaching screw into plug, and slide plug out from the adjacent bore.

11. Remove the 2-3 governor valve from the same bore.

12. Remove the valve bore plug and the 3-4 governor valve from the adjacent bore.

13. Remove the valve bore plug, coupling timing valve spring and valve from the next adjacent bore.

14. Remove the pressure boost valve retaining pin from the same bore on the cored side of the valve body.

15. Remove the pressure boost valve from the same bore.

16. On the opposite side of the valve body, start with the lower bore and remove the retaining pin.

17. Remove the 2-3 T.V. bushing and valve from the same bore.

18. Remove the 2-3 T.V. spring and valve spring, then remove the 2-3 valve from the same bore.

19. Remove the valve bore plug retainer and plug, while holding finger over plug as plug is under spring pressure, from the adjacent bore.

20. Remove the 3-4 T.V. valve, spring and bushing from the same bore.

21. Remove the 3-4 valve and spring from the same bore.

22. Remove the retaining pin and valve bore plug from the fourth bore.

23. Remove the neutral clutch valve spring and neutral clutch valve.

24. Remove the front clutch exhaust valve retaining pin from the same bore on the cored side of valve body. Compress spring with a small screwdriver to remove pin.

25. Remove the front clutch exhaust valve spring and valve.

26. Remove the pressure drop retaining pin, spring and valve from the last bore on the opposite side of the control valve assembly.

27. Loosen T.V. adjustment screw EXACTLY 5 TURNS. (Fig. 3-90)

28. Turn the valve body over and remove the throttle lever by removing the outside "C" ring and washer, positioning the shaft so that the lever will clear the T.V. adjustment screw, then remove the lever and washer.

29. Remove T.V. plunger and sleeve, then remove the T.V. spring and valve ("OB" transmission has two springs).

30. If necessary, remove the reverse blocker piston retaining pin spring and reverse blocker piston.

31. Remove detent spring.

    NOTE: Do not remove detent lever unless replacement is necessary.

32. If necessary to remove detent lever, use a small screwdriver to pry the lever free of the pin, then remove pin. A new lever will be required on assembly.

33. Clean and inspect all parts.

ASSEMBLY—CONTROL VALVE ASSEMBLY (Fig. 3-91)

NOTE: All attaching screws are to be torqued 2.5 to 3.5 ft. lbs. and all attaching bolts are to be torqued 6 to 8 ft. lbs.

1. If previously removed, install manual detent by positioning manual detent in valve body and installing retaining pin.

2. Install detent spring into manual detent.

3. If removed, install the reverse blocker piston, spring and pin.

4. Install the pressure drop valve, stem end of valve last, then install spring and retaining pin in the top bore adjacent to the detent spring.

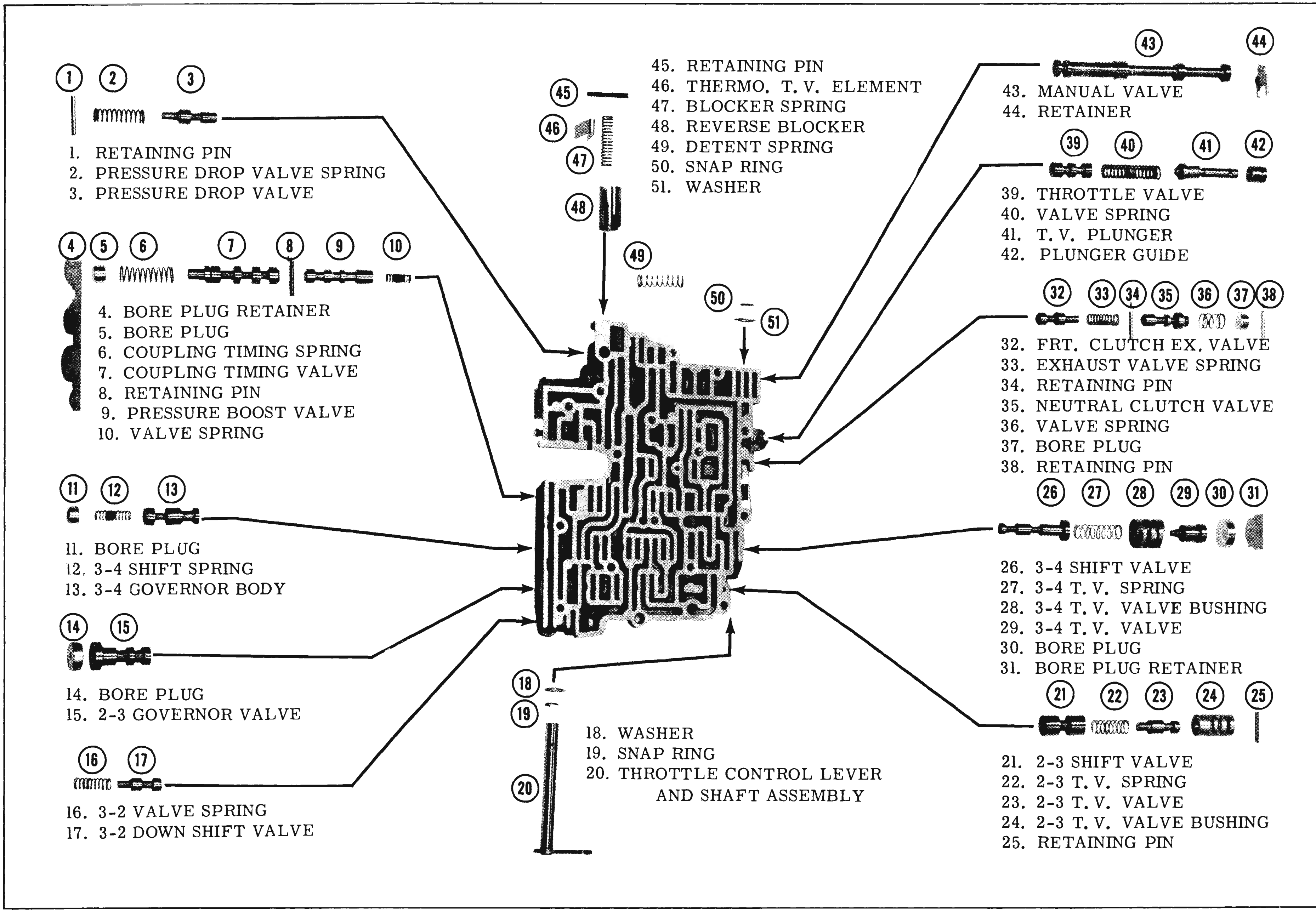


Fig. 3-91 Oil Control Valve Body

5. Install the T.V. valve (round end first), spring, plunger and sleeve into the T.V. bore adjacent to the manual valve bore.

6. Place washer against "C" ring on T.V. lever shaft.

7. Install T.V. lever shaft through hole in valve body so that the T.V. lever will index between the T.V. plunger and throttle adjusting screw.

8. Install washer and "C" ring securing lever assembly to valve body.

9. Turn T.V. adjusting screw back to original position, EXACTLY 5 TURNS. (Fig. 3-91)

10. Install the T.V. plunger guide retainer through cored side of valve body into annular groove in T.V. plunger guide.

11. Install the front clutch exhaust valve (land end first) and front clutch exhaust valve spring in the bore adjacent to the T.V. bore.

12. Install short retaining pin through cored side of valve body while compressing the front clutch exhaust valve spring.

13. Install the neutral clutch valve (small end first) and spring in the same bore.

14. Compress the neutral clutch valve spring and install valve bore plug (hole end out) and long (copper) retaining pin.

15. In the next open bore install the 3-4 valve.

16. Place the 3-4 T.V. spring into the 3-4 shift valve.

17. Install the 3-4 T.V. valve into the 3-4 regulator bushing so that valve will completely enter bore of bushing.

18. Install the 3-4 T.V. valve and bushing into the 3-4 bore. (Small end of T.V. valve first.)

19. Install the 3-4 valve bore plug and retainer.

20. Install the 2-3 valve in the bore adjacent to the 3-4 valve.

21. Install the 2-3 T.V. valve spring in the same bore.

22. Install the 2-3 T.V. valve into the bushing, stem end out.

23. Install the 2-3 T.V. valve and bushing into the 2-3 bore, stem end first.

24. Compress the bushing and install retaining pin from the cored side of the valve body.

25. In the bore adjacent to the "U" shaped "cut-out" install the pressure boost spring and valve, using brass rod to guide valve into bore, (long land first). Install retaining pin through core face of body.

26. Install coupling timing valve (land end first) into the same bore.

27. Install coupling timing valve spring over stem end of coupling timing valve.

28. Install valve bore plug in valve body compressing and partially installing multiple plug retainer. Install retainer in such a manner that only one corner of the plug is retained. This will permit the installation of the remaining valves. (Fig. 3-92)

29. Install the 3-4 governor valve and spring into the adjacent 3-4 bore (flat end first).

30. Install the 3-4 valve bore plug open end over the 3-4 spring, compressing plug against spring tension into the bore and position the retainer so that edge of plug is secure.

31. Install the 2-3 governor valve into the adjacent 2-3 shift valve bore.

32. Install the 2-3 bore plug, compressing the valve against spring pressure and position multiple retainer.

33. Install the 3-2 downshift valve (land end first) into the remaining bore.

34. Place 3-2 downshift spring over 3-2 downshift valve, compressing spring and secure with multiple retainer.

35. Install the T.V. element (open end down) in

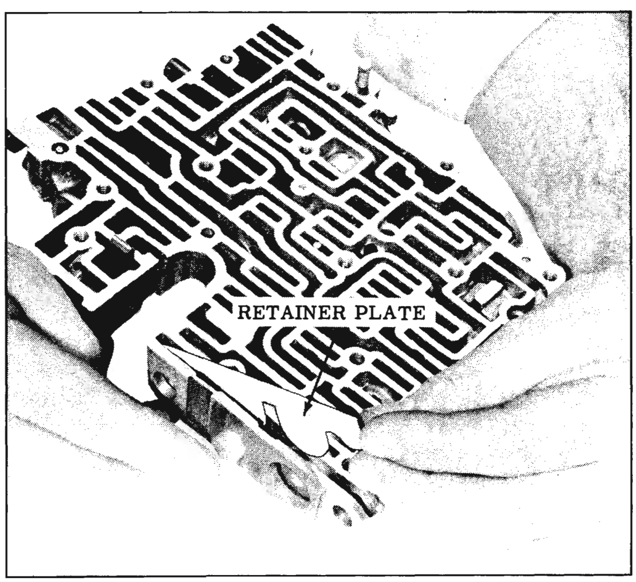


Fig. 3-92 Installing Retainer Plate

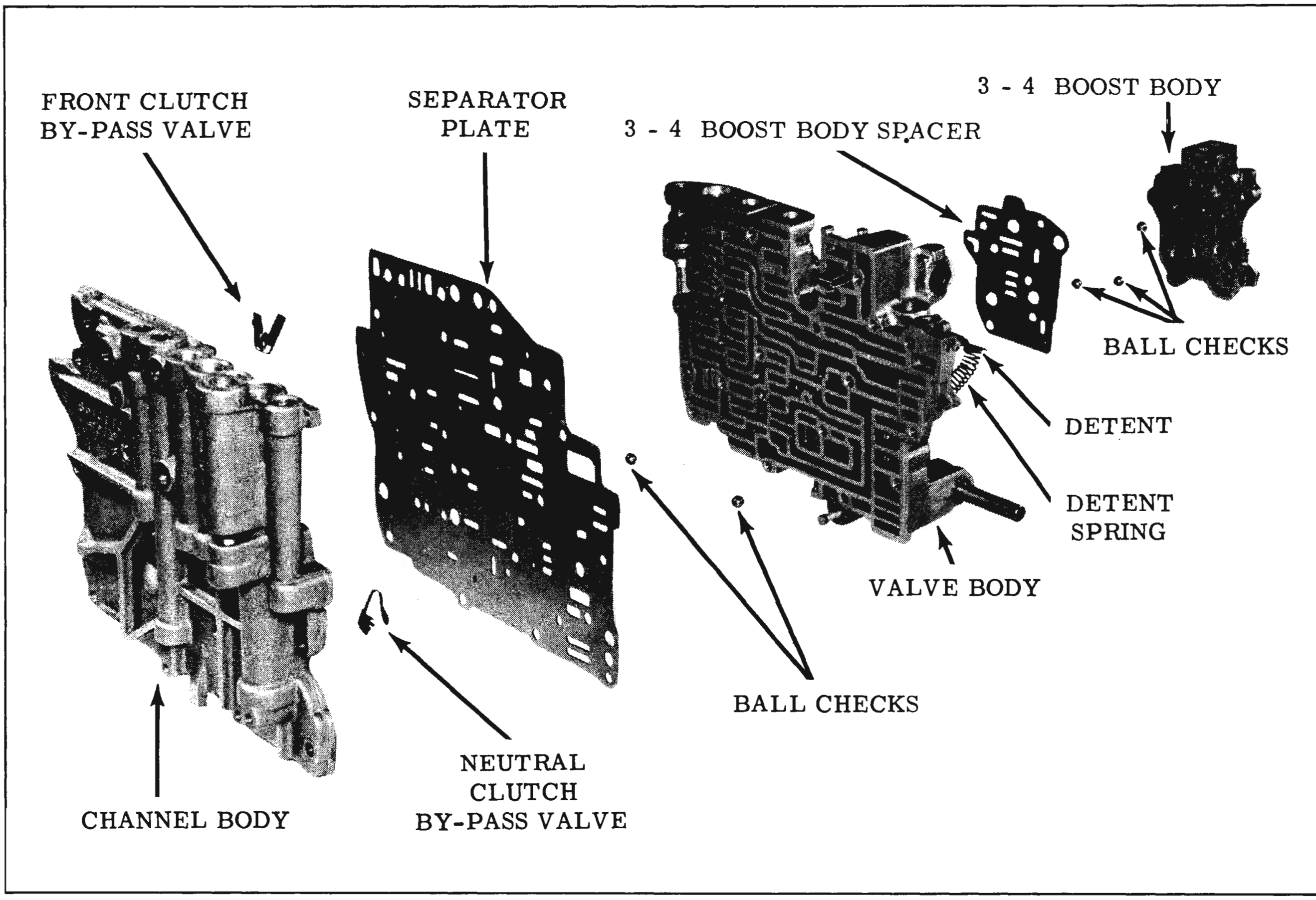


Fig. 3-93 Control Valve Body Assembly

cavity behind throttle valve.

FINAL ASSEMBLY OF THE COMPLETE CONTROL VALVE ASSEMBLY (Fig. 3-93)

1. Install 2 ball check valves into pockets on cored side of valve body.
2. Position separator plate over cored side of control valve body.
3. Position channel body on valve body and attach with 13 screws, leave loose for final adjustment.
4. Turn control valve assembly over and install one large and two small ball check valves into pockets.
5. Place 3-4 boost body to valve separator on valve body.
6. Place 3-4 boost body on separator plate and install 3 attaching screws. (Do not tighten screws at this time).
7. Install 2 screws, valve body to channel body.
8. Turn valve assembly over and install the 3-4 boost body to control valve body long attaching screw.
9. Tighten 19 control valve body assembly attaching screws. Torque 2.5 to 3.5 ft. lbs.

CLEAN AND INSPECT TRANSMISSION CASE (Fig. 3-94)

ASSEMBLY OF INDIVIDUAL UNITS INTO TRANSMISSION CASE

CAUTION: Before installing cap screws into aluminum parts, the screws should be dipped into Hydra-Matic oil to prevent galling and/or seizing of threads.

FRONT AND REAR UNITS

1. Place transmission case in holding fixture with the front end up.
2. Install neutral clutch backing plate into case (flat side up).
3. Install 4 neutral clutch drive and driven clutch plates as follows:
   a. Position every other steel plate so that the notched lug is on the opposite side of the wide space. The steel plates must be installed one above the other in this arrangement to properly un-nest the clutch pack. (Fig. 3-95)

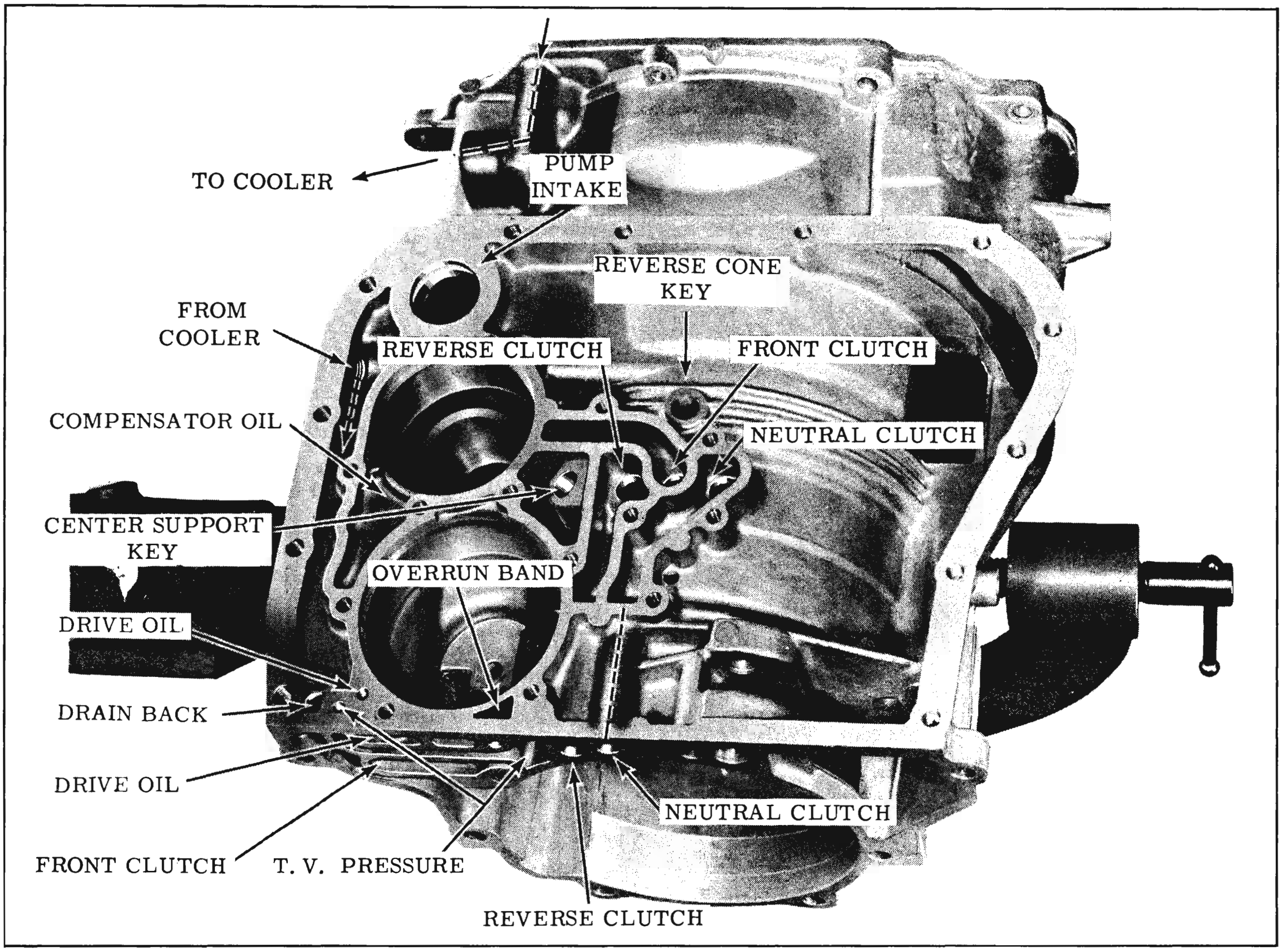


Fig. 3-94 Case Passages

b. Install the composition drive and steel driven clutch plates alternately starting with a composition clutch plate and be certain that the steel plates are stacked as previously arranged.

4. Install long case support key, (chamfered side up).

5. Mark the case to indicate one side of the key to assist in alignment for installation of case support. (Fig. 3-96)

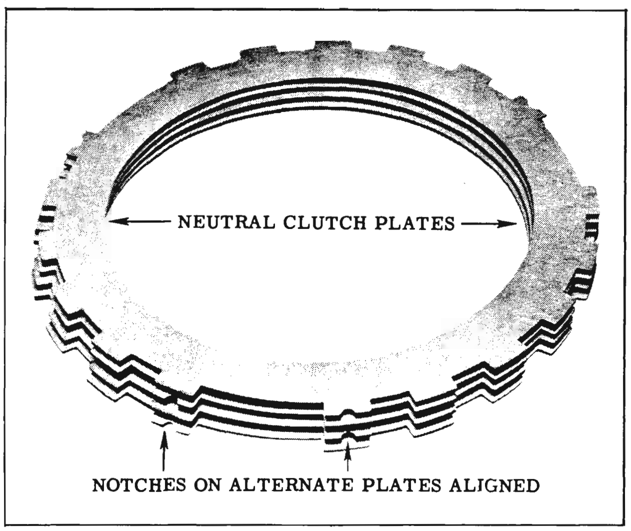


Fig. 3-95 Clutch Plate Alignment

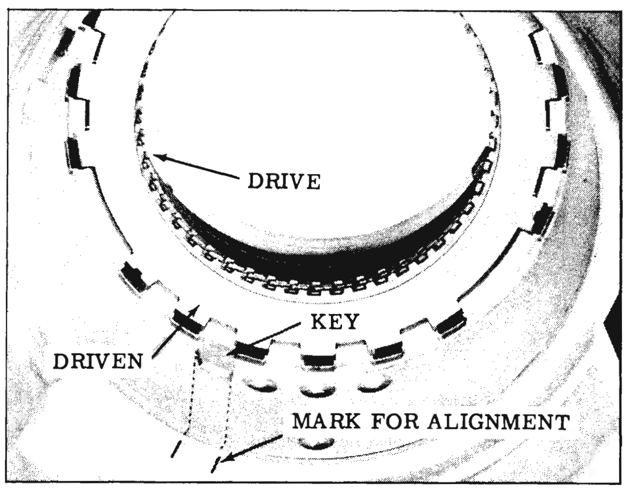


Fig. 3-96 Alignment Marks

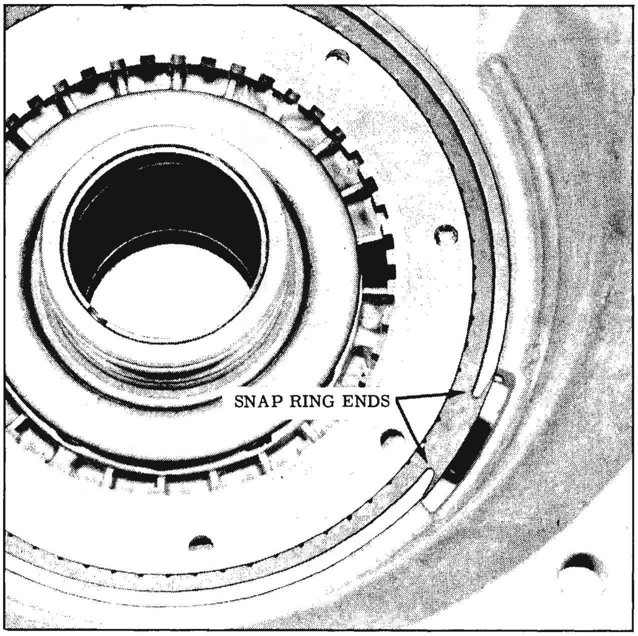


Fig. 3-97 Snap Ring Location

6. Install neutral and reverse clutch assembly into case, aligning case support key into keyway. Taping may be required.

7. Install reverse stationary cone key into case (rounded side up).

8. Install reverse cone (steel) into case over reverse piston.

9. Install reverse stationary cone (plastic), aligning reverse stationary cone keyway, with the key, lightly tap into place, if required.

10. Install large reverse cone snap ring into snap ring groove in case. (Fig. 3-97)

11. Reposition transmission, rear end up, and install overrun band over anchor in case.

12. Install rear unit internal gear assembly into case, aligning neutral clutch plates with outer race.

    NOTE: Be sure assembly bottoms against case support to insure engagement of all plates.

13. Reposition transmission (bottom side up).

14. Install front clutch assembly into front of transmission.

    NOTE: Be sure bronze washer is positioned in counterbore of front unit clutch drum.

15. Install thick bearing race, thrust bearing and the thin cupped bearing race on front sun gear and shaft assembly. (Fig. 3-98)

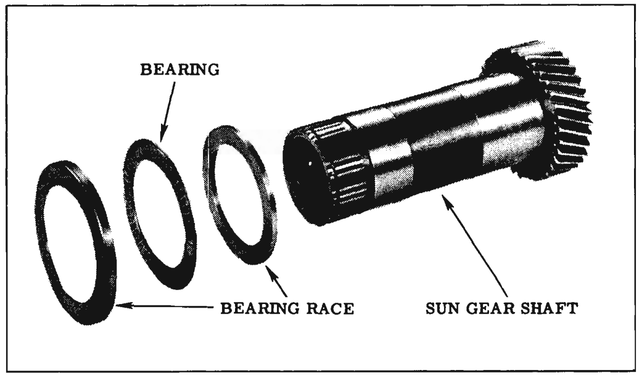


Fig. 3-98 Bearing and Races

16. Install front sun gear and shaft assembly through case support, aligning splines of sun gear shaft with rear internal gear and cutaway splines with clutch retainer.

17. Install bearing race (inner flange out) and bearing on rear planet carrier. Retain with petrolatum. (Fig. 3-99)

18. Install rear planet carrier through front unit sun gear shaft from rear of transmission. (Fig. 3-100)

19. Install thrust bearing and races as shown and retain with petrolatum. (Fig. 3-101)

20. Holding the rear planet carrier forward, install front unit carrier.

21. Install front unit carrier to rear planet

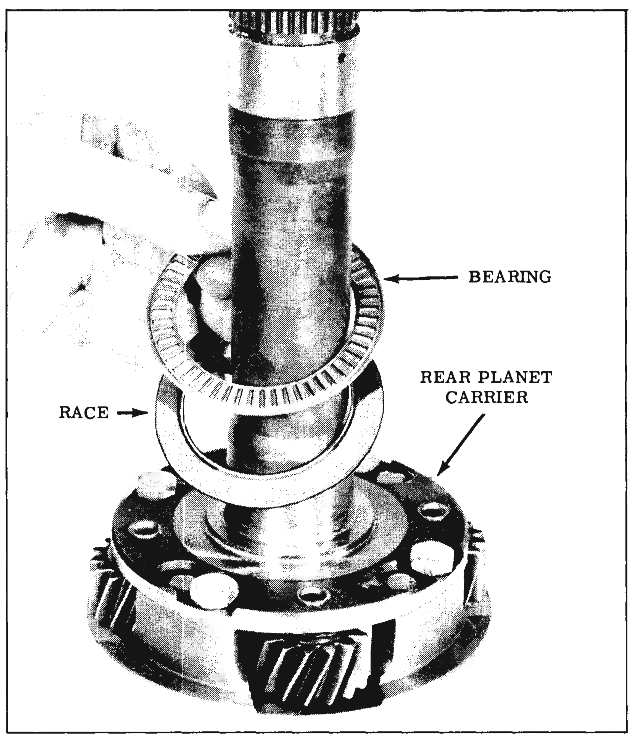


Fig. 3-99 Thrust Bearing and Races

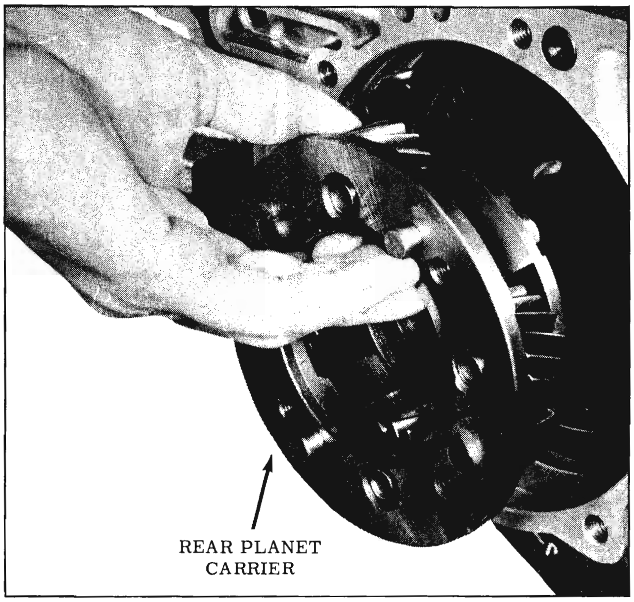


Fig. 3-100 Installing Rear Carrier

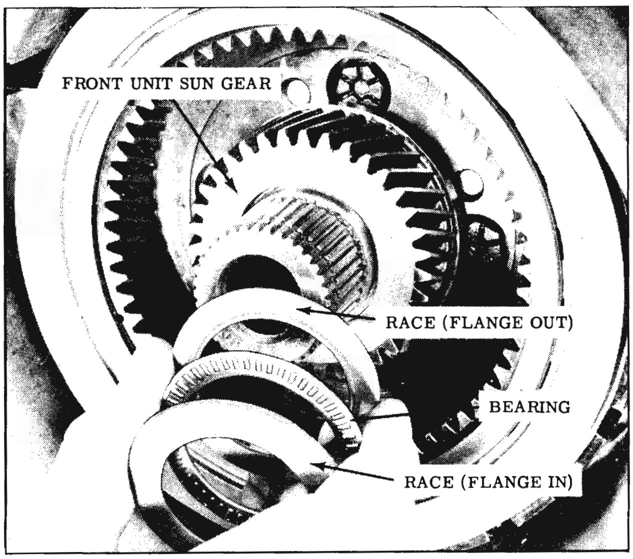


Fig. 3-101 Installing Bearing and Races

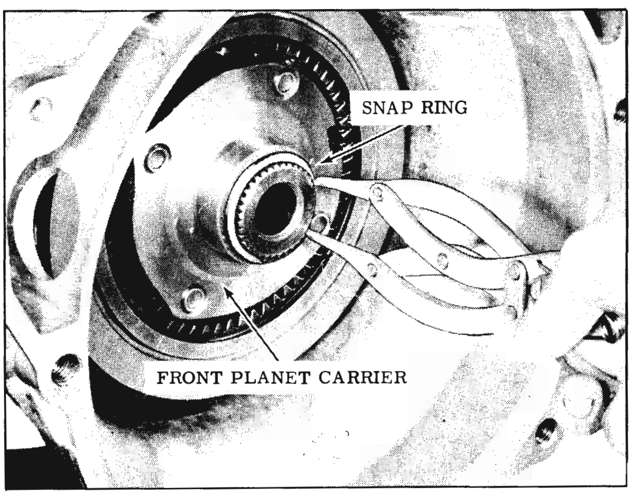


Fig. 3-102 Installing Snap Ring

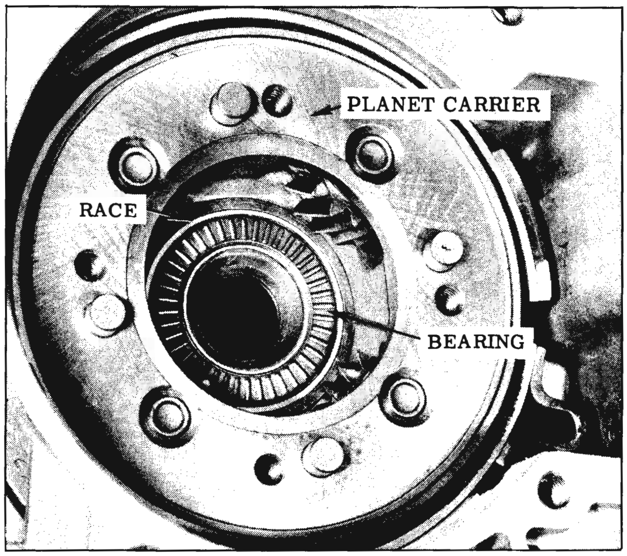


Fig. 3-103 Installing Thrust Bearing

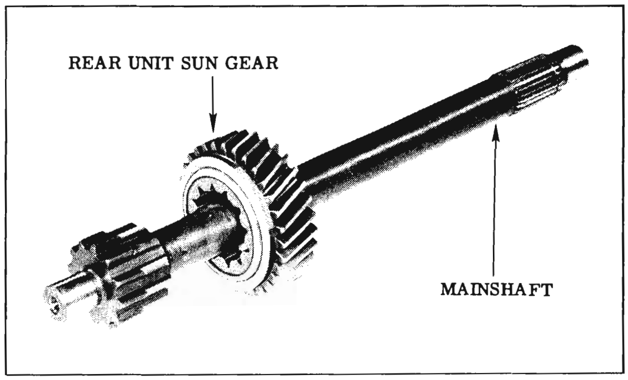


Fig. 3-104 Installing Sun Gear

carrier shaft snap ring while holding rear carrier forward. (Fig. 3-102)

22. Reposition transmission (rear end up).

23. Install rear unit sun gear to rear carrier bearing race into rear carrier with flange up, retain with petrolatum.

24. Install rear unit sun gear to rear carrier thrust bearing into bearing race. (Fig. 3-103)

25. Assemble rear unit sun gear to mainshaft, if removed, and install through rear carrier. (Fig. 3-104)

PARKING PAWL LINKAGE (Fig. 3-105)

1. Install parking pawl spacer into transmission case.

2. Position parking pawl and linkage assembly against spacer with tooth of parking pawl facing toward center of case and install parking pawl pin.

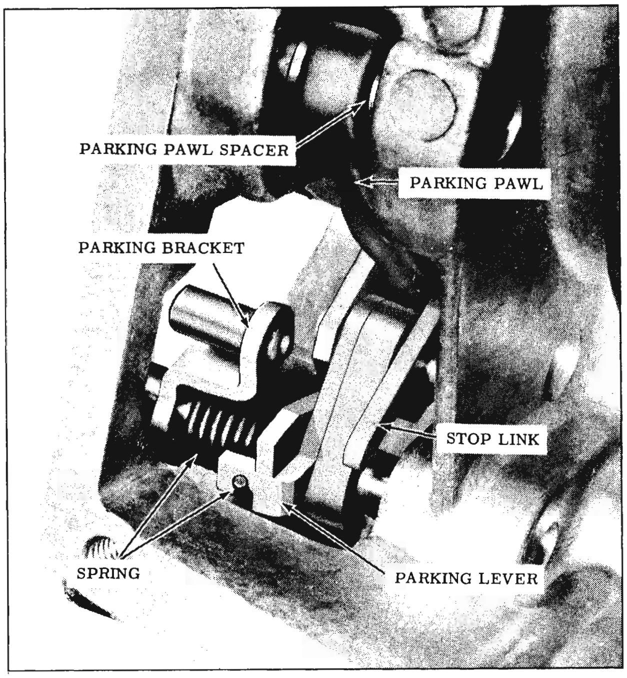


Fig. 3-105 Parking Pawl Assembly

3. Install parking bracket shaft through linkage and into case.
4. Install parking brake spring into parking bracket, with hook end of spring facing opposite to free end of dowel pin and with straight leg of spring in narrow slot between sides of bracket, and install over bracket shaft with dowel pin facing up.
5. Hook spring on parking lever, holding stop against pin. (Fig. 3-105)
6. Move parking pawl to disengage position.

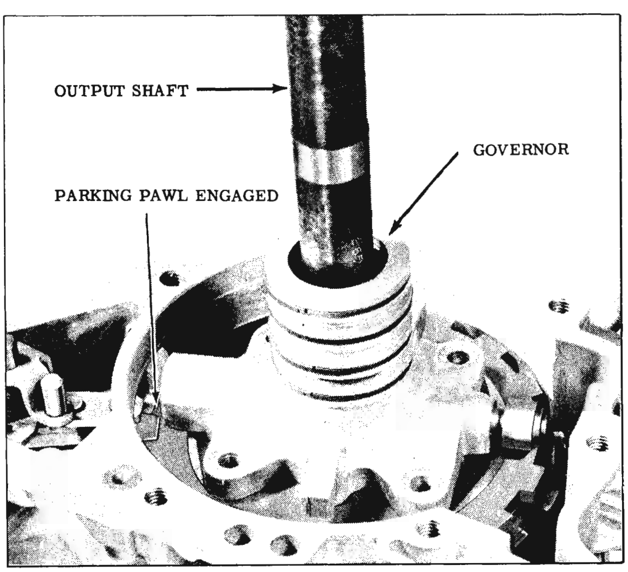


Fig. 3-106 Installing Governor

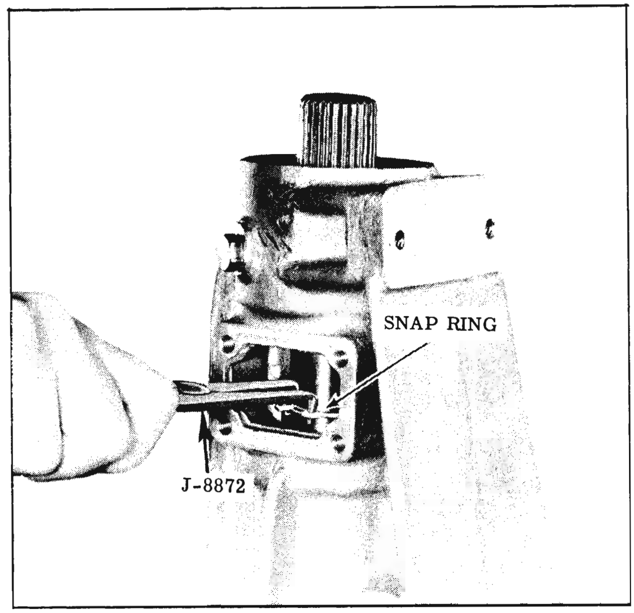


Fig. 3-107 Installing Snap Ring

OUTPUT SHAFT, GOVERNOR AND REAR BEARING RETAINER

1. Place governor assembly on output shaft.
2. Install snap ring in output shaft groove (nearest to governor).
3. Install output shaft to rear carrier assembly using alignment marks.
4. Engage parking pawl. (Fig. 3-106)
5. Install 4 governor attaching bolts. Torque 19 to 24 ft. lbs.

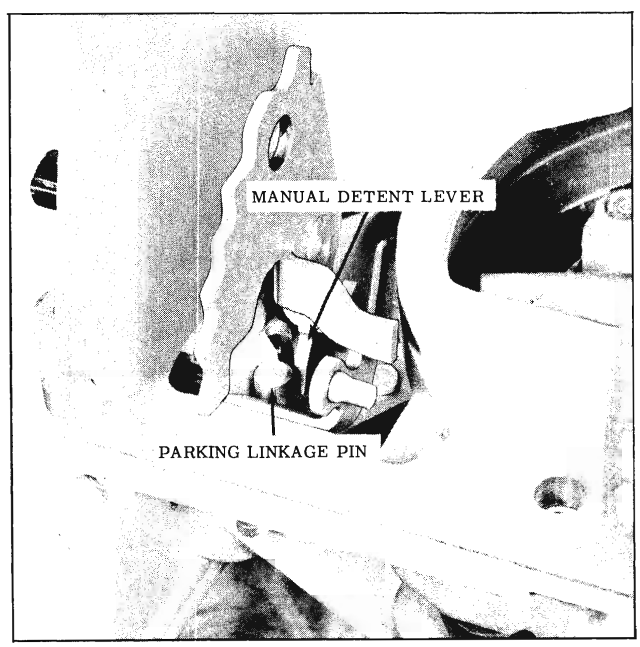


Fig. 3-108 Aligning Parking Linkage

6. Install rear bearing retainer gasket on rear bearing retainer and retain with petrolatum.

7. Start rear bearing retainer down over output shaft and install rear output shaft snap ring through access hole and over end of output shaft while retainer is being carefully lowered over governor assembly. (Fig. 3-107)

8. Carefully align parking linkage pin and manual detent lever as rear bearing retainer is aligned with dowel pin and case. (Fig. 3-108)

9. Install 8 rear bearing retainer to case attaching bolts as shown in Fig. 3-109. Torque all bolts 20 to 25 ft. lbs.

10. Using Tool J-6133-A, seat rear bearing snap ring. It may be necessary to move output shaft rearward to locate snap ring, by repositioning transmission to horizontal position and pushing on front unit carrier.

11. Install "O" ring seal over output shaft and into groove.

12. If rear seal was removed, lubricate sealing lip of new seal with Lubricant Part No. 567196 and apply a light coat of sealer Part No. 557622 to the outer diameter of the seal, then install seal, using Tool J-5154.

13. Install rear bearing retainer cover plate and gasket with 4 attaching bolts. Torque 6 to 8 ft. lbs.

14. Reposition transmission (front end up).

TORUS MEMBERS, PUMP AND CASE COVER

1. Install front unit drive torus, aligning front unit clutch plates with drive torus. Look through vent port in case to make sure that all clutch plates are engaged.

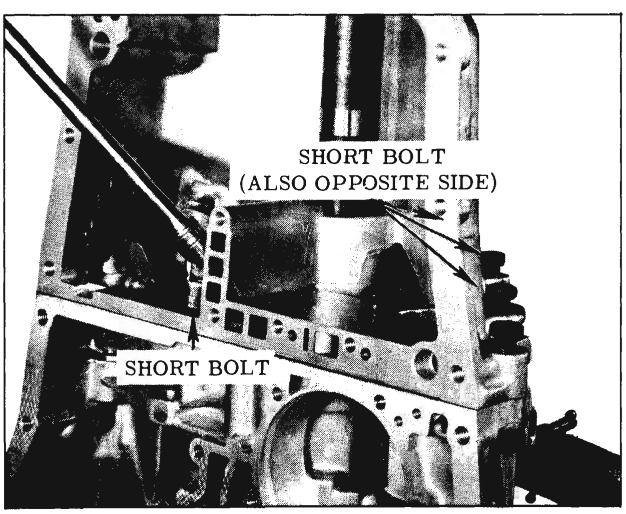


Fig. 3-109 Rear Bearing Retainer Bolts

Fig. 3-110 Accel-A-Rotor

2. Install lock type oil ring on Accel-A-Rotor hub, if removed. (Fig. 3-110)

3. Install lock type oil ring on front and rear hubs of driven torus member, if removed. (Fig. 3-111)

4. Install Accel-A-Rotor into drive torus aligning splines and position Accel-A-Rotor so that the I.D. of the hub of the Accel-A-Rotor is flush with the planet carrier shaft. (Fig. 3-112) A light tap with a plastic hammer may be required.

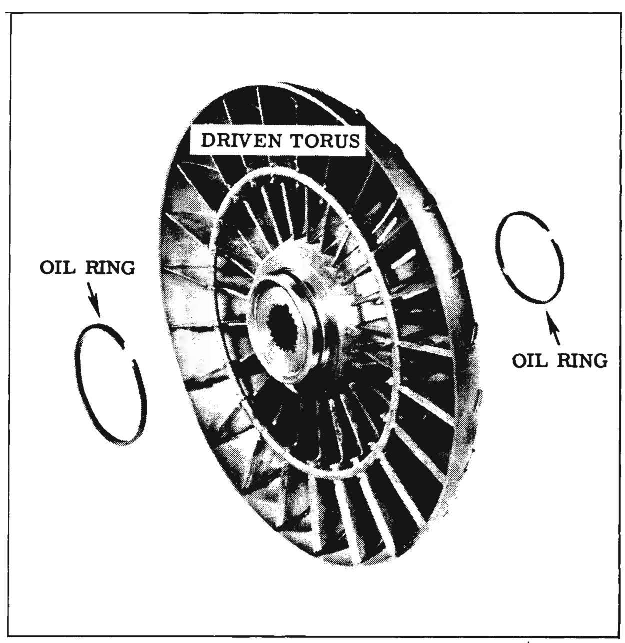


Fig. 3-111 Driven Torus

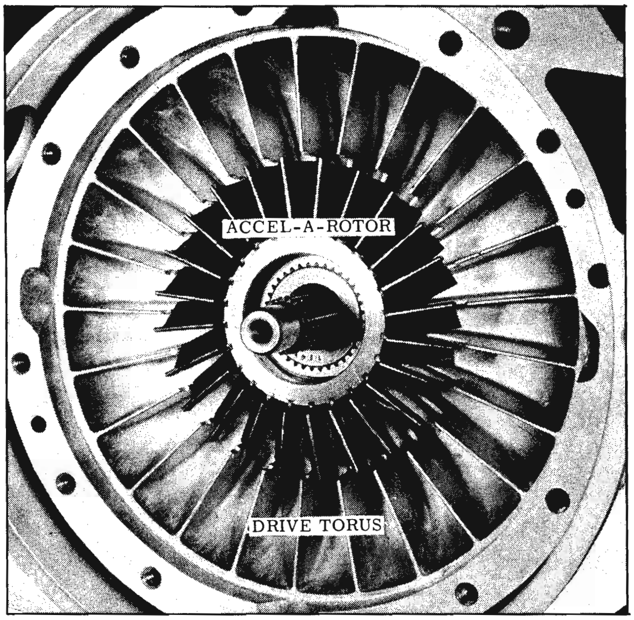


Fig. 3-112 Accel-A-Rotor Installation

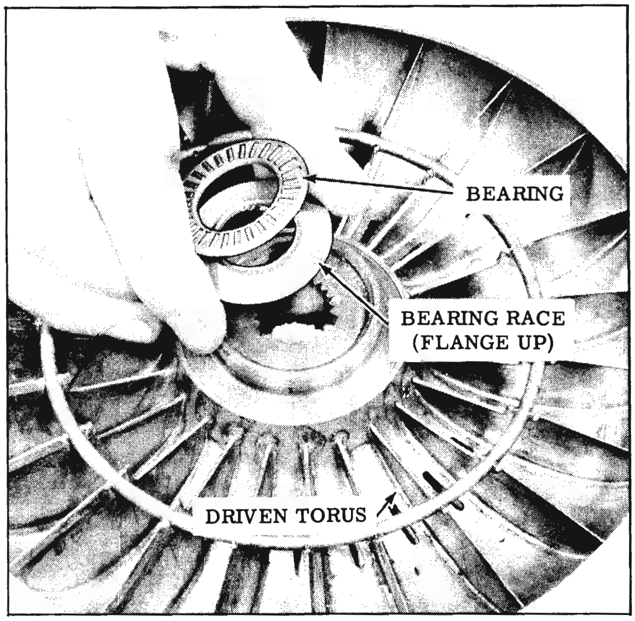


Fig. 3-114 Installing Race and Bearing

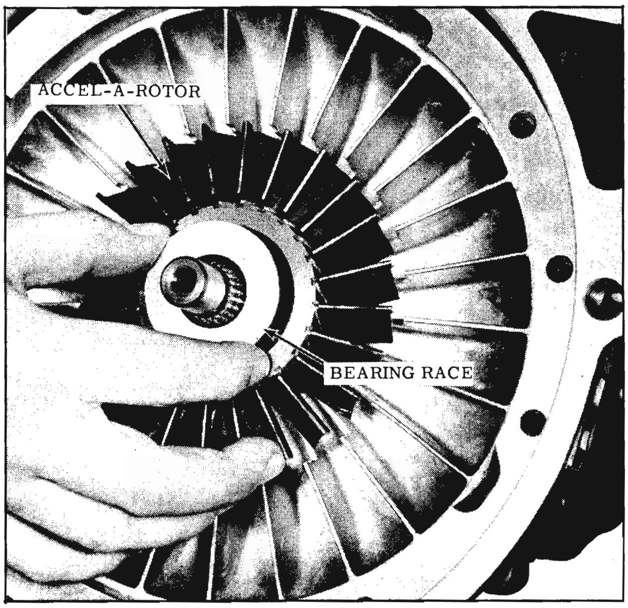


Fig. 3-113 Installing Bearing Race

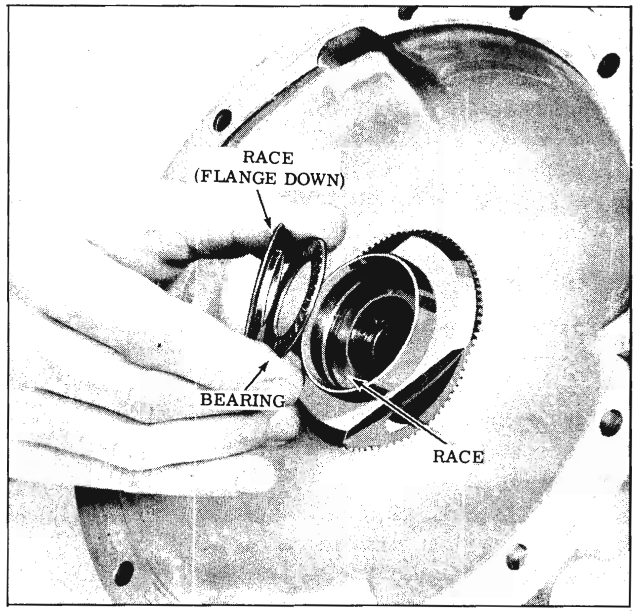


Fig. 3-115 Installing Bearing and Races

5. Install driven torus to Accel-A-Rotor rear bearing race into Accel-A-Rotor. (Fig. 3-113)

6. Install flanged race into driven torus (flange side up). (Fig. 3-114)

7. Install bearing into flanged race and retain with petrolatum.

8. Install driven torus member over main shaft, pull up on main shaft while repositioning transmission (pan side up).

9. Hold main shaft forward while installing driven torus to main shaft retaining ring.

10. Reposition transmission (front end up).

11. Install NEW drive torus to torus cover metal gasket on drive torus. Retain with petrolatum.

12. Install flat bearing race into torus cover.

13. Install bearing into flanged race, coat with petrolatum and install into torus cover with flanged side down. (Fig. 3-115)

14. Coat new gasket with petrolatum and install on torus cover.

15. Install torus cover to the drive torus member, aligning dowel pins.

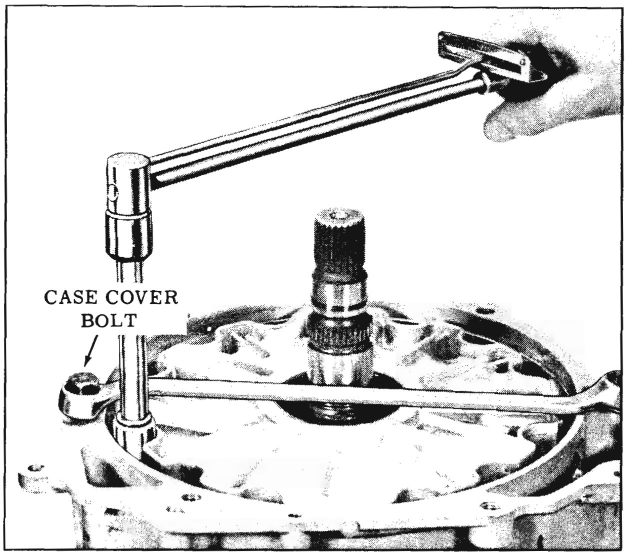


Fig. 3-116 Torus Cover Installation

16. Install box end wrench on case, as a holding tool, and install 12 torus cover to drive torus attaching bolts, cross tightening the bolts. Torque 17 to 20 ft. lbs. (Fig. 3-116)

17. Remove box end wrench.

18. Install gasket, coated with petrolatum, on case cover.

19. Install Seal Protector Tool J-8828 over input shaft. (Fig. 3-117)

20. Install case cover and pump assembly on transmission case.

21. Install six large case cover to case attaching bolts with copper washers and torque 30 to 35 ft. lbs. Install the three small attaching bolts as shown in Fig. 3-117 and torque 15 to 18 ft. lbs. Remove seal protector.

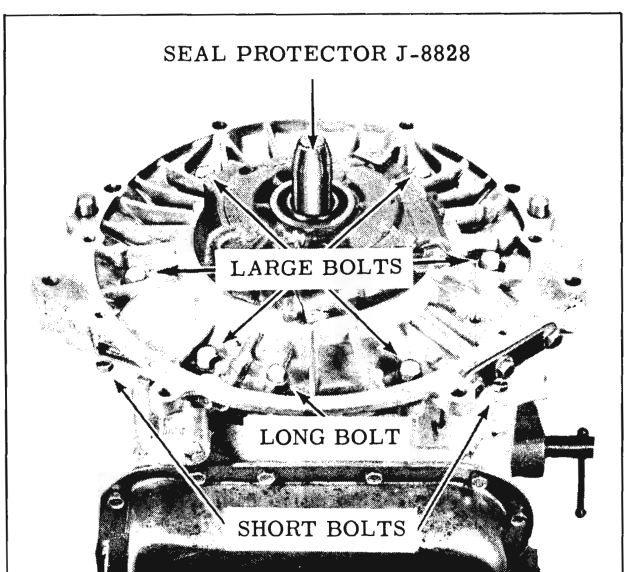


Fig. 3-117 Seal Protector and Bolt Location

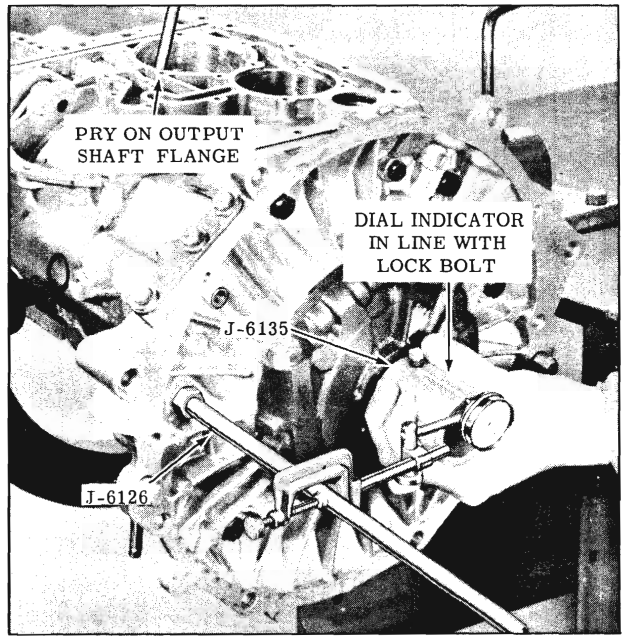


Fig. 3-118 Checking End Play

FRONT UNIT END PLAY CHECK

1. Remove one case cover to case attaching bolt.

2. Install Tool Bolt J-6126 into transmission case.

3. Assemble Neutral Clutch Retainer Tool J-6135 on the input shaft of the torus cover.

4. Clamp dial indicator on Tool J-6126 and index indicator with end of Tool J-6135 in line with the lock screw.

5. Position a screwdriver through case, BEHIND THE FLANGE ON THE OUTPUT SHAFT and gently pry forward on output shaft to position units forward.

6. At the same time move tool handle and record end play. (Fig. 3-118)

7. End play should be .005" to .020". If end play is incorrect, refer to selective shim washer chart and install new selective shim washer(s). (Page 3-42)

8. Remove tools and reinstall case cover to case attaching bolt. Torque bolt 30 to 35 ft. lbs.

9. Rotate transmission (pan side up).

ACCUMULATOR, SERVO AND VALVE BODY

1. Install accumulator pin into case. (Fig. 3-119)

2. Install upper accumulator spring (tapered end down).

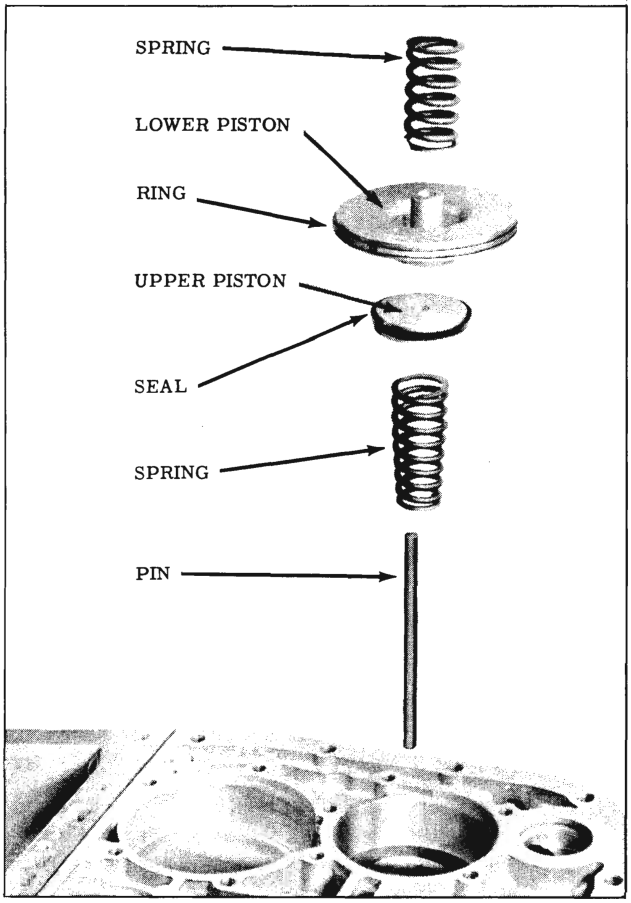


Fig. 3-119 Accumulator Installation

3. Install NEW small accumulator piston seal with lip of seal facing flat side of piston.
4. Install small accumulator piston with lip of seal facing up.
5. Install large accumulator piston ring on piston, if removed.

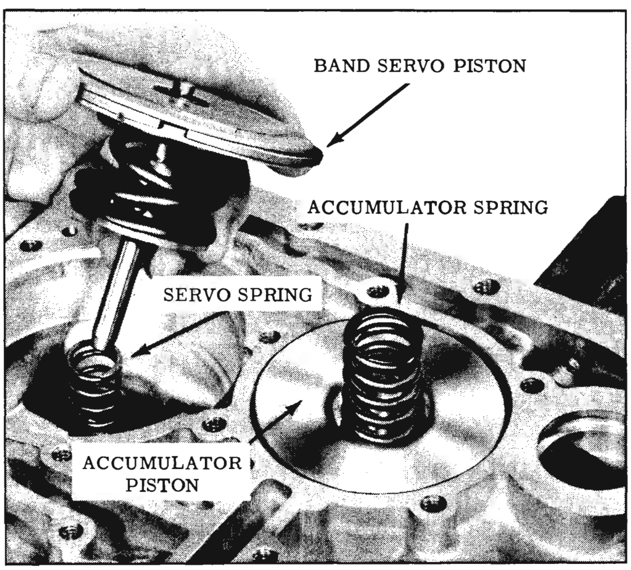


Fig. 3-120 Servo Installation

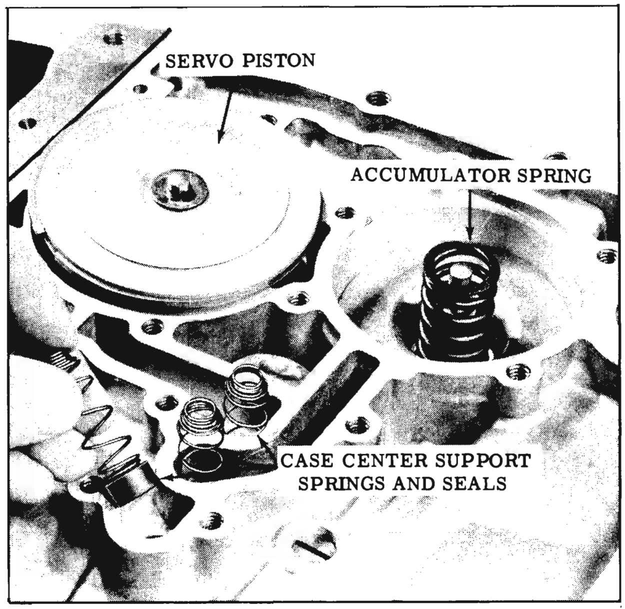


Fig. 3-121 Installing Seals and Springs

6. Install large accumulator piston over pin with spring pocket up.

7. Install short accumulator spring into spring pocket.

8. Install servo release spring into case bore. (Fig. 3-120)

9. Install servo piston assembly into case (stem down).

10. Install 3 case support to case seals and springs (seals down). (Fig. 3-121)

11. Install servo and accumulator gasket, coated

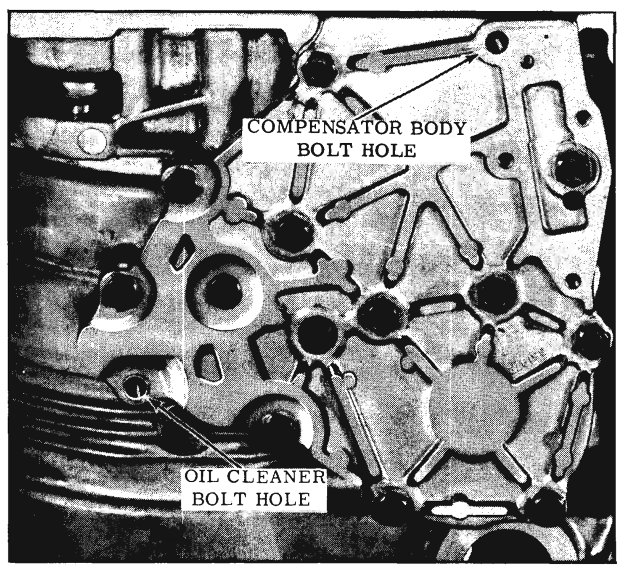


Fig. 3-122 Accumulator Cover Bolt Location

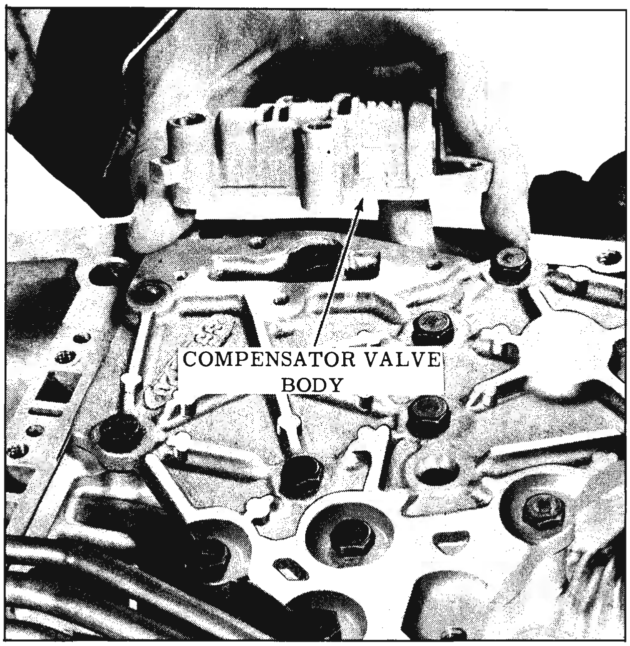


Fig. 3-123 Installing Compensator Body

with petrolatum, on servo and accumulator cover.

12. Install servo and accumulator cover. Use 4 bolts through center of cover to locate the cover and align case support to case seals and accumulator seal ring. After cover is lined up, depress cover and tighten bolts. Torque 6 to 8 ft. lbs.

13. Install 8 servo and accumulator cover bolts. Leave the remaining bolts out. (Fig. 3-122) Torque 6 to 8 ft. lbs.

14. Install compensator body assembly on accumulator cover using 3 screws and 1 bolt. (Fig. 3-123) Torque screws 2.5 to 3.5 ft. lbs. and torque bolt 6 to 8 ft. lbs.

15. Install a case to oil cleaner pipe "O" ring in case bore, if removed.

16. Install oil cleaner with pipe in case bore and secure oil cleaner with one remaining cover attaching bolt. Torque 6 to 8 ft. lbs.

17. Install seals on pipe assembly, if removed.

18. Install pipe assembly into case through opening in case. (Fig. 3-124)

19. Install seal and washer, if removed, on pipe assembly attaching bolt, and install bolt to pipe assembly from front side of case cover. Torque 10 to 12 ft. lbs.

20. Install manual valve in valve body.

21. Apply petrolatum to valve body pipe ports and install valve body assembly by guiding T.V. shaft through opening in rear bearing retainer and positioning manual valve on pick up pin. Position pipe assembly to index with pipe ports in valve body and move forward to seat pipe seals. (Fig. 3-125) Install 5 valve body attaching bolts. Torque 6 to 8 ft. lbs.

22. Install throttle shaft seal over T.V. shaft into case.

23. Install new oil pan gasket on transmission.

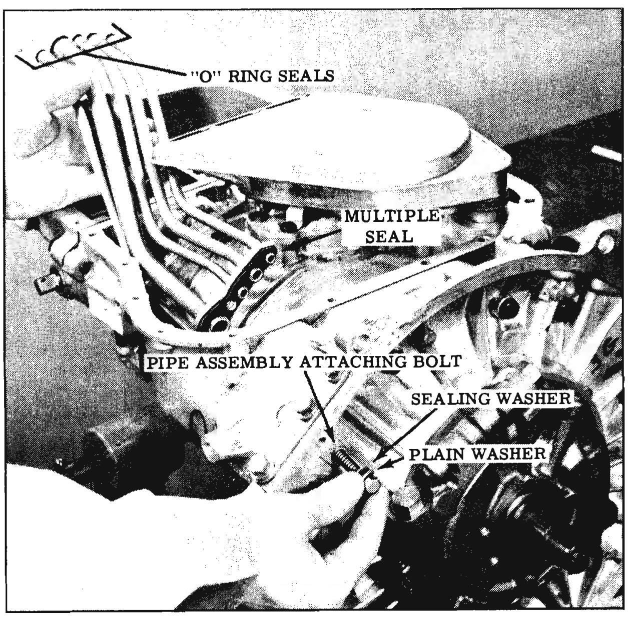


Fig. 3-124 Installing Pipe Assembly

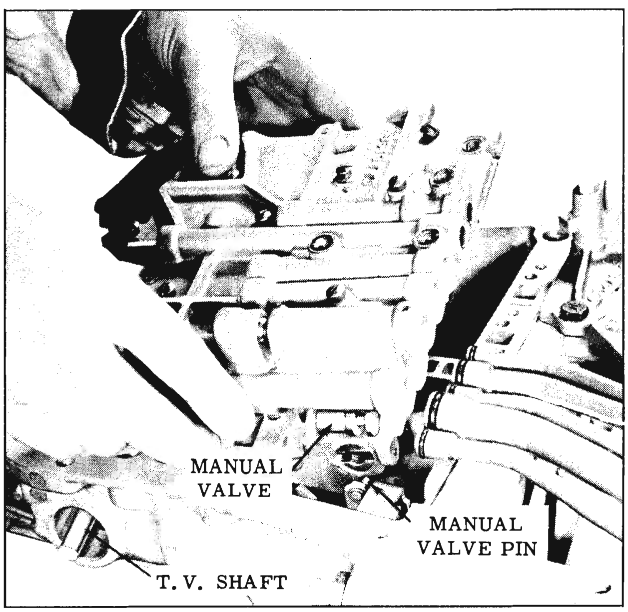


Fig. 3-125 Installing Valve Body

24. Install oil pan on transmission using 21 attaching screws. Torque 12 to 15 ft. lbs.

SERVICING THE OIL COOLER

The oil cooler is located in the lower tank of the radiator and its purpose is to cool the oil in the event excessive temperature tends to develop.

In a major transmission failure, where particles of metal have been carried with the oil throughout the units of the transmission, it will be necessary to flush out the oil cooler and connecting lines. The oil cooler is a sealed container providing a passage for oil to flow from the inlet to the outlet. Clean solvent can be flushed through the cooler with air pressure. (An engine desludge gun may be used.) The cooler should be back-flushed first through the return line to remove all foreign material possible. Then flush through the inlet line and finish by flushing through the return line. Clean remaining solvent from cooler with compressed air applied to the return line and flush with Hydra-Matic oil.

MINOR SERVICE ADJUSTMENTS

THROTTLE LINKAGE ADJUSTMENTS (Fig. 3-126)

1. ADJUST T.V. LEVER AT SIDE OF TRANSMISSION

a. Raise car and remove clip and lower T.V. rod from T.V. lever "A" at side of transmission. (Fig. 3-127)

b. Place short end of T.V. lever Gauge BT-33-1 into manual lever shaft. While holding T.V. lever at the end of its rearward travel, the T.V. lever hole should be visible within the hole in the gauge. (Fig. 3-127)

c. If T.V. lever hole is not completely visible within the gauge hole, bend lever with Tool BT-33-7 and recheck adjustment. Install T.V. rod and clip.

d. Lower car.

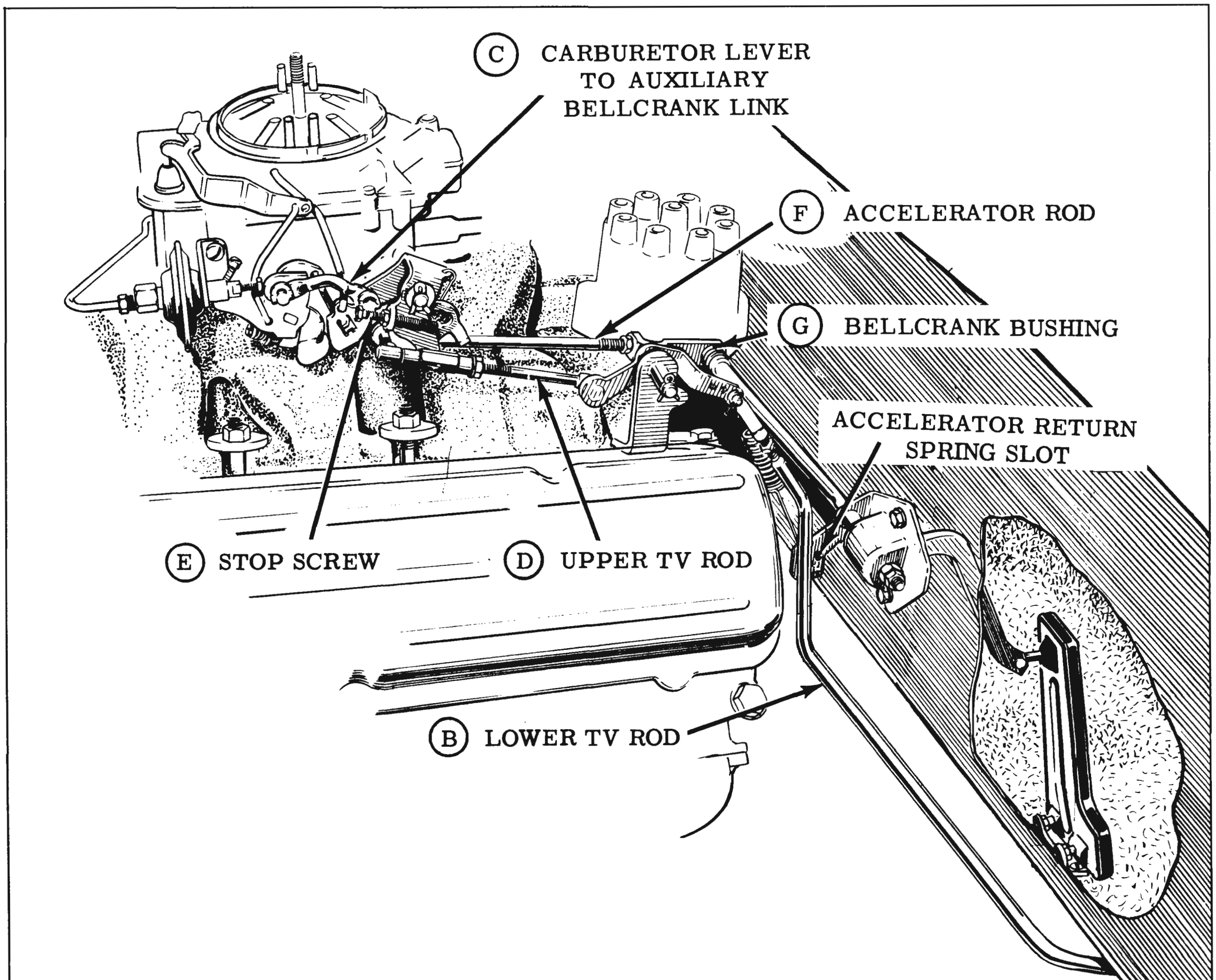


Fig. 3-126 Throttle Linkage Adjustment

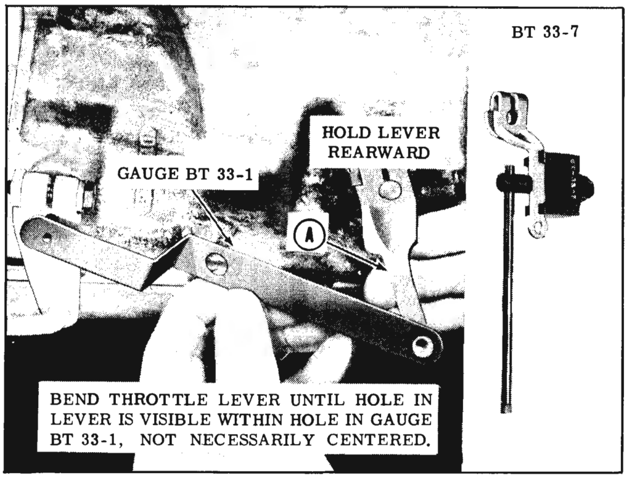


Fig. 3-127 Checking T.V. Lever Adjustment

THE FOLLOWING LINKAGE ADJUSTMENT STEPS MUST BE MADE WITH THE CARBURETOR THROTTLE VALVES IN THE CLOSED BORE POSITION.

LOWER T.V. ROD ADJUSTMENT (Step 2)

CARBURETOR LEVER TO AUXILIARY BELLCRANK LINK ADJUSTMENT (Step 3)

UPPER T.V. ROD ADJUSTMENT (Step 4)

To completely close throttle valves, start engine, remove air cleaner and block intermediate choke lever at climatic control housing to release fast idle cam. Install throttle return check holding Tool J-6342-01 to hold plunger away from throttle lever. Turn off ignition switch and BACK OUT SLOW IDLE ADJUSTING SCREW UNTIL CARBURETOR THROTTLE VALVES ARE COMPLETELY CLOSED. In a true closed bore position, clearance will be present at the end of the fast idle screw, slow idle screw, and the throttle return check plunger.

2. ADJUST LOWER T.V. ROD (B, Fig. 3-126)

a. Loosen jam nut on lower T.V. rod "B" and remove both rods from T.V. bellcrank. Upper T.V. rod has socket and ball stud connections which snap on and off.

b. With T.V. bellcrank and transmission lower T.V. rod "B" held against their rearward stops, adjust lower T.V. rod clevis so that the pin will enter freely into holes in clevis and T.V. bellcrank. (Fig. 3-127)

c. Install cotter pin and tighten jam nut on lower T.V. rod "B".

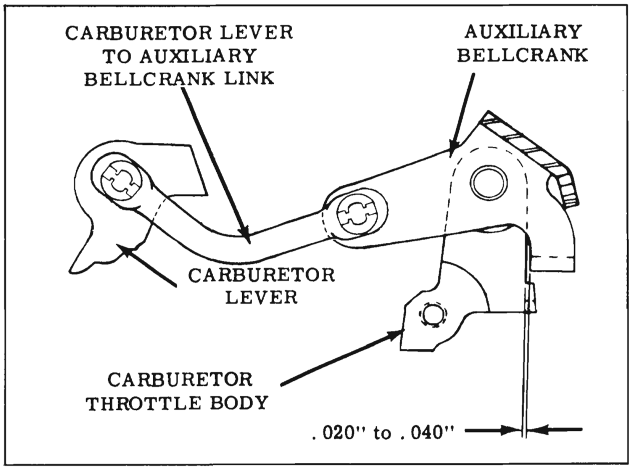


Fig. 3-128 Checking Carburetor Link (4 Bbl.)

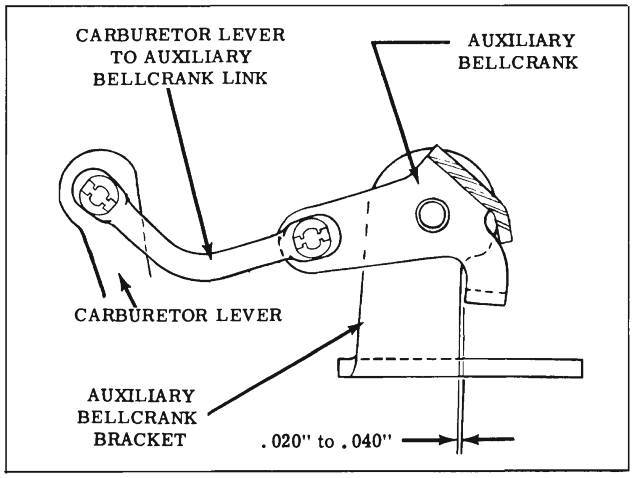


Fig. 3-129 Checking Carburetor Link (2 Bbl.)

3. ADJUST CARBURETOR LEVER TO AUXILIARY BELLCRANK LINK (C, Fig. 3-126)

a. Measure clearance as shown in Fig. 3-128 (four barrel) or Fig. 3-129 (two barrel) with feeler gauge. To obtain proper clearance of .020" to .040" remove link "C" and bend. Reinstall link and recheck clearance. Link can be installed up or down.

4. ADJUST UPPER T.V. ROD (D, Fig. 3-126)

IMPORTANT: Before attaching the upper T.V. rod to the bellcrank, check the swivel to be sure it turns FREELY on the threads.

a. Adjust upper T.V. rod "slightly short" and snap it onto the ball stud.

b. While holding the T.V. bellcrank against its stop, lengthen the rod until the swivel turns freely and feels "sloppy". Continue to lengthen the rod by turning the swivel until a very slight resistance is felt. At this point the upper rod is properly adjusted.

The resistance occurs when the loose feeling or end play has been taken up by the lengthening of the rod.

NOTE: The resistance that is felt, is very slight and is a matter of feel and it may be necessary to perform this step more than once to obtain the correct adjustment.

c. Tighten lock nut while holding swivel in adjusted position.

5. IDLE SPEED ADJUSTMENT

a. Remove block holding choke valve open, start engine and allow it to reach normal operating temperature.

b. With throttle return check Holding Fixture J-6342-01 in place, set slow idle speed according to the following chart and instructions.

SLOW IDLE SPEED	
SELECTOR LEVER	RPM
Drive	500
Factory Installed Air Conditioning-Air Conditioning turned "OFF". Idle Compensator held closed = 550 rpm. Dealer Installed Air Conditioning (Without Idle Compensator) - Air Conditioning turned "ON".	

NOTE: When setting idle speed make sure the idle compensator is closed by holding it down with a pencil or other suitable tool. If the idle speed increases when the air cleaner is installed, do not reduce idle speed setting since the idle compensator is open. If idle speed decreases, readjust to correct rpm.

THE FOLLOWING ADJUSTMENTS MUST BE MADE WITH THE CHOKE COMPLETELY OFF, FAST IDLE OFF, AND THE CARBURETOR THROTTLE VALVES IN THE SLOW IDLE POSITION.

THROTTLE STOP SCREW ADJUSTMENT (Step 6)

ACCELERATOR PEDAL HEIGHT (Step 7)

6. ADJUST THROTTLE DOWNSHIFT STOP SCREW (E Fig. 3-126)

a. Loosen jam nut and back out stop screw several turns. Push rearward on accelerator pedal lever until throttle valves are wide open, then hold in wide open position

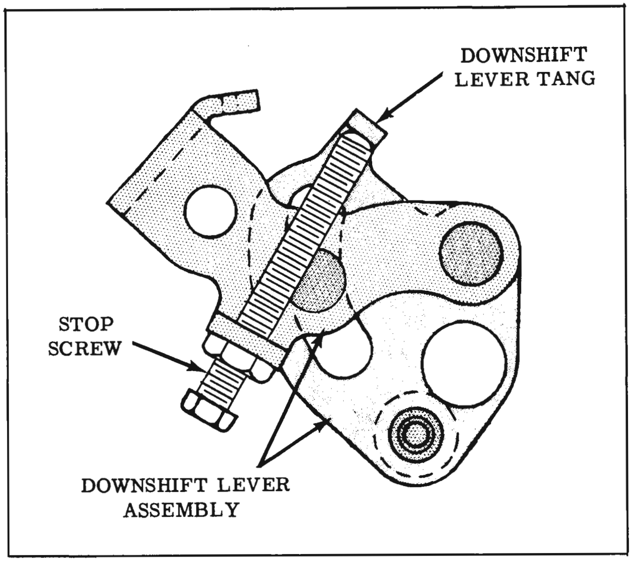


Fig. 3-130 Throttle Downshift Stop Screw Adjustment

with left hand on carburetor throttle lever. Rotate T.V. bellcrank counterclockwise with right hand to the point of maximum transmission lever travel. This point is a matter of feel - do not bend or stretch linkage beyond this point.

b. With linkage held in this position, adjust stop screw "E" to just touch the tang on the downshift lever.

c. Allow the throttle valves to return to a closed position, then turn stop screw in 1-1/2 to 2 turns and tighten jam nut. (Fig. 3-130)

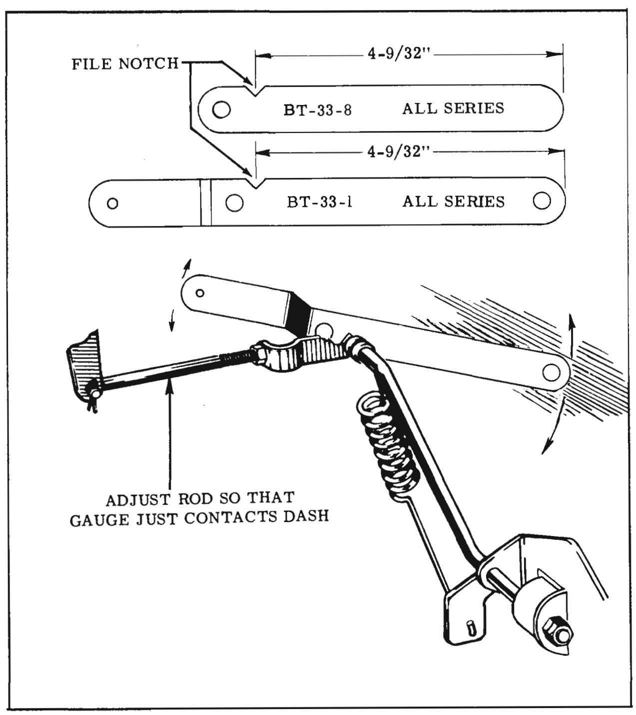


Fig. 3-131 Accelerator Pedal Height Adjustment

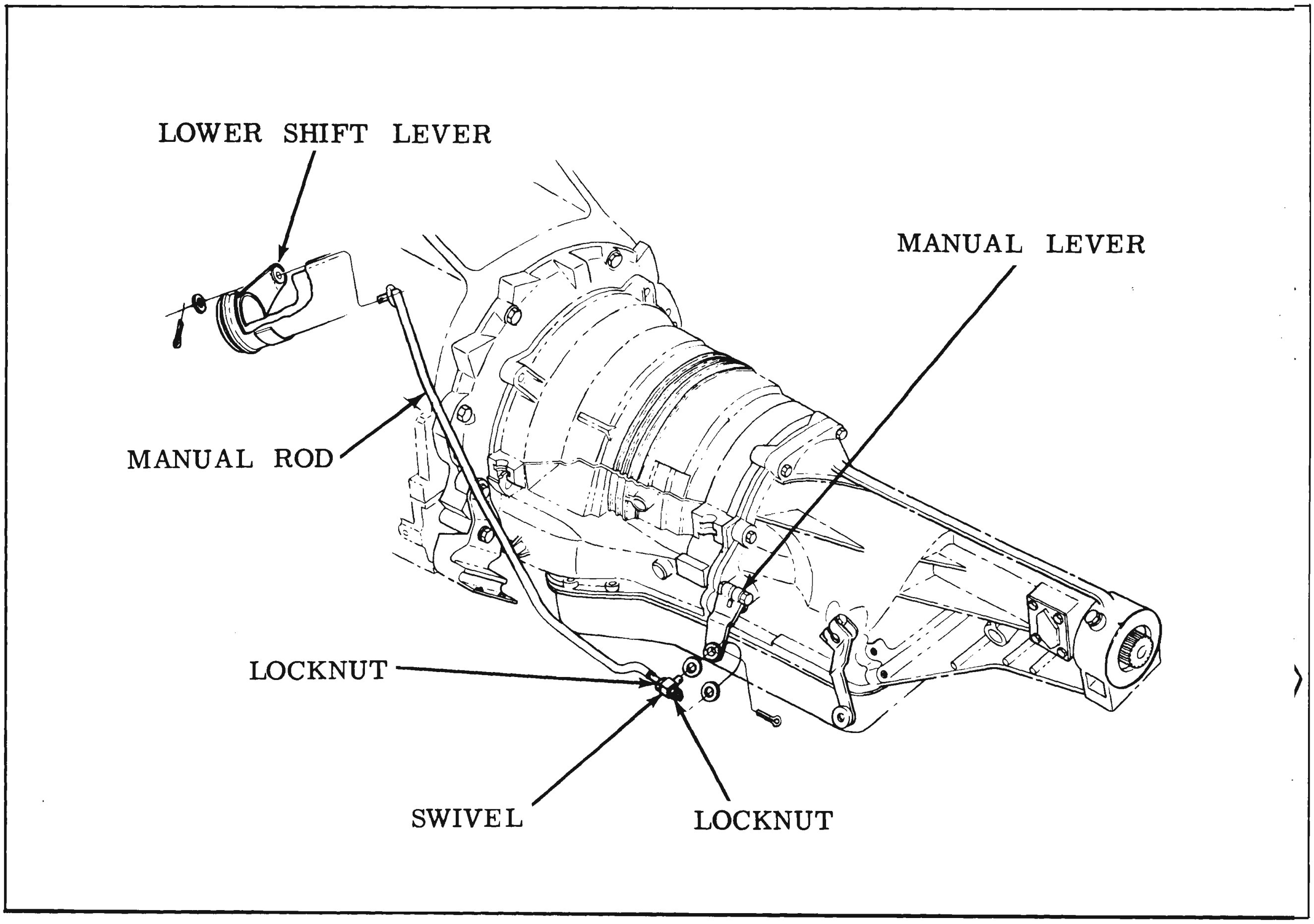


Fig. 3-132 Manual Lever Adjustment

7. ADJUST ACCELERATOR PEDAL ALIGNMENT AND HEIGHT

a. Disconnect accelerator pedal bellcrank link from pedal and check alignment. If pedal and link are misaligned, bend the left ball stud up or down as required.

b. Adjust accelerator rod "F" to position accelerator rod to bellcrank bushing "G" so that gauge just touches dash. (Fig. 3-131)

c. Lubricate linkage pivot points with light engine oil.

MANUAL LEVER ADJUSTMENT (WITHOUT CONSOLE)

The following adjustment provides proper clearance between the neutral detent in the transmission and the stop for the manual shift lever in the upper steering column mast jacket.

1. Loosen both swivel locknuts on the manual rod.
2. Set transmission manual lever in neutral detent position.
3. Hold lower shift lever upward so selector lever is positioned against stop in upper steering column. Do not raise lever.
4. Tighten rear nut finger tight against swivel.
5. Adjust manual rod short, by tightening rear nut two turns.
6. Lock swivel in position, by tightening front nut.

CONSOLE SHIFT LINKAGE (Fig. 3-133)

For linkage removal, refer to Fig. 3-133. To remove the shift lever or bracket assembly, the console must be removed.

MANUAL LEVER ADJUSTMENT (WITH CONSOLE)

The manual lever adjustment provides for proper clearance between the neutral detent in the transmission and the stop for the selector lever in the console.

1. Place the selector lever in the neutral position.
2. Disconnect the manual rod from the transmission manual lever.
3. Place the transmission manual lever in the neutral detent position.

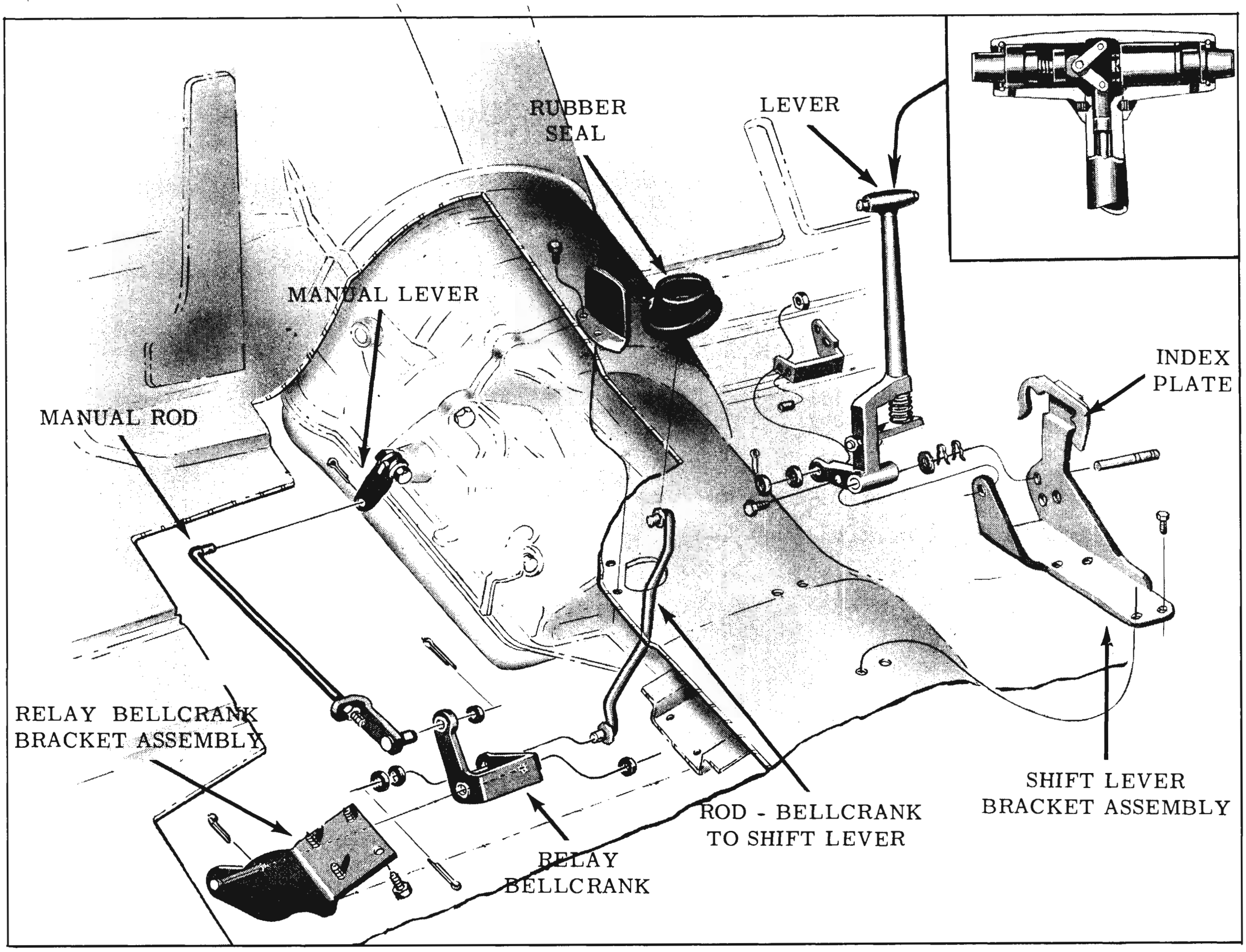


Fig. 3-133 Console Shift Linkage

4. Loosen lock nut on manual rod. With selector lever held against its stop in the neutral position and the transmission manual lever in the neutral detent position, adjust the manual rod until the manual rod enters the transmission manual lever.

5. Lengthen manual rod 4 turns and check alignment. Readjust if necessary.

6. Connect manual rod to transmission manual lever and install washer and cotter pin. Tighten lock nut on manual rod.

DIAGNOSIS

This information is an aid to and not a substitute for a good basic understanding of the Principles of Operation. It is of utmost importance to observe and perform all preliminary steps outlined in this Diagnosis Guide. Make certain that all "on the car repairs" possibilities have been exhausted before the transmission is removed from the car.

Prior to attempting to correct any assumed malfunctions of the transmission, always check and test as follows:

CHECK OIL LEVEL

Always check the oil level before road testing. Erratic shifting or other malfunctions can in some cases be traced to improper oil level.

ROAD TEST

For a proper diagnosis, a thorough knowledge of the operation of the transmission is essential. Where possible, a test route should be established to include some hilly section to test for open throttle downshifts, a level section for testing upshift points and a quiet section for testing for noise.

Check all upshifts and downshifts for smoothness of operation in drive range. Also check transmission in low, "S" range and reverse.

NOTE: There are only two gear upshifts in drive range, 2nd to 3rd and 3rd to fourth.

While road testing, the transmission oil pressure gauge should be connected and the pressures checked as follows:

Check in "S" Range with steady road load at approximately 25 M.P.H. Reading should be between 98.6 and 111.4 psi. (Transmission in 3rd stage)

CAUTION: Do not stall test transmission under any conditions.

LOW OIL PRESSURE

POSSIBLE CAUSES:

1. Oil Level - Low
2. Boost Plug - Wrong - Stuck
3. Pressure Regulator Valve
4. Strainer and "O" Ring
5. Manual Valve - Misaligned
6. Foaming or Cavitation
7. Control Valve Assembly - Stuck Valve(s)
8. Internal Leak
9. Front Pump - Slide - Low Output

HIGH OIL PRESSURE

POSSIBLE CAUSES:

1. Pressure Regulator Valve - Stuck
2. Boost Plug - Wrong - Stuck
3. Manual Valve - Misaligned With Quadrant
4. Control Valve Assembly - Stuck Valve
5. Front Pump - Slide - High Output

Always be certain the engine is operating at peak performance. The engine and transmission are designed to operate as an integral power unit. Failure of the engine to deliver peak power can result in improper shift characteristics and apparent transmission malfunction.

EXTERNAL LINKAGE

The importance of proper linkage adjustment cannot be over emphasized. Improper linkage adjustment can cause rough erratic shifting, missing shifts, or the inability to select one or more of the ranges.

OIL LEAKS

Before attempting to correct an oil leak, the actual source of the leak must be determined. In many cases the source of the leak can be deceiving due to "wind flow" around the engine and transmission. If any doubt exists as to the source of the leak there are two ways to determine it.

RED DYE

The addition of red dye to the transmission oil will indicate if the leak is from the transmission.

BLACK LIGHT

The use of a "Black Light", Tool No. J-6640, to identify the oil from the leak is also suitable. Comparing the oil from the leak to that on the engine or transmission dipstick when viewed by black light will determine the source of the leak.

POSSIBLE POINTS OF OIL LEAKS

1. TRANSMISSION OIL PAN
   a. Improperly installed or damaged gasket.
   b. Attaching bolts not correctly torqued.
   c. Filler pipe flange weld or stripped threads.
   d. Filler pipe.
   e. Oil pan not flat.
   f. Rear bearing retainer and/or case not positioned correctly at oil pan.
2. REAR BEARING RETAINER
   a. Rear seal not installed properly or damaged.
   b. Gasket (rear bearing retainer to case) damaged or improperly installed.
   c. Rear bearing retainer to case attaching bolts not correctly torqued.
   d. Main line pressure plug not tight.
   e. T.V. line pressure plug not tight.
   f. Inner T.V. lever seal.
   g. Cover plate gasket improperly installed or defective.
   h. Cover plate screws not correctly torqued.
3. COOLER CONNECTIONS
   a. Adapter not correctly torqued.
   b. Adapter defective.
4. CASE COVER ASSEMBLY LEAKS
   a. Gasket - Case to Case Cover improperly installed.

b. Bolts - Improperly torqued.

c. Washer Seals - Damaged.

d. Plate or Gasket - Defective.

5. FRONT END LEAKS

a. Pump "O" ring cut or improperly installed.

b. Front seal.

c. Case to case cover gasket.

d. Case cracked or porus.

e. Cut or improperly installed "O" ring - coupling feed limit valve, (oil pump).

f. Cut or improperly installed "O" ring - pressure regulator assembly.

g. Breather pipe.

h. Manual shaft "O" ring - defective or improperly installed.

NO DRIVE IN DRIVE RANGE

POSSIBLE CAUSES:

1. Low Oil Level
2. Linkage, Manual
3. Control Valve Assembly
4. Internal Leak
5. Low Oil Pressure
6. Neutral Clutch
7. Sprag or Roller Clutch Assembly - Or Race
8. Coupling
9. Passage Restricted
10. Reverse Cone Engaged

FIRST AND SECOND STAGE ONLY

POSSIBLE CAUSES:

1. Governor
2. Control Valve Assembly
3. Clutch

DRIVE IN THIRD AND FOURTH ONLY

POSSIBLE CAUSE:

1. Control Valve Assembly

DRIVE IN FIRST, SECOND AND FOURTH ONLY

(MIGHT BE REPORTED AS 2-3 SLIP)

POSSIBLE CAUSES:

1. Control Valve Assembly
2. Coupling

DRIVE IN FIRST, SECOND AND THIRD ONLY

POSSIBLE CAUSES:

1. Governor (G-2)
2. Control Valve Assembly

DRIVE IN NEUTRAL

POSSIBLE CAUSES:

1. Linkage, Manual
2. Neutral Clutch

NO REVERSE

POSSIBLE CAUSES:

1. Linkage, Manual
2. Low Pressure
3. Reverse Cone Clutch
4. Restricted Passage
5. Neutral Clutch

DRIVE IN "S" OR LOW RANGE ONLY

POSSIBLE CAUSES:

1. Sprag or Roller Clutch Assembly
2. Neutral Clutch

ROUGH 2-3 STAGE

POSSIBLE CAUSES:

1. T.V. Linkage
2. Control Valve Assembly
3. Accumulator
4. Compensator Body Assembly
5. 2-3 Oil Passage
6. Coupling
7. Front Clutch

ERRATIC SHIFTS

POSSIBLE CAUSES:

1. Governor Assembly

2. Control Valve Assembly

SLIPPING ALL RANGES

POSSIBLE CAUSES:

1. Low oil level
2. Low oil pressure

SLIPPING—2-3 STAGE

(CAN BE REPORTED AS 1, 2-4 ONLY)

POSSIBLE CAUSES:

1. T.V. Linkage
2. Low Oil Pressure
3. Control Valve Assembly
4. Compensator Body Assembly
5. Accumulator
6. 2-3 Oil Passages
7. Front Clutch

SLIPPING—3-4

POSSIBLE CAUSES:

1. Control Valve Assembly
2. Coupling
3. Linkage Adjustment

NO ENGINE BRAKING IN "S" OR LOW RANGE

POSSIBLE CAUSES:

1. Overrun Servo
2. Overrun Band

NO PART THROTTLE OR DETENT DOWNSHIFTS

POSSIBLE CAUSES:

1. T.V. Linkage
2. Accelerator Travel
3. Control Valve Assembly
4. Governor

SELECTOR LEVER WILL NOT GO INTO REVERSE

POSSIBLE CAUSES:

1. Manual Linkage
2. Reverse Blocker Valve
3. Governor

SELECTOR LEVER WILL NOT GO INTO PARK

POSSIBLE CAUSES:

1. Parking Linkage
2. Manual Linkage

FORWARD DRIVE IN REVERSE

POSSIBLE CAUSES:

1. Manual Linkage
2. Neutral Clutch

REVERSE DRIVE IN NEUTRAL

POSSIBLE CAUSE:

1. Reverse Cone Clutch

HIGH UPSHIFTS

POSSIBLE CAUSES:

1. Upper T.V. Rod Too Long or Lower T.V. Rod Too Short.
2. T.V. Lever
3. T.V. Pressure
4. Control Valve Assembly
5. Governor
6. Governor Oil Passages

UPSHIFTS LOW

POSSIBLE CAUSES:

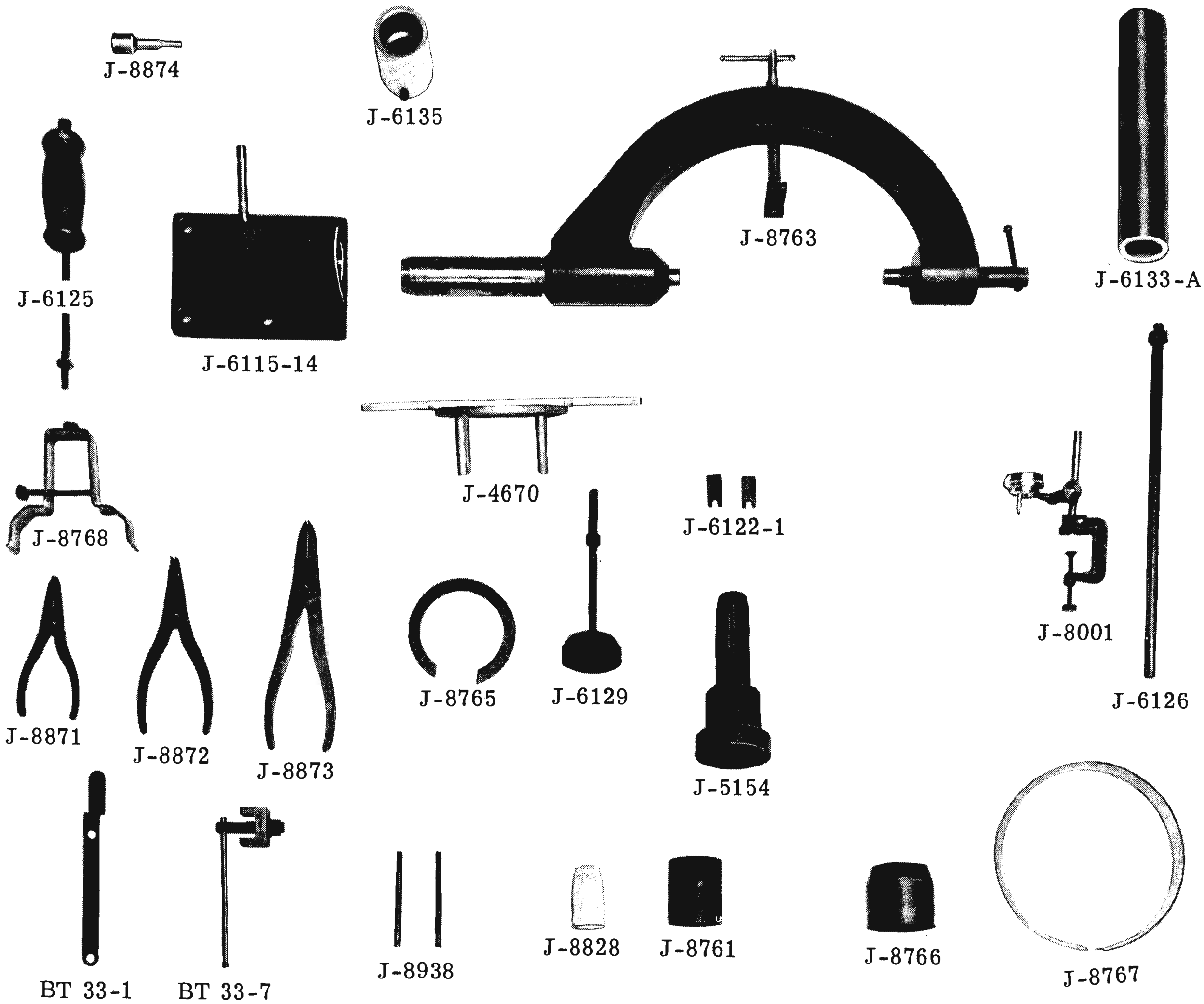
1. Upper T.V. Rod Too Short or Lower T.V. Rod Too Long.
2. Control Valve Assembly
3. Governor
4. T.V. Lever
5. Governor Passages
6. T.V. Pressure

NOISE DIAGNOSIS

CONDITION	CAUSE
1. All Ranges - More pronounced with Hot oil - 1st and 2nd stage approximately 1000 to 1200 RPM (Moan)	1. Oil Pump
2. 3-2, 1 - 3-4 stage (Whine)	2. Oil Pump
3. 3rd & Reverse Gear Noise Low RPM (Only)	3. Front Unit Gear Set
4. 1st-2nd-3rd, Reverse & Neutral Gear Noise - High RPM Predominant noise in 3rd during 3-4 stage.	4. Rear Unit Gear Set
5. 3-4 stage noise with Hot Oil and Low RPM	5. (Coupling Fill) Pump Whine
6. Noise In All Except 3rd	6. Coupling
7. Buzzing Noise	7. T.V. Valves, Governor or Pressure Regulator Valve
8. Rattle - Light Load - 4th	8. Damper

TORQUE SPECIFICATIONS

LOCATION	TORQUE (Ft. Lbs.)
Valve Bodies	
Channel Plate to 3-4 Boost Body	2.5 to 3.5
Channel Plate to Valve Body	2.5 to 3.5
Valve Body to Channel Plate	2.5 to 3.5
3-4 Boost Body to Valve Body	2.5 to 3.5
Compensator Body to Servo & Accumulator Cover	2.5 to 3.5
Valve Body to Case	6 to 8
Compensator Valve Body to Case	6 to 8
Rear Bearing Retainer	
Rear Bearing Retainer Cover to Retainer	6 to 8
Rear Bearing Retainer to Bushing Sleeve	12 to 15
Rear Bearing Retainer to Case	20 to 25
Pump and Case Cover	
Oil Cooler Control Valve to Case Cover	2.5 to 3.5
Pump Cover to Pump Body	6 to 8
Case Cover to Case (5/16-18)	15 to 18
Case Cover to Case (7/16-14)	30 to 35
Case Cover to Pump	15 to 18
Case Cover to Pipe	10 to 12
Plate to Case Cover	18 to 20
Torus Feed Limit Valve Plug	15 to 20
Pressure Regulator Plug	15 to 20
Front and Rear Units	
Front Internal Gear to Clutch Housing	22 to 27
Rear Planet Shaft to Carrier	19 to 23
(Governor) Output Shaft to Carrier	19 to 23
Torus Exhaust Valve Cover to Torus Cover	24 to 29
Torus Cover to Drive Torus	17 to 20
Oil Pan to Case	12 to 15
Servo and Accumulator Cover to Case	6 to 8
Case Cover to Engine and Lower Flywheel Housing	50 to 55



BT 33-1	Transmission T.V. Lever Gauge
BT 33-7	T.V. Lever Bending Tool
J-4670	Clutch Spring Compressor
J-5154	Rear Oil Seal Installer
J-6115-14	Holding Fixture Bench Adapter
J-6122-01	Coupling Valve Retainers
J-6125	Slide Hammers
J-6126	Dial Indicator Support
J-6129	Clutch Spring Compressor
J-6133-A	Rear Bearing and Speedometer Gear Installing Tool
J-6135	Neutral Clutch Retainer (Output Shaft End Play Adapter)
J-8001	Dial Indicator Set
J-8761	Oil Pump Seal Installer (Transmission)
J-8763	Holding Fixture
J-8765	Reverse & Neutral Clutch Retainer Adapter
J-8766	Reverse & Neutral Clutch Inner Seal Protector
J-8767	Reverse Clutch Outer Seal Protector
J-8768	Reverse Cone Puller
J-8828	Oil Pump Seal Protector
J-8871	No. 22-90 Degree Truarc Plier External
J-8872	No. 24-90 Degree Truarc Plier External
J-8873	No. 25-90 Degree Truarc Plier Internal
J-8874	F-30 Clutch Head 3/8 Drive Bit
J-8938	(J-3387-2) Internal Gear & Clutch Housing Assembly (Holding Studs)

Fig. 3-134 Hydra-Matic Tools

HYDRA-MATIC

(4-S)

(F-85)

CONTENTS OF SECTION 3

MAINTENANCE RECOMMENDATIONS

The fluid level in the transmission should be checked every oil change interval and the fluid should be changed every 24,000 miles.

Check with the selector lever in the "Park" position, the engine running and on a level surface.

IT IS VERY IMPORTANT THAT THE FLUID LEVEL BE AT FULL AT ALL TIMES.

Approximately 4 quarts are required to fill the transmission after it has been drained, or 5 if the pan has been removed. Approximately 7 quarts are required after a complete overhaul.

When changing the oil, add 4 quarts, start the engine, and add oil to bring fluid level to the "Full" mark.

Only fluid with the following identification on the container should be used: brand name, including the words "- . . . . Fluid Type A, plus the mark "AQ-ATF", number and a letter "A" embossed on the top of the can as follows "AQ-ATF" -- number "A".

There is a band adjustment required every 24,000 miles. Refer to "Adjustments" for correct procedure. It may be necessary to adjust the shift linkage should erratic shifting occur.

TOWING PRECAUTIONS

Complete towing instructions are covered in the General Information Section.

PUSHING CAR TO START ENGINE

As a result of the Transmission design, the engine cannot be started by pushing the car.

TRANSMISSION OPERATION

The transmission offers three selective drive ranges, "D", "S" and "L". In "D" range, the transmission starts in first and shifts automatically to second, third, and fourth.

With the selector lever in "S" range, the transmission starts in first, shifts to second and third and remains in third until approximately 60-65 M.P.H., regardless of throttle opening. This provides additional acceleration for long hills or traffic driving as well as engine braking power when descending long grades. When car speed increases above approximately 60-65 M.P.H., the transmission automatically shifts to fourth. If car speed decreases to approximately 60-65 M.P.H., the transmission will downshift to third.

With the selector lever in "L" range, the transmission will remain in first regardless of throttle opening or car speed. "L" range is designed for engine breaking when descending steep grades. It may also be used to hold the car in first for maximum pulling power.

PART THROTTLE DOWNSHIFT FOURTH TO THIRD

A part throttle downshift can be made any time the transmission is in fourth and the car speed is

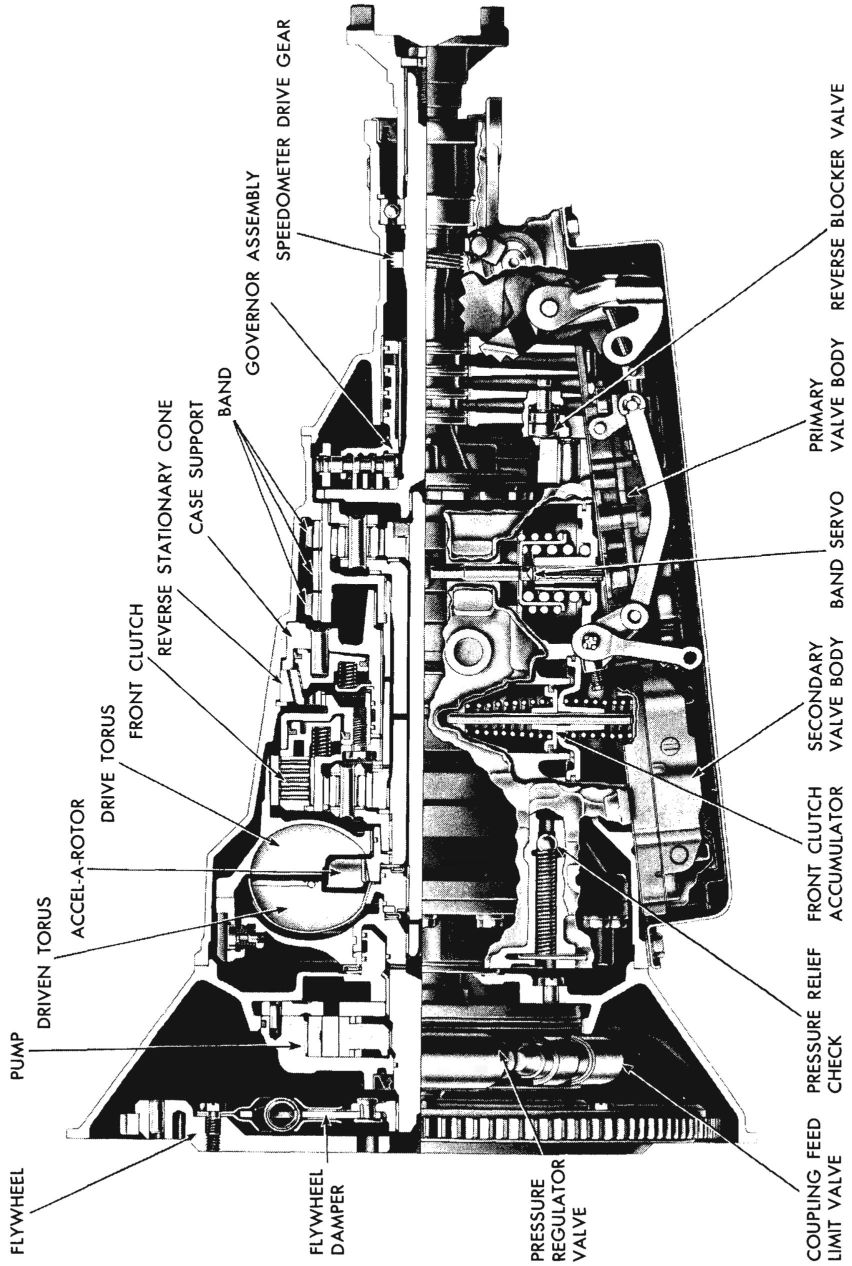


Fig. 3-201 Hydra-Matic (4-S)

below approximately 38 M.P.H. Since this downshift will occur at part throttle opening, the advantage of third power is obtained without a wide open throttle. This feature is desirable in traffic conditions where a wide open throttle would be unnecessary.

FORCED DOWNSHIFTS (Detent)

In "D" range, the transmission can be downshifted fourth to third and third to second within set speed ranges.

In "S" range, a third to second forced downshift can be made within a set speed range. A warning "feel" on the accelerator pedal makes it possible for the driver to obtain full throttle performance with or without downshift, as desired.

REVERSE

Reverse is accomplished through use of a friction clutch applied by oil pressure and designed for ease in "rocking" the car. A reverse blocker piston prevents movement of the selector lever to reverse position above 13 M.P.H.

PARKING

With the selector lever in the "Park" (P) position, a parking pawl engages with lugs on the reverse planet carrier and locks the output shaft to the transmission case. A detent in the steering column prevents accidental movement of the selector lever to the "Park" (P) position.

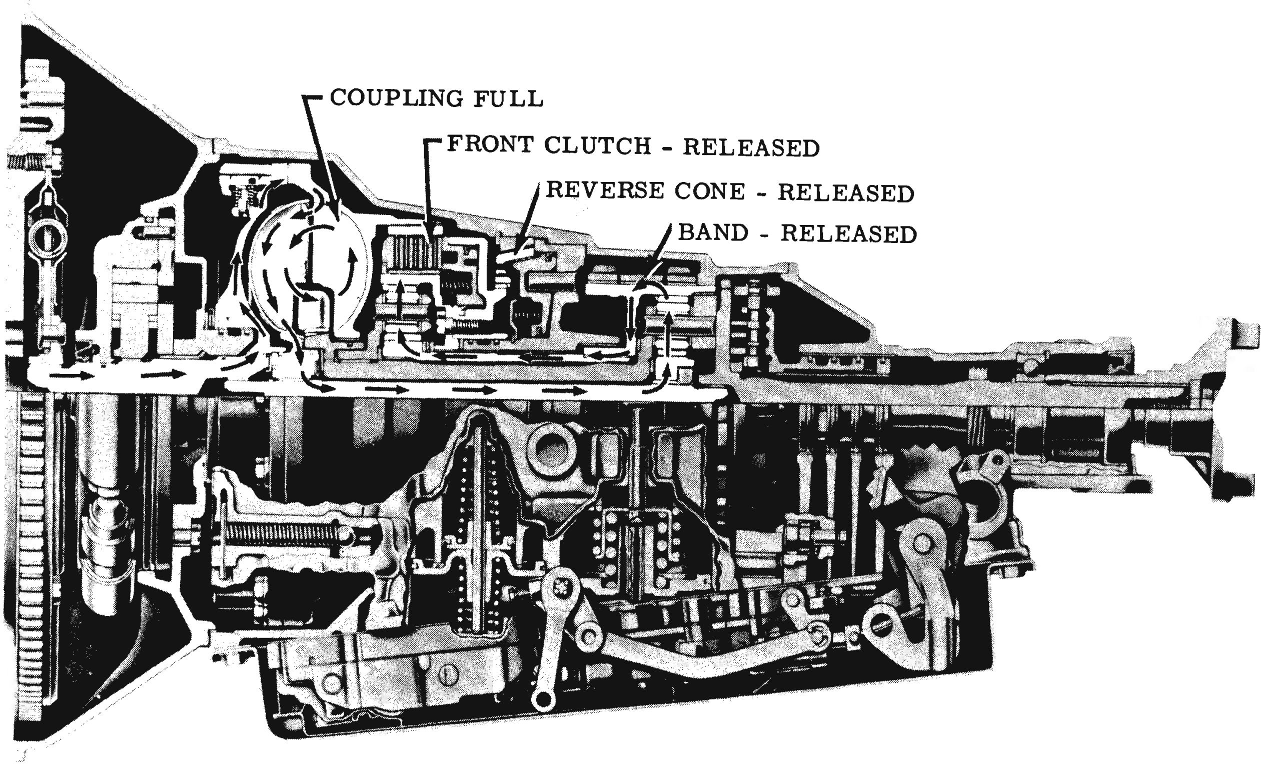


Fig. 3-202 Neutral-Engine Running

POWER FLOW (ACCEL-A-ROTOR DESIGN)

NEUTRAL—ENGINE RUNNING **FRONT CLUTCH—RELEASED** **REVERSE CLUTCH—RELEASED**

FLUID COUPLING—FULL **BAND—RELEASED** **ACCEL-A-ROTOR—INEFFECTIVE**

Power from the engine (in a clockwise direction) is mechanically transmitted through the flywheel damper assembly and torus cover to the drive torus member. The drive member then directs the oil against the driven member causing it to turn the main shaft and rear unit sun gear clockwise.

In neutral the band is released and allows the rear unit internal gear to turn. Therefore, as the rear unit sun gear turns clockwise, the rear unit pinions turn counterclockwise driving the gear internal gear counterclockwise.

The front unit sun gear is mechanically connected to the rear internal gear and is also turning counterclockwise, this causes the front unit pinions to rotate clockwise on their pins. The clockwise motion of the front unit pinions then drives the front internal gear clockwise.

Because both the rear unit internal gear and the front unit internal gear are spinning freely, there is no transfer of torque from the front or rear units to the carriers or output shaft.

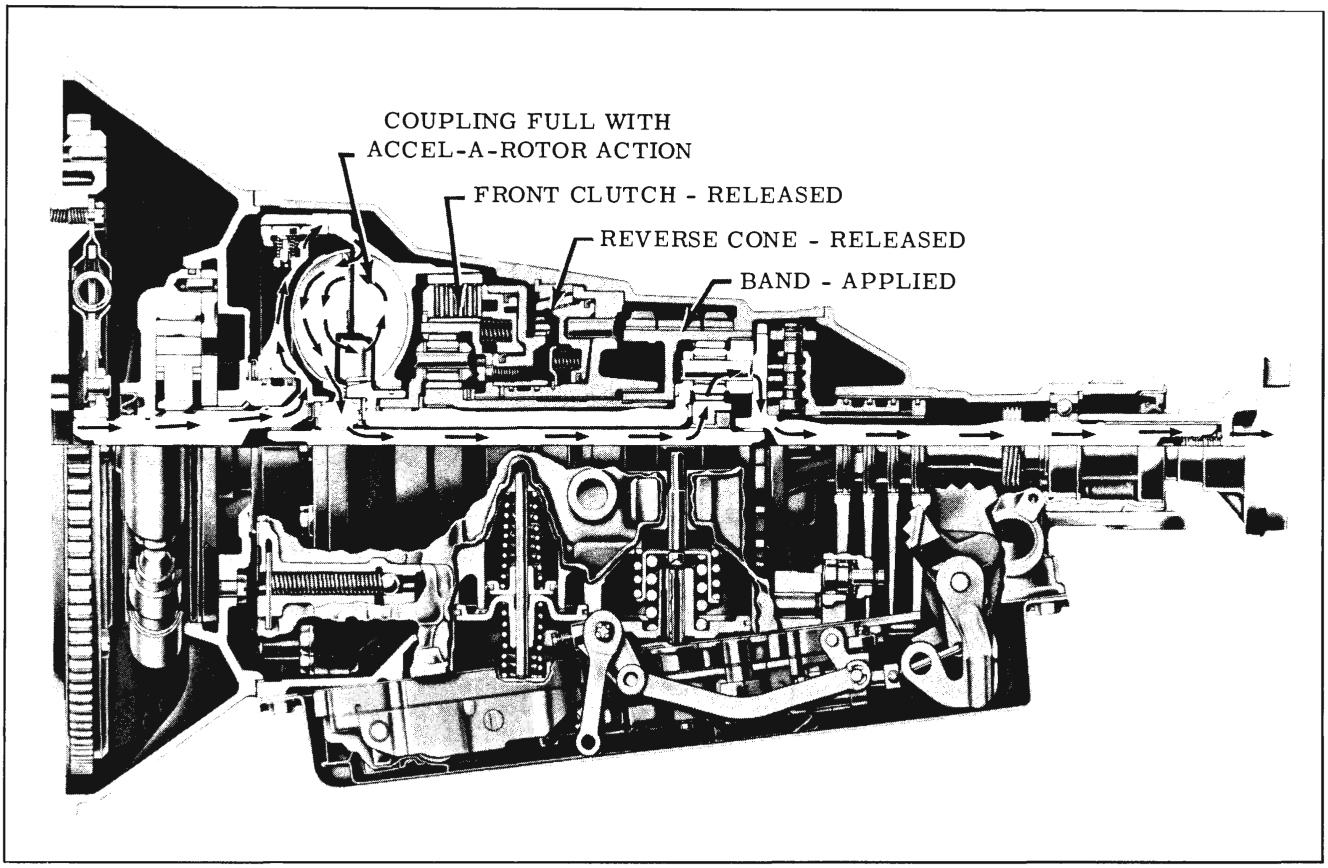


Fig. 3-203 First Stage

FIRST RATIO: 3.64:1

FLUID COUPLING—FULL

BAND—APPLIED

FRONT CLUTCH—RELEASED

REVERSE CLUTCH—RELEASED

ACCEL-A-ROTOR—EFFECTIVE

Power from the engine is mechanically transmitted through the flywheel, damper assembly and torus cover to the drive torus member. Engine torque is then hydraulically transmitted through oil to the driven torus member. Oil from the driven torus member is then directed against the accel-a-rotor which redirects the force of the oil back to the drive member in such a way as to assist in turning the drive member. Engine torque through the coupling is then multiplied and applied to the mainshaft and rear unit sun gear.

The band is applied locking the rear unit internal gear stationary. Coupling torque clockwise through the rear sun gear then attempts to drive the pinions and internal gear counterclockwise, however, because the band holds the internal gear stationary, the output shaft through the pinions is compelled to rotate clockwise within the internal gear at a reduced speed and with increased torque.

As the rear carrier and output shaft rotate clockwise at reduced speed, the front carrier which is mechanically connected to the rear carrier, also rotates clockwise at a reduced speed. Because the band is holding the front unit sun gear stationary, the carrier and pinions rotate the front unit internal gear clockwise at approximately one-half engine speed.

Because the front clutch is released, the reduction in first is due to the rear unit gear reduction times the coupling torque multiplication, less the .3 engine torque acting on the output shaft through the accel-a-rotor.

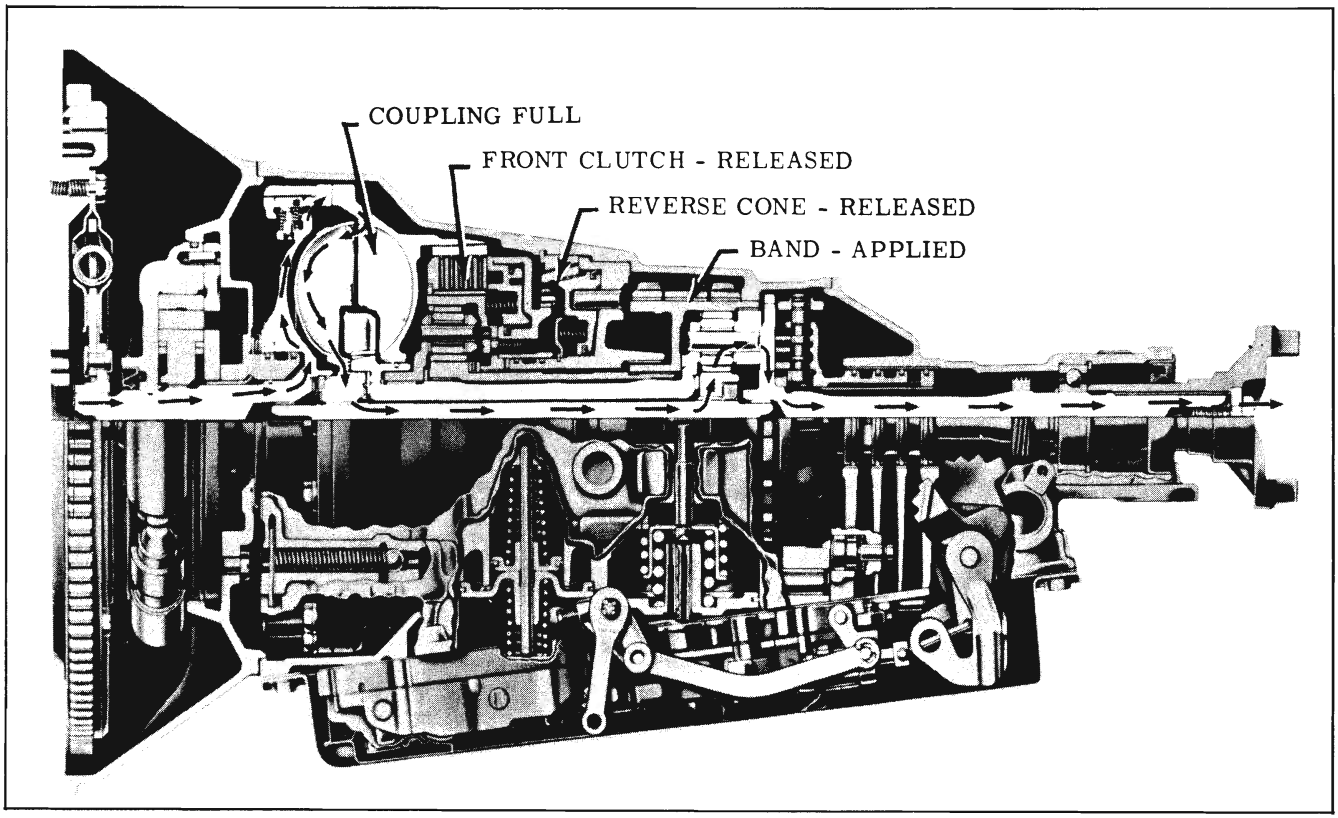


Fig. 3-204 Second Stage

SECOND **RATIO: 3.03:1**

FLUID COUPLING—FULL

BAND—RELEASED

FRONT CLUTCH—RELEASED

REVERSE CLUTCH—RELEASED

ACCEL-A-ROTOR—INEFFECTIVE

Power from the engine is mechanically transmitted through the flywheel, damper assembly and torus cover to the drive torus member. Engine torque is then hydraulically transmitted through oil to the driven torus member. Engine torque through the coupling is then applied to the mainshaft and rear unit sun gear.

The band is applied locking the rear unit internal gear stationary. Coupling torque clockwise through the rear sun gear then attempts to drive the pinions and internal gear counterclockwise, however, because the band holds the internal gear stationary, the output shaft through the pinions is compelled to rotate clockwise within the internal gear at a reduced speed and with increased torque.

As the rear carrier and output shaft rotate clockwise at reduced speed, the front carrier which is mechanically connected to the rear carrier, also rotates clockwise at a reduced speed. Because the band is holding the front unit sun gear stationary, the carrier and pinions rotate the front unit internal gear clockwise at approximately one-half engine speed.

Reduction in second is due to the rear unit gear ratio.

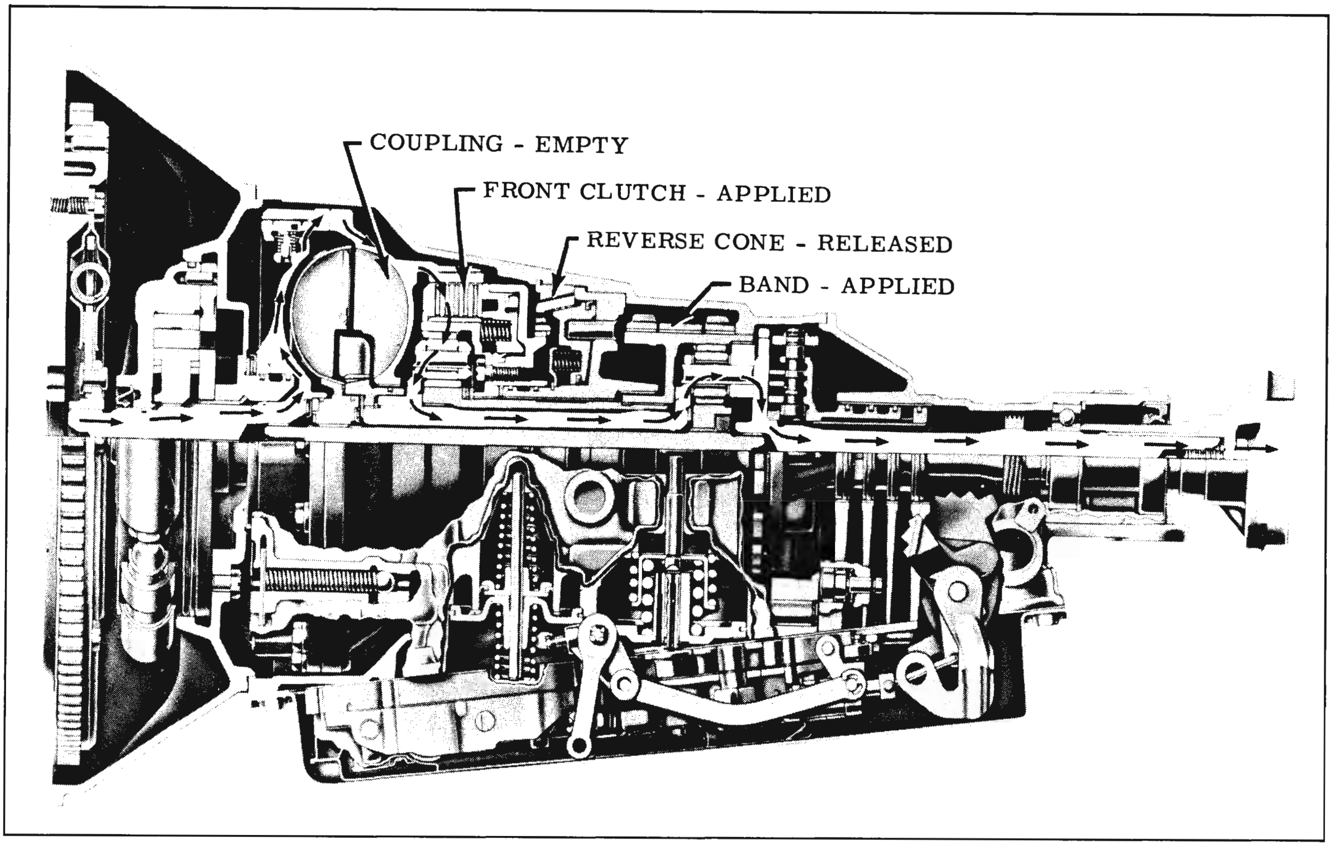


Fig. 3-205 Third Stage

THIRD RATIO: 1.57:1

FLUID COUPLING—EMPTY

BAND—APPLIED

FRONT CLUTCH—APPLIED

REVERSE CLUTCH—RELEASED

ACCEL-A-ROTOR—INEFFECTIVE

Power from the engine is mechanically transmitted through the flywheel, damper assembly and torus cover to the drive torus member. The front clutch is applied and the coupling is empty so engine torque is mechanically applied to the front unit internal gear.

The front unit sun gear assembly is splined to the rear unit internal gear and is prevented from turning counterclockwise when the band is applied. Engine torque at the front internal gear is then applied to the pinions, and because the sun gear cannot rotate counterclockwise the planet pinions and carrier are compelled to revolve clockwise around the sun gear in reduction. The front carrier is splined to the rear unit carrier and shaft assembly which in turn is bolted directly to the output shaft.

As the output shaft and rear unit carrier turns clockwise in reduction, the pinions will drive the rear unit sun gear and driven torus in a clockwise direction faster than engine speed. Because the coupling is empty, no power is transmitted and all torque multiplication in third is due to the front unit gear ratio.

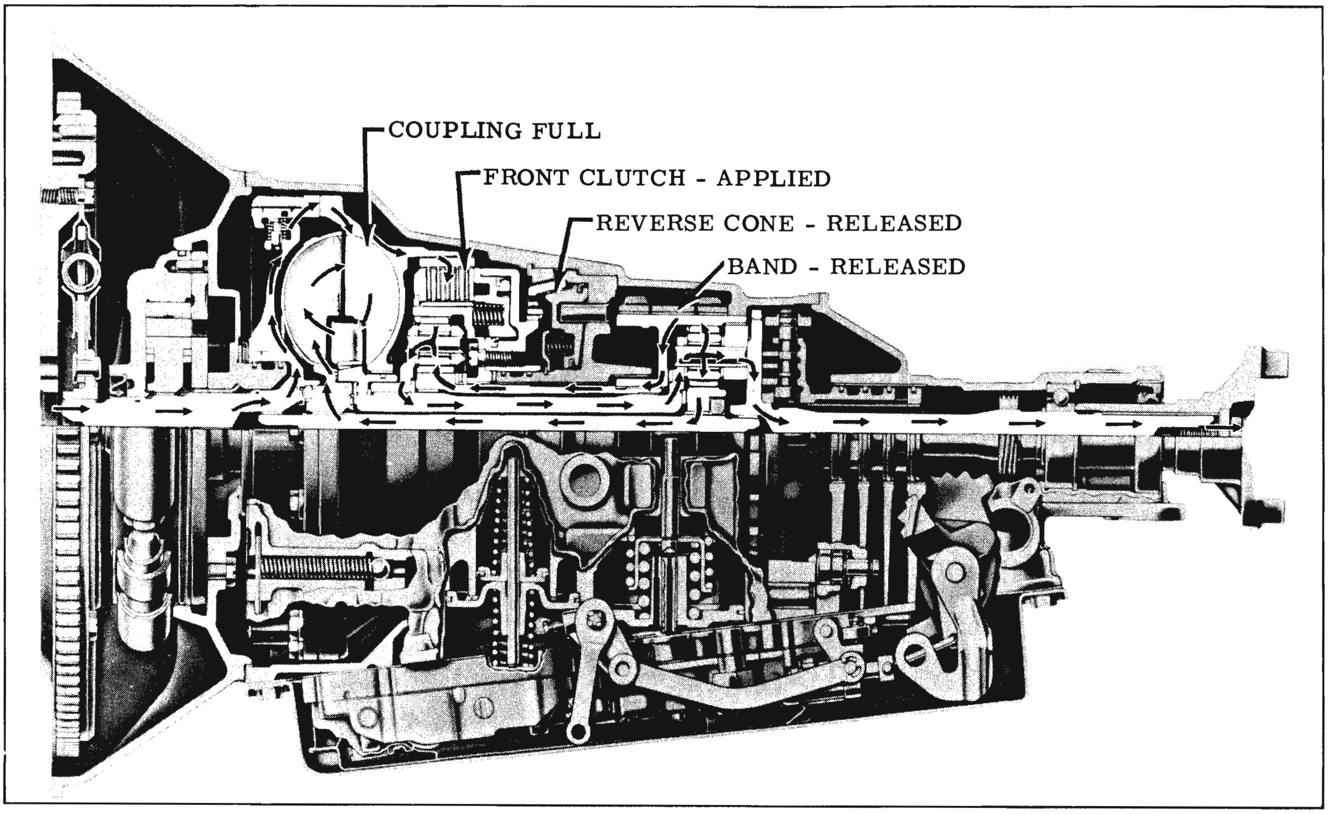


Fig. 3-206 Fourth Stage

FOURTH RATIO: 1:1

FLUID COUPLING—FULL

BAND—RELEASED

FRONT CLUTCH—APPLIED

REVERSE CLUTCH—RELEASED

ACCEL-A-ROTOR—INEFFECTIVE

Power from the engine through the flywheel, damper assembly and torus cover is applied through the front clutch to the front unit internal gear. The front internal gear then, through the pinions, tends to turn the front sun gear counterclockwise. This would cause the front carrier to run clockwise in reduction. The rear carrier, then, must also attempt to revolve clockwise in reduction. With the rear carrier rotating clockwise in reduction, and the rear internal gear tending to turn counterclockwise, the rear unit pinions attempt to rotate counterclockwise on their pins, thus driving the rear unit sun gear and driven torus clockwise faster than engine speed.

However, because the coupling is filled, the coupling driven member and rear unit sun gear cannot revolve faster than the drive torus which turns at engine speed. Therefore, the rear sun gear speed is slowed down to approximately engine speed. In so doing, the rear unit pinions are slowed down in their rotation on the pinion pins. The carrier and pinions then change the direction of load against the internal gear causing it to revolve clockwise with the carrier and sun gear at the same speed. Because the output shaft and carriers are connected to the accel-a-rotor in the coupling, the accel-a-rotor is also turning the same speed as the drive and driven member so that it has no effect in multiplying torque in the coupling.

Both carriers and the output shaft are common, the front sun gear and rear internal gear are common, and the front internal gear and rear unit sun gear are turning at approximately the same speed, thus the entire train must revolve as one common unit in direct drive.

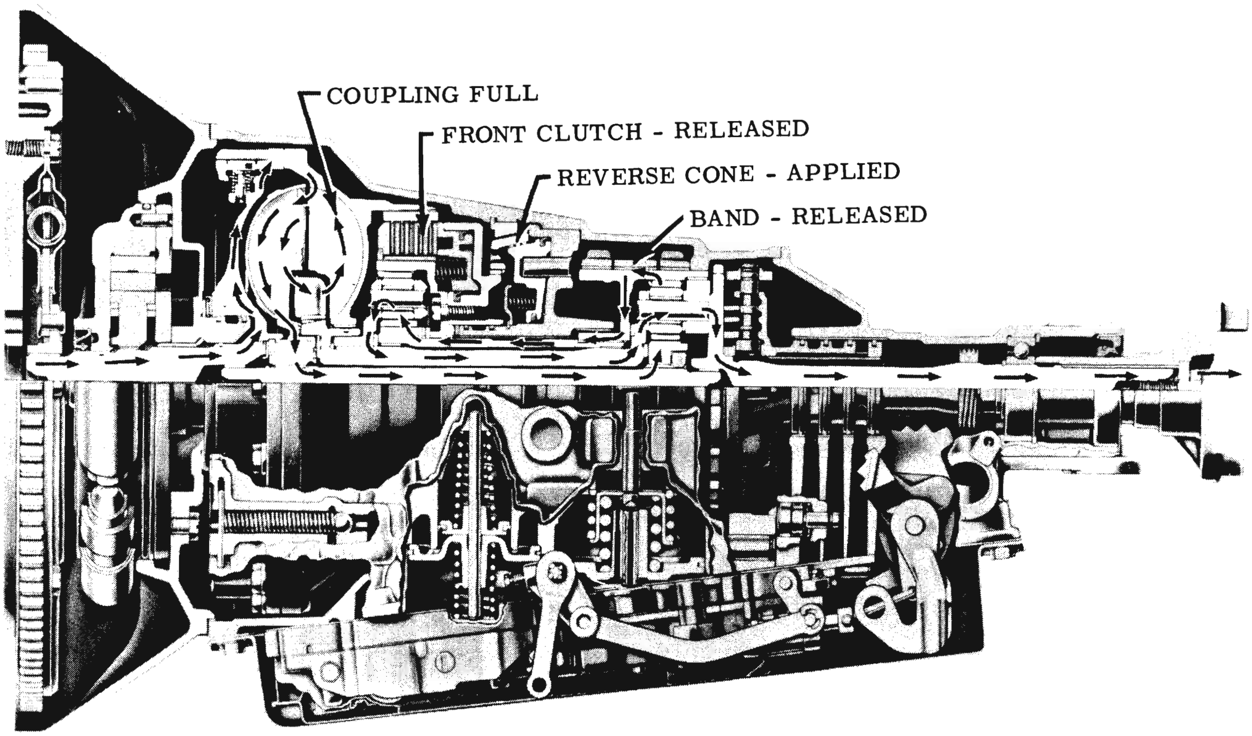


Fig. 3-207 Reverse

REVERSE **RATIO: 3.57:1**

FLUID COUPLING—FULL

BAND—RELEASED

FRONT CLUTCH—RELEASED

REVERSE CLUTCH—APPLIED

ACCEL-A-ROTOR—EFFECTIVE

Power from the engine is mechanically transmitted through the flywheel, damper assembly and torus cover to the drive torus member. Engine torque is then hydraulically transmitted through oil to the driven torus member. Oil from the driven torus member is then directed against the accel-a-rotor which re-directs the force of the oil back to the drive member in such a way as to assist in turning the drive member. Engine torque through the coupling is then multiplied and applied to the mainshaft and rear unit sun gear.

The rear unit sun gear then drives the rear unit pinions as idlers which in turn drive the rear unit internal gear in a counterclockwise direction.

Since the rear unit internal gear is turning counterclockwise, the front unit sun gear is turning counterclockwise. The reverse cone is holding the front unit internal gear stationary so that the front unit pinions and carriers are compelled to walk around the front internal gear in counterclockwise direction in reduction. The output shaft is common with the front and rear carrier so the output shaft is turning counterclockwise or in reverse at a reduction.

The effect of the force of the oil in the coupling is such that the accel-a-rotor is imparting an additional .3 times engine torque to the carrier and output shaft in the reverse direction.

The total reduction in reverse is due to the 1.3 coupling torque ratio times the 2.51 gear ratio plus the .3 engine torque action on the accel-a-rotor and output shaft in the reverse direction.

VALVES AND THEIR FUNCTION

PRESSURE REGULATOR VALVE

Controls line pressure by regulating the output of the pump.

This valve is constructed with two areas where pressures can be applied to create forces which either add to or subtract from the pressure regulator spring force and thus either boost or drop the line pressure.

THROTTLE VALVE

A regulator valve which generates a pressure proportional to carburetor opening.

This valve senses carburetor opening through the throttle valve spring and T.V. plunger (band apply valve) which is operated mechanically by the throttle linkage.

The T.V. pressure increases 5 p.s.i. when the oil temperature reaches approximately 75°F. This is accomplished by a bimetal thermostatic element which contacts the throttle valve at temperatures less than 75°F. with a force that opposes the force of the regulator spring.

The T.V. plunger also functions as a band apply valve which provides an auxiliary band feed when the throttle is opened.

GOVERNOR

The governor contains two valves of different weight which rotate with the output shaft and thus generate two pressures proportional to the vehicle speed.

G-1 pressure senses the low speeds and G-2 pressure the higher speeds.

COMPENSATOR VALVES

The compensator valves generate a pressure that varies with T.V. pressure in a manner somewhat proportional to an engine torque curve.

MANUAL VALVE

The manual valve distributes pressures to place the transmission in either neutral, drive range, super range, lo range, or reverse. It is controlled mechanically through a linkage from the selector lever.

2-3 SHIFT VALVE

The 2-3 shift valve initiates the 2-3 and 3-2 shifts by sensing a balance between T.V. and G-1 governor pressures.

3-4 SHIFT VALVE

The 3-4 shift valve initiates the 3-4 and 4-3 shifts by sensing a balance between T.V. and both G-1 and G-2 governor pressures.

COUPLING FEED LIMIT VALVE

This valve is located in the pump body and provides a direct feed to the coupling from the pump in first, reverse and third with light throttle. It is controlled by coupling signal pressure but opens only when coupling signal is greater than 90 psi.

COUPLING EXHAUST VALVES

The coupling exhaust valves are located in the torus cover assembly and they seal the coupling exhaust ports whenever coupling signal pressure is directed to close them.

COUPLING TIMING VALVE

The coupling timing valve controls the dump and fill of the coupling.

It is controlled by front clutch pressure on 2-3 shift and delays the dump of the coupling until clutch capacity is sufficient to carry the drive load.

On a 3-4 shift it is controlled by 1st, 2nd and 4th pressure and shifts immediately after the 3-4 shift valve.

BAND RELEASE ACCUMULATOR VALVE

The band release accumulator is a safety device designed to release the band and prevent a locked transmission in the event the coupling timing valve should stick and not move during a 2-3 shift.

In the interval after the shift of the 2-3 valve and before the shift of the coupling timing valve, coupling pressure which is channeled through both the 2-3 shift and coupling timing valves starts to feed band release. If the coupling timing valve functions, it dumps the coupling and exhausts band release before the band release accumulator completes its stroke, and thus the band remains on. However, should the coupling timing valve stick, the band release accumulator valve would complete its stroke and allow coupling pressure to build up and release the band.

PRESSURE BOOST VALVE

The pressure boost valve controls the flow to the line boost area of the pressure regulator valve and to the pressure drop valve. It is shifted by front clutch pressure and is timed to move after the clutch has assumed the drive.

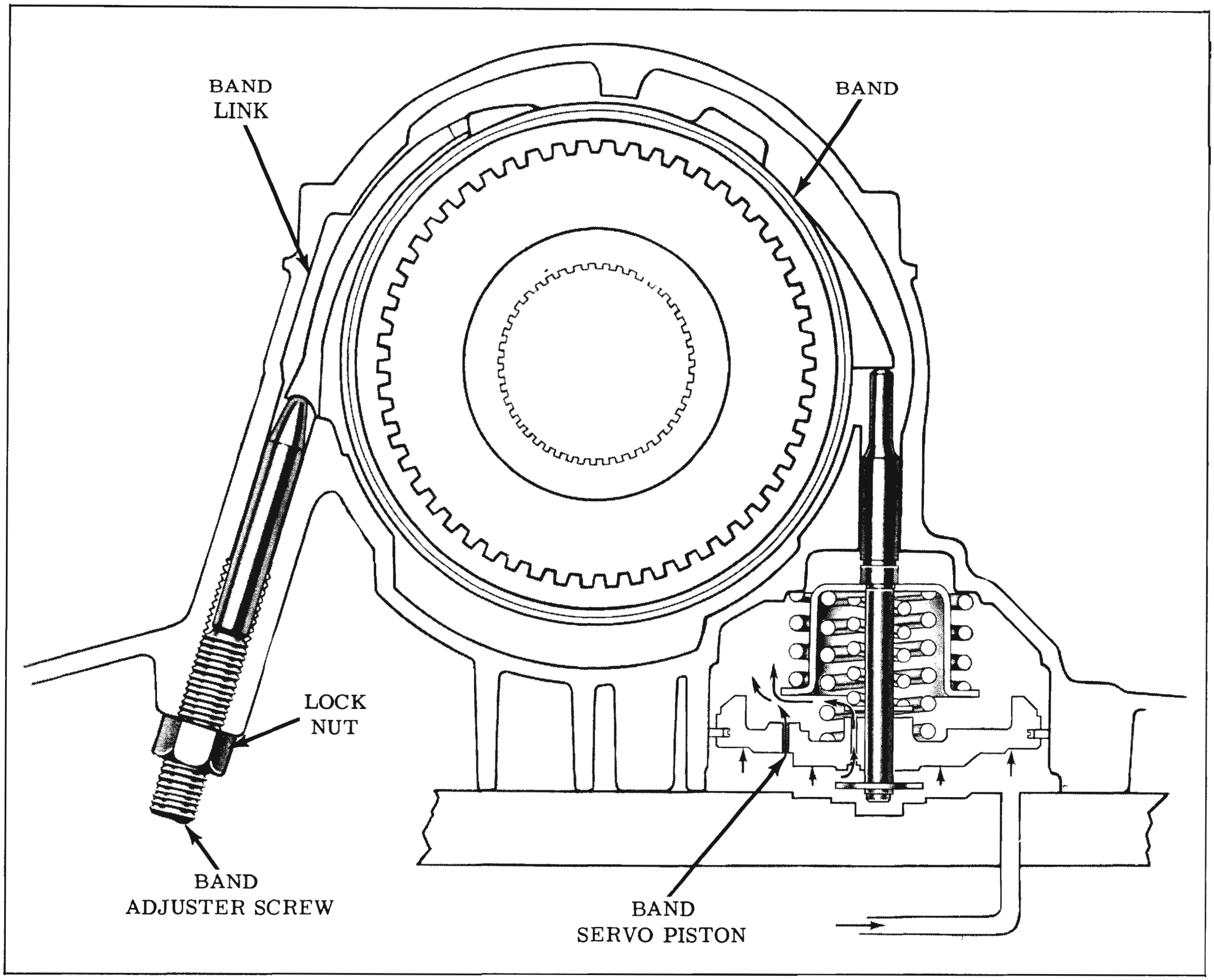


Fig. 3-208 Band Servo

PRESSURE DROP VALVE

The pressure drop valve controls the flow to the line drop area of the pressure regulator valve. It generates a varying pressure inversely proportional to T.V. pressure which results in a modulated line pressure.

LOW THROTTLE EXHAUST VALVE

The low throttle exhaust valve is a valve which senses drive conditions relative to overrun by shifting at 15 psi T.V. pressure. It provides an immediate band release on overrun 3-4 shifts and a rapid clutch exhaust on overrun 3-2 shifts.

3-2 DOWNSHIFT VALVE

The 3-2 downshift valve regulates the exhaust of the front clutch on throttle 3-2 downshifts. It is designed to allow the clutch to slip momentarily until the coupling is full enough to assume the drive without excessive engine flare.

FRONT CLUTCH EXHAUST VALVE

The front clutch exhaust valve controls the duration of front clutch slipping during a throttle 3-2 downshift. It provides a wide open clutch exhaust when coupling pressure is sufficient.

DETENT VALVE

The detent valve initiates the part throttle 4-3 and the detent 4-3 and 3-2 shifts. It is operated mechanically by the T.V. linkage.

REVERSE BLOCKER VALVE

The reverse blocker valve prevents a shift into reverse at speeds above 13 M.P.H. It is controlled by G-1 pressure and provides a mechanical stop for the manual linkage.

BAND RELEASE VALVE

The band release valve senses a balance between spring pressure and coupling feed and compensator pressure to control the flow of band release pressure in conjunction with coupling pressure.

3-4 BOOST VALVE

The 3-4 boost valve provides a momentary increase in pump pressure to fill the coupling quickly on a light throttle 3-4 upshift.

T.V. PRESSURE

Under some conditions it is desirable to provide for greater acceleration and/or greater pulling power, such as climbing hills, etc. To accomplish this, higher shift speeds are required. This is accomplished by an oil pressure that will oppose the effect of governor pressure in opening the shift valves. This pressure, called T.V., is a regulated pressure and is directly proportional to throttle opening, which is regulated by the driver. Therefore, at the driver's option, the shift speeds can be raised or lowered to insure suitable shift speeds for operation under all driving conditions.

When the accelerator pedal is depressed, linkage connected with the carburetor and the accelerator pedal acts against T.V. plunger, opens the throttle valve and allows main line pressure to become regulated T.V. pressure.

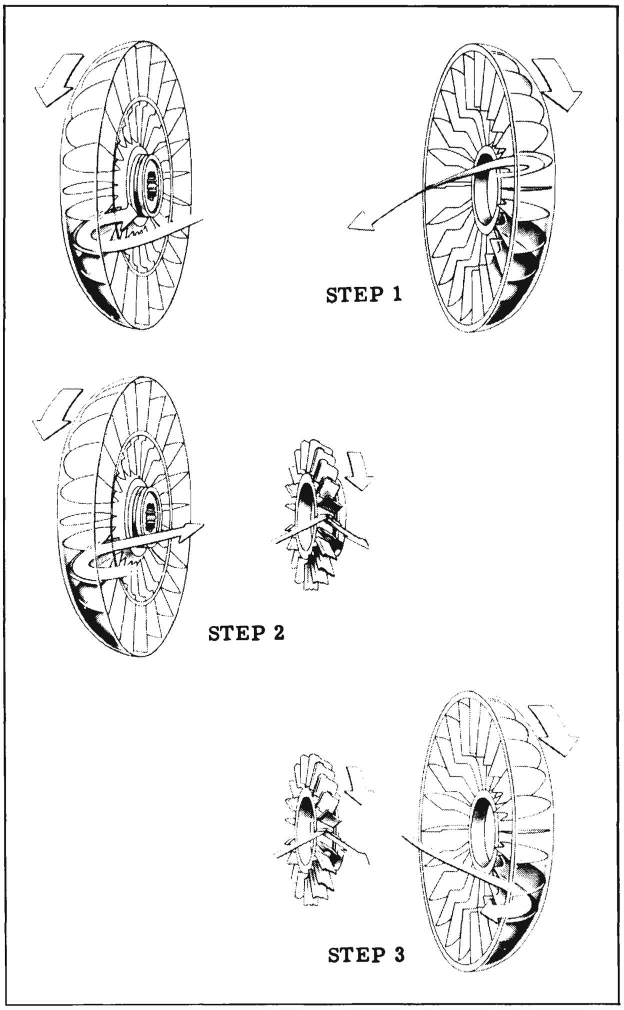


Fig. 3-209 Fluid Coupling and Accel-a-rotor

T.V. pressure is directed to the shift valves to assist spring pressure to hold the shift valve closed against governor pressure. Governor pressure increases with car speed until it can overcome spring and T.V. pressure causing the shift valve to open and the shift to occur.

FLUID COUPLING AND ACCEL-A-ROTOR

The fluid coupling and accel-a-rotor consists of three members located within an oil filled housing. The drive and driven members are shaped like halves of a split torus, having a series of radially arranged vanes within them. The accel-a-rotor consists of a series of curved blades mounted radially on a hub. The accel-a-rotor is located between the drive and driven coupling members.

The drive coupling member is connected to and driven by the engine, the driven coupling member is connected to the main shaft and rear unit sun gear, the accel-a-rotor is connected to the carrier shaft or output shaft.

OPERATION

Step 1. The engine turns the coupling drive member thus causing the drive member to force the oil against the vanes of the driven member, forcing the driven member to turn.

Step 2. After the oil has acted on the driven member the oil is routed to the accel-a-rotor.

Step 3. The oil flow rushing out of the curved blades of the accel-a-rotor is then directed back to the drive member in such a way as to impart an additional driving force to the back side of the drive member vanes. This additional driving force, plus the energy added to the flowing oil from engine power, allows an even greater force of oil to be directed against the vanes of the driven member.

This causes the torque on the driven member to be multiplied.

In first, the fluid coupling and accel-a-rotor provide an increase of 1.3 times engine torque to the rear unit, thus increasing the over-all ratio. In second, the accel-a-rotor phases out allowing the coupling to transmit engine torque.

In third, the coupling is emptied and not used. Drive, through the transmission, is complete mechanical drive.

In fourth, all three members of the fluid coupling are turning at approximately the same speed, therefore, the accel-a-rotor is no longer effective. Because of the over-all transmission design, the coupling is required to carry only 40% of the engine torque.

During reverse operation the coupling and accel-a-rotor are again capable of increasing torque output from the engine by 1.3.

OPERATION OF THE PUMP

The transmission pump is of the variable displacement high capacity type and is engine driven.

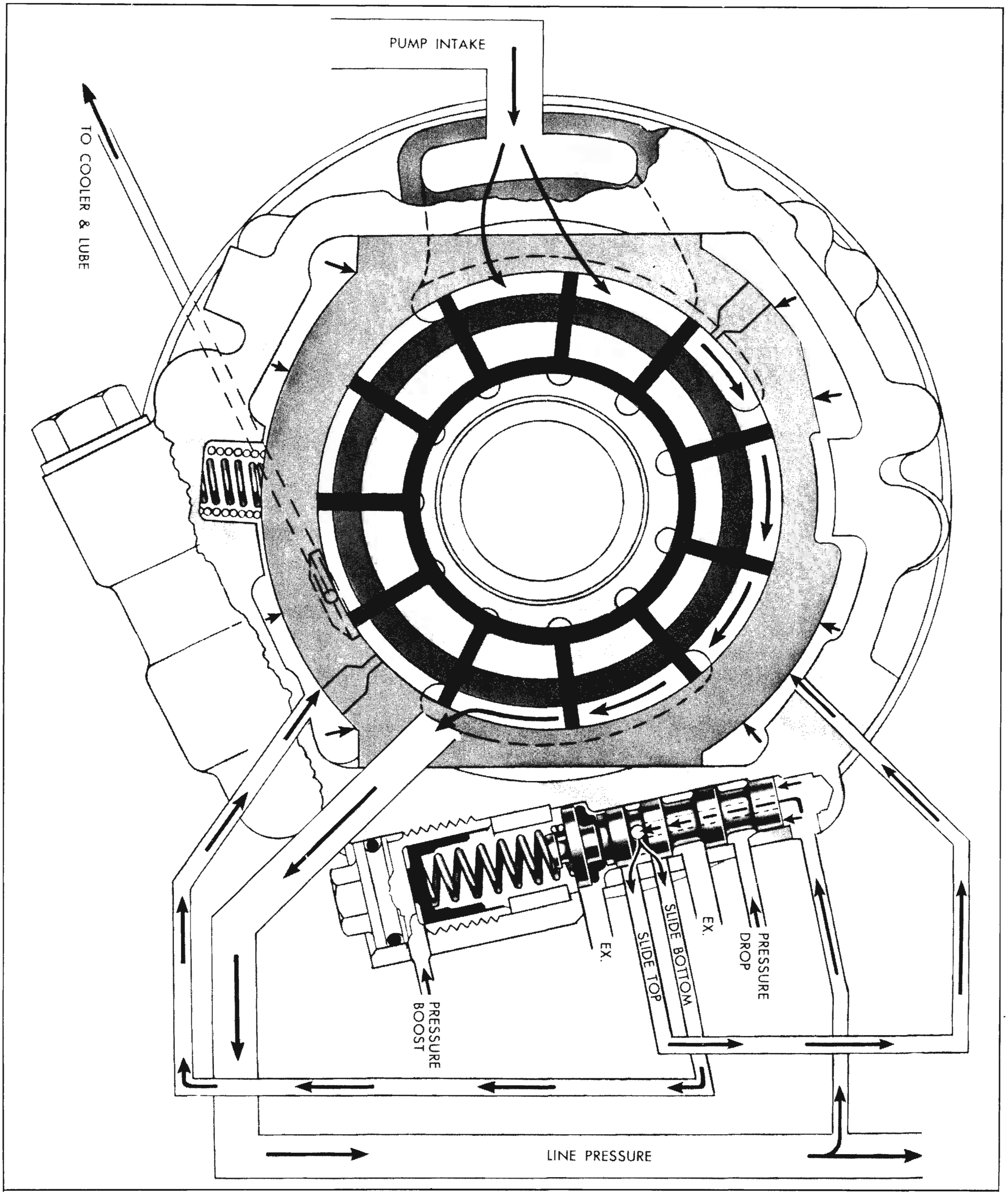


Fig. 3-210 Pump Operation

A variable capacity type pump is one that will vary its output according to the oil flow and pressure requirements of the transmission. The effort required to drive the pump is only great when the demand for oil is great, consequently, large pumping capacity can be obtained at low pump speeds without having large pumping loads at high speeds.

The rotor of the pump is engine driven and carries vanes. Oil trapped between vanes at the suction or intake side is moved to the pressure side in greater quantity than oil from the pressure side is moved to the suction side.

Variable output of the pump is obtained in the following manner.

When the slide is in the up position maximum volume will be delivered. When the slide is in the middle "neutral" position no volume will be delivered.

Two springs are located on the bottom of the slide. The longer spring keeps the slide in the up or prime position so that the moment the engine is started the slide will be in the prime position and full output will be obtained.

The small spring or inner spring acts as a bumper keeping the slide from returning to a full exhaust position if the demand for oil falls quickly.

MAIN LINE PRESSURE

Main line oil pressure from the pump is directed to the end of the pressure regulator valve. The valve will then move against the pressure regulator spring. The pressure regulator spring, having a predetermined value, will then produce a constant pressure. The lands on the pressure regulator valve direct pressure to either the top or bottom of the pump slide. Pressure to the bottom will force the slide into the up or pumping position. Pressure to the top of slide will force the slide downward to the neutral position.

When line pressure drops the pressure regulator spring will move the pressure regulator valve against reducing line pressure, thereby moving the valve so that a feed hole in the valve indexes with a passage to the underside of the slide causing the slide to move upward to the prime position, thereby causing pump output to increase.

Conversely, if there is little or no oil demand from the transmission, pressure will increase and move the pressure regulator valve so that main line oil is directed to the top of the slide moving the slide to the down position reducing output.

Therefore, the pressure regulator valve will produce consistent pressure determined by the pressure regulator spring.

BOOSTED LINE PRESSURE

A higher pressure may be obtained by directing a pressure called line boost pressure behind the pressure boost plug, compressing the pressure regulator spring, which increases the spring load, thus raising pressure.

LOWER VARIABLE LINE PRESSURE

A lower pressure for certain types of operation may be obtained by directing line drop oil to the main line oil side of the pressure regulator valve. This will work against spring pressure sending line pressure to the top of the slide moving it toward the lower output position. This line drop oil will reduce main line pressure as the line drop pressure increases. Also, included in the pump is the coupling limit valve which is used to fill the coupling.

BAND SERVO OPERATION

A hydraulic servo assembly is used to apply and hold the band to the rear unit internal gear.

The band servo is designed to function in three phases to provide for a smooth application of the band during a shift from neutral to drive or fourth to third.

During the first phase of band servo operation, some of the oil which is directed under the piston to apply the servo is allowed to leak or exhaust through the orifice located in the piston. This allows the pressure under the piston to build up slowly while the entire servo piston assembly moves up against the release spring positioning the band on the internal gear.

As the band continues to tighten about the rear internal gear, the piston pin encounters resistance and tends to stop its travel. The servo piston then continues to travel upward on the piston pin against the force of the large accumulator spring and applies a greater force to the piston pin. Finally, as the piston makes contact with the spring retainer, the second orifice becomes sealed off to permit an even faster build up of servo apply pressure. The piston is now in direct contact with the spring retainer and piston pin to apply the full final force of the applied pressure to the band.

FRONT CLUTCH ACCUMULATOR

The front clutch accumulator is a cushioning and timing device which enables the front clutch to apply smoothly under all throttle conditions. Regulation is necessary due to the varying torque loads that the front clutch is subjected to. For example, with light throttle conditions the front clutch will be applied slowly with a minimum of compensator pressure, conversely with full throttle operation the front clutch is applied quickly with greater compensator pressure required.

The accumulator body contains two opposed sets of springs and pistons. One is called the upper accumultor piston and spring, and the other, lower accumulator piston and spring, with each piston acting against spring pressure.

When the front clutch is engaging, front clutch apply oil is also directed to the front clutch accumulator. Front clutch oil compresses the pistons against spring pressure, causing the accumulator to absorb an amount of clutch apply oil. During the initial application of the front clutch piston, a comparatively small quantity of clutch apply oil is diverted to the accumulator. When the clutch piston is stroked to its apply position, the accumulator pistons move against spring pressure and the amount of oil absorbed by the accumulator will increase, thereby, slowing the flow to the front clutch. Since the pistons moving against their springs meet increasing resistance to their motion, the oil pressure applying the front clutch increases gradually to provide a smooth application.

When the pistons reach the end of their strokes, the front clutch pressure rises to main line pressure to insure positive and complete engagement following the shift.

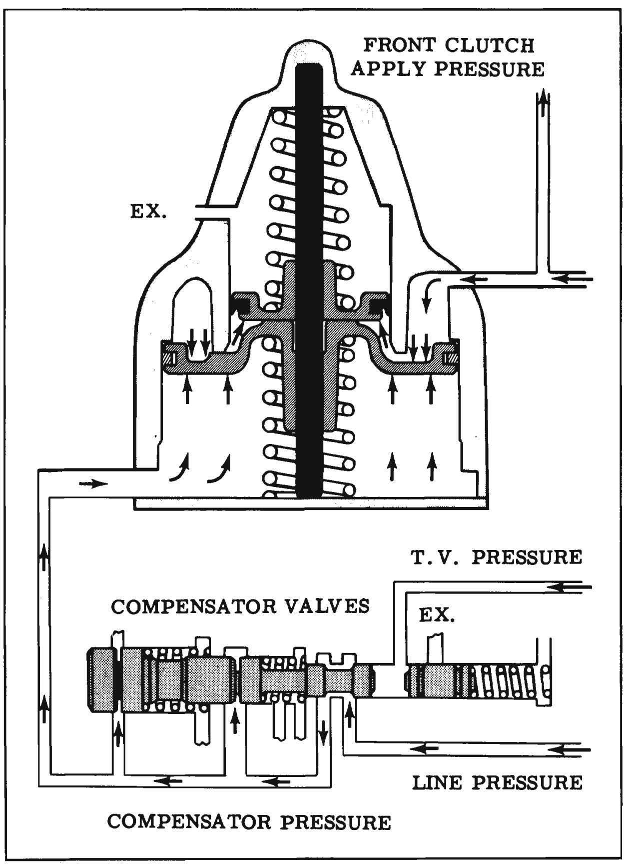


Fig. 3-211 Front Clutch Accumulator

COMPENSATOR

Further control of front clutch pressure as produced by the accumulator is obtained by the primary and secondary compensator valves and springs, also a compensator limit valve and spring. The purpose of these valves and springs is to provide pressure to the accumulator to help the lower accumulator piston spring to resist piston motion, and thus further increase the front clutch pressure during shifting. T.V. pressure, along with spring pressure, acts against the primary compensator valve allowing drive oil to enter the compensator line and fill the accumulator. The compensator limit valve limits the maximum amount of compensator pressure under full and part throttle conditions.

When T.V. pressure is low, the compensator pressure is low, and the secondary compensator valve is held against its stop by the secondary compensator valve spring. When T.V. pressure is high, the secondary compensator valve is pushed against the primary compensator valve by higher compensator pressure. It then moves with the primary compensator valve. When the front clutch oil is fed into the accumulator, compensator oil is forced over to the compensator valves where it pushes open the primary valve and discharges compensator oil to exhaust. The resistance of the compensator valves to permitting compensator oil to be exhausted controls the compensator pressure which helps to control the front clutch pressure during a shift.

GOVERNOR OPERATION

The governor is a centrifugal type, rotating with the transmission output shaft to generate two speed controlled oil pressures which are primarily used in the control valve assembly to initiate the shifts.

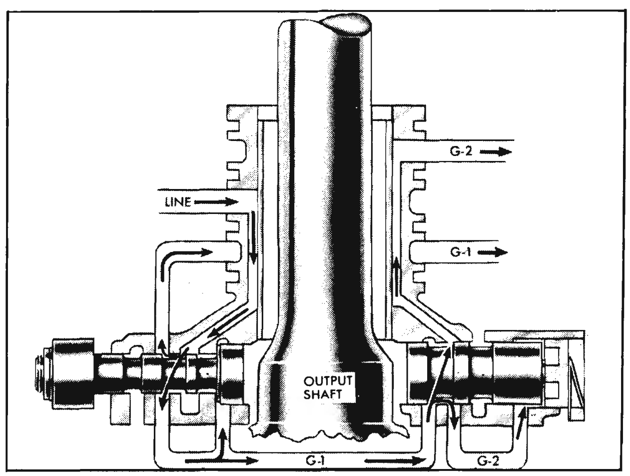


Fig. 3-212 Governor Operation

G-1 PRESSURE

As the governor rotates with the output shaft, centrifugal force acting on the G-1 or primary governor valve tends to throw the valve outward. Main line pressure to the governor is then ported into the G-1 passage where it can act on the large land of the G-1 valve to provide a force in the opposite direction to the centrifugal force. The G-1 valve will then move to close off the incoming line pressure and allow G-1 pressure to exhaust until the force of G-1 pressure acting against the centrifugal force is equal to the centrifugal force. The G-1 valve continues to regulate against centrifugal force so that G-1 pressure is proportional to output shaft speed.

G-2 PRESSURE

The second governor valve is called the G-2 or secondary governor valve. As centrifugal force throws the G-2 valve outward, G-1 pressure is admitted to the G-2 passage. G-2 pressure then acts against the large land of the G-2 valve to oppose the centrifugal force. G-2 pressure then regulates to a value directly proportional to output shaft speed.

G-2 pressure is designed to be more sensitive at the higher car speeds.

OIL CONTROL CIRCUITS

OIL CIRCULATION DESCRIPTION

NEUTRAL—ENGINE RUNNING

COUPLING—FULL

FRONT CLUTCH—OFF

REVERSE CONE—OFF

BAND—OFF

Whenever the engine is running line pressure is always directed to the:

Pressure Regulator Valve
Coupling Feed Limit Valve
Coupling Signal Valve
Pressure Boost Valve
Throttle Valve
Manual Valve
3-4 Governor Valve (2 places)
Pressure Relief Valve

BASIC CONTROL

Line pressure through the coupling signal valve is directed into the coupling signal passage. Signal oil closes the coupling exhaust valves to seal the coupling and opens the coupling feed limit valve to allow line pressure to fill the coupling. Line pressure through the orifice at the 3-4 governor valve provides an additional source for coupling feed.

Line pressure at the manual valve flows into the PNR passage which in turn flows through the 2-3 valve to become 3rd and 4th oil which flows through the coupling timing valve to become band release oil. Band releases oil and the servo spring releases the servo and band to provide neutral.

PRESSURE CONTROL

The pressure relief valve provides for the exhaust of abnormally high pressures (above approximately 230 psi) if the pressure regulator or pump slide should stick.

Line pressure to the throttle valve is regulated to a variable pressure called T.V. pressure. The throttle valve, which regulates T.V. pressure is controlled by the T.V. spring and band apply valve through adjustable linkage from the carburetor throttle. As the throttle is opened, the linkage depresses the band apply valve to increase the force of the T.V. spring, thus causing the throttle valve to regulate T.V. pressure to a higher value. T.V. pressure is designed to vary in proportion to throttle opening and is used throughout the control system to activate or control different valves at various times in relation to throttle opening.

With the manual valve in the neutral position, line pressure is directed into the line drop feed passage to the pressure boost valve to become the source for line drop signal oil in third. Line pressure to the pressure boost valve is directed into the line drop signal passage and line boost passage. Line drop signal oil is then routed to the pressure drop valve. Throttle pressure acting on the pressure drop valve regulates line drop signal to a variable decreasing line drop pressure which is applied against the pressure regulator valve. Throttle pressure acting on the pressure drop valve regulates line drop signal to a variable decreasing line drop pressure which is applied against the pressure regulator valve. Line boost oil is directed against the boost plug in the pressure regulator to compress the spring for higher line pressures.

At light throttle, line drop pressure is maximum, thus causing the greatest drop in line pressure. At full throttle, line drop pressure is regulated to exhaust resulting in high line pressure. Line pressure then is controlled to vary according to throttle opening from 131 to 170 psi.

Line pressure to the governor will become two variable governor pressures; G-1 and G-2. These pressures vary in proportion to output shaft or vehicle speed. G-1 being more sensitive at the lower speeds and G-2 being more sensitive at high vehicle speeds. Governor pressure is used to initiate the 2-3 and 3-4 shifts.

SUMMARY

The coupling is filled and the band is released, thereby causing the transmission to be in Neutral.

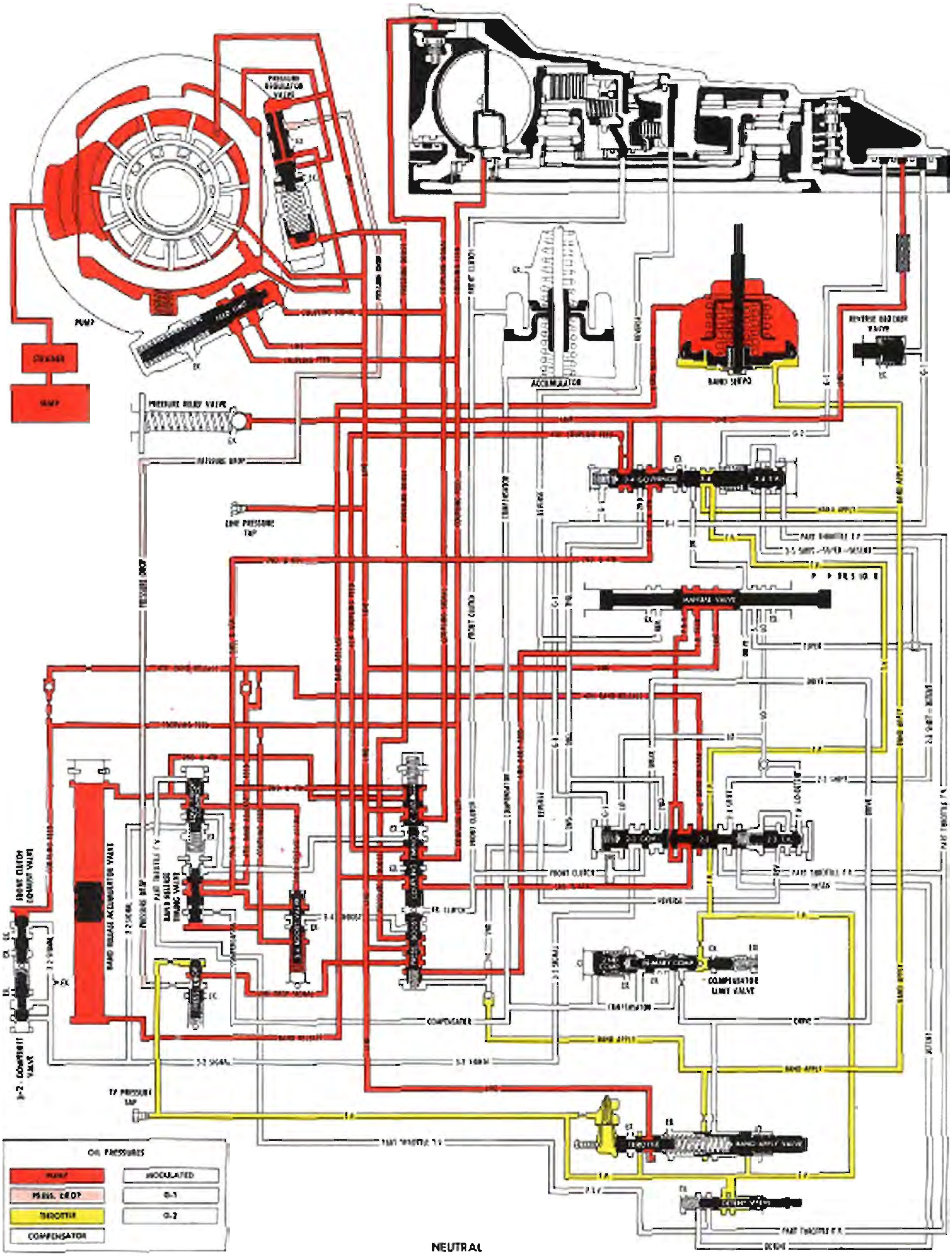


Fig. 3-213 Neutral-Engine Running

DRIVE RANGE—FIRST AND SECOND

COUPLING—FULL

REVERSE CONE—OFF **FRONT CLUTCH—OFF**

BAND-ON (Except Coasting)

When the selector lever is moved to the Drive position, the manual valve is repositioned to allow line pressure to flow into the Drive oil circuit. Drive oil flows to the following:

Band apply valve to provide a source for band apply pressure.

Primary compensator to provide a source for compensator.

2-3 governor valve to become second oil.

3-4 valve to provide a source for band apply pressure.

BASIC CONTROL

As the accelerator is depressed sufficiently to drive the vehicle, the band is applied by oil from three sources. One, the band apply valve opens to allow drive oil to enter the band apply passage, applying the band.

Two, Drive oil to the 2-3 governor valve feeds the second oil passage, second oil flows through an orifice and a ball check to provide another source of band apply oil.

Three, T.V. pressure flowing past the detent valve enters the part throttle T.V. passage and acts against the 3-4 T.V. valve thus closing the 3-4 valve system against the springs. Drive oil through the 3-4 valve then also feeds the band apply system.

If the accelerator is released to allow the vehicle to coast (at speeds below where an upshift can occur) the band apply valve will close to shut off its source to band apply. The detent valve will also close cutting off the source of part throttle T.V. pressure, this causes the 3-4 valve system to open thus cutting off Drive oil from entering the band apply circuit. Instead, band apply at the 3-4 valve is connected to the T.V. circuit thus causing the band apply pressure to drop. The low T.V. pressure tending to apply the band and the loss of the self-energizing action of the band during coasting allows the band to release and the vehicle to coast freely.

PRESSURE CONTROL

Pressure control in first is identical to Neutral.

TIMING CONTROL

Second and fourth oil is routed to the band release accumulator to charge the band release accumulator for use during a 2-3 shift.

Second and fourth oil is also directed to the band release timing valve and 3-4 boost valve for use during the 3-4 shift.

Drive oil to the primary compensator valve is regulated by T.V. pressure acting on the primary compensator valve to become compensator pressure. Compensator pressure is designed to vary in proportion to engine torque and is routed to the clutch accumulator and the band release valve for use during a 2-3 and 3-4 shift.

SUMMARY

The coupling is filled and the band is applied causing the transmission to be in 1st or 2nd depending on the effectiveness of the torque multiplier.

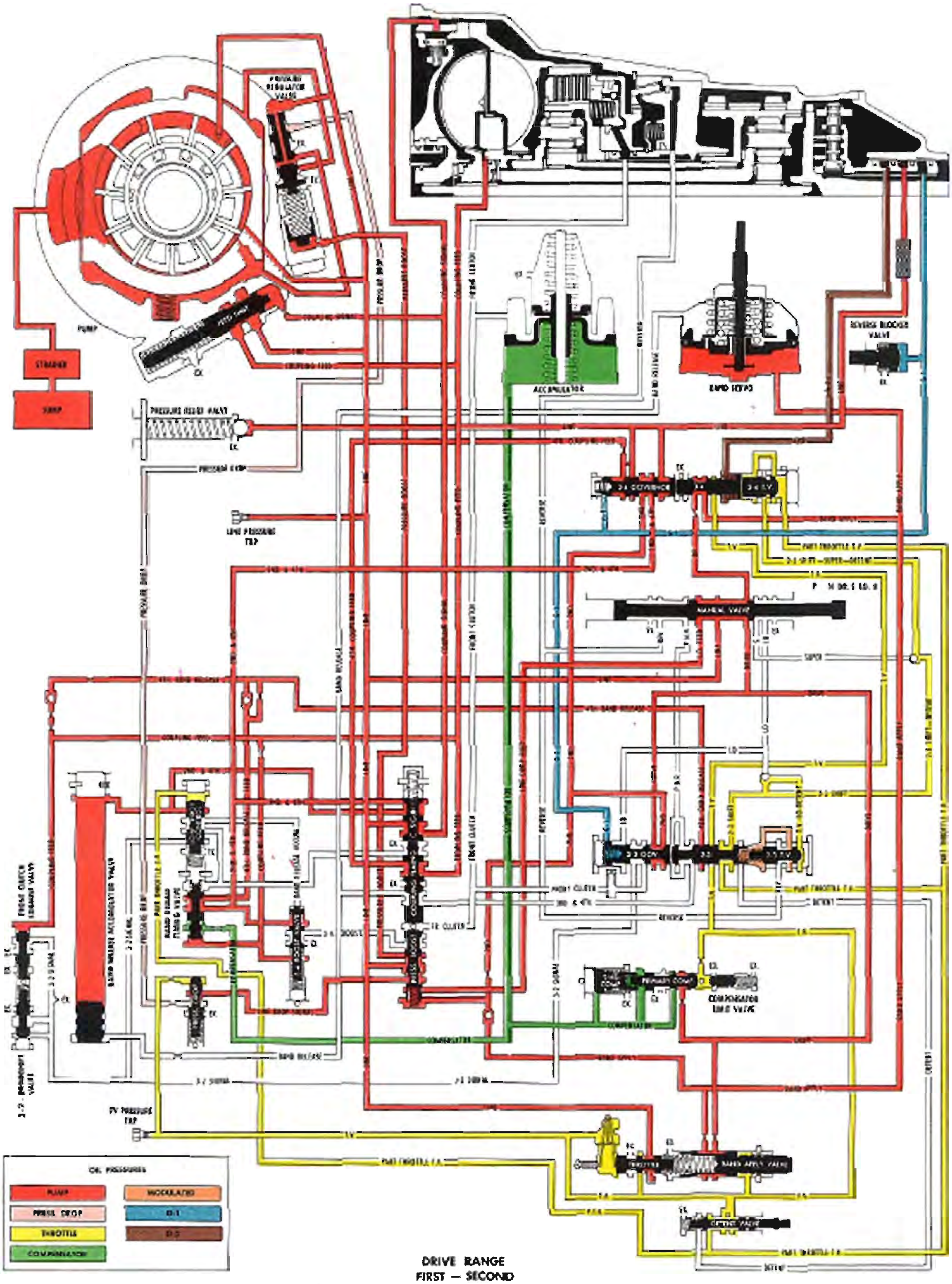


Fig. 3-214 Drive Range—First and Second

DRIVE RANGE—THIRD

COUPLING—EMPTY

FRONT CLUTCH—ON

REVERSE CONE—OFF

BAND—ON

With increased vehicle speed and G-1 pressure, the force of G-1 acting on the 2-3 governor valve will overcome the force of the 2-3 modulated T.V. pressure. This causes the 2-3 shift valve to open, which allows drive oil to enter the front clutch apply passage. Simultaneously, T.V. to the 2-3 regulator valve is cut off at the 2-3 shift valve, and 2nd oil, which charged the band release accumulator, is exhausted through the 2-3 shift valve.

BASIC CONTROL

Front clutch oil from the 2-3 shift valve applies the clutch and repositions the coupling timing valve against the spring to cut off coupling signal oil and coupling feed oil. The coupling exhaust valves then open allowing the coupling to empty.

PRESSURE CONTROL

Front clutch oil repositions the pressure boost valve against line pressure and the spring. This cuts off line pressure from entering the line boost and line drop signal passages. Line drop feed line oil again enters the line drop signal passage. The result is a dropped line pressure which varies with throttle (74-105 psi).

TIMING CONTROL

Front clutch oil to the front clutch accumulator is accumulated at varying rates and pressures depending on the amount of compensator pressure present in the accumulator. This in turn determines the time and pressure required to apply the front clutch smoothly for either a gentle application at light throttle or a firm application at heavy throttle.

Front clutch oil is used to reposition the pressure boost valve because it acts as a signal oil which notifies the pressure boost valve that sufficient clutch pressure is present to carry third torque before allowing line pressure to drop. Also, it prevents line pressure from dropping in the band servo until the shift to third is completed (torque on the band in second is greater than in third) thus preventing the band from slipping in second.

FAIL SAFE FEATURES

To provide a safety feature, coupling feed pressure in first and second is orificed and directed past a ball check into the fourth band release passage and brought against the 2-3 shift valve. With the 2-3 shift valve open, fourth band release oil enters the third and fourth passages. If for any reason the coupling timing valve should remain in second position when clutch pressure is applied to it, third and fourth oil will flow through the coupling timing valve to the band release accumulator and will cause the accumulator to complete its stroke and allow pressure to build up on the release side of the band servo.

Band release accumulator oil which charged the band release accumulator is exhausted through the low throttle control valve into either the second and fourth oil passages.

This releases the band and shifts the transmission to fourth preventing the transmission from becoming locked up as it would be if the coupling were filled with the band and clutch on.

If the coupling timing valve moves as it should, the band release passage will exhaust at the coupling timing valve and allow line 2nd and 4th oil through the coupling timing valve to recharge the band release accumulator.

SUMMARY

The coupling is exhausted with the clutch and band applied, thus placing the transmission in third.

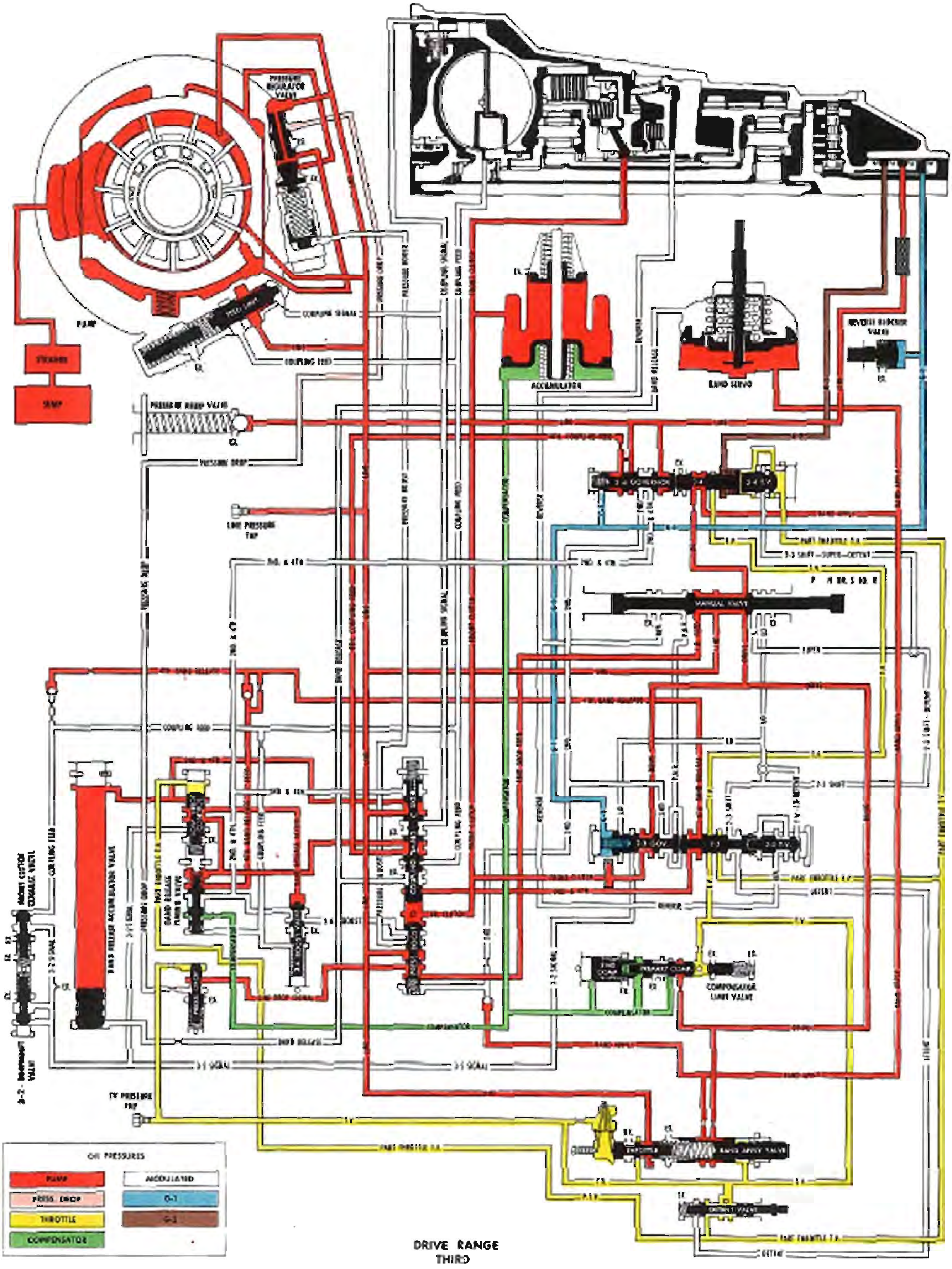


Fig. 3-215 Drive Range-Third

DRIVE RANGE—FOURTH

COUPLING—FULL **REVERSE CONE—OFF**

FRONT CLUTCH—ON **BAND—OFF**

As vehicle speed increases further, G-1 and G-2 pressure and the springs acting on the 3-4 shift valve train will overcome the force of the T.V. pressure on the 3-4 shift valve. The shift valve will then open allowing line pressure to enter the 2nd and 4th and fourth coupling fill passages.

BASIC CONTROL

Second and fourth oil repositions the coupling signal and timing valves against front clutch pressure to again allow coupling signal oil to close the coupling exhaust valves, sealing the coupling. Fourth coupling feed oil, enters the coupling feed passage to begin filling the coupling. Simultaneously, 2nd and 4th oil is resting on the band release timing valve, as coupling pressure reaches the desired value it opens the band release timing valve allowing 2nd and 4th oil to enter the 4th band release passage. Fourth band release oil then flows through the coupling timing valve to become band release oil. This causes the band to release as the coupling reaches the proper charge pressure.

PRESSURE CONTROL

The normal operating pressure in fourth is the same as third except as follows:

> During light throttle 3-4 shifts below approximately 25 psi T.V. pressure, the low throttle control valve is positioned by the spring to allow 2nd and 4th oil to flow to the end of the 3-4 boost valve positioning it against the spring. This allows 2nd and 4th oil to flow past the 3-4 boost valve to the pressure boost valve providing line boost. Line boost assists in providing a more rapid coupling fill. As the coupling reaches operating pressure, coupling oil acting on the spring end of the 3-4 boost valve shifts the valve to cut off 3-4 boost oil to the pressure boost valve thus restoring the normal 4th speed oil pressure of 74-105 psi.

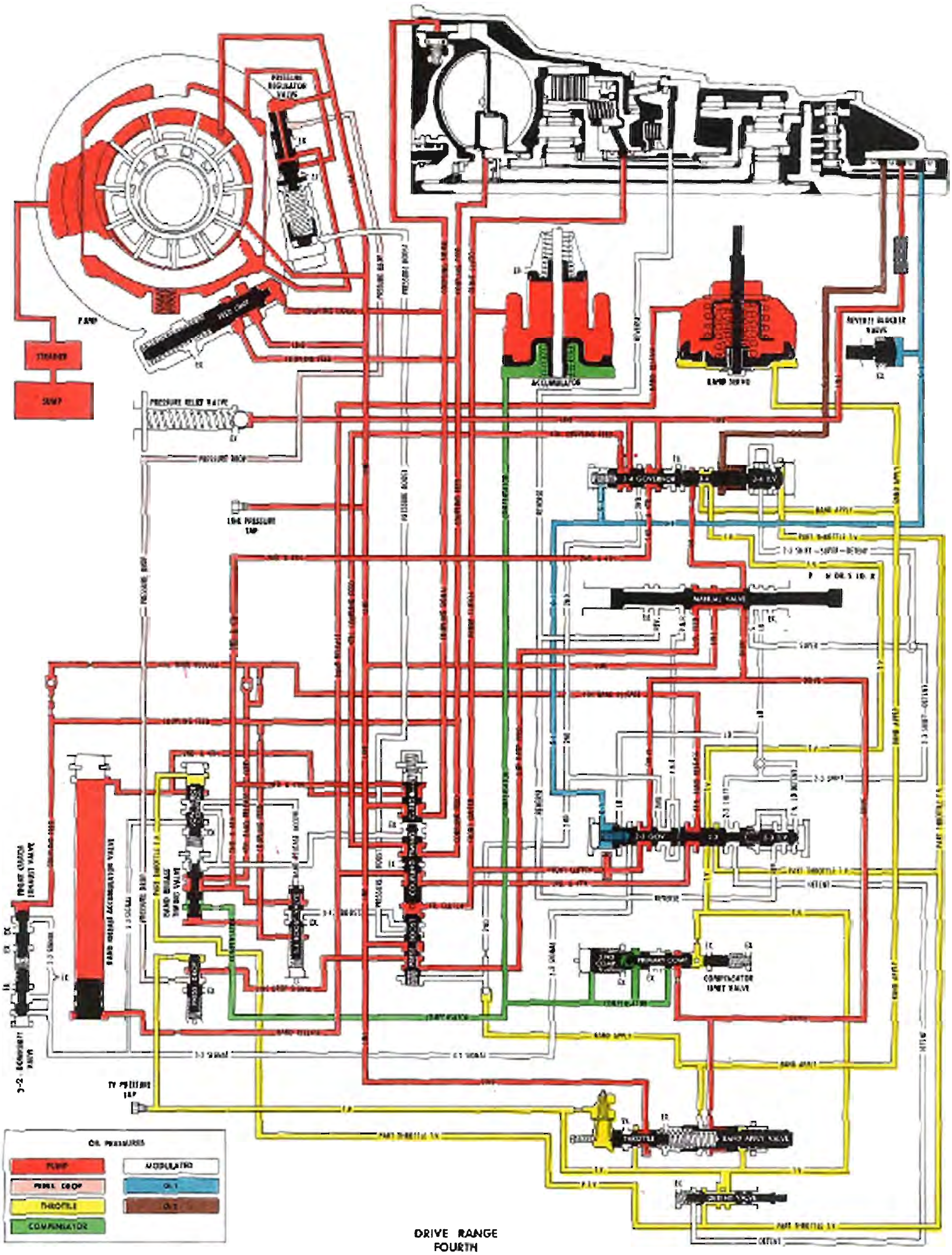


Fig. 3-216 Drive Range-Fourth

SUPER RANGE—THIRD

COUPLING—EMPTY

FRONT CLUTCH—ON

REVERSE CONE—OFF

BAND—ON

Oil flow in super range third is primarily identical to that in drive range third with the following exceptions.

BASIC CONTROL

Super range pressure from the manual valve is directed through the ball check against the large end of the 3-4 shift valve to prevent a 3-4 shift from normally occurring in the super range.*

*As a safety feature, it is possible to obtain a 3-4 upshift in the super range but only above the speed at which the normal drive range through detent 3-4 upshift occurs. (Approximately 60 M.P.H.).

PRESSURE CONTROL

When the manual valve is in the Super position, the line drop feed passage is cut off. This stops the source of line drop pressure so that line pressure is constant at approximately 105 psi regardless of throttle opening.

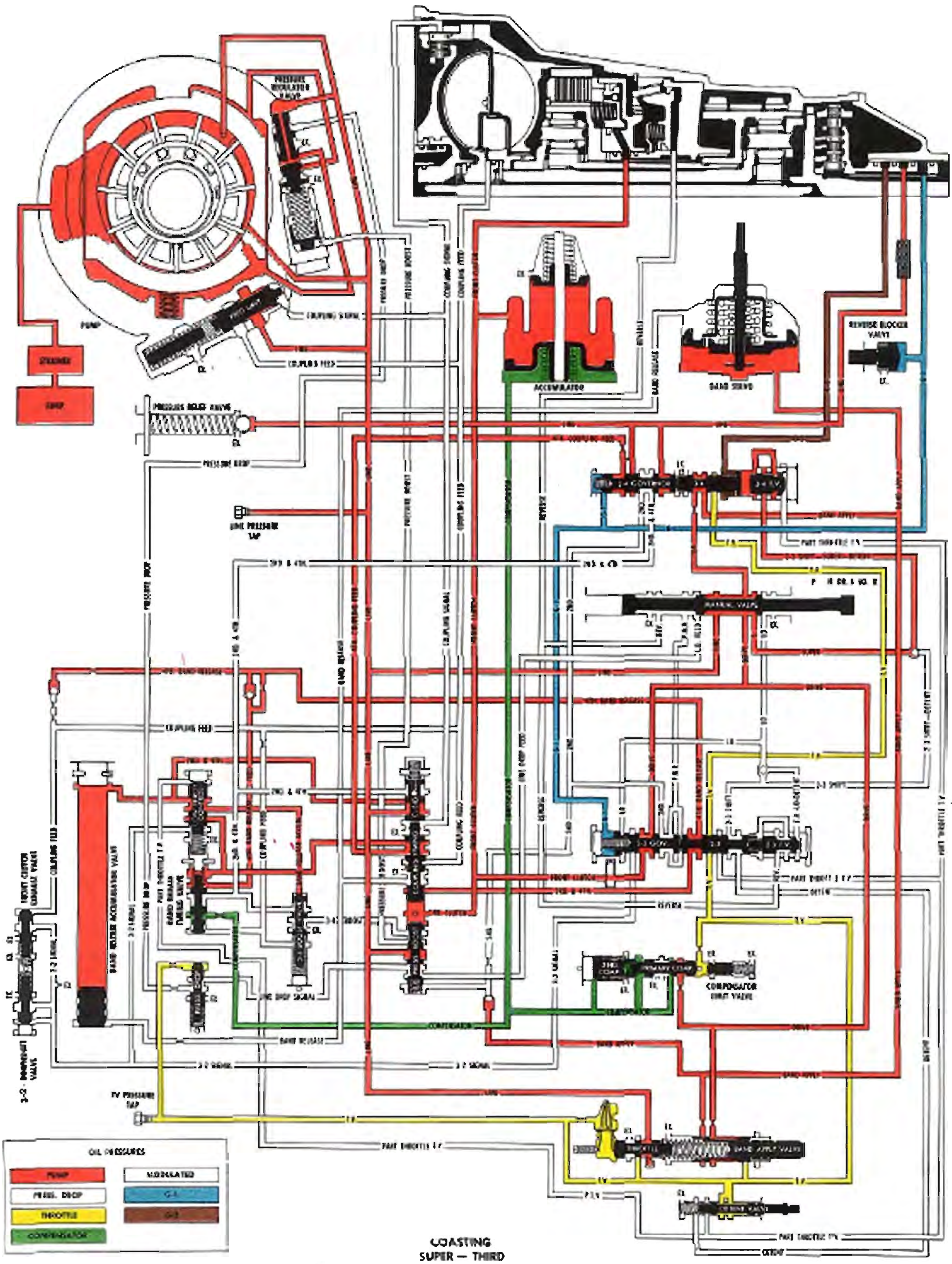


Fig. 3-217 Super Range-Third

LO RANGE—SECOND

COUPLING—FULL

FRONT CLUTCH—OFF

REVERSE CONE—OFF

BAND—ON

When the selector lever is placed in the "Lo" position, the manual valve is moved to uncover an additional source of pressure, Lo Oil.

Lo Oil is directed to two locations:

1. Against the large end of the 2-3 governor valve to work against the force of G-1 pressure.
2. Through the ball check valve, past the 2-3 T.V. regulator valve to act against the 2-3 shift valve to further assist in keeping the 2-3 shift valve closed against G-1 pressure.

The transmission will never shift above second in the Lo Range.

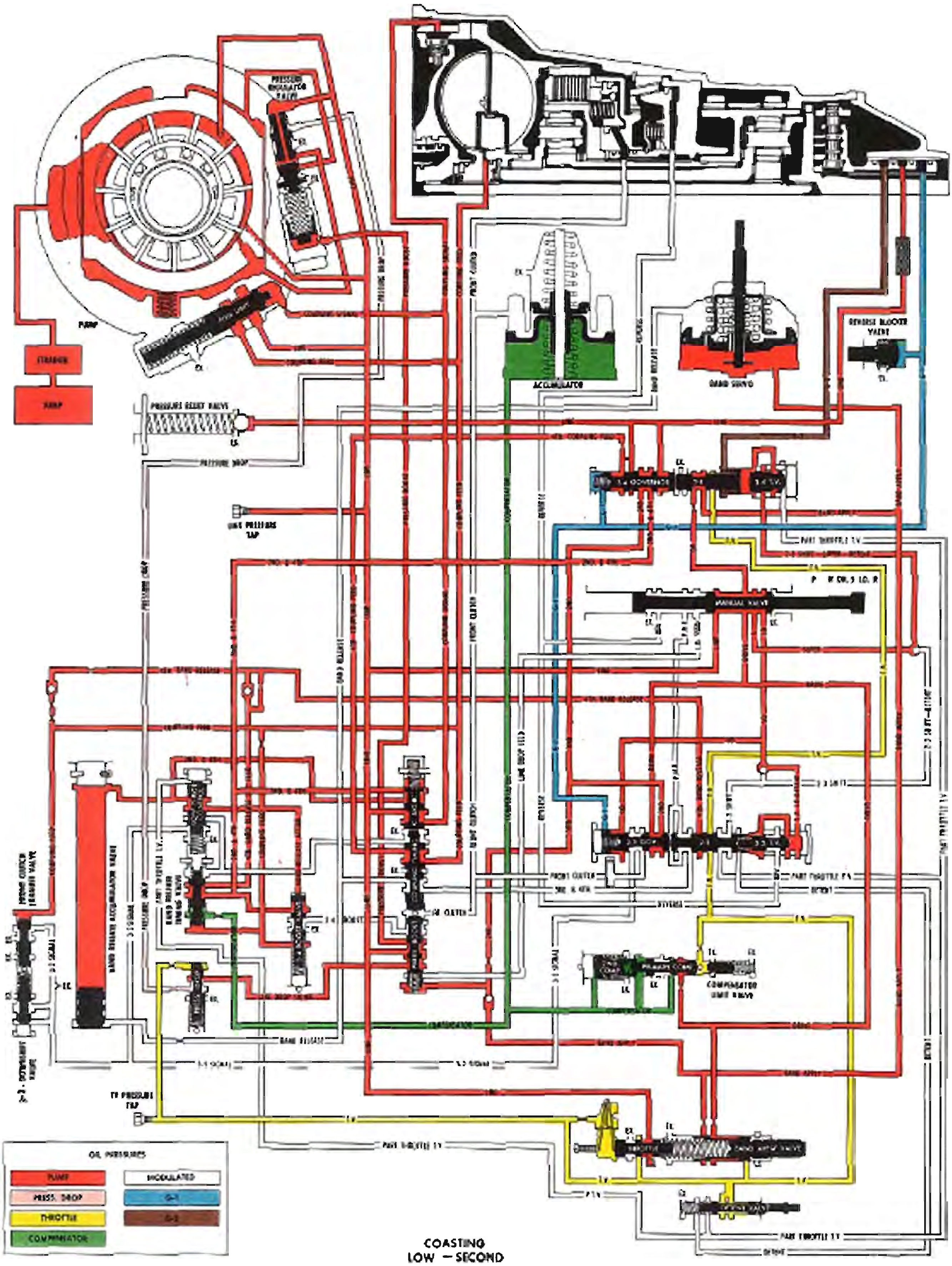


Fig. 3-218 Lo Range-Second

REVERSE

COUPLING—FULL

FRONT CLUTCH—OFF

REVERSE CONE—ON

BAND—OFF

In reverse the coupling is full, the front clutch is released, the reverse cone applied, and the band is released.

Line pressure is directed to the:

1. Throttle Valve
2. Governor
3. Line Boost Valve
4. Manual Valve
5. Coupling Signal Valve
6. Pressure Regulator
7. Coupling Feed Limit Valve
8. 3-4 Governor Valve

Drive, Super and Lo Range Oil is exhausted at the manual valve.

BASIC CONTROL

Line pressure, through the coupling timing valve, enters the signal passage to close the coupling exhaust valves and open the coupling feed limit valve for coupling fill.

Reverse pressure from the manual valve is directed to apply the reverse cone clutch, thus holding the front unit internal gear stationary.

PNR pressure from the manual valve flows through the 2-3 valve to become 3rd and 4th oil which flows through the coupling timing valve to become band release oil. This provides a positive release of the band in reverse.

PRESSURE CONTROL

Line pressure flows into the line boost and line drop signal passage to provide a variable line pressure similar to that obtained in first and second.

SUMMARY

The coupling is full, the reverse cone is applied, thereby placing the transmission in reverse. Reverse pressure to the 2-3 T.V. valve directs reverse pressure behind the 2-3 shift valve to prevent the 2-3 shift valve from upshifting.

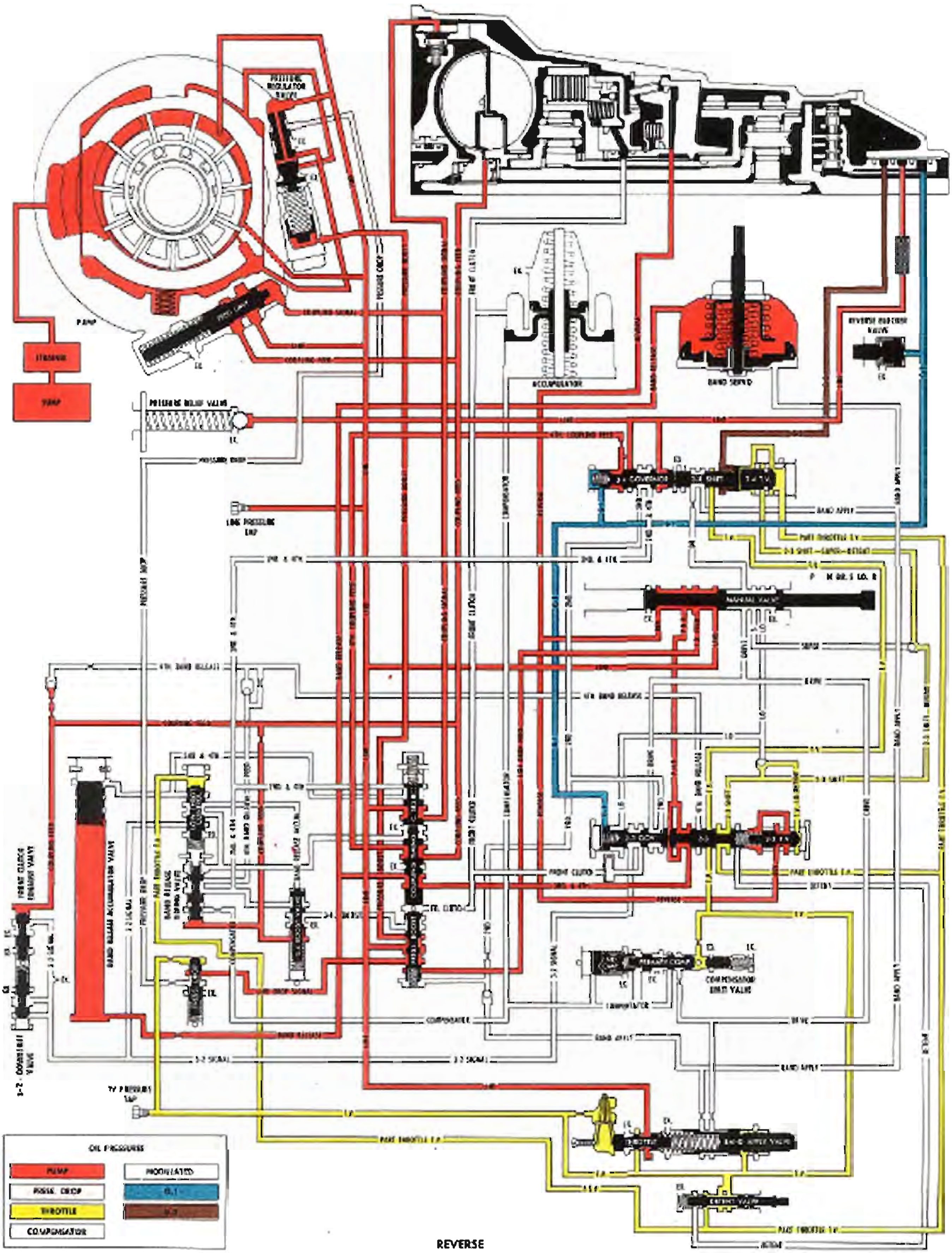


Fig. 3-219 Reverse

OPERATIONS NOT REQUIRING REMOVAL OF TRANSMISSION

Some of the component parts of the transmission can be removed without removing the transmission from the car. The procedures for such operations are not specifically outlined; however, the basic procedure and specifications outlined under "Disassembly of the Transmission" and "Assembly of the Transmission" will apply.

Units that may be readily removed from the transmission are:

Limit Valve

Pressure Regulator Valve

Companion Flange

Rear Oil Seal

Oil Filler Pipe

Oil Pan

Rear Bearing Retainer

Units that can be removed after oil pan removal are:

Control Valve Assembly-Loosen band adjusting screw before removing control valve assembly. After installing control valve assembly, refer to Service Adjustments to adjust band.

Parking Linkage

Channel Plate

Band Adjusting Screw & Nut

Accumulator-Servo

Throttle and Manual Control Levers, Shafts and/or Seals

Oil Cleaner, Oil Pump Intake Pipe, and "O" Ring Seals

Units that can be removed after Rear Bearing Retainer removal are:

Speedometer Drive Gear

Governor

Reverse Blocker Valve

Rear Bearing

REMOVAL (TRANSMISSION ASSEMBLY)

1. Install Engine Support Tool J-8974.
2. Remove oil filler tube and breather tube.
3. Disconnect propeller shaft, shift and throttle linkage, cooler lines and speedometer cable.
4. Remove exhaust pipe and transmission rear cross support bar.
5. Place transmission lift in position and remove transmission to engine bolts.

INSTALLATION (TRANSMISSION ASSEMBLY)

When installing transmission, lubricate threads of transmission to engine block bolts with Part No. 980131 lubricant, and torque 20-25 ft. lbs. Install the 6 longer bolts at the rubber mounts and the 2 shorter bolts in the upper case cover holes. These holes are not rubber insulated. Install two safety washers, one on each side at the lower insulated holes, next to the rubber insulator. Fill transmission with fluid and adjust linkage under "Service Adjustments".

NOTE: Use sealer on breather tube where it is installed in transmission.

GENERAL SERVICE PRECAUTIONS

Extreme care should be exercised in the cleaning and inspection of all transmission parts. All parts should be inspected on an individual basis for nicks, scratches, etc. It should be remembered that it is important to distinguish between parts that are simply worn in and those which are worn to a degree that complete replacement is necessary. Many of the transmission parts are made of aluminum; therefore, care should be exercised in their handling, both while as loose parts and during assembly and disassembly. Screws and bolts can become damaged through improper installation of bolts.

There are several self-locking bolts in the transmission which will be cadmium plated (bright color). These bolts should be tight fitting during the complete process of removal and installation. If these bolts are loose fitting, then they should be replaced and if they are still loose then the mating or part into which they are installed should be replaced.

If the self-locking bolts are extremely difficult to install, then they should be removed and lubricated. Also, any other bolt or screw that threads into aluminum should be installed carefully as cross-threading may result. If cross-threading is observed and the bolt or screw is loose or cannot be fully installed then the part should be repaired with a heli-coil.

It is important that the highest standards of cleanliness be observed in repair of a Hydra-Matic transmission as even a relatively small particle of dirt can cause a transmission malfunction. Wash all parts thoroughly before reassembly making certain that any small burrs or metal particles are completely removed.

Also, metal oil seal rings should be replaced if visual inspection indicates they are defective. All gaskets, seals, and washers should be replaced as indicated in the Disassembly and Assembly section.

Before disassembly of the unit, thoroughly clean the exterior.

Seal protecting tools must be used when assembling the units to prevent damage to the seals. The slightest flaw in the sealing surface of the seal can cause an oil leak.

The internal snap rings should be expanded and the external snap rings compressed if they are to be reused. This will insure proper seating when installed. DO NOT REUSE TRUARC SNAP RINGS.

During assembly of each unit, all internal parts must be lubricated with Hydra-Matic oil.

Gears that may be installed either way should be installed the same as they were removed. If gears are not installed the same, the tooth contact would change which could result in noisy gears.

PARTS CLEANING AND INSPECTION

After complete disassembly of a unit, all metal parts should be washed in a clean solvent and dried with compressed air. All oil passages should be blown out and checked to make sure that they are not obstructed. The small passages, such as in the front pump slide, should be checked with tag wire. All parts should be inspected to determine which parts are to be replaced.

The various inspection of parts are as follows:

1. Inspect linkage and pivot points for excessive wear.
2. Bearing and thrust surfaces of all parts should be checked for excessive wear and scoring.
3. Check for broken seal rings, damaged ring lands and threads.
4. Mating surfaces of castings and end plates should be checked for burrs and irregularities. If a good seal is not apparent, burrs and irregularities may be removed by lapping the surface with crocus cloth. The crocus cloth should be held on a flat surface, such as a piece of plate glass.
5. Castings should be checked for cracks, sand holes and porosity.
6. Gear teeth should be checked for chipping, scoring, and excessive wear.
7. Valves should be free of burrs and the shoulders of the valves must be square. Any burrs or irregularities may be removed by honing. Valves should be free to slide in their respective bores.

   Inspect torus members and accel-a-rotor for damaged vanes.
8. Inspect composition clutch plates for damaged surfaces and loose facings. If flakes of facing material can be removed with the thumbnail, the plates should be replaced; however, composition plate discoloration is not an indication of failure.
9. Inspect steel clutch plates for scored surfaces and damaged lugs. The equally spaced waves must be .008" to .012" and can be checked by placing the plates on a flat surface.
10. Inspect springs for distortion or collapsed coils. Slight wear (bright spots) on the sides of the springs are permissible.
11. When inspecting bushings, fit the mating part into the bushing and observe the amount of looseness. Bushing clearance is excessive if more than .008" exists when checked with a wire feeler gauge.
12. If the transmission shows evidence that foreign material has circulated throughout the transmission or if the oil strainer is dirty, it should be discarded and a new one installed.

Disassembly of Units from Transmission Case

1. Remove the transmission filler pipe "O" ring seal from side of transmission case before installing transmission in fixture. (Fig. 3-220)

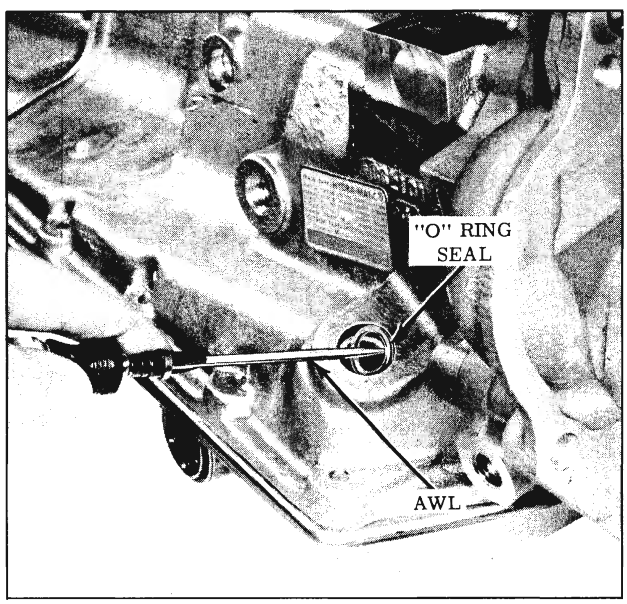


Fig. 3-220 Removing Filler Pipe "O" Ring Seal

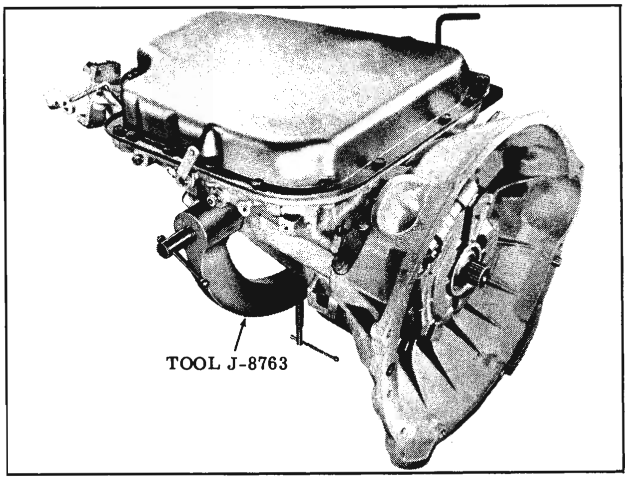


Fig. 3-221 Transmission Holding Fixture

2. Install transmission holding fixture as shown in Fig. 3-221.

3. Place transmission and holding fixture into bench support J-6115 with the oil pan up.

4. Remove oil pan and discard the gasket.

5. Remove cleaner assembly from transmission. Inspect "O" ring seal in case and replace if damaged. (Fig. 3-222).

6. If transmission is to be completely disassembled, check front unit end play as follows:

Front Unit End Play Check

a. Remove 1 case cover to case attaching bolt and install tools as shown. (Fig. 3-223)

b. Position a screwdriver through case, behind the flange on the output shaft. (Fig. 3-223)

c. Gently pry forward on output shaft to position units forward. Be careful not to pry on governor weights.

d. At the same time move input shaft in or out and record end play.

e. End play should be .004" to .022".

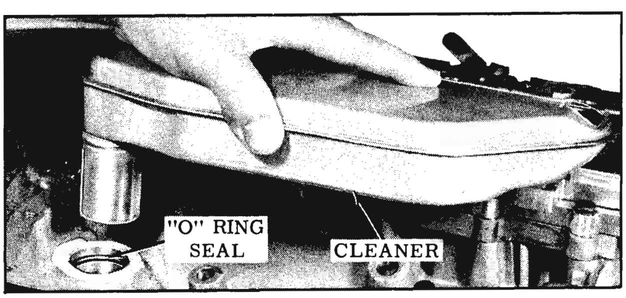


Fig. 3-222 Removing Cleaner Assembly

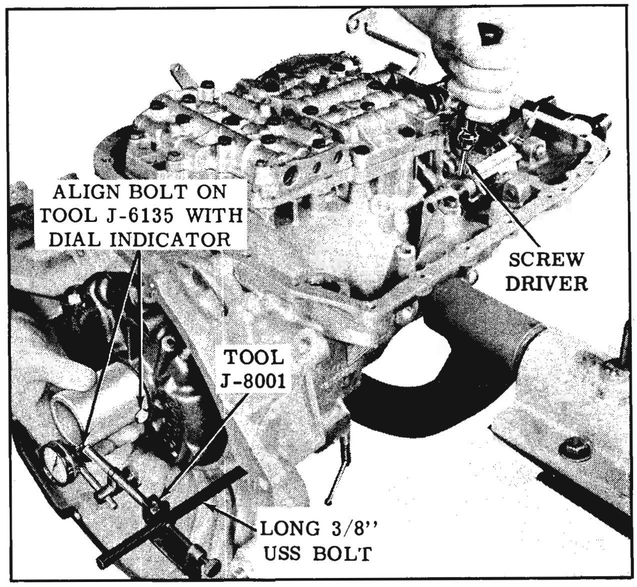


Fig. 3-223 Checking Front Unit End Play

f. Remove tools.

NOTE: End play is corrected by changing the selective thrust washer behind the case cover as shown in Figs. 3-275 and 3-276.

SELECTIVE THRUST WASHER CHART

PART NO.	THICKNESS	COLOR IDENT.
8620697	.027"-.029"	Bright Metal
8620698	.036"-.038"	Copper
8620699	.045"-.047"	Black
8620700	.054"-.056"	Bright and Flats on Edge

7. Remove inside T.V. link from rear T.V. lever

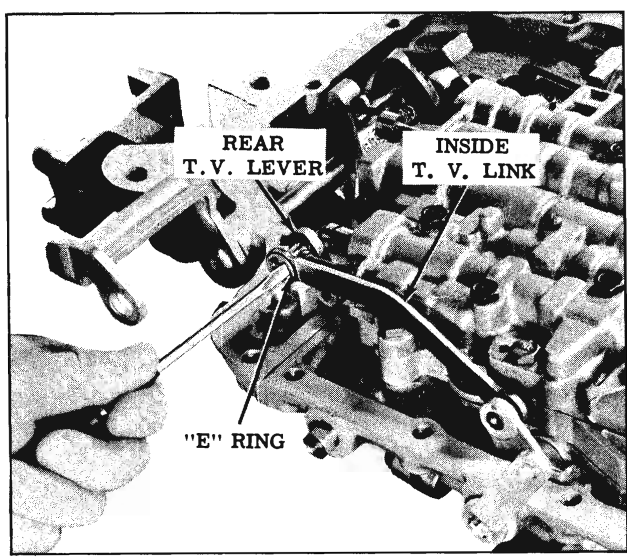


Fig. 3-224 Removing Inside T.V. Link

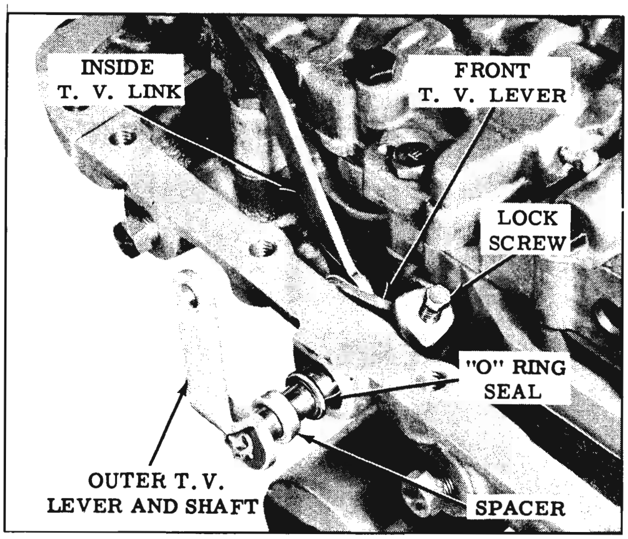


Fig. 3-225 Removing Outer T.V. Lever "O" Ring

by removing the "E" retaining ring. (Fig. 3-224)

CAUTION: Do not lose spacer from end of detent valve.

8. Remove outer T.V. lever, "O" ring and spacer as shown. (Fig. 3-225)

9. Remove front T.V. lever and link assembly.

10. To disengage linkage, remove "E" ring retaining front T.V. lever to inside T.V. link.

11. Loosen inside manual and detent lever lock screw, and remove "E" ring from end of manual shaft.

12. Slide manual shaft out of retainer to remove valve link. (Fig. 3-226)

13. Remove manual and detent lever assembly from rear bearing retainer, and remove the manual shaft "O" ring seal.

14. Remove control valve assembly to case attaching bolts.

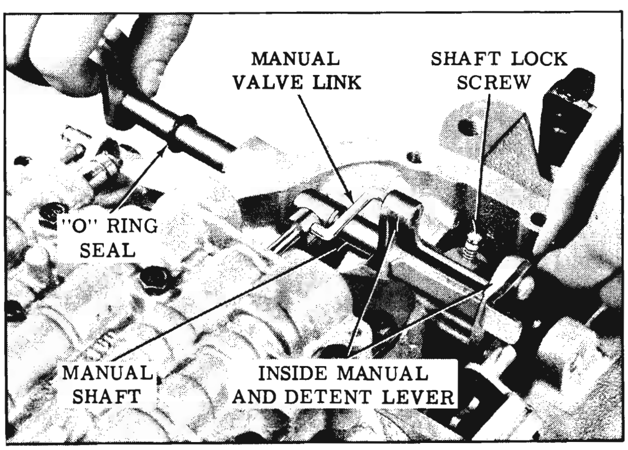


Fig. 3-226 Removing Manual Valve Link

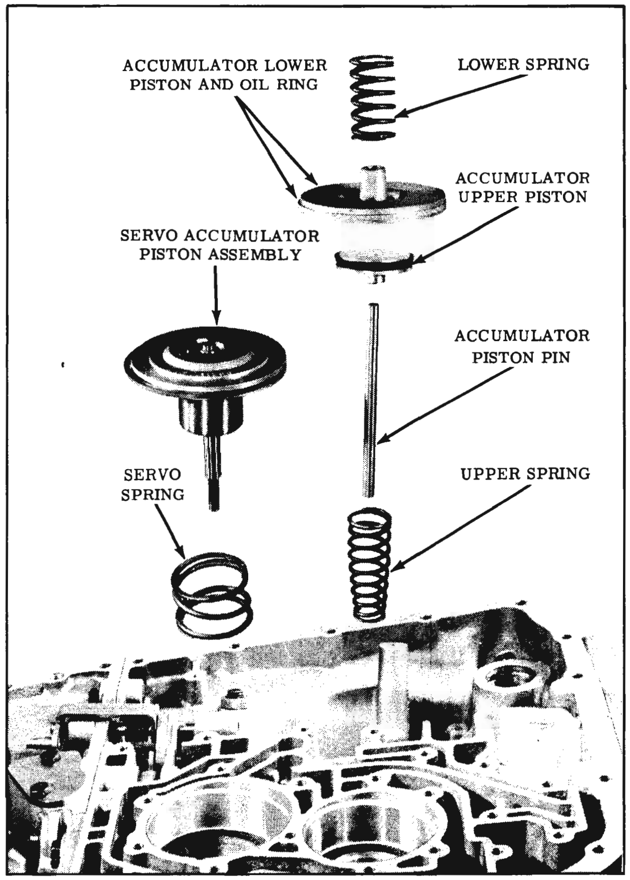


Fig. 3-227 Servo and Accumulator Pistons

15. Loosen band adjusting screw lock nut, and remove screw and nut. (Fig. 3-228)

NOTE: The band anchor pin is located under adjusting screw and will fall out when transmission is turned over.

16. Remove the control valve assembly from the transmission case.

CAUTION: Do not loosen detent valve spacer.

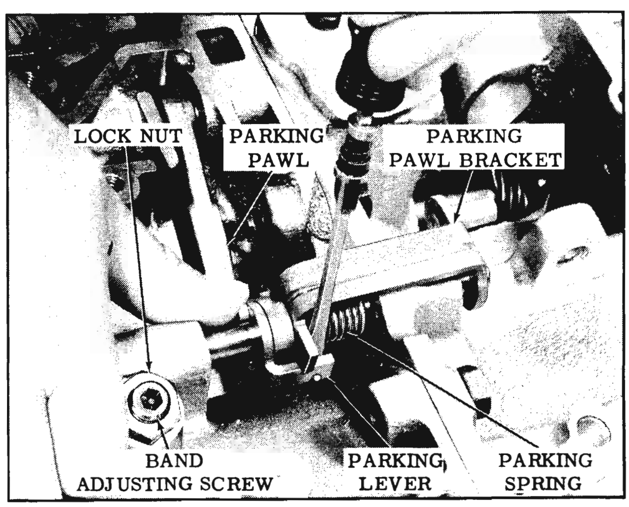


Fig. 3-228 Parking Pawl Spring

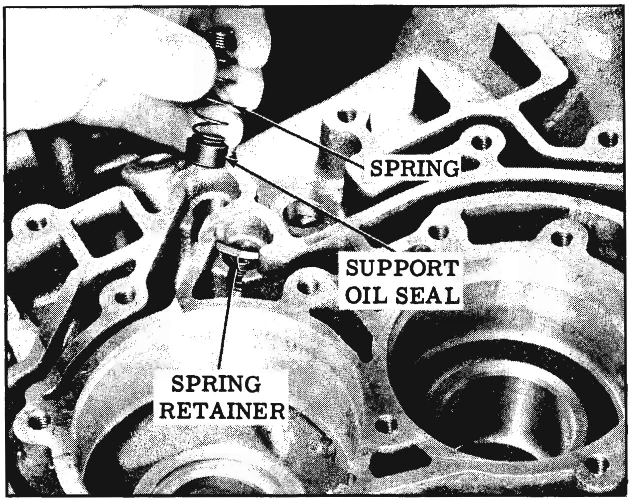


Fig. 3-229 Removing Case Support Oil Seals

17. Remove the servo and accumulator pistons and springs as shown in Fig. 3-227.

18. Unhook parking pawl spring from parking lever. (Fig. 3-228)

19. Remove 2 case center support seal spring retainers, springs and seals.

    CAUTION: Retainer is under spring pressure. (Fig. 3-229)

20. Remove the rear bearing retainer cover attaching bolts.

21. Engage the parking pawl to hold output shaft and remove the companion flange attaching bolt, and companion flange using Tool J-8614. (Fig. 3-230)

22. If replacement of the rear seal is necessary, remove the rear seal by driving around outer edge with a sharp punch and prying out of retainer.

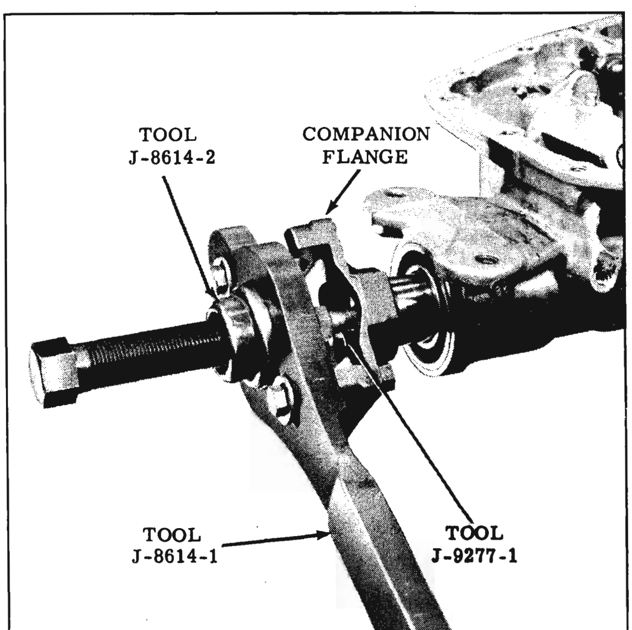


Fig. 3-230 Removing Companion Flange

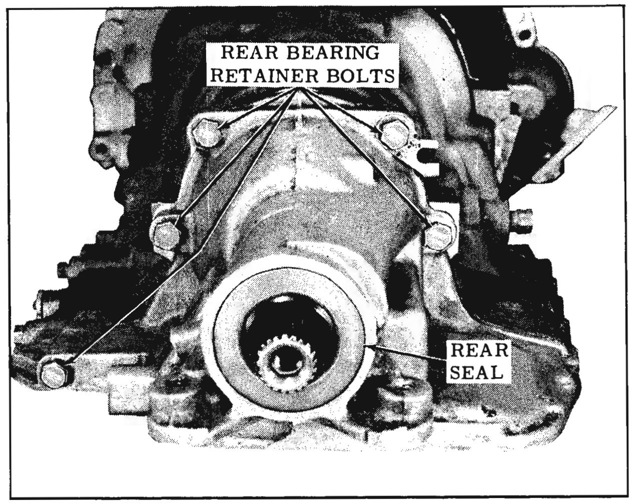


Fig. 3-231 Removing Rear Bearing Retainer

23. Remove 3 internal and 5 external rear bearing retainer to case attaching bolts, remove breather pipe clip, and remove retainer assembly with bearing and gasket. (Fig. 3-231)

24. Remove the rear bearing to output shaft snap ring. (Fig. 3-232)

25. With parking pawl engaged, remove the speedometer drive gear using Tool J-8760 and J-6123. (Fig. 3-233)

26. Remove the 3 governor attaching bolts, and remove governor.

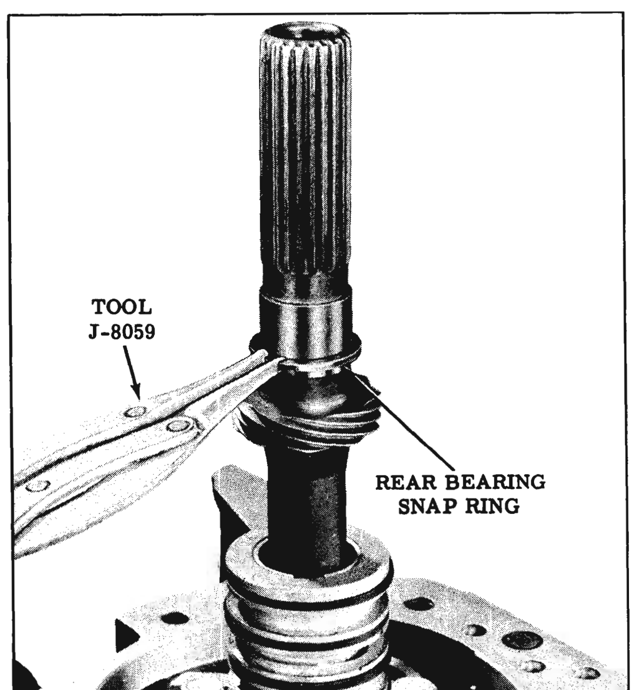


Fig. 3-232 Removing Rear Bearing Snap Ring

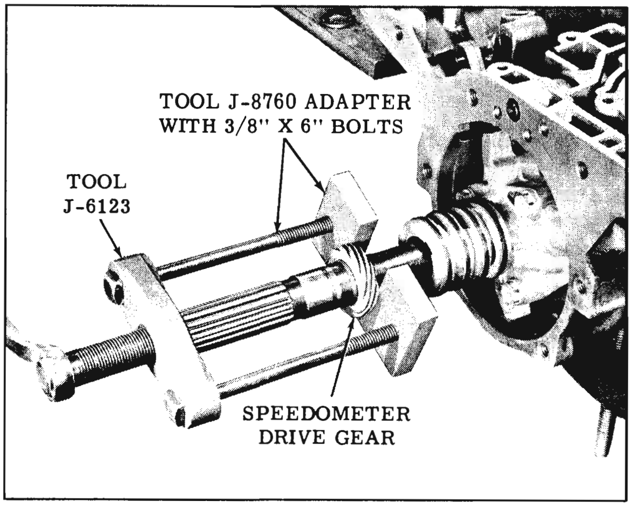


Fig. 3-233 Removing Speedometer Gear

NOTE: Keep the parking pawl engaged, with one hand while breaking bolts loose. (Fig. 3-234)

27. Scribe mark on dowel of carrier and lug of output shaft for alignment on reassembly. (Fig. 3-235)
28. Remove the output shaft.
29. Remove the parking pawl assembly. (Fig. 3-236)
30. If replacement of pump seal is necessary, remove it as shown. (Fig. 3-237)
31. Rotate transmission pan side down to allow band anchor pin to fall free from case, then rotate transmission front end up.

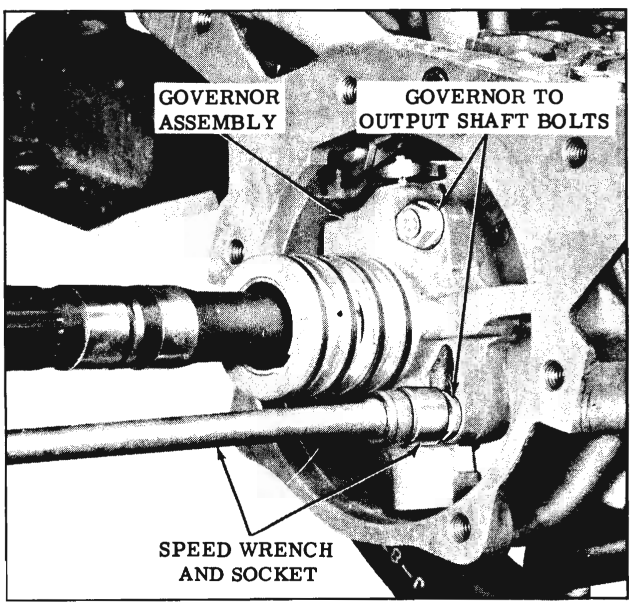


Fig. 3-234 Removing Governor

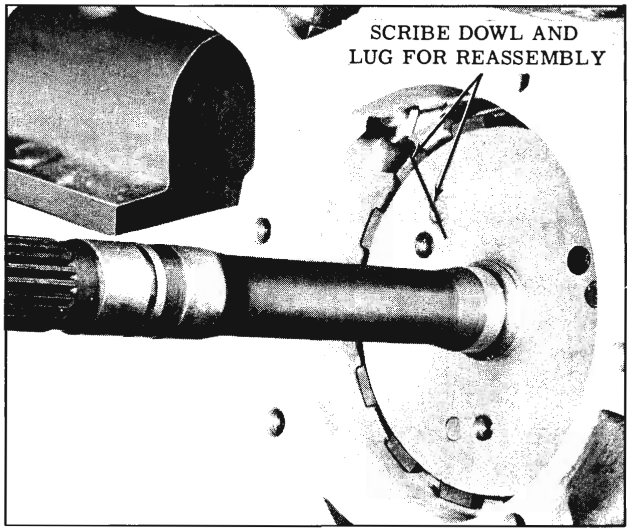


Fig. 3-235 Removing Output Shaft

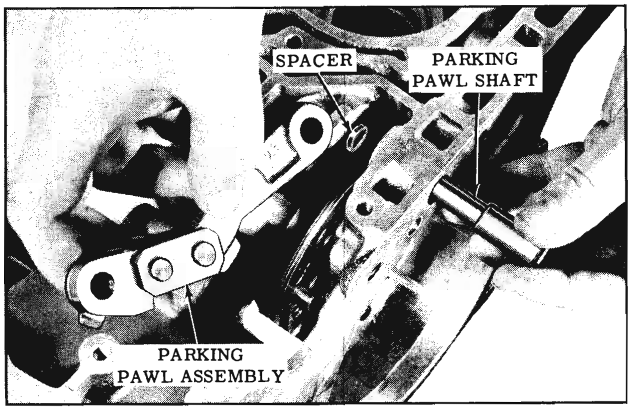


Fig. 3-236 Removing Parking Pawl

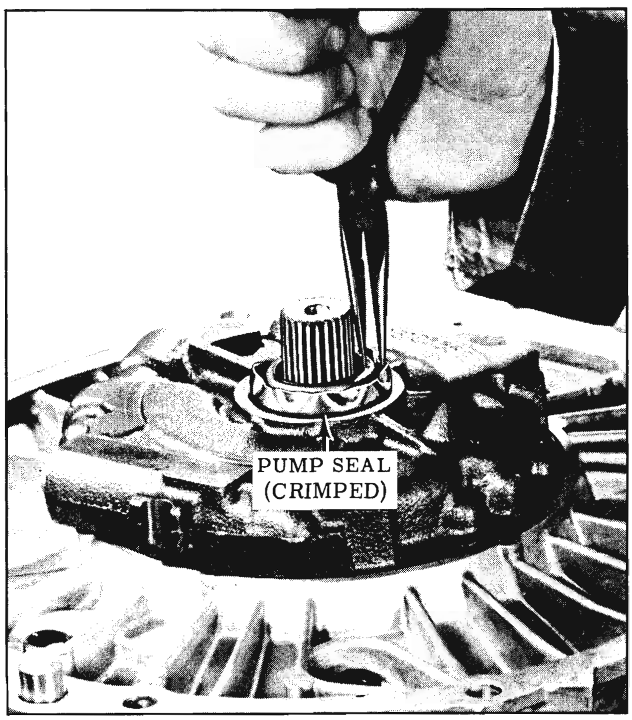


Fig. 3-237 Removing Pump Seal

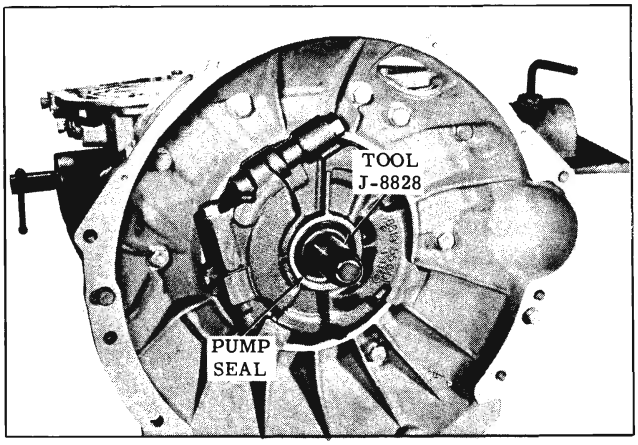


Fig. 3-238 Pump Seal Protector

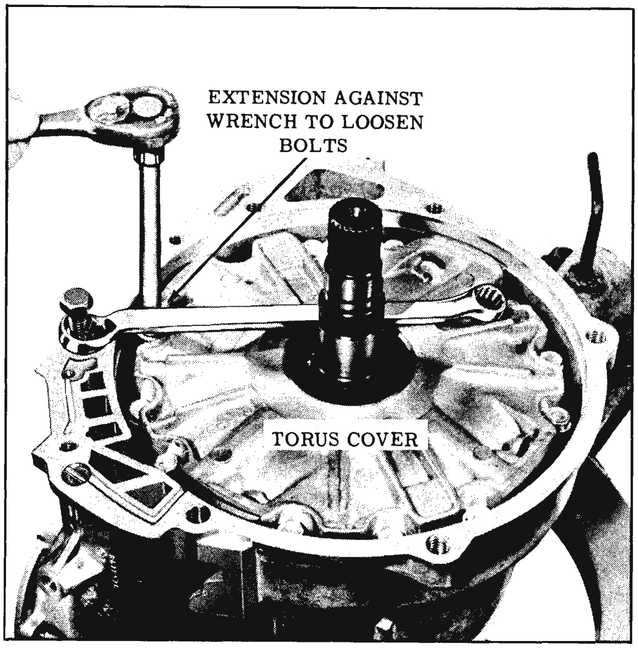


Fig. 3-239 Removing Torus Cover

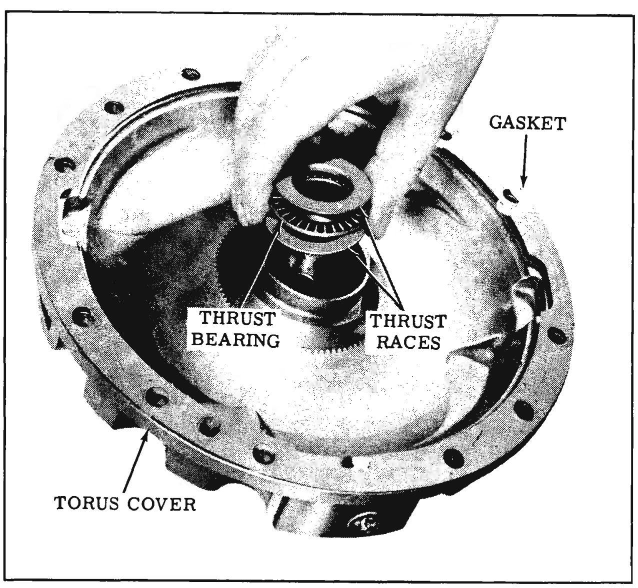


Fig. 3-240 Torus Cover Bearing

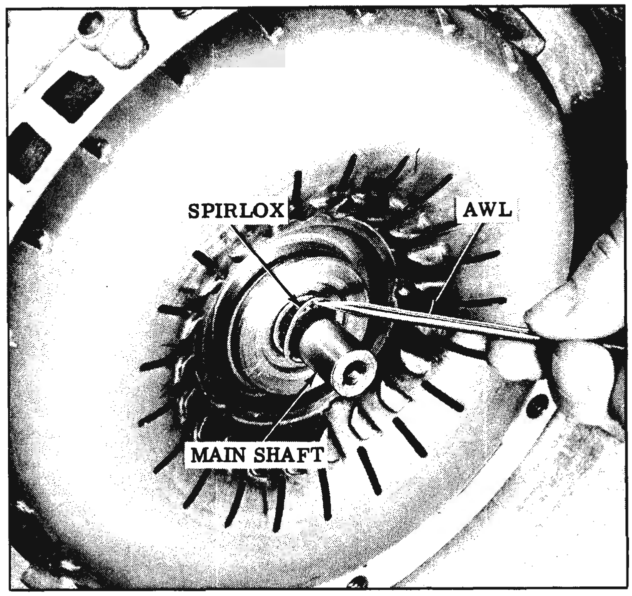


Fig. 3-241 Removing Retaining Ring

32. Remove eight remaining case cover to case attaching bolts. If pump seal was not removed install seal protector J-8828 over input shaft. (Fig. 3-238)

33. Remove case cover, case cover gasket, and pump assembly by lifting straight up.

34. Remove the seal protector.

35. Remove twelve torus cover attaching bolts, then remove the box wrench and case cover attaching bolt. (Fig. 3-239)

36. Remove the torus cover assembly by lifting straight up on input shaft.

37. Remove and DISCARD the metal torus cover to drive torus gasket. Remove the torus cover to driven member race, thrust bearing and race. (Fig. 3-240)

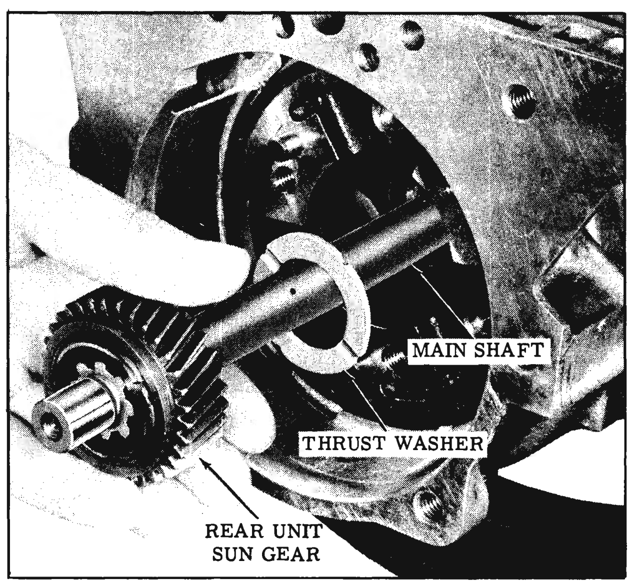


Fig. 3-242 Removing Main Shaft Sun Gear

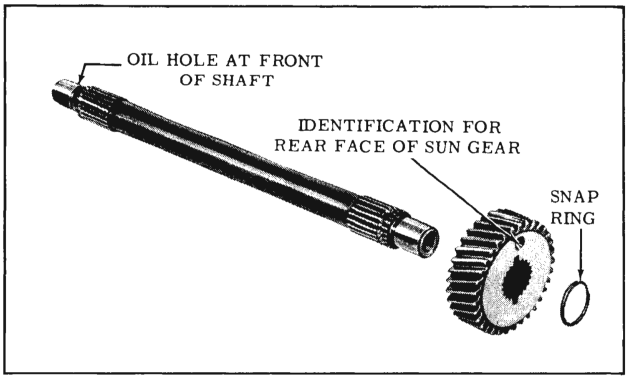


Fig. 3-243 Rear Sun Gear

38. Rotate transmission with the pan side up and remove retaining ring (spirlox) with an awl or pointed tool. (Fig. 3-241)
39. Push mainshaft through driven torus and remove driven torus.
40. Remove the driven torus to accel-a-rotor race, thrust bearing and second race from accel-a-rotor.
41. Inspect and remove if necessary, two lock type oil rings from driven torus.
42. Remove the mainshaft with sun gear and thrust washer from the rear of the transmission. (Fig. 3-242)
43. Remove the rear sun gear from the main shaft by removing the snap ring. (Fig. 3-243)
44. Remove the drive torus and accel-a-rotor as a unit. (Fig. 3-244)
45. Inspect and remove if damaged, one lock type oil ring from the accel-a-rotor.
46. Remove front carrier to rear carrier shaft snap ring. (Fig. 3-245)
47. Remove the front planet carrier assembly, bronze thrust washer, and front unit sun gear. (Fig. 3-246)

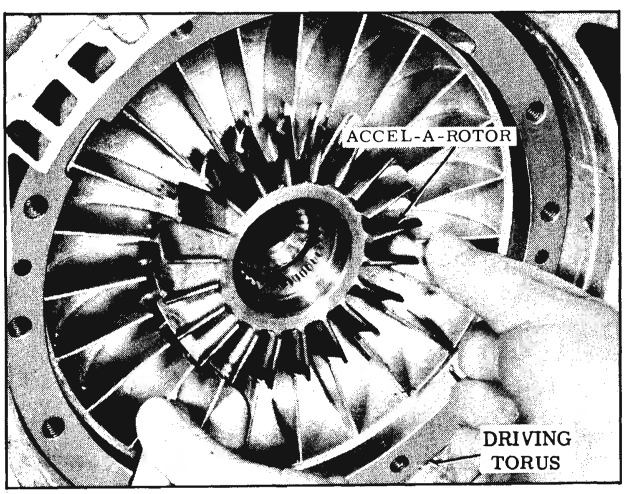


Fig. 3-244 Removing Drive Torus

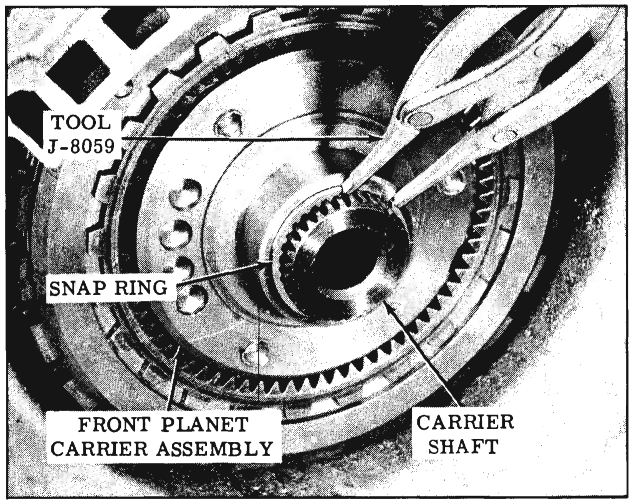


Fig. 3-245 Rear Carrier Snap Ring

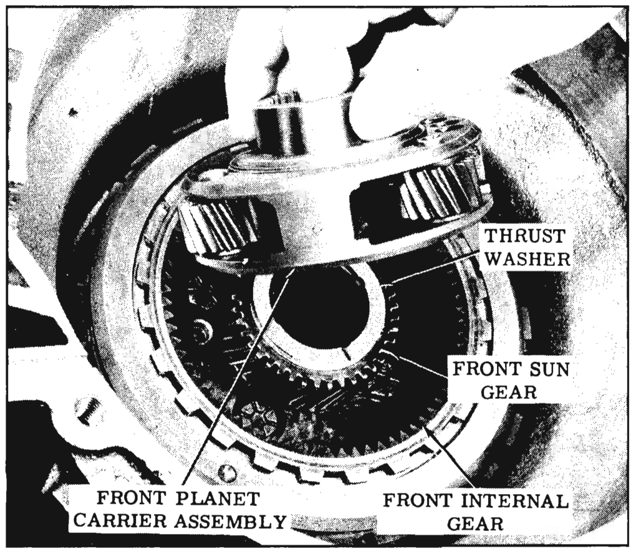


Fig. 3-246 Removing Front Unit Sun Gear

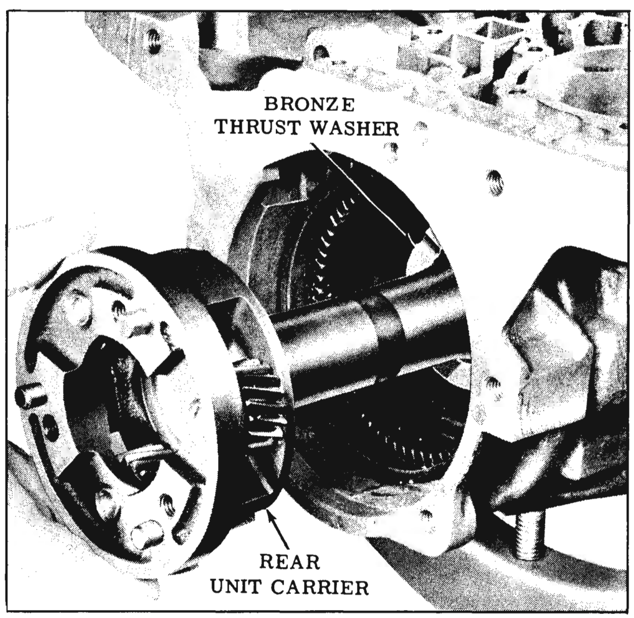


Fig. 3-247 Removing Rear Unit Carrier

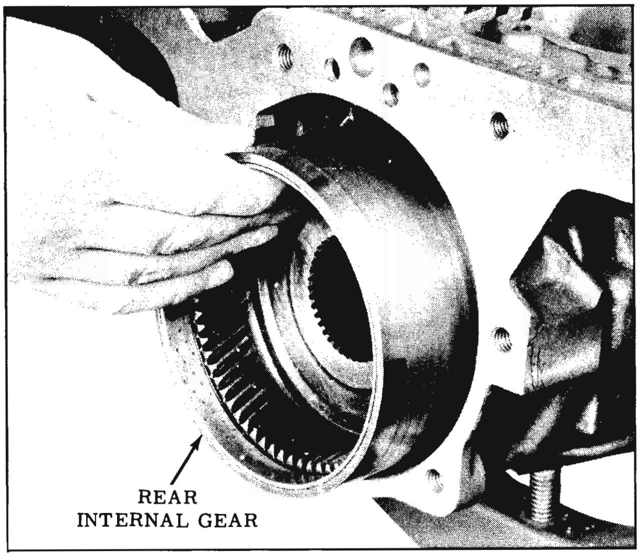


Fig. 3-248 Removing Rear Internal Gear

48. Remove the rear unit carrier assembly and internal gear bronze thrust washer from rear of transmission. (Fig. 3-247)

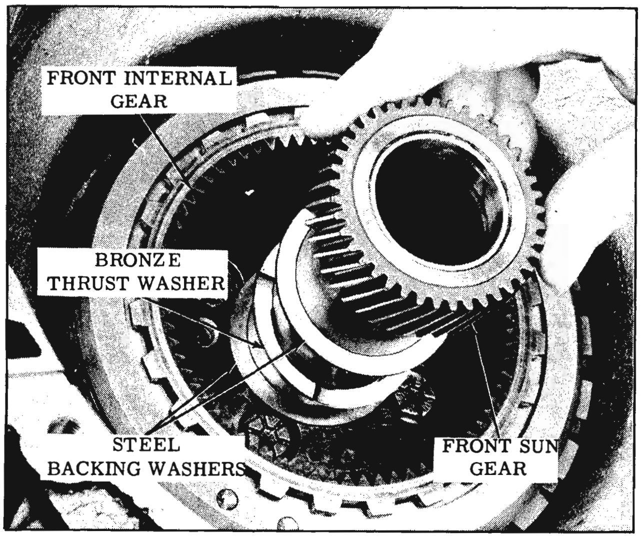


Fig. 3-249 Removing Sun Gear and Washers

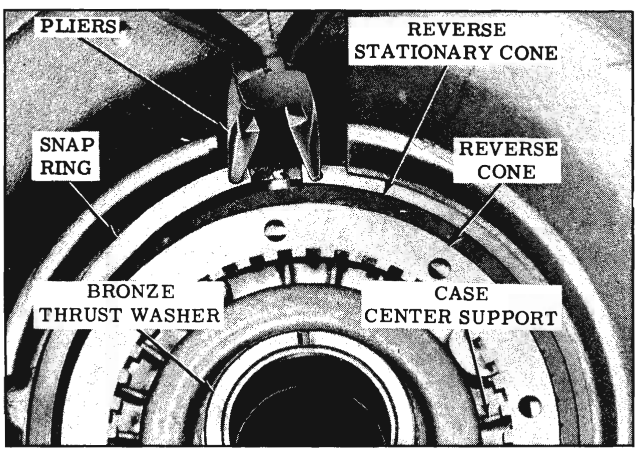


Fig. 3-250 Case Center Support Thrust Washer

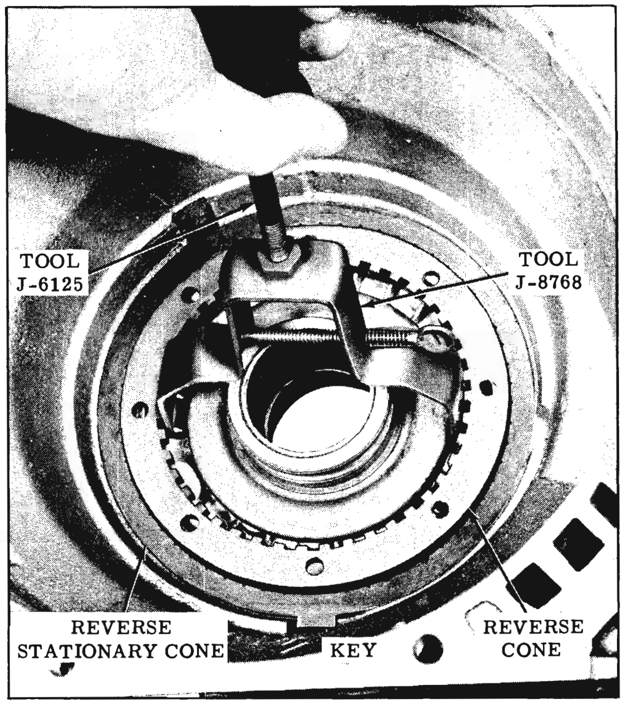


Fig. 3-251 Removing Reverse Cone

49. Remove the rear internal gear. (Fig. 3-248)

50. Rotate transmission front end up.

51. Remove the front sun gear and front internal gear backing washers and bronze thrust washer. (Fig. 3-249)

52. Remove the front unit internal gear and clutch housing assembly by lifting straight up.

53. Remove the front internal gear to case center support bronze thrust washer. (Fig. 3-250)

54. Remove the stationary cone to case snap ring.

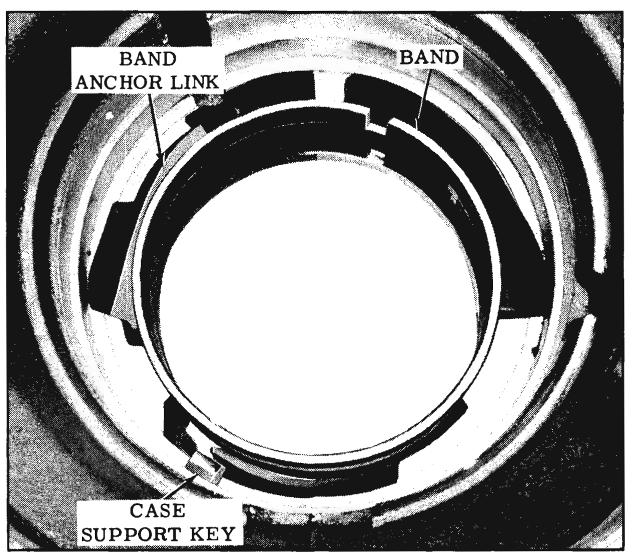


Fig. 3-252 Band and Band Anchor Link

55. Remove the reverse cone and stationary cone using Tool J-8768, Cone Remover. Slide hammer, Tool J-6125 may be used if reverse cone sticks. (Fig. 3-251)

56. Remove the case center support assembly. If unit does not remove easily, tap on the back of support with a brass drift. Remove the case center support key from the transmission case. (Fig. 3-252)

57. Lift the band and band anchor link out of case. (Fig. 3-252)

Disassembly and Assembly of Individual Units

TRANSMISSION CASE

Disassembly

1. If pressure leak was indicated on diagnosis, replacement of the pressure relief ball or spring may be necessary. Pull the tapered pin then remove spring and ball check valve. (Fig. 3-253)

   CAUTION: The spring is under considerable tension so extreme care should be exercised during disassembly.

   NOTE: Use a new pin on each assembly.

2. Remove two pressure take-off pipe plugs from transmission case..(Fig. 3-253)

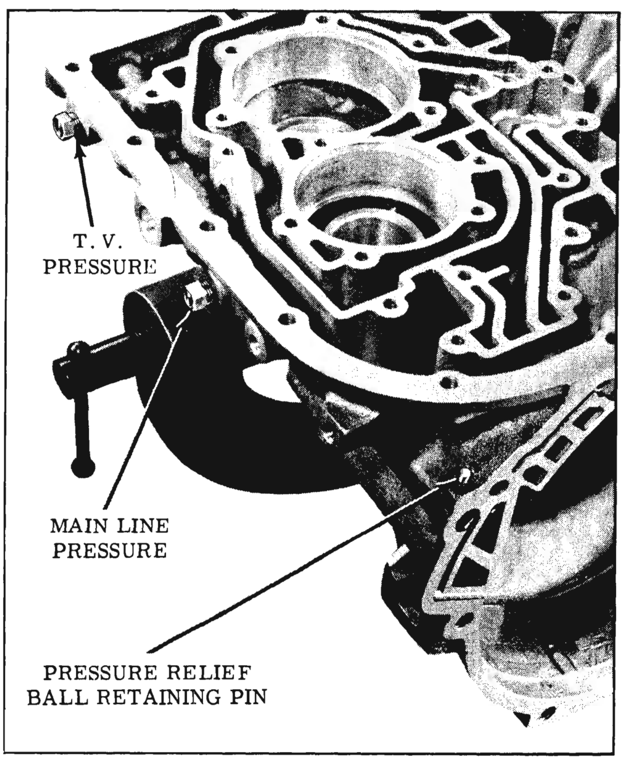


Fig. 3-253 Transmission Case

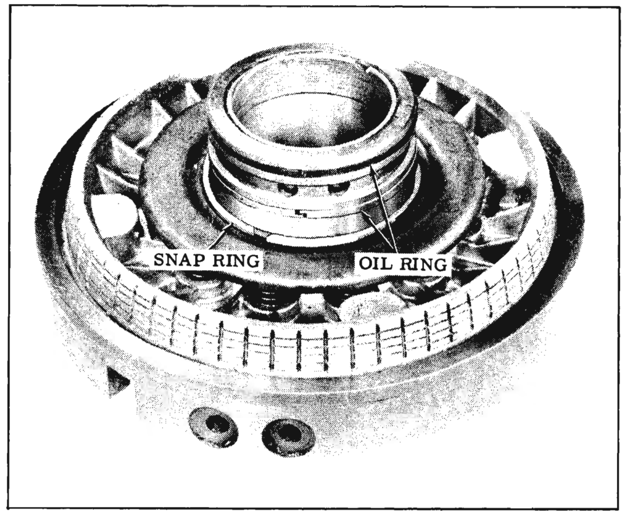


Fig. 3-254 Removing Case Support Oil Rings

Assembly

1. Install two pressure take-off pipe plugs.

2. Install the ball check valve, spring and tapered pin.

   CAUTION: Use extreme care when compressing spring and installing tapered pin.

Case Support

Disassembly

1. Remove two lock type oil rings from case support. (Fig. 3-254)

2. Remove snap ring as shown. (Fig. 3-255)

3. Remove tools.

4. Remove the spring retainer, 12 reverse clutch release springs, and reverse clutch piston. (Fig. 3-256)

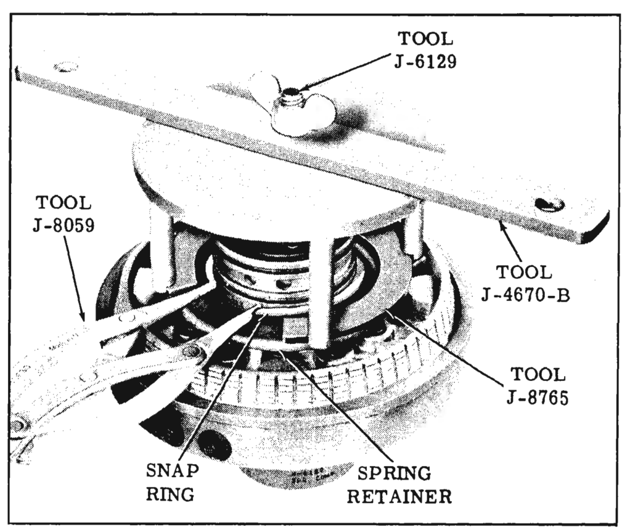


Fig. 3-255 Removing Case Support Snap Rings

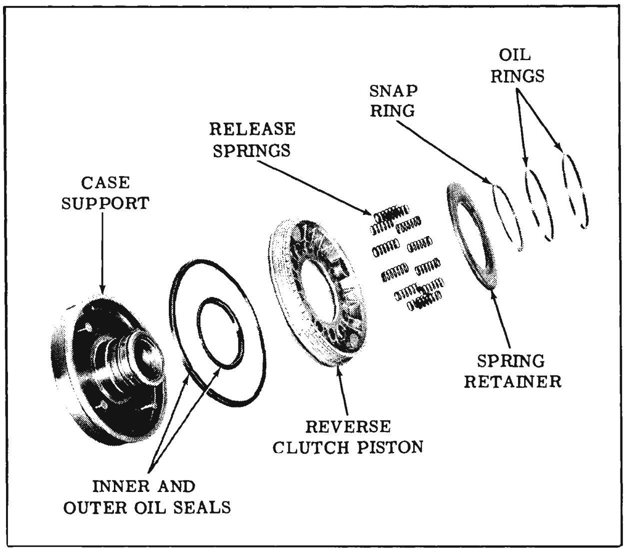


Fig. 3-256 Reverse Clutch

5. Remove the inner and outer reverse piston seals and discard.

Assembly

1. Install new inner and outer reverse piston seals so that lip of seals will face case support.

2. Install reverse piston inner seal protector J-8843 over oil delivery sleeve of case center support. (Fig. 3-257)

3. Install the reverse piston into the case center support guiding the outer piston seal into the support with a small screw driver. Piston will go on only two ways because of offset dowels. (Fig. 3-257)

4. Remove seal protector, J-8843.

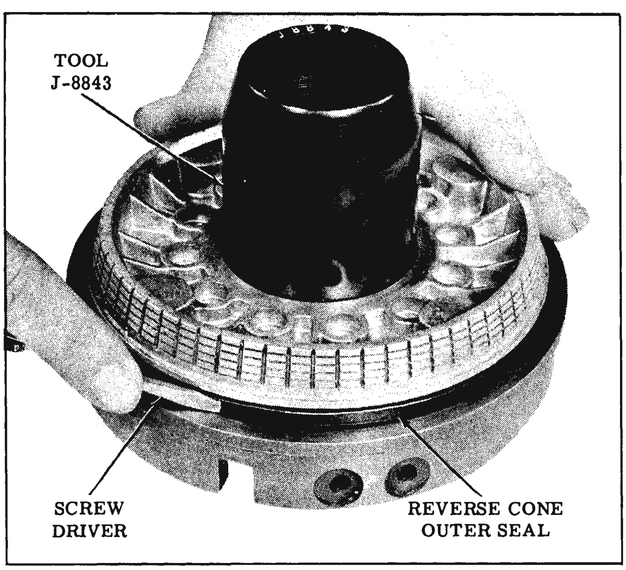


Fig. 3-257 Installing Outer Piston Seal

5. Install twelve reverse clutch release springs, and spring retainer. Be sure all release springs are properly seated in their pockets.

6. Place snap ring on case support and attach all spring compressing tools. (Refer to Fig. 3-255)

7. Install case support spring retainer snap ring and remove all tools.

8. Install two new lock type oil rings.

Front Internal Gear and Clutch Housing Assembly

Disassembly

1. Install Tool J-8938, (two studs) in dowel pin holes in clutch housing assembly and secure in vise. (Fig. 3-258)

2. Remove four front internal gear to clutch housing attaching bolts.

3. Remove assembly from dowel pins and place on bench. Separate the internal gear and clutch drum by tapping on assembly to free internal gear from dowel pins.

4. Remove front unit internal gear, backing plate, and discs. (Fig. 3-259)

5. Remove twenty clutch release springs, clutch piston and outer piston seal. Discard the seal.

6. Remove the inner clutch piston seal from the clutch housing and discard.

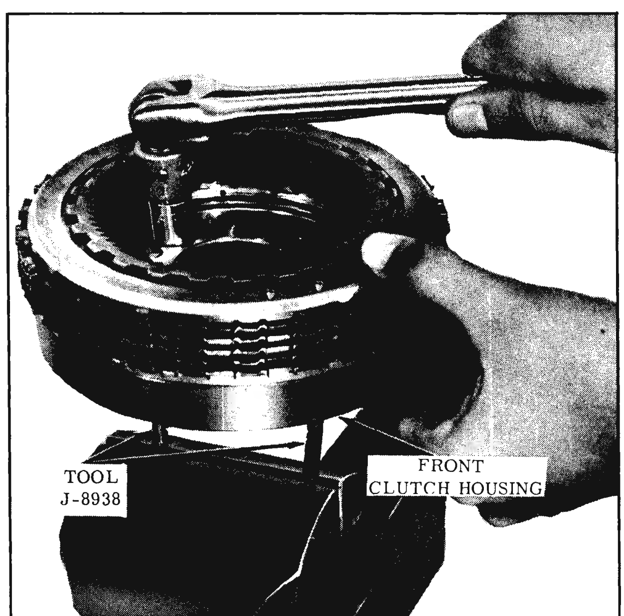


Fig. 3-258 Internal Gear Attaching Bolts

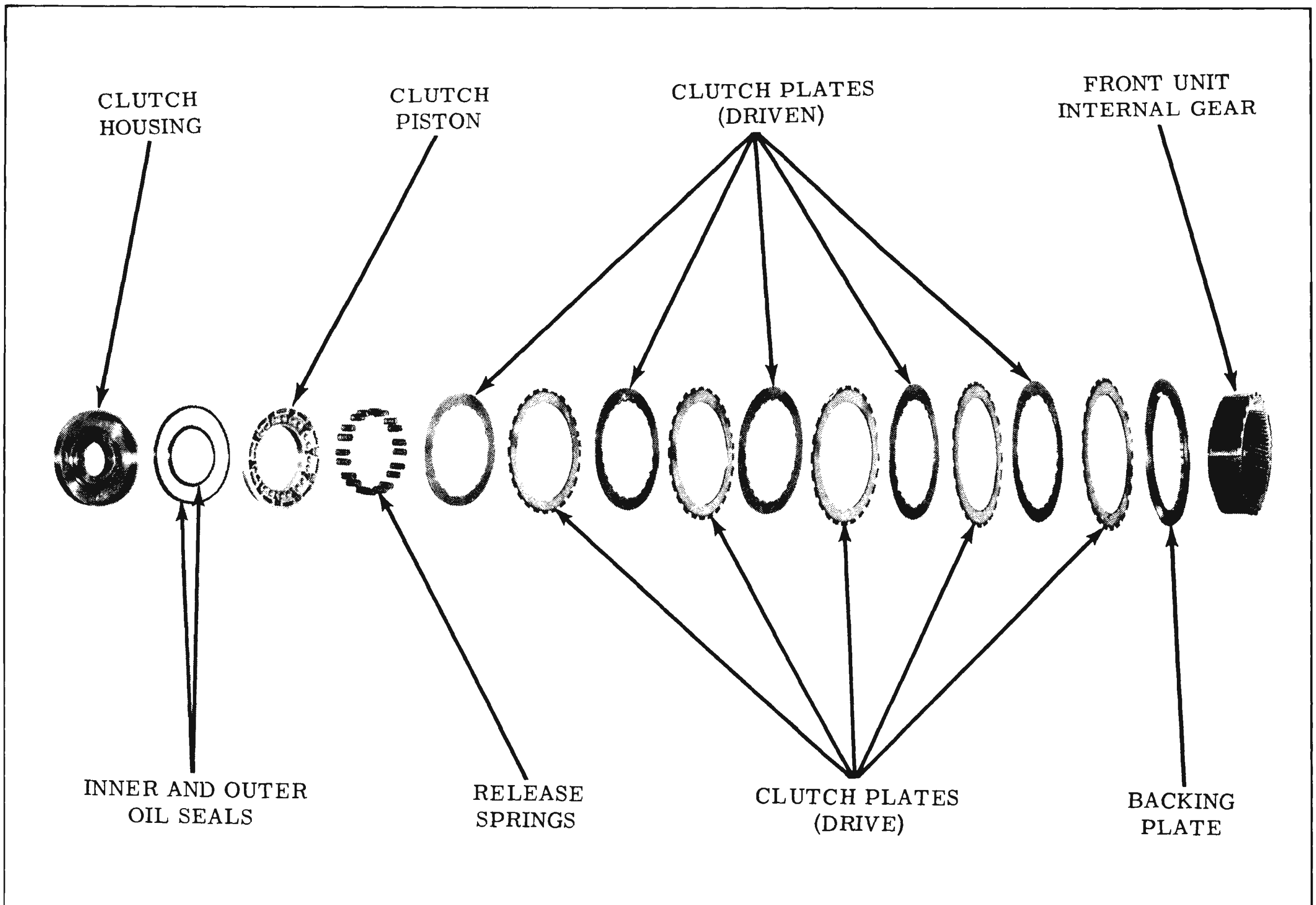


Fig. 3-259 Front Unit Clutch Assembly

Assembly

1. Install a new inner piston seal on the clutch housing, with lip of seal facing down.

2. Install a new outer piston seal on the clutch piston with lip of seal facing the flat side of piston and lubricate with No. 567196 Lubricant.

3. Install piston into clutch housing using small screw driver to guide outer seal into bore. (Fig. 3-260)

4. Install twenty clutch release springs into pockets in clutch piston.

5. Install the front clutch backing plate over front internal gear with counter bore facing tooth flange on front internal gear.

6. Install five composition drive and five steel driven front clutch plates alternately, nesting them as follows: (Fig. 3-261)

   a. Place a composition clutch plate over the front unit internal gear.

   b. Place a steel plate over the internal gear and notice the position of the slight half moon notch in the edge of the steel plate.

   c. Continue to install the composition and steel plates alternately so that all steel plates have their notches one above the other.

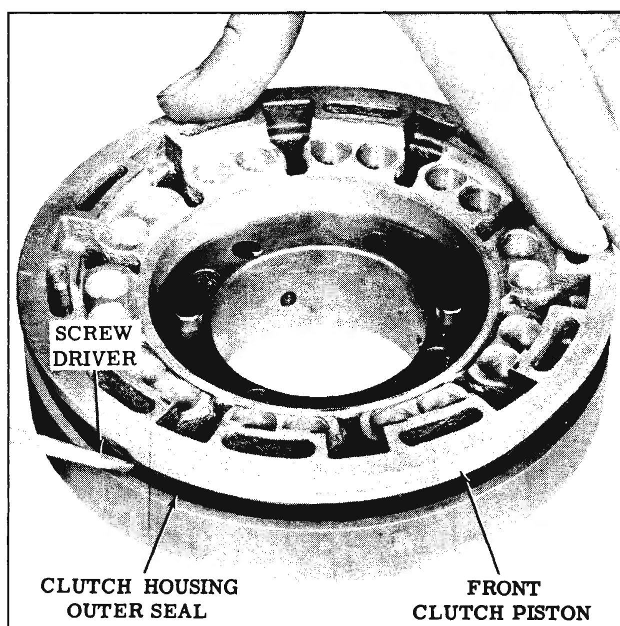


Fig. 3- 260 Installing Outer Clutch Piston Seal

Fig. 3-261 Assembling Clutch Plates

7. Carefully, place the front unit internal gear backing plate and clutch plates over the front clutch housing, aligning the dowel pins and holes, and holding the lower (steel) plate in position on the internal gear.

8. Install four front internal gear to clutch housing attaching bolts. Tighten bolts lightly and evenly using caution so as not to pinch bottom steel plate between internal gear and clutch piston.

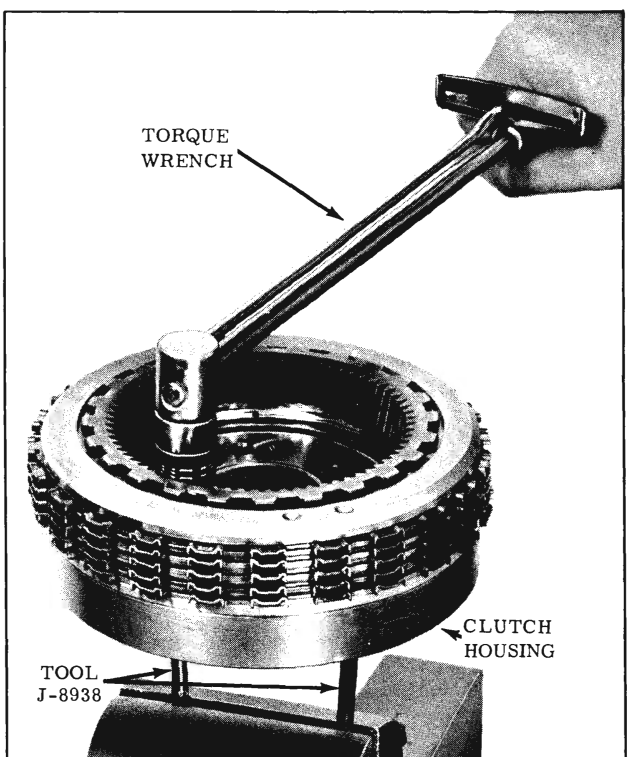


Fig. 3-262 Assembling Clutch Housing

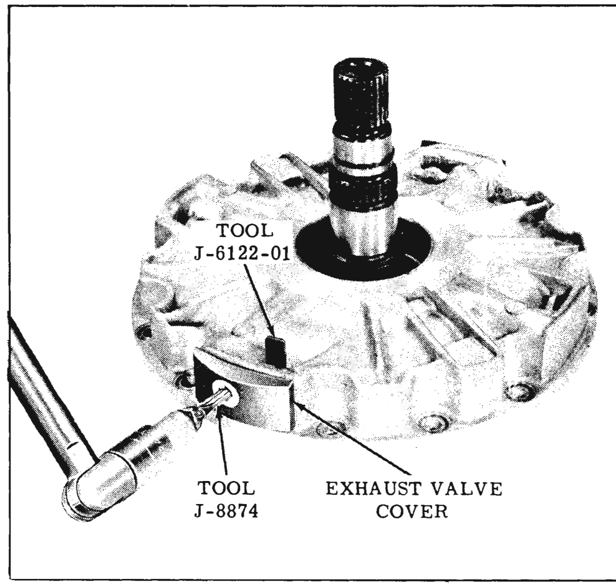


Fig. 3-263 Removing Exhaust Valve Covers

9. Install Tool J-8938 (studs) in dowel pin holes in clutch housing assembly and secure in vise. (Fig. 3-262) Torque 22-27 ft. lbs.

Torus Cover

Disassembly

1. Install Tools J-6122-01 Exhaust Valve Retainers, then remove the exhaust valve covers by removing the attaching screws, using Tool J-8874. (Fig. 3-263)
2. Remove the two steel torus exhaust valve cover gaskets and discard.
3. Remove the two exhaust valves and springs. (Fig. 3-264)

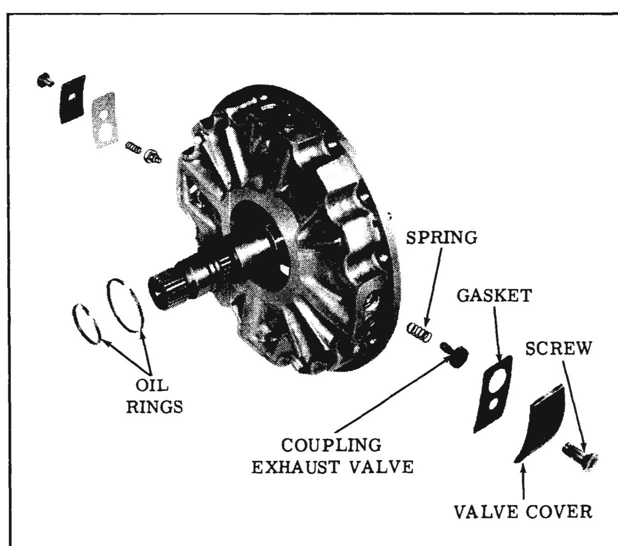


Fig. 3-264 Torus Cover Assembly

4. Inspect and remove, if necessary, two lock type oil rings from input shaft.

Assembly

1. Install two new lock type oil rings on input shaft, if removed.
2. Install exhaust valve springs and valves.
3. Retain the valves with Tools J-6122-01.
4. Replace torus cover exhaust valve covers, and new gaskets with attaching screw and Tool J-8874. Torque to 20-25 ft. lbs. (Fig. 3-265)
5. Remove Tools J-6122-01.

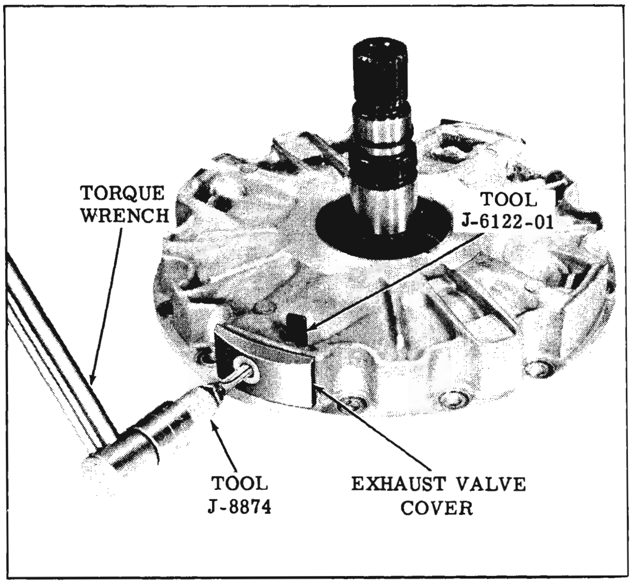


Fig. 3-265 Installing Exhaust Valve Cover

Rear Bearing Retainer (Fig. 3-266)

Disassembly

1. Remove the reverse blocker valve and spring by removing the "E" ring.
2. Remove the detent plunger and spring by holding plunger against spring tension while removing the retainer. (Fig. 3-267)

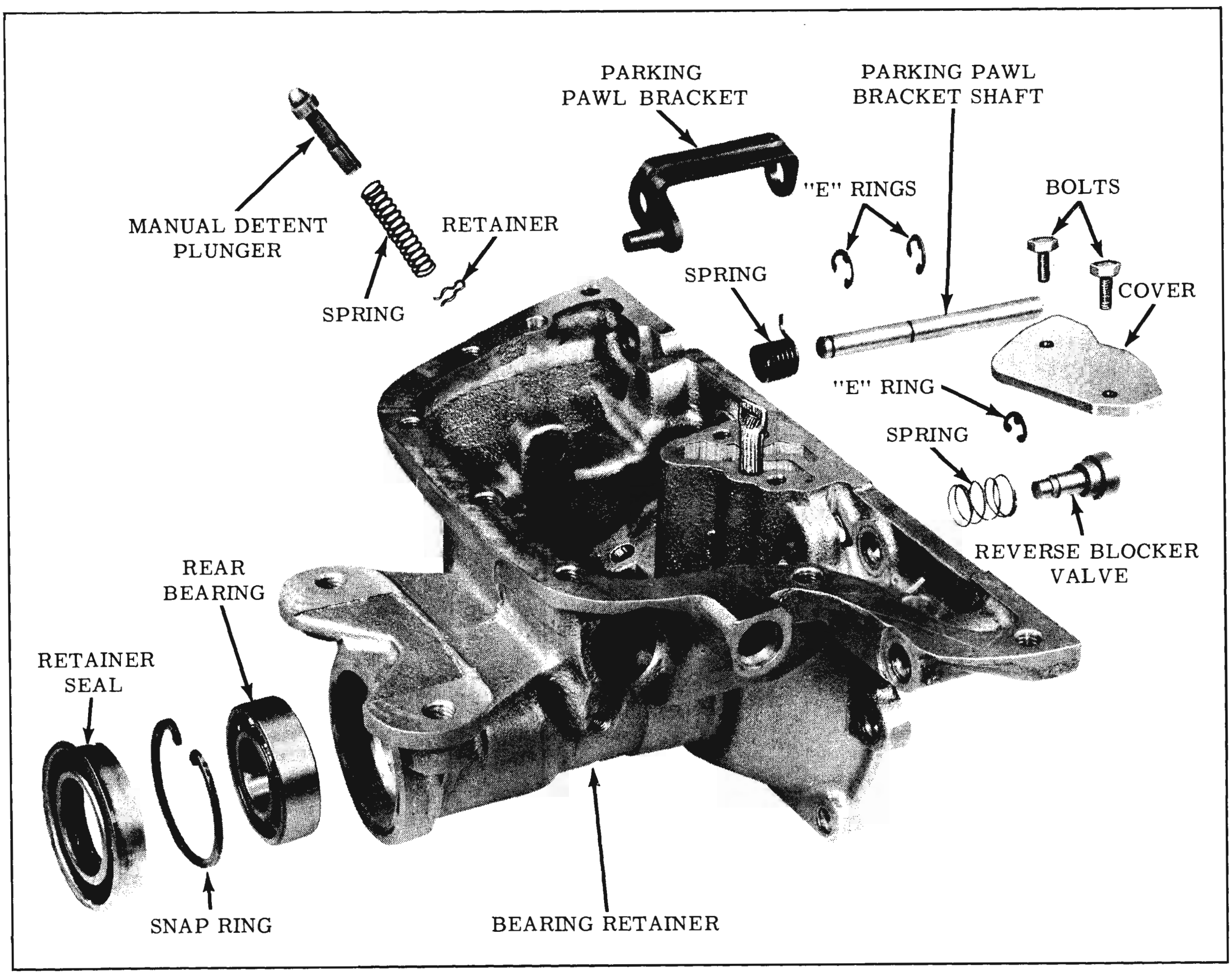


Fig. 3-266 Rear Bearing Retainer

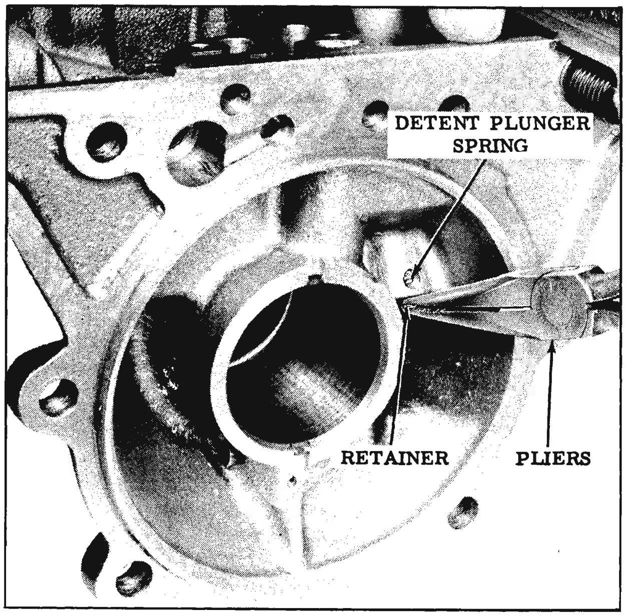


Fig. 3-267 Removing Detent Plunger

3. Remove rear bearing snap ring, and remove bearing. (Fig. 3-266)

4. If necessary to remove parking pawl bracket shaft, remove two bracket shaft "E" rings. (Fig. 3-269)

Assembly

1. Install the rear bearing and snap ring.

2. Install the detent plunger and spring, compress the plunger and spring and install the retainer. (Fig. 3-267)

3. Install the reverse blocker valve and spring into the rear bearing retainer and secure with "E" ring.

4. Apply a coating P.O.B. #2, to outer diameter of the rear oil seal and install with Tool J-5154. (Fig. 3-269)

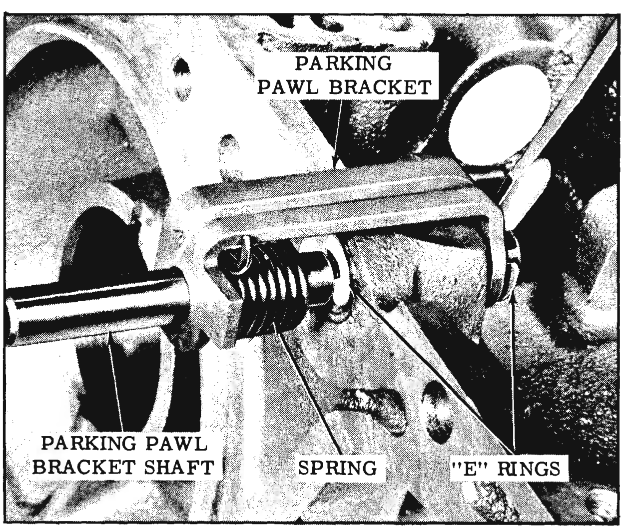


Fig. 3-268 Removing Parking Pawl Bracket

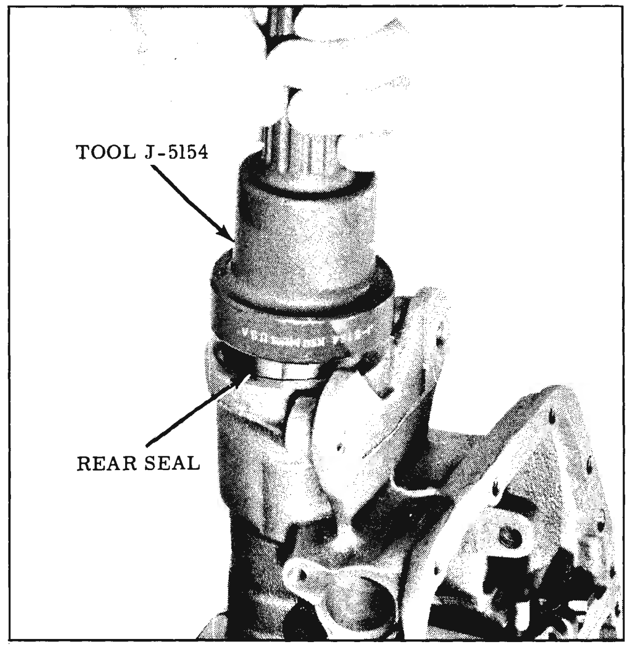


Fig. 3-269 Installing Rear Seal

5. Install the parking pawl bracket, shaft and spring into bearing retainer and install two "E" rings on shaft. (Fig. 3-270)

Governor

Disassembly

1. Inspect and remove, if necessary, 4 lock type oil rings. (Fig. 3-271)

2. Remove the G-2 valve retainer, plug and valve.

Assembly

1. Install the G-2 valve, stem end out.

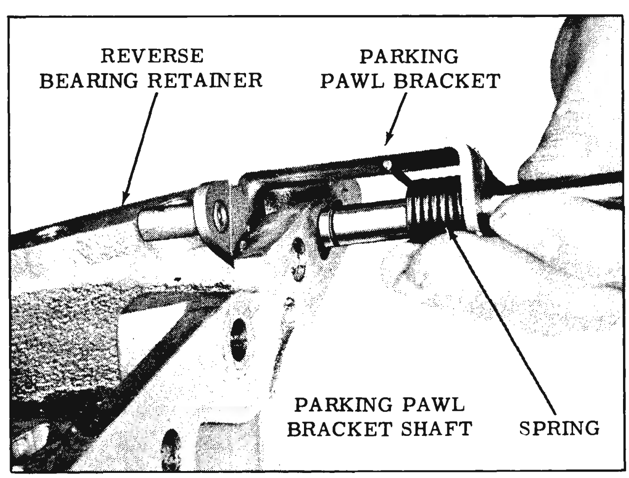


Fig. 3-270 Installing Parking Pawl Bracket

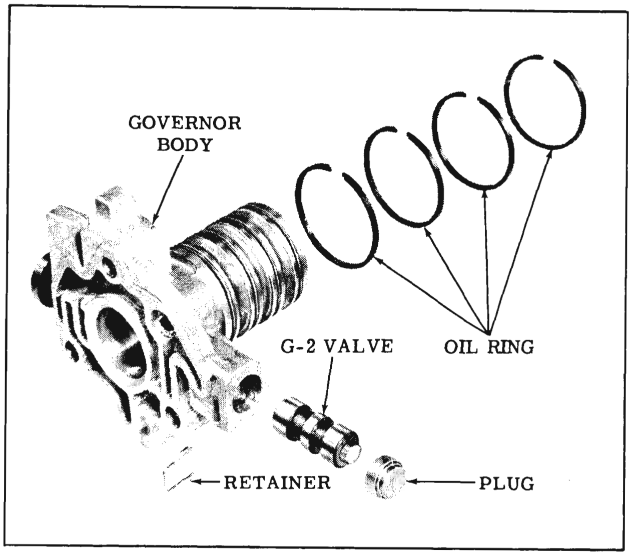


Fig. 3-271 Removing Govenor Oil Rings

2. Install the G-2 plug, cupped end first.

3. Install the G-2 valve plug retainer and 4 new lock type oil rings if removed.

Servo Assembly

Disassembly

1. Clamp servo piston assembly and Tool J-8760 in a vice to compress springs for snap ring removal. (Fig. 3-272)

2. Using Tool J-8871 remove the snap ring.

3. Carefully loosen vice and remove assembly

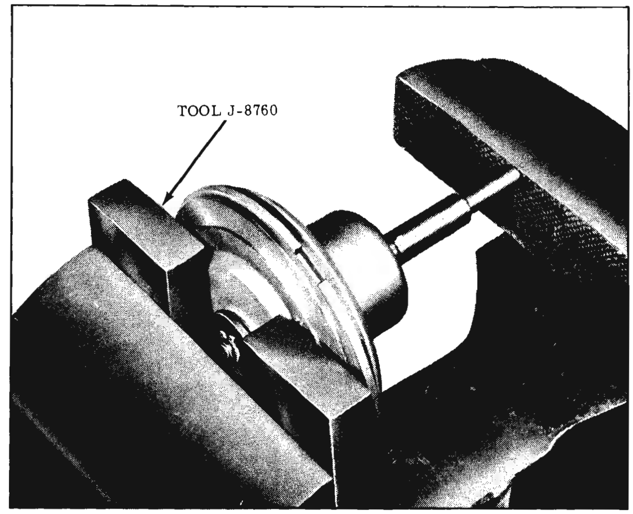


Fig. 3-272 Servo Piston Snap Ring

and Tool J-8760.

4. Remove the large servo piston washer, piston and ring, primary spring (large), servo accumulator washer, secondary spring (small) and the retainer. (Fig. 3-273)

Assembly

1. Place spring retainer on servo pin.

2. Install secondary spring, primary spring and small washer on piston pin.

3. Install the servo piston, cupped side first.

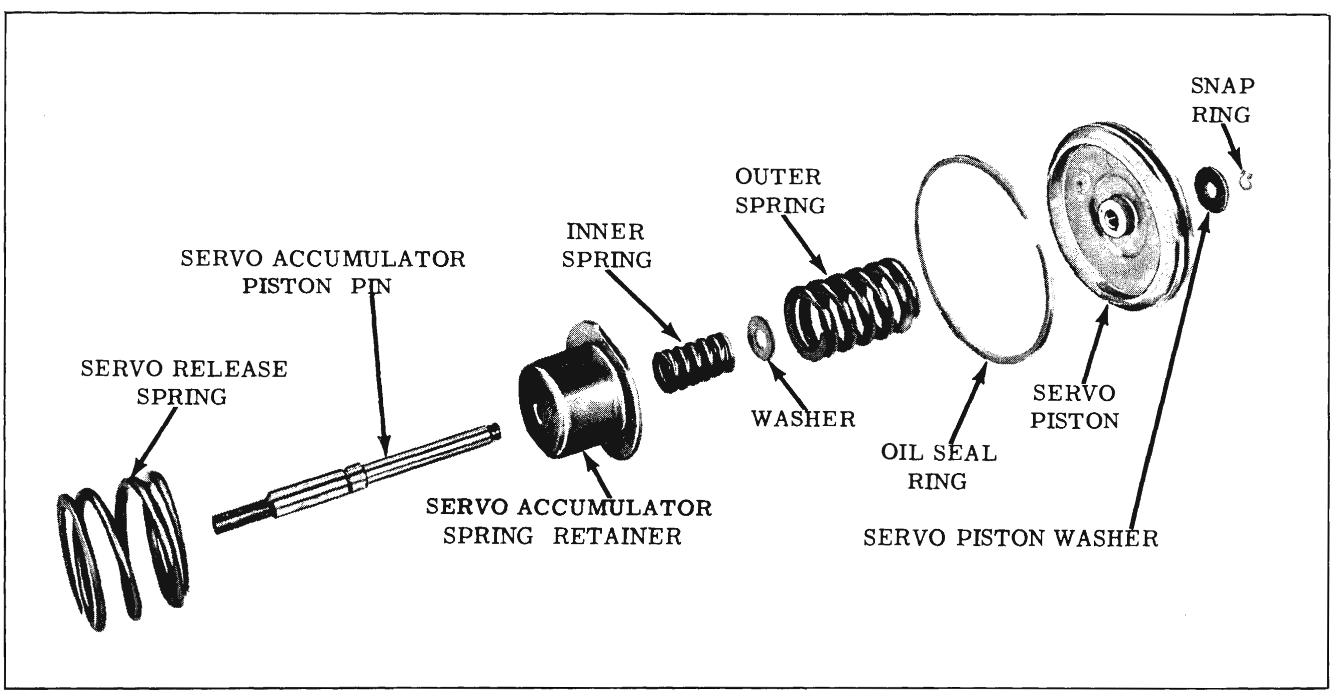


Fig. 3-273 Servo Piston Assembly

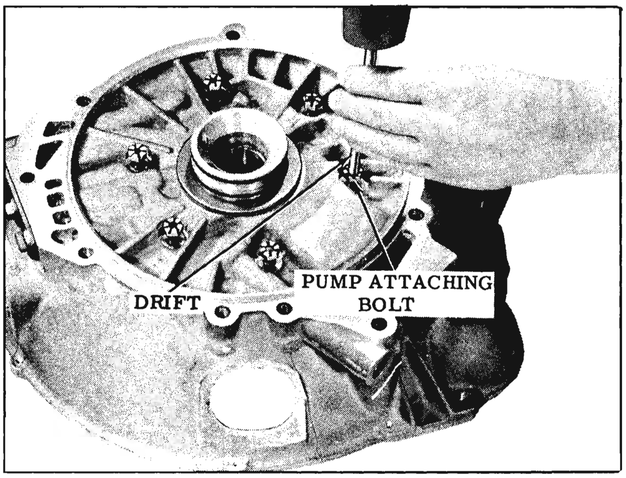


Fig. 3-274 Servo Piston Assembly

4. Place the assembly and Tool J-8760 in a vise to compress the springs.

5. Install the large flat washer with the identification groove towards the piston.

6. Install a new retaining ring using Tool J-8871. Do not expand the snap ring further than required for assembly.

7. Remove the servo piston assembly and tool from the vise.

Accumulator Piston

Disassembly

1. Remove and discard the lip seal from the upper accumulator piston, if necessary.

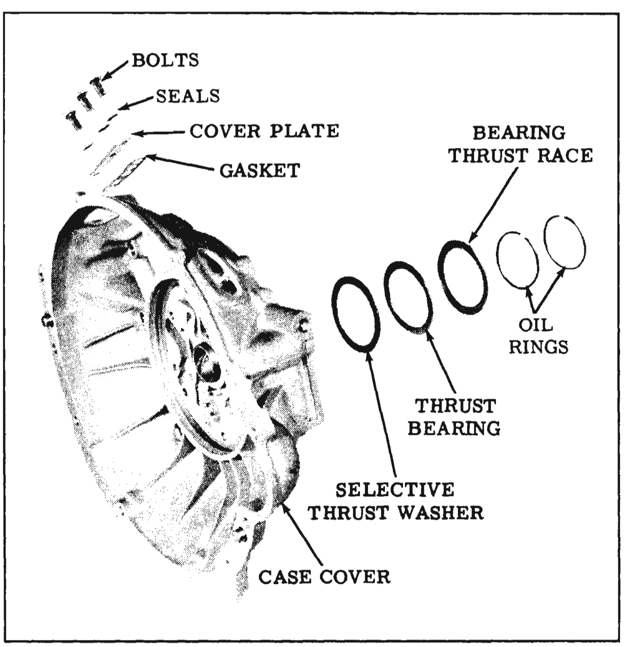


Fig. 3-275 Case Cover Assembly

2. Inspect seal ring on lower accumulator piston and replace if necessary.

Assembly

1. Install a new piston seal on the upper accumulator piston, lip facing flat side of piston and new ring on lower if removed.

Case Cover and Pump

1. Loosen the 6 case cover to pump attaching bolts, approximately 4 turns each.

2. Carefully, tap on the bolt heads to free the pump and "O" ring seal from the case cover assembly. (Fig. 3-274)

3. Remove the case cover to pump attaching bolts and remove the pump.

Case Cover

Disassembly

1. Remove two lock type oil rings from the case cover hub. (Fig. 3-275)

2. Remove cupped race, thrust bearing and the selective washer. (Fig. 3-276)

3. Remove the case cover plate and gasket by removing three bolts and bolt head seals.

Assembly

1. Install the case cover plate and gasket using the three attaching bolts and bolt head washer seals, torque 18-20 ft. lbs. (Fig. 3-275)

2. Install the predetermined selective washer over the hub of the case cover.

3. Install the thrust bearing and cupped race with cover over bearing and two lock type oil rings.

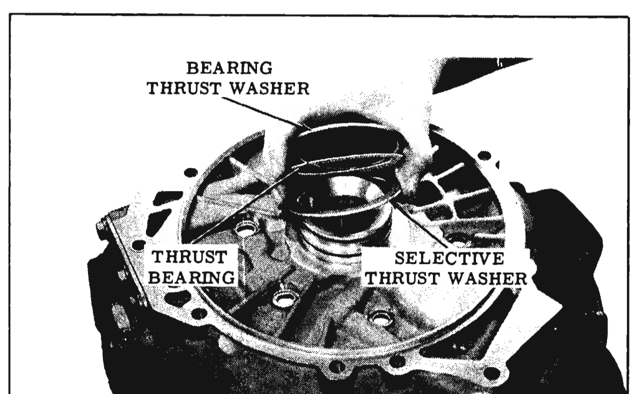


Fig. 3-276 Removing Case Cover Bearing

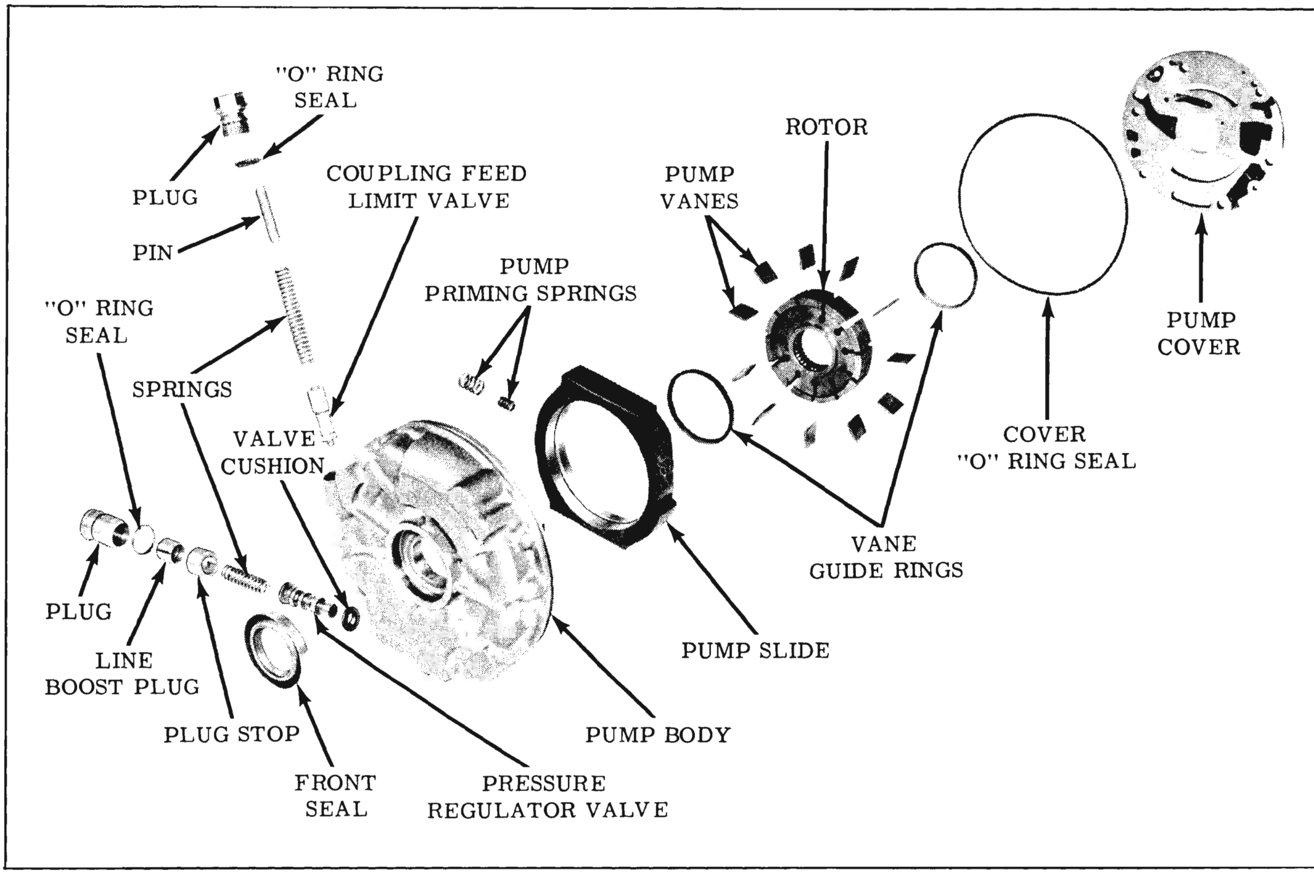


Fig. 3-277 Pump Assembly

Pump

Disassembly (Fig. 3-277)

1. Inspect and if condition indicates replacement is necessary, remove and discard pump to case cover "O" ring.

2. Remove the pump cover by removing one attaching screw (Fig. 3-278)

3. Remove the upper vane ring, rotor, eleven vanes and the bottom vane ring.

4. Remove pump slide. (Fig. 3-279)

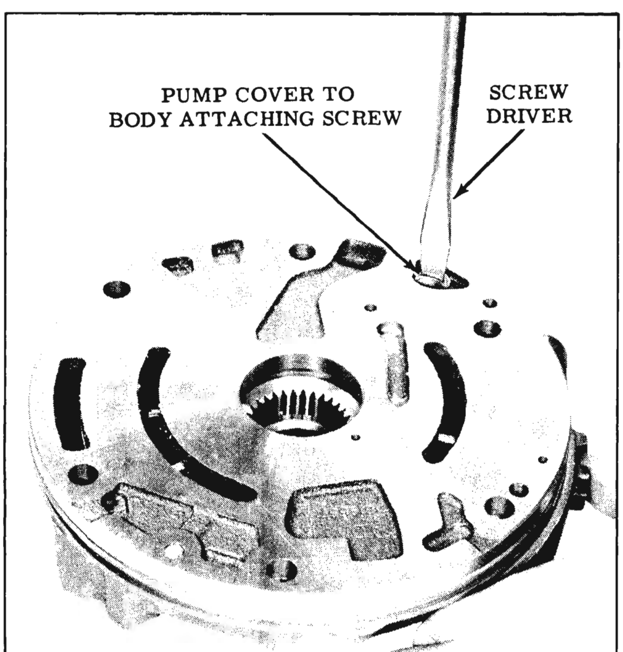


Fig. 3-278 Removing Pump Cover

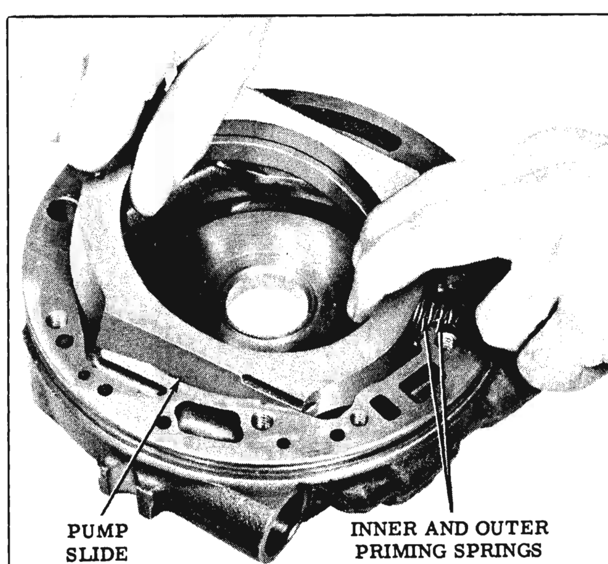


Fig. 3-279 Removing Pump Slide

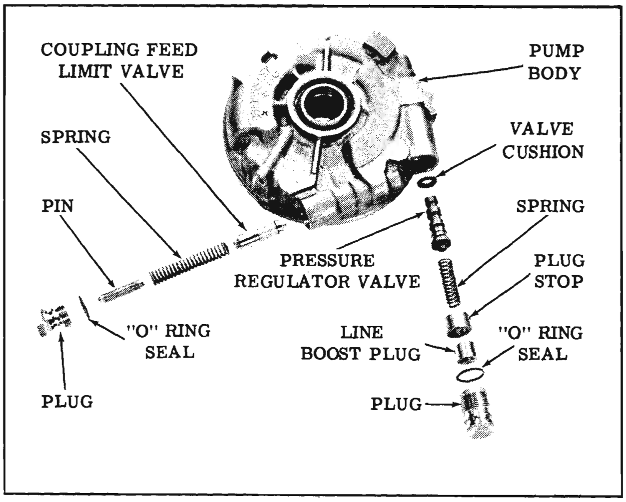


Fig. 3-280 Pump Valves

5. Remove the inner and outer priming springs.

6. Remove the coupling feed limit valve plug and "O" ring. Inspect and remove the "O" ring if necessary. (Fig. 3-280)

7. Remove the coupling feed limit valve spring, valve and pin. (Fig. 3-280)

8. Remove the pressure regulator plug, "O" ring seal and line boost plug. (The line boost plug is in the pressure regulator plug). Inspect and remove the "O" ring, if necessary.

9. Remove the pressure regulator spring, valve and line boost plug stop. (Fig. 3-280)

10. Do not remove the pressure regulator valve cushion unless replacement is necessary.

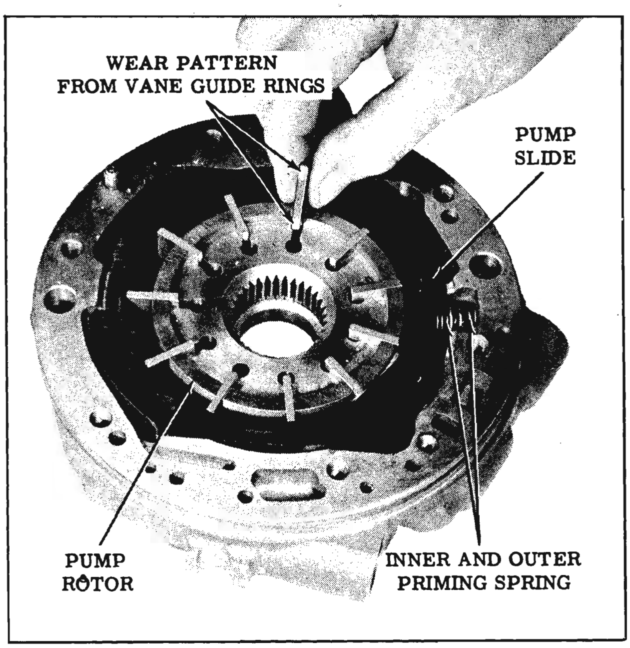


Fig. 3-281 Installing Pump Valves

Assembly

1. Install a new pressure regulator valve cushion if replacement is necessary. (Fig. 3-280)

2. Install the pressure regulator valve, spring, plug stop, boost plug, "O" ring and plug. Torque plug 15-20 ft. lbs. (Fig. 3-280)

3. Install the coupling feed limit valve spring, pin, "O" ring and plug. Torque 15-20 ft. lbs. (Fig. 3-280)

4. Install the inner and outer priming springs and slide. (Slide will only fit one way). (Fig. 3-281)

5. Install the lower vane guide ring into the pump body.

6. Install the pump rotor into the pump body, so that the shoulder on the rotor seats over the raised center portion of the pump body.

7. Install eleven vanes so the vane ring wear pattern on the edge of the vanes faces towards the vane rings. (Fig. 3-281)

8. Install the upper vane guide ring.

9. Install the pump cover by locating on pin and secure with one attaching screw. Torque 6-8 ft. lbs.

10. Install pump body to case cover "O" ring seal, if removed.

Assembly of Pump to Case Cover

1. Support pump assembly on convenient support to raise the pump above the work bench enough to allow the case cover to fit against the pump.

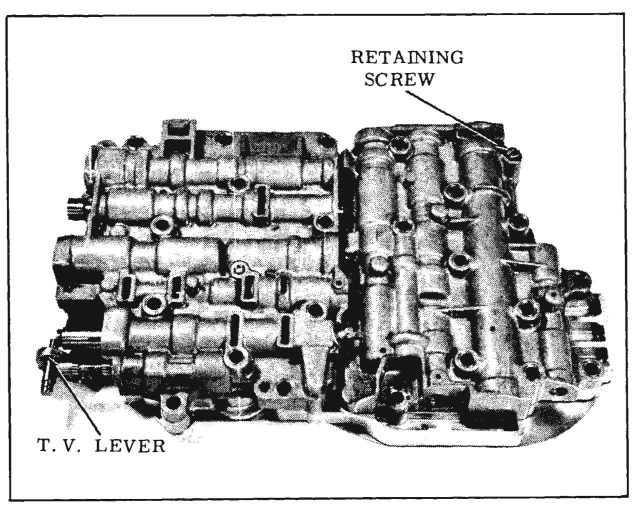


Fig. 3-282 Control Valve Assembly

2. Align the case cover to pump bolt holes and position the case cover on the pump. Holes will only align in one position.

3. Install six case cover to pump attaching bolts, drawing the bolts up evenly to properly seat the "O" ring seal in the case cover. Torque 20-25 ft. lbs.

CONTROL VALVE

Disassembly of Complete Control Valve

1. Remove one secondary body to channel plate attaching screw. (Fig. 3-282)

2. Place the control valve assembly with the channel plate to case spacer facing up on a clean surface.

3. Remove 3 spacer plate attaching screws and the channel plate to case spacer. (Fig. 3-283)

4. Remove (2) 5/16 dia. and (2) 3/16 dia. ball check valves from the channel plate. (Fig. 3-284)

5. Remove 4 channel plate to valve body attaching screws and the channel plate assembly.

6. Remove the channel plate to valve body spacer.

7. Remove (2) 1/4 dia. check balls from the primary valve body. (Fig. 3-285)

8. Place the secondary body assembly aside temporarily.

Disassembly of the Primary Valve Body

Position the primary body with the band apply

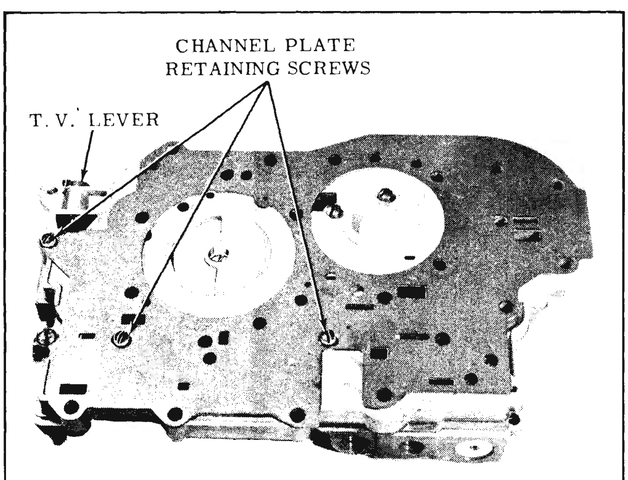


Fig. 3-283 Control Valve Assembly

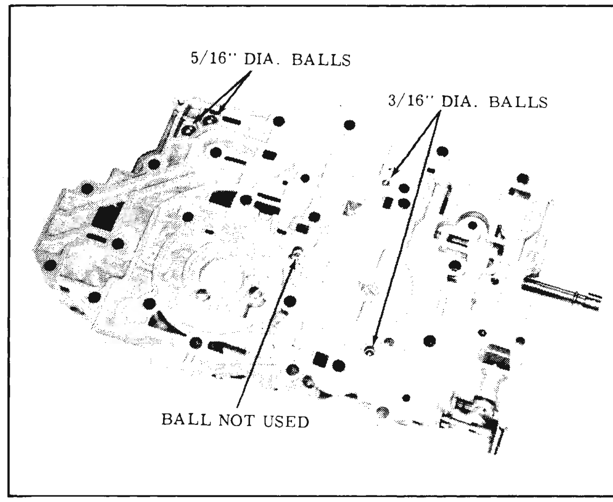


Fig. 3-284 Ball Checks

valve in the lower right hand corner. (Fig. 3-286)

1. Remove the manual valve from primary body.

2. Remove the detent valve spacer, valve and spring.

3. Remove the band apply valve retainer from the cored face lower right hand side.

4. Remove the band apply valve, bushing, spring and T.V. spring.

5. Remove the throttle valve retainer from the cored face at the T.V. valve.

6. Remove the T.V. valve.

7. Remove the T.V. thermostatic retaining clip and element.

NOTE: Do not tamper with the factory set T.V. element adjusting screw.

8. From the left side, next bore up; remove the retaining pin and bore plug.

9. Remove the secondary compensator valve and spring and, primary compensator spring.

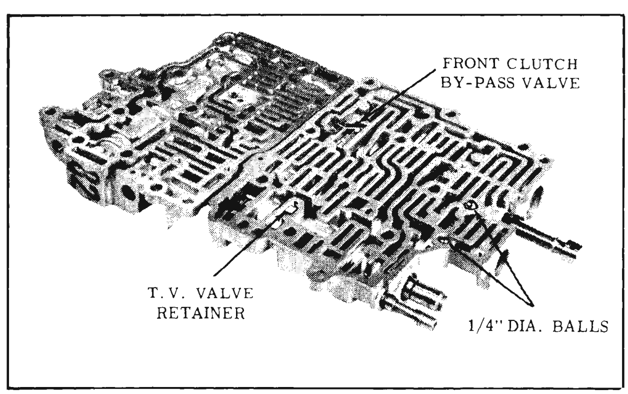


Fig. 3-285 Ball Checks

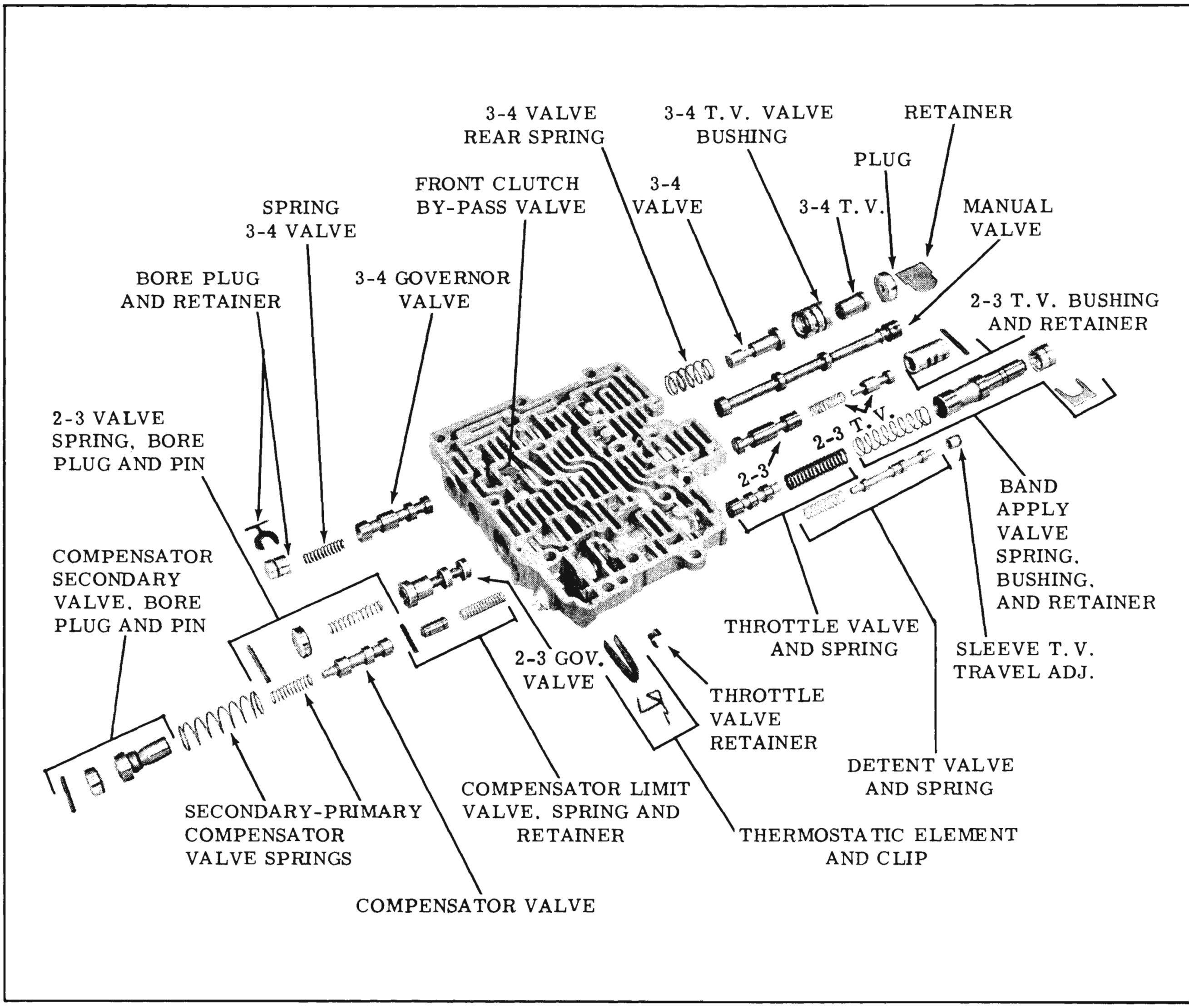


Fig. 3-286 Primary Valve Body

10. Remove the primary compensator valve.

11. Compress the compensator limit valve against its spring and remove the retaining pin.

12. Remove the compensator limit valve and spring.

NOTE: The OX model transmission uses a second compensator valve in place of the spring.

13. From the right side, next bore up; remove the the retaining pin, 2-3 bushing, T.V. valve and spring.

14. Remove the 2-3 valve from the same bore.

15. From the left side remove the retaining pin, bore plug, 2-3 spring and governor valve.

16. From the upper bore, left side remove plug retaining clip, and bore plug.

17. Remove the 3-4 spring and 3-4 governor valve.

18. From the upper bore right side, remove the bore plug retainer, bore plug, 3-4 T.V. valve and bushing.

19. Remove the 3-4 valve and rear 3-4 spring.

NOTE: Do not remove the front clutch by-pass valve unless necessary to replace.

Assembly of Primary Valve Body (Fig. 3-286)

1. Install the 3-4 governor valve (end with hole out) into the upper bore, left side.

2. Install the 3-4 spring, bore plug (cupped end over spring) and bore plug retainer.

3. Place rear 3-4 spring on 3-4 valve and install both parts into right side of upper bore.

4. Install the 3-4 T.V. valve into the bushing so that the valve enters the bushing completely.

5. Install the 3-4 T.V. valve and bushing into the primary body, small end of 3-4 T.V. valve first.

6. Install the 3-4 T.V. bore plug (hole out) and retainer.

7. Install the 2-3 governor valve into the left side of the third bore down.

8. Install the 2-3 spring, bore plug (end with hole over spring) and retaining pin.

9. In right side of same bore install the 2-3 valve, hole end out.

10. Install the 2-3 T.V. spring.

11. Install the 2-3 T.V. valve into the bushing and install the assembly into the primary body.

12. Install the 2-3 T.V. bushing retaining pin. Be sure pin is completely below the face of the primary body.

13. On left side, fourth bore down, install the compensator limit spring and valve. Compress the spring to install the retaining pin through the face of the body.

14. Install the primary compensator valve (stem end out).

15. Install the primary and secondary compensator springs.

16. Install the secondary compensator valve, bore plug (hole out) and retaining pin.

17. Install the T.V. thermostatic element and retaining clip into the pocket in the primary body.

18. Install the T.V. valve (stem end out) into the right side of the fifth bore down.

19. Install the T.V. spring and band apply spring into the band apply valve.

20. Install the band apply valve and springs into the T.V. bore.

21. Install the band apply valve bushing and the retainer. Be sure retainer fits in groove in bushings.

22. Install the T.V. valve retainer with the long leg reaching into the valve bore and the short leg resting on the step.

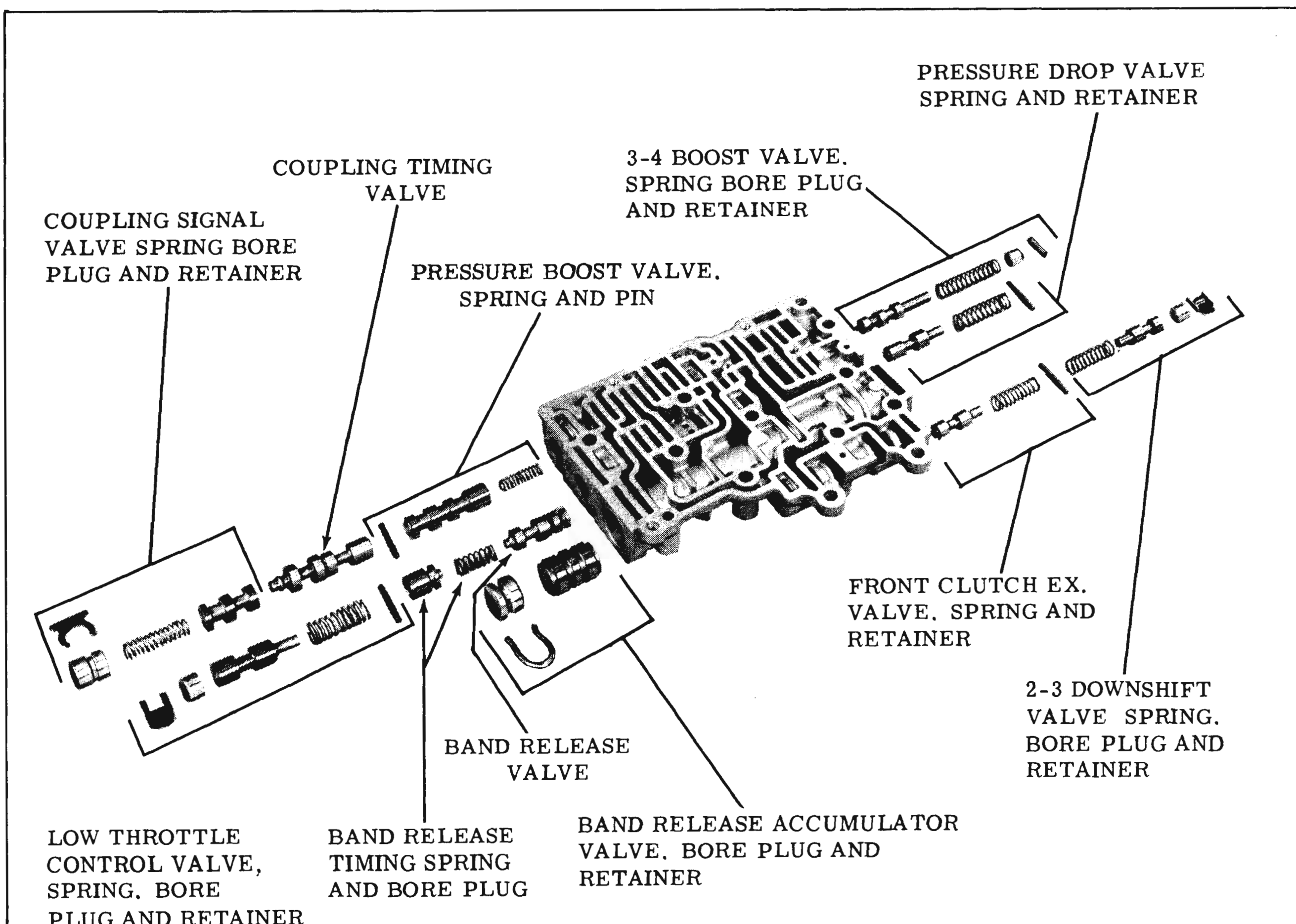


Fig. 3-287 Secondary Valve Body

23. Install the detent spring and valve into the last bore.

24. Place detent valve spacer sleeve on valve.

25. Place completed primary assembly aside temporarily.

Disassembly of the Secondary Valve Body (Fig. 3-287)

1. Place the secondary body assembly on a clean surface with the cored face up and the two bolt hole ears located at the lower right hand corner.

2. Starting at the upper left corner, compress the bore plug and remove the retainer clip.

3. Remove the bore plug, signal spring, coupling signal valve and coupling timing valve.

4. Compress the pressure boost valve and remove the retaining pin.

5. Remove the pressure boost valve and spring.

6. On the right side, upper bore; compress the bore plug and remove the retaining pin and bore plug.

7. Remove the 3-4 boost spring and valve.

8. On the right side next bore down; remove the retaining pin, spring and pressure drop valve. (The spring is under considerable pressure.)

9. On the left side, middle bore, remove the bore plug retaining clip and bore plug.

10. Remove the low throttle control valve and spring.

11. Remove the bore plug retaining pin from the cored face of the body.

12. Remove the bore plug, spring and band release timing valve.

13. From the left side, third, bore, remove the retaining clip, bore plug and band release accumulator valve.

14. From the right side; last bore, remove the retainer, bore plug, 3-2 down shift valve and spring.

15. Remove the retaining pin from the cored face (hold finger over bore so as not to loose the spring).

16. Remove the spring and front clutch exhaust valve.

Assembly of Secondary Valve Body

1. Install the pressure boost spring into the pressure boost valve.

2. Install the spring and valve into the upper left bore, spring first.

3. Compress the boost valve and spring and install the retaining pin.

4. In the same bore, install the coupling timing valve, signal valve (hole end out).

5. Install the signal spring and bore plug, cupped end over the spring.

6. Install the retaining clip into the bore plug.

7. In the left side, second bore, install the band release timing valve. (Small lands first).

8. Install the band release timing spring and bore plug, cupped end last.

9. Compress the bore plug and install the retaining pin in the groove in the plug.

10. Install the low throttle control spring and valve.

11. Install the bore plug (hole out) and retaining clip with the tabs facing towards the center of the body.

12. In the bottom bore left side, install the band release accumulator valve, bore plug (large end first) and the retaining clip.

13. In the right side top bore, install the 3-4 boost valve, stem end out.

14. Install the 3-4 boost spring, bore plug and retaining pin.

15. In the next bore down, install the pressure drop valve stem end out.

16. Install the pressure drop spring and retaining pin.

17. In the lower bore right side install the front clutch exhaust valve, stem end last.

18. Install the front clutch exhaust valve spring, compress the spring and install the retaining pin.

19. Install the 3-2 downshift spring and valve, stem first.

20. Install the bore plug (hole out) and retainer, (tabs facing towards center of body).

Assembly of Complete Control Valve (Fig. 3-288)

1. Install manual valve in primary body assembly with hole end to right.

2. Position primary and secondary bodies side by side, cored faces up with detent valve in lower right corner and 3-2 downshift valve at lower left.

3. Install (2) 1/4" check balls into ball seats at right side of primary body.

4. Place the channel plate to valve body spacer on the valve bodies, be sure orifice in front clutch by-pass valve is visible. Use valve body attaching bolts to aid in aligning the parts.

5. Place the channel plate on the spacer and install four attaching screws, (two flat head and two short filister head screws). The two filister head screws should be located within the circle on the left side. (Fig. 3-289)

6. Install (2) 5/16" check balls in the pockets in the upper left hand corner. (Fig. 3-284)

7. Install (2) 3/16" dia. check balls, one at the top near center and one near the bottom right side. (Fig. 3-284)

   NOTE: A ball is not required in the small pocket in the center of the channel plate.

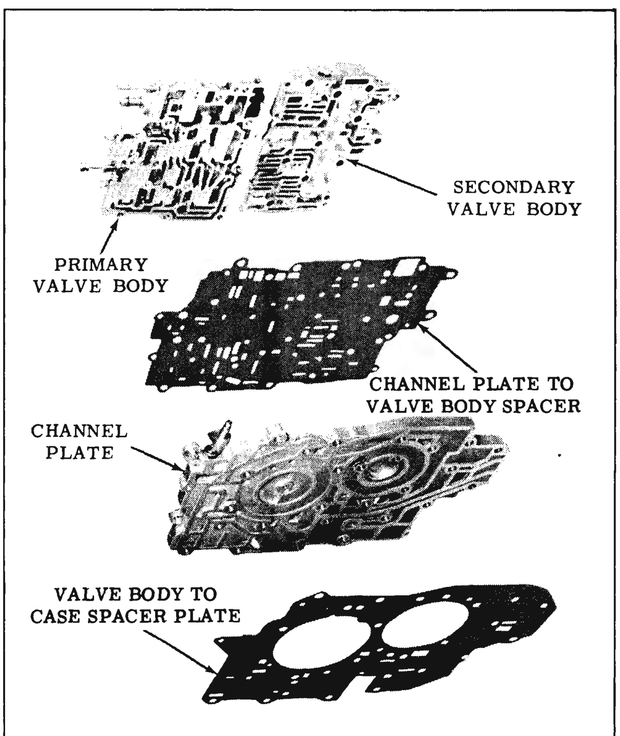


Fig. 3-288 Complete Control Valve

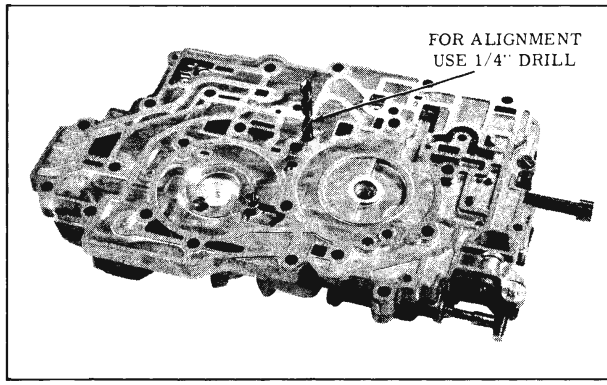


Fig. 3-289 Assembling Valve Bodies

8. Place the channel plate to case spacer in position and install the 3 shorter remaining filister head screws.

9. Turn assembly over and install one long secondary body to channel plate attaching screw.

Installation of Units into Transmission Case

1. Install transmission case into holding fixture J-8763 with front end up.

2. Install band with a single ear facing servo side of case. (Fig. 3-290)

3. Install band anchor link between band and case with cupped end of link against band adjusting stop pin hole.

4. Install the case center support key, bevel up.

5. Install the case center support assembly aligning keyway in support with key. (Fig. 3-291)

6. Install the reverse stationary cone into case. (Fig. 3-292)

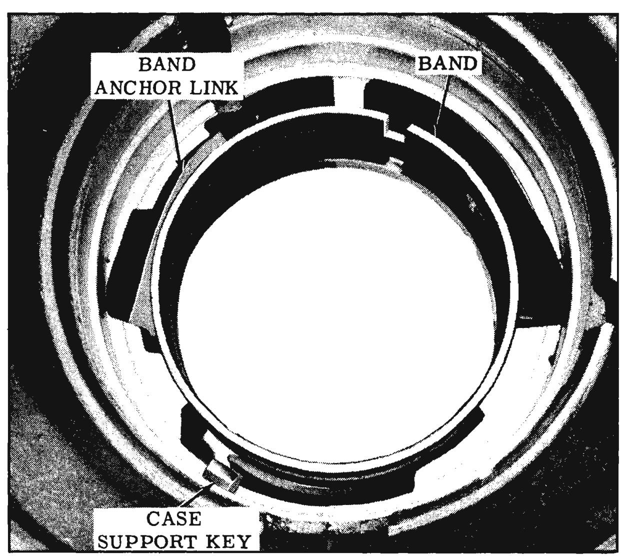


Fig. 3-290 Installing Band

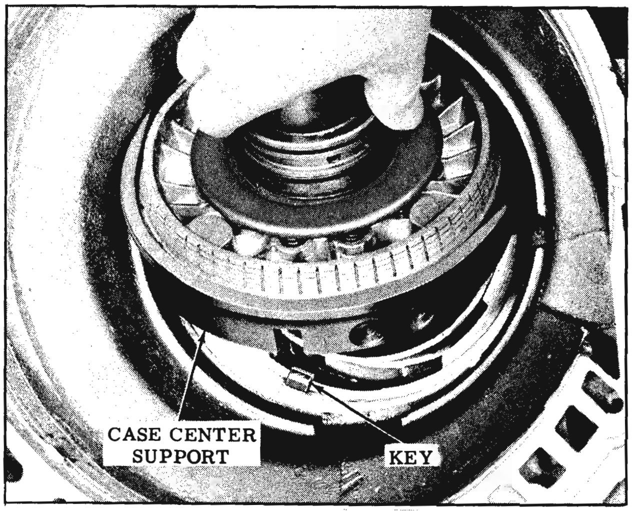


Fig. 3-291 Installing Case Center Support

7. Install the reverse cone over the reverse piston.

8. Install the reverse stationary cone aligning the lock with the slot in the case.

9. Install the reverse stationary cone retaining snap ring with ring gap at open section of ring groove.

10. Install case center support to front internal gear bronze thrust washer into the front clutch housing. Retain with petrolatum. (Fig. 3-293)

11. Install front internal gear and clutch assembly over splines of reverse cone. Rotate transmission, bottom side up.

    CAUTION: DO NOT ROTATE OVER 1/4 TURN OR CLUTCH ASSEMBLY WILL FALL OUT.

12. Install the rear internal gear into the rear of transmission. (Fig. 3-294)

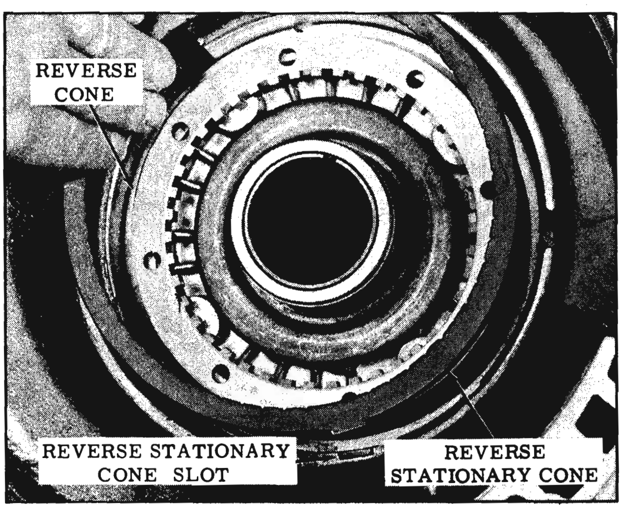


Fig. 3-292 Installing Reverse Cone

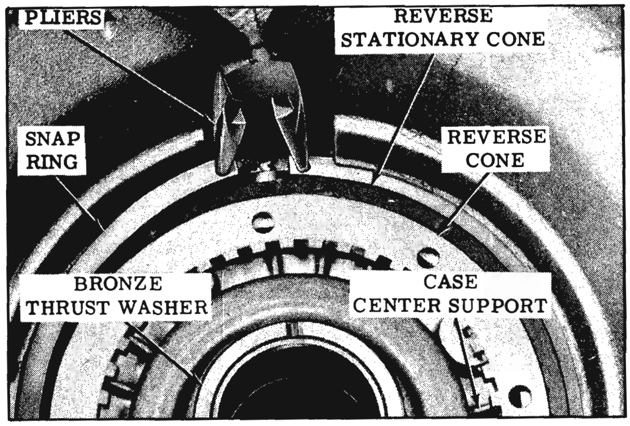


Fig. 3-293 Case Center Support Thrust Washer

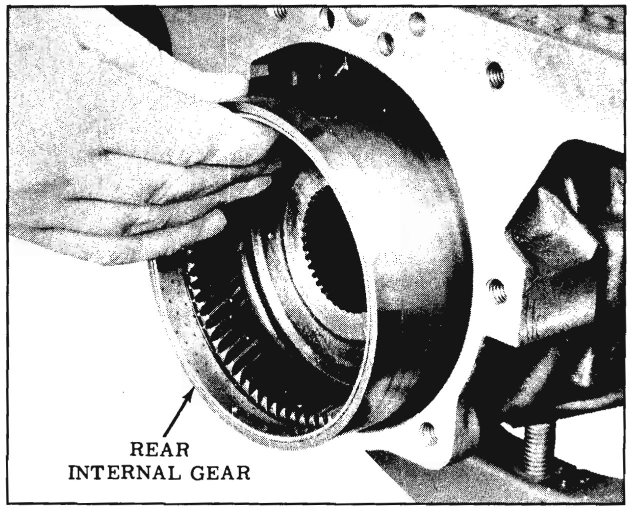


Fig. 3-294 Rear Internal Gear

13. Install steel backing washer, bronze thrust washer, steel backing washer and sun gear on front sun gear shaft. (Fig. 3-295)

14. Install rear carrier to rear internal gear bronze thrust washer over carrier shaft. (Fig. 3-296)

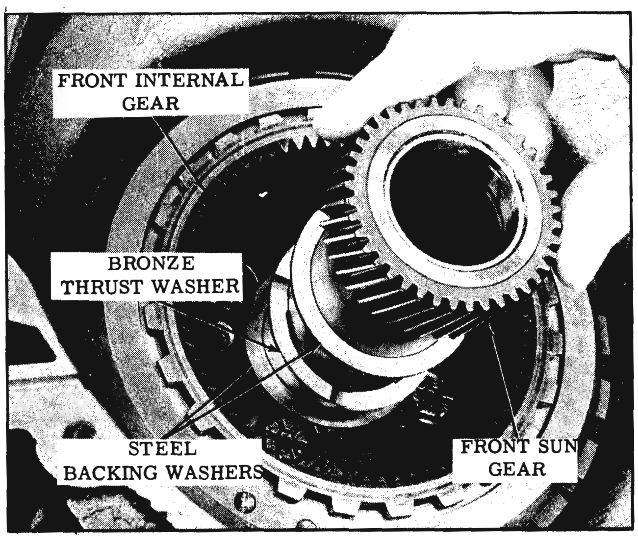


Fig. 3-295 Sun Gear Washers

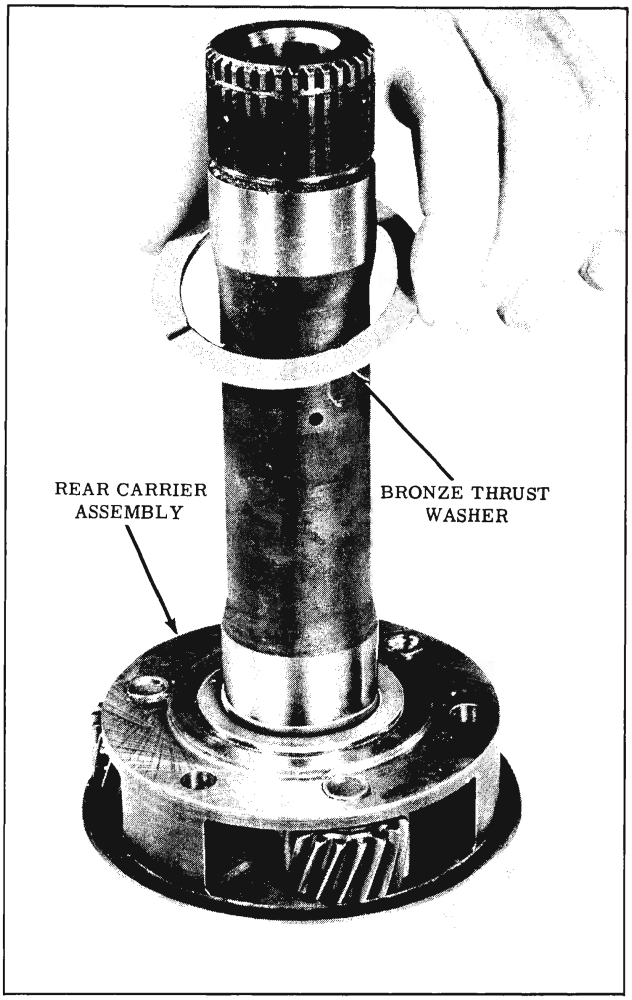


Fig. 3-296 Rear Carrier Thrust Washer

15. Install rear carrier from rear of transmission.
16. Install front sun gear to front carrier bronze thrust washer over carrier shaft and retain with petrolatum. (Fig. 3-297)
17. Install the front carrier assembly and retain with snap ring. (Fig. 3-298)

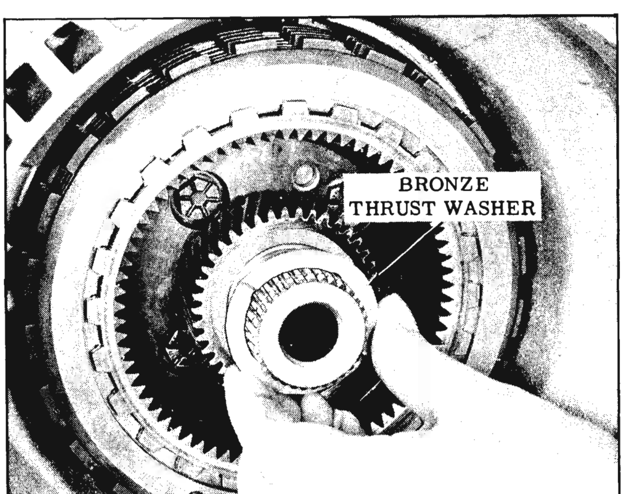


Fig. 3-297 Front Sun Gear Thrust Washer

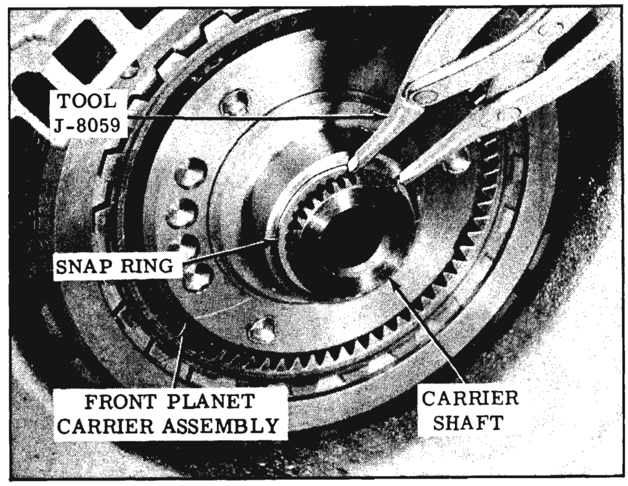


Fig. 3-298 Rear Carrier Snap Ring

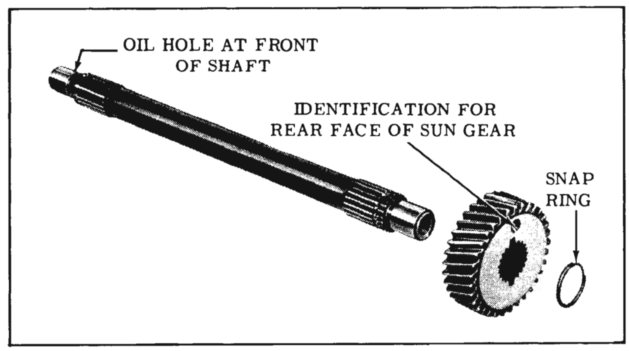


Fig. 3-299 Rear Sun Gear

18. Rotate transmission rear end up.
19. Install rear sun gear on mainshaft. (Fig. 3-299)
20. Install the rear carrier to sun gear bronze

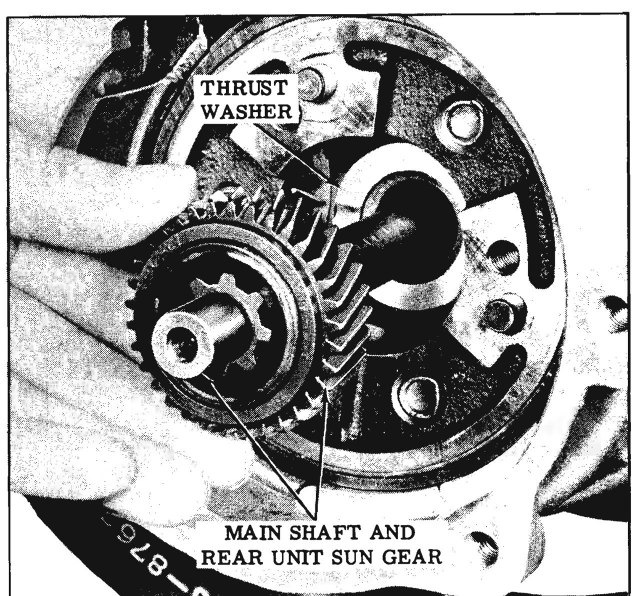


Fig. 3-300 Installing Rear Carrier

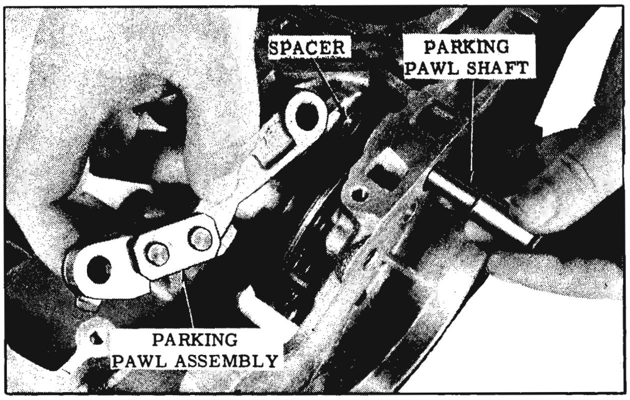


Fig. 3-301 Installing Parking Pawl

thrust washer into rear carrier and install mainshaft. (Fig. 3-300)

21. Install the output shaft on rear carrier using the marks for proper alignment.

22. Install the parking pawl spacer into counterbore in case. (Fig. 3-301)

23. Install the parking pawl and linkage against the spacer so that the tooth of the pawl faces the flange on the output shaft.

24. Install the parking pawl pivot shaft.

25. Engage the pawl with the output shaft.

26. Install the governor assembly with 3 attaching bolts. Torque 22-27 ft. lbs. (Fig. 3-302)

27. Install the speedometer drive gear 1/2" past snap ring groove using Tool J-8760 and 6133-A. (Fig. 3-303, 3-304)

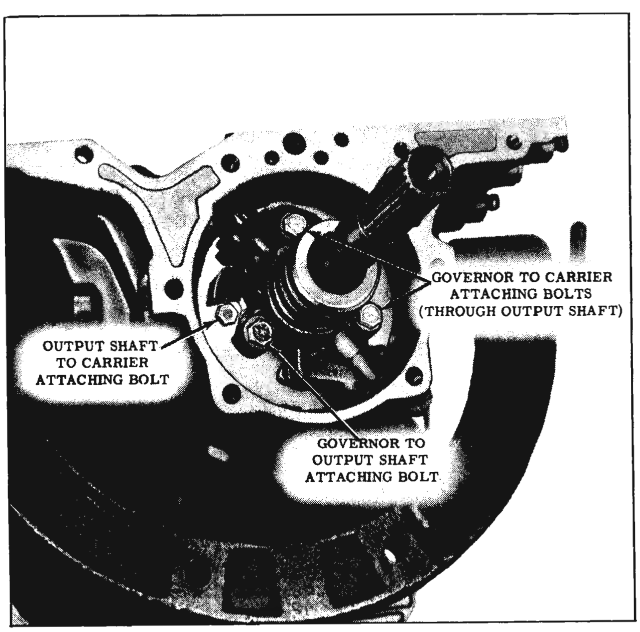


Fig. 3-302 Governor Attachment

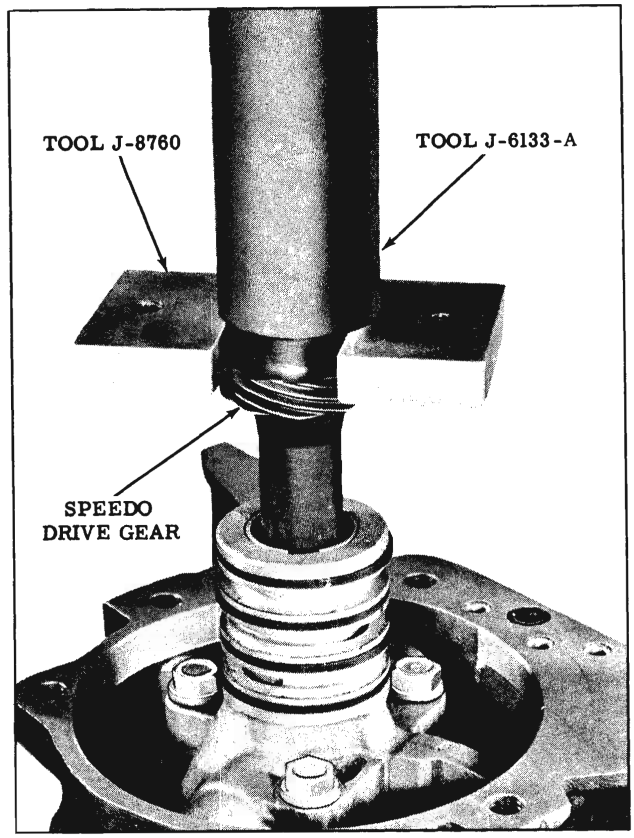


Fig. 3-303 Installing Speedometer Gear

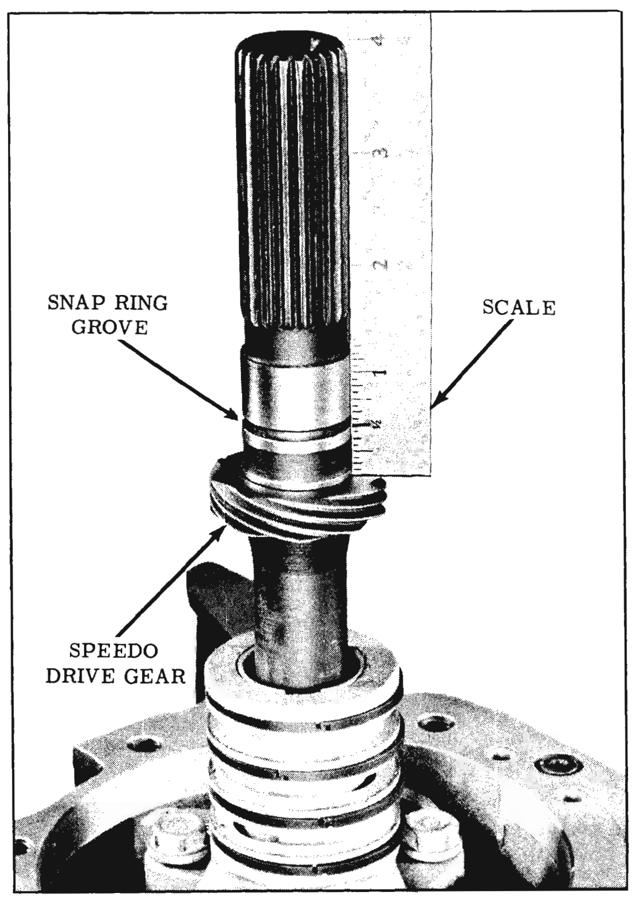


Fig. 3-304 Speedometer Gear Position

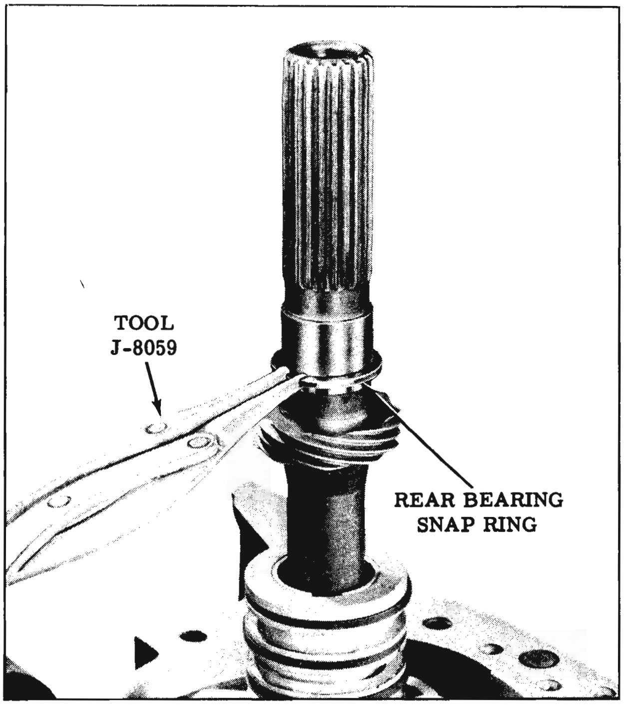


Fig. 3-305 Rear Bearing Snap Ring

28. Install the rear bearing to output shaft snap ring. (Fig. 3-305)

29. Install new gasket on the rear bearing retainer, retain with petrolatum.

30. Install rear bearing retainer over output shaft, guiding parking pawl shaft into the parking pawl assembly. (Fig. 3-306)

    NOTE: Use caution when guiding the retainer over the governor rings.

31. Install one long rear bearing retainer attaching bolt in the lower left hand corner of the retainer. Install breather pipe clip over upper right bolt.

32. Install 7 remaining rear bearing retainer attaching bolts. Torque all bolts 20-25 ft. lbs.

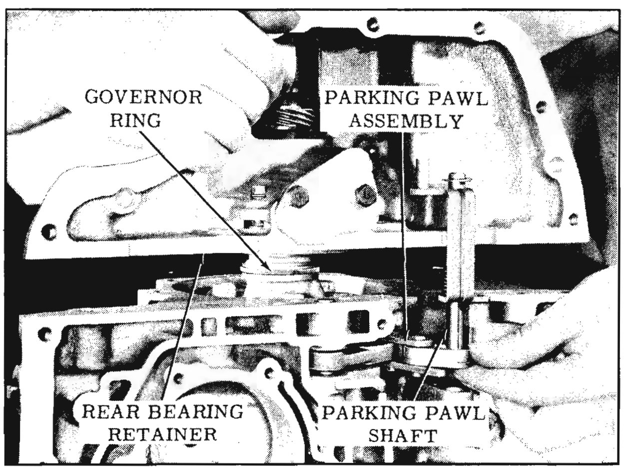


Fig. 3-306 Installing Rear Bearing Retainer

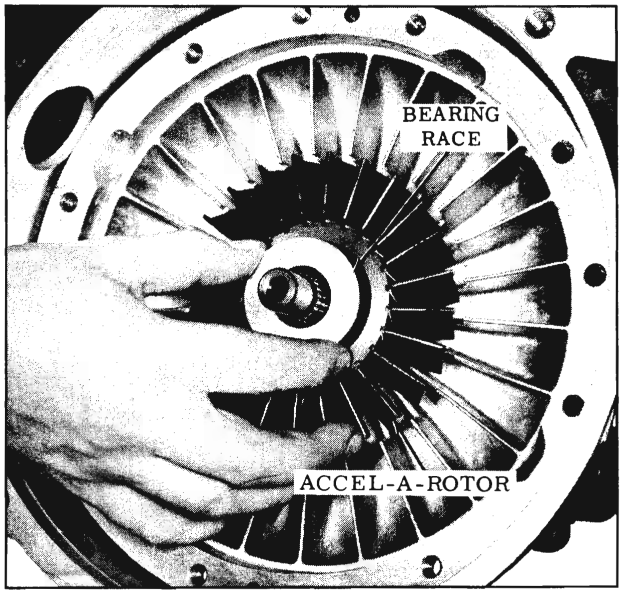


Fig. 3-307 Accel-a-rotor Bearing Race

33. Rotate transmission front end up.

34. Install drive torus over front unit clutch. Be sure all clutch plates are engaged by observing that drive torus rests against the front carrier.

35. Install lock type oil ring on accel-a-rotor, if removed.

36. Install accel-a-rotor.

37. If removed install 2 lock type oil rings on driven torus.

38. Install the flat bearing race into accel-a-rotor. (Fig. 3-307)

39. Install cupped race and bearing into driven torus, bearing out. Retain with petrolatum. (Fig. 3-308)

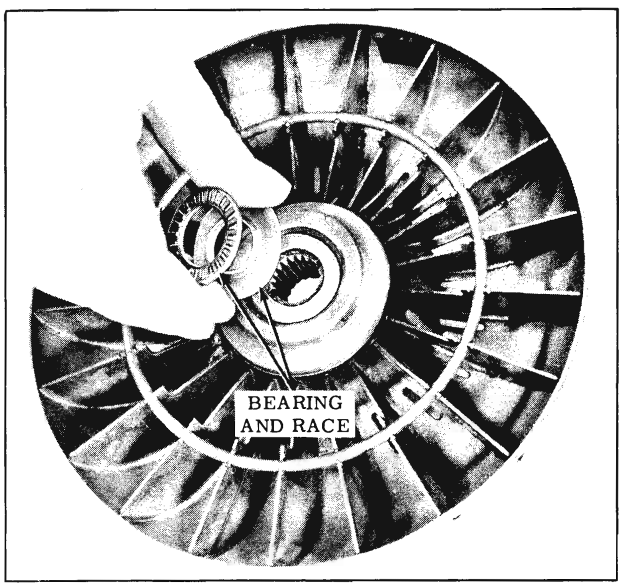


Fig. 3-308 Driven Torus Bearing

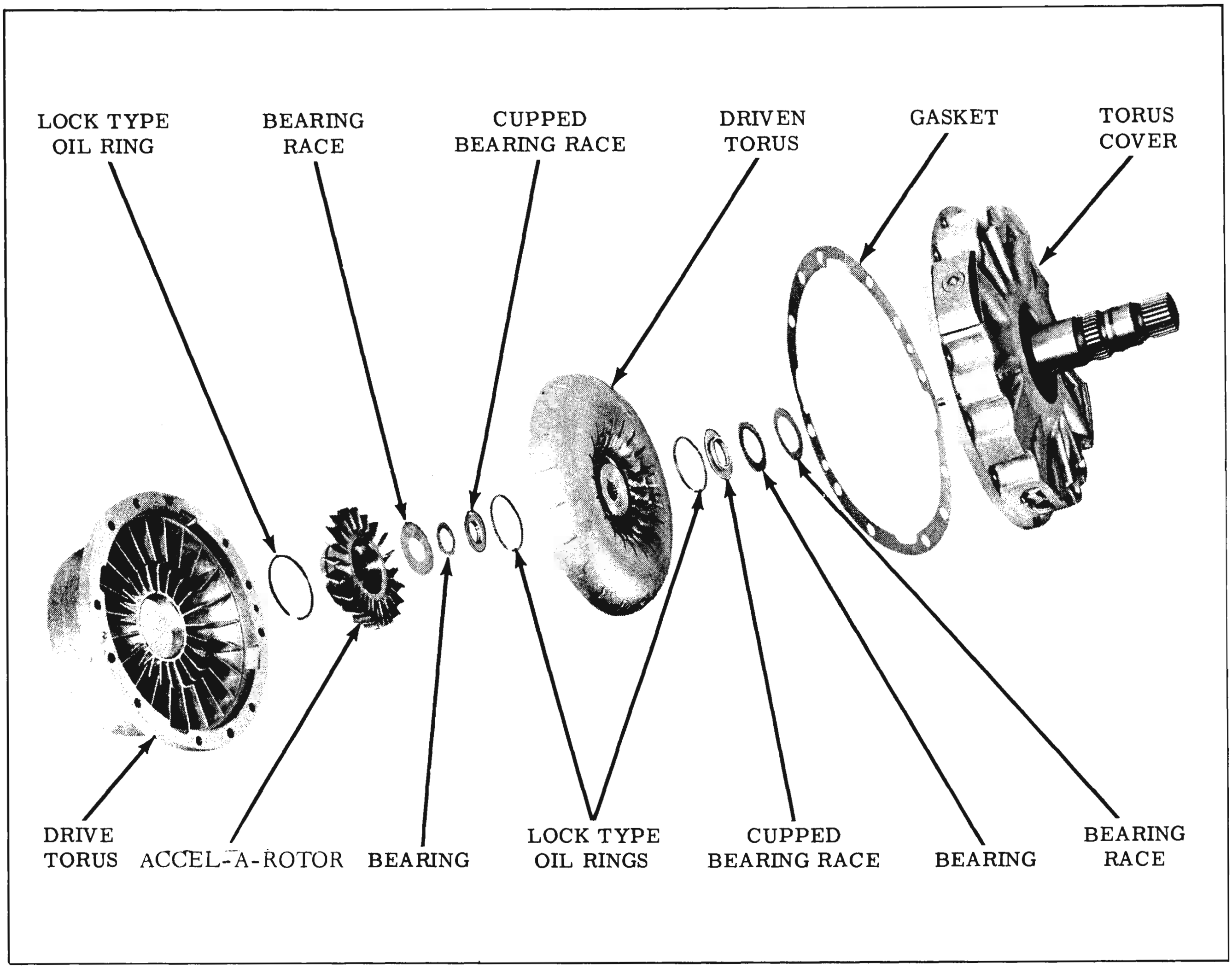


Fig. 3-309 Front Unit Assembly

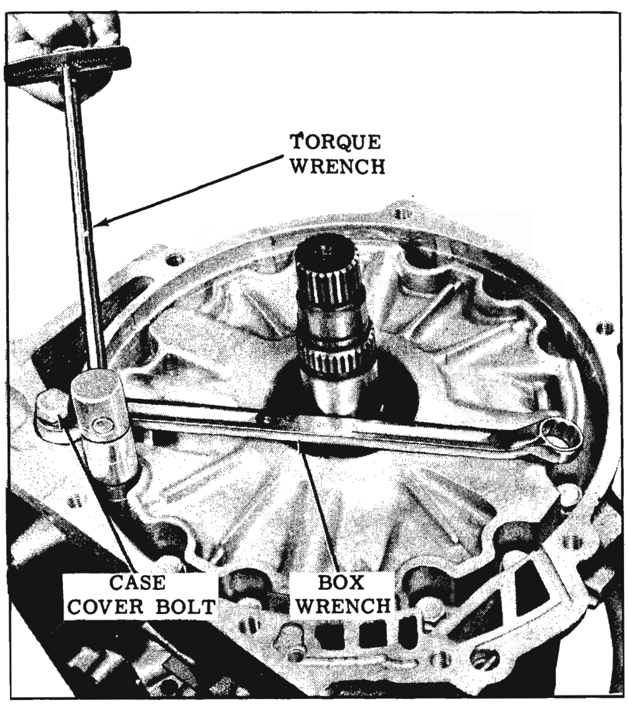


Fig. 3-310 Installing Torus Cover

40. Install driven torus on the mainshaft.

41. Install new driven torus to mainshaft retaining ring.

    NOTE: It may be necessary to lift up on the mainshaft.

42. Install flat bearing race, bearing and cupped race (cup facing torus cover) into torus cover, retain with petrolatum. (Fig. 3-309)

43. Install NEW gasket on torus cover, aligning the dowel pin holes. Retain with petrolatum.

44. Install the torus cover on drive torus aligning the dowel pins with the dowel pin holes.

    CAUTION: Dowel pins are slightly offset and must be aligned with holes to prevent damage to cover.

45. Install 12 torus cover attaching bolts and cross tighten the bolts 10-12 ft. lbs. (Fig. 3-310)

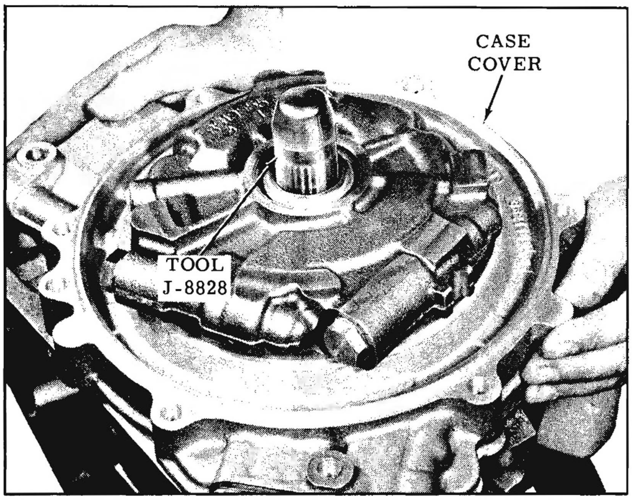


Fig. 3-311 Installing Case Cover

46. Install gasket on case cover and retain with petrolatum.
47. Install the case cover and pump assembly while aligning the attaching bolt holes. Install Tool J-8828 on shaft before installing case cover if seal was not removed. (Fig. 3-311)
48. Install 9 case cover to case attaching bolts. Torque 20-25 ft. lbs.

    NOTE: Of the 9 bolts 1 is longer.
49. Install new seal by placing the front seal protector, J-8828 over input shaft, install seal and drive into pump with Tool J-8761. (Fig. 3-312)
50. Remove tools and rotate transmission to pan side up.

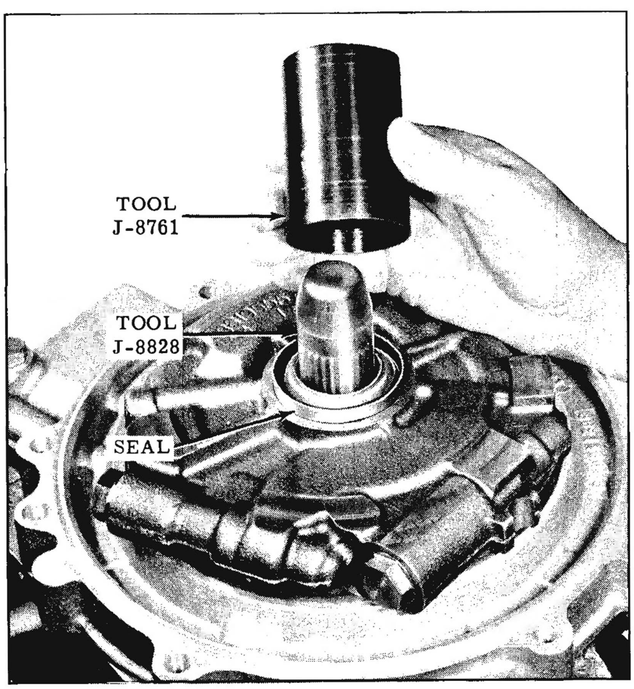


Fig. 3-312 Installing Pump Seal

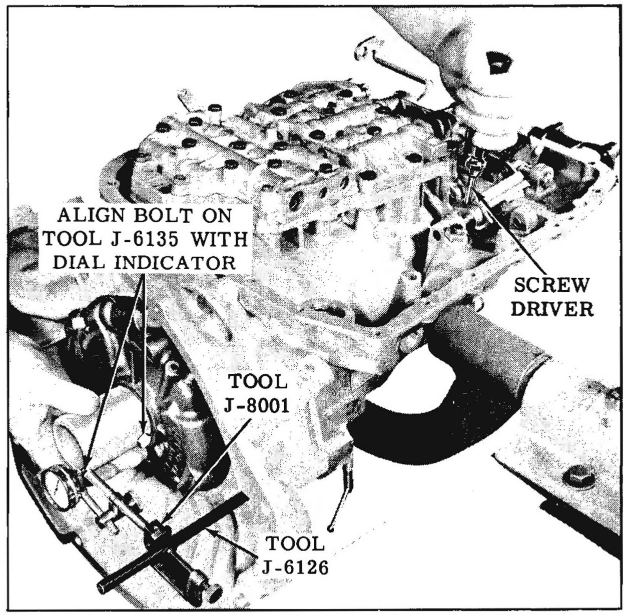


Fig. 3-313 Checking Front Unit End Play

Front Unit End Play Check

a. Remove one case cover to case attaching bolt and install tools as shown. (Fig. 3-313)

b. Position a screwdriver through case, behind the flange on the output shaft.

c. Gently pry forward on output shaft to position units forward. Be careful not to pry on governor weights.

d. At the same time move input shaft in and out and record end play.

e. End play should be .004" to .022".

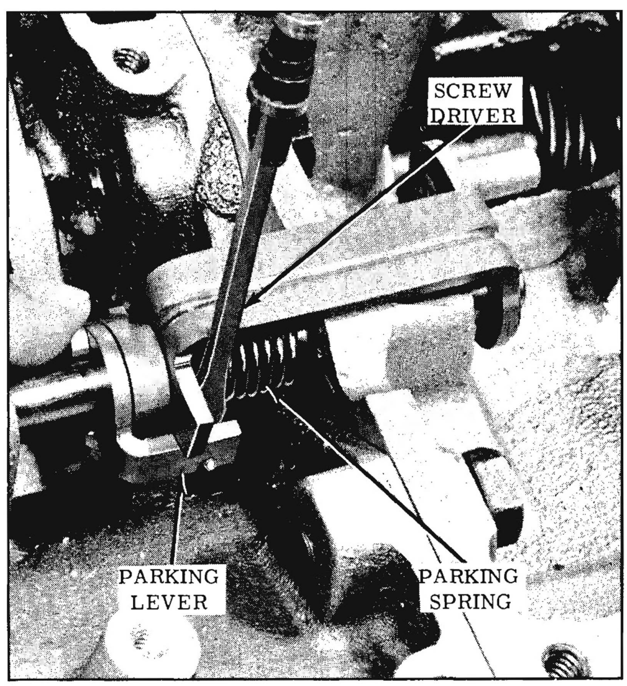


Fig. 3-314 Installing Parking Lever Spring

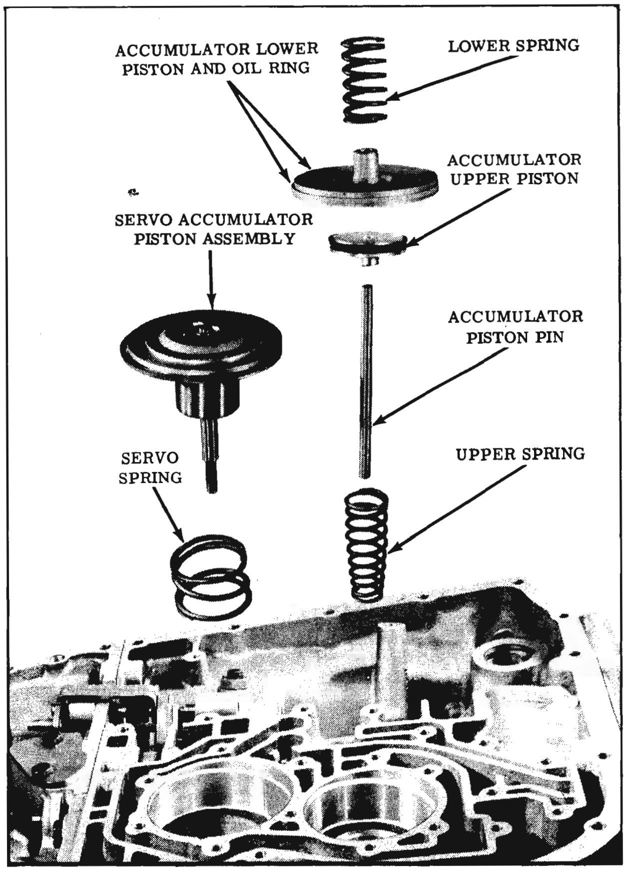


Fig. 3-315 Installing Accumulator

f. Remove tools.

NOTE: End play is corrected by changing the selective thrust washer behind the case cover as shown in Figs. 3-275 and 3-276.

SELECTIVE THRUST WASHER CHART

PART NO.	THICKNESS	COLOR IDENT.
8620697	.027"-.029"	Bright Metal
8620698	.036"-.038"	Copper
8620699	.045"-.047"	Black
8620700	.054"-.056"	Bright and Flats on Edge

51. Hook curved end of spring into notch on parking lever. (Fig. 3-314)

52. Install the rear bearing retainer cover using 2 attaching bolts. Torque 20-25 ft. lbs.

53. Install the upper accumulator spring, pin, upper piston, lower piston, and spring into case. (Fig. 3-315)

54. Install the servo spring and piston assembly.

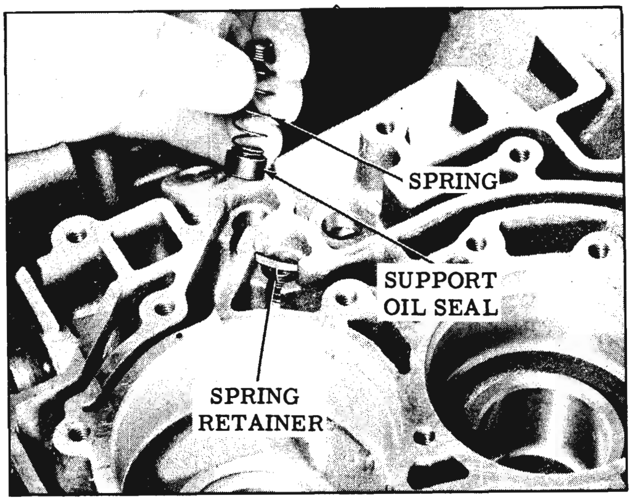


Fig. 3-316 Installing Case Support Seals

55. Install 2 case support to case seals on springs then install into case and push retainers into place. (Fig. 3-316)

56. Place the control valve assembly over the servo and accumulator pistons and install attaching bolts. Torque 6-8 ft. lbs. (Fig. 3-317)

57. Install the band anchor stop pin into hole in case. (Fig. 3-318)

58. Install the band adjusting screw and lock nut, leave the lock nut loose.

59. With J-8591 and inch pound torque wrench, torque the band adjusting screw to 100 inch pounds, and then back the screw off 2-1/4 turns. (Fig. 3-319)

60. Tighten the band adjusting screw lock nut. Torque to 30 ft. lbs.

61. Install an "O" ring seal on manual lever shaft and install shaft as shown. (Fig. 3-320)

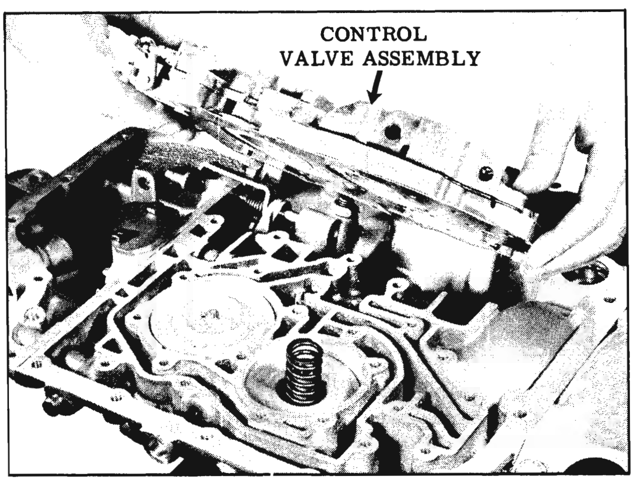


Fig. 3-317 Installing Valve Bodies

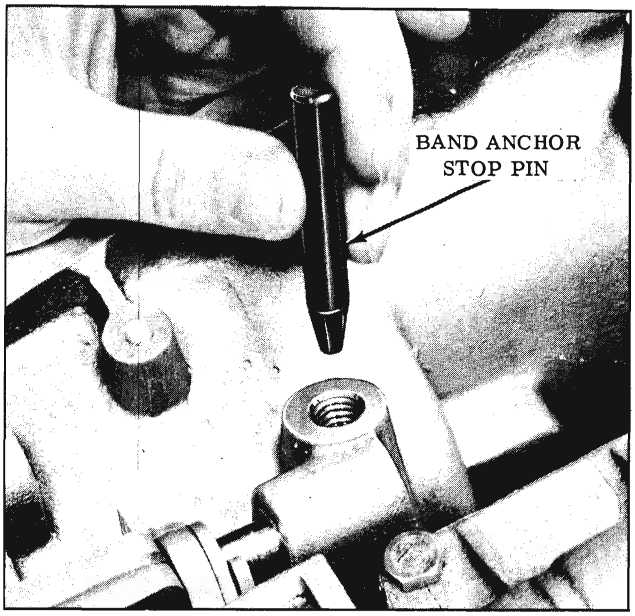


Fig. 3-318 Installing Band Anchor Pin

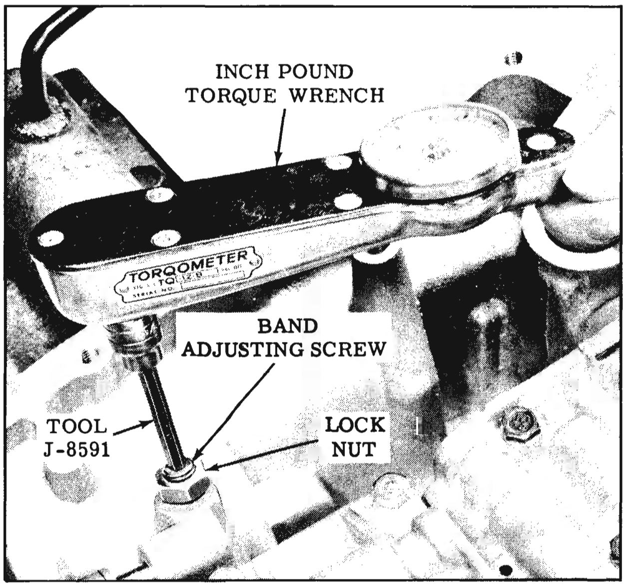


Fig. 3-319 Adjusting Band

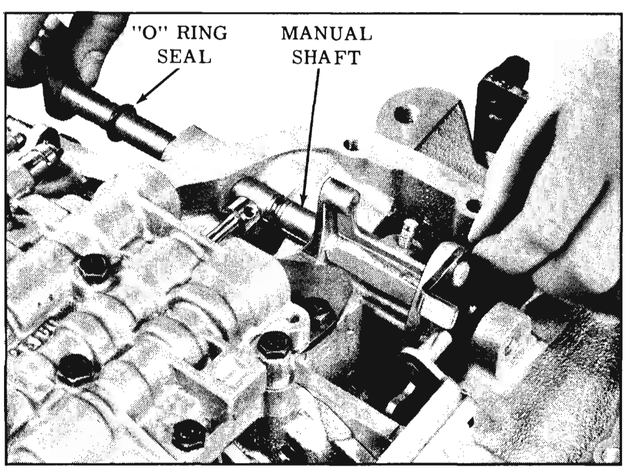


Fig. 3-320 Installing Manual Shaft

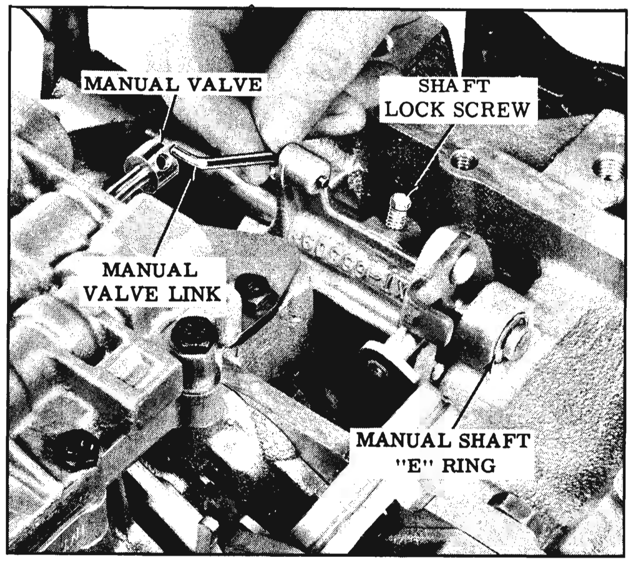


Fig. 3-321 Installing Manual Link

NOTE: Depress detent plunger to allow manual and detent assembly to slide by.

62. Install "E" ring on manual shaft then install manual valve link in detent lever and manual valve. Position detent and manual lever over detent plunger. (Fig. 3-321)

63. Tighten the manual shaft lock screw, indexing the lock screw with the groove in the manual shaft. Torque to 6-8 ft. lbs.

64. If removed, install inside T.V. link to front T.V. lever assembly and retain with "E" ring. (Fig. 3-322)

65. Install the spacer on outer T.V. lever.

66. Install an "O" ring on outer T.V. lever.

67. Install the outer T.V. lever through the case and into the front T.V. lever.

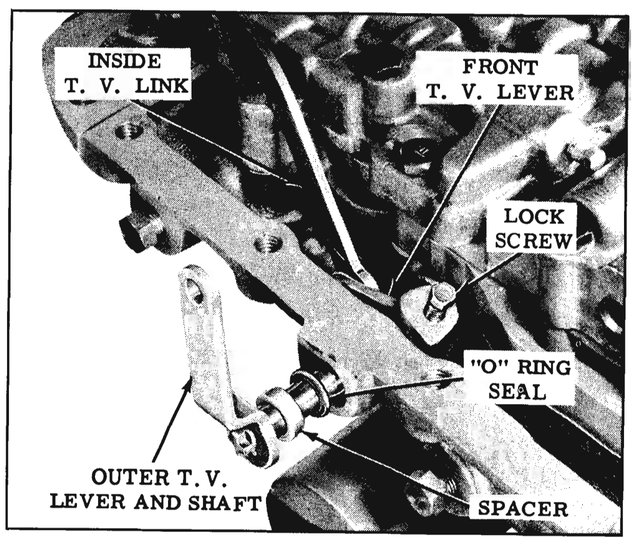


Fig. 3-322 Installing T.V. Link

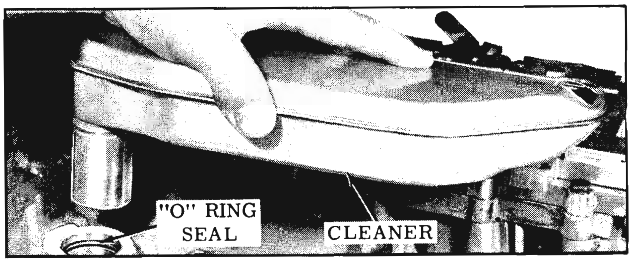


Fig. 3-323 Installing Cleaner

68. Align lock screw with hole in shaft and tighten lock screw. Torque to 6-8 ft. lbs.

69. Install the inside T.V. link over the rear T.V. lever shaft and retain with "E" ring.

70. Install the filler pipe "O" ring seal into bore inside of case, if removed.

71. Install the cleaner "O" ring into bore in case. (Fig. 3-323)

72. Install the cleaner into case and clip into valve body.

73. Install a new oil pan gasket.

74. Install the bottom pan attaching bolts. Torque to 12-15 ft. lbs.

75. Engage parking pawl in park position.

76. Install the companion flange assembly, using Tool J-6505. (Fig. 3-324)

77. Install the companion flange attaching bolt. Torque to 30-40 ft. lbs.

SERVICING THE OIL COOLER

In the event of a major transmission failure, where particles of metal have been carried with the oil throughout the units of the transmission, it will be necessary to flush out the oil cooler and

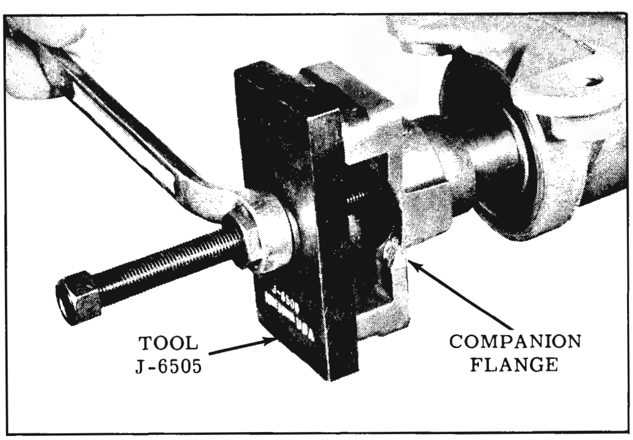


Fig. 3-324 Installing Companion Flange

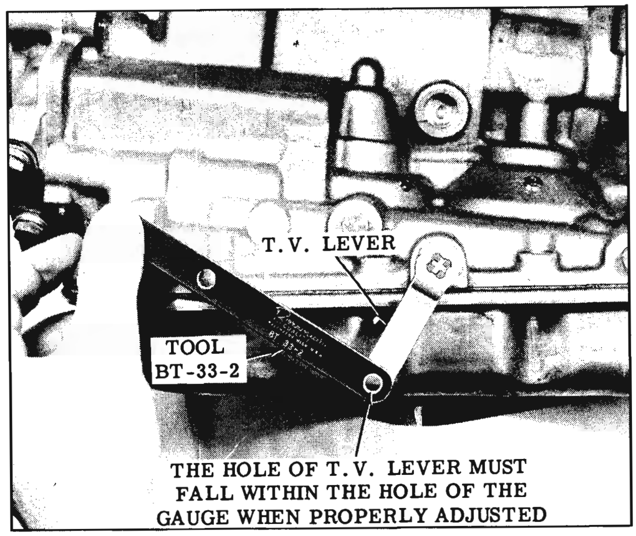


Fig. 3-325 Checking T.V. Lever

connecting lines. The oil cooler is located in the radiator lower tank. It is a sealed container providing a passage for oil to flow from the inlet to the outlet. Clean solvent can be flushed through the cooler with air pressure. (An engine desludge gun may be used.) The cooler should be back-flushed first through the return line to remove all foreign material possible. Then flush through the inlet line and finish by flushing through the return line. Clean remaining solvent from cooler with compressed air applied to the return line and flush with Hydra-Matic oil.

SERVICE ADJUSTMENTS

THROTTLE LINKAGE ADJUSTMENT (2GC) (HYDRA-MATIC)

1. Raise car on hoist.

2. Disconnect lower T.V. rod from T.V. lever and position gauge BT-33-2 as shown in Fig. 3-325. The hole of the T.V. lever must be within the hole of the gauge as shown when

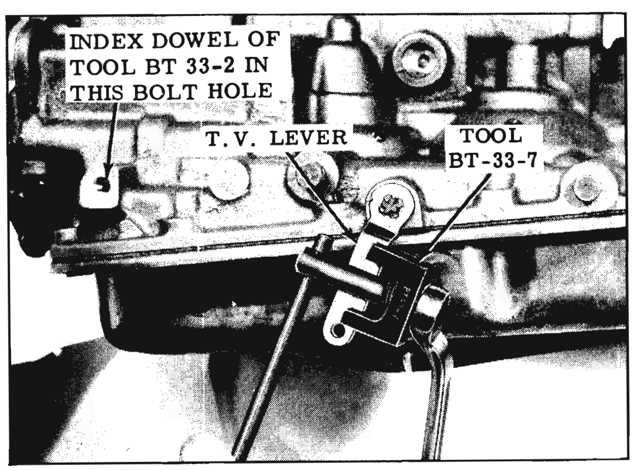


Fig. 3-326 Bending T.V. Lever

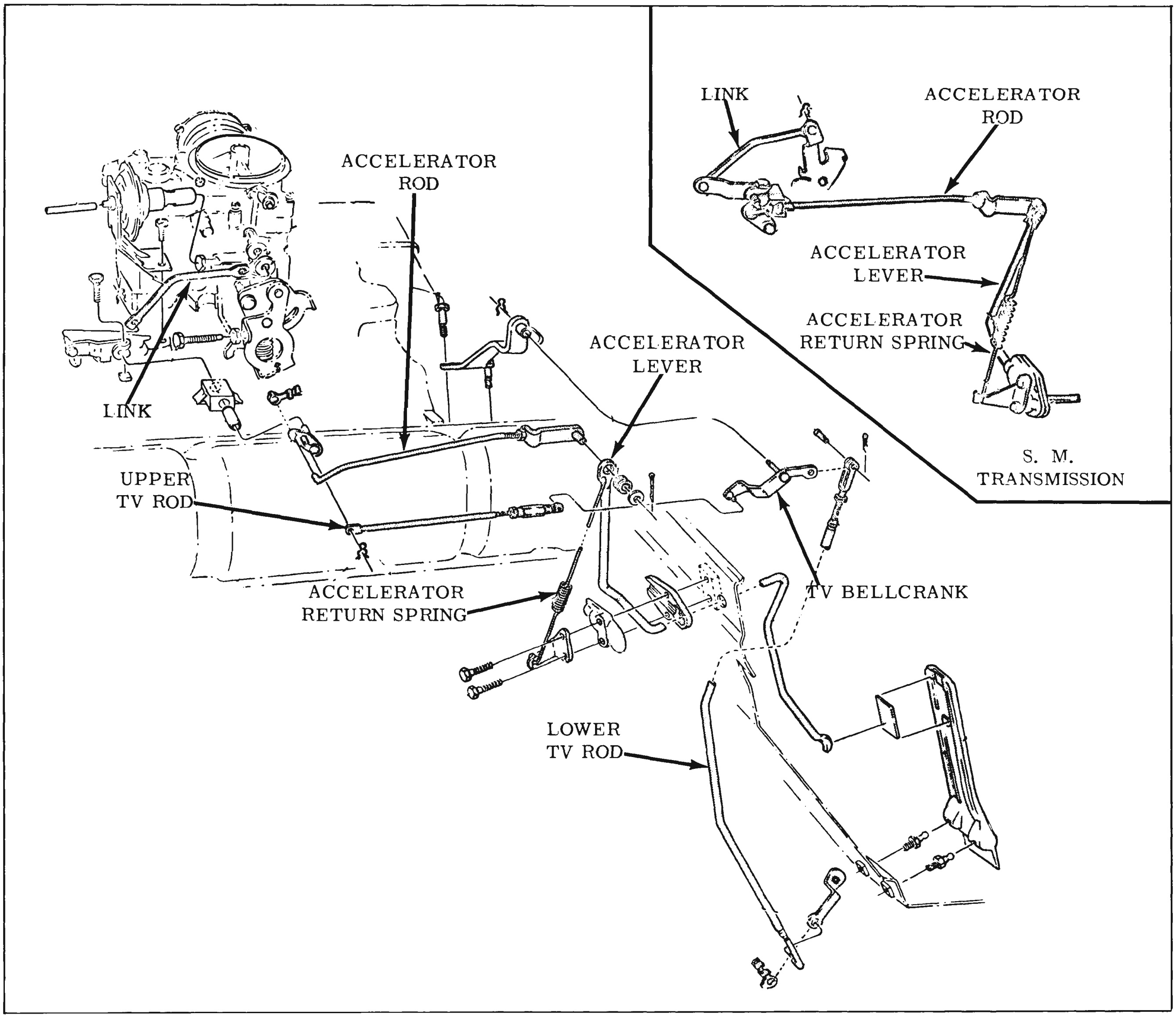


Fig. 3-327 2GC Throttle Linkage

holding T.V. lever in rearward position. If the hole of the T.V. lever does not fall within the gauge hole, bend the lever with bending tool BT-33-7. (Fig. 3-326)

3. Disconnect the upper and lower T.V. rod from the T.V. bellcrank. (Fig. 3-327)

4. While holding lower T.V. rod downward and T.V. bellcrank down at the rear, the clevis pin must be a free pin. If necessary, adjust clevis, then connect lower T.V. rod to bellcrank.

5. Remove air cleaner and move throttle return check out of the way.

6. Block choke open.

7. Back-off idle adjusting screw until it is not touching the idle cam when accelerator return spring is holding the throttle valves in the closed bore position.

8. With tool BT-6117 on the machine surface of the manifold, the top of the accelerator rod should just touch the tool. If necessary, bend auxiliary bellcrank link to adjust the bellcrank.

IMPORTANT: Before attaching the upper T.V. rod to the bellcrank, check the swivel to be sure it turns FREELY on the threads.

9. Adjust upper T.V. rod "slightly short" and snap it onto the ball stud.

10. While holding the T.V. bellcrank against its stop, lengthen the rod until the swivel turns freely and feels "sloppy". Continue to lengthen the rod by turning the swivel until a very slight resistance is felt. At this point the upper rod is properly adjusted. The resistance occurs when the loose feeling or end play has been taken up by the lengthening of the rod.

NOTE: The resistance that is felt, is very slight and is a matter of feel and it may be necessary to perform this step more than once to obtain the correct adjustment.

11. Tighten lock nut while holding swivel in adjusted position.

12. Loosen the throttle down shift stop screw lock nut and back-off stop screw approximately 6 turns. With the accelerator lever move the throttle to wide open and over travel the linkage to point of maximum transmission T.V. lever travel.

CAUTION: Do not bend or stretch linkage.

13. Back out throttle downshift stop screw a few turns, then while holding the accelerator lever in the wide open position, set the stop screw to just touch the downshift lever tang then screw the stop screw in an additional 1-1/2 turns and tighten lock nut.

14. Apply hand brake, start engine, and allow it to reach operating temperature. Adjust the idle speed with transmission in "Drive" to obtain 500 R.P.M. If equipped with Air Conditioning, adjust to 550 R.P.M. with Air Conditioning "OFF" and Carb-air-ator valve closed.

15. With the engine off, check and adjust the pedal height with Tool BT-33-2. (Fig. 3-328)

16. Reposition the throttle return check and adjust the throttle return check stop screw to obtain .020" clearance at the return check plunger with the idle screw on the high step of the cam.

17. Lubricate linkage.

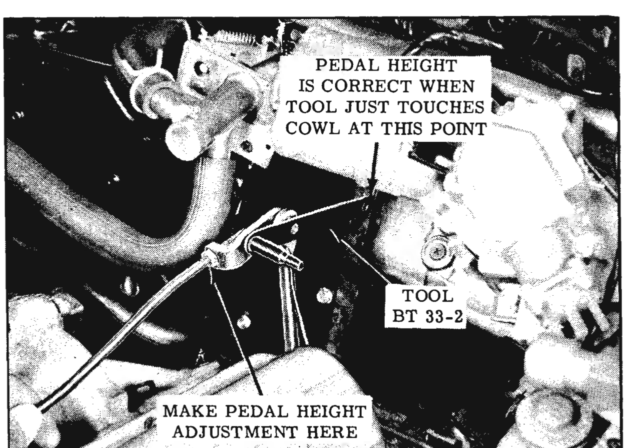


Fig. 3-328 Checking Pedal Height

THROTTLE LINKAGE ADJUSTMENT (4GC) (HYDRA-MATIC)

1. Raise car on hoist.

2. Disconnect lower T.V. rod from T.V. lever. With gauge BT-33-2 check the position of the T.V. lever. The hole in the T.V. lever must be within the hole of the gauge when holding T.V. lever in rearward position. (Fig. 3-325) If the hole of the T.V. lever does not fall within the gauge hole, bend the lever with bending tool BT-33-7. (Fig. 3-326)

3. Lower car and disconnect upper T.V. rod from T.V. bellcrank. (Fig. 3-329)

4. Disconnect the lower T.V. rod from the T.V. bellcrank.

5. While holding lower T.V. rod downward and T.V. bellcrank down at the rear, the clevis pin must be a free pin. If necessary, adjust clevis then connect lower T.V. rod to bellcrank.

6. Remove air cleaner and pivot throttle return check out of the way.

7. Block intermediate choke lever to release fast idle cam.

8. Back off idle adjusting screw until the throttle retarder is holding the throttle valves in the closed bore position.

9. Back out the auxiliary stop screw until the bellcrank stop contacts the carburetor body.

10. With the carburetor on closed bore and the auxiliary bellcrank against the stop, bend the auxiliary bellcrank link as short as possible without pulling the carburetor off closed bore.

11. Adjust upper T.V. rod "slightly short" and snap it onto the ball stud.

12. While holding the T.V. bellcrank against its stop, lengthen the rod until the swivel turns freely and feels "sloppy". Continue to lengthen the rod by turning the swivel until a very slight resistance is felt. At this point the upper rod is properly adjusted. The resistance occurs when the loose feeling or end play has been taken up by the lengthening of the rod.

NOTE: The resistance that is felt, is very slight and is a matter of feel and it may be necessary to perform this step more than once to obtain the correct adjustment.

13. Tighten lock nut while holding swivel in adjusted position.

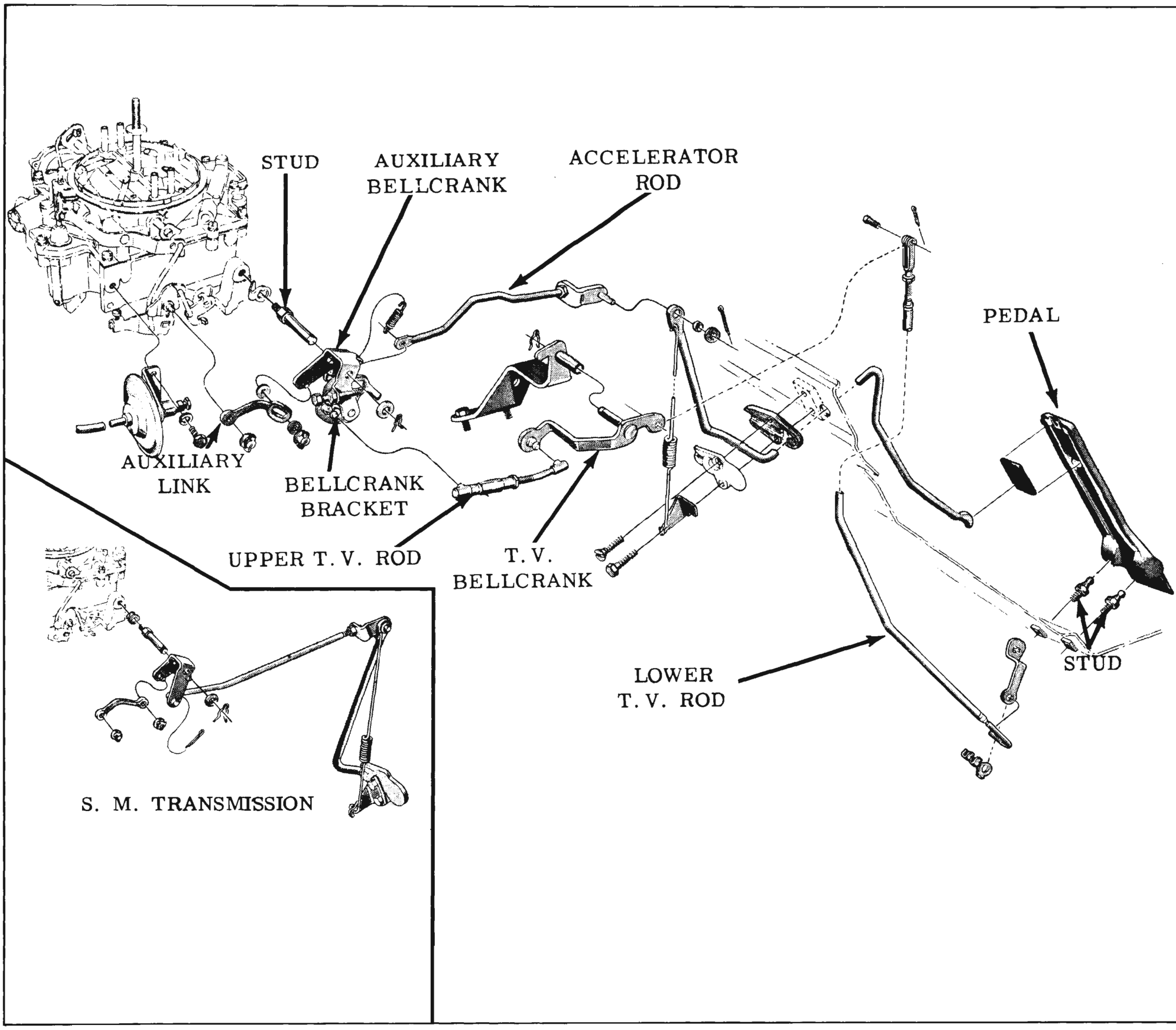


Fig. 3-329 4GC Throttle Linkage

14. Loosen the throttle down shift stop screw lock nut and back off stop screw approximately 6 turns. With the accelerator lever, move the throttle to wide open and over travel the linkage to the point of maximum transmission throttle valve lever travel.

    CAUTION: DO NOT BEND OR STRETCH LINKAGE.

15. Holding the accelerator lever in the wide open position, set the stop screw to just touch the down shift lever tang then turn the stop screw in an additional 1-1/2 to 2 turns.

16. Remove block from intermediate choke lever. Start engine and allow engine to reach operating temperature. With transmission in "Dr" adjust slow idle to 500 R.P.M. - with factory installed air conditioning adjust to 550 R.P.M. with air conditioning "OFF" and idle compensator held closed. Adjust fast idle to 1800 R.P.M. - transmission in "N".

17. Adjust the auxiliary bellcrank stop screw until it just affects the slow idle and then back it out one turn.

18. With engine off, check and adjust pedal height with Tool BT-33-2 (Fig. 3-328).

19. Reposition throttle return check and install attaching screw.

20. Adjust throttle return check plunger length to obtain .040" gap between plunger and carburetor lever.

21. Check throttle retarder stem travel, adjust rod by bending so that wide open throttle can be obtained.

22. Lubricate linkage.

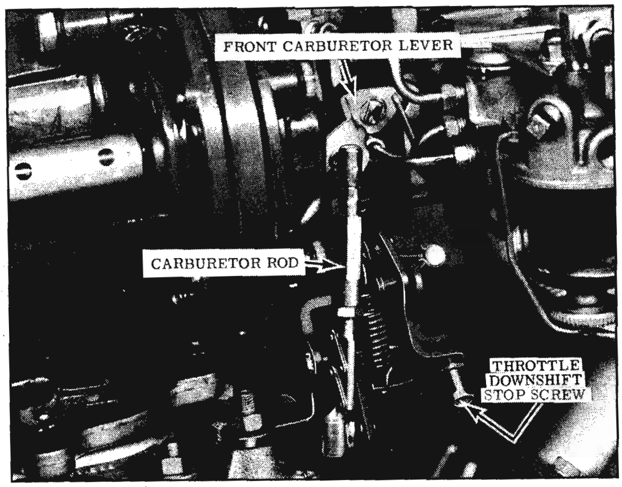


Fig. 3-330 Carburetor Rod

THROTTLE LINKAGE ADJUSTMENT (RC)

1. Raise car on hoist.

2. Disconnect lower T.V. rod from T.V. lever and position gauge BT-33-2 as shown in Fig. 3-125. The hole of the T.V. lever must be within the hole of the gauge when holding the T.V. lever in the rearward position. If the hole of the T.V. lever does not fall within the gauge hole, bend the lever with bending tool BT-33-7. (Fig. 3-326)

3. Disconnect the lower T.V. rod from the T.V. bellcrank.

4. While holding the lower T.V. rod downward and T.V. bellcrank down at the rear, the clevis pin must be a free pin. If necessary, adjust clevis, then connect lower T.V. rod to bellcrank.

5. Remove air cleaner and disconnect upper end of the carburetor rod. (Fig. 3-330)

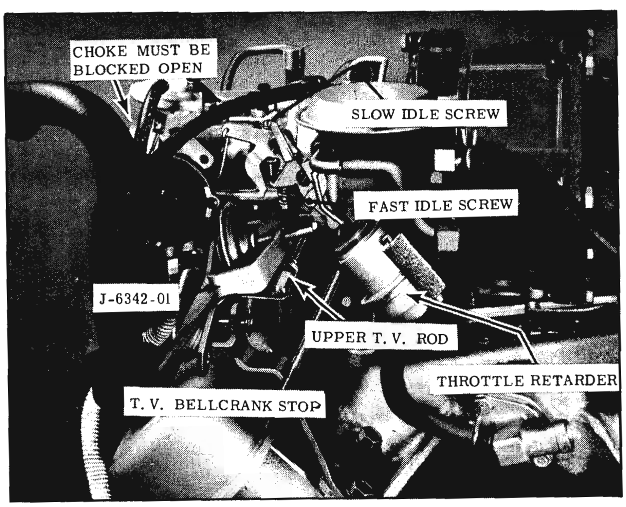


Fig. 3-331 Throttle Return Check Holding Tool

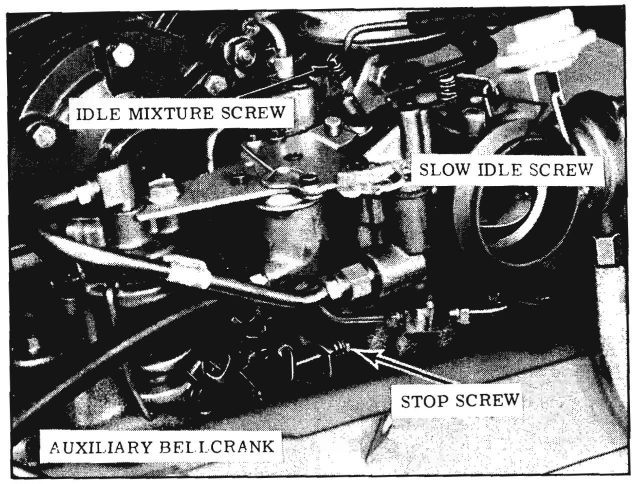


Fig. 3-332 Bellcrank Stop Screw

6. Install throttle return check Tool J-6342-01 and back out slow idle screw. Fast idle screw should not contact cam, if necessary insert a screwdriver into the carburetor bore to block open the choke valve. (Fig. 3-331)

7. Back out the auxiliary bellcrank stop screw until the bellcrank contacts the stop. (Fig. 3-332)

8. Loosen the carburetor rod lock nut and shorten the rod. (Fig. 3-330) Connect the upper end of carburetor rod to the front carburetor lever.

9. While holding the throttle valve at closed bore with the rear carburetor lever, lengthen the carburetor rod until the links close and a slight load is felt on the threads. Then shorten rod one (1) turn and tighten the lock nut.

10. Shorten the upper T.V. rod slightly and connect it to the ball stud on the T.V. bellcrank. While holding the T.V. bellcrank against its stop, lengthen the upper T.V. rod until a slight resistance is felt on the threads and tighten the lock nut.

11. Adjust the slow idle to 550 R.P.M. in drive. If equipped with air conditioning, adjust to 600 R.P.M. with air conditioning "OFF".

12. Adjust the auxiliary bellcrank stop screw until it just affects the slow idle and then back it out one turn. (Fig. 3-332)

13. With transmission in "N" adjust the fast idle to 1500 R.P.M. with the fast idle screw on the second step of the fast idle cam, air conditioning-"OFF". (Fig. 3-333)

14. With engine off, choke fully off and fast idle screw not touching the fast idle cam, adjust the pedal height, if necessary, with Tool BT-33-2 as shown in Fig. 3-328.

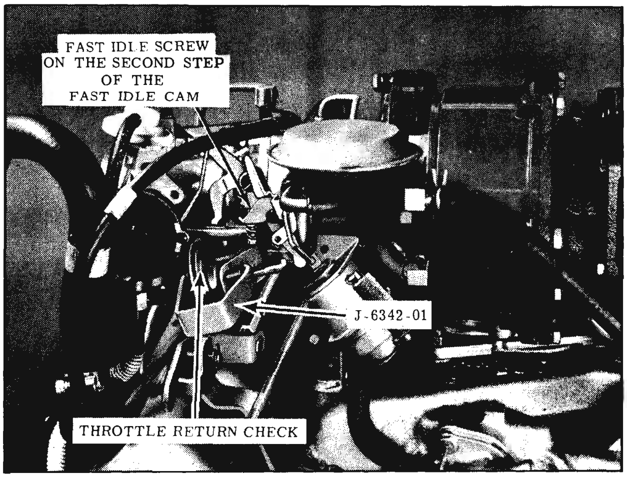


Fig. 3-333 Fast Idle Adjustment

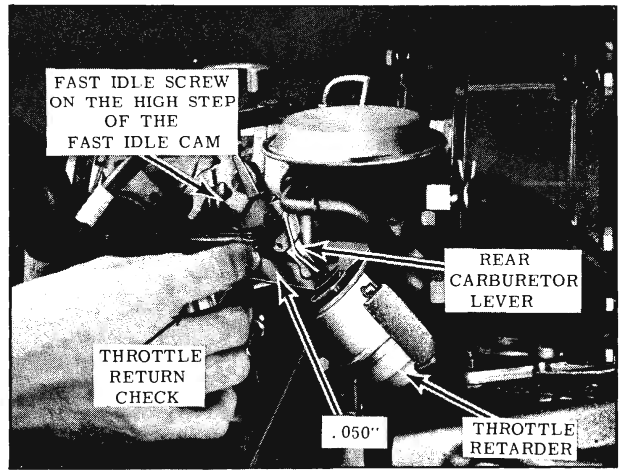


Fig. 3-334 Throttle Return Check Adjustment

15. Adjust the throttle return check to .050" with the fast idle screw positioned on the high step of the fast idle screw. (Fig. 3-334)

16. Loosen the throttle downshift stop screw lock nut and back off stop screw approximately six (6) turns. With the accelerator lever, move the throttle to wide open and over travel the linkage to point of maximum transmission T.V. lever travel. (Fig. 3-335)

CAUTION: Do not bend or stretch linkage.

17. Holding the accelerator lever in the wide open position, set the stop screw to just touch the downshift lever tang, then screw the stop screw in an additional 1-1/2 turns and tighten lock nut.

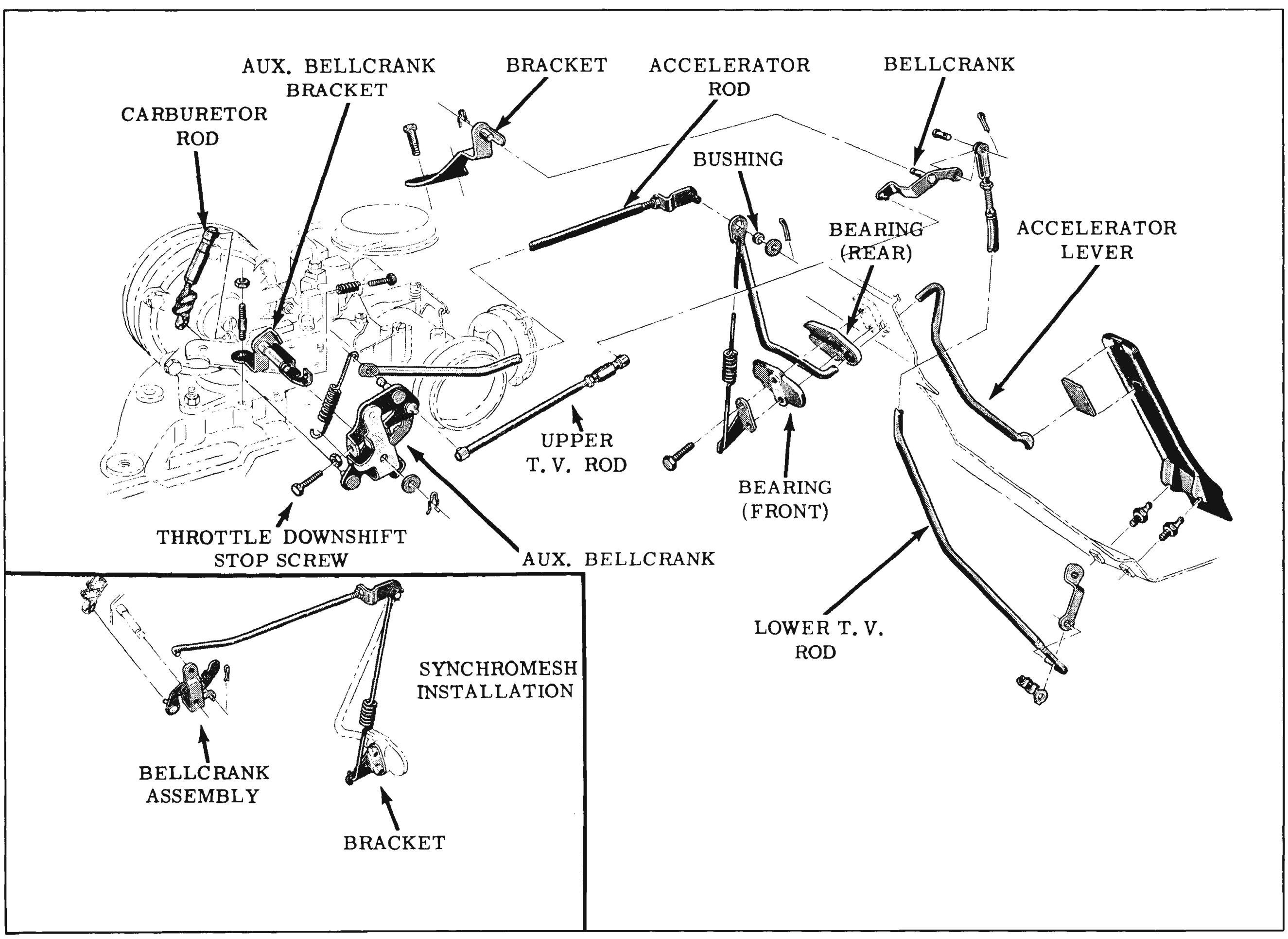


Fig. 3-335 RC Carburetor Throttle Linkage

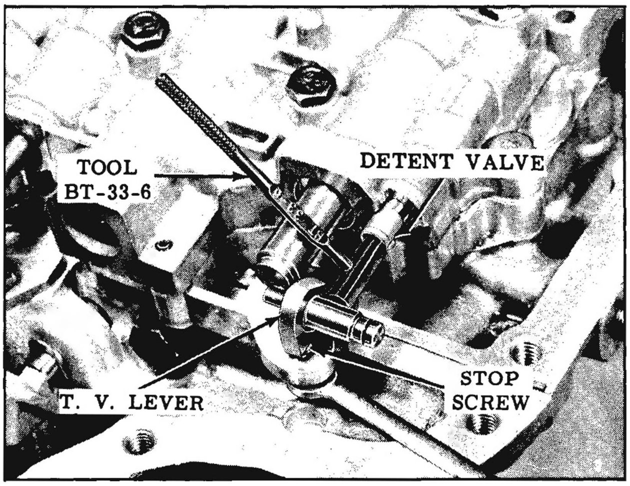


Fig. 3-336 Adjusting Throttle Stop Screw

18. Lubricate linkage.

THROTTLE STOP SCREW ADJUSTMENT

The throttle stop screw is located in the channel body. The throttle lever is located in the valve body. It is necessary to check the throttle stop screw adjustment with gauge BT-33-6 whenever the channel body and throttle body have been separated or either has been replaced.

Disconnect the T.V. rod from the outer T.V. lever. Insert Tool BT-33-6 between the T.V. plunger and the T.V. lever by pushing the plunger into its bore and holding the lever rearward. (Fig. 3-336) Adjust the stop screw against the lever until the T.V. plunger bottoms in its bore. Then back the stop screw out only enough to permit the gauge to be removed.

BAND ADJUSTMENT

The band must be adjusted every 24,000 miles.

Remove the oil pan and cleaner. Loosen the adjusting screw lock nut.

With an in. lb. torque wrench and Tool J-8591 tighten the adjusting screw to 100 in. pounds and then loosen the screw 2-1/4 turns and hold while tightening lock nut. Torque the lock nut 30 ft. lbs. (Fig. 3-319)

Replace oil cleaner and pan.

T.V. LEVER ADJUSTMENT

Remove the lower T.V. rod from the T.V. lever. Place the pin of the T.V. lever gauge BT-33-2 in the threaded hole in the case, ahead of the T.V. lever. (Fig. 3-325) If the hole in the lever does not align WITHIN the hole in the gauge, bend the T.V. lever as necessary using Bending Tool BT-33-7 to the center of the hole WITHIN the gauge hole.

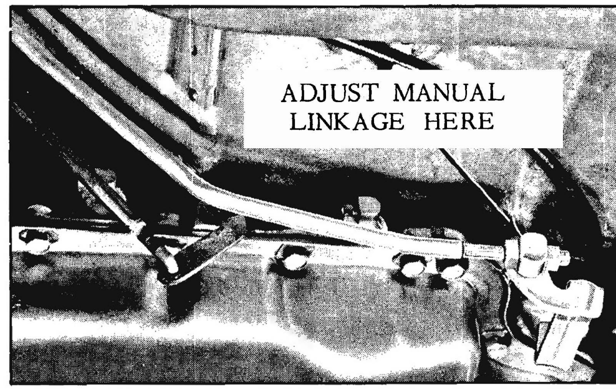


Fig. 3-337 Manual Lever Adjustment

MANUAL LINKAGE ADJUSTMENT

Place manual lever in "N" position. Loosen front and rear locknuts at manual lever on transmission. (Fig. 3-337)

Hold the manual rod and shift lever upward so the selector lever is positioned against the neutral stop.

Tighten the rear lock nut until it just contacts the swivel, then tighten it two additional turns. Tighten the front lock nut.

ACCELERATOR PEDAL HEIGHT

The pedal height is adjusted by using Tool BT-33-2. Place the tool in position (with the hole nearest the pin) over the T.V. bellcrank pin. Swing the gauge in an arc and adjust the length of the accelerator lever rod until the end of the gauge just contacts the closest surface of the cowl. (Fig. 3-328)

DIAGNOSIS

The information contained in this Diagnosis Guide has been prepared as a Supplementary Guide. It is an aid to and not a substitute for a good basic understanding of the Principles of Operation.

It is of utmost importance to observe and perform all preliminary steps outlined in this Diagnosis Guide.

Make certain that all "on the car repairs" possibilities have been exhausted before the transmission is removed from the car.

Figs. 3-338, 3-339, 3-340 and 3-341 show oil passages through the case cover and front pump.

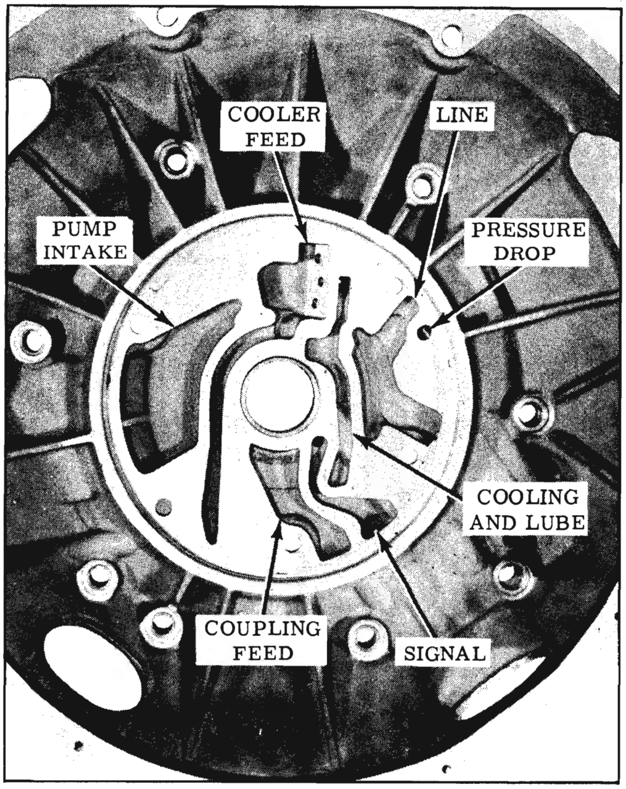


Fig. 3-338 Case Cover to Pump Oil Passages

UNIT OPERATIONAL POWER FLOW

Range	Speed	Cplg.	Front Clutch	Band	Reverse Cone
Park	-	Full	Off	Off	Off
Neutral	-	Full	Off	Off	Off
Drive	First	Full	Off	On	Off
	Second	Full	Off	On	Off
	Third	Empty	On	On	Off
	Fourth	Full	On	Off	Off
Super	First	Full	Off	On	Off
	Second	Full	Off	On	Off
	Third	Empty	On	On	Off
Lo	First	Full	Off	On	Off
	Second	Full	Off	On	Off
Reverse	-	Full	Off	Off	On

TESTING AND DIAGNOSIS

TESTING

This section outlines the procedure to be followed in testing and diagnosis prior to attempting to correct any assumed malfunctions of the Hydra-Matic transmission.

1. Check Oil Level

Always check the oil level before road testing. Erratic shifting or other malfunctions can in some cases be traced to improper oil level.

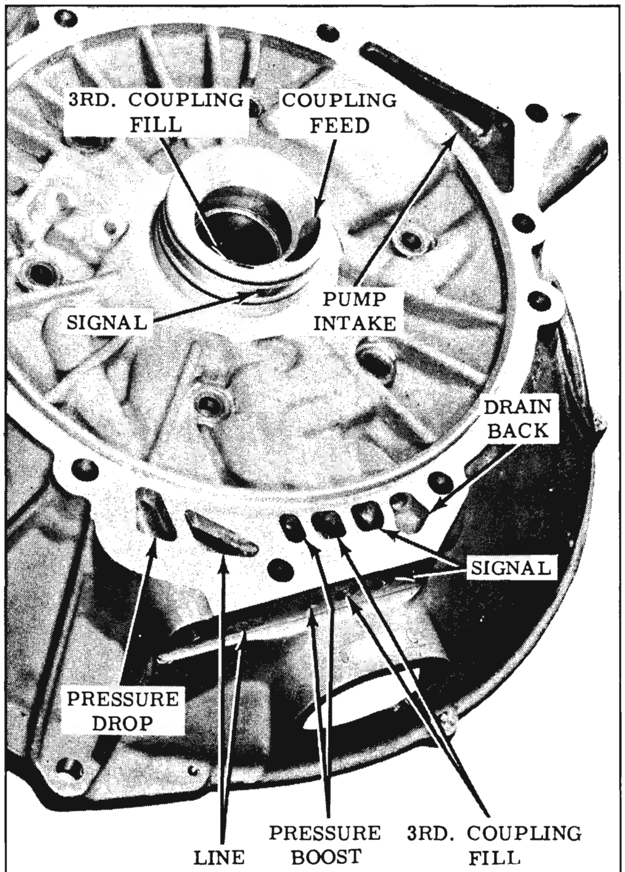


Fig. 3-339 Case Cover to Case Oil Passages

a. Park the car in a level position and set selector lever in the "P" position.

Let engine idle until operating temperature is reached.

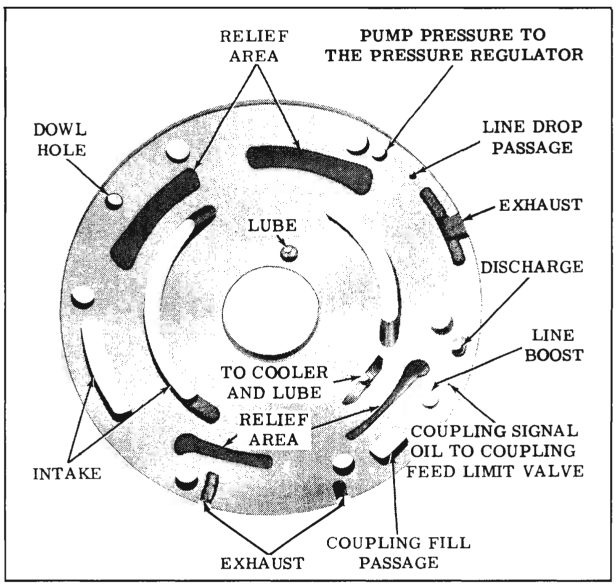


Fig. 3-340 Pump Plate Oil Passages

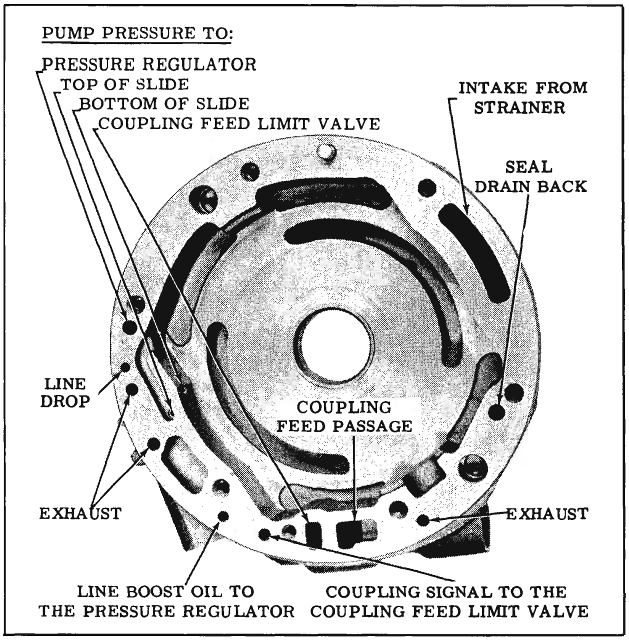


Fig. 3-341 Pump Body Oil Passages

b. Check oil level indicator. If oil level is low add Hydra-Matic fluid to "Full" mark.

CAUTION: Use only "G.M. Hydra-Matic Fluid" or "Automatic Transmission Fluid" (Type A) which have been approved and labeled "AQ-ATF-Number-A".

For a proper diagnosis, a thorough knowledge of the operation of the transmission is essential. A predetermined test route should be established to save time and permit comparison of different cars over the same route. Where possible, the route should be laid out to include some hilly section to test for open throttle downshifts, a level section for testing upshift points and a quiet section for testing for noise.

MAIN LINE OIL PRESSURE TEST

The main line oil pressure test chart is to be used in conjunction with the diagnosis section to aid in determining the malfunctioning unit(s). To check oil pressure, remove the pipe plug (Fig. 3-53) and connect a 300 lb. oil pressure gauge. In performing the oil pressure test it is extremely important that THE TRANSMISSION IS AT NORMAL OPERATING TEMPERATURE (APPROXIMATELY 175°).

SHOP TEST

ENGINE SPEED	SELECTOR LEVER POSITION	P.S.I.
500 r.p.m. (Parking Brake Applied)	P., N., DR., S., L., or R.	60 to 125 p.s.i. transmission temperature should not exceed 200°F. for this check. (With not more than 10 p.s.i. difference between ranges)

DO NOT STALL TEST as damage to the reverse unit may result.

ROAD TEST

SHIFT	SELECTOR LEVER POSITION	P.S.I.*
1st and 2nd	DR., S., L., and REV.	118 to 185
3rd	S. 30 m.p.h.	98 to 111
4th	DR. Zero Throttle 30 m.p.h.	68 to 78

*A drop in pressure of approximately 10 p.s.i. as each shift is made is normal, but the gauge reading should stabilize after each shift is made.

SHIFT SPEED CHART
UPSHIFTS IN M.P.H.

	Minimum Throttle	Maximum Throttle
Drive Range 2-3 3-4	 12 to 15 17 to 24	 24 to 30 58 to 65
Super 1-2 2-3	 12 to 15 60 to 68	 24 to 30 60 to 68
Lo Range 1-2 2-3	 Not Possible 60 to 68	 60 to 68

DOWNSHIFTS IN M.P.H.

	Medium	Part Throttle	Detent
Drive Range 3-2 2-1	 35 to 16 12 to 8	 35 to 16 None	 58 to 50 24 to 8
Super 3-2 2-1	 58 to 50 12 to 8	 58 to 50 None	 58 to 50 22 to 8
Lo Range 3-2 2-1	 58 to 50 28 to 22	 58 to 50 28 to 22	 58 to 50 28 to 22

While road testing, the transmission oil pressure gauge should be connected and the pressures checked as follows:

Super-Range	Minimum	Maximum
2ND GEAR-Steady road load at approximately 25 m.p.h.	98	111
CAUTION: Do not hold brakes and accelerate engine with transmission in gear.		

LOW OIL PRESSURE

1. Oil Level - Low, Check for cause.
2. Boost Plug - Wrong - Stuck
3. Pressure Regulator Valve or Spring - Damaged or missing
4. Strainer and "O" Ring - Missing or leaking
5. Manual Valve - Misaligned
6. Foaming or Cavitation
7. Internal Leak
8. Control Valve Assembly - Stuck Valve (Pressure Drop)
9. Front Pump - Slide - Low Output
10. Low Range only - Control Valve Assembly - Ball check valve.

HIGH OIL PRESSURE

1. Pressure Regulator Valve - Stuck - Wrong - Damaged
2. Boost Plug - Wrong - Stuck
3. Manual Valve - Misaligned with quadrant
4. Control Valve Assembly - Stuck Valve
5. Front Pump - Slide Sticking - High Output

Always be certain the engine is operating at peak performance. The engine and transmission are designed and built to operate as an integral power unit. Failure of the engine to deliver peak power can result in improper shift characteristics and apparent transmission malfunction.

EXTERNAL LINKAGE

The importance of proper linkage adjustment cannot be over emphasized. Improper linkage adjustment can cause rough erratic shifting, missing shifts, or the inability to select one or more of the ranges.

OIL LEAKS

Before attempting to correct an oil leak, the actual source of the leak must be determined. In many cases the source of the leak can be deceiving due to "wind flow" around the engine and transmission. If any doubt exists as to the source of the leak there are two ways to determine it.

1. Red Dye

The addition of red dye to the transmission oil will indicate if the leak is from the transmission.

2. Black Light

The use of a "Black Light"* to identify the oil from the leak is also suitable. Comparing the oil from the leak to that on the engine or transmission dip stick when viewed by black light will determine the source of the leak.

*A "Black Light" testing unit may be obtained from several different service tool suppliers.

Oil leaks around the engine and transmission are generally carried toward the rear of the car by the air stream. For example, a transmission "oil filler tube to case leak" will sometimes appear as a leak at the rear of the transmission.

POSSIBLE POINTS OF OIL LEAKS

1. Transmission Oil Pan
   a. Improperly installed or damaged gasket.
   b. Attaching bolts not correctly torqued.
   c. Drain plug flange weld or stripped threads.
   d. Drain plug.
   e. Oil pan not flat.
   f. Rear bearing retainer and or case not positioned correctly at oil pan.

2. Rear Bearing Retainer
   a. Rear seal not installed properly or damaged.
   b. Gasket (rear bearing retainer to case) damaged or improperly installed.
   c. Rear bearing retainer to case attaching bolts not correctly torqued.
   d. Speedo gear housing not tight.
   e. Porus casting.
   f. Breather pipe.

3. Cooler Connections
   a. Adapter not correctly torqued.
   b. Adapter defective.

4. Case Cover Assembly Leaks
   a. Gasket-Case to case cover improperly installed.
   b. Bolts-Improperly torqued.
   c. Washer Seals-Damaged.
   d. Plate Not Flat.
   e. Plate Gasket-Defective.

5. Front End Leaks
   a. Front pump "O" ring cut or improperly installed.
   b. Front seal.
   c. Case to case cover gasket.
   d. Case cracked or porus.
   e. Cut or improperly installed "O" ring-coupling feed limit valve, (front pump).
   f. Cut or improperly installed "O" ring pressure regulator assembly.
   g. Manual Shaft Seal-Defective or improperly installed.
   h. Main Line Pressure Plug not tight-case.
   i. T.V. line pressure plug not tight-case.

DIAGNOSIS

CONDITION	CAUSE
NO DRIVE IN DRIVE RANGE	
1. Low Oil Level	Check
2. Low Oil Pressure	See Low Oil Pressure
3. Manual Linkage	Adjust
4. Control Valve Assembly	Sticking Valve
5. Band	Adjust or Replace
6. Internal Leak	Check
7. Passage Restricted	Air Check
8. Coupling	Not Filling
MISSING ALL SHIFTS	
1. Governor	Sticking Valve
2. Control Valve Assembly	Sticking Valve
3. Clutch	Not Applying
DRIVE IN SECOND AND THIRD ONLY	
1. Control Valve Assembly	Sticking Valve
2. Clutch	Locked-Too Many Plates
DRIVE IN FIRST ONLY	
1. Control Valve Assembly	Sticking Valve
2. Front Clutch	Inspect Accumulator and Clutch for leaks
3. Governor	Broken Rings, Worn Ring Lands, Sticking Valves
DRIVE IN FIRST AND SECOND ONLY	
1. Governor (G-2)	Sticking
2. Control Valve Assembly	Sticking Valve
DRIVE IN THIRD ONLY	
1. Control Valve Assembly	Sticking Valve
2. Governor	Sticking Valves

DIAGNOSIS (Cont'd.)

CONDITION	CAUSE
DRIVE IN NEUTRAL (REVERSE OR FORWARD)	
1. Internal Linkage-Manual	Engaging
2. Front Clutch	Mispositioned
3. Reverse Cone Clutch	Not Applying
NO REVERSE	
1. Internal Manual Linkage	Mispositioned
2. Low Pressure	See Low Pressure
3. Reverse Cone Clutch	Not Engaging
4. Restricted Passage	Air Check Passages
5. Band	Not Releasing
ROUGH 1-2 SHIFT	
1. T.V. Linkage	Short or Long
2. Control Valve Assembly	Sticking Valves
3. Accumulator	Sticking Parts, etc.
4. Coupling	Not emptying fast enough
5. Front Clutch	Slipping
6. 1-2 Oil Passages	Restricted
ROUGH 2-3	
1. Band	Not Releasing quickly
2. Servo	Sticking parts
SLIPPING-ALL RANGES	
1. Low Oil Pressure	See Low Oil Pressure
SLIPPING 1-2 SHIFT (CAN BE REPORTED AS 1-3 ONLY)	
1. T.V. Linkage	Long
2. Low Oil Pressure	See Low Oil Pressure
3. Accumulator	Check for restrictions or sticking parts.
4. Control Valve Assembly	Sticking Valves
5. Band	Slipping
6. Front Clutch	Check number of plates
7. 1-2 Oil Passages	Restricted

DIAGNOSIS (Cont'd.)

CONDITION	CAUSE
SLIPPING - 2-3	
1. Control Valve Assembly	Sticking valves
2. Coupling	Not filling fast enough
3. Front Clutch	Slipping
NO ENGINE BRAKING INTERMEDIATE OR LOW RANGE	
1. Control Valve Assembly	Sticking valves
2. Band	Slipping
3. Servo	Not applying
NO PART THROTTLE OR DETENT DOWNSHIFTS	
1. T.V. Linkage	Long
2. Control Valve Assembly	Sticking Valves
3. Accelerator Travel	Short
4. Governor	Valves Sticking
SELECTOR LEVER WILL NOT GO INTO REVERSE	
1. Internal Manual Linkage	Mispositioned
2. Reverse Blocker Valve	Stuck Open
3. Governor	G-2 Valve-Sticking
SELECTOR LEVER WILL NOT GO INTO PARK	
1. Parking Linkage	Broken, improperly assembled, distorted.
2. Manual Linkage	Not adjusted properly.
FORWARD DRIVE IN REVERSE	
1. Internal Manual Linkage	Improperly assembled, distorted.
HIGH UPSHIFTS	
1. T.V. Linkage	Short
2. Control Valve Assembly	Sticking Valve
3. Governor	Sticking Valve
4. T.V. Lever	Bent
5. T.V. Pressure	High
6. Line Pressure	High
7. Governor Oil Passage	Restricted

DIAGNOSIS (Cont'd.)

CONDITION	CAUSE
UPSHIFTS LOW	
1. T.V. Linkage	Long
2. Control Valve Assembly	Sticking Valve
3. Governor	Sticking Valve
4. T.V. Lever	Bent
5. T.V. Pressure	Low
6. Line Pressure	Low
7. Governor Passages	Restricted
HANGING IN 2ND - ENGINE STALL UPON STOP	
1. Governor	Sticking Valve
2. Control Valve Assembly	Sticking Valve
3. T.V.	Short
4. Clutch	Not Releasing

TORQUE SPECIFICATIONS

Location	Ft. Lbs.
Channel Plate to Valve Body	2.5 to 3.5
Secondary Valve Body to Channel Plate	2.5 to 3.5
Primary Valve Body to Channel Plate	2.5 to 3.5
Front T.V. Lever to Throttle Control Shaft	5 to 6
Inside Manual & Detent Lever to Manual Shaft	5 to 6
Valve Body to Case	6 to 8
Pump Cover to Pump Body	6 to 8
T.V. Pressure Take-Off (Plug)	6 to 7
Line Pressure Take-Off (Plug)	6 to 7
Case Cover to Pump	15 to 18
Oil Pan to Case	12 to 15
Front Internal Gear to Clutch Housing	22 to 27
(Governor) Output Shaft to Carrier	19 to 23
Torus Exhaust Valve Cover to Torus Cover	19 to 23
Torus Cover to Driving Torus	17 to 20
Band Adjusting Screw Lock Nut	18 to 20
Flange Assembly to Output Shaft	40 to 50
Rear Bearing Retainer to Case	20 to 25
Case Cover to Case	20 to 25
Oil Pan Drain Screw	35 to 45
Coupling Feed Limit Valve Plug	15 to 20
Pressure Regulator Plug	15 to 20

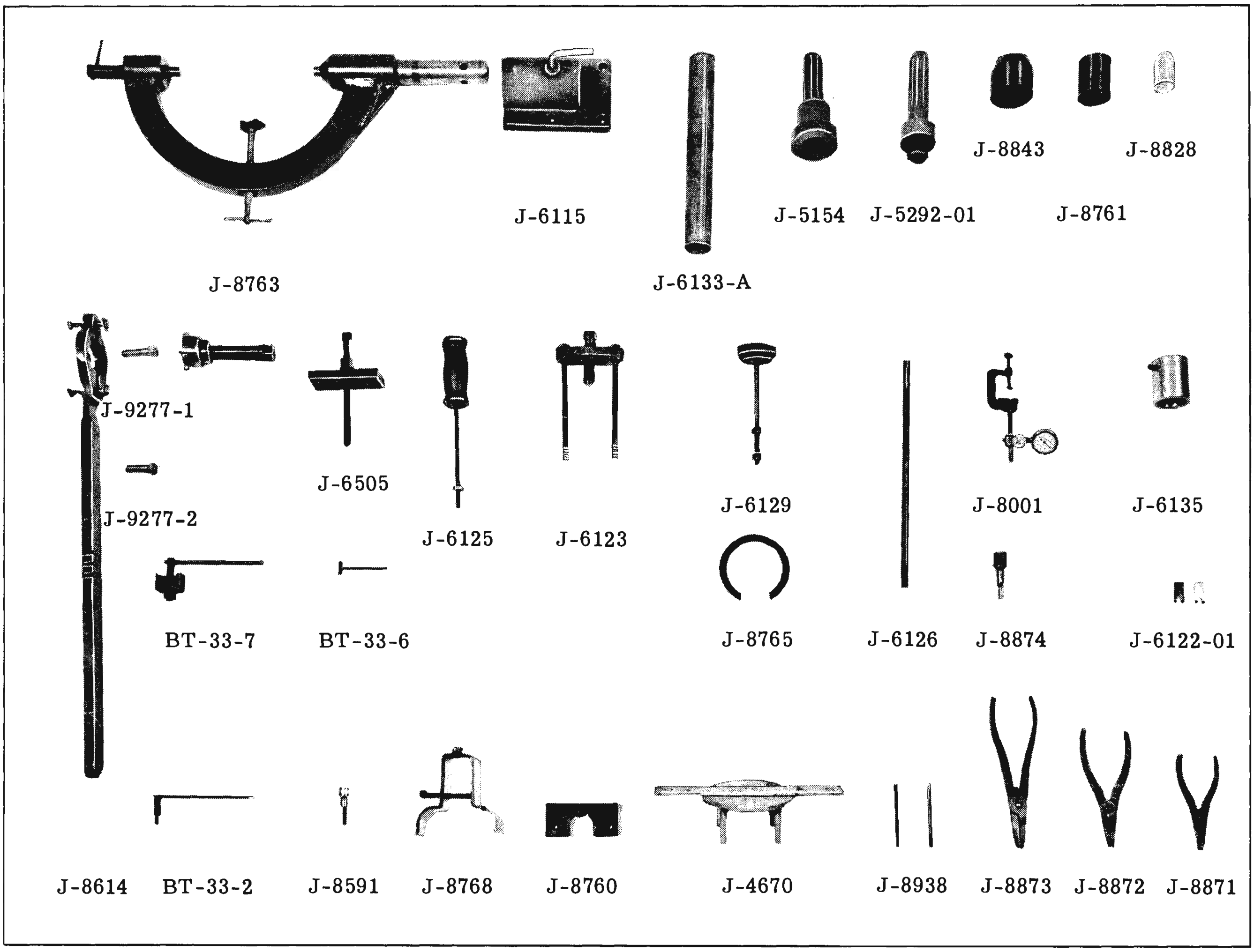


Fig. 3-342 Tools

BT-33-2	T.V. Lever Gauge
BT-33-6	Stop Screw Adjusting Gauge
BT-33-7	T.V. Lever Bending Tool
J-4670	Clutch Spring Compressor
J-5154	Rear Bearing Retainer Seal Installer
J-5292-01	Differential Side Bearing Installer (Used to Install Rear Bushing Assembly)
J-6115	Transmission Holding Fixture Base
J-6122-01	Front Unit Coupling Valve Retainers
J-6123	Speedometer Gear Puller
J-6125	Slide Hammer (Used to Remove Reverse Cone)
J-6126	Dial Indicator Support
J-6129	Clutch Spring Compressor
J-6133-A	Speedometer Gear Installer
J-6135	Rear Unit Clutch Retainer (Used On Main Shaft To Check End Play)
J-6505	Rear Companion Flange Installer
J-8001	Dial Indicator Set
J-8591	Band Adjuster
J-8614	Companion Flange Holder and Remover
J-8760	Speedometer Gear Remover Adapter Set
J-8761	Front Pump Seal Installer
J-8763	Transmission Holding Fixture
J-8765	Reverse and Neutral Clutch Spring Compressor Adapter
J-8768	Reverse Cone Remover
J-8828	Oil Pump Seal Protector
J-8843	Reverse Clutch Inner Seal Protector
J-8871	Truarc 22-90° Plier External
J-8872	Truarc 24-90° Plier External
J-8873	Truarc 25-90° Plier Internal
J-8874	Exhaust Valve Cover Remover
J-8938	Internal Gear Holding Studs
J-9277-1	Bolt For Removing Hydra-Matic Transmission Companion Flange
J-9277-2	Bolt For Removing Syncro-Mesh Transmission Companion Flange

STEERING

(FULL SIZE CAR)

CONTENTS OF SECTION 4

PERIODIC MAINTENANCE

Power Steering gear lubrication is accomplished by the oil supplied through the gear by the power steering pump. Regular or seasonal changes are unnecessary. Refer to PERIODIC MAINTENANCE, Section 2, for steering linkage lubrication requirements.

STEERING LINKAGE (Fig. 4-1)

GENERAL INFORMATION

The only steering linkage adjustment is at the tie rod sleeves for the setting of steering wheel spoke alignment and front wheel toe-in. If worn linkage joints are suspected, they should be checked for wear and worn parts should be replaced. Linkage joints are worn if free travel within the joints can be detected while operating the steering mechanism.

REPLACEMENT OF STEERING LINKAGE PARTS

PITMAN ARM

To disconnect the pitman arm from the pitman shaft use Tool J-5504-B or a similar puller. Upon assembly, install the pitman arm with the front wheels in the straight ahead position and with the steering wheel at the center of its travel. Torque pitman shaft nut 90 to 120 ft. lbs.

LINKAGE JOINTS

IMPORTANT: When disconnecting a linkage joint, no attempt should be made to disengage the joint by driving a wedge between the joint and the attached part.

Tie rod joints should be disconnected from the relay rod, after removing the attaching nut, by using Tool J-5504-B. (Fig. 4-2) To disconnect the outer end of a tie rod, remove the tie rod to

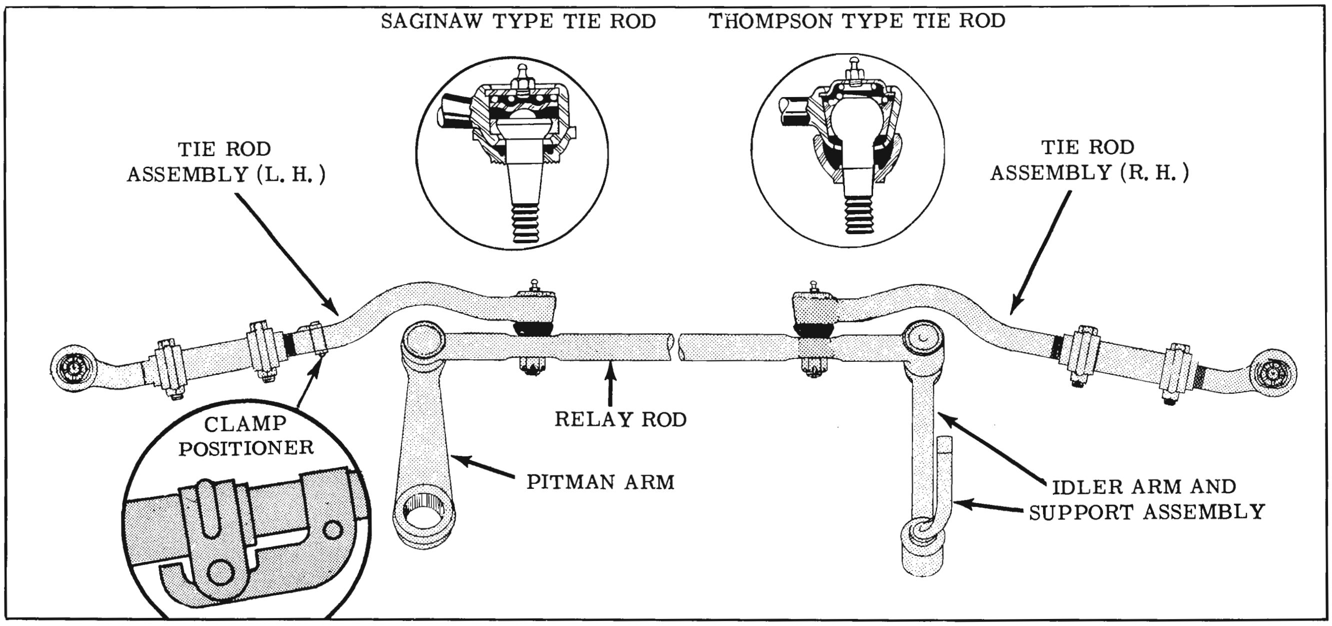


Fig. 4-1 Steering Linkage

plain arm attaching nut, then tap the END of the PLAIN ARM with a hammer to free the tie rod from the plain arm. Upon reassembly, the linkage joint nuts should be tightened 50 to 60 ft. lbs. To remove the pitman arm or idler arm from the relay rod, the steering linkage should be removed from the car. After removing the nut, the relay rod can be clamped in a vise or supported so that the joint can be driven out of the relay rod.

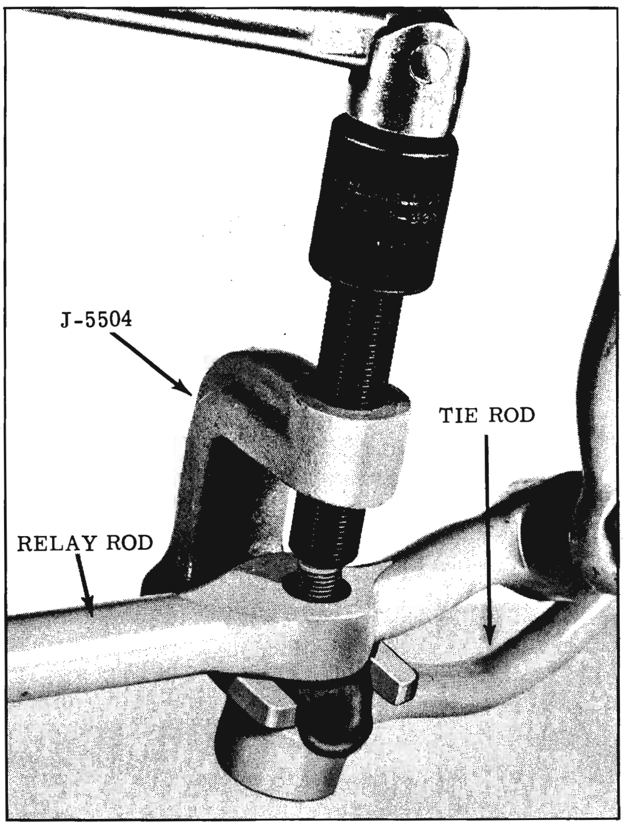


Fig. 4-2 Disconnecting Linkage Joint

IDLER ARM AND SUPPORT ASSEMBLY

The idler arm and support is serviced as an assembly and no adjustments are required. When installing the support to the frame bracket, torque the bolts 25 to 35 ft. lbs.

TIE RODS

Whenever the tie rod end is assembled to the tie rod and prior to assembling the tie rod end to the plain arm, make certain that an equal number of tie rod and tie rod end threads are exposed at each end of the tie rod sleeve.

LINKAGE ADJUSTMENT

Toe-in and steering wheel spoke alignment is obtained by turning the adjusting sleeves on the tie rods which in turn lengthen or shorten the tie rod assemblies. Refer to WHEEL ALIGNMENT. After adjusting toe-in, make certain that the sleeve clamps are positioned as shown in Fig. 4-3.

MANUAL STEERING (Fig. 4-4)

ADJUSTMENTS (ON CAR)

Before any adjustments are made to the steering gear in an attempt to correct such conditions as shimmy, hard or loose steering, or road shock, careful check should be made to determine that front end alignment, shock absorbers, wheel balance, and tire pressure are correct.

There are two adjustments on the manual steering gear:

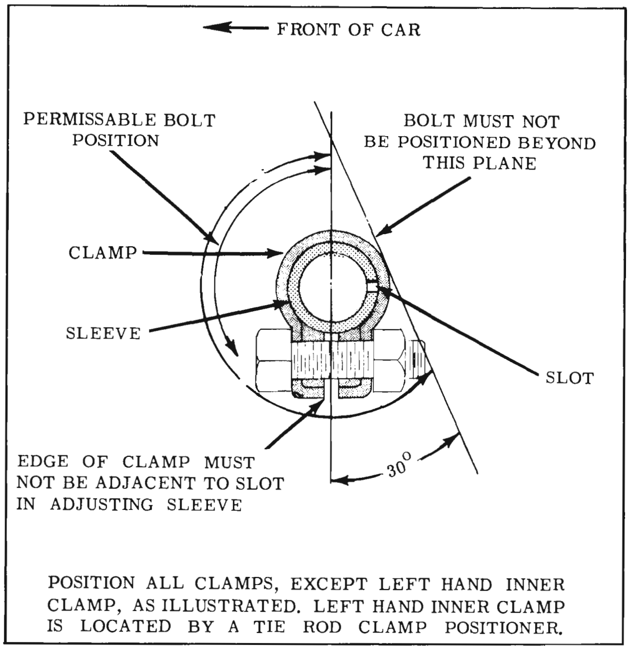


Fig. 4-3 Tie Rod Clamp Positioning

a. WORM BEARING PRELOAD ADJUSTMENT

b. OVER-CENTER ADJUSTMENT

IMPORTANT: The worm bearing preload adjustment must be checked and corrected if necessary before the over-center adjustment is made. Failure to follow the proper sequence may result in damage to the steering gear.

WORM BEARING PRE-LOAD ADJUSTMENT

1. Disconnect the pitman arm from pitman shaft using Tool J-5504-B or a similar puller.

2. Loosen pitman shaft adjusting screw lock nut

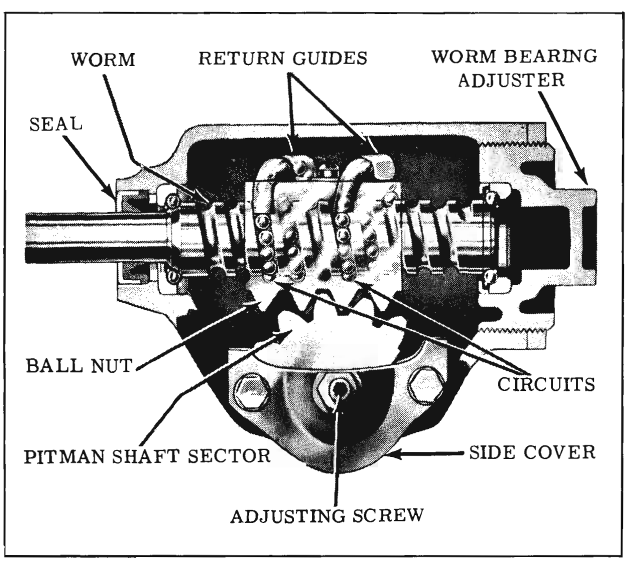


Fig. 4-4 Manual Steering Gear

Fig. 4-5 Checking Worm Bearing Preload

and loosen adjusting screw a few turns. (Fig. 4-7)

3. Using an inch pound torque wrench measure the torque which is required to keep the wheel in motion at about 30° off straight ahead position. (Fig. 4-5)

4. The torque required should be between 5 and 9 inch pounds. If it is not, it will be necessary to loosen the worm bearing adjuster lock nut with a brass drift (Fig. 4-6) and turn the worm bearing adjuster the required amount to bring the torque within limits.

5. When adjustment is correct, retighten lock

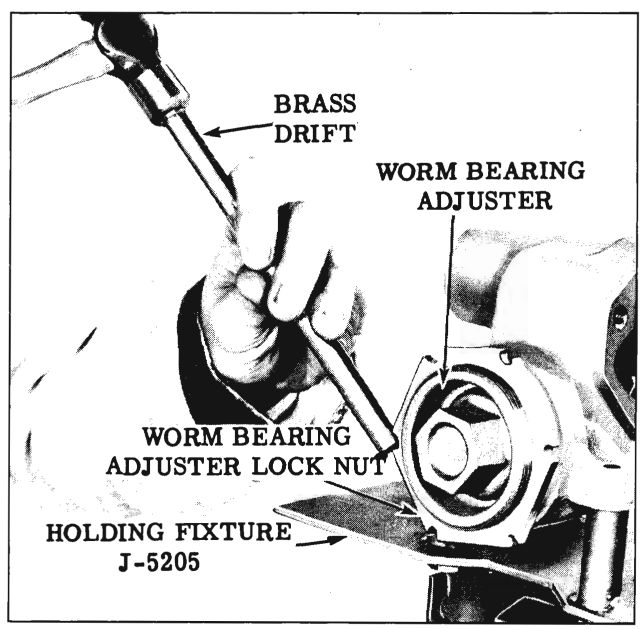


Fig. 4-6 Loosening Lock Nut

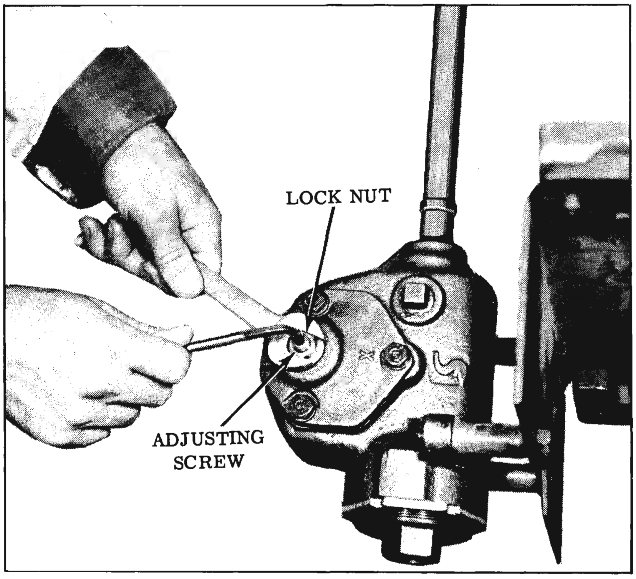


Fig. 4-7 Over-Center Adjustment

nut 70 to 100 ft. lbs. and recheck preload.

OVER-CENTER ADJUSTMENT

6. After making the worm bearing adjustment, the pitman shaft adjusting screw should be tightened until a pull of 5 to 11 inch pounds in excess of worm bearing preload is required to turn the wheel through the center range. (Approximately 2-7/8 turns from either end of travel on car or 3-1/8 turns for bench adjustment.) (Fig. 4-7) Tighten the lock nut 18 to 27 ft. lbs. and recheck the over-center adjustment.

7. After adjustments have been made, assemble pitman arm to pitman shaft with front wheels and steering wheel in the straight ahead position so that splines will align properly. Torque pitman shaft nut (90 to 120 ft. lbs.).

GEAR ASSEMBLY REMOVE AND INSTALL

1. Remove steering wheel and loosen column upper clamp to bracket attaching bolts.

2. Fold back floor mat and remove mast jacket cover plate from toe pan.

3. Hoist front of car and support car with floor stands under outer ends of lower control arms.

4. Remove pitman shaft nut and pull pitman arm from shaft using Tool J-5504-B or a similar puller.

5. Remove gear to frame bolts, position steering linkage and speedometer cable out of the way and withdraw gear assembly from under car.

To install, first apply wheel bearing grease to the gear mounting pads to prevent gear to frame squeak, then reverse removal procedure. Before tightening steering gear to frame and upper column clamp bolts, position column assembly to obtain 2-7/32" between horn contact and end of worm shaft to provide 1/8" to 3/16" clearance between turn signal housing and steering wheel.

IMPORTANT: Tighten upper mast jacket clamp before tightening steering gear to frame bolts. Torque steering gear to frame bolts 60 to 80 ft. lbs. Torque pitman shaft nut 90 to 120 ft. lbs.

DISASSEMBLY OF GEAR

1. Mount gear on Holding Fixture J-5205, and remove clamp and spring from worm shaft.

2. Loosen the pitman shaft adjusting screw lock nut.

3. Rotate worm shaft 3-1/8 turns from end of travel, then remove side cover and pitman shaft from steering gear housing.

4. Loosen worm bearing adjuster lock nut with a brass drift, then remove lock nut and adjuster assembly from gear housing.

5. Remove worm shaft assembly (with ball nut) out through bottom of housing. Slide rubber grommet and upper worm bearing off steering shaft.

SERVICING INDIVIDUAL UNITS

PITMAN SHAFT AND SIDE COVER

Dissassembly

1. Remove pitman shaft adjusting screw lock nut.

2. Thread, adjusting screw through pitman shaft cover, then remove cover and gasket.

3. If needle bearing is to be replaced, remove bearing from side cover using Tool J-5190-A as follows:

   a. Loosen the forcing screw of Tool J-5190-A so the expander jaws can be fully retracted.

   b. Place Tool J-5190-A through needle bearing in side cover.

   c. Thread a 7/16" x 20 bolt in the adjusting screw hole in the side cover until Tool J-5190-A is raised up just enough for the knurled section to clear the bearing.

   d. Turn the forcing screw in to expand jaws and remove the bearing (Fig. 4-9)

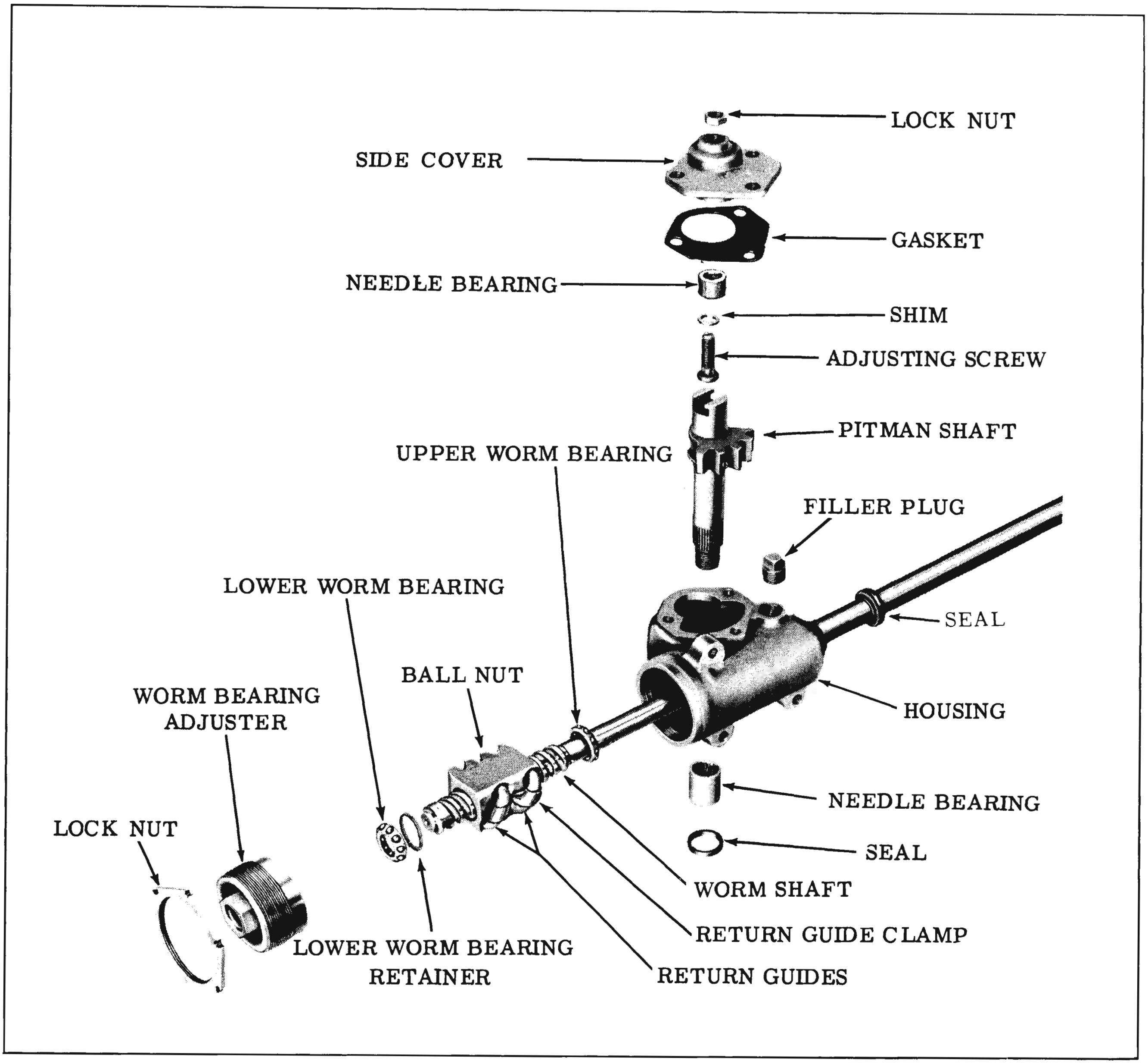


Fig. 4-8 Manual Steering Gear

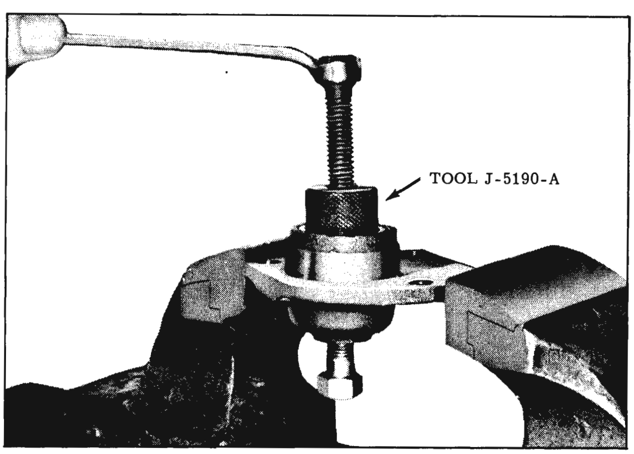


Fig. 4-9 Removing Needle Bearing

4. Wash all parts in clean solvent and dry with compressed air. Inspect parts.

Assembly

1. If needle bearing was removed, position new bearing on side cover with manufacturer's identification facing out, and drive needle bearing flush with surface of casting bore using Tool J-7030-1 and driver handle J-8092. (Fig. 4-10) Pack bearing with SAE 80 Multi-Purpose Gear Lubricant.

2. Check the end clearance of the adjusting screw in the slot of the pitman shaft. (Fig. 4-11) The screw should rotate freely but not have more than .002" clearance. If clearance exceeds .002", select the proper shim to bring the clearance to specification. (Shim thicknesses are .063", .065", .067", and .069")

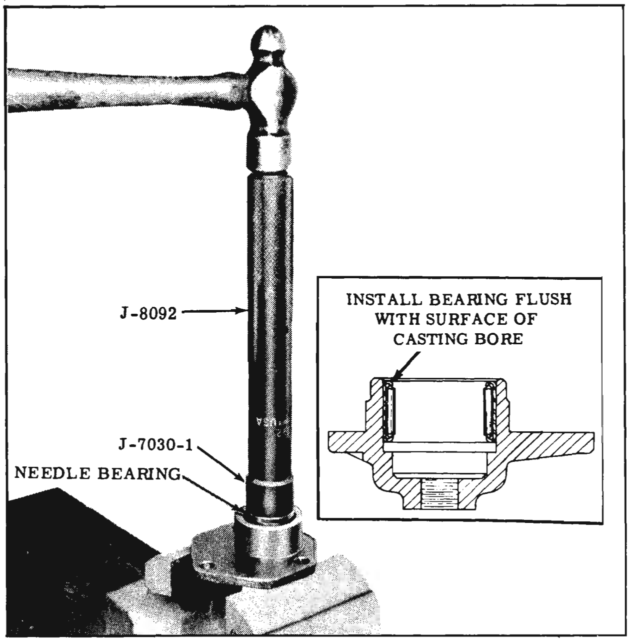


Fig. 4-10 Installing Needle Bearing

3. Assemble the pitman shaft and adjusting screw (with proper shim) to side cover. Thread the adjusting screw through the side cover until the side cover bottoms on the pitman shaft.
4. Install lock nut but do not tighten.

HOUSING

Disassembly

1. If pitman shaft seal ONLY is to be replaced, use a small chisel to collapse the seal so it can be lifted from the housing. (Fig. 4-12)
2. If pitman shaft needle bearing is to be replaced, use Tool J-7030-1 with Driver Handle J-8092 to drive bearing and seal from housing. (Fig. 4-13)

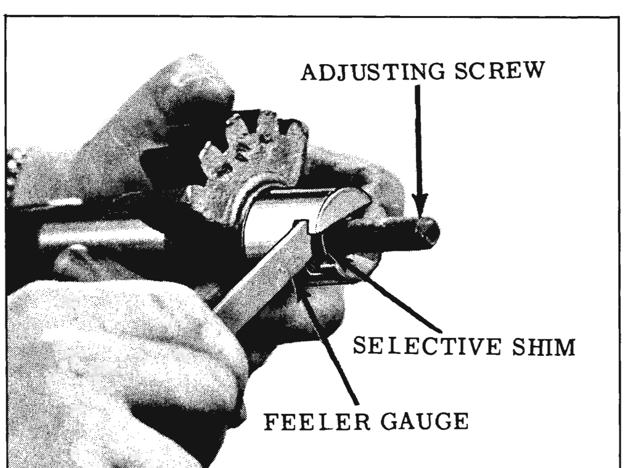


Fig. 4-11 Checking End Clearance

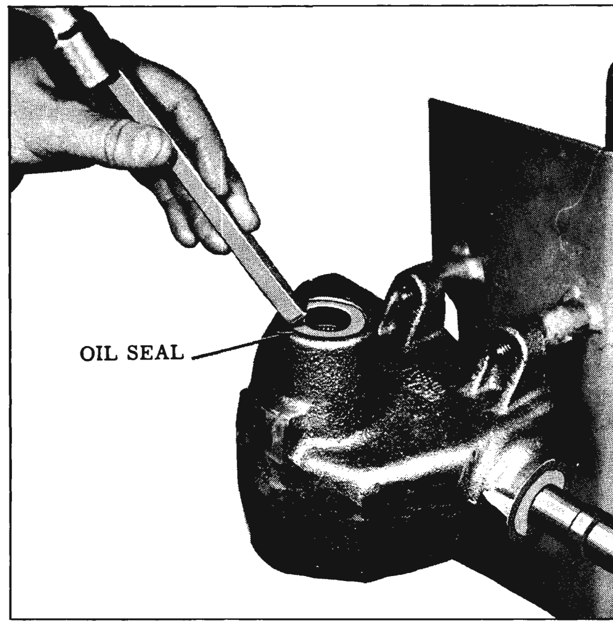


Fig. 4-12 Removing Pitman Shaft Seal

3. The upper worm bearing race can be removed with a brass drift and installed with Tool J-8811.
4. Wash housing in clean solvent and dry with compressed air.

Assembly

1. If pitman shaft needle bearing was removed, install Ring J-7030-2 over J-7030-1 and place stamped end (manufacturer's name) of new

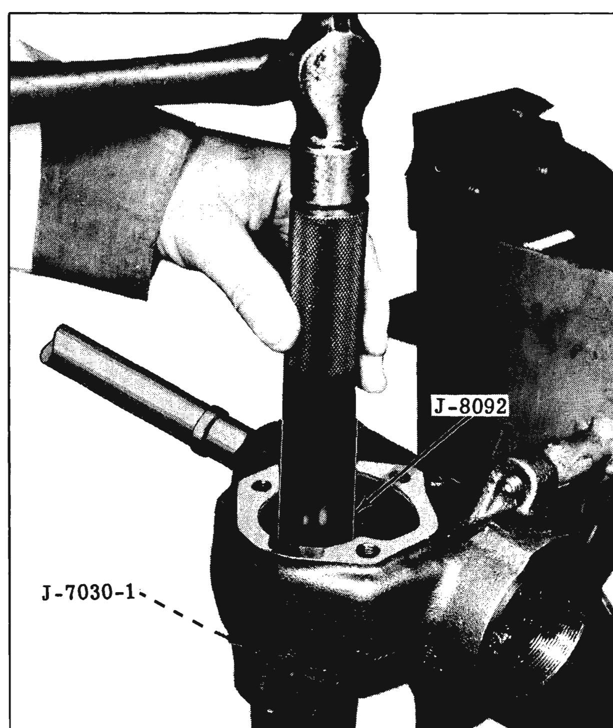


Fig. 4-13 Removing Needle Bearing

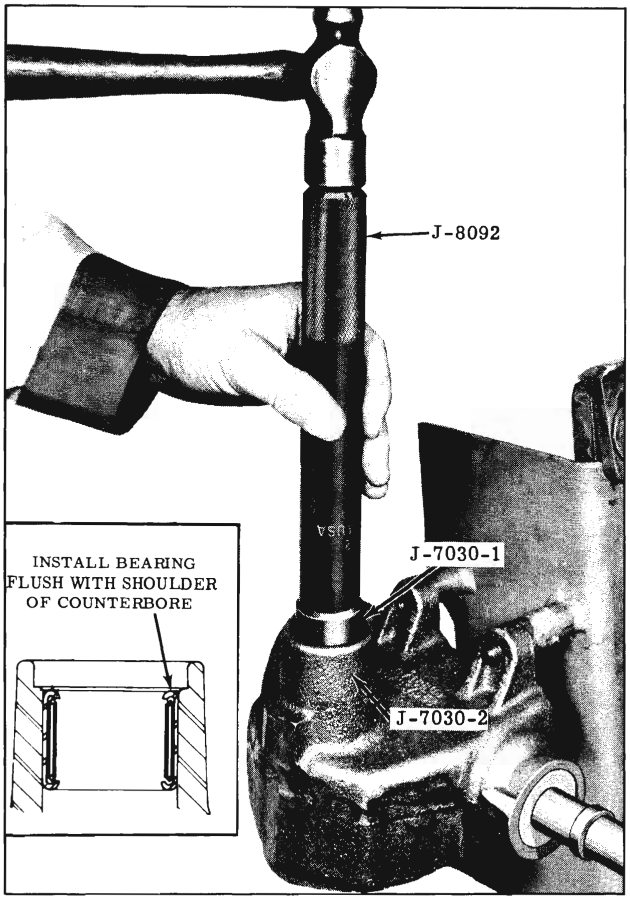


Fig. 4-14 Installing Pitman Shaft Bearing

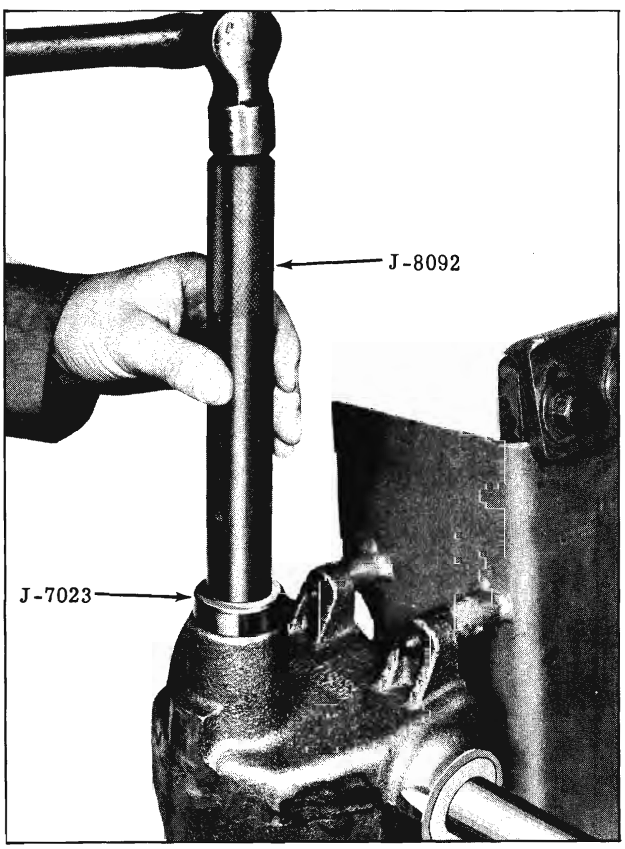


Fig. 4-15 Installing Pitman Shaft Seal

bearing over end of Tool J-7030-1, then drive bearing into housing until Ring J-7030-2 bottoms in bore. (Fig. 4-14) Pack bearing with SAE 80 Multi-Purpose Gear Lubricant.

2. Place a new seal into housing with lip of seal facing inward. Drive seal in the housing until it bottoms against shoulder of counterbore, using Tool J-7023. (Fig. 4-15) Coat lip of seal with seal lubricant, Part No. 567196.

WORM BEARING ADJUSTER

Disassemble

1. Pry lower worm bearing retainer from adjuster, then remove lower worm bearing.
2. Wash all parts in clean solvent and dry with compressed air. Inspect parts for wear.

Assemble

1. Pack lower worm bearing with SAE 80 Multi-Purpose Gear Lubricant, then place bearing on race and install retainer.

BALL NUT

Remove

1. Remove ball return guide clamp and guides from ball nut.
2. Rotate worm until all balls have dropped out of the nut, then remove nut from worm.
3. Wash all parts in clean solvent and dry with compressed air. Inspect parts for wear.

Install

1. Slide ball nut over worm. (Fig. 4-16)
2. With ball nut teeth facing downward, install 20 balls into EACH CIRCUIT.

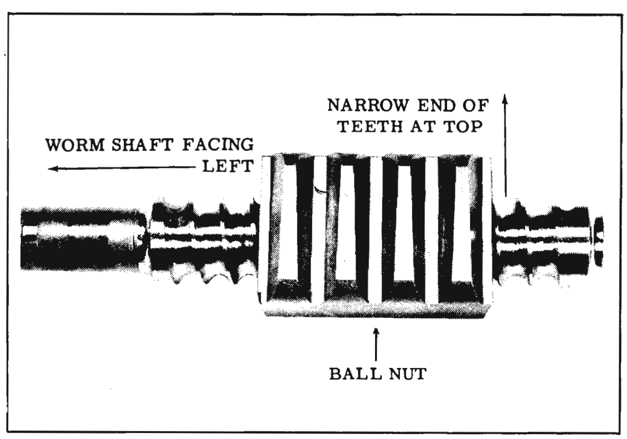


Fig. 4-16 Positioning Ball Nut

3. Place 5 balls into EACH RETURN GUIDE and retain with SAE 80 Multi-Purpose Gear Lubricant.

4. Install return guides and guide clamp onto ball nut.

ASSEMBLY OF STEERING GEAR

1. Pack the upper worm bearing with SAE 80 Multi-Purpose Gear Lubricant, then slide upper worm bearing over worm shaft and position bearing against worm. Install grommet. Slide worm shaft, bearing and ball nut assembly into gear housing.

2. Install worm bearing adjuster into gear housing. Adjuster should be installed just tight enough to hold worm bearing in place. Final adjustment will be made later.

3. Install pitman shaft and side cover assembly and gasket, with sector and ball nut teeth centered as shown in Fig. 4-17. Torque side cover bolts 20 to 22 ft. lbs.

4. Fill steering gear with SAE 80 Multi-Purpose Gear Lubricant.

5. Steering gear should be bench adjusted before it is assembled in car as follows:

   a. Place steering wheel on shaft.

   b. Turn steering gear from one extreme to the other to make certain there are no unusual binds.

   NOTE: Never allow ball nut to strike the ends of the ball races when reaching its extreme position due to the possibility of damaging ball guides.

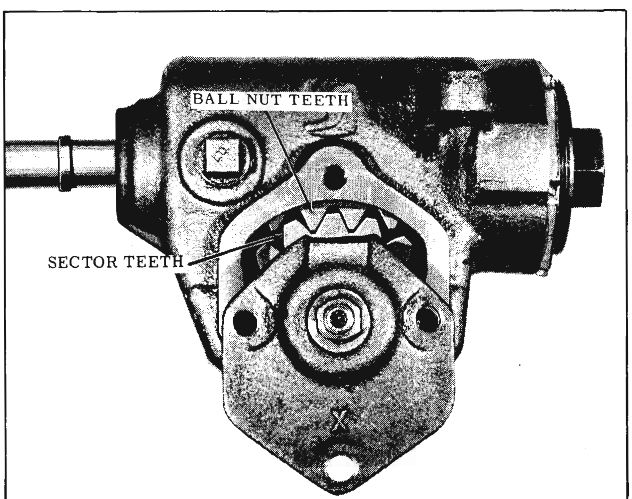


Fig. 4-17 Sector and Ball Nut Centered

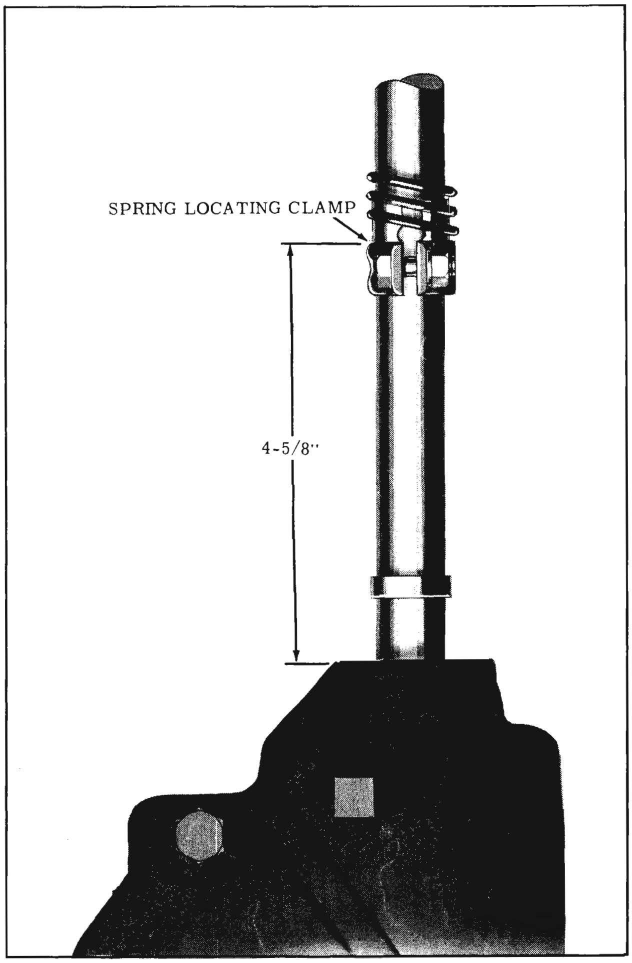


Fig. 4-18 Clamp Location

   c. Adjust worm bearing preload and over-center adjustment as outlined under ADJUSTMENTS (ON CAR) following steps 3 thru 6.

6. Remove steering wheel from shaft.

7. Install clamp and spring on worm shaft.(Fig. 4-18)

8. Remove gear from Holding Fixture.

POWER STEERING

PUMP

OPERATION (Fig. 4-19)

Oil is supplied from the reservoir to the pumping chambers (composed of the cam ring, rotor, thrust plate and pressure plate) through passage A. Oil discharged from the pumping chamber is discharged to cavity B. From the cavity B, oil passes through orifice C into the outlet passage and on through the flexible lines to the steering gear. Part of the oil in cavity B passes through

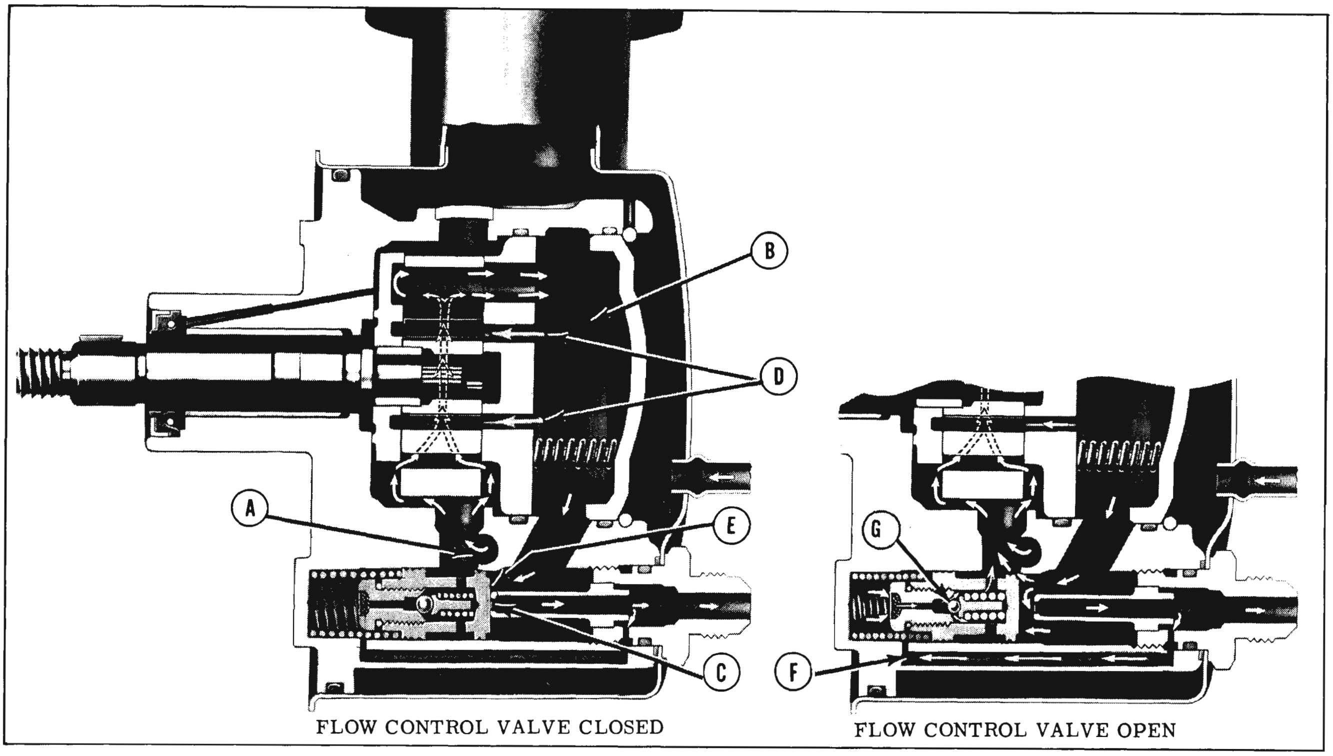


Fig. 4-19 Oil Flow at Low Speed

openings D in the pressure plate to act on the inner edge of the ten vanes and assist centrifugal force in keeping the vanes out against the cam ring. The thrust plate has four blind cavities directly opposite these four openings in the pressure plate to prevent side thrust on the vanes.

When pump output exceeds the calibration of orifice C, a back pressure builds up behind the flow control valve at E which overcomes spring force and opens the valve to allow oil to return to the intake side of the pump and to the reservoir. (Inset, Fig. 4-19) Flow control is desirable to reduce power consumption which would otherwise result if the pump were allowed to circulate oil through the steering gear with no regulation when driving at high speed.

When steering conditions demand high pressure for power assist, the pump builds up sufficient pressure on the steering gear rack-piston to turn the pitman shaft. This pressure is also being exerted on the front end of the flow control valve through passage F. When extremely high pressure is built up in the steering gear (such as when holding the steering linkage against its stop) the pressure relief ball G is forced from its seat. Oil flowing past the ball, plus the normal internal leakage at the outer edge of the flow control valve, reduces the pressure on the forward side of the flow control valve. The flow control valve then opens, allowing oil to return to the intake side of the pump and to the reservoir.

When making a partial turn at low speed, the pressure requirements are normally well below maximum pressure, so the pressure relief ball will be closed. Also the pump output is less than system requirements so the flow control valve is closed.

MINOR SERVICE OPERATIONS

PUMP BELT ADJUSTMENT

Checking

Position Gauge 33-70 on pump belt as shown in Fig. 4-20. If the pointers on sleeve of tool do not index with the groove in tool plunger, the belt should be adjusted as follows:

Adjustment

With Gauge 33-70 positioned on pump belt, loosen the pump attaching bolts and adjust the belt tension by moving the pump away from engine. On used belts, the pointers on gauge 33-70 should index with groove in gauge plunger. (Fig. 4-21) On new belts, align index groove with notch. (Fig. 4-20) Tighten attaching bolts 20 to 28 ft. lbs. and recheck adjustment.

SERVICING OF THE FLOW CONTROL VALVE (WITHOUT REMOVING PUMP ASSEMBLY FROM CAR)

1. Disconnect high pressure hose from pump union and drain oil.

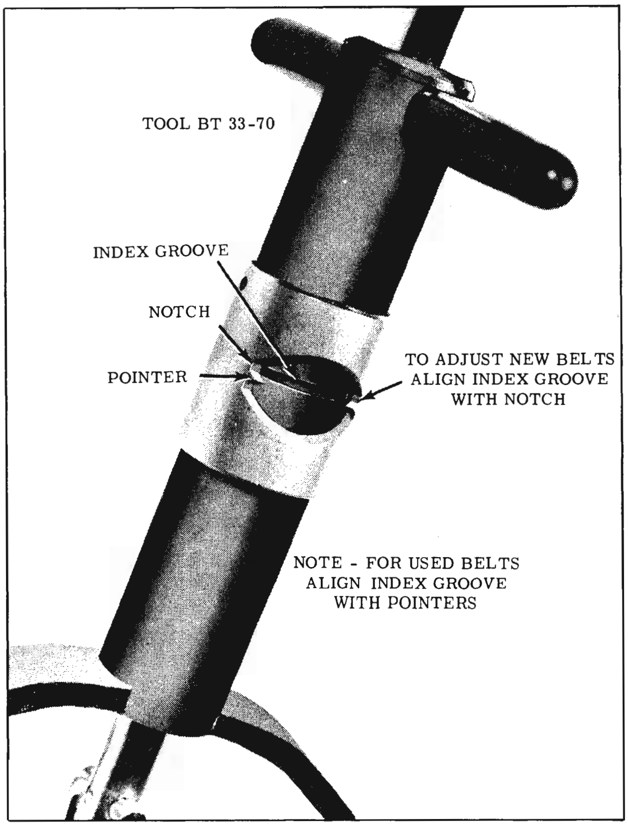


Fig. 4-20 Gauge Position for New and Used Belts

2. Remove union and withdraw flow control valve and spring with a magnet.
3. For disassembly and assembly of flow control valve refer to step 13 under PUMP DISASsembly and step 1 under PUMP ASSEMBLY.
4. To install reverse the above procedure and install a new "O" ring seal on the union.

PUMP SHAFT OIL SEAL REPLACEMENT (WITHOUT DISASSEMBLING PUMP)

The pump shaft oil seal can be replaced without

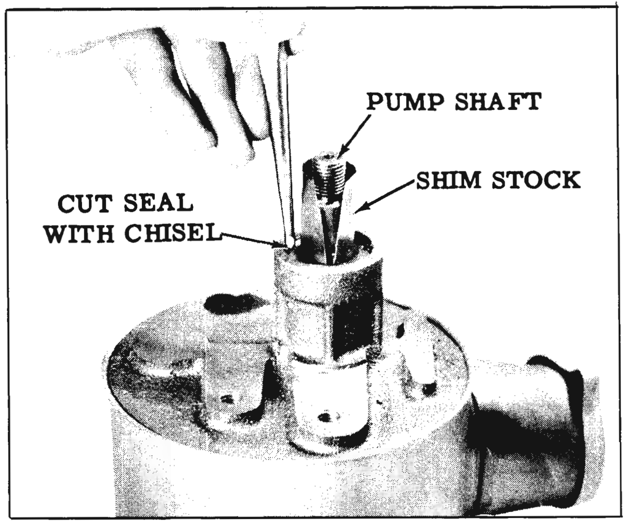


Fig. 4-22 Cutting Pump Seal

disassembling the pump from the car as follows:

1. With the pump pulley removed, bend a piece of .005" shim stock (approximately 2-1/2" long) into a cylindrical shape, then push the shim stock past seal until it bottoms in pump body. (Fig. 4-22)

   NOTE: The use of Seal Protector Tool J-7132-1 will aid in pushing shim stock into pump body. The use of shim stock around the drive shaft will prevent damage to the machined surfaces of the shaft when removing seal.

2. Cut metal body of seal with a small chisel as shown in Fig. 4-22.
3. Tear metal body approximately 1" with diagonals. Force an awl between the pump body and the O.D. of seal to collapse the seal, then pry seal from pump body. (Fig. 4-23) Remove shim stock.
4. Apply Special Seal Lubricant (Part No.

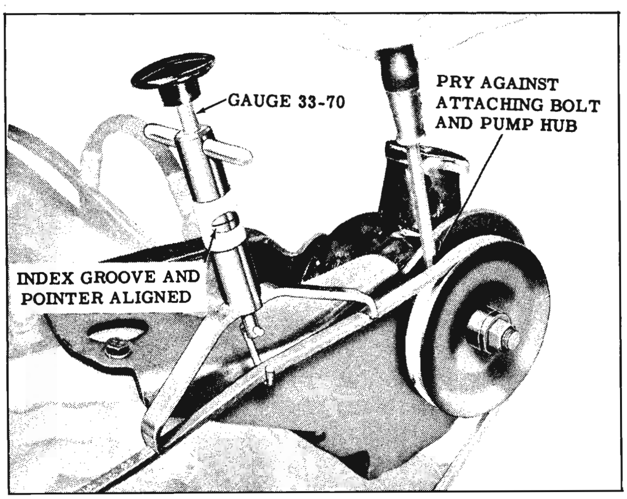


Fig. 4-21 Adjusting Pump Belt

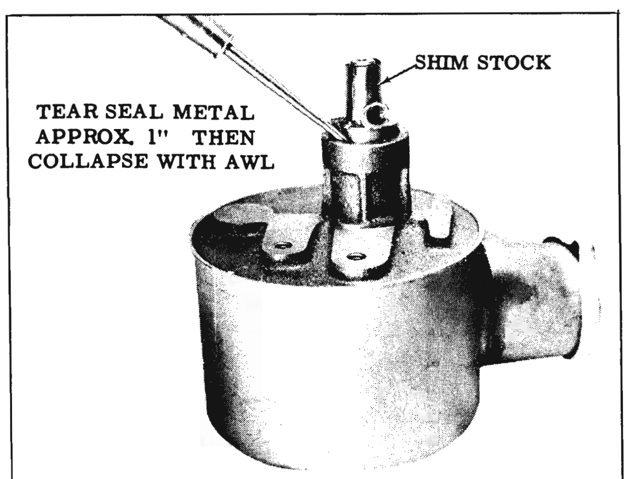


Fig. 4-23 Removing Pump Seal

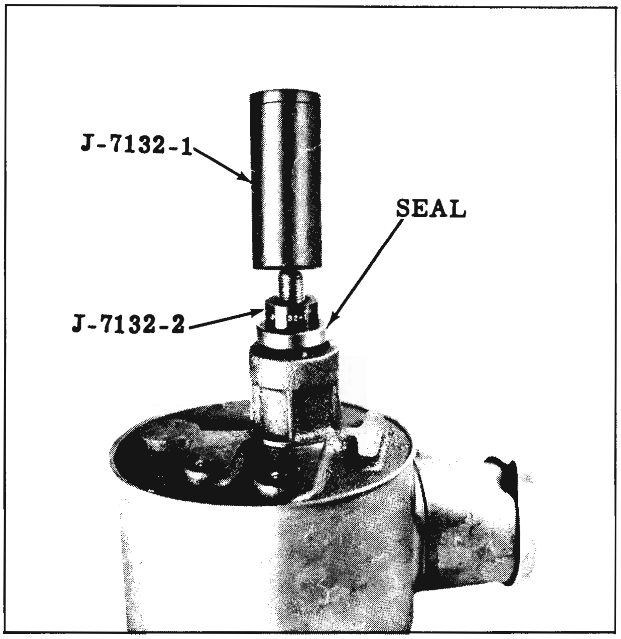


Fig. 4-24 Installing Pump Seal

567196) to the sealing lip of a new seal, then install seal over Seal Protector Tool J-7132-1 with metal side of seal against tool.

5. Slide Tool J-7132-1 (with seal) over drive shaft, then using Tool J-7132-2, drive seal into pump body. (Fig. 4-24)

6. Remove tools.

PUMP REMOVAL AND (INSTALLATION (Fig. 4-25)

1. Disconnect the hoses from the pump and secure end of hoses above fluid level. Cap pump fittings.

2. Remove the pump pulley attaching nut.

3. Remove the rear bracket by removing the 3 bracket attaching nuts and the bracket to intake manifold bolt.

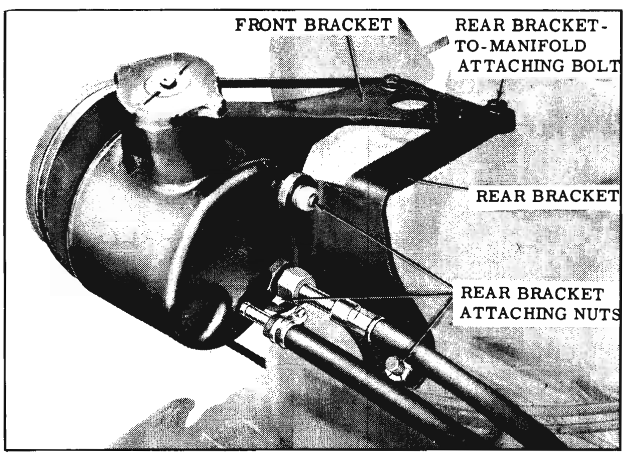


Fig. 4-25 Pump Mounting

4. Loosen the pump to front bracket attaching bolts and remove the belt and pulley. DO NOT HAMMER PULLEY OFF SHAFT.

5. Remove the 2 pump to front bracket attaching bolts and remove pump.

To install, reverse the removal procedure. Tighten the rear bracket attaching nuts 20 to 40 ft. lbs., rear bracket to intake manifold bolt and pump to front bracket bolts 20 to 28 ft. lbs. and the pulley attaching nut 35 to 45 ft. lbs. Fill reservoir with Hydra-Matic fluid, then bleed pump by turning pulley counterclockwise until air bubbles cease to appear. Refill reservoir to proper fluid level, if necessary. Adjust pump belt as outlined under PUMP BELT ADJUSTMENT.

PUMP ASSEMBLY (Fig. 4-27)

1. Clean the exterior of the pump and drain the reservoir. Lightly clamp the pump body in a vise so that the rear of the reservoir is facing up.

2. Remove the rear mounting stud and then remove the "O" ring seal. Discard the seal.

3. Remove the union. Remove "O" ring seal from union and discard.

4. Remove the reservoir by rocking it while pulling upward. Remove pump body from vise.

5. Remove the "O" ring, flow control valve assembly and spring from the bore in the pump body.

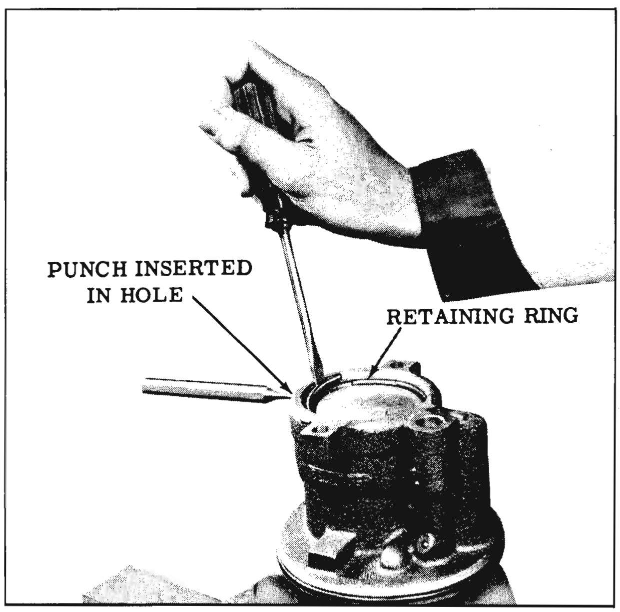


Fig. 4-26 Removing End Cover Retaining Ring

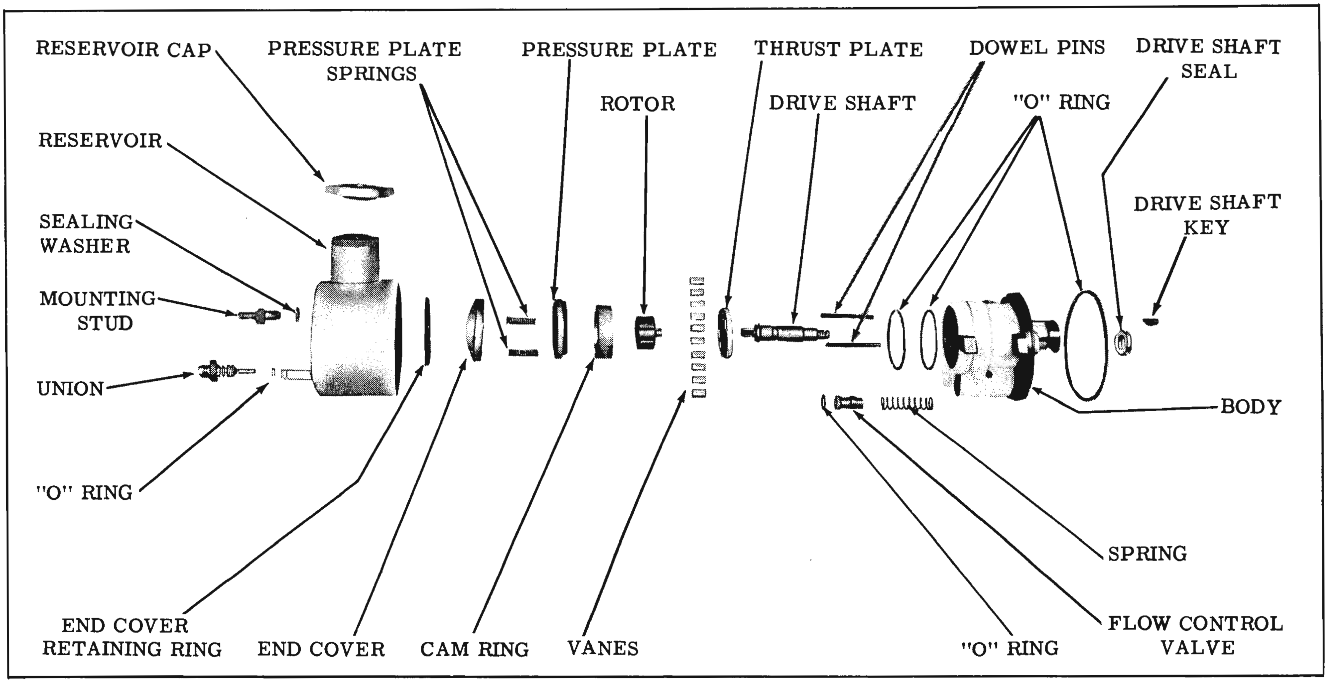


Fig. 4-27 Power Steering Pump

6. Rotate the end cover retainer ring so that one end of the ring is over the hole in the side of body, then force end of ring from its groove and remove ring. (Fig. 4-26)

7. Remove end cover from pump body. If cover is cocked in pump body, tap plate with a soft hammer to free up.

8. Remove the two pressure plate springs from the dowel pins.

9. Remove the drive shaft key, then place the pump on a bench with the drive shaft up. Tap end of shaft with a soft hammer until it is free.

10. Lift the pump body off the shaft, then remove the drive shaft, thrust plate, dowel pins, cam ring, rotor, vanes and pressure plate.

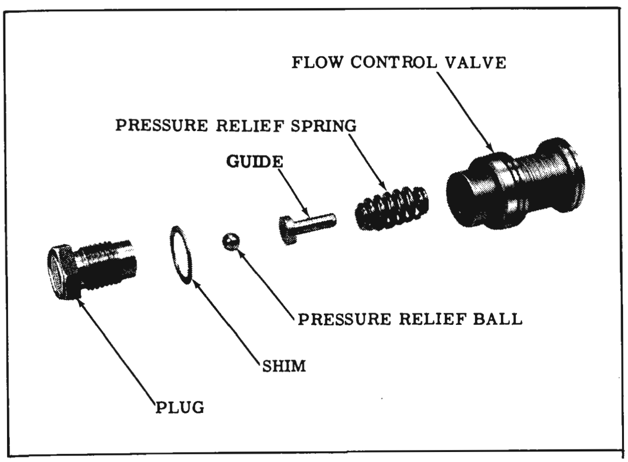


Fig. 4-28 Flow Control Valve

11. Remove 2 inside and 1 outside "O" rings from the pump body.

12. Pry the drive shaft oil seal from the pump body with a screwdriver.

13. If necessary to disassemble the flow control valve, proceed as follows:

    a. Clamp the valve in a brass jawed vise.

    b. Remove the hex head plug and shims. (Fig. 4-28) Note the number of shim(s) on the plug so the same number of shim(s) can be reinstalled during assembly.

    c. Remove the pressure relief ball, guide and spring from the flow control valve.

CLEANING AND INSPECTION

1. Wash all parts in clean solvent, blow out all passages with compressed air and air dry.

2. Inspect the drive shaft for wear and see that the seal area of the shaft is smooth and free of nicks.

3. Check the fit of the vanes in the rotor slots. They must slide freely but snugly in the slots. Tightness may be relieved by thorough cleaning or by removal of irregularities with a fine stone. Replace the rotor and/or vanes if excessive looseness exists between the rotor and vanes.

4. Inspect the flat surfaces on the thrust plate and pressure plates for scoring or irregular wear. Light scores can be smoothed by light lapping, after which all lapping compound must be thoroughly removed.

5. Inspect all ground surfaces of the cam ring for roughness or irregular wear. Light scores on the flat surfaces may be smoothed by lapping. Normal wear or scuff marks on the inner surface do not affect pump operation or cause excessive noise; however, if the wear consists of chatter marks or gouges, both the cam ring and vanes should be replaced.

6. Inspect the ground surfaces of the flow control valve and remove any slight irregularities with a fine stone. Install the flow control valve spring on the valve, insert the spring end of the valve in the pump body and check the fit of the valve by pushing it down into its operating position.

7. Check the end cover for nicks on the surface which contacts the "O" ring. Remove small nicks with a fine stone. Replace the cover if it is badly nicked or distorted.

8. Inspect the pump body bushing. If the bushing is scored or badly worn, replace the pump body and bushing as an assembly.

9. Inspect the reservoir for cracks, broken welds or distortion. If any of these conditions are present, replace the reservoir.

PUMP ASSEMBLY

1. If the flow control valve was disassembled, assemble as shown in Fig. 4-28. Use the

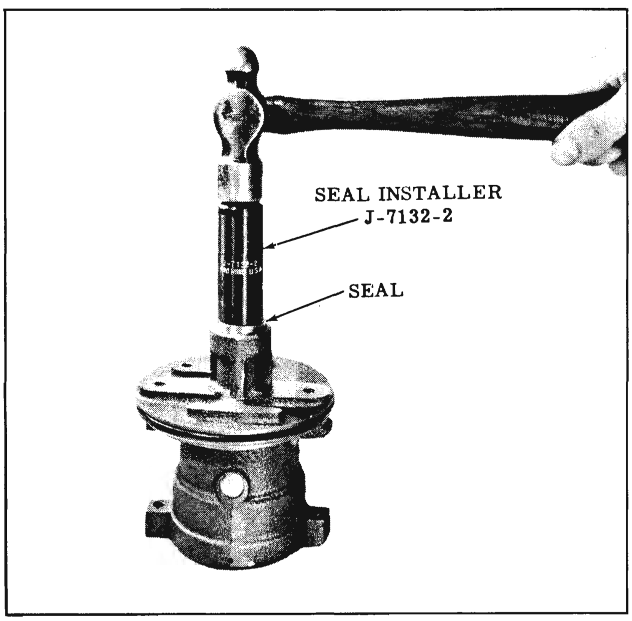


Fig. 4-29 Installing Pump Seal

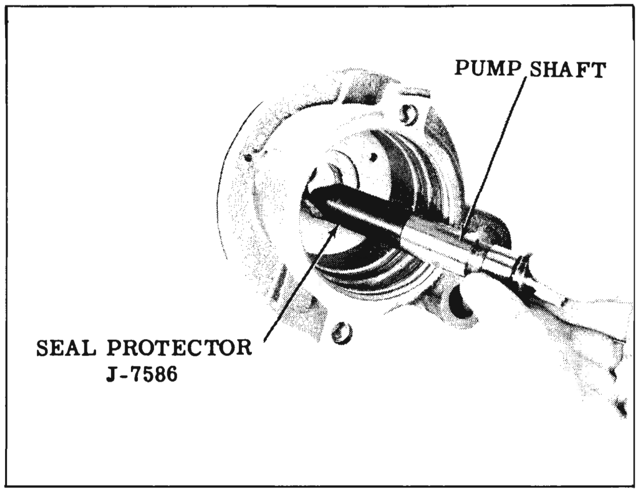


Fig. 4-30 Installing Pump Shaft

same number of shims removed, as altering shim thickness will change relief pressure. Tighten the plug to approximately 4 ft. lbs.

2. Apply Special Seal Lubricant (Part No. 567196) to the sealing lips of a new drive shaft seal and drive the seal into the pump body using Tool J-7132-2. (Fig. 4-29) Remove tool.

3. Place Seal Protector J-7586 over the threaded end of the shaft, then install the shaft in the pump body. (Fig. 4-30) Remove protector.

4. Lightly clamp body in a vise, cavity up.

5. Coat a new pressure plate to pump body "O" ring with petrolatum and install in the lower groove in the pump body.

NOTE: This "O" ring is slightly smaller in diameter than the end cover "O" ring.

6. Coat the end cover to pump body "O" ring with petrolatum and install in the upper "O" ring groove.

7. Install the two dowel pins in the holes at the bottom of the pump body cavity.

8. Install the thrust plate over the dowel pins with the oil ports up.

NOTE: One of the dowel pin holes is slightly elongated in both the thrust plate and cam ring. These holes should be at the same dowel pin to minimize the possibility of pump noise. (Fig. 4-31)

9. Install the cam ring with the small holes over the dowel pins SO THAT THE ARROW ON THE OUTER SURFACE IS NEAR THE TOP OF THE CAM RING. (Fig. 4-31)

10. Install the rotor with the alignment sleeve down.

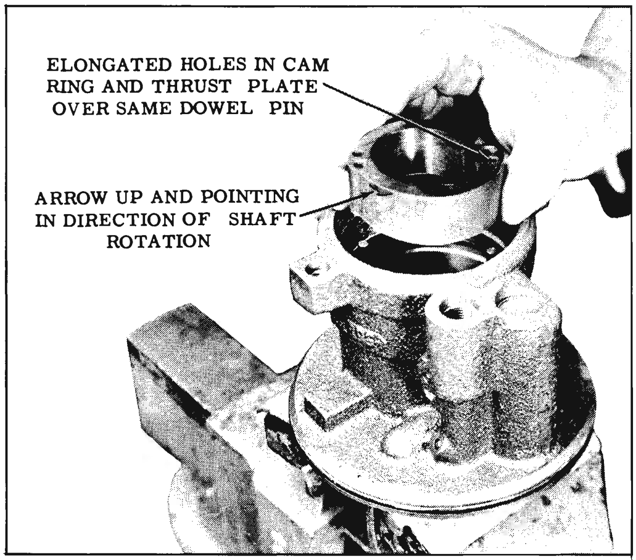


Fig. 4-31 Installing Cam Ring

11. Install the vanes in the rotor slots with the radius edge of vanes outward.

12. Apply petrolatum to the outer circumference of the pressure plate, then, with the oil ports down toward the rotor, install the pressure plate over the dowel pins through the two smallest notches in the pressure plate until the pressure plate seats against the cam ring.

13. Install the two springs over the dowel pins.

14. Install the end cover and retaining ring as follows:

    a. Apply petrolatum to the outer circumference of the end cover and position the cover into the pump body.

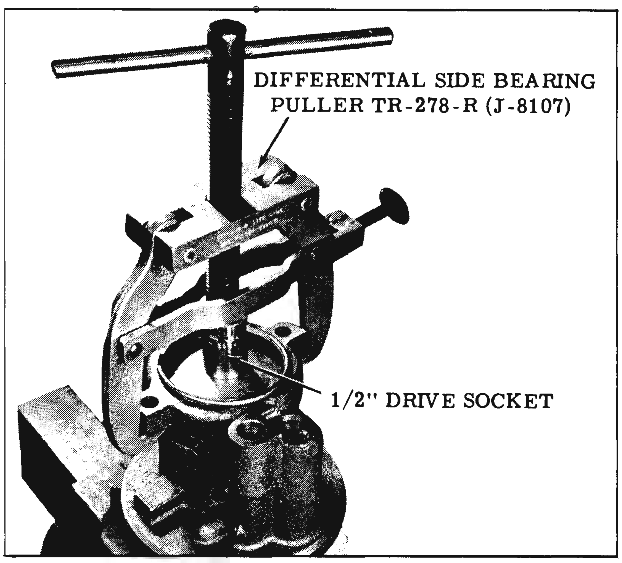


Fig. 4-32 Installing End Cover

    b. Install Differential Side Bearing Puller (J-8107), along with a 1/2" drive socket to press the end cover down beyond the retaining ring groove. (Fig. 4-32)

    c. Install the retaining ring in the pump body and remove the puller and socket.

15. Install flow control valve spring, flow control valve (hex head plug end down), and "O" ring seal into pump body bore.

16. Apply petrolatum to the reservoir to the pump body "O" ring, then install the "O" ring on the pump body.

17. Place the reservoir over the pump body, align the holes, and push the reservoir down over the "O" ring.

18. Install the "O" ring seal on the short end of the mounting stud, then install the stud and tighten 25 to 35 ft. lbs.

19. Install the "O" ring on the union, (groove next to hex head) then install union and tighten 15 to 20 ft. lbs.

20. Install the drive shaft key while supporting the shaft on the opposite side.

POWER STEERING GEAR (Fig. 4-33)

OPERATION

NEUTRAL (STRAIGHT AHEAD POSITION) (Fig. 4-34)

When turning effort is not being applied at the steering wheel, the slots in the spool valve are positioned so that oil entering the valve body from the housing pressure port passes through the slots in the spool valve to the oil return port in the housing. The chambers at both ends of the rack-piston and around the pitman shaft are always full of oil, which acts as a cushion to absorb road shock so that they are not transferred to the driver. In addition, this oil lubricates all the internal components of the gear.

RIGHT TURN (Fig. 4-35)

When the steering wheel is turned to the right, the worm resists being turned because of the resistance offered by the front wheels. The valve body also resists turning because it is pinned to the worm. Driver force exerted at the steering wheel turns the lower shaft and spool valve a slight amount which twists the torsion bar between the worm and the spool valve. This slight amount of turning of the spool valve is sufficient to position the slots in the valve body and spool valve for power .assist.

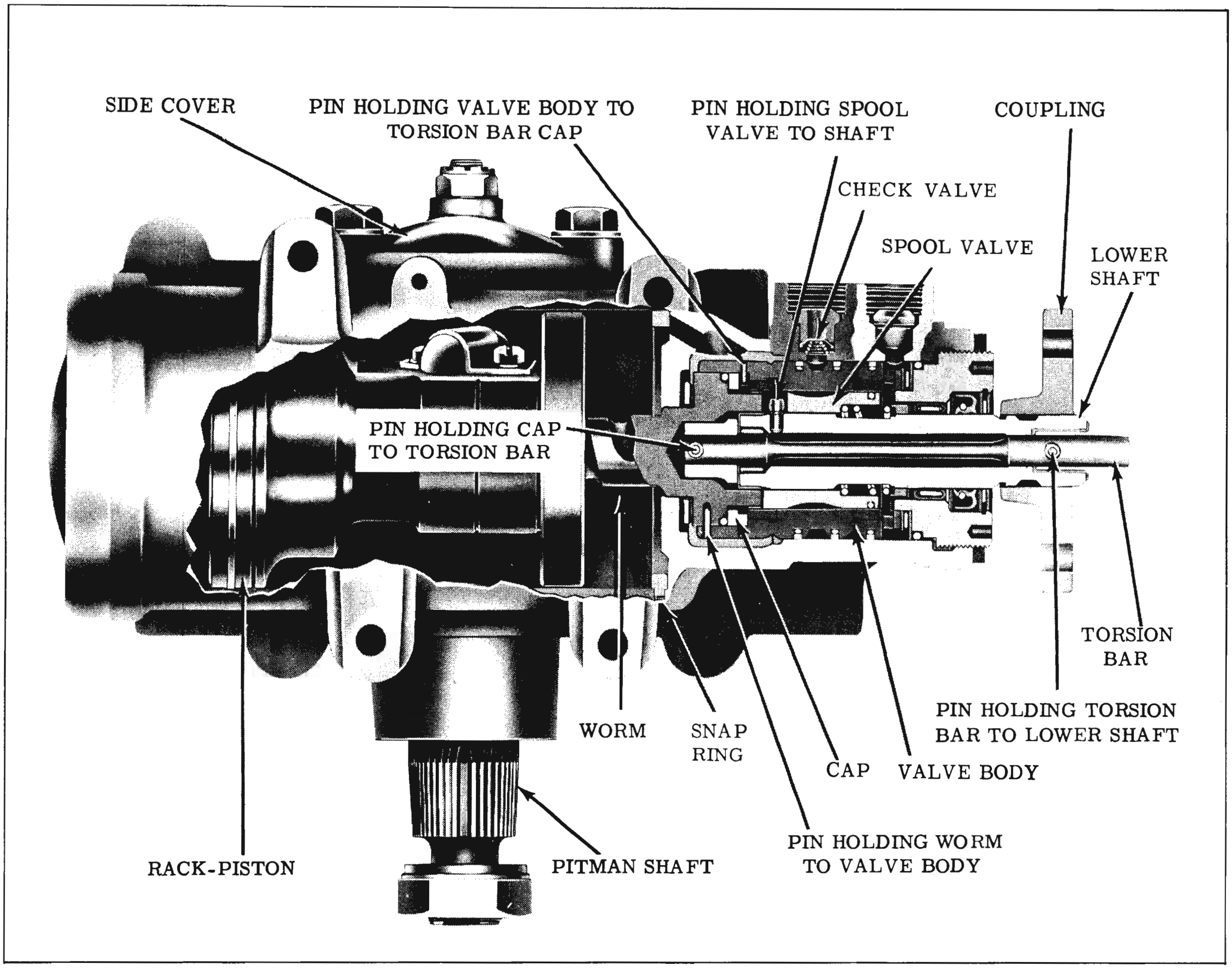


Fig. 4-33 Power Steering Gear

The right turn slots in the spool valve are closed off from the return (wide) slots in the valve body and opened more to the pressure (narrow) slots in the valve body. The left turn slots in the spool valve are closed off from the pressure slots in the valve body and opened more to the return slots in the valve body.

Pressure immediately begins to build up against the lower end of the rack-piston, forcing it upward to apply turning effort to the pitman shaft. The oil in the chamber at the upper end of the rack-piston is then forced out through the valve body and spool valve through the oil return port to the pump reservoir.

The instant the driver stops applying turning effort to the steering wheel, the spool valve is forced back into its neutral position by the torsion bar. Oil pressure on the lower end of the rack-piston then decreases so that pressure is again equal on both sides of the rack-piston, and the front wheels return to the straight ahead position, when the car is moving.

Under normal driving conditions, oil pressure does not exceed 200 psi except when turning corners where it does not ordinarily exceed 600 psi. Oil pressure when parking ranges from 1,200 to 1,300 psi depending upon road conditions and weight of the car. The steering effort during normal driving, ranges from 1 to 2 lbs. and during parking from 2 to 3-1/2 lbs. again depending upon road conditions.

A check valve located under the high pressure connector seat (Fig. 4-33) hydraulically dampens the shock transmitted to the steering gear when driving on washboard roads.

LEFT TURN (Fig. 4-36)

When the steering wheel is turned to the left, the relationship between the spool valve slots and valve body slots is again changed through twisting of the torsion bar. Pressure immediately builds up against the upper end of the rack-piston, forcing it downward to apply turning effort to the pitman shaft. The oil in the chamber at the lower end of the rack-piston is forced out through the valve body and spool valve to the pump reservoir.

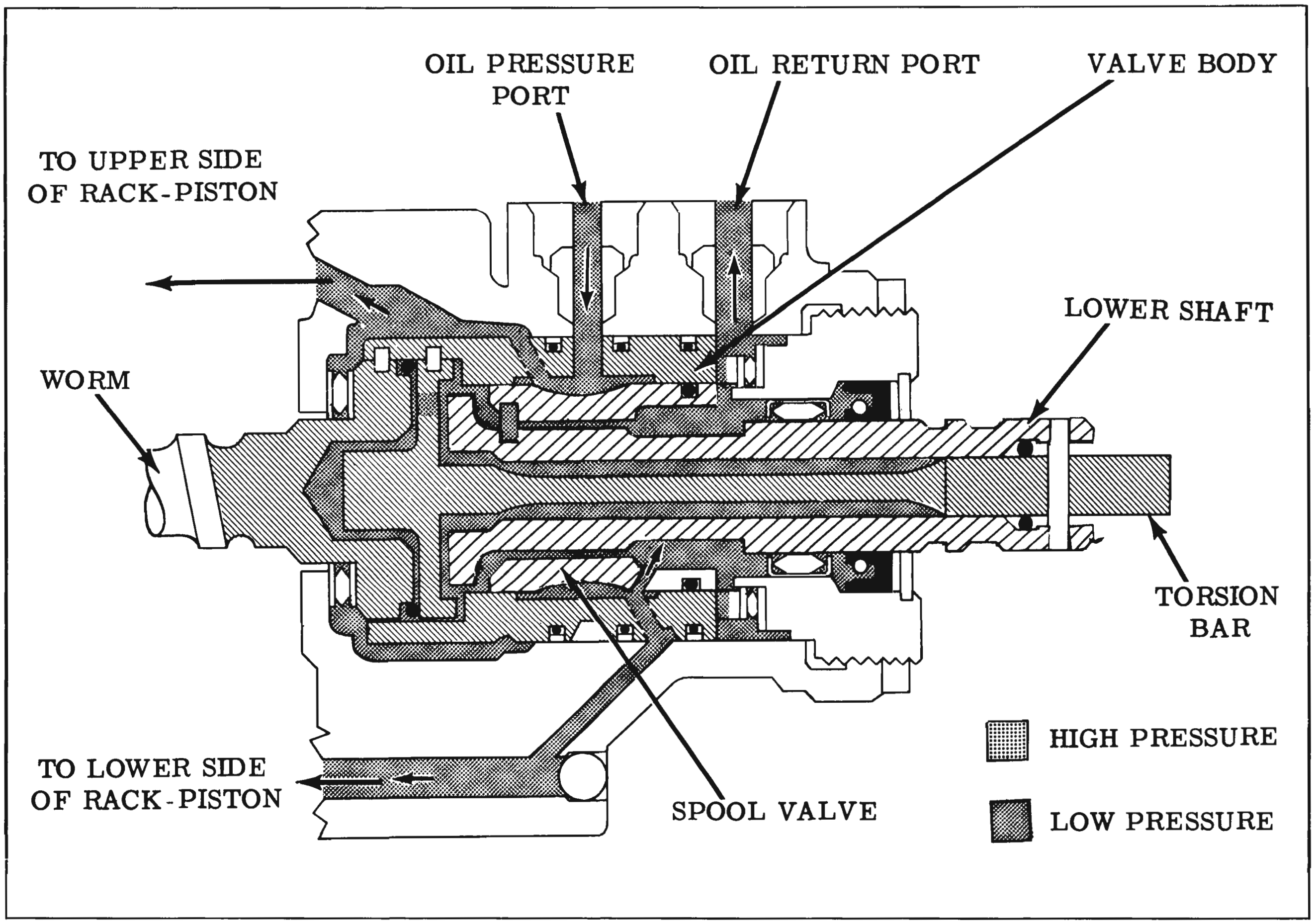


Fig. 4-34 Neutral Position

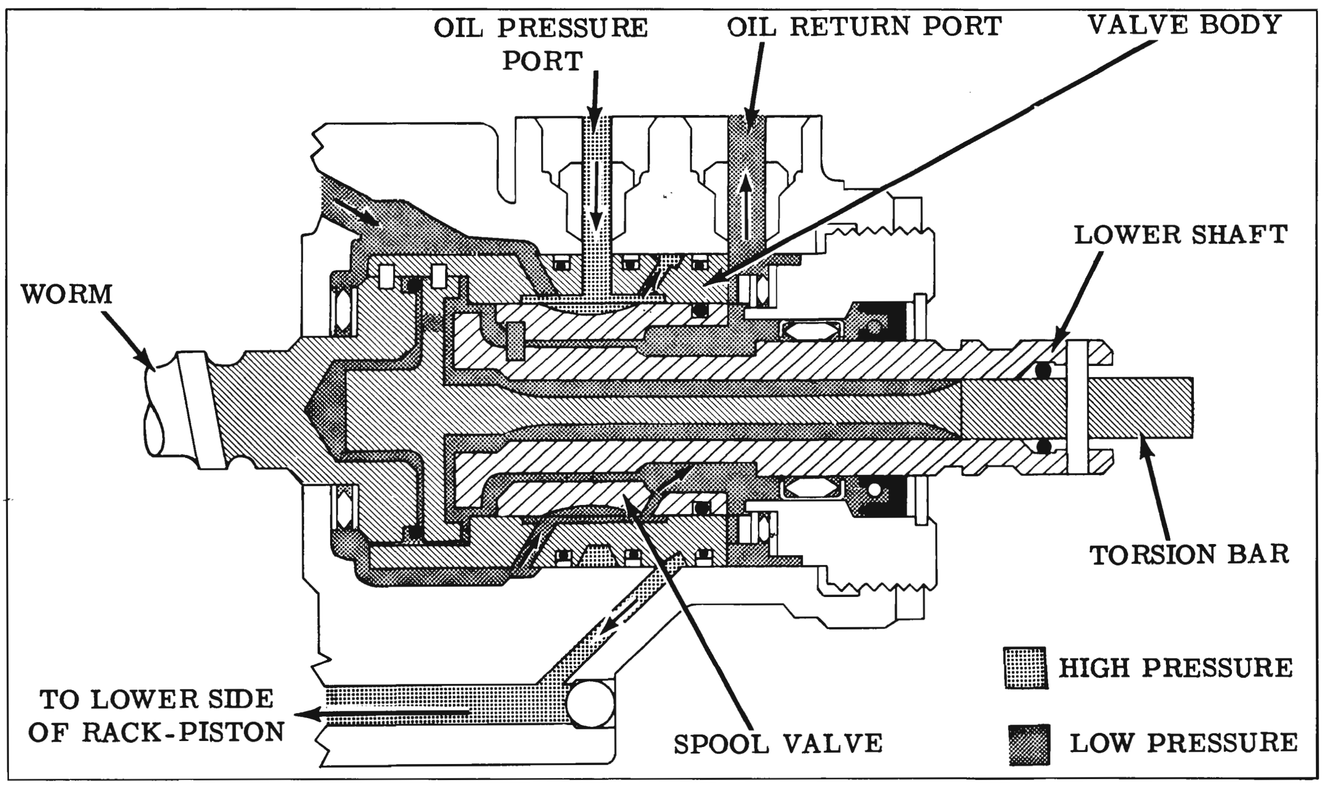


Fig. 4-35 Right Turn Position

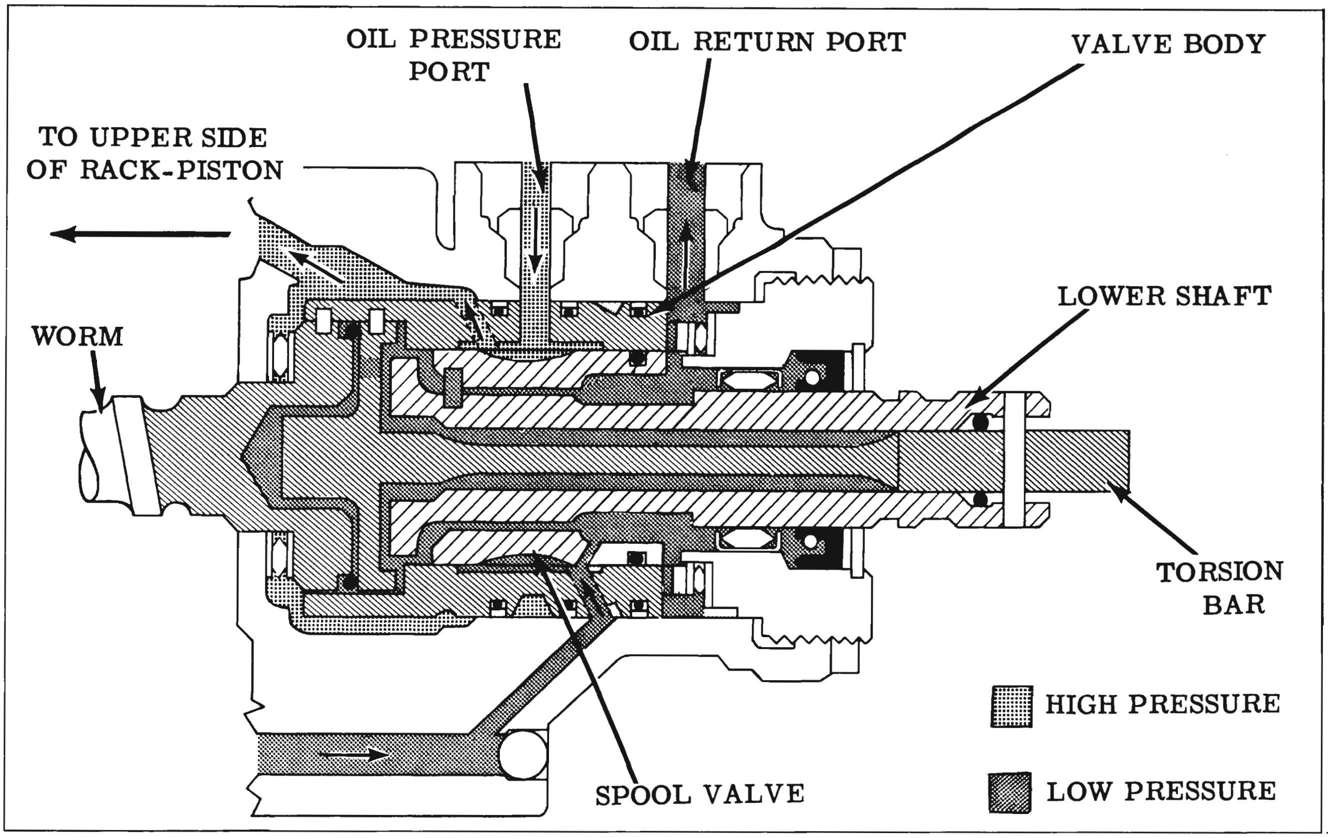


Fig. 4-36 Left Turn Position

ADJUSTMENT (ON CAR)

OVER-CENTER ADJUSTMENT

The over-center adjustment is the only power steering gear adjustment which can be made on the car; however, in order to make this adjustment, it is also necessary to check the combined ball and thrust bearing preload.

1. Remove the pitman shaft nut, then disconnect the pitman arm from the pitman shaft using Puller J-5504-B or a similar puller.

2. Loosen the pitman shaft adjusting screw lock nut and thread the adjusting screw out to the limit of its travel through the pitman shaft side cover.

3. Disconnect the horn wire at the relay, then remove the horn button or ornament from the steering wheel.

4. Count the number of turns of the steering wheel through its full travel to locate the steering wheel at its center of travel.

5. Check the combined ball and thrust bearing preload with an inch-pound torque wrench on the steering shaft nut by rotating through the center of travel. (Fig. 4-37) Note the highest reading.

6. Tighten the pitman shaft adjusting screw until the torque wrench reads 4 to 8 in. lbs. higher than the previous reading on the steering shaft. The total over-center preload should not exceed 16 in. lbs.

7. While holding the pitman shaft adjusting screw, tighten the lock nut and recheck the adjustment.

8. Install the horn button or ornament and connect the horn wire. Connect the pitman arm to the pitman shaft. Torque pitman shaft nut 90 to 120 ft. lbs.

POWER STEERING GEAR REMOVAL AND INSTALLATION

1. Remove the coupling flange hub bolt. (Fig. 4-38)

2. Disconnect the hoses from the pump and cap the pump and hose fittings.

3. Hoist the car.

4. Remove the pitman shaft nut, then disconnect

Fig. 4-37 Checking Preload

the pitman arm from the pitman shaft using Puller J-5504-B or a similar puller.

5. Remove the three bolts attaching the gear to the frame side rail, permit the lower shaft to slide free of the coupling flange then remove the gear with the hoses attached.

Before installing the steering gear, apply a sodium soap fine fiber grease to the gear mounting pads to prevent squeaks between the gear housing and the frame. Make sure the alignment pin on the gear housing enters the hole provided in the frame side rail. Make certain there is a minimum of .040" clearance between coupling hub and steering gear upper seal. Install the coupling flange hub bolt and torque 20 to 25 ft. lbs. Before tightening the steering gear to frame bolts, shift the steering gear as necessary to place it in the same plane as the steering shaft so that the flexible coupling is

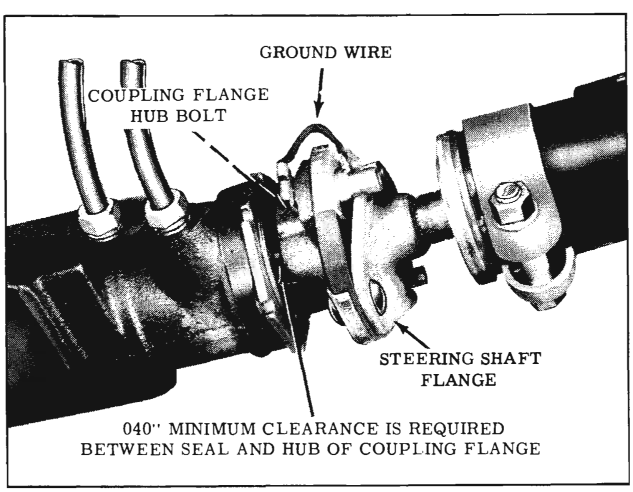


Fig. 4-38 Coupling Assembly

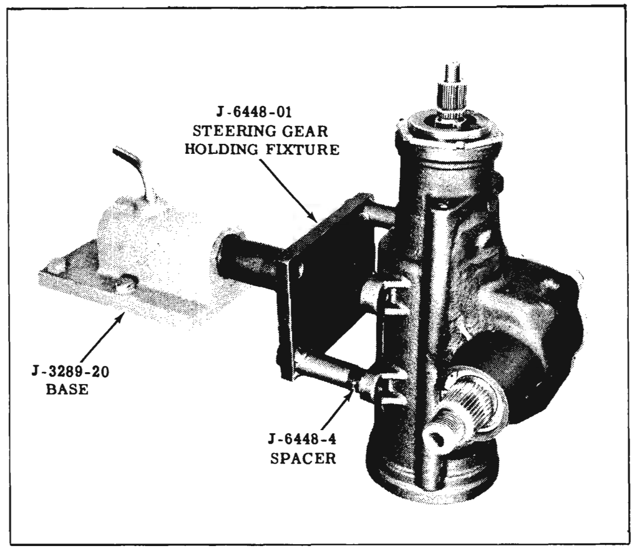


Fig. 4-39 Holding Fixture J-6448-01

not distorted. Tighten the steering gear to frame bolts 60 to 80 ft. lbs. and the pitman shaft nut 90 to 120 ft. lbs.

After the hoses are connected to the pump, add Hydra-Matic oil as necessary to bring the fluid level to the full mark. Run engine at idle for 30 seconds, then run at fast idle for one minute before turning steering wheel. With the engine running, turn the steering wheel through its full travel two or three times to bleed air from the system. Recheck the oil level and add oil if necessary.

STEERING GEAR DISASSEMBLY

NOTE: In many cases, complete disassembly of the gear will not be necessary since most of the component parts can be removed without complete disassembly of the gear. The procedure for such operations are not specifically outlined;

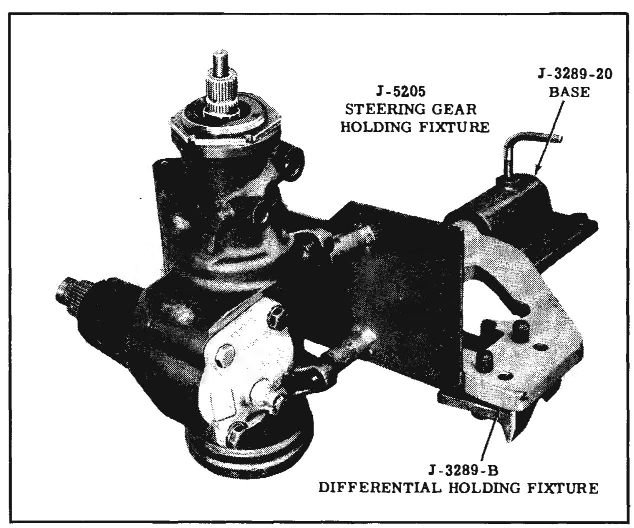


Fig. 4-40 Holding Fixture J-5205

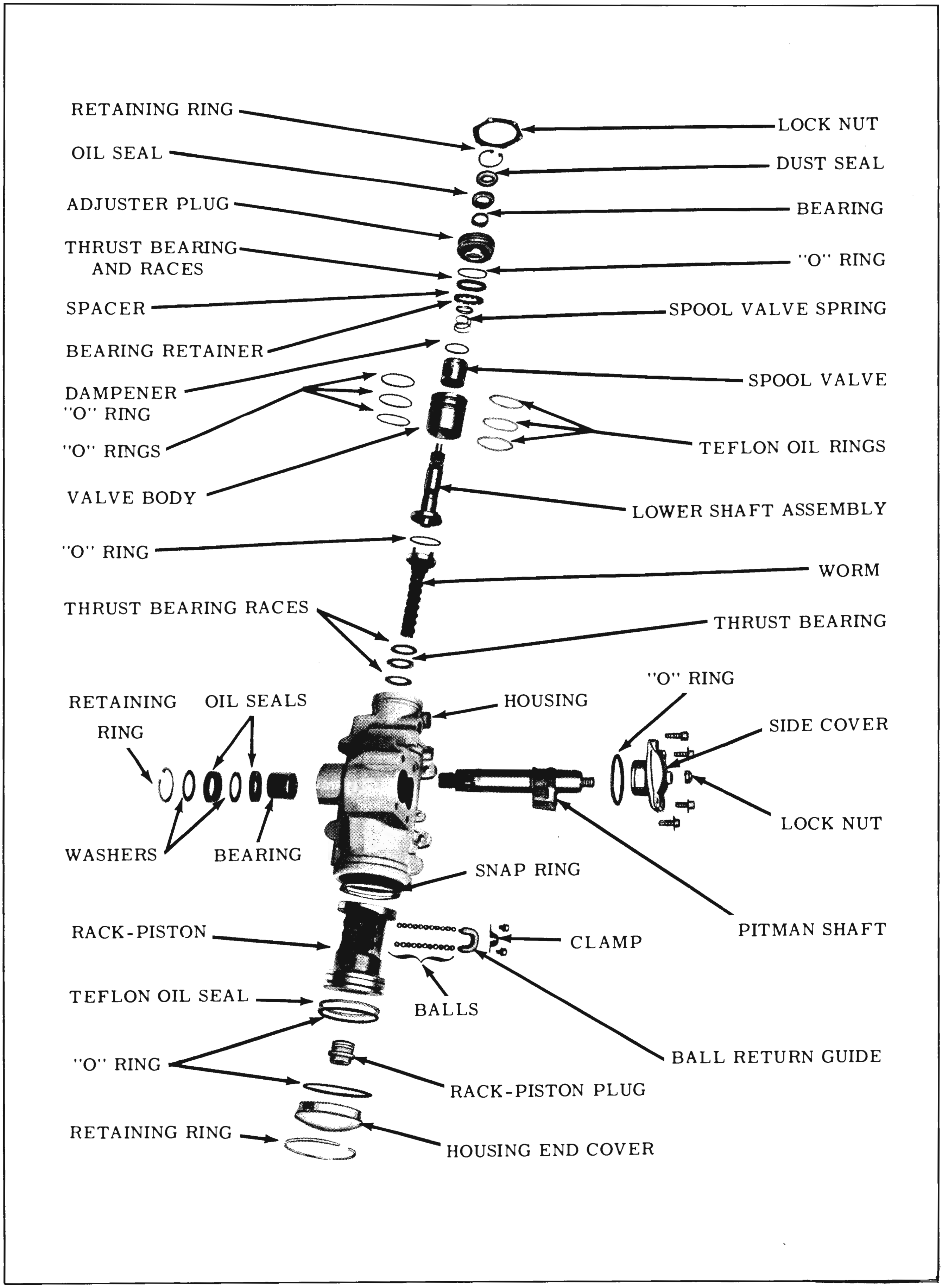


Fig. 4-41 Power Steering Gear

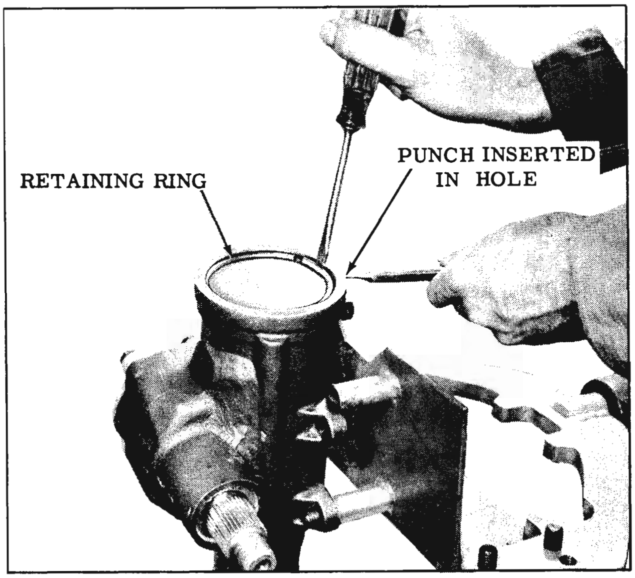


Fig. 4-42 Removing End Cover Ring

however, the following basic procedure and specifications will apply.

To facilitate servicing of the gear, the gear should be mounted in Holding Fixture J-6448-01 (Fig. 4-39) or Holding Fixture J-5205. Holding Fixture J-5205 is designed to be used with Modified Differential Holding Fixture J-3289-B. (Fig. 4-40)

1. Rotate end cover retainer ring so that one end of the ring is over hole in side of housing then force end of ring from its groove and remove ring. (Fig. 4-42)

2. Turn coupling flange counterclockwise until rack-piston just forces end cover out of housing otherwise the worm may thread out of the rack-piston and the balls will fall out of their circuit. Remove cover and discard "O" ring.

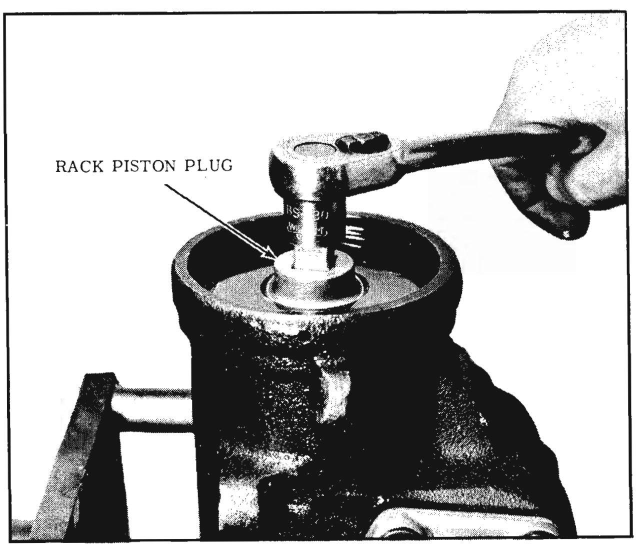


Fig. 4-43 Removing Rack-Piston Plug

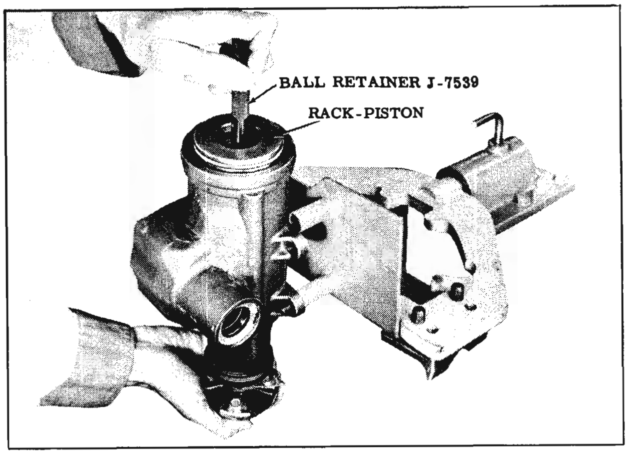


Fig. 4-44 Removing Rack-Piston

3. Remove the rack-piston plug from rack-piston as shown in Fig. 4-43.

4. Remove the pitman shaft and side cover as follows:

   a. Loosen the over-center adjusting screw lock nut and remove the 4 side cover attaching cap screws and 3 lock washers.

   b. Rotate side cover until the rack-piston and pitman shaft teeth are visible, then turn the coupling flange until the pitman shaft teeth are centered in the housing opening. Tap pitman shaft with a soft hammer and remove the pitman shaft and side cover from the housing. Remove the side cover "O" ring and discard.

5. Remove the rack-piston as follows:

   a. Insert Ball Retainer Tool J-7539 into the rack-piston bore with pilot of tool seated in the end of the worm. (Fig. 4-44) Turn lower shaft counterclockwise while holding tool tightly against worm. The rack-piston will be forced onto the tool.

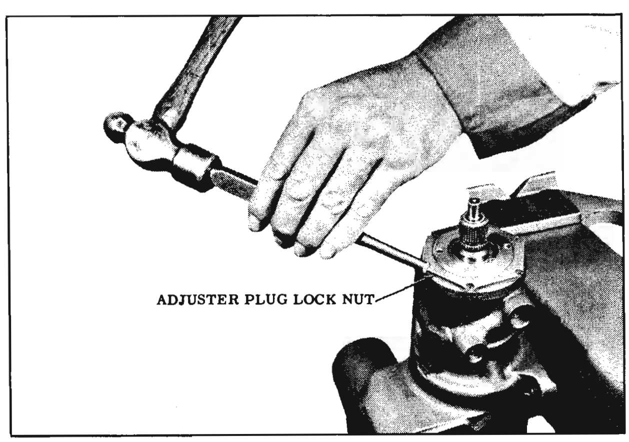


Fig. 4-45 Loosening Lock Nut

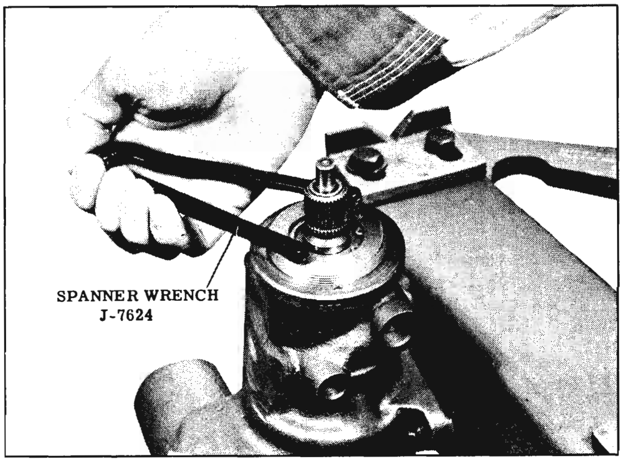


Fig. 4-46 Removing Adjuster Plug

b. Remove the rack-piston with Ball Retainer Tool J-7539 from gear housing.

6. Remove the adjuster plug as follows:

a. Loosen the adjuster plug lock nut with punch. (Fig. 4-45)

b. Remove adjuster plug assembly with Spanner Wrench J-7624. (Fig. 4-46) Remove and discard the plug "O" ring.

7. Grasp the lower shaft and pull the valve and shaft assembly from the housing bore. Separate worm and shaft and remove the lower shaft cap "O" ring and discard.

8. If the worm or lower thrust bearing and race(s) remained in the gear housing, remove at this time.

SERVICING INDIVIDUAL UNITS

ADJUSTER PLUG ASSEMBLY (Fig. 4-47)

Disassembly

1. Remove the thrust bearing retainer by prying at the two raised areas with an awl or small screwdriver, remove the thrust bearing spacer, thrust bearing and washers.

2. If the seal ONLY is to be replaced and not the bearing, remove the retaining ring with internal pliers, then remove the dust seal. Pry the seal from the bore of the adjuster plug. Discard seal.

3. If the needle bearing is to be replaced, remove the retaining ring using internal pliers, then drive the dust seal, seal and bearing from the adjuster plug with Tool J-5254. (Fig. 4-48) Discard seal and bearing.

CLEANING AND INSPECTION

1. Wash all parts in clean solvent and dry parts with compressed air.

2. Inspect thrust bearing spacer for wear or cracks. Replace if damaged.

3. Inspect thrust bearing rollers and washers for wear, pitting or scores. If any of these conditions exists, replace the bearing and washers.

Assembly

1. If the needle bearing was removed, place new

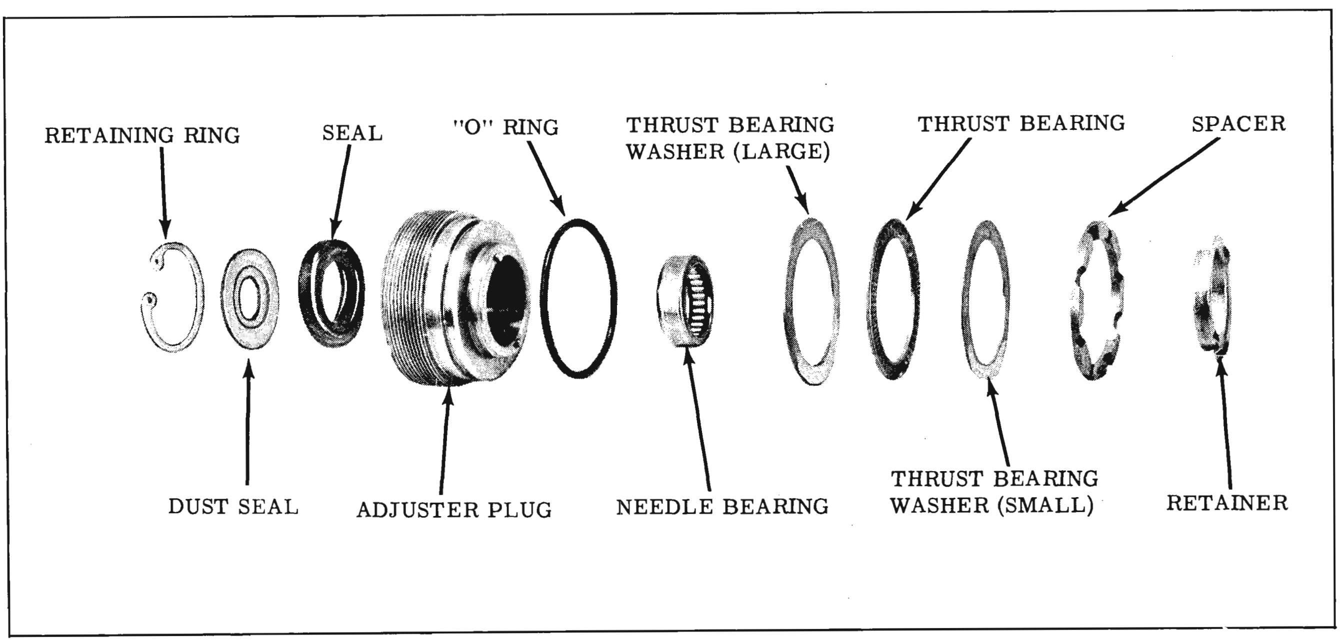


Fig. 4-47 Adjuster Plug Assembly

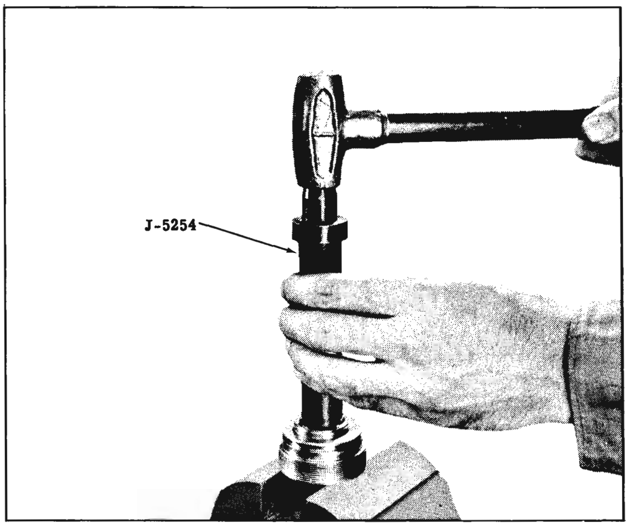


Fig. 4-48 Seal and Bearing Removal

needle bearing over Tool J-5254 with the manufacturer's identification against the tool and drive or press bearing until it is flush with the surface of the seal bore. (Fig. 4-49)

2. If seal was removed, temporarily install the adjuster plug in the gear housing and place dust seal and a new oil seal on Tool J-5254 (lip of seal away from tool). Lubricate seal with Hydra-Matic oil and drive or press seal into adjuster plug just far enough to provide clearance for the retaining ring. (Fig. 4-50) Tool J-5254 must be free of burrs that could scratch the seal.

3. Install retaining ring with internal pliers, then remove the adjuster plug from the housing.

4. Lubricate the thrust bearing assembly with Hydra-Matic oil. Place the large thrust bearing washer on the adjuster plug hub, then install the upper thrust bearing, small bearing washer and spacer (grooves of spacer away from bearing washer).

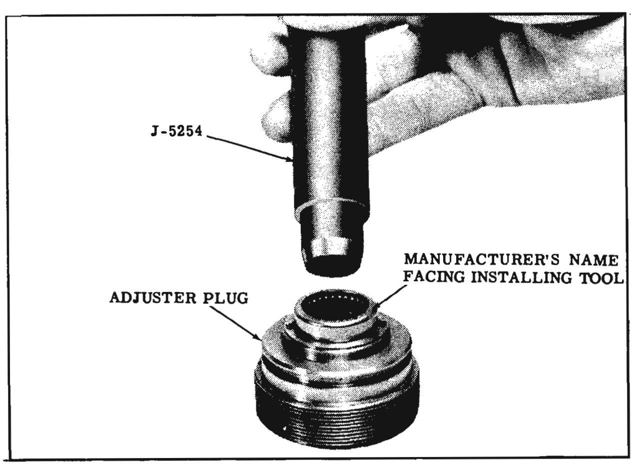


Fig. 4-49 Installing Bearing

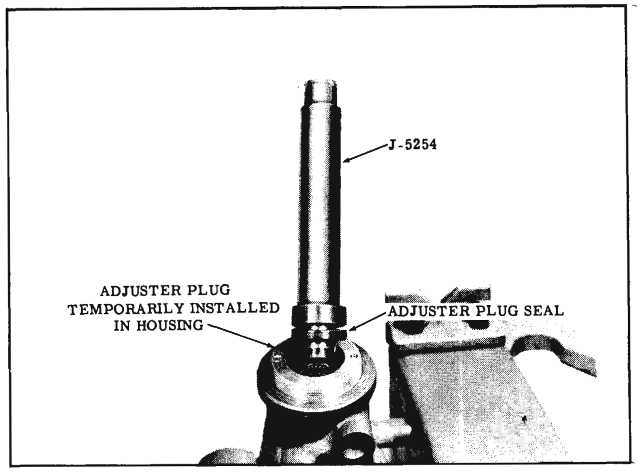


Fig. 4-50 Installing Seal

5. Install a new bearing retainer on the adjuster plug by carefully tapping on the flat surface of the retainer. (Fig. 4-51)

NOTE: The projections must not extend beyond the spacer when the retainer is seated. The spacer must be free to rotate.

VALVE AND LOWER SHAFT ASSEMBLY (Fig. 4-52)

Disassembly

1. Remove the spool valve spring by carefully prying top coil out of groove in the lower shaft, then slide the spring from the shaft.

2. To remove the lower shaft assembly from the valve body, proceed as follows:

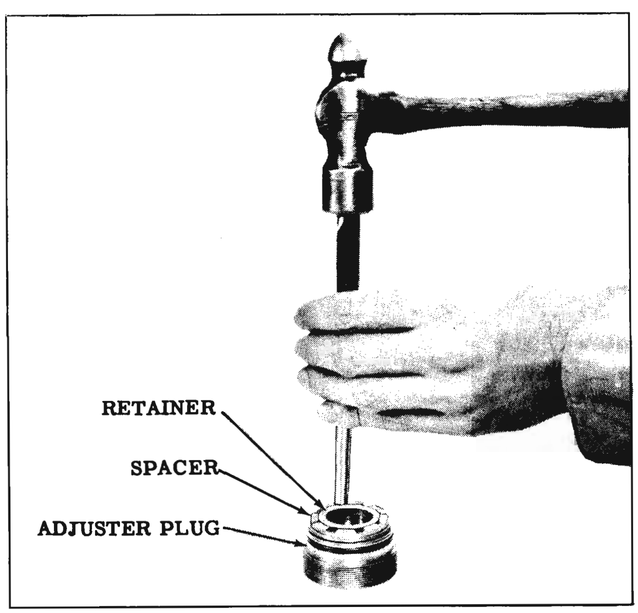


Fig. 4-51 Installing Bearing Retainer

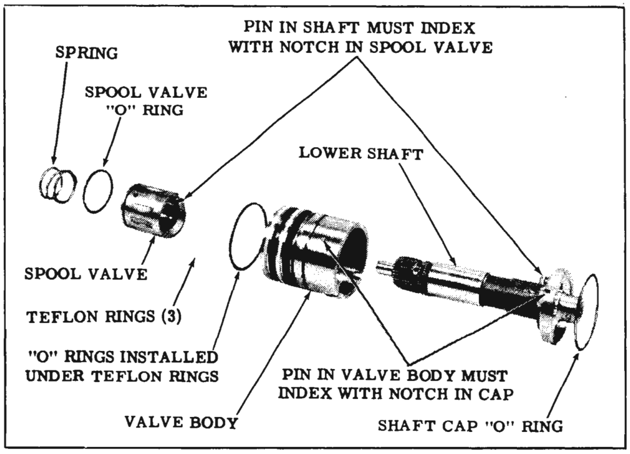


Fig. 4-52 Valve and Lower Shaft Assembly

a. While holding the assembly (lower shaft down), lightly tap the lower shaft against the bench until the shaft cap is free from the valve body. (Fig. 4-53) The spool valve should be held in the valve body while tapping the shaft.

b. Carefully remove the lower shaft assembly so as not to cock the spool valve in the valve body.

3. Push the spool valve out of the flush end of the valve body until the dampener "O" ring is exposed, then carefully pull the spool from the valve body while rotating the valve. (Fig. 4-54) If the spool valve becomes cocked, reverse the withdrawal procedure, then again attempt to remove the valve.

IMPORTANT: Do not attempt to force the spool valve in or out of the valve body. If the spool is cocked in the valve body, straighten the spool by tapping with a plastic or rawhide mallet, then push the spool back into the body

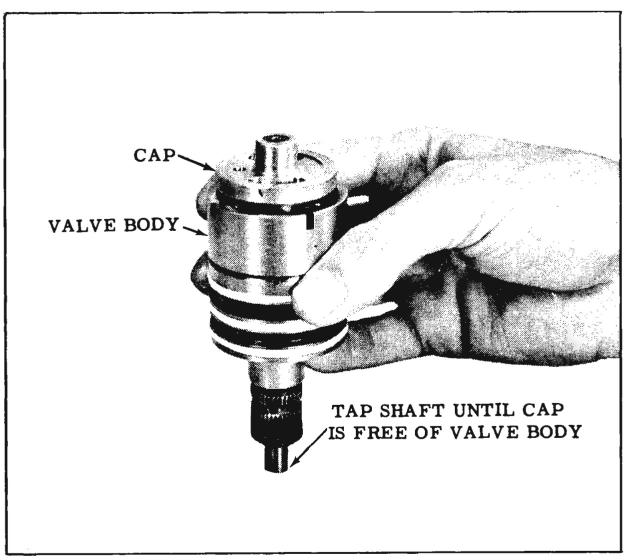


Fig. 4-53 Freeing Shaft Cap

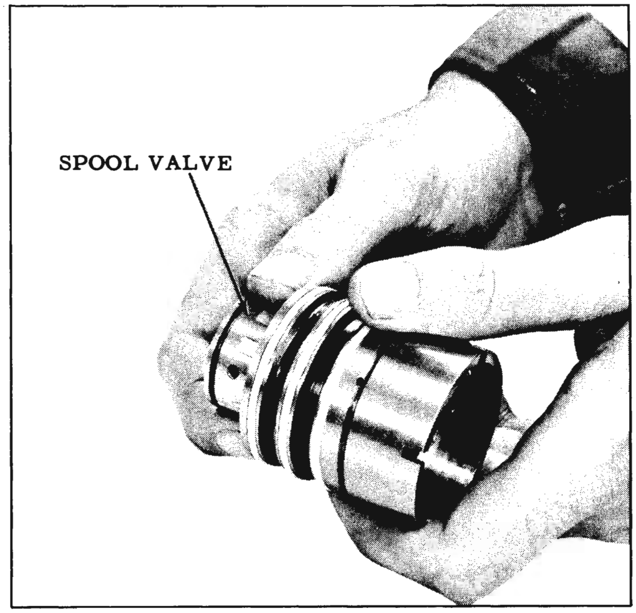


Fig. 4-54 Removing Spool Valve

and repeat the removal procedure.

4. Remove the dampener "O" ring from the spool valve and discard.

5. If the teflon oil rings are to be replaced, cut the 3 teflon oil rings and "O" rings from the valve body and discard.

Cleaning and Inspection

1. Wash all parts in clean solvent and blow out all oil holes with compressed air.

2. If the drive pin in the lower shaft or valve body is cracked, excessively worn or broken, replace the complete valve and shaft assembly.

3. If there is evidence of leakage between the torsion bar and the lower shaft, or scores, nicks, or burrs on the ground surface of the lower shaft that cannot be cleaned up with crocus cloth, the entire valve and shaft assembly must be replaced.

4. Check the O.D. of the spool valve and the I.D. of the valve body for nicks, burrs, or bad wear spots. If the irregularities cannot be cleaned up by the use of crocus cloth, the complete valve and shaft assembly will have to be replaced.

5. If the small notch in the skirt of the valve body is excessively worn, the complete valve and shaft assembly will have to be replaced.

6. Lubricate the spool valve with Hydra-Matic fluid and check the fit of the spool valve in the valve body (with the spool valve dampener "O" ring removed). If the valve does not

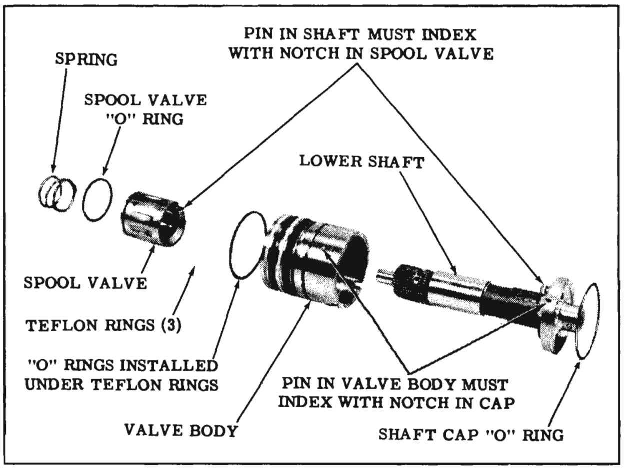


Fig. 4-55 Valve and Lower Shaft Assembly

rotate freely without binding, the complete valve and shaft assembly will have to be replaced.

7. Check the overall length of the spool valve spring. The spring should be approximately 3/4". If it is less than 11/16", replace the spring.

ASSEMBLY (Fig. 4-55)

1. Install the 3 valve body "O" rings in the oil ring grooves and lubricate with Hydra-Matic oil.

2. Lubricate the 3 teflon oil rings with petrolatum and install in grooves over "O" rings.

   NOTE: The oil rings may appear to be distorted, but the heat of the oil during operation of the gear will straighten them out.

3. Assemble the lower shaft assembly in the valve body so the notch in the lower shaft cap engages with the pin in the valve body. (Fig. 4-55) If necessary, tap the shaft cap with a plastic hammer until cap is seated in the valve body.

4. Install the spool valve as follows:

   a. Lubricate the spool valve dampener "O" ring with petrolatum and install over spool valve.

   b. Lubricate the spool valve with Hydra-Matic oil and slide the valve over the lower shaft (notch in spool towards the valve body). Rotate the spool valve while pushing the valve into the valve body until the notch in the spool engages the pin in the lower shaft.

   c. Carefully crowd the dampener "O" ring into its groove until the spool valve can be pushed all the way in the valve body. The

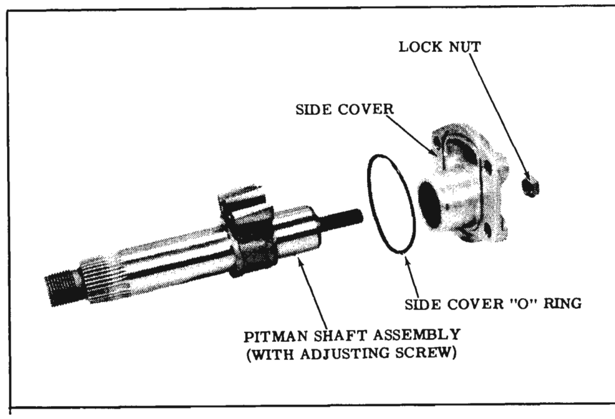


Fig. 4-56 Pitman Shaft and Side Cover

   spool valve is properly seated when it is flush with the top of valve body.

   NOTE: Exercise extreme caution during this operation so the "O" ring will not be cut.

5. Slide the valve spring over the lower shaft and down into the spool valve until the top coil of the spring is in the shaft groove.

PITMAN SHAFT AND SIDE COVER (Fig. 4-56)

Disassembly

Remove the lock nut and side cover from the adjusting screw. Do not attempt to disassemble pitman shaft. Discard lock nut.

NOTE: The power steering gear is equipped with a self-adjusting type of pitman shaft which automatically keeps the over-center adjustment within specifications for a limited mileage (up to approximately 10,000 miles), regardless of the wear of the rack-piston and related parts. This is accomplished by the use of a wear washer and a heavy spring in the pitman shaft assembly. The wear washer is calibrated to wear at the same rate as the other components of the gear. Replacement pitman shafts do not have this feature and adjusting screw torque is zero.

In cases where gear chucking or "clunk" cannot be corrected by performing the over-center adjustment (See POWER STEERING GEAR ADJUSTMENT-ON CAR), the trouble may be due to excessive wear in the pitman shaft or a broken spring in the pitman shaft.

To check the pitman shaft for excessive wear or a broken spring:

1. With the side cover removed from the pitman shaft, clamp the shaft in a vise and thread two 7/16" S.A.E. nuts on the adjusting screw.

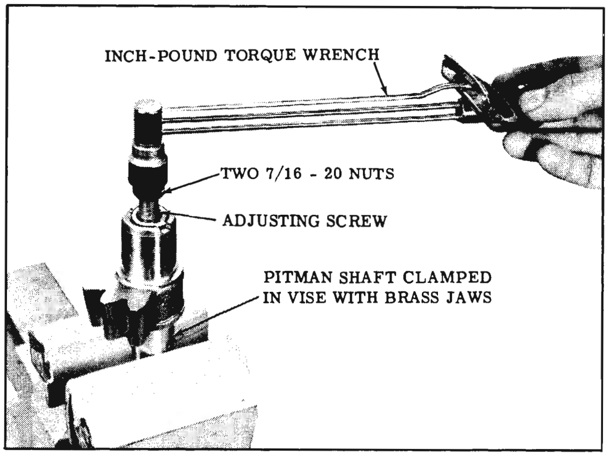


Fig. 4-57 Checking Adjusting Screw Torque

Tighten nuts so they are locked on the shaft.

2. Using a 5/8" socket and an inch-pound torque wrench, measure the torque required to turn the adjusting screw. (Fig. 4-57) Torque reading should be 1 to 15 inch lbs.
3. If the reading is not within this range, the complete pitman shaft assembly must be replaced. DO NOT ATTEMPT TO CORRECT READING BY DISASSEMBLING THE PITMAN SHAFT.
4. Remove the torque wrench and the two 7/16" nuts from the adjusting screw.

Cleaning and Inspection

1. Wash all parts in clean solvent and dry parts with compressed air.
2. Check pitman shaft bearing surface in the side cover for scoring. If badly worn or scored, replace the side cover.
3. Check the sealing and bearing surfaces of the pitman shaft for roughness, nicks, etc. If minor irregularities in surface cannot be cleaned by use of crocus cloth, replace the pitman shaft.
4. Replace pitman shaft assembly if teeth are damaged or if the bearing surfaces are pitted or scored.

Assembly

Thread the side cover onto the pitman shaft adjusting screw until it bottoms. Install, but do not tighten, a new adjusting screw lock nut.

RACK-PISTON

Disassembly

1. Check the ball preload as follows:

a. Lightly clamp the rack-piston assembly in a brass jawed vise with Tool J-7539 still in place.

b. Thread worm into rack-piston while holding Tool J-7539 tightly against worm so the balls will not fall out of the rack-piston. When the worm is in place, remove Tool J-7539.

c. Clamp rack-piston (flanged end of worm up) in vise, then install the valve and lower shaft assembly so that the small notch in the valve body engages the drive pin in the worm. Locate the over-center position of the worm by slowly turning the worm and noting the area where the turning effort is highest. DO NOT THREAD THE WORM OUT TOO FAR SINCE THIS MAY CAUSE SOME OF THE BALLS TO DROP OUT OF THE RACK-PISTON.

d. Using a torque wrench and a 3/4" 12 point socket, check the preload while rotating the torque wrench in a 120^{o} arc. The reading should be 1/16 to 5 in. lbs. (Fig. 4-58)

e. If the preload is not within limits, a new set of balls must be installed upon reassembly. Note the ball size stamped on the rack-piston and install the next size larger balls to increase the preload or the next size smaller balls to decrease the preload, black balls need not be replaced unless they are defective. A change of one ball size will change the preload approximately 1 in. lb.

NOTE: If a number is not apparent, the ball size is number 7.

f. Remove the torque wrench and valve and shaft assemblv.

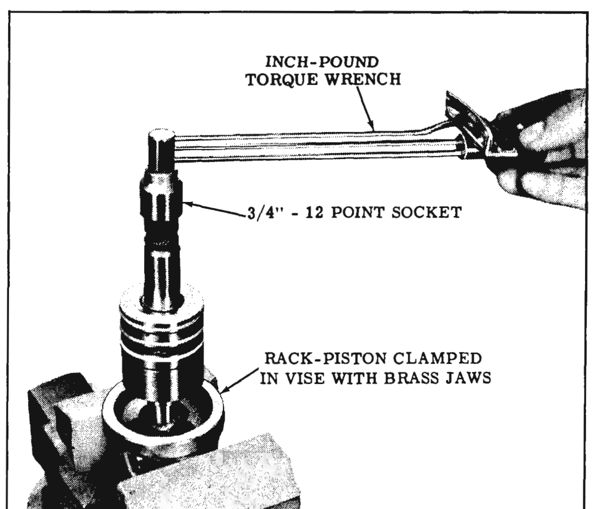


Fig. 4-58 Checking Preload

2. Thread the worm out of the rack-piston, remove ball return guide clamp, guide valves and balls.

3. If necessary to replace the teflon oil seal and "O" ring remove at this time.

Cleaning and Inspection

1. Wash all parts in clean solvent and dry with compressed air.

2. Inspect the worm and rack-piston grooves and all the balls for scoring. If either the worm or rack-piston needs replacing, both must be replaced as a matched assembly.

3. Inspect ball return guide halves, making sure that the ends where the balls enter and leave the guides are not damaged.

4. Inspect lower thrust bearing and washers for scores or excessive wear. If any of these conditions are found, replace the thrust bearing and washers.

5. Inspect rack-piston teeth for scores or excessive wear. Inspect the external ground surfaces for wear, scoring or burrs.

6. Inspect the rack-piston stop ring (inside of housing) and replace if damaged.

Assembly

1. If the teflon oil seal and "O" ring were removed, install a new "O" ring and seal, lubricated with Hydra-Matic oil, in the groove of the rack-piston.

2. Slide the worm all the way into the rack-piston. It is not necessary to have the thrust bearing assembly on the worm at this time.

3. Turn the worm until the worm groove is aligned with the lower ball return guide hole. (Fig. 4-59)

4. Lubricate the balls with Hydra-Matic oil, then feed 16 balls into the rack-piston while slowly rotating the worm counterclockwise.

   IMPORTANT: The black balls are .0005" smaller than the silver balls. The black and silver balls must be installed alternately into the rack-piston and return guide.

5. Alternately install 6 balls into the return guide and retain with petrolatum. Install the return guide assembly onto the rack-piston. Install the return guide clamp and tighten the 2 clamp screws 8 to 12 ft. lbs.

6. Check the ball preload if it was necessary to

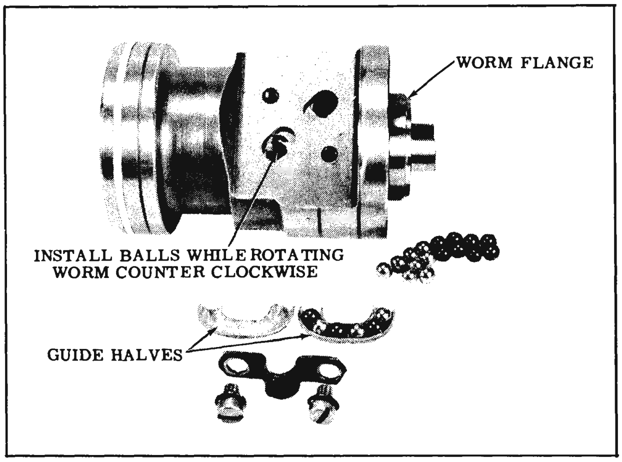


Fig. 4-59 Installing Balls in Rack-Piston

install a new set of balls to correct the preload. Refer to RACK-PISTON - DISASSEMBLY (Step 1).

7. Insert Bearing Retainer Tool J-7539 into the rack-piston, then while holding tool tightly against end of worm, thread worm out of the rack-piston.

PITMAN SHAFT NEEDLE BEARING AND SEALS (Fig. 4-60)

Remove

1. If pitman shaft seals ONLY are to be replaced, remove the seal retaining ring and outer steel washer, then pry out the outer seal. Remove the inner steel washer, then drive out the inner seal.

2. If pitman shaft needle bearing replacement is necessary, remove the seal retaining ring, outer steel washer, then drive needle bearing, seals and inner washer out with Tool J-6278-1. (Fig. 4-61)

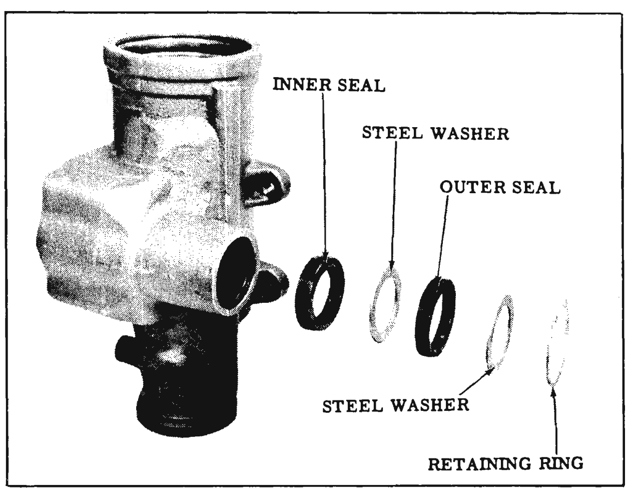


Fig. 4-60 Pitman Shaft Seals

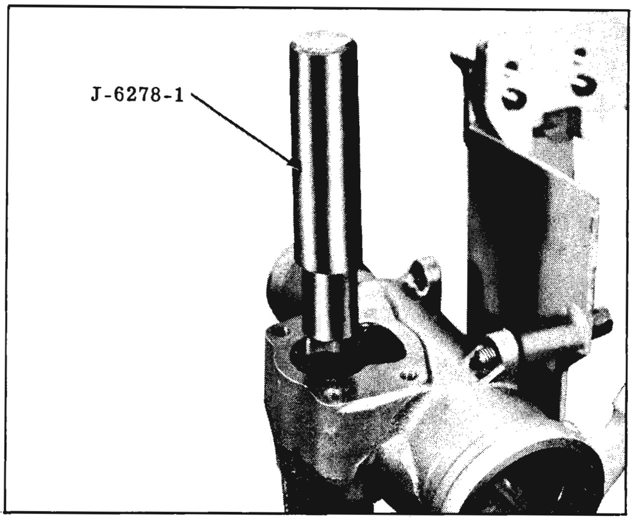


Fig. 4-61 Needle Bearing and Seal Removal

Install

1. If the pitman shaft needle bearing was removed, place Adaptor J-6278-2 over Tool J-6278-1; slide the new needle bearing on the tool with the manufacturer's identification against the adaptor and drive the bearing into the housing until adaptor bottoms in housing. (Fig. 4-62)

2. Coat the lips of the oil seals with special lubricant (Part No. 567196).

3. Install the pitman shaft oil seals as follows:

   a. Place Adaptor J-6278-2 over Tool J-6278-1; then install the outer seal, inner steel washer, and inner seal with the lips of the seals facing away from the adaptor.

   b. Drive the seals into the housing until the top of Adaptor J-6278-2 is flush with the housing. (Fig. 4-63)

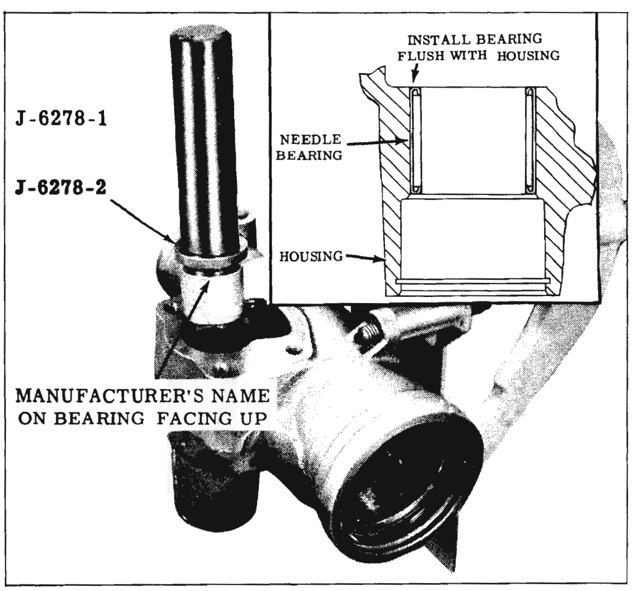


Fig. 4-62 Installing Needle Bearing

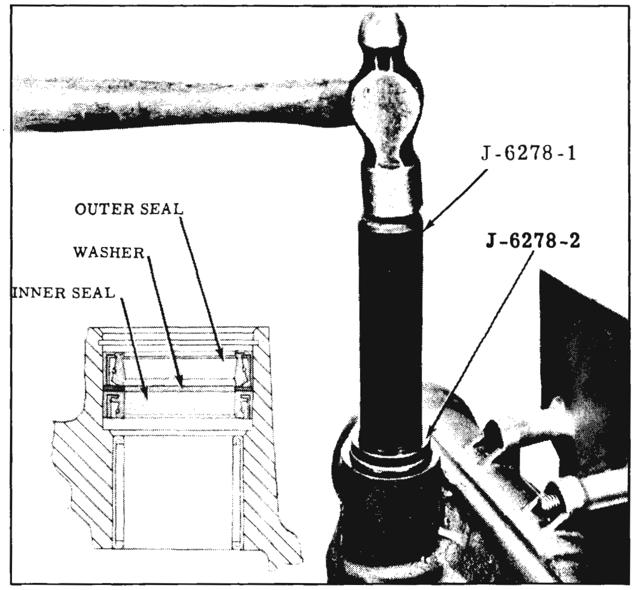


Fig. 4-63 Installing Oil Seals

   c. Remove the tool and adaptor, then install the outer steel washer and seal retaining ring. The retaining ring will not seat in the groove at this time.

   d. Reinsert Tool J-6278-1 with Adaptor J-6278-2 and continue driving the seals until the retaining ring seats in its groove (Inset, Fig. 4-63), then remove the tool and adaptor.

HOSE CONNECTORS

Remove

If the hose connections were leaking at the connector seats in the housing, remove one or both connector seats as follows:

1. Thread a nut and place a washer on a 5/16"-18 tap.

2. If the connector seat is being removed from an assembled gear, coat the end of the tap with petrolatum to prevent chips from entering the passage while tapping the seat.

3. With the steering gear in a vertical position, thread the tap into the connector seat not more than three turns. (Fig. 4-64)

4. Tighten the nut to remove the seat.

NOTE: A check valve and spring is located below the high pressure connector seat and can be replaced when seat is removed.

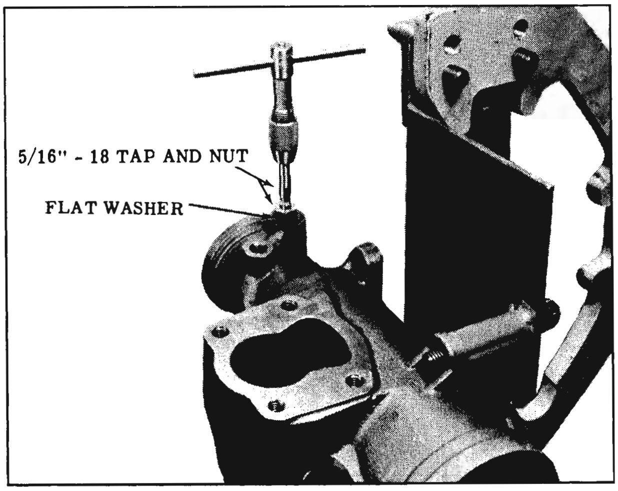


Fig. 4-64 Removing Connector Seat

Install

To install a new connector seat, use Tool J-6217 to seat it in the housing. (Fig. 4-65)

STEERING GEAR ASSEMBLY

1. Install the worm as follows:

   a. Lubricate the worm, lower thrust bearing and the two thrust washers with Hydra-Matic oil, then install one thrust washer, the bearing, and the other thrust washer over the end of the worm.

   b. With the valve bore end of gear housing down, insert the worm and thrust bearing assembly into the housing. While holding the worm in place, turn the gear housing so the valve bore end of the housing is up.

2. Install the valve and lower shaft assembly as follows:

   a. Lubricate the valve body teflon rings and a new lower shaft cap "O" ring with petrolatum. Install the lower shaft cap "O" ring in the valve body so it is seated against the lower shaft cap. Align the NARROW NOTCH in the valve body with the pin in the worm, then install the valve and shaft assembly in the gear housing. (Fig. 4-66) Apply pressure to the VALVE BODY when installing. If pressure is applied to the lower shaft during installation, the shaft may be forced out of the valve body.

   IMPORTANT: The valve body is properly seated when the oil return hole in the housing is entirely uncovered. (Fig. 4-67)

3. Lubricate a new adjuster plug "O" ring with petrolatum and install in groove on adjuster plug. Place Seal Protector J-6222 over lower shaft, then install the adjuster plug assembly in the housing until it seats against the valve body. (Fig. 4-68) Remove Seal Protector.

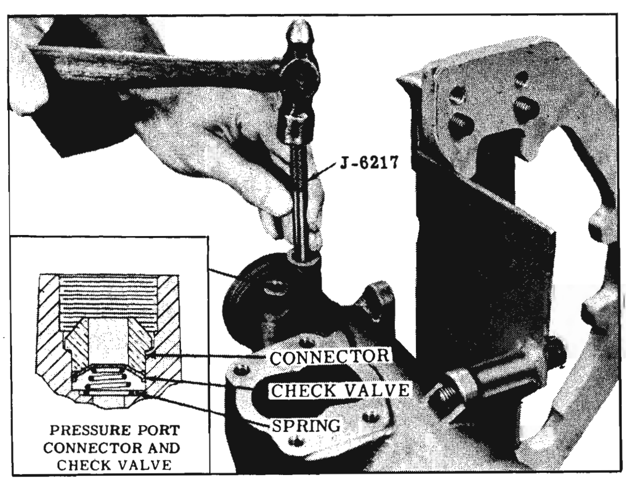


Fig. 4-65 Installing Connector Seat

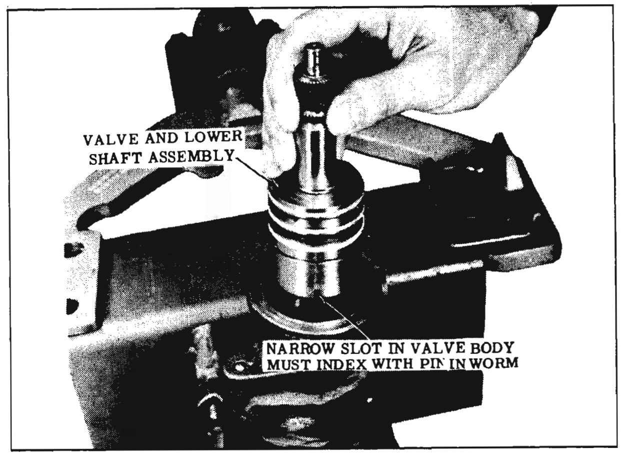


Fig. 4-66 Installing Valve and Lower Shaft Assembly

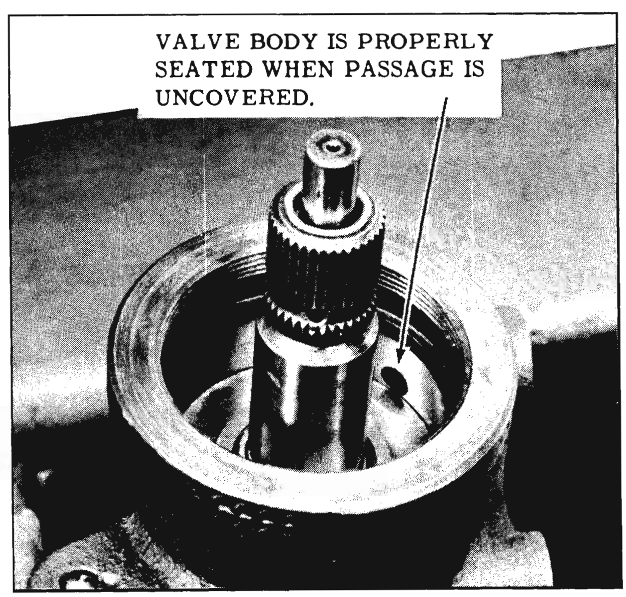


Fig. 4-67 Valve Body Properly Seated

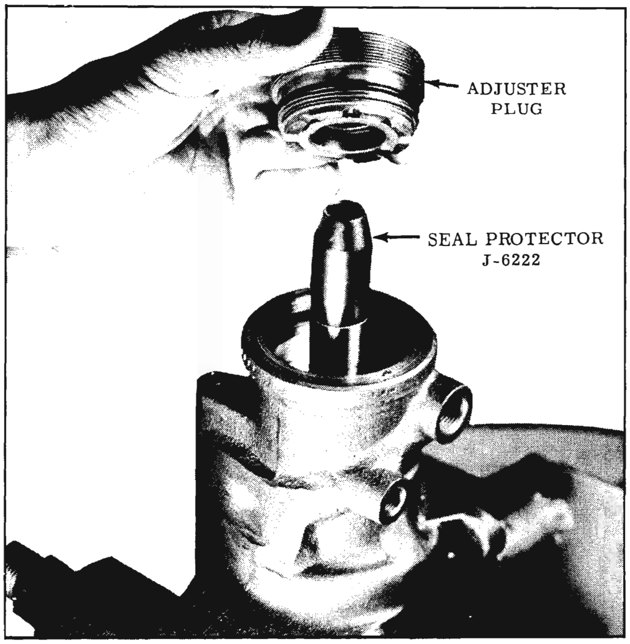


Fig. 4-68 Installing Adjuster Plug

Do not adjust the thrust bearing preload at this time.

4. Install the rack-piston as follows:

   a. Lubricate the rack-piston teflon seal with petrolatum.

   b. With the rack-piston bore of the housing facing up, position Seal Compressor J-7576 against the shoulder in the housing.

   c. With Ball Retainer J-7539 in place in the rack-piston, push the rack-piston into the housing until Tool J-7539 contacts the worm. (Fig. 4-69)

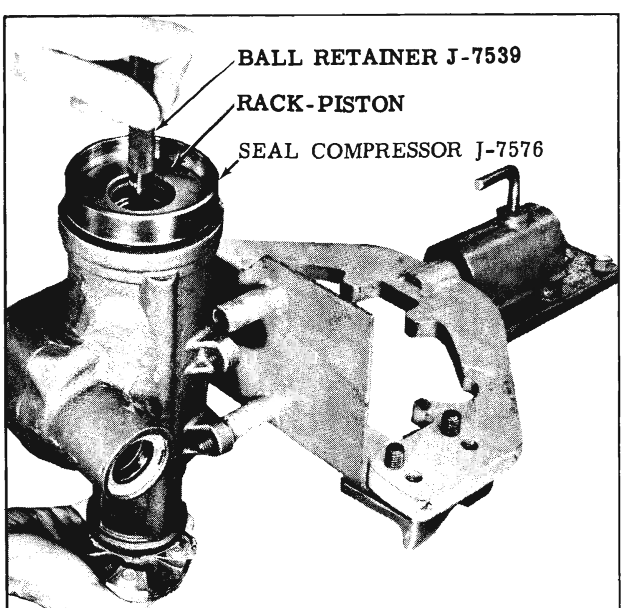


Fig. 4-69 Installing Rack-Piston

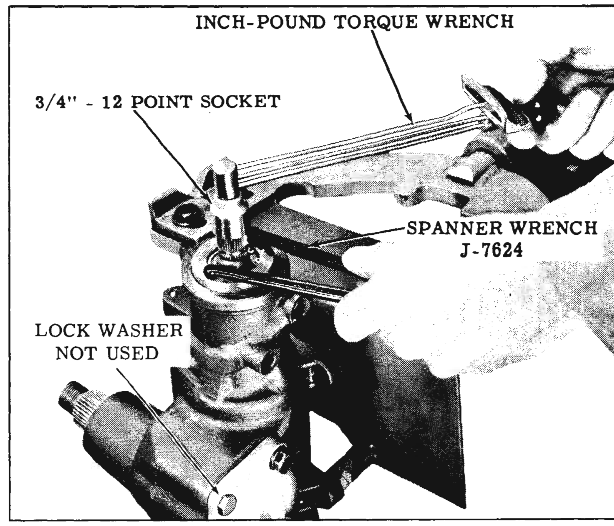


Fig. 4-70 Adjusting Thrust Bearing Preload

   d. Turn the lower shaft clockwise with a 3/4" twelve point socket or a replacement coupling flange to thread the rack-piston onto the worm while holding Tool J-7539 against the end of the worm.

   e. When the rack-piston is completely threaded on the worm, remove Ball Retainer J-7539 and Seal Compressor J-7576.

5. Install the rack-piston plug in the rack-piston and torque 35 to 65 ft. lbs.

6. Install a new housing end cover "O" ring and lubricate it with petrolatum, then install the end cover and retaining ring.

7. Install the pitman shaft and side cover as follows:

   a. Install a new "O" ring in the pitman shaft side cover and retain with petrolatum.

   b. Turn the lower shaft until the rack-piston teeth are centered in the pitman shaft opening, then install the pitman shaft and side cover so that the center tooth of the pitman shaft engages the center groove of the rack-piston.

   c. Install the 4 side cover bolts and 3 lock washers and tighten 25 to 30 ft. lbs. Refer to Fig. 4-70 for washer location.

8. Adjust the thrust bearing preload as follows:

   a. Turn the adjuster plug clockwise with Spanner Wrench J-7624 until it is tight, then loosen it 1/8 turn.

   b. Install an inch-pound torque wrench with a 3/4" 12 point socket on the lower shaft splines. (Fig. 4-70)

d. Rotate the torque wrench in a 45° arc and note the highest reading.

e. Tighten the adjuster plug with Spanner Wrench J-7624 until the torque wrench reads 1 to 3 in. lbs. higher than the initial load reading.

f. Install the adjuster plug lock nut and tighten with Spanner Wrench J-972-A.

g. Recheck the adjustment to be sure it is still only 1 to 3 in. lbs. higher than the initial load reading. If the adjustment changed when tightening the lock nut, re-adjust the adjuster plug.

9. Adjust the over-center preload as follows:

a. Make sure the over-center adjusting screw is backed all the way out.

b. Install an inch-pound torque wrench with a 3/4" 12 point socket on the lower shaft splines.

c. Rotate the lower shaft from one stop to the other to count the number of turns and locate the center of travel, then check the combined ball and thrust bearing preload by rotating the torque wrench through the center of travel. (Fig. 4-71) Note the highest reading.

d. Tighten the pitman shaft adjusting screw until the torque wrench reads 4 to 8 in. lbs. higher than the previous reading. The total reading should not exceed 16 in. lbs.

e. While holding the adjusting screw, tighten the lock nut and recheck the adjustment.

10. Position the coupling flange onto the lower shaft, then install the flange attaching bolt and lock washer. Position the flange so that there is 3/4" between the adjuster lock nut and the coupling to steering flange bolt heads. Tighten the coupling flange attaching bolt 20 to 25 ft. lbs.

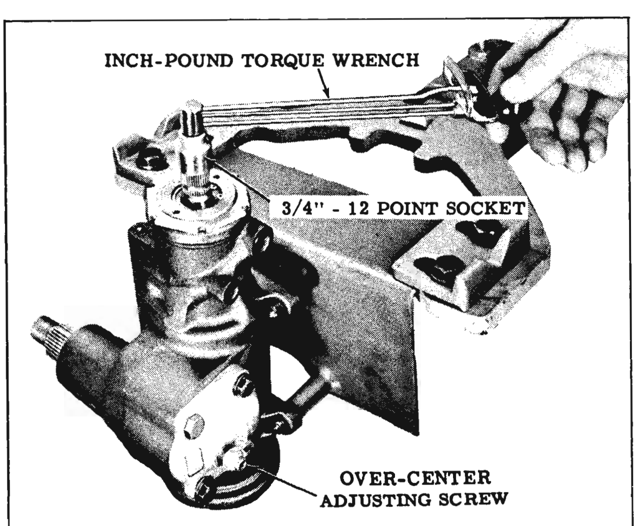


Fig. 4-71 Checking Over-Center Preload

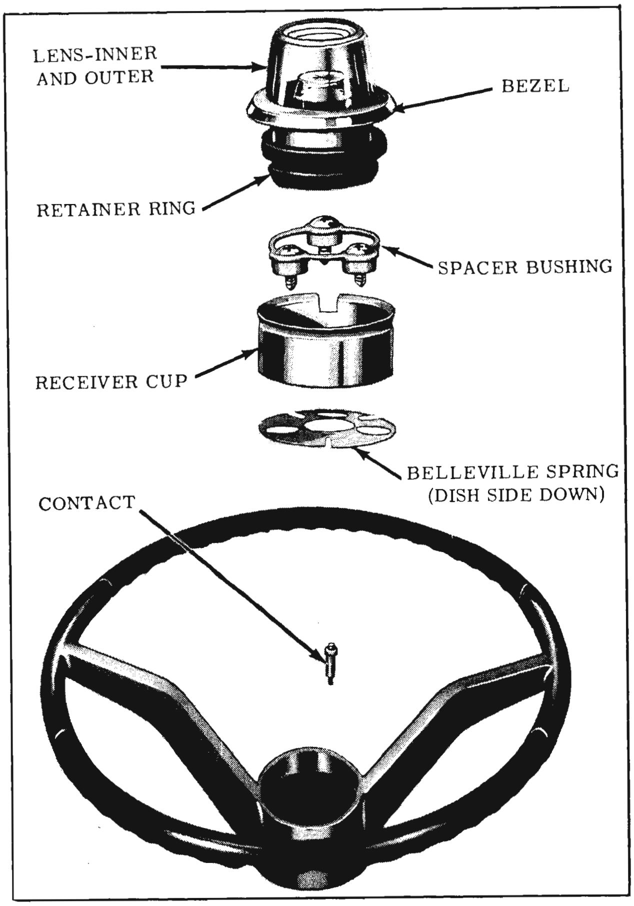


Fig. 4-72 Standard Steering Wheel

STEERING WHEEL AND HORN CONTACT (Fig. 4-72 and 4-73)

STEERING WHEEL

Remove

1. Disconnect the horn wire from the wiring harness.

2. Standard wheel - Pull lens and bezel assembly from wheel.

3. Deluxe wheel - Carefully pry the cap and emblem assembly from the shroud.

4. Remove the steering wheel attaching nut and washer, then using a puller such as BT-61-9, remove the steering wheel from the steering shaft. (Fig. 4-74) Remove puller from steering wheel.

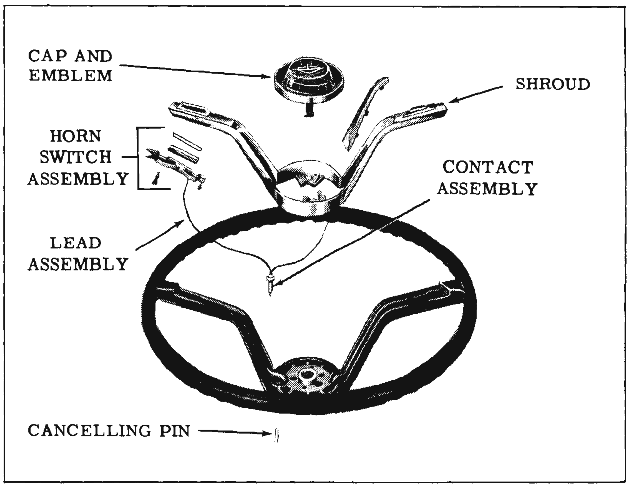


Fig. 4-73 Deluxe Steering Wheel

Install

1. With the marks on the steering wheel and steering shaft aligned, install the wheel, flat washer and nut.

   NOTE: When mark on steering wheel hub and steering shaft are lined up, wheel spokes should be horizontal as car is driven straight ahead.

   If this is not the case, it will be necessary to adjust the tie rod ends until steering wheel assumes its proper position. When a new steering gear is installed, it may be necessary to adjust steering wheel spoke alignment even though spoke alignment had been correct for the old gear.

2. Torque the nut 25 ft. lbs. and stake to steering shaft. On standard steering wheels, install lens and bezel assembly. Water may be used on bezel retainer ring to aid installation. DO NOT USE LUBRICANT ON RETAINER RING. On deluxe steering wheels, install cap and emblem assembly.

3. Connect horn wire to wiring harness.

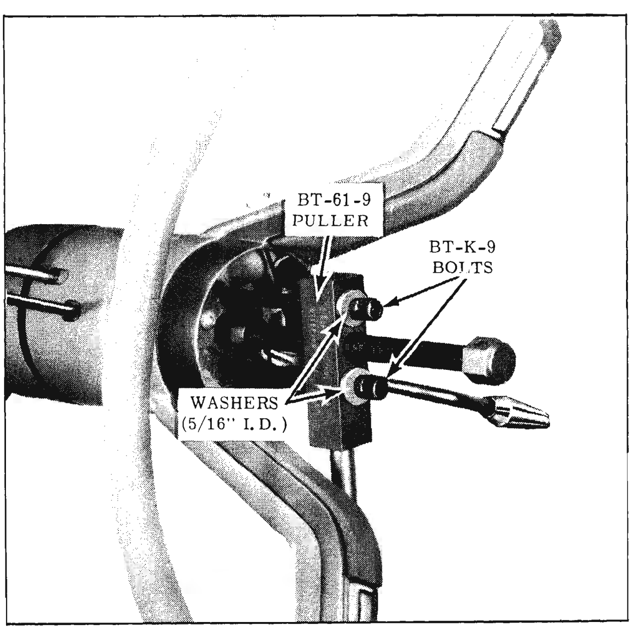


Fig. 4-74 Steering Wheel Removal

HORN CONTACT ASSEMBLY REPLACEMENT

1. Remove the steering wheel.

2. Deluxe steering wheels - Disconnect the horn switch wires from the contact assembly lead, then remove the 4 shroud attaching screws and shroud.

3. Remove the staking from the wheel hub and pull the contact assembly from the steering wheel.

To install, place contact assembly in steering wheel and stake hub in three places (Fig. 4-75) to retain the contact assembly, then reverse the removal procedure.

HORN SWITCH ASSEMBLY REPLACEMENT

The horn switch is retained to the cap (standard steering wheel) or to the shroud (deluxe steering wheel) by screws. (Figs. 4-72 and 4-73)

To remove the horn switch from the standard wheel, the cap must be removed. To remove the horn switch from the deluxe steering wheel, the steering wheel and the shroud must be removed.

UPPER BEARING, HORN CONTACT RING OR WIRE REPLACEMENT (Without Tilt-Away Steering Wheel)

1. Disconnect horn contact wire from chassis wiring harness.

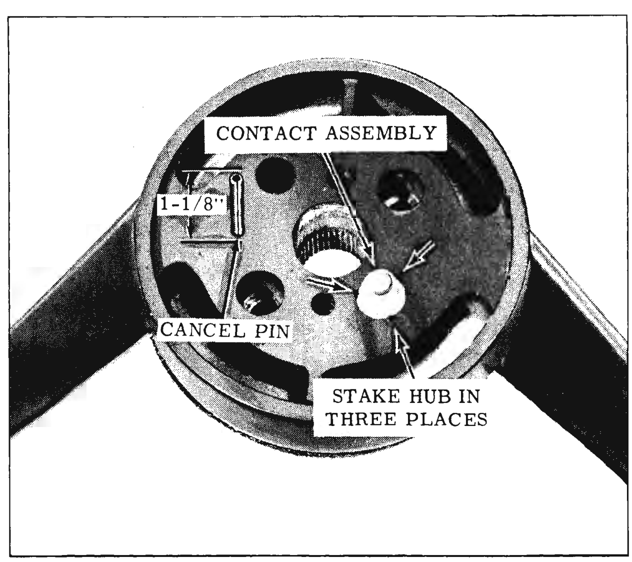


Fig. 4-75 Cancel Pin and Horn Contact

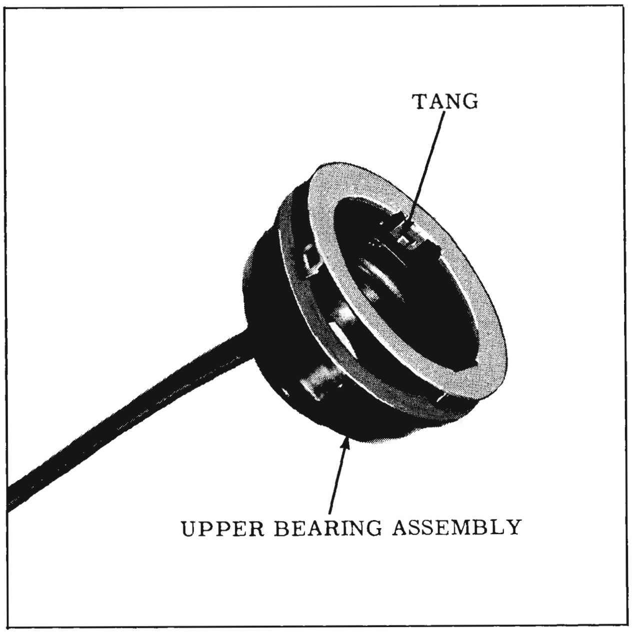


Fig. 4-76 Horn Contact Removal

2. Remove steering wheel.

3. Pry bearing from retainer, then pry horn contact from bearing just enough to expose horn wire tang. (Fig. 4-76)

4. Depress tang and remove horn contact and wire from bearing.

5. Prior to assembly, bend horn wire terminal tang if necessary so that it will lock in horn contact. (Fig. 4-77)

6. After assembly of contact and bearing, install assembly into retainer using hand pressure.

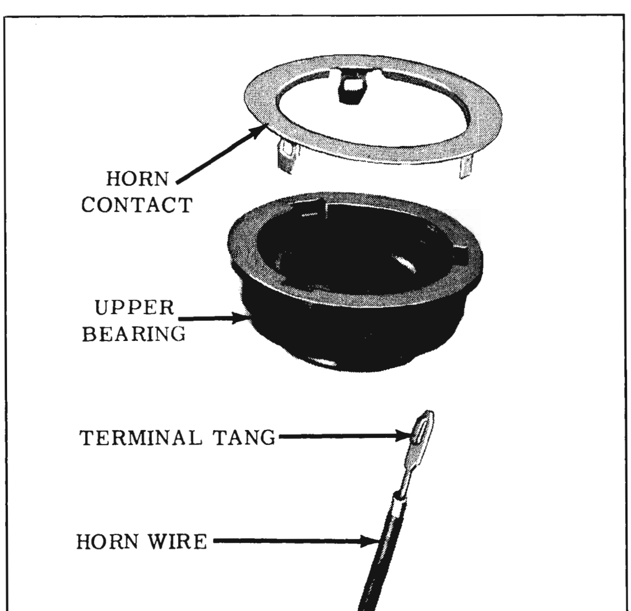


Fig. 4-77 Horn Contact and Bearing

7. Install steering wheel and connect horn wire.

TURN SIGNAL ACTUATOR ASSEMBLY REMOVE AND INSTALL (Fig. 4-78)

1. Remove the steering wheel assembly and the turn signal lever.

2. Insert a screwdriver, with a round shank, through the turn signal lever hole in the housing and pull or pry the housing from the bearing retainer.

3. Remove the cancel spring and pivot pin with wave washer from the lever plate.

4. Depress the detent spring to disengage it from the upper bearing retainer, then separate the lever plate, detent spring, detent roller and detent balls from the upper bearing retainer. (Fig. 4-78)

5. To install, reverse the removal procedure and lubricate all frictional areas with a thin coat of Lithium Soap Grease. Press the housing over the upper bearing retainer so that it just snaps over the rim of the bearing retainer flange.

STEERING COLUMN

REMOVE AND INSTALL

1. Disconnect battery and remove steering wheel. For other than Tilt-Away-Wheel, remove spring and retainer.

2. Disconnect rod from lower shift lever.

3. On cars equipped with Synchromesh, disconnect rod from cross shift lever. (Fig. 4-79)

4. From under instrument panel, disconnect the horn wire from chassis wiring harness and the turn signal wires from turn signal switch on mast jacket.

5. Disconnect the wires from the Hydra-Matic combination neutral safety and back-up switch or the wires from the Synchromesh back-up light switch on the mast jacket.

6. Remove cap from upper mast jacket bracket, then remove the Hydra-Matic indicator needle from the shifter tube. (Fig. 4-80)

7. Disconnect mast jacket grommet and retainer from floor pan.

8. Remove mast jacket cover plate.

9. Disconnect positive battery cable sleeve from mast jacket or lower clamp.

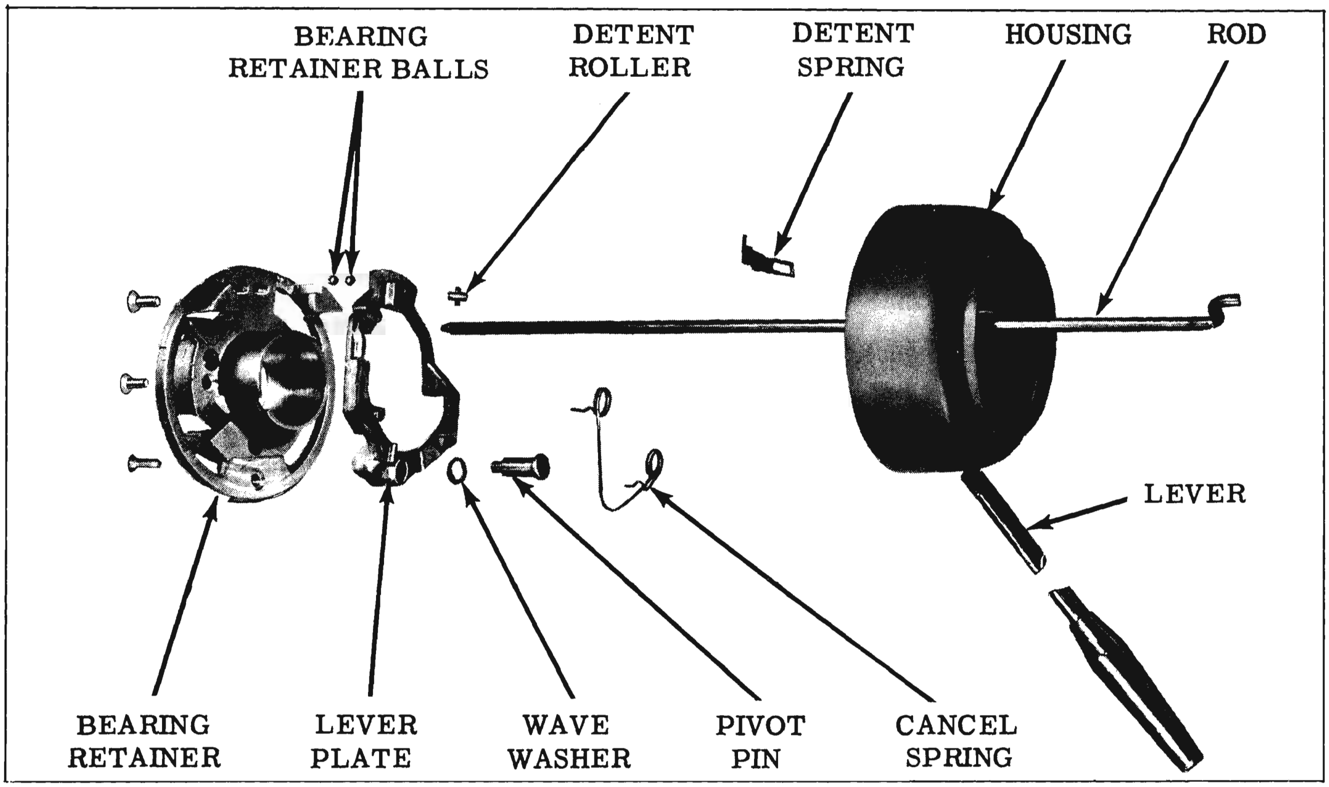


Fig. 4-78 Turn Signal Actuator Assembly

10. Remove clamp from upper mast jacket bracket.

11. For other than Tilt-Away column, slide mast jacket off steering shaft.

12. For Tilt-Away column, disconnect flexible coupling from steering shaft and remove column assembly.

To install steering column assembly, reverse removal procedure.

NOTE: Before tightening the upper clamp, position the steering column assembly (all except power steering with Hydra-Matic) or lower bearing (power steering with Hydra-Matic), to provide 2-7/32" between horn contact surface and end of steering shaft. Install retainer ring after lower bearing has been correctly located.

If console equipped, the steering shaft must be centered in the steering column before column is secured to toe-pan.

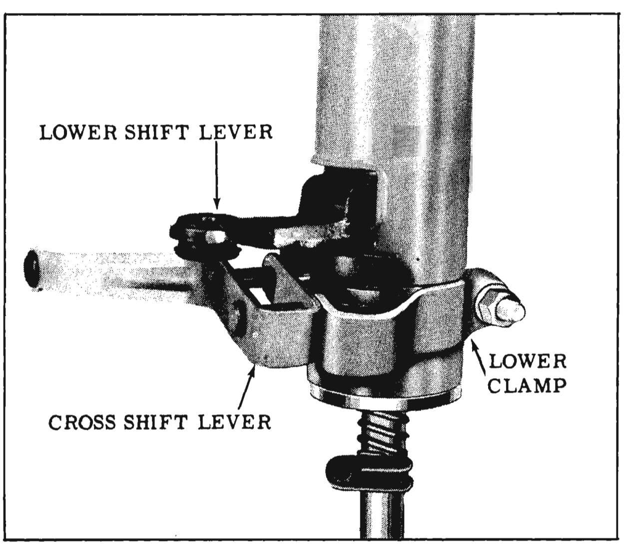


Fig. 4-79 Synchromesh Shift Levers

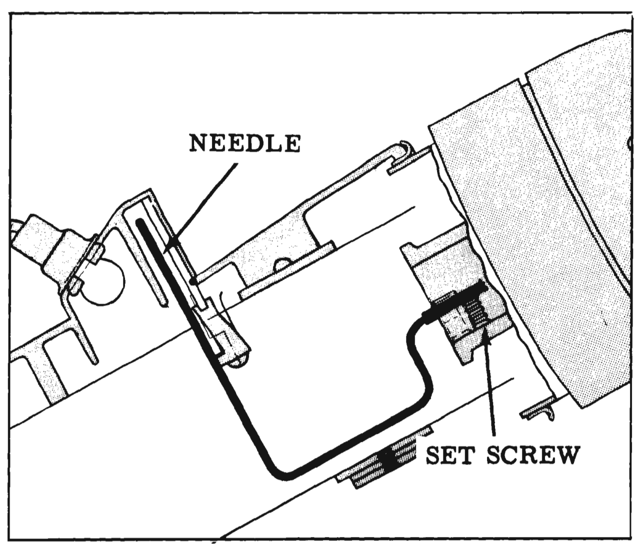


Fig. 4-80 Hydra-Matic Indicator Needle

DISASSEMBLE AND ASSEMBLE (Fig. 4-81 and 4-82) (Without Tilt-Away Steering Wheel)

NOTE: If console equipped, disregard reference to shift tube.

1. Remove turn signal switch from side of mast jacket. Remove the switch pin and spring from the turn signal rod.

2. Remove the Hydra-Matic combination neutral safety and back-up light switch or the Synchromesh back-up light switch from the mast jacket. Remove the switch lever from the shift tube.

3. Remove the turn signal lever and pull upper bearing retainer housing.

4. Pry out the upper bearing from the bearing retainer, then remove the upper bearing and horn wire.

5. On Hydra-Matic models, remove the shift tube retainer ring and washer from inside the upper bearing retainer.

6. Remove the 3 upper bearing retainer screws, then remove the upper bearing retainer and turn signal actuator assembly.

   NOTE: If necessary, the shift stop plate (Hydra-Matic models) can be removed from the upper bearing retainer at this time.

7. On Hydra-Matic models, remove wave washer from shift tube.

8. Support shifter bowl, and drive shift lever pin from bowl. Remove shift lever and spring from bowl.

9. Pull shifter bowl from shift tube.

10. On Synchromesh models, loosen lower clamp, and remove lower bearing.

11. On Hydra-Matic models without console, remove lower bearing retainer and bearing.

12. On Synchromesh model, remove spring

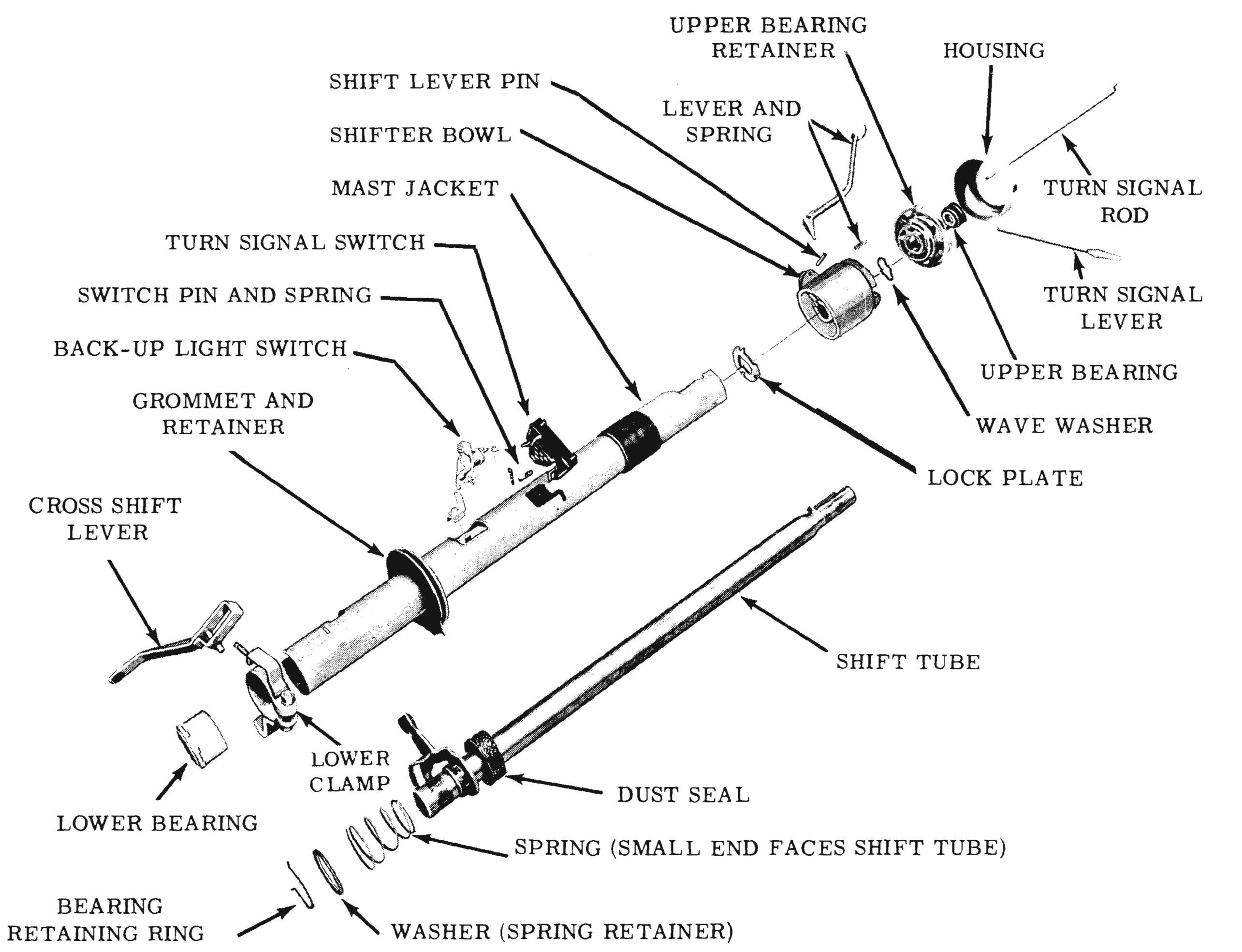


Fig. 4-81 Steering Column (Synchromesh)

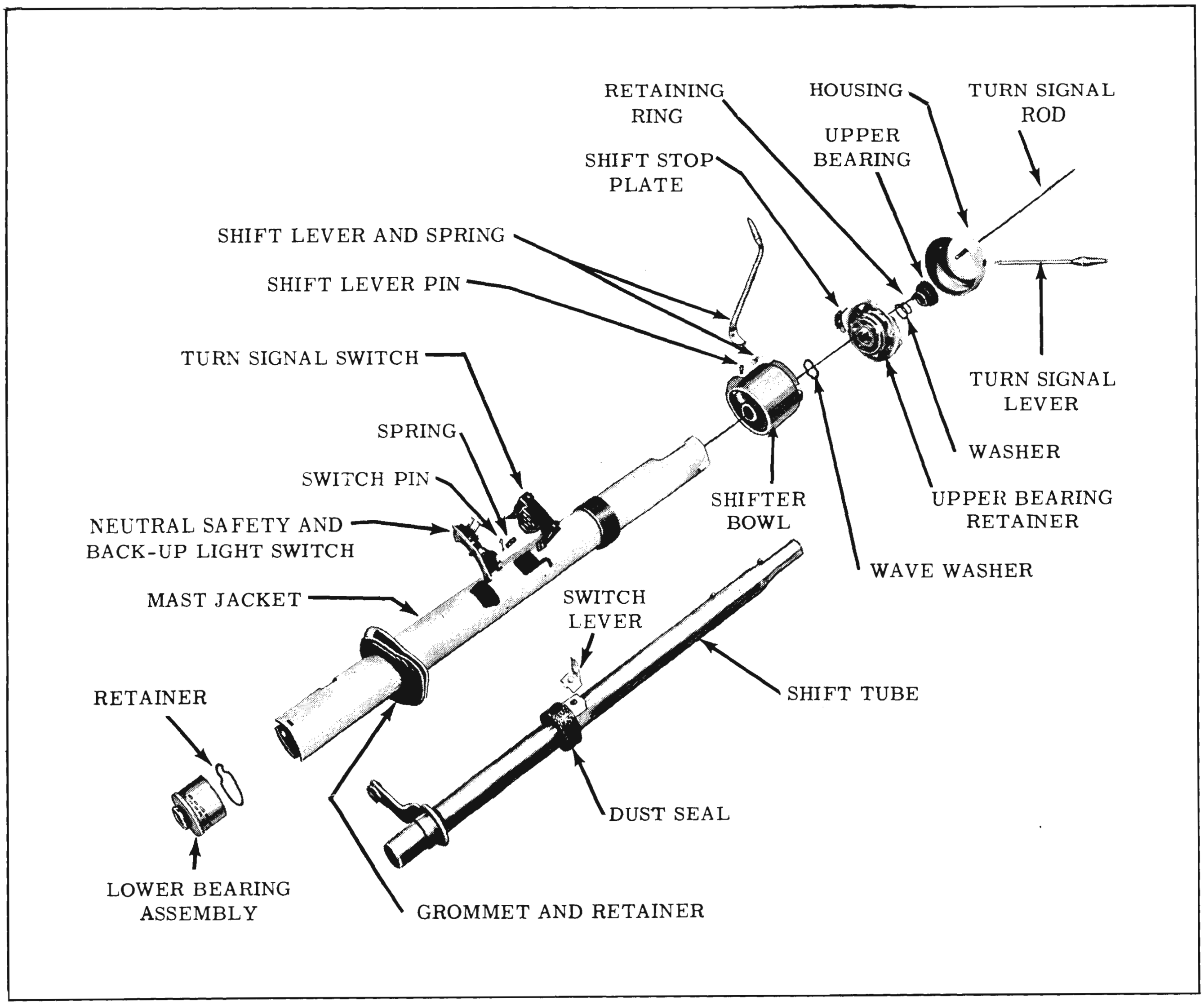


Fig. 4-82 Steering Column (Hydra-Matic) without Console

retainer washer and spring.

13. Remove shift tube from lower end of mast jacket.

14. For Synchromesh models, remove lock plate from top of mast jacket.

NOTE: The lower bearing should not be disassembled.

To reassemble mast jacket, reverse the removal procedure. Apply a thin coat of Lithium Soap Grease to all frictional parts. On Hydra-Matic models with power steering, locate lower bearing to obtain 2-7/32" between horn contact surface and end of steering shaft, then install bearing retainer ring.

TILT-AWAY STEERING WHEEL COLUMN DISASSEMBLY

The following disassembly procedure is applicable for all tilt wheel steering columns. If the steering column is from a car that has a console, disregard reference to the shift tube and the safety switch.

TURN SIGNAL AND NEUTRAL SAFETY SWITCH REMOVAL

1. Remove the turn signal switch from the mast jacket by removing the two attaching screws and disconnecting the Bowden cable by loosening the cable clamp and removing the gripper washer from the switch pin.

2. Remove the neutral safety and back-up lamp switch assembly from the mast jacket, then remove the switch lever from the shift tube.

ACTUATOR HOUSING REMOVAL

1. With the column in the centered position, remove the turn signal lever and the tilt lever.

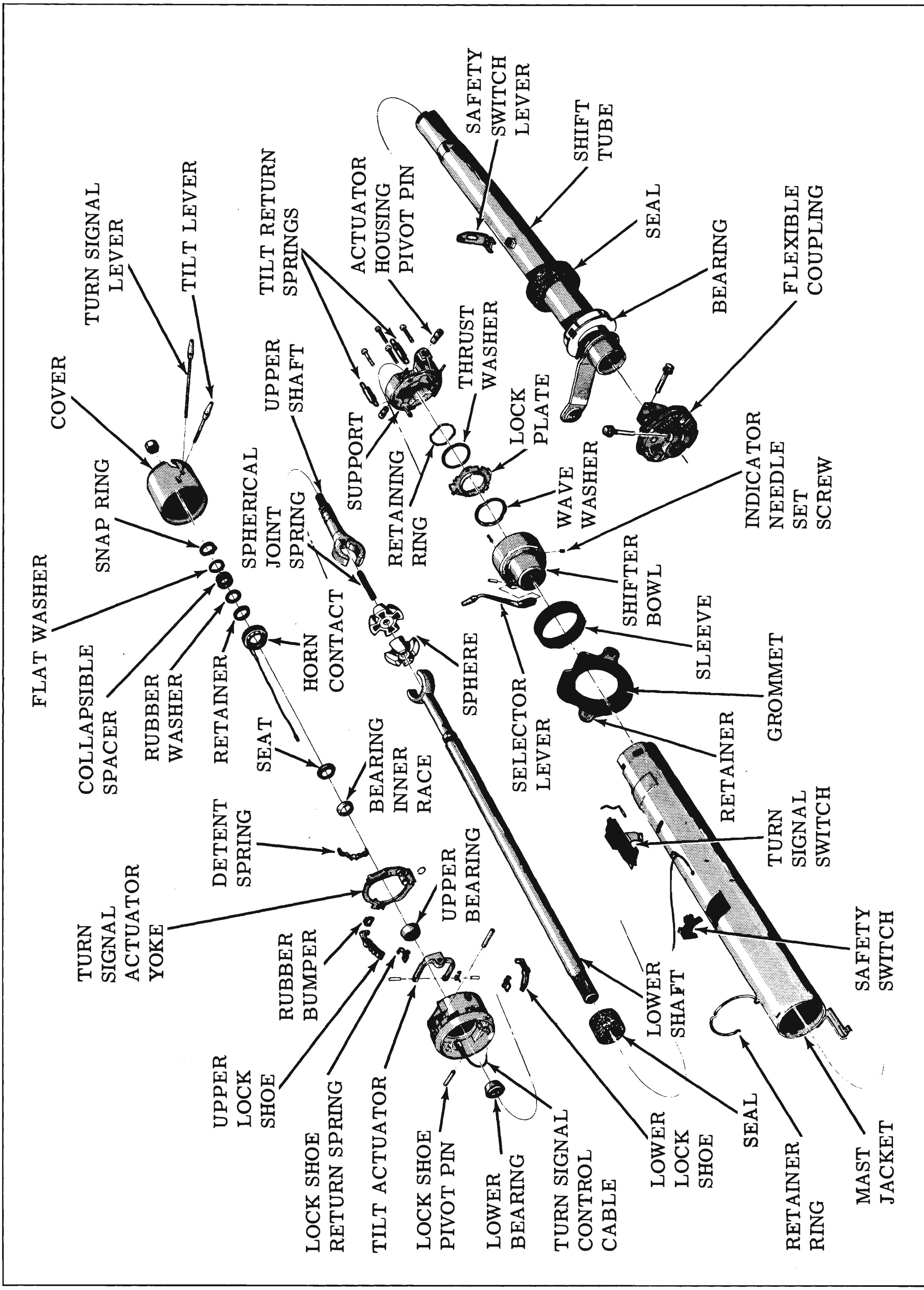


Fig. 4-83 Tilt-Away Steering Column (Without Console)

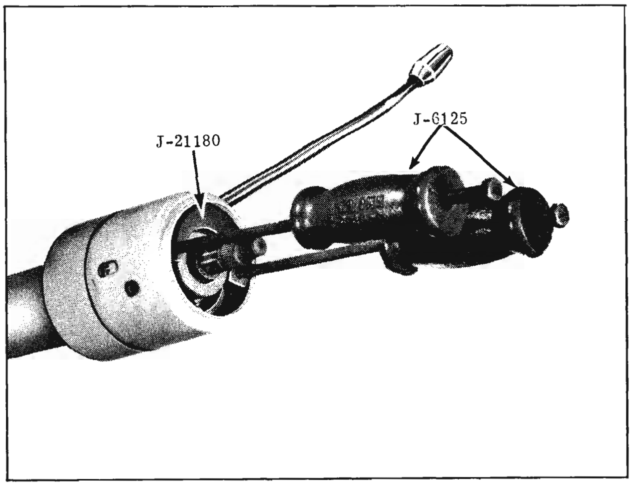


Fig. 4-84 Removing Turn Signal Cover

2. Remove the turn signal cover. (Fig. 4-84)

3. Pry out the horn contact assembly from the turn signal actuator housing and remove the contact and wire assembly. (Fig. 4-85)

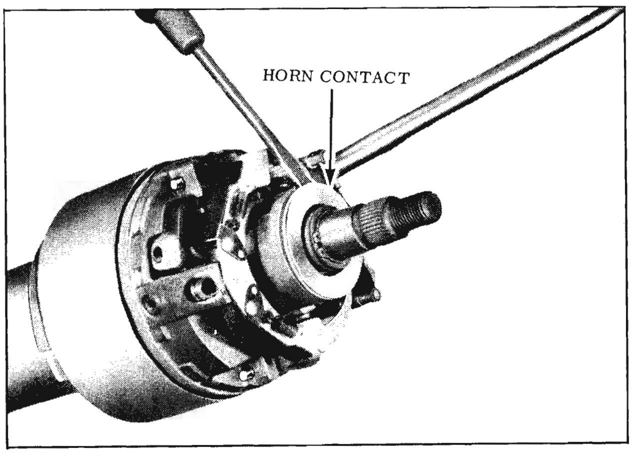


Fig. 4-85 Removing Horn Contact

4. Remove the upper shaft snap ring. (Fig. 4-86)

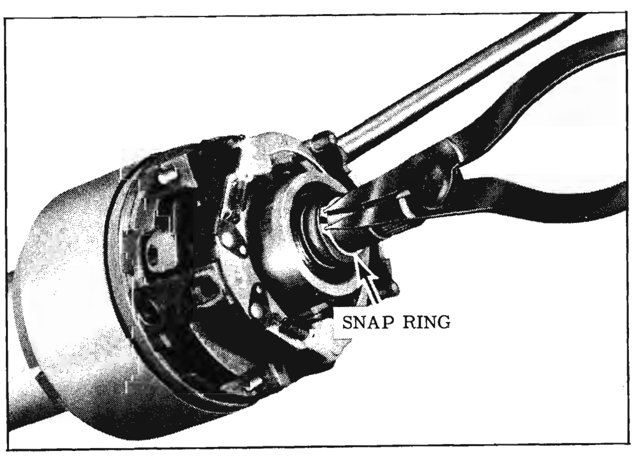


Fig. 4-86 Removing Upper Shaft Retaining Ring

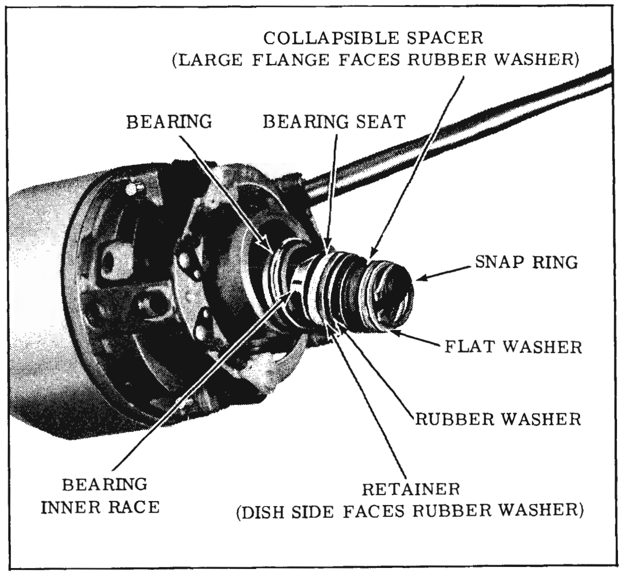


Fig. 4-87 Removing Upper Shaft Parts

5. Remove the washer, collapsible spacer, rubber washer, retainer, bearing seat, inner race and steering shaft upper bearing. (Fig. 4-87)

   NOTE: The collapsible spacer MUST NOT be re-used.

6. Remove the turn signal switch detent spring, then pull the actuator yoke from the actuator housing.

7. Install the tilt lever and lift up so the column will go to the full up position, then unhook the upper ends of the two tilt return springs by inserting a small bladed screwdriver through the upper coil and lifting up. (Fig. 4-88) It may be necessary to use another screwdriver to unhook the spring as shown. Installer Tool J-21181 may be required to remove the right hand return spring.

8. Remove the two pivot pins with Tool J-21179. (Fig. 4-89)

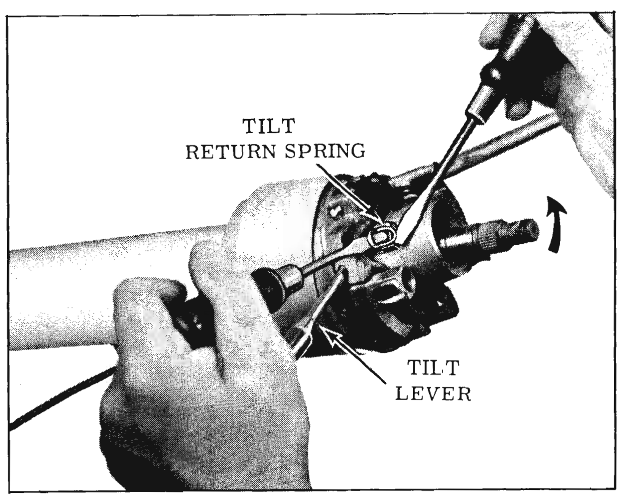


Fig. 4-88 Removing Tilt Return Springs

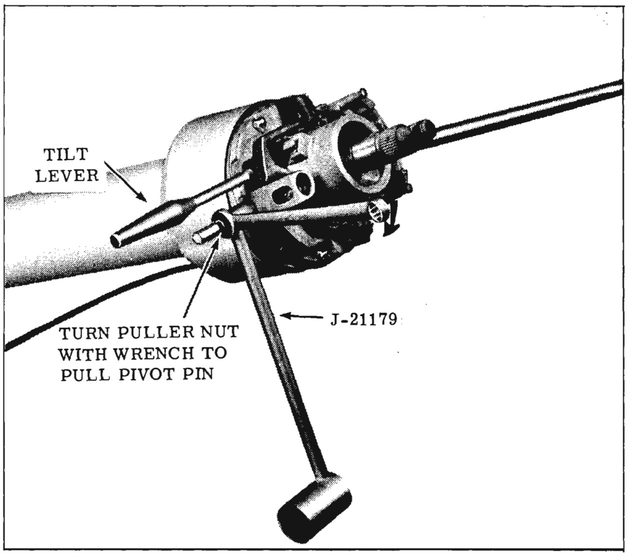


Fig. 4-89 Removing Actuator Housing Pivot Pins

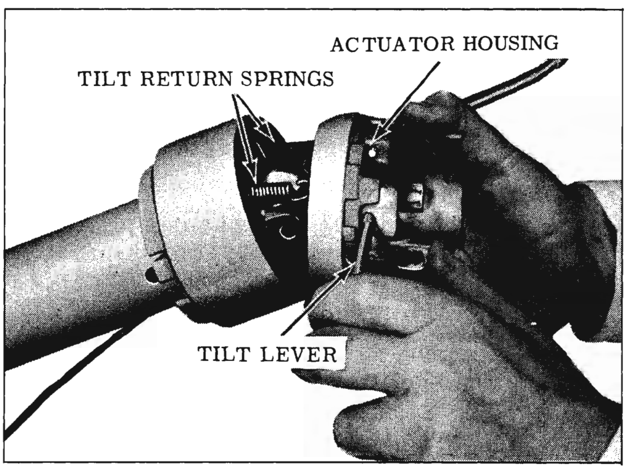


Fig. 4-90 Removing Actuator Housing

CAUTION: If the screw starts to turn, hold it with a wrench. Do not allow the screw to bottom in the pivot pin or the tool to become cocked on the housing.

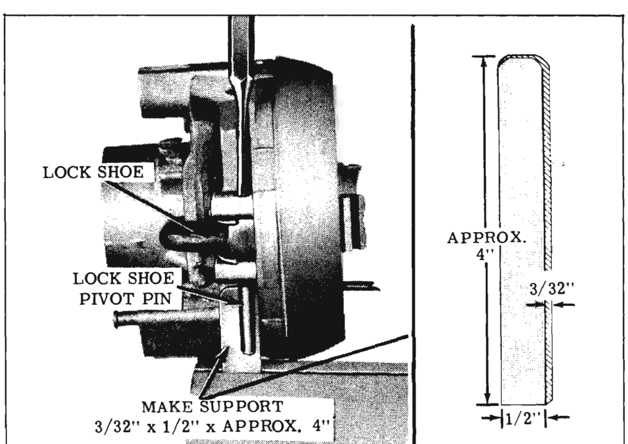


Fig. 4-91 Removing Lock Shoe Pivot Pins

9. Slightly lift the tilt lever to disengage the lock shoes from the pins and remove the actuator housing, then remove the tilt return springs and the upper shaft lower bearings. (Fig. 4-90)

ACTUATOR HOUSING DISASSEMBLY

1. Back up the lock shoe pivot pin boss in the acutator housing, with a suitable tool, inboard of the pivot pins. (Fig. 4-91)

2. Drive the upper and lower lock shoe pivot pins from the actuator housing with an 1/8" straight punch.

3. Remove the lock shoes and springs by pushing the upper end of the lock shoe through the openings in the actuator housing. (Fig. 4-92)

4. Remove the turn signal switch control cable from the turn signal bellcrank by removing the retaining screw at the top of the housing and disconnecting from the bellcrank. Remove the cable through the top of the actuator housing.

STEERING SHAFT DISASSEMBLY

1. Pull the steering shaft assembly upward and out of the mast jacket.

2. Clamp the steering shaft in brass jawed vise.

3. Move the upper shaft fully from center line of lower shaft.

4. Using a narrow bladed screwdriver through the coils of the spring, compress spring enough to remove the upper end from the

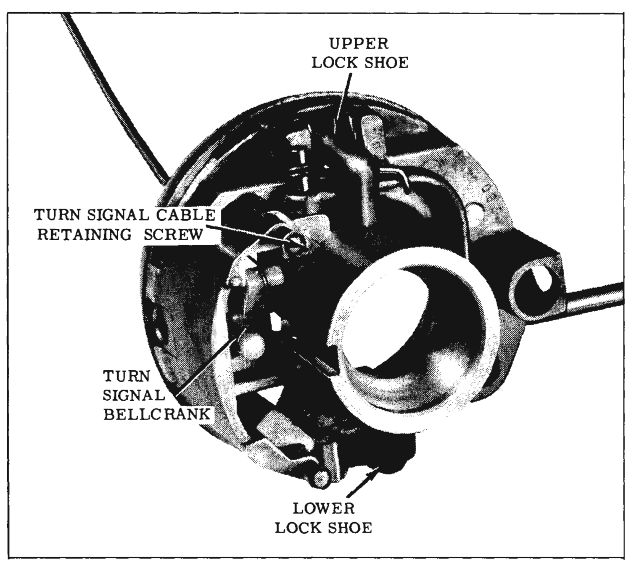


Fig. 4-92 Actuator Housing (Top View)

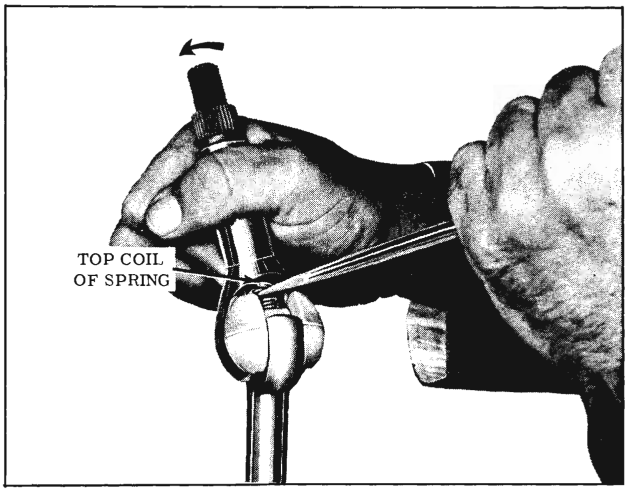


Fig. 4-93 Removing Spherical Joint Spring

upper seat. (Fig. 4-93)

5. Move the upper shaft to the opposite side and allow the spring to snap out of the opening between the shaft and the sphere.

6. Remove the spring.

7. Turn the upper shaft 90° from the center line of the lower shaft and remove the upper shaft and sphere from the lower shaft. (Fig. 4-94)

8. Remove the sphere from the upper shaft by rotating so flats on sphere align with socket.

SHIFT TUBE AND SHIFTER BOWL REMOVAL

1. Remove the four support screws, then lift the support from the mast jacket. (Fig. 4-95)

   NOTE: Support may have to be tapped slightly to loosen.

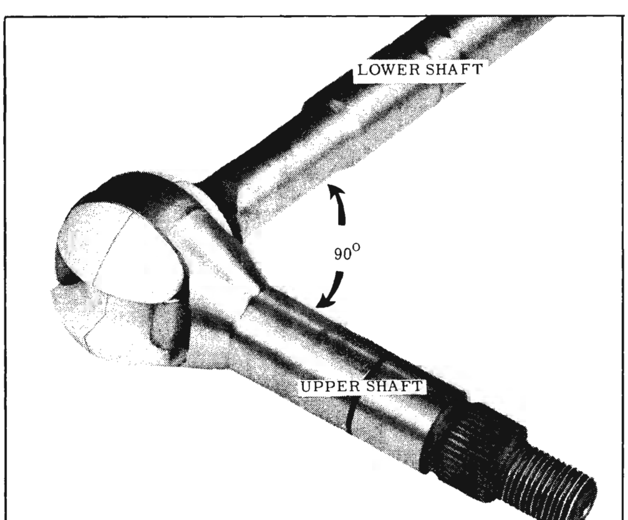


Fig. 4-94 Removing Sphere and Upper Shaft

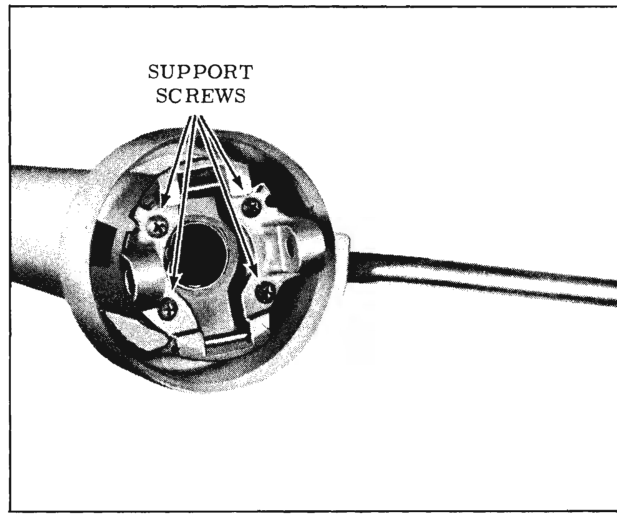


Fig. 4-95 Support Screw Location

2. Remove the shift tube retainer ring and washer from the top of the shift tube. (Fig. 4-96)

3. Remove the shift tube bearing retainer from the lower end of the mast jacket.

4. Remove the shift tube from the lower end of the mast jacket using Tool J-21180 and two Slide Hammers J-6125-1. (Fig. 4-97)

5. Remove the lock plate, wave washer and shifter bowl from upper end of the mast jacket. It may be necessary to slide the bowl toward the shift lever to remove the lock plate.

6. Drive the shift lever pivot pin from the bowl, then remove the shift lever and spring.

7. Remove the anti-rattle grommet from the shift lever.

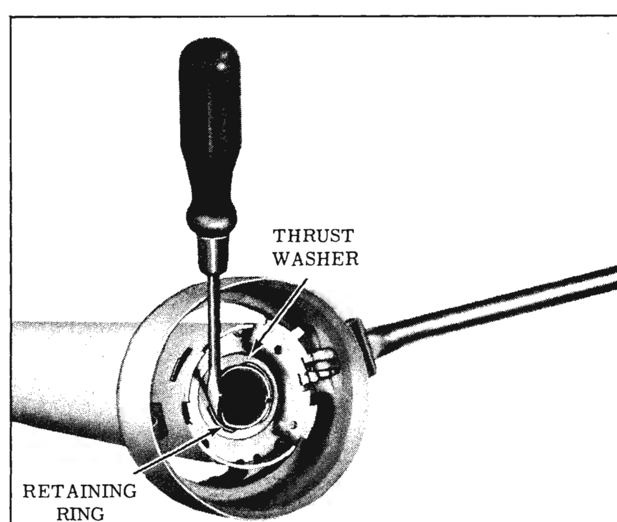


Fig. 4-96 Removing Shift Tube Upper Retaining Ring

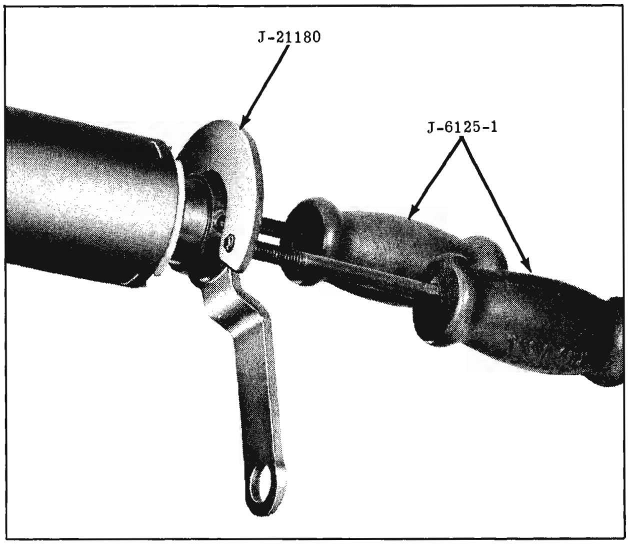


Fig. 4-97 Removing Shift Tube

ASSEMBLY OF TILT-AWAY STEERING COLUMN

When assembling the steering column, APPLY A THIN COAT OF BALL JOINT LUBRICANT, PART NO. 585617, TO ALL FRICTION PARTS.

SHIFT TUBE AND SHIFTER BOWL ASSEMBLY

1. Install the anti-rattle grommet on the shift lever, if removed.
2. Place shift lever spring and lever in bowl, then install the pin.
3. Place the shifter bowl on the mast jacket with the shift lever on the right side of the column.
4. Insert the shift tube and felt dust seal assembly into the lower end of the mast jacket.

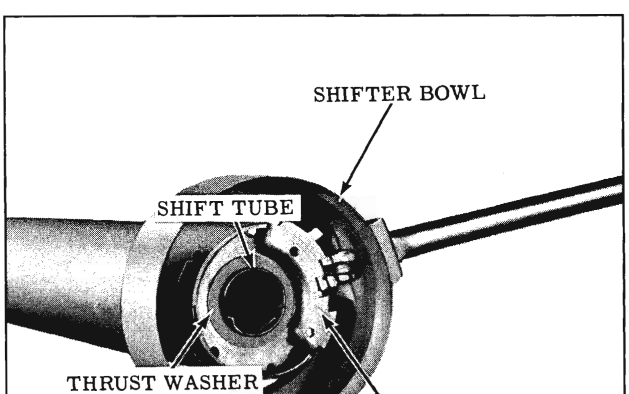


Fig. 4-98 Lock Plate Location

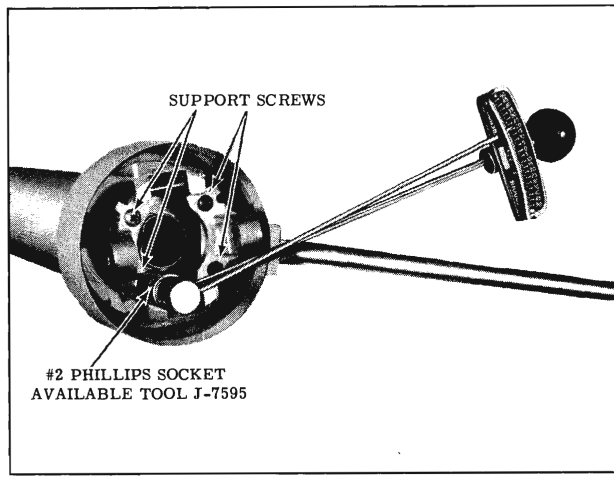


Fig. 4-99 Installing Support Screws

Guide the shift tube into the shifter bowl aligning the key in the bowl with the keyway in the tube. Hold the shifter bowl and tap the lower end of the shift tube until the upper end of the tube is flush with the inner portion of the shifter bowl.

5. Position the lower mast jacket bushing flange against the lower end of the mast jacket, align the slots in the bushing with the holes in the mast jacket and install the retaining ring.
6. Place the wave washer on the lower side of the lock plate, retain with ball joint lubricant, then slide the lock plate into position through the opening in the mast jacket. (Fig. 4-98)
7. Align the lock plate and wave washer with the end of the shift tube, then tap the lower end of the tube to fully seat it in the jacket.
8. Install the thrust washer and retaining ring on the upper end of the shift tube.
9. Install the support on the upper end of the mast jacket with the long leg aligned with the notch in the low side of the lock plate, then install the four attaching support screws. (Fig. 4-99) Torque the two larger (left) screws first, 20 to 25 in. lbs., then torque the right two screws 20 to 25 in. lbs. using a No. 2 Phillips Socket, J-7595.

STEERING SHAFT ASSEMBLY

1. Lubricate the grooves of the centering sphere with ball joint lubricant, Part No. 585617, then place the sphere in the upper shaft socket.
2. Turn the sphere so the lower shaft can be installed over the flat area of the sphere (Fig. 4-100) approximately 90° from center line of lower shaft, then, install lower shaft socket over the sphere and straighten the shaft.

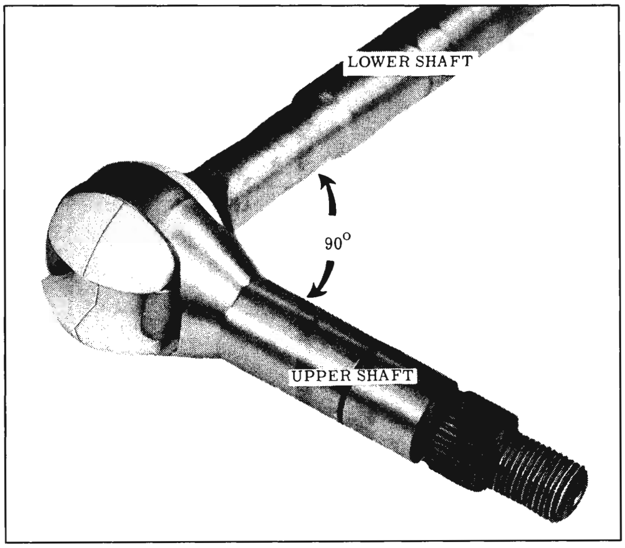


Fig. 4-100 Installing Sphere and Upper Shaft

3. Install the preload spring through the centering sphere and into the spring seat in the lower shaft. Compress the spring into the opening between the sphere and the upper shaft, then move upper shaft to hold spring. With a screwdriver, inserted through the coils from the opposite side of the shaft, compress the spring so the upper end will snap into the spring seat in the upper shaft. (Fig. 4-101)

4. Install the steering shaft assembly into the mast jacket from the upper end.

5. Install the steering shaft felt seal on lower end of steering shaft.

ACTUATOR HOUSING ASSEMBLY

1. Install the lock shoe return springs on the upper and lower lock shoes as follows:

   NOTE: The upper lock shoe has three notches and a rubber bumper, whereas, the lower shoe has four notches. (Fig. 4-102)

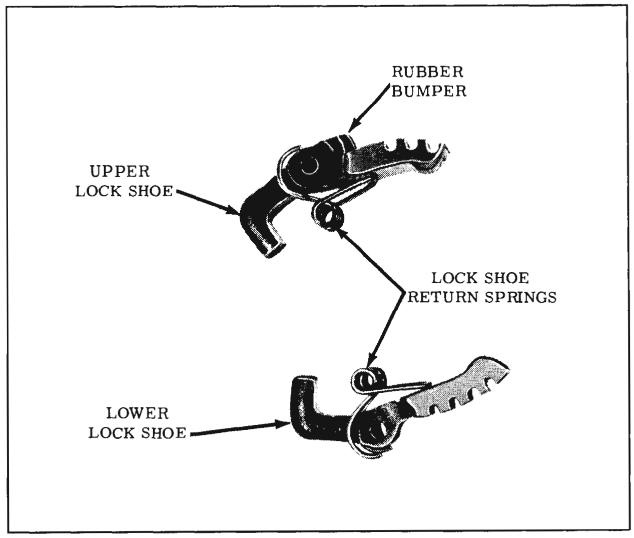


Fig. 4-102 Lock Shoes and Spring

   a. Place the actuator housing on the bench with the lower side up and the turn signal and tilt lever openings on the right side. (Fig. 4-103)

   b. Install the upper shoe in the upper opening of the housing by pushing on the rubber bumper and the end of the shoe.

   c. Turn the housing around and insert the lower shoe as in Step "B".

   d. Install the pivot pins in the actuator and through the lock shoes making certain that the pins are centered.

2. From the top of the actuator housing, install the turn signal switch control cable on the plastic bellcrank with the cable loops facing toward the center of the actuator, then install

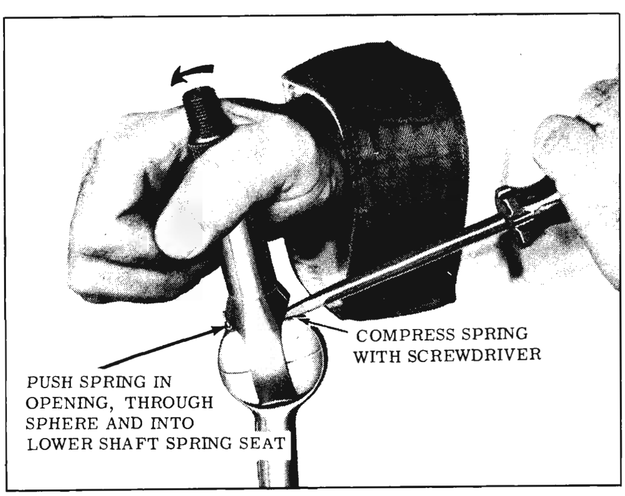


Fig. 4-101 Installing Spherical Joint Spring

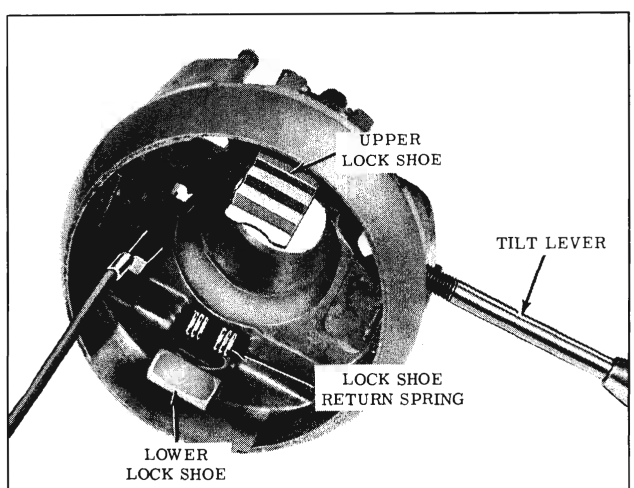


Fig. 4-103 Actuator Housing (Bottom View)

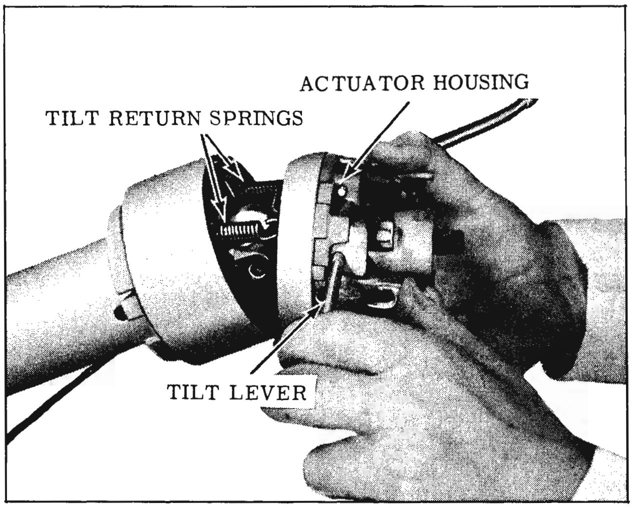


Fig. 4-104 Installing Actuator Housing

the cable bracket screw.

3. Install the horn contact wire through the keyway in the actuator housing. Do not install the contact at this time.

4. Install upper shaft lower bearing with rollers down.

5. Install the lower ends of the two return springs on the support spring anchors.

NOTE: The loops on the upper ends of the springs must have the opening toward the top of the column. (Fig. 4-104)

6. Install the tilt lever in the actuator.

ACTUATOR HOUSING INSTALLATION

1. Raise the tilt lever "up" slightly to prevent the lock shoes from engaging the pins, then install the actuator assembly over the steering shaft while guiding the turn signal cable and horn wire through the shift bowl. (Fig. 4-104)

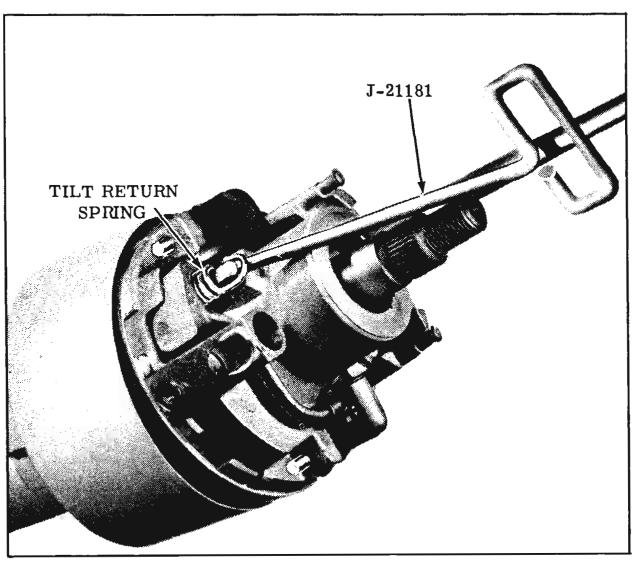


Fig. 4-105 Installing Tilt Return Springs

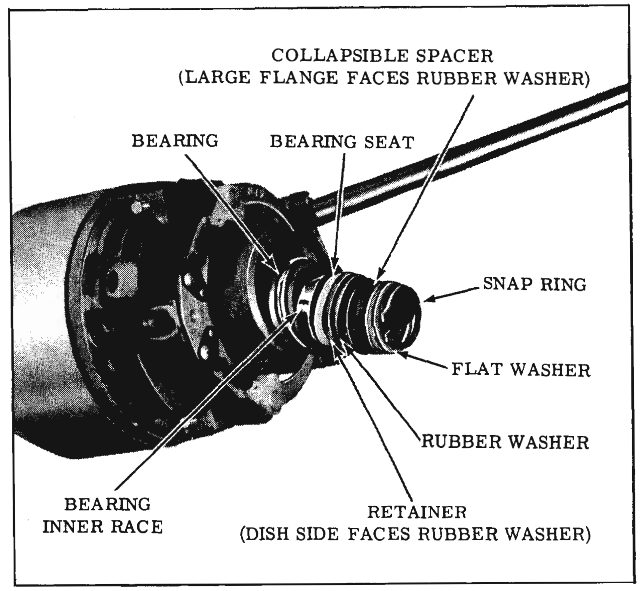


Fig. 4-106 Installing Upper Shaft Parts

2. Align the actuator assembly pivot pin holes with the holes in the support assembly, then install the pivot pins using a brass drift to fully seat the pins. Steering shaft may have to be slightly raised to have lock shoes clear socket.

3. Raise the tilt lever and lift the upper steering column to the full "up" position.

4. Install the upper ends of the two tilt return springs with Tool J-21181. (Fig. 4-105)

5. Install the turn signal actuator yoke assembly making sure that the ball socket engages the bellcrank ball, then install the detent spring.

6. Install the upper bearing (rollers facing up), bearing inner race, bearing seat (flanged portion "up", retainer (dish facing up), rubber washer, a new collapsible spacer and washer. (Fig. 4-106)

NOTE: When installing these parts on the

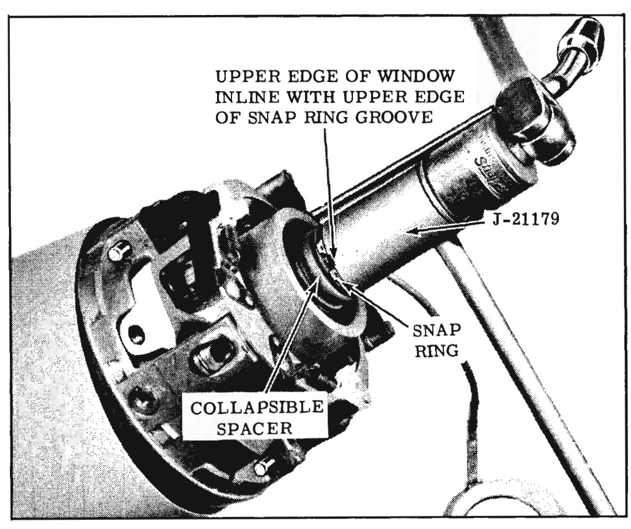


Fig. 4-107 Installing Upper Shaft Snap Ring

shaft, make sure that they do not hang up on the snap ring groove.

7. Install the snap ring over the steering shaft and against the collapsible spacer, then place Tool J-21179 over the steering shaft with the window in line with the snap ring opening. (Fig. 4-107)

8. Install the steering wheel nut and turn down until the upper edge of the window (cut out) in Tool J-21179 is in line with the upper edge of the snap ring groove. This will compress the spacer and preload the upper shaft bearings.

9. Remove the steering wheel nut and Tool J-21179 making sure the snap ring seats in the groove.

CHECKING THE STEERING SHAFT TORQUE

1. Install the steering wheel nut on the upper shaft.

2. Check the torque of the steering shaft by installing a 3/4" twelve point socket and using an inch lb. torque wrench. (Fig. 4-108) The shaft should rotate with the column in the full "up" position and the full "down" position with a maximum reading of 2-1/2 inch lbs. If the torque reading is greater than 2-1/2 inch lbs., it will be necessary to install a new collapsible spacer.

3. Remove the steering wheel nut.

HORN CONTACT AND TURN SIGNAL COVER

1. Install the horn contact in the actuator housing.

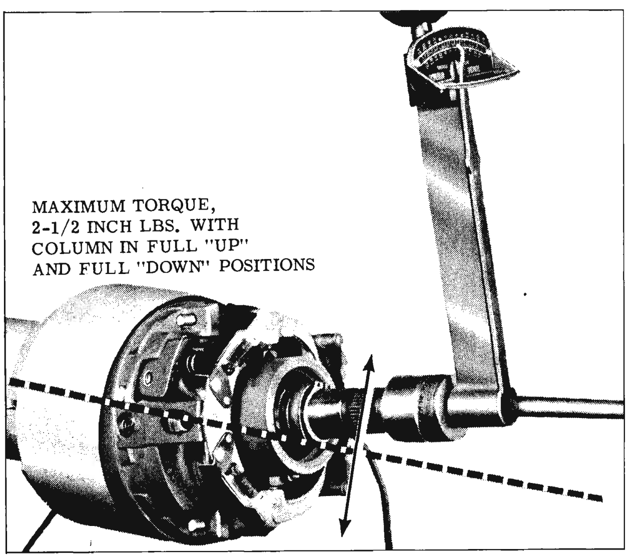


Fig. 4-108 Checking Steering Shaft Torque

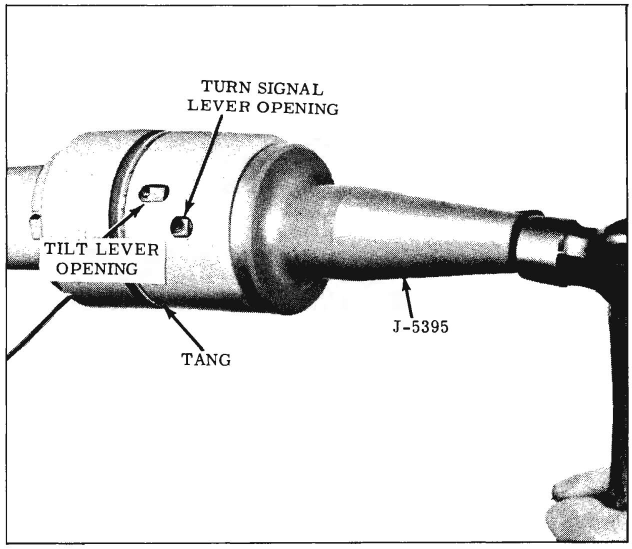


Fig. 4-109 Installing Turn Signal Cover

2. Move the column to the centered position, then remove the tilt lever.

3. Install the turn signal cover with Tool J-5395, pinion seal installer, aligning the openings for the tilt and turn signal levers, and with the small tang on the lower edge of the cover in line with the groove in the actuator housing. (Fig. 4-109)

4. Install the tilt and turn signal levers.

TURN SIGNAL SWITCH INSTALLATION AND ADJUSTMENT

1. Check to see that the turn signal lever is in the neutral position.

2. Place the loop of the control cable through the cable clamp and over the switch pin.

3. Center the switch pin, install a .060" pin in the switch carrier, then tighten the control cable clamp. Remove pin.

4. Install the gripper washer on the switch pin.

5. Move the steering wheel to the full "down" position.

6. Position the switch on the column and secure with the two screws leaving a minimum amount of slack in the control cable.

NEUTRAL SAFETY SWITCH AND BACK-UP LIGHT SWITCH

Install and adjust as outlined in the ELECTRICAL section.

DIAGNOSIS OF MANUAL AND POWER STEERING

NOTE: Items identified by (M.S.) apply to manual steering only and items identified by (P.S.) apply to power steering only. All items not identified by (M.S.) or (P.S.) apply to both units.

HARD STEERING WHILE DRIVING OR POOR RETURN OF STEERING TO CENTER

CAUSE	CORRECTION
1. Tight steering shaft bearings.	1. Replace bearings.
2. Lower coupling flange rubbing against adjuster plug. (P.S.)	2. Loosen bolt and reposition for clearance.
3. Steering wheel rubbing against turn signal collar.	3. Adjust mast jacket endwise.
4. Tires not properly inflated.	4. Inflate to specifications.
5. Steering linkage tie-rod joints misaligned.	5. Loosen tie-rod sleeve and center ball joint.
6. Steering gear misaligned.	6. Align at frame.
7. Tight over-center adjustment.	7. Adjust in car to specifications.
8. Thrust bearing adjustment too tight.	8. Adjust to specifications.
9. Ball preload too tight. (P.S.)	9. Remove gear and change ball size as required.
10. Sticky spool valve. (P.S.)	10. Remove and clean valve or replace valve assembly.
11. Sticking pump flow control valve. (P.S.)	11. Remove valve and clean.

CAR LEADS TO ONE SIDE OR THE OTHER

CAUSE	CORRECTION
1. Front end misaligned.	1. Adjust to specification.
2. Worn or damaged valve and shaft assembly. (P.S.) NOTE: If this is the cause, steering effort will be very light in direction of lead and heavy in opposite direction.	2. Replace valve and shaft assembly.

MOMENTARY INCREASE IN EFFORT WHEN TURNING WHEEL FAST TO THE RIGHT OR LEFT (P.S.)

CAUSE	CORRECTION
1. Low oil level in pump.	1. Check oil level in pump reservoir.
2. Pump belt slipping.	2. Tighten or replace belt.
3. Excessive internal leakage.	3. Replace rack-piston teflon seal and "O" ring and/or replace spool valve.

DIAGNOSIS OF MANUAL AND POWER STEERING (Cont'd.)

EXTERNAL OIL LEAKS
(WIPE GEAR THOROUGHLY AND MAKE SURE SOURCE OF LEAKAGE IS DETERMINED)

CAUSE	CORRECTION
1. Loose hose connections. (P.S.)	1. Tighten.
2. Damaged hose. (P.S.)	2. Replace.
3. Side cover "O" ring seal. (P.S.)	3. Replace seal.
4. Pitman shaft seals.	4. Replace seals.
5. Housing end cover "O" ring seal. (P.S.)	5. Replace seal.
6. Adjuster plug seals. (P.S.)	6. Replace seals.
7. Torsion bar seal. (P.S.)	7. Replace valve and shaft assembly.

GEAR NOISE (RATTLE, CREAK OR CHUCKING)

CAUSE	CORRECTION
1. Loose over-center adjustment. NOTE: A slight rattle may occur on turns because of the increased lash off the "high point". This is normal and the lash must not be reduced below the specified limits to eliminate this slight rattle.	1. Adjust to specification.
2. Gear loose on frame.	2. Check gear to frame mounting bolts. Tighten bolts to specification.
3. Lack of lubricant at gear contact points.	3. Lubricate gear box to frame contact points.

GEAR NOISE ("HISSING" SOUND) (P.S.)

CAUSE	CORRECTION
There is some noise in all power steering systems. One of the most common is a "hissing" sound most evident at standstill parking. There is no relationship between the noise and performance of the gear. "Hiss" may be expected when steering wheel is at end of travel or when slowly turning at standstill.	Do not replace valve and shaft assembly unless "hiss" is extremely objectionable. Slight "hissing" is satisfactory and in no way effects steering. A replacement valve and shaft assembly may also exhibit slight noise and is not always a cure for the objection. Check clearance around safety drive bolts in flexible coupling. Be sure steering shaft and gear are aligned so the flexible coupling rotates in a flat plane and is not distorted as shaft rotates. Any metal to metal contact through the flexible coupling will transmit the valve "hiss" into the car.

DIAGNOSIS OF MANUAL AND POWER STEERING (Cont'd.)

EXCESSIVE WHEEL KICK-BACK OR LOOSE STEERING

CAUSE	CORRECTION
1. Lash in steering linkage.	1. Replace parts affected.
2. Air in system. (P.S.)	2. Add oil to pump reservoir.
3. Excessive lash between pitman shaft and rack-piston.	3. Make over-center adjustment.
4. Loose thrust bearing adjustment.	4. Adjust to specification.
5. Ball and worm preload incorrect. (P.S.)	5. Remove rack-piston and worm, and change balls to obtain specified preload.

STEERING WHEEL SURGES OR JERKS WHEN TURNING ENGINE RUNNING, ESPECIALLY DURING PARKING (P.S.)

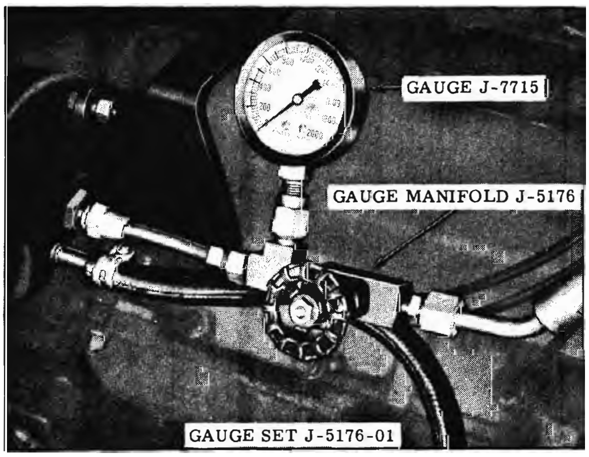
CAUSE	CORRECTION
1. Loose pump belt.	1. Adjust to specification.

HARD STEERING WHEN PARKING

CAUSE	CORRECTION
1. Loose pump belt. (P.S.)	1. Adjust to specification.
2. Low oil level in reservoir. (P.S.)	2. Fill to proper level. If excessively low, check all lines and joints for evidence of external leakage.
3. Lack of lubrication in ball joints or steering linkage.	3. Add lubricant.
4. Tires not properly inflated.	4. Inflate to recommended pressure.
5. Insufficient oil pressure. (P.S.)	5. If all of the above checks do not reveal the cause of hard steering, make the following tests of oil pressure. a. Disconnect the pressure line at pump, then install Gauge Set J-5176-01. (Fig. 4-110) b. With engine at slow idle and gauge valve open, note the oil pressure on the gauge while turning steering wheel from one extreme position to the other. Especially note the maximum pressure which can be built up with the wheel held in either right or left extreme position. CAUTION: Do not hold wheel in extreme position for an extended period of time because it will drastically increase

DIAGNOSIS OF MANUAL AND POWER STEERING (Cont'd.)

HARD STEERING WHEN PARKING (Continued)

CAUSE	CORRECTION
 Fig. 4-110 Oil Pressure Gauge	the oil temperature and will cause undue wear on the pump. c. With oil temperature between 150° F. and 170° F. (measured with a thermometer in the reservoir) oil pressure should not be less than 1,100 p.s.i. for satisfactory power steering operation. (Fig. 4-110) d. If the maximum oil pressure is less than 1,100 p.s.i., it indicates trouble in the pump, hoses, steering gear, or a combination of these parts. To eliminate the hoses and gear, close the gauge valve and quickly test pressure of the pump only with the engine at slow idle, then open the valve to avoid increasing oil temperature. e. Comparing the maximum pressure obtained in these two tests will indicate source of trouble as follows: (1) First test (step b) pressure low, and second test (step d) pressure normal - indicates faulty hoses or steering gear. (2) First test (step b) and second test (step d) pressure equally low - indicates faulty oil pump.
6. Low oil pressure due to restriction in hose. (P.S.)	6. Clean or replace as required.
7. Low oil pressure due to steering gear. (P.S.)	7. Remove steering gear for disassembly.
a. Pressure loss in cylinder due to worn rack-piston seal, damaged "O" ring or scored housing bore.	a. Inspect rack-piston seal and "O" ring and housing bore.
b. Leakage at valve rings, valve body to worm seal.	b. Replace rings and seals.
c. Loose fit of spool in valve body or leaky valve body.	c. Replace valve and shaft assembly.

VALVE "SQUAWK" WHEN TURNING OR WHEN RECOVERING FROM A TURN (P.S.)

CAUSE	CORRECTION
1. Cut or worn dampener "O" ring on spool valve.	1. Replace dampener ring.
2. Loose or worn valve.	2. Replace valve and shaft assembly.

DIAGNOSIS OF MANUAL AND POWER STEERING (Cont'd.)

NO EFFORT REQUIRED TO TURN (P.S.)

CAUSE	CORRECTION
1. Broken torsion bar.	1. Replace valve and shaft assembly.

PUMP NOISE

CAUSE	CORRECTION
1. Loose belt.	1. Tighten belt.
2. Hose(s) touching other parts of car.	2. Adjust hose position.
3. Low Oil Level.	3. Fill reservoir.
4. Air in the oil.	4. Check oil level.
5. Excessive back pressure caused by hoses or steering gear.	5. Locate restriction and correct.
6. Scored pressure plate.	6. Lap away light scoring. Replace heavily scored part.
7. Vanes not installed properly.	7. Install properly.
8. Vanes sticking in rotor slots.	8. Free up by removing burrs or dirt.
9. Extreme wear of pump ring.	9. Replace part.
10. Face of thrust plate scored.	10. Lap away light scoring. Replace heavily scored part.
11. Scored rotor.	11. Lap away light scoring. Replace heavily scored part.

INOPERATIVE, POOR, OR NO ASSIST: (PUMP ASSEMBLY)

CAUSE	CORRECTION
1. Loose drive belt.	1. Tighten belt.
2. Low oil level.	2. Fill reservoir.
3. Air in the oil.	3. Add oil to pump reservoir.
4. Flow control valve stuck.	4. Remove burrs or dirt.
5. Vanes sticking in rotor slots.	5. Free up by removing burrs or dirt.
6. Faulty flow control valve assembly.	6. Clean and free up parts. Replace part(s) as necessary.

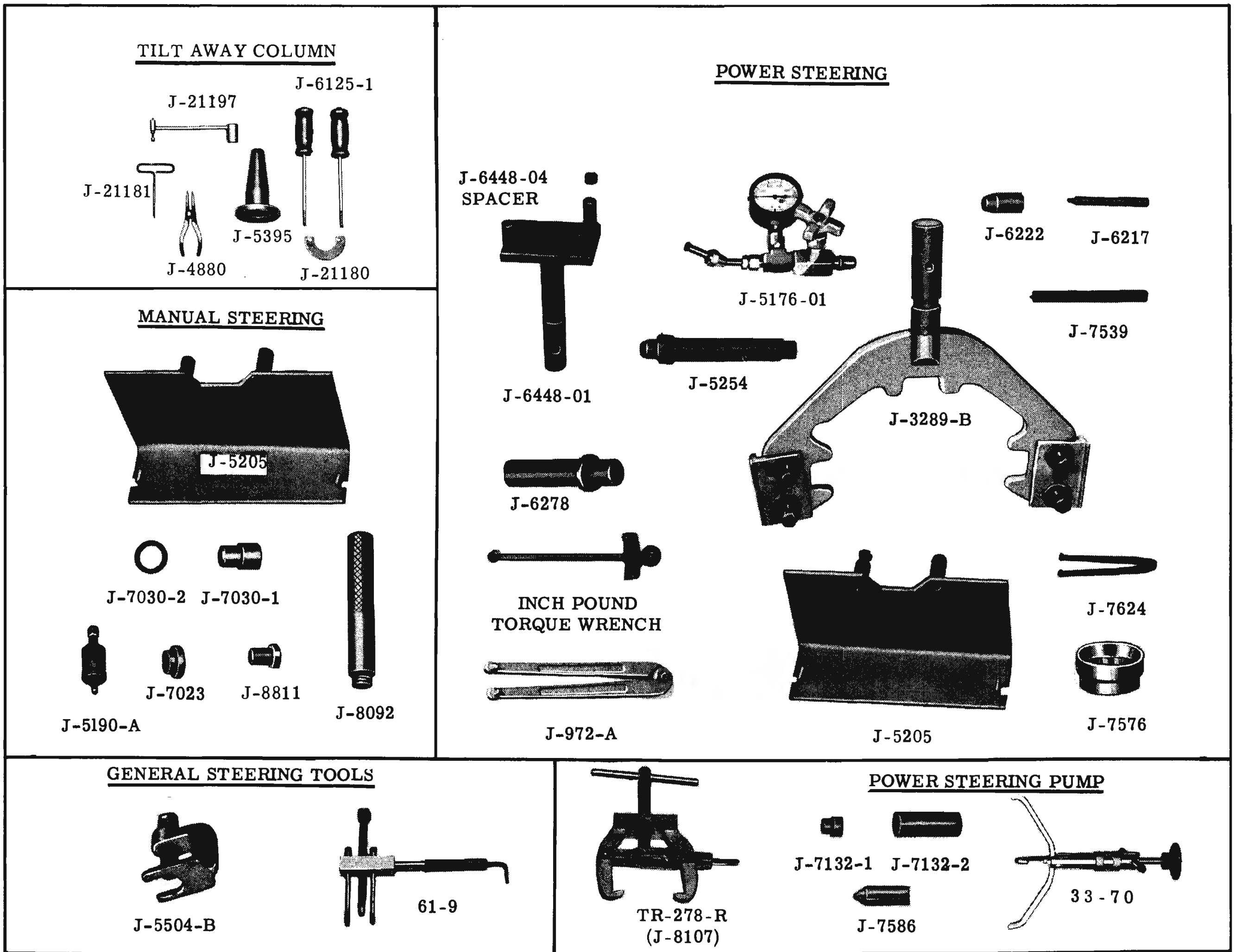
TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specifications.

APPLICATION	FT.LBS.
STEERING LINKAGE	
1. Idler Arm Support to Frame Bolt	25 to 35
2. Tie Rod Clamp Bolts	20 to 25
3. Tie Rod to Plain Arm and Relay Rod Nuts	50 to 60
4. Steering Wheel Nut	5 Min. and Stake
MANUAL STEERING GEAR	
5. Gear to Frame Bolts	60 to 80
6. Pitman Shaft Nut	90 to 120
7. Side Cover Bolts	20 to 22
POWER STEERING PUMP	
8. Pulley Nut	35 to 45
9. Pump Bracket to Cylinder Head	20 to 40
10. Pump Bracket to Intake Manifold and to Pump	20 to 28
11. Pump Mounting Stud	25 to 35
12. Union	25 to 35
13. Flow Control Valve Plug	4
POWER STEERING GEAR	
14. Gear to Frame Bolts	60 to 80
15. High Pressure Line Fitting (At Gear)	20 to 30
16. Oil Return Line Fitting (At Gear)	20 to 30
17. Pitman Shaft Adjusting Screw Lock Nut	25 to 35
18. Side Cover Bolts	30 to 35
19. Adjuster Plug Lock Nut	50 (Approx.)
20. Coupling Flange Bolt(s)	20 to 25
21. Return Guide Clamp Screws	8 to 10
22. Rack-Piston Plug	35 to 65

GENERAL SPECIFICATIONS

MANUAL STEERING	
RATIO	24 to 1
LUBRICANT	SAE 80 Multi-Purpose Gear Lubricant
ADJUSTMENTS	
1. Worm Bearing Preload	1/2 to 7/8 lbs.
2. Over-Center Adjustment	1-1/2 to 2 lbs.
3. Pitman Shaft Adjusting Screw End Clearance	.002" Max.
POWER STEERING	
RATIO	17.5 to 1
LUBRICATION	
4. Lubricant	Hydra-Matic Fluid
5. Capacity - Complete System	1-3/4 Qts.
6. Capacity - Pump Only	1 Qt.
ADJUSTMENTS	
7. Ball Preload	1/2 to 5 in. lbs.
8. Thrust Bearing Preload	1 to 3 in. lbs. in excess of initial load
9. Over-Center Adjustment	4 to 8 in. lbs. in excess of combined ball and thrust bearing preload



61-9	Steering Wheel Puller
TR-278-R	(J-8107) Differential Side Bearing Puller (Used for Pump End Cover Installation)
J-544-A	Spring Scale
J-3289-B	Differential Holding Fixture (Used for Mounting Gear Holding Fixture J-5405)
33-70	Belt Tensioning Gauge
J-4880	No. 2 Snap Ring Pliers
J-5176-01	Pressure Testing Manifold (Used with Gauge J-7715)
J-5190-A	1955 Power Steering Gear End Casting Bearing Puller (Used for Side Cover Needle Bearing Puller)
J-5254	End Cover Seal and Needle Bearing Installer (Used for Removing and Installing Adjuster Plug Oil Seal and Needle Bearing)
J-5205	Steering Gear Holding Fixture
J-5395	Turn Signal Cover Installer (Pinion Seal Installer)
J-5504-B	Pitman Arm Puller
J-6125-1	Slide Hammer
J-6217	Hose Connector Installer
J-6222	End Cover Seal Protector (Used for Installing Adjuster Plug)
J-6278	Pitman Shaft Bearing Remover and Installer
J-6278-2	Adaptor (Used with J-6278 for Installing Pitman Shaft Seals and Bearing)
J-6448-01	Power Steering Gear Holding Fixture
J-6448-04	Spacer (Used with J-6448-01)
J-7023	Pitman Shaft Seal Installer
J-7030-1	Side Cover Needle Bearing Installer and Shaft Remover and Installer
J-7030-2	Used with J-7030-1 for Installing Pitman Shaft Needle Bearing
J-7132-1	Seal Protector
J-7132-2	Seal Installer
J-7539	Ball Retainer
J-7576	Rack-Piston Teflon Ring Compressor
J-7586	Pump Oil Seal Protector
J-7624	Spanner Wrench (Used for Removing and Installing Adjuster Plug. Also used for Adjusting Thrust Bearing Preload)
J-7715	Pressure Testing Gauge (Used with Gauge Manifold J-5176)
J-8092	Drive Handle
J-8811	Upper Bearing Race Installer
J-972-A	Differential Adjusting Nut Wrench (Used for Tightening Adjuster Plug Lock Nut)
J-21180	Turn Signal Cover and Shift Tube Remover
J-21181	Spring Installer
J-21197	Pivot Pin Remover and Snap Ring Installer

Fig. 4-111 Manual and Power Steering Tools

STEERING

(F-85)

CONTENTS OF SECTION 4

MAINTENANCE RECOMMENDATIONS

For lubrication recommendations refer to the "Lubrication" Section; Section 2.

The steering linkage should be periodically inspected for signs of wear or damage. The steering gears (manual and power) should be periodically checked for proper over-center adjustment.

STEERING LINKAGE

The conventional relay type steering linkage is used to connect both front wheels to the steering gear pitman arm. The right and left tie rods are attached to a forged intermediate rod by ball studs. The left end of the intermediate rod is supported by the pitman arm and the right end by an idler arm which pivots on a support attached to the cross member. There are two different

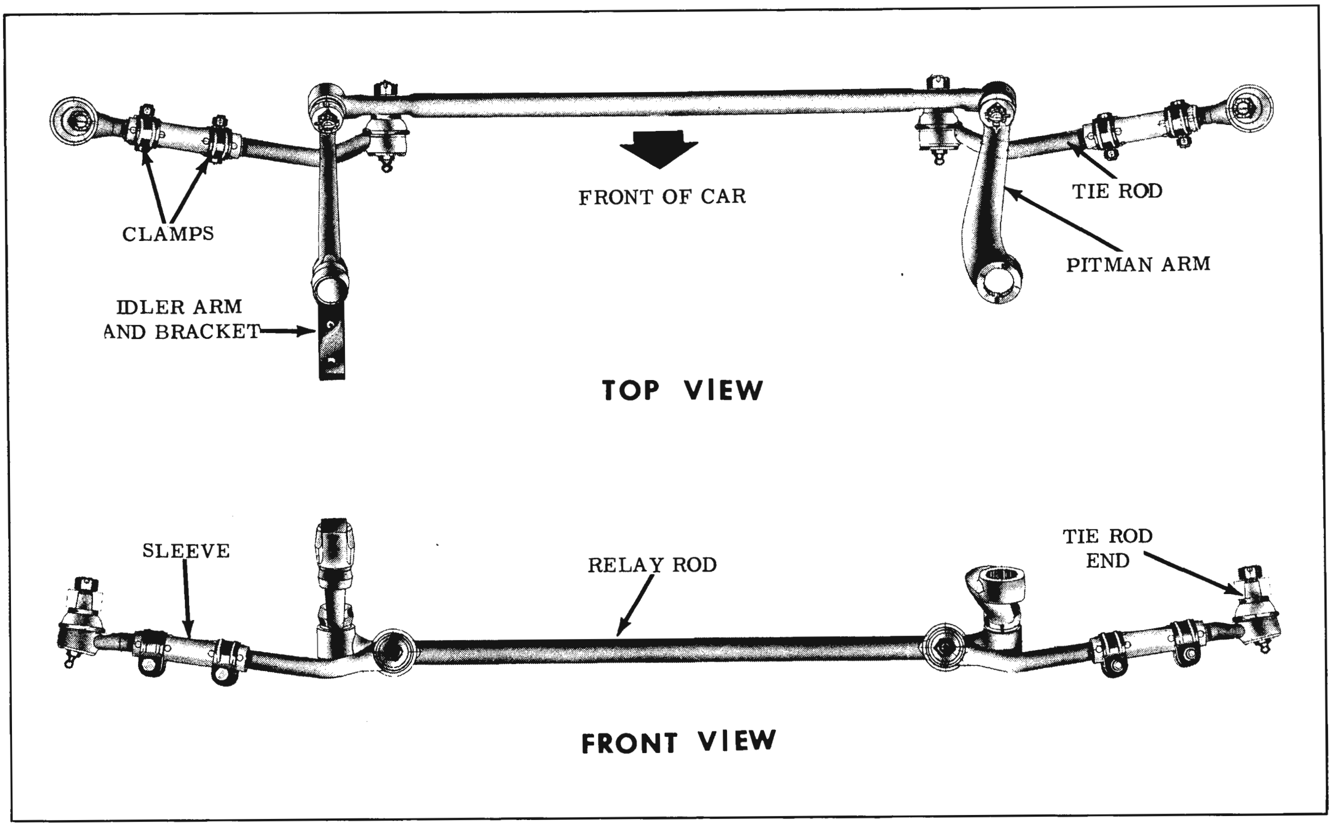


Fig. 4-201 Steering Linkage

linkage set-ups, both manufactured by Saginaw Steering, one for power gears and the other for manual gears. They differ only in the design of the pitman arm.

Fig. 4-201 shows the pitman arm, relay rod, idler arm and bracket, the tie rods and tie rod ends in their respective positions. Condition and proper adjustment of these parts play an important role in the handling and steering ease of the vehicle and in the length of tire life. Poor adjustment of the tie rod ends will cause the toe-in to be off resulting in abnormally fast tire wear. Worn and loose steering linkage parts will cause poor handling and if allowed to become excessively loose, danger of steering failure is eminent. Therefore, periodic inspection of the steering linkage components is important.

PITMAN ARM

REMOVAL

1. The pitman arm (connecting link from steering gear to relay rod) should be removed only after removing the steering gear from the car as outlined under STEERING GEAR REMOVAL on Page 4-206.
2. Place the steering gear in a vise and remove the pitman arm nut and lock washer.
3. Mark pitman shaft and pitman arm with a file.
4. Using Tool J-5504 or a similar puller disengage the pitman arm from the pitman shaft.

INSTALLATION

1. Position the pitman arm on the pitman shaft spline with alignment marks matched up.
2. Install the lock washer and nut. Torque the pitman arm nut to 150-180 ft. lbs.
3. Proceed to install gear as outlined under STEERING GEAR INSTALLATION on Page 4-206.

RELAY ROD

REMOVAL

1. Remove the cotter pins from the ball studs at the pitman arm,. idler arm, and the two tie rods.
2. Remove the (4) ball stud nuts.
3. Remove relay rod from steering gear pitman arm and the relay rod idler arm.
4. Disconnect the relay rod from the tie rods and remove relay rod from car.

INSTALLATION

1. Position the relay rod on the ball studs of

the tie rods. Install the hex nuts and torque 50-70 ft. lbs.

2. Install cotter pins. If necessary to rotate the nut to allow for cotter pin installation, tighten nut but do not exceed 85 ft. lbs. torque. Never back off nut to install cotter pin.

3. Position the relay rod on the pitman arm and idler arm ball studs. Install hex nuts and torque 40-50 ft. lbs.

4. Install cotter pins. If necessary to rotate the nut to allow for cotter pin installation, tighten nut; but do not exceed 65 ft. lbs. torque. Never back off nut to install cotter pin.

IDLER ARM AND SUPPORT

The idler arm and idler arm support are not serviced separately. Therefore, they need not be removed separately nor will it be necessary to disassemble the idler arm from the support.

REMOVAL

1. Remove the cotter pin and hex nut from the relay rod ball stud and disconnect the relay rod from the idler arm.

2. Remove the two idler arm to suspension bar attaching bolts and remove the assembly from the car.

INSTALLATION

1. Position idler arm and support on suspension bar, install attaching bolts and torque bolts 35-45 ft. lbs.
2. Connect the right hand end of relay rod to the idler arm.
3. Install hex nut and torque 40-50 ft. lbs.

4. Install cotter pin. If necessary to rotate nut to allow for cotter pin installation, tighten nut; but do not exceed 65 ft. lbs. torque. Never back off nut to install cotter pin.

TIE ROD ENDS

REMOVAL

1. Remove the tie rod end to plain arm attaching nut and disconnect the tie rod end from the plain arm.
2. Loosen the outer tie rod sleeve clamp.
3. Thread the tie rod end out of the tie rod sleeve.

INSTALLATION

1. Thread new tie rod end into the tie rod sleeve until approximately 1/4" to 3/8" of threads show at each end of tie rod clamp sleeve as shown in Fig. 4-202.

2. Position clamp on the sleeve with the bolt down and tighten clamp bolt. Torque nut 20-25 ft. lbs.

3. Place tie rod end stud in plain arm and install attaching nut. Torque nut 40-50 ft. lbs. and install cotter pin.

4. Check toe-in and steering wheel alignment and, if necessary, adjust.

TIE ROD

REMOVAL

1. Disconnect the tie rod from the relay rod.

2. Loosen inboard tie rod adjuster sleeve clamp bolt.

3. Thread tie rod out of sleeve.

INSTALLATION

1. Thread new tie rod into the tie rod adjuster sleeve until 1/4" to 3/8" of threads show at each end of the sleeve as shown in Fig. 4-202.

2. Position clamp on sleeve with bolt down and tighten clamp bolt to 20-25 ft. lbs. torque.

3. Connect tie rod to relay rod and tighten nut to 50-70 ft. lbs.

4. Install cotter pin. If necessary to rotate nut in order to install the cotter pin, tighten nut; but do not exceed 85 ft. lbs. torque. Never back off nut to install cotter pin.

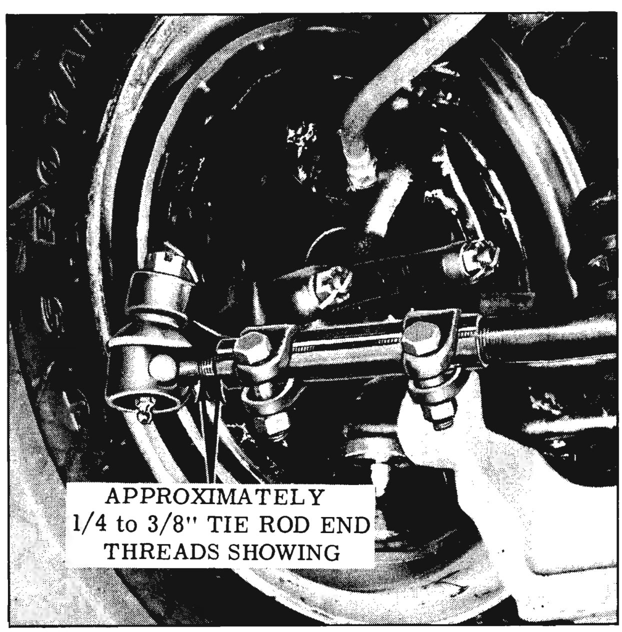
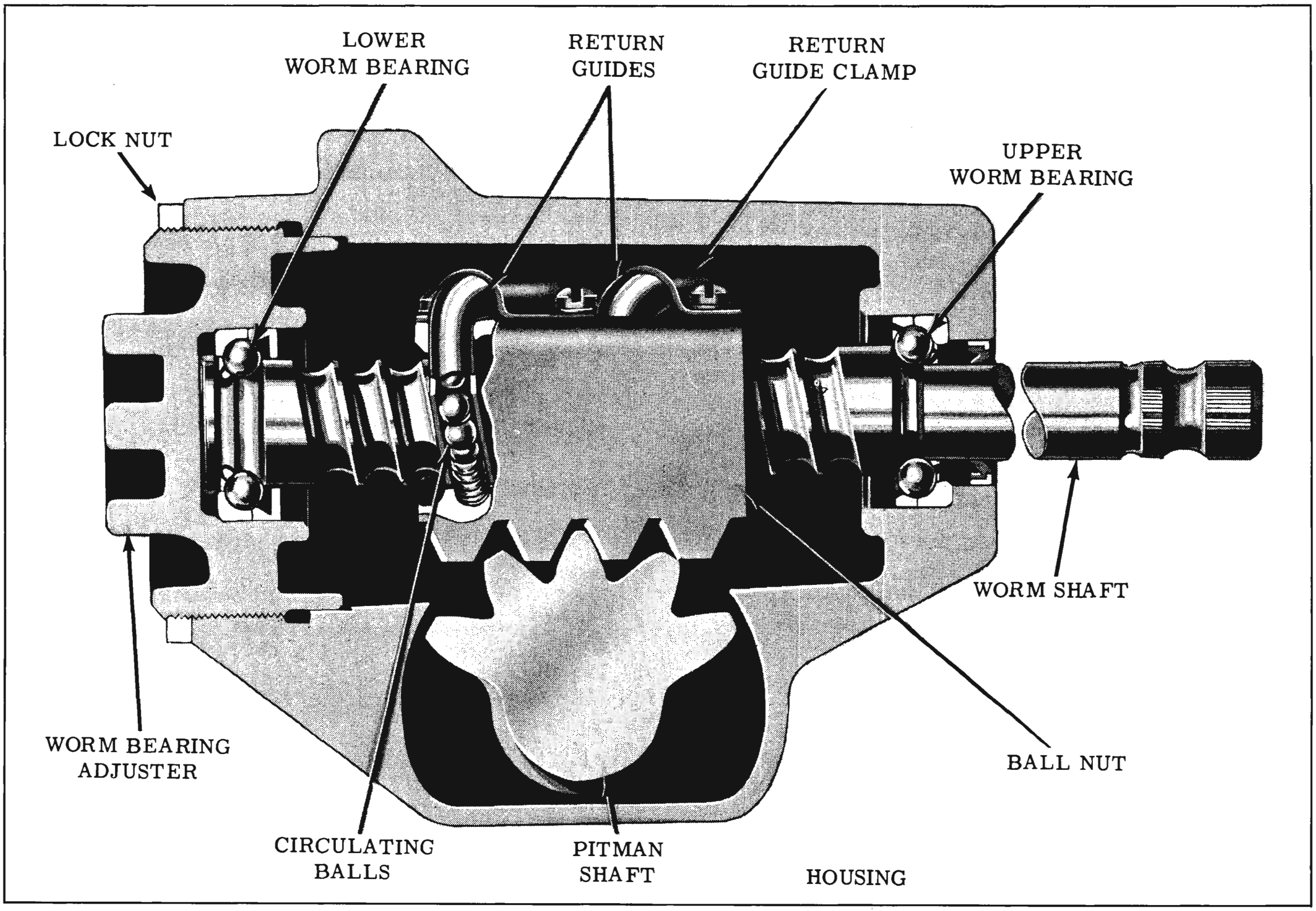


Fig. 4-202 Tie Rod End Installation



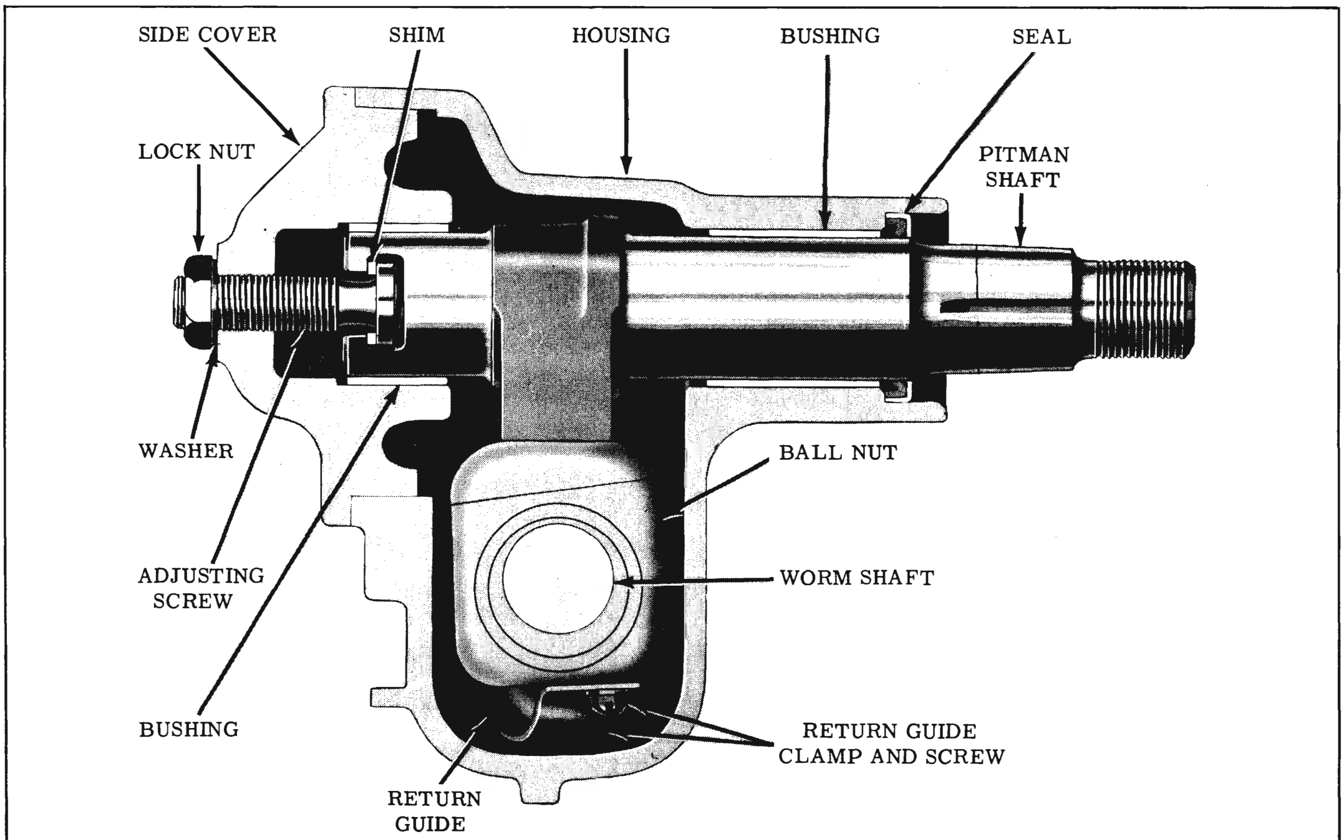


Fig. 4-203 Manual Steering Gear

PLAIN ARM

REMOVAL

1. Disconnect tie rod end from plain arm.

2. Remove wheel, hub and drum, and two plain arm to steering knuckle attaching bolts. Remove plain arm.

INSTALLATION

1. Position plain arm on steering knuckle and install two attaching bolts. Torque the nuts 55-80 ft. lbs. and install cotter pins.

2. Attach the tie rod end to the plain arm and torque attaching nut 40-50 ft. lbs. Install cotter pin.

3. Replace the hub and drum and the wheel assembly. Adjust the front wheel bearing as outlined in Steps 5 through 10 under FRONT WHEEL BEARING INSTALLATION on Page 7-115.

MANUAL STEERING GEAR

The steering system of the 1963 Oldsmobile F-85 is of the conventional relay type. The steering column assembly consists of a mast jacket, shift tube and steering shaft. The steering gear is the recirculating ball type mounted on the front cross bar. The worm shaft and the ball nut have mating spiral grooves in which two sets of twenty-five balls each circulate to provide a low friction drive between the worm shaft and ball nut. (Fig. 4-203) Each set of balls circulate through separate circuits. When the steering wheel is turned to the right, the ball nut is moved upward by the balls which roll between the worm shaft and ball nut. (Fig. 4-204) As the balls reach the outer guides, the guides direct them across the ball nut and back into the circuit again. As the ball nut moves upward during right turn, the pitman shaft rotates clockwise pulling the relay rod to the left through the pitman arm which turns the wheels to the right. Turning the steering wheel to the left moves the ball nut downward turning the wheels to the left.

ADJUSTMENTS ON CAR

Before making adjustments in the steering gear check the front end alignment, shock absorbers, wheel balance and tire pressure to see that they are correct. There are two adjustments on the manual steering gear; worm bearing preload and over-center. (Fig. 4-205)

The worm bearing preload adjustment must be checked and, if necessary, corrected before the over-center adjustment is made. If the worm bearing preload is not correct, adjustment of the over-center may result in damage of the gear.

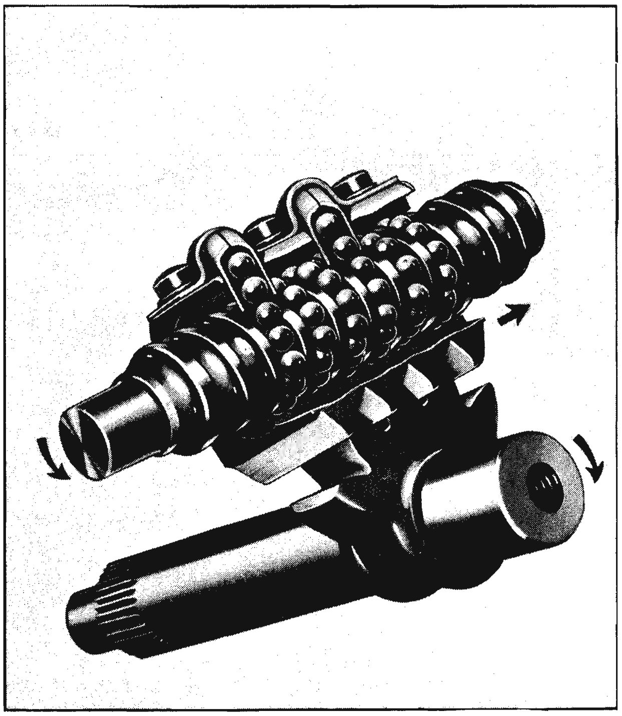


Fig. 4-204 Gear Motion During R.H. Turn

Worm Bearing Preload

1. Disconnect the pitman arm from the relay rod as follows:

   a. Remove the relay rod to pitman arm cotter pin and ball stud nut.

   b. Disconnect the relay rod from the pitman arm.

2. Loosen pitman shaft adjusting screw lock nut and loosen adjusting screw a few turns.

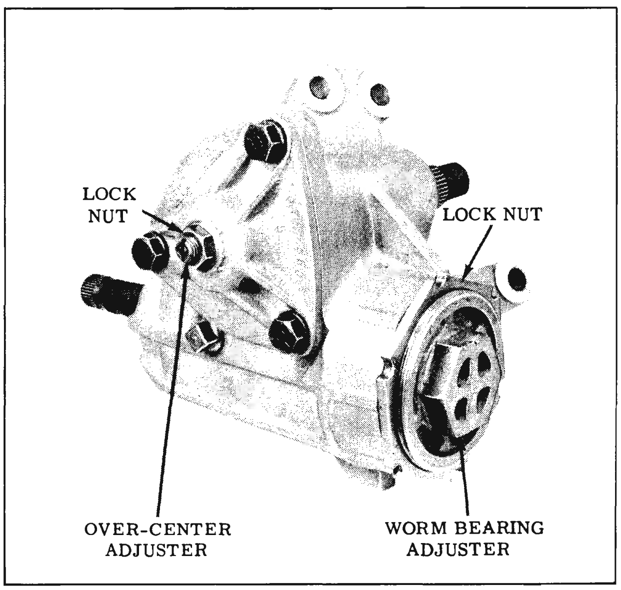


Fig. 4-205 Manual Steering Gear Adjustments

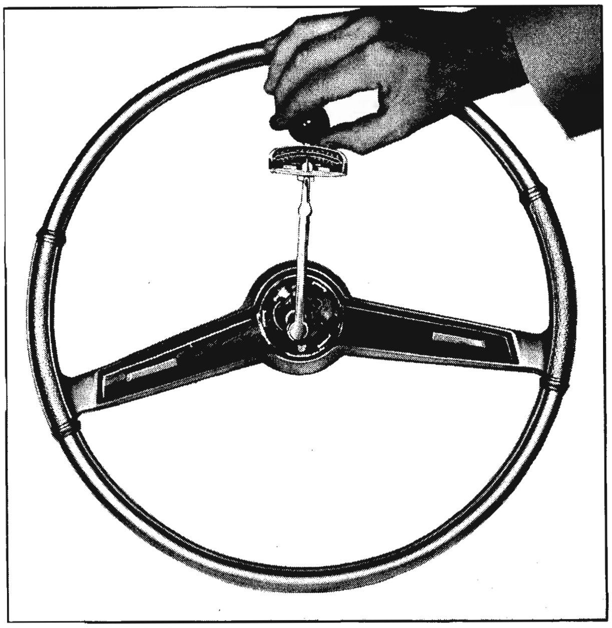


Fig. 4-206 Checking Worm Bearing Preload

3. Using an inch pound torque wrench, measure the pull required to keep the wheel in motion at about 30° off the straight ahead position. (Fig. 4-206)

4. The torque required should be between 4 and 7 in. lbs. If the torque does not fall within this range, it will be necessary to adjust the worm bearing preload.

5. Loosen the worm bearing adjuster lock nut with a brass drift. Turn the worm bearing adjuster nut in to tighten or out to loosen to bring the preload into specifications. (Fig. 4-205)

6 After each adjustment, tighten the lock nut while holding the adjuster nut to maintain the adjuster nut position since turning the worm shaft during preload measurement may cause the adjuster nut to loosen. Lock nut should be torqued 70-100 ft. lbs.

7. When the adjustment has been corrected, retighten the lock nut, while holding the adjuster nut. Recheck preload and proceed to make the over-center adjustment. Record final preload measurement.

Over-Center

1. After making the worm bearing preload adjustment, the pitman shaft adjusting screw should be tightened (turned counterclockwise) until a pull of 4 to 10 in. lbs. in excess of the total worm bearing preload is required to turn the wheel through the center position. The center is 2.6 turns of the steering wheel from either extreme.

2. Tighten the lock nut 18-27 ft. lbs. while holding adjuster screw from turning. Recheck over-center adjustment.

3. After completion of adjustments, reassemble the pitman arm to the relay rod. Torque hex nut 40-50 ft. lbs. and install cotter pin. If necessary to rotate the nut to install the cotter pin, tighten nut; but do not exceed 65 ft. lbs. torque. Never back off nut to install cotter pin.

REMOVAL

To facilitate removal of the steering gear from the car it will be necessary to raise the steering shaft in the column assembly.

1. Remove the steering shaft coupling clamp bolt and slide clamp off coupling housing onto steering gear worm shaft. Mark steering shaft in line with slot at coupling clamp surface.

2. Disconnect horn wire from harness.

3. Remove the cap from center of steering wheel.

4. Remove steering wheel to steering shaft nut and washer.

5. Using Tool BT-61-9, pull the steering wheel from the steering shaft.

6. Pull the horn contact plate up out of recess in actuator assembly sufficient to give clearance for removal of upper bearing to actuator assembly retaining clip.

7. Using a small screwdriver pry the upper bearing actuator assembly retaining clip out of the actuator housing. (Fig. 4-302)

8. Pull steering shaft up out of steering column and block shaft up approximately two inches. This will be sufficient clearance to remove the coupling from the steering shaft or the steering gear from the suspension cross bar.

9. Remove the cotter pin and nut from the relay rod ball stud and pull the relay rod off of the pitman arm. (Fig. 4-207)

10. Remove the 4 gear to front suspension cross bar attaching bolts and remove the gear from the car. (Fig. 4-207)

INSTALLATION

Before installing the gear in the car, check the pitman arm nut torque. Torque should be 150-180 ft. lbs. .

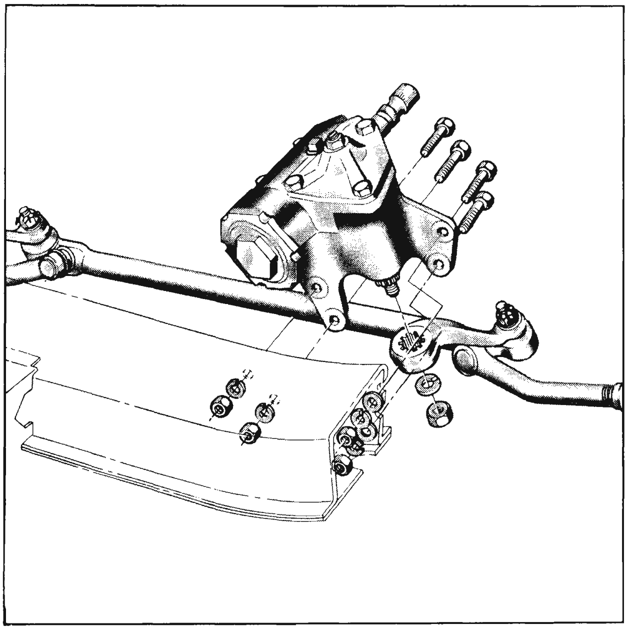


Fig. 4-207 Steering Gear Removal

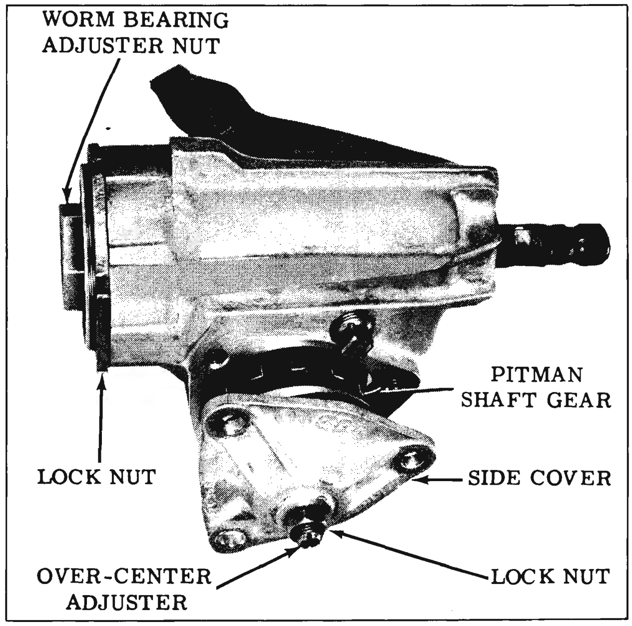


Fig. 4-208 Removing Pitman Shaft

1. Position gear on front suspension cross bar and install the 4 attaching bolts and torque to 45-60 ft. lbs. (Fig. 4-207)

2. Reconnect pitman arm to the relay rod.

3. Lower the steering shaft (guide upper bearing into actuator assembly) and connect the coupling to the worm shaft matching up the alignment marks on the worm shaft with a slot in clamp surface of coupling. (Fig. 4-287)

4. Place the coupling clamp into position on the coupling, but do not tighten the clamp.

5. Install the upper bearing retainer ring and place the horn contact plate in the actuator assembly.

6. Install the steering wheel on the steering shaft and install the washer and nut. Torque the nut to 25 ft. lbs. and stake nut to steering shaft.

7. Check operation of coupling by turning steering wheel. There should be no binding or misalignment of coupling.

8. Install the steering wheel cap and reconnect the horn wire to chassis wiring harness.

9. Tighten coupling clamp bolt and torque 35-40 ft. lbs.

DISASSEMBLY

As with any ball bearing unit, the steering gear parts must be kept free of dirt. Clean paper or rags should be spread on the bench before starting disassembly of the steering gear.

1. Remove pitman arm with puller J-5504. Loosen lock nut on end of pitman shaft and turn the over-center adjuster a few turns counterclockwise. (Fig. 4-205) This will remove the load from the worm bearings caused by the close meshing of the rack and sector teeth.

2. Loosen the lock nut on the worm bearing adjuster (Fig. 4-205) and turn the adjuster counterclockwise a few turns.

3. Place a pan under the assembly to catch the lubricant and remove the three bolts and washers attaching side cover to housing.

4. Pull the side cover with the pitman shaft from the housing (Fig. 4-208).

   NOTE: IF THE SECTOR DOES NOT CLEAR THE OPENING IN THE HOUSING EASILY, TURN THE WORM SHAFT BY HAND UNTIL THE SECTOR WILL PASS THROUGH THE OPENING IN THE HOUSING.

5. Remove the worm bearing adjuster, adjuster lock nut and lower ball bearing from housing.

6. Remove worm shaft and ball nut assembly from housing (Fig. 4-209). Remove upper ball bearing.

   CAUTION: USE CARE THAT THE BALL NUT DOES NOT RUN DOWN TO EITHER END OF THE WORM. DAMAGE WILL BE DONE TO THE ENDS OF THE BALL GUIDES IF THE WORM SHAFT IS ALLOWED TO ROTATE UNTIL THE NUT IS STOPPED AT THE END OF THE WORM.

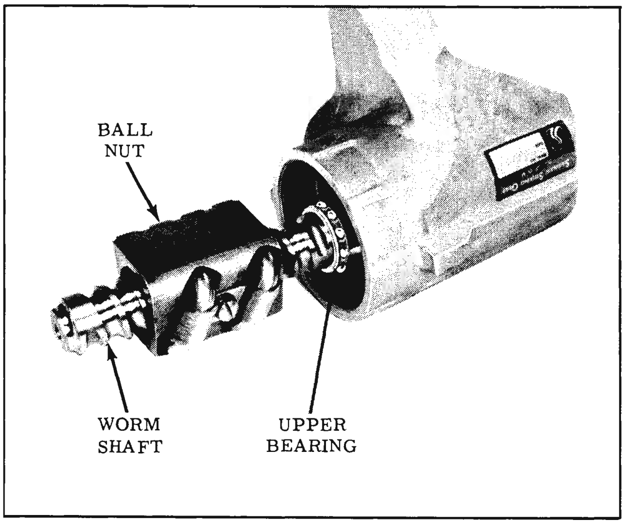


Fig. 4-209 Removing Worm Shaft

7. Remove lock nut from lash adjuster and unscrew adjuster from side cover by turning adjuster clockwise. Slide adjuster and shim out of slot in end of sector shaft.

8. Remove the pitman shaft seal by tapping it toward the outside of the housing with a drift.

Ball Nut Disassembly

As a rule, disassembly of the ball nut will not be necessary if it is perfectly free with no indication of binding or tightness when rotated on the worm. However, if there is any indication of binding or tightness, the unit should be disassembled, cleaned and inspected as follows:

1. Remove screws and clamp retaining ball guides in nut. Lift guides out of nut.

2. Turn the nut upside down and rotate the worm shaft back and forth until all the balls have

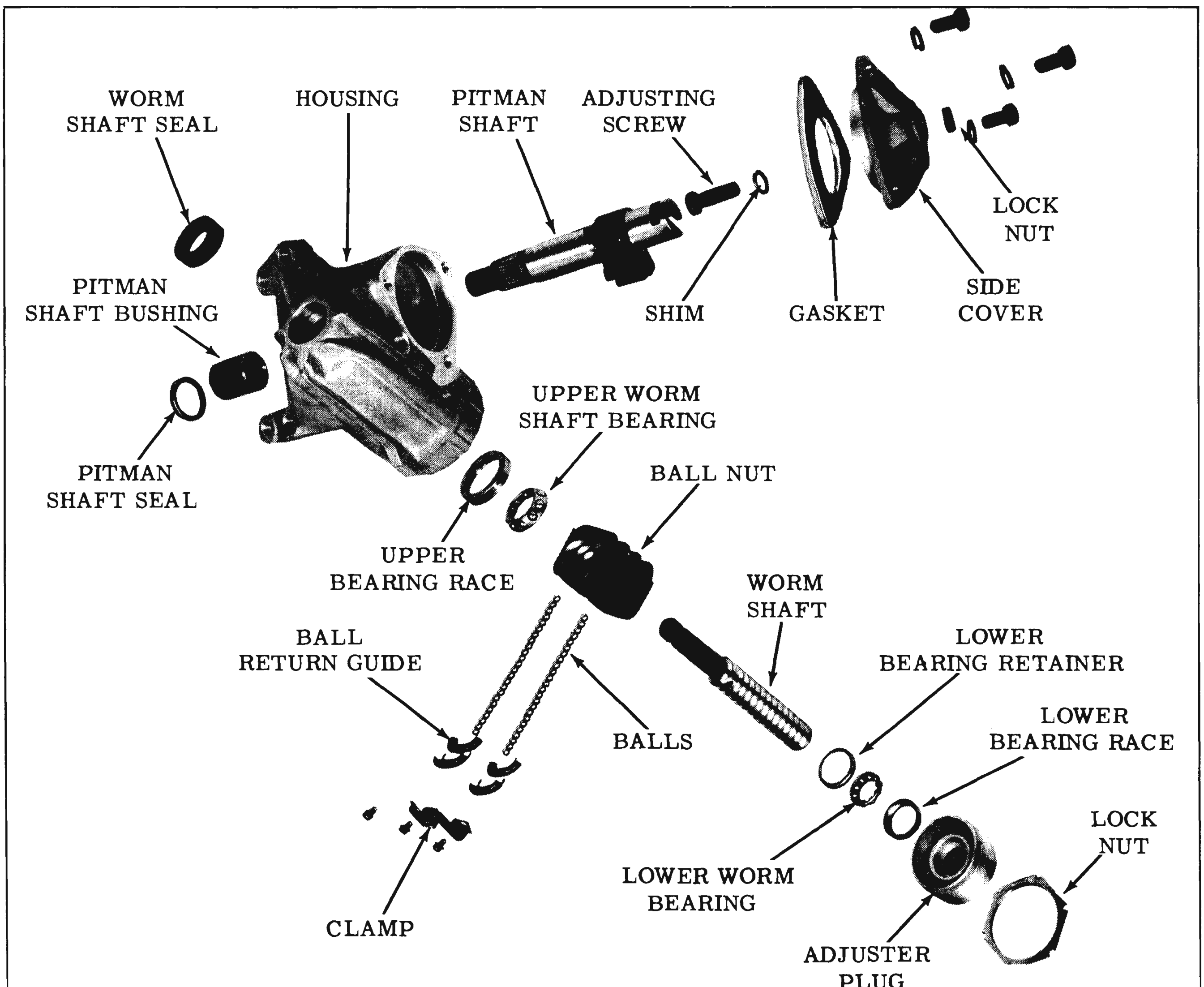


Fig. 4-210 Manual Steering Gear

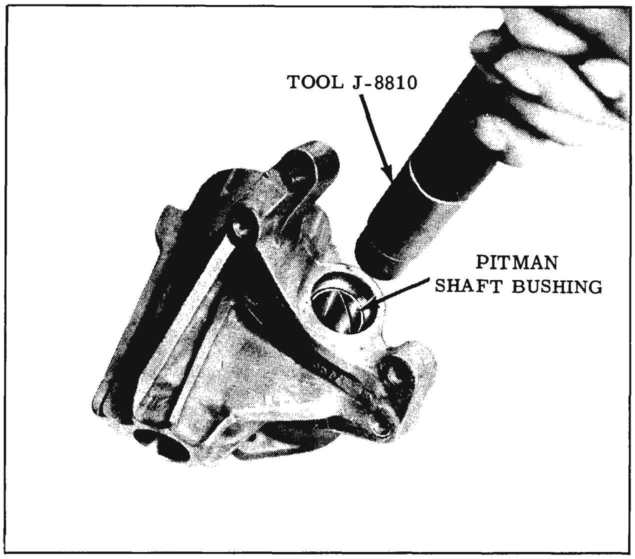


Fig. 4-211 Removing Pitman Shaft Bushing

dropped out of the nut into a clean pan. With the balls removed the nut can be removed from the worm. Note the position of shaft in ball nut so it can be replaced the same way.

Inspection

With the steering gear completely disassembled (Fig. 4-210), wash all parts in cleaning solvent. Dry them thoroughly with clean rags. Inspect the ball bearings, bearing cups, worm and nut grooves and the surface of all balls for signs of indentation. Also check for any signs of chipping or breakdown of the surface.

Any parts that show signs of damage should be replaced. Balls should be replaced with genuine Oldsmobile parts made according to specifications for this steering gear.

Inspect worm shaft seal for defects.

Inspect the pitman shaft for wear and check the fit of the shaft in the housing bushings.

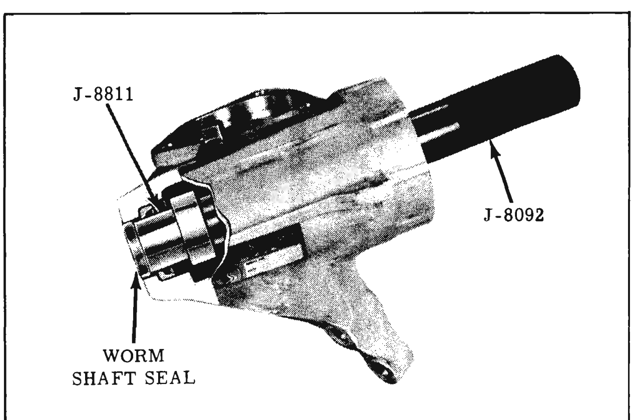


Fig. 4-212 Removing Worm Shaft Seal

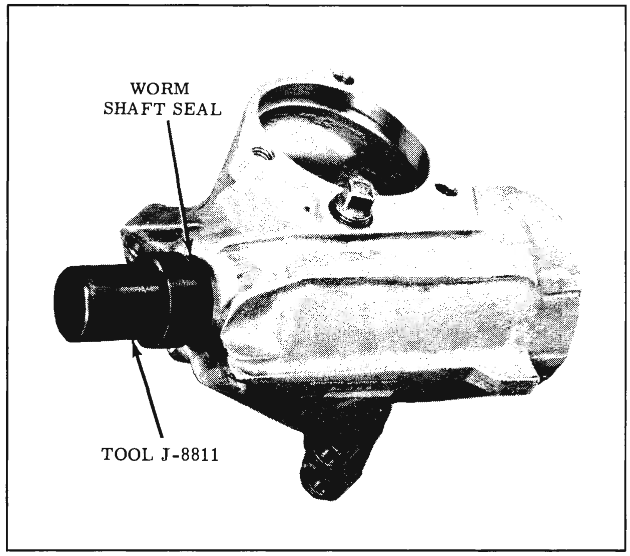


Fig. 4-213 Installing Worm Shaft Seal

Inspect the fit of the pilot on the end of the pitman shaft in its bushing in the side cover. If this bushing is worn, a new side cover and bushing assembly should be installed.

Check ball guides for damage at ends where they deflect or pick the balls from the helical path. Any damaged guides should be replaced.

Check steering gear worm shaft assembly for bent or damaged shaft.

Pitman Shaft Bushing Replacement

1. After removing pitman shaft seal, support steering gear housing in an arbor press and press pitman shaft bushing from housing with Tool J-8810 inserted from lower end of housing as shown in Fig. 4-211.

2. Press new bushing into position using the same sector shaft bushing driver as used for removal.

   NOTE: SERVICE BUSHINGS ARE BORED TO SIZE AND REQUIRE NO FURTHER FITTING.

Worm Shaft Seal Replacement

If the worm shaft seal indicates need of replacement, it should be removed with Tool J-8811. (Fig. 4-212)

Using Tool J-8811 in inverted position, install new seal. Seal must be installed FLUSH with housing (Fig. 4-213).

If necessary to replace the Upper Worm Shaft Seal with the gear assembled, it may be done by punching a small hole in the seal and installing a small metal screw approximately 2 turns. Then pry out as shown in Fig. 4-214.

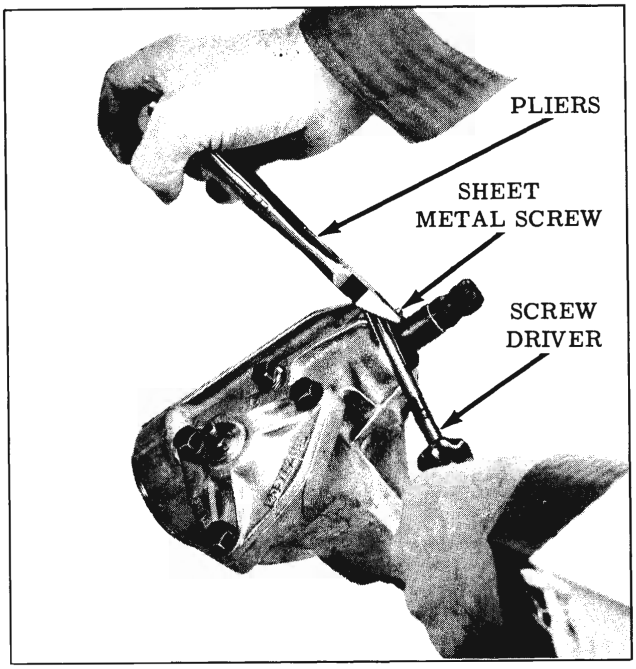


Fig. 4-214 Worm Shaft Seal Replacement - Gear Assembled

Install the new seal with tool J-7132-7 as shown in Fig. 4-215.

Side Cover Bushing Replacement

The entire side cover assembly, including bushing, is serviced as a unit and should be replaced when it is necessary to replace the bushing.

Pitman Shaft Seal

The pitman shaft seal must be replaced each time a defective seal is indicated or the steering

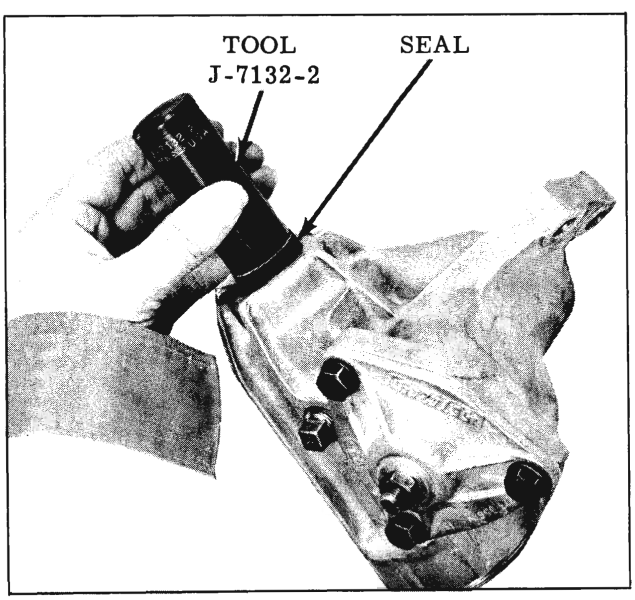


Fig. 4-215 Installing Wormshaft Seal-Gear Assembled

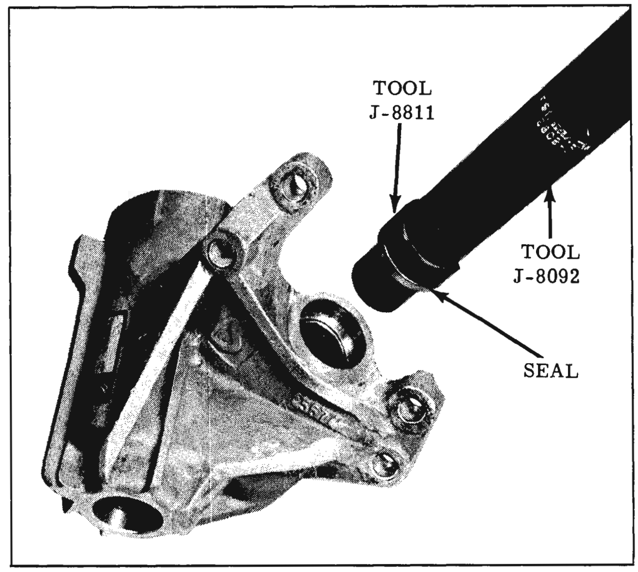


Fig. 4-216 Installing Pitman Shaft Seal

gear is disassembled.

This seal is removed by driving it toward the outside of the housing with a drift.

To install a new seal use Tool J-8811 as shown in Fig. 4-216. The additional length of this tool guides in the pitman shaft bushing to insure correct seal installation. Install seal in housing until seal seats firmly on shoulder of housing bore.

Worm Shaft Bearing Race Replacement

The upper worm shaft bearing race may be serviced separately, the lower is serviced with the adjusting nut.

The upper race can be removed with a drift by tapping race into gear housing.

Press a new race into position with Tool J-8811 (Fig. 4-217).

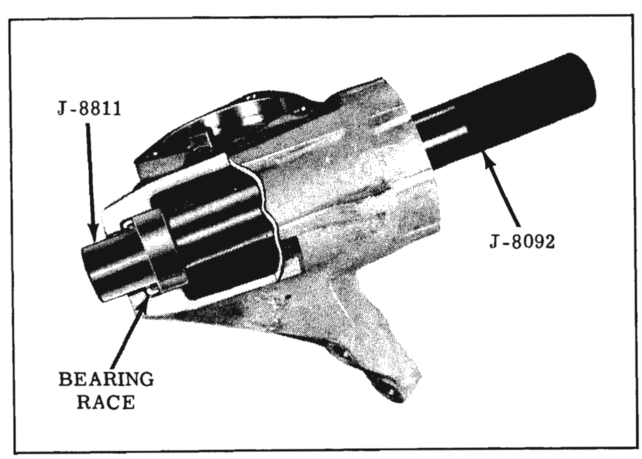


Fig. 4-217 Installing Upper Worm Bearing

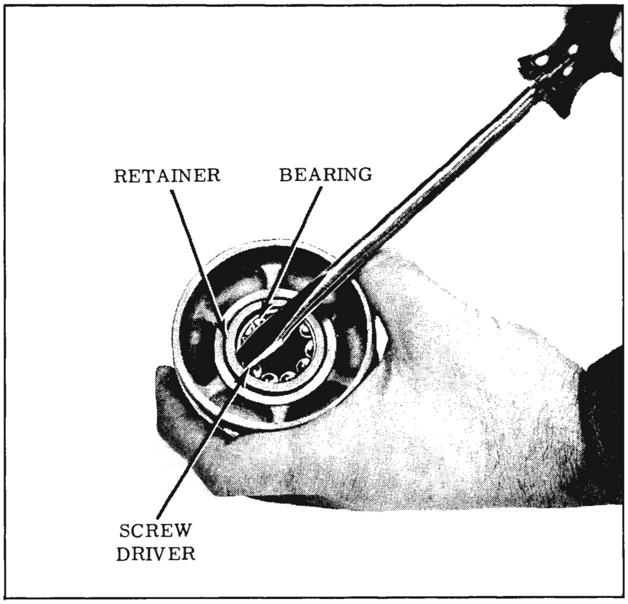


Fig. 4-218 Removing Lower Worm Bearing

To remove the lower bearing, pry out retainer as shown in Fig. 4-218.

Ball Nut Assembly

1. Place the worm shaft on the bench with the splined end to the right and with the ball nut over the worm with the ball guide holes up and the shallow end of the rack teeth away from you. Align the grooves in the worm and ball nut by sighting through the ball guide holes. Shaft should be centered about half way in ball nut.

2. Count twenty-five balls into a suitable container. This is the proper number of balls for one circuit. Insert balls into one of the guide holes while turning the worm gradually away from that hole. Continue until ball circuit is full from bottom of one guide hole to bottom of the other or until stopped by reaching the end of the worm.

   NOTE: IN CASES WHERE THE BALLS ARE STOPPED BY THE END OF THE WORM, HOLD DOWN THOSE BALLS ALREADY DROPPED INTO THE NUT WITH THE BLUNT END OF A CLEAN ROD OR DRIFT, (FIG. 4-219), AND TURN THE WORM IN THE REVERSE DIRECTION A FEW TURNS. THE FILLING OF THE CIRCUIT CAN THEN BE CONTINUED. IT MAY BE NECESSARY TO WORK THE WORM BACK AND FOURTH, HOLDING THE BALLS DOWN FIRST IN ONE HOLE THEN THE OTHER, TO CLOSE UP THE SPACES BETWEEN THE BALLS AND FILL THE CIRCUIT COMPLETELY AND SOLIDLY.

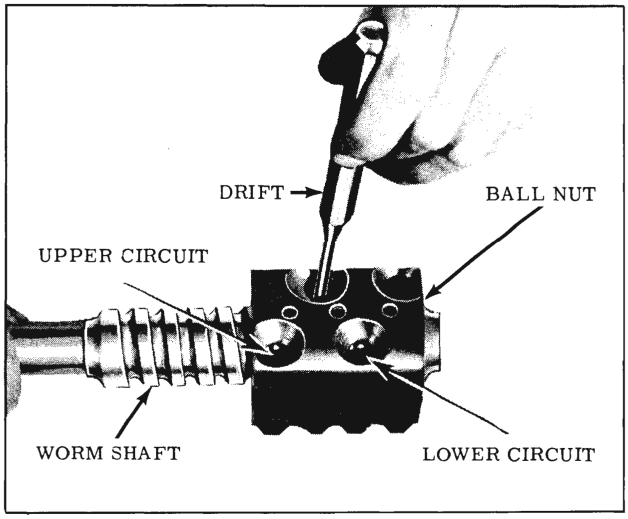


Fig. 4-219 Installing Balls in Ball Nut

3. Lay one-half of the ball guide, groove up, on the bench and place the remaining balls from the count container in it (Fig. 4-220).

4. Close this half of guide with the other half. Hold the two halves together and plug each open end with petrolatum so balls will not drop out while installing guide (Fig. 4-221).

5. Push the guide into the guide holes of the ball nut (Fig. 4-222). This completes one circuit of balls. If the guide does not push all the way down easily, rotate worm shaft back and forth slightly until guide can be pushed into position.

6. Fill second ball circuit in the same manner.

7. Position the ball guide clamp over the ball guides on the ball nut and install the attaching screws with lock washers and tighten securely.

Check the assembly by rotating the nut on the

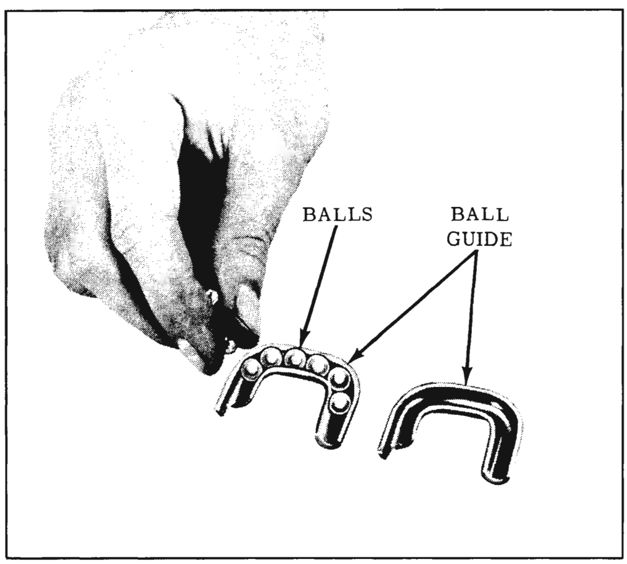


Fig. 4-220 Installing Balls in Guides

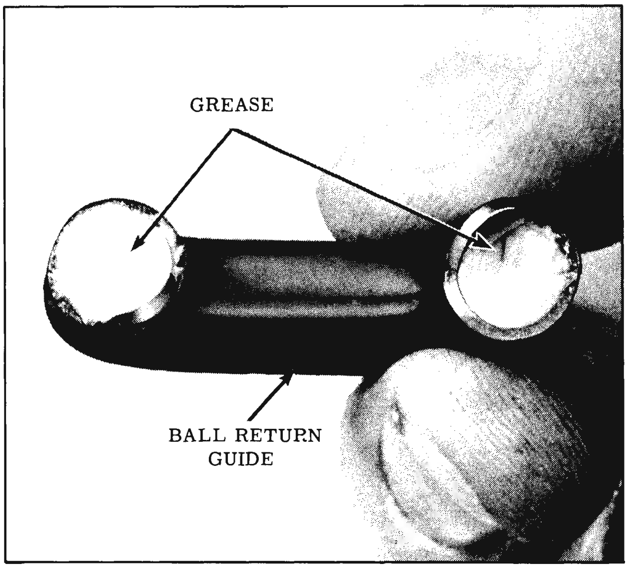


Fig. 4-221 Packing Ball Guides

worm to see that it moves freely. Do not rotate the nut to the end of the worm threads as this may do damage to the ball guides. If there is any "stickiness" in the motion of the nut, some slight damage to the ends of the ball guides or to other gear components may have been overlooked.

ASSEMBLY

1. With worm shaft seal, bushings and bearing race installed and ball nut assembly installed on worm shaft, slip upper ball bearing over worm shaft and insert worm shaft and nut assembly into housing, feeding end of shaft through upper ball bearing cup and seal.

2. Place the lower ball bearing in the adjuster cup. IMPORTANT: Adjuster cup threads must

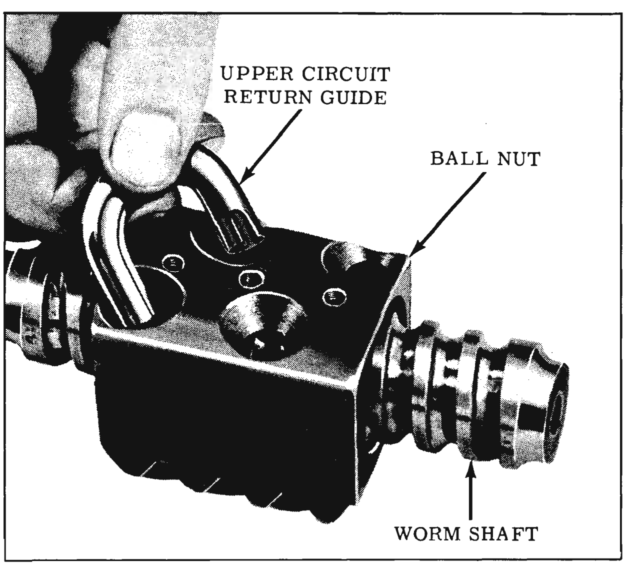


Fig. 4-222 Installing Ball Guides

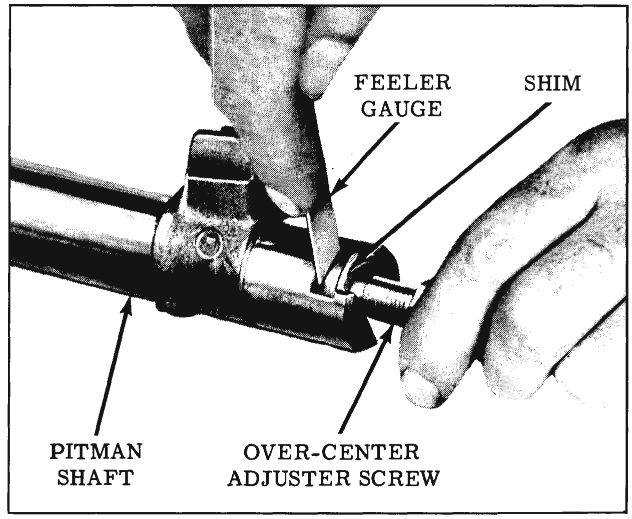


Fig. 4-223 Pitman Shaft Adjuster Clearance

be lubricated with grease before threading into housing. Install adjuster and lock nut in lower end of housing.

3. Assemble the over-center adjuster with shim in the slot in the end of the pitman shaft. Check the end clearance which should not be greater than .002" (Fig. 4-223). For the purpose of adjusting this end clearance, a steering gear over-center adjuster shim unit, Part Number 605142, is available. It contains four shims--.063", .065", .067" and .069" thick.

4. After over-center adjuster end clearance has been adjusted, start sector shaft pilot into bushing in side cover. Then, using a screwdriver through the hole in cover, turn lash adjuster in a counterclockwise direction to pull sector shaft pilot into its bushing as far as it will go.

5. Rotate worm shaft by hand until ball nut is about in the center of travel. This is to make sure that the rack and sector will engage properly with center tooth of the sector entering center tooth space of the nut.

6. Place a new gasket on side cover, then push side cover assembly including pitman shaft into place. After making sure there is some lash between rack and sector teeth, assemble and tighten side cover bolts 25 to 35 ft. lbs. Fill gear with S.A.E. 80 Multi-Purpose gear lube to the level of the filler plug hole and replace filler plug.

7. Proceed with bench adjustment.

ADJUSTMENT ON BENCH

Worm Bearing Preload

1. Tighten the worm bearing preload adjuster

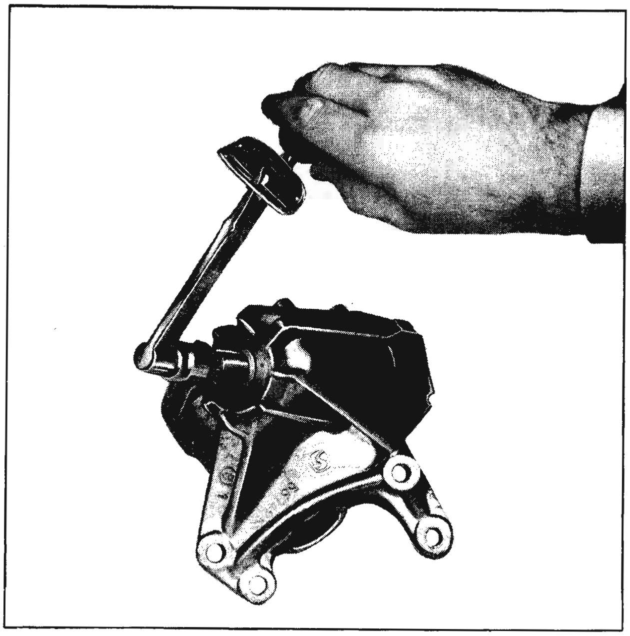


Fig. 4-224 Checking Worm Bearing Preload

until all worm shaft end play has been removed. Then tighten the lock nut.

2. Install the steering wheel on the worm shaft temporarily. Carefully turn the steering wheel all the way in one direction and then turn back about one turn. Remove steering wheel.

   NOTE: USE CARE WHEN PLACING STEERING WHEEL ON LOWER STEERING SHAFT. TAP IN PLACE LIGHTLY. DO NOT FORCE.

3. Using an inch pound torque wrench, measure the pull required to keep the worm shaft in motion at about 30° off the center position. (Fig. 4-224)

   NOTE: An 11/16", 12 point socket will fit the splines of the worm shaft.

4. The torque required should be between 4 and 7 in. lbs. If the torque does not fall within this range, it will be necessary to adjust the worm bearing preload.

5. Loosen the worm bearing adjuster lock nut. Turn the worm bearing adjuster nut in to tighten, or out to loosen to bring the preload into specifications.

6. After each adjustment, tighten the lock nut while holding the adjuster nut to maintain the adjuster nut position since turning the worm shaft during preload measurement may cause the adjuster nut to loosen. The lock nut should be torqued 70-100 ft. lbs.

7. When the adjustment has been corrected, retighten the lock nut, while holding the adjuster nut. Recheck preload and proceed to make the over-center adjustment. Record final preload measurement.

Over-Center

1. After making the worm bearing preload adjustment, the pitman shaft adjusting screw should be tightened (turned counterclockwise) until a pull of 4-10 in. lbs. in excess of the total worm bearing preload is required to turn the worm shaft through the center position. The center is 2.6 turns from either extreme position.

2. Tighten the lock nut 18-27 ft. lbs. while holding adjuster screw from turning. Recheck over-center adjustment.

POWER STEERING

MAINTENANCE RECOMMENDATIONS

At every oil change interval, check and maintain pump oil level at "Full" mark on dipstick. OIL MUST BE WARM WHEN CHECKING OIL LEVEL. Use Hydra-Matic transmission fluid.

Inspect hoses and connections for leaks and deterioration at each oil change interval.

Check steering gear adjustment when looseness is felt in the steering or when abnormal tire wear is noted.

DESCRIPTION

Power Steering Pump

The F-85 power steering hydraulic pump is belt driven and it is mounted on a bracket attached to the left front of the engine. The component parts of the power steering pump are encased in the reservoir so that only the pump housing face and hub are exposed. The reservoir has a filler neck and a cap with an oil level indicator which simplifies checking and adding oil.

Power Steering Gear (4-225)

The rotary valve type power steering gear used on the 1963 Oldsmobile "F-85" is compactly designed with the steering shaft, control valve, worm, rack-piston and power cylinder all in line. All oil passages are internal.

The outer race for the recirculating balls in the steering gear is an integral part of the rack-piston rather than being a separate ball nut.

When effort is not being applied at the steering wheel, the spool valve and valve body automatically center themselves resulting in a neutral

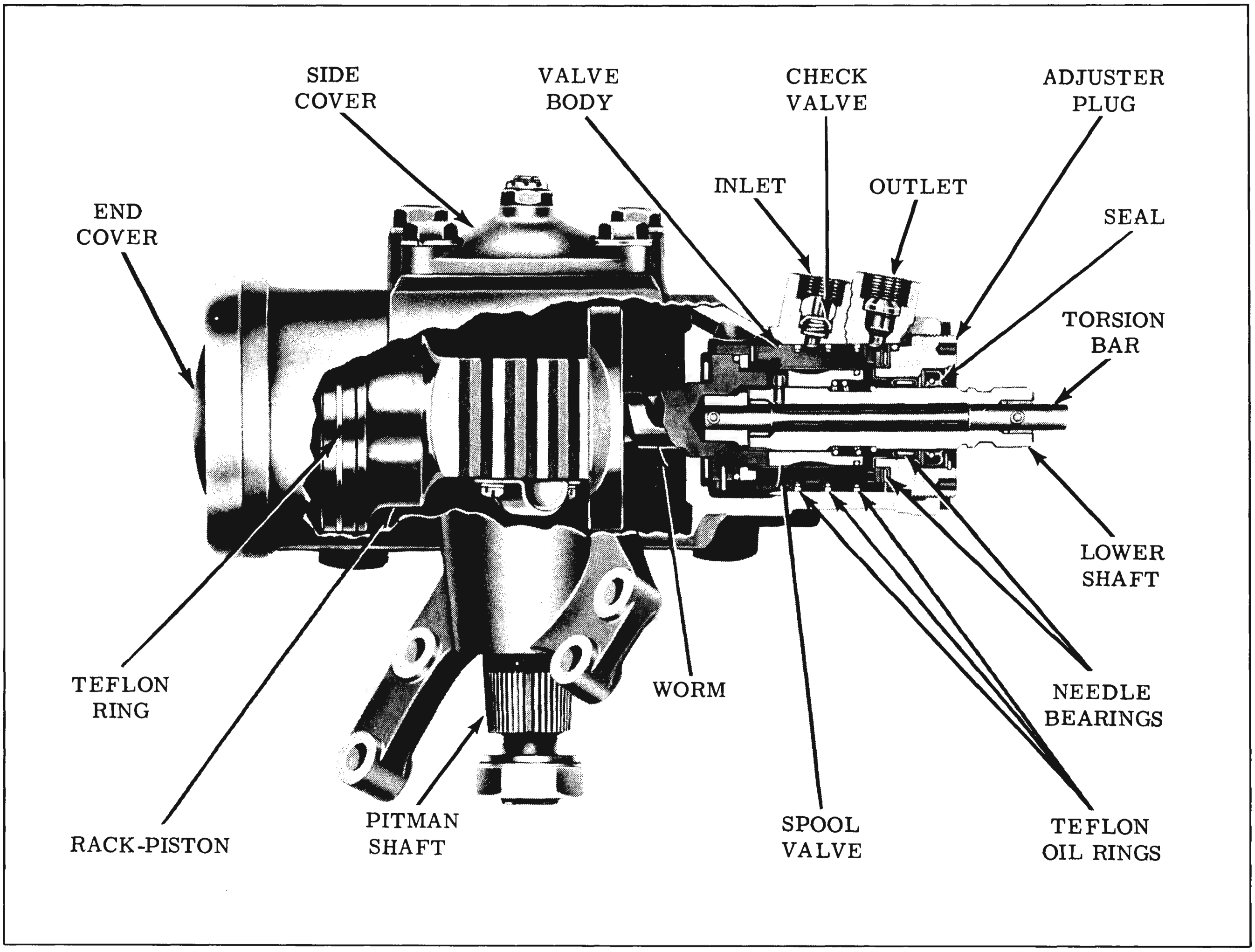


Fig. 4-225 Power Steering Gear

condition with all passages open so only a low neutralizing oil pressure exists.

Only a small amount of movement of the steering wheel is required to actuate the control valve for power assist.

Power assist is obtained by a delay in the radial movement of the valve body in relation to the radial movement of the spool valve and is accomplished as follows:

Effort applied at the steering wheel is transferred through the steering shaft, flexible coupling to the lower shaft. The spool valve (pinned to the lower shaft) turns with the lower shaft. The upper end of the torsion bar (pinned to the lower shaft) also turns at the same rate as the lower shaft. The lower end of the torsion bar is pinned to the cap which in turn, is connected to the worm by 2 lugs. The worm resists turning due to the resistance of the front wheels, therefore, the valve body which is connected to the cap also remains stationary. With the worm and valve body held stationary and the lower shaft and spool valve turning a slight amount, the torsion bar will twist to allow the slots in the spool valve to align with the passages in the valve body to direct oil for power assist.

PUMP OPERATION (Fig. 4-226)

Oil is supplied from the reservoir to the pumping chambers (composed of the cam ring, rotor, thrust plate and pressure plate) through passage A. Oil discharged from the pumping chamber is discharged to cavity B. From the cavity B, oil passes through orifice C into the outlet passage and on through the flexible lines to the steering gear. Part of the oil in cavity B passes through openings D in the pressure plate to act on the inner edge of the ten vanes and assist centrifugal force in keeping the vanes out against the cam ring. The thrust plate has four blind cavities directly opposite these four openings in the pressure plate to prevent side thrust on the vanes.

When pump output exceeds the calibration of orifice C, a back pressure builds up behind the flow control valve at E which overcomes spring force and opens the valve to allow oil to return to the intake side of the pump and to the reservoir. (Fig. 4-226) Flow control is desirable to reduce power consumption which would otherwise

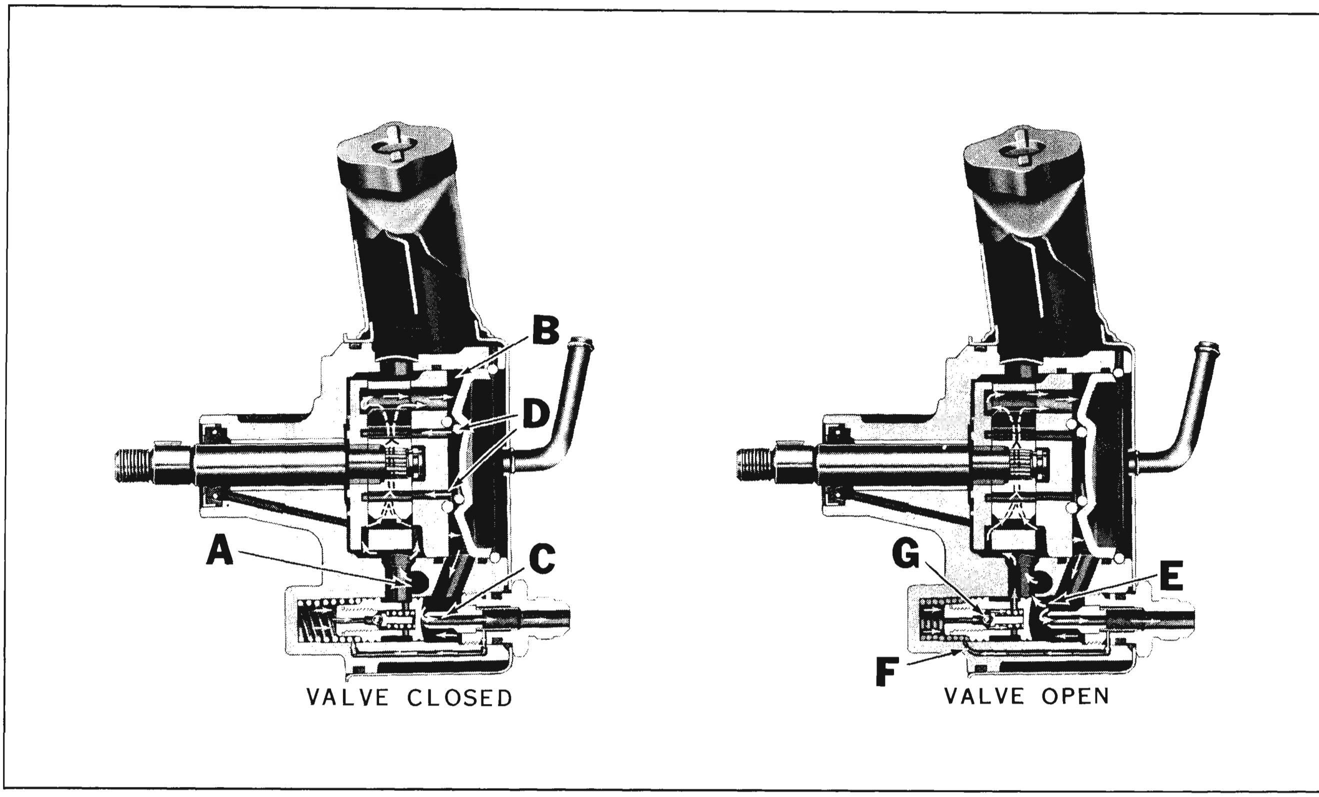


Fig. 4-226 Pump Oil Flow at Low Speed

result if the pump were allowed to circulate oil through the steering gear with no regulation when driving at high speed.

When steering conditions demand high pressure for power assist, the pump builds up sufficient pressure on the steering gear rack-piston to turn the pitman shaft. This pressure is also being exerted on the front end of the flow control valve through passage F. When extremely high pressure is built up in the steering gear (such as when holding the steering linkage against its stop) the pressure relief ball G is forced from its seat. Oil flowing past the ball, plus the normal internal leakage at the outer edge of the flow control valve, reduces the pressure on the forward side of the flow control valve. The flow control valve then opens, allowing oil to return to the intake side of the pump and to the reservoir.

When making a partial turn at low speed, the pressure requirements are normally well below maximum pressure, so the pressure relief ball will be closed. Also the pump output is less than system requirements so the flow control valve is closed.

GEAR OPERATION

NEUTRAL (STRAIGHT AHEAD POSITION) (Fig. 4-227)

When turning effort is not being applied at the steering wheel, the slots in the spool valve are positioned so that oil entering the valve body from the housing pressure port passes through the slots in the spool valve to the oil return port in the housing. The chambers at both ends of the rack-piston and around the pitman shaft are always full of oil, which acts as a cushion to absorb road shock so that they are not transferred to the driver. In addition, this oil lubricates all the internal components of the gear.

RIGHT TURN (Fig. 4-228)

When the steering wheel is turned to the right, the worm resists being turned because of the resistance offered by the front wheels. The valve body also resists turning because it is pinned to the worm. Driver force exerted at the steering wheel turns the lower shaft and spool valve a slight amount which twists the torsion bar between the worm and the spool valve. This slight amount of turning of the spool valve is sufficient to position the slots in the valve body and spool valve for power assist.

The right turn slots in the spool valve are closed off from the return (wide) slots in the valve body and opened more to the pressure (narrow) slots in the valve body. The left turn slots in the spool valve are closed off from the pressure slots in the valve body and opened more to the return slots in the valve body.

Pressure immediately begins to build up against the lower end of the rack-piston, forcing it upward to apply turning effort to the pitman shaft. The

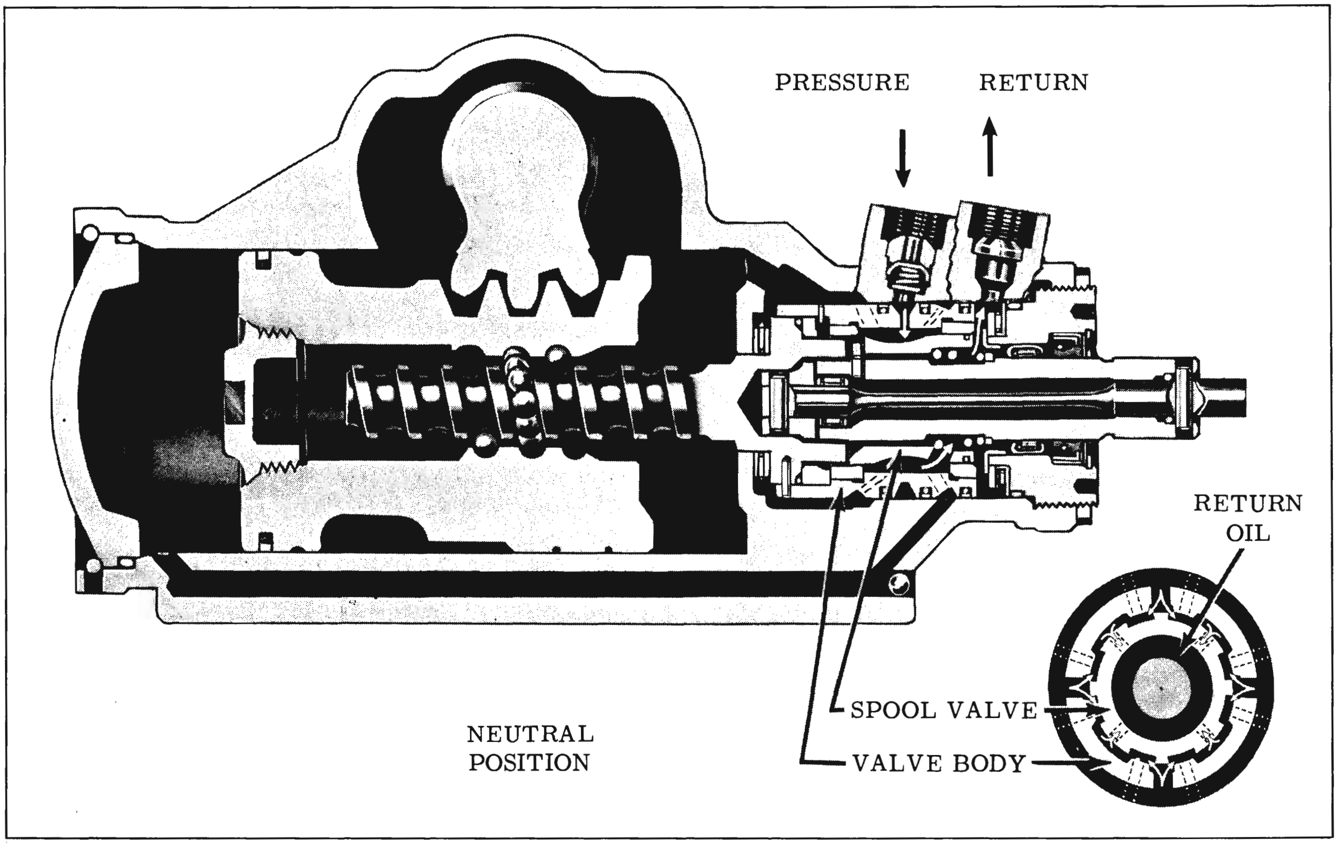


Fig. 4-227 Neutral (Straight Ahead Position)

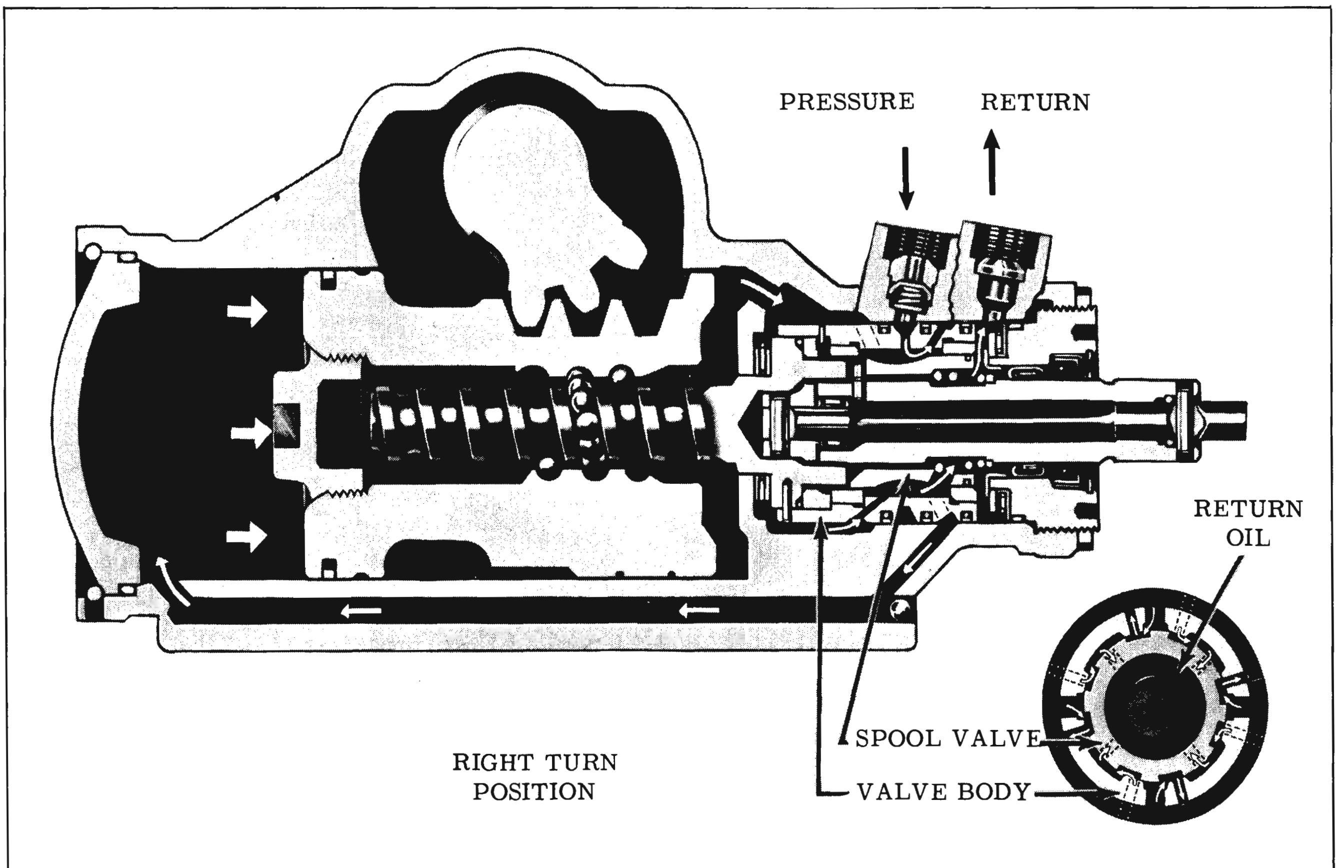


Fig. 4-228 Right Turn Position

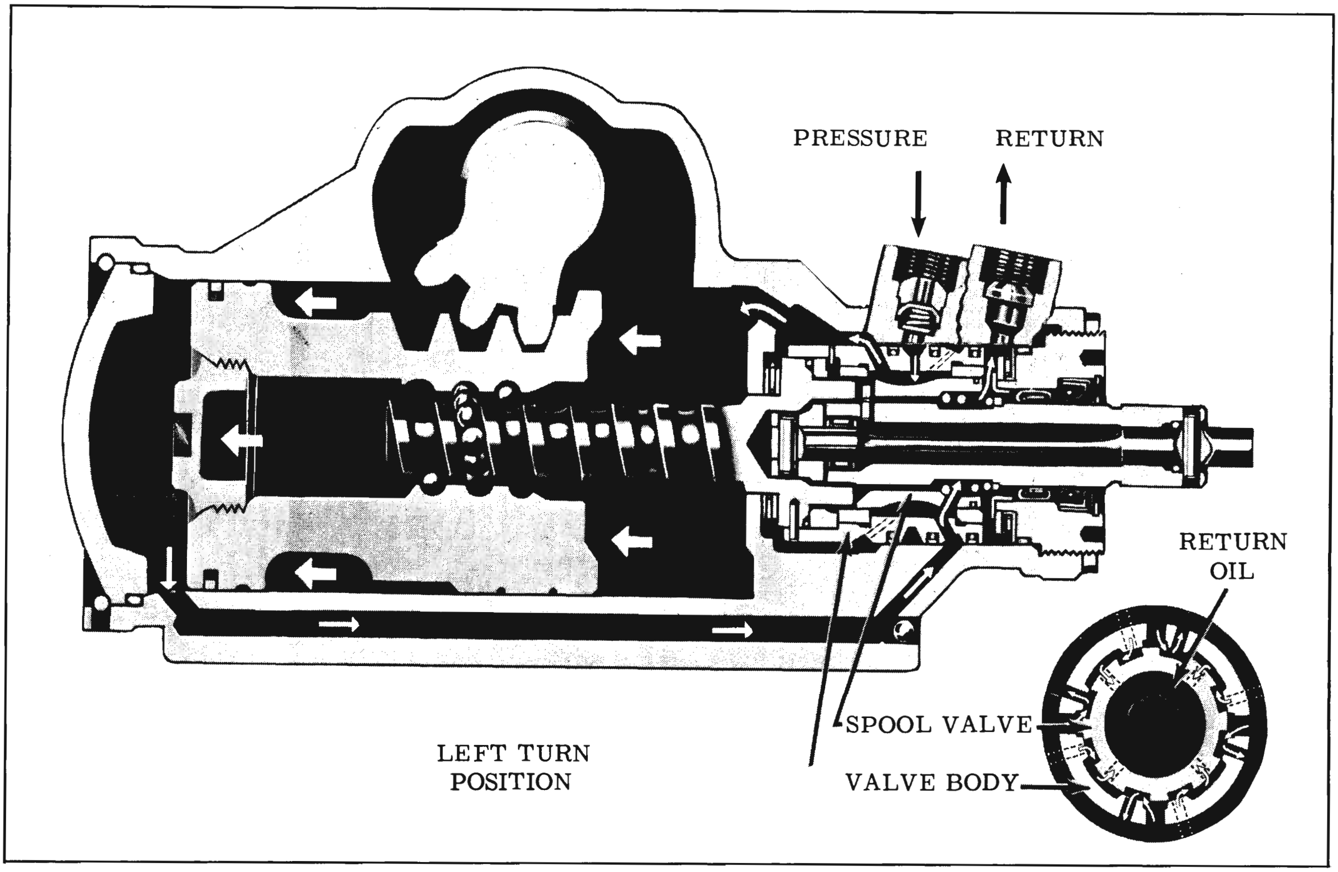


Fig. 4-229 Left Turn Position

oil in the chamber at the upper end of the rack-piston is then forced out through the valve body and spool valve through the oil return port to the pump reservoir.

The instant the driver stops applying turning effort to the steering wheel, the spool valve is forced back into its neutral position by the torsion bar. Oil pressure on the lower end of the rack-piston then decreases so that pressure is again equal on both sides of the rack-piston, and the front wheels return to the straight ahead position, when the car is moving.

Under normal driving conditions, oil pressure does not exceed 100 p.s.i. except when turning corners where it does not ordinarily exceeed 400 p.s.i. Oil pressure, when parking, ranges from 800 to 900 p.s.i. depending upon road conditions and weight of the car. The steering effort during normal driving, ranges from 1 to 2 lbs. and during parking from 2 to 3-1/2 lbs. again depending upon road conditions.

A check valve located under the high pressure connector seat hydraulically dampens the shock transmitted to the steering gear when driving on washboard roads.

LEFT TURN (Fig. 4-229)

When the steering wheel is turned to the left, the relationship between the spool valve slots and valve body slots is again changed through twisting of the torsion bar. Pressure immediately builds up against the upper end of the rack-piston, forcing it downward to apply turning effort to the pitman shaft. The oil in the chamber at the lower end of the rack-piston is forced out through the valve body and spool valve to the pump reservoir.

ADJUSTMENTS (On Car)

Over-Center Adjustment

The over-center adjustment is the only power steering gear adjustment which can be made on the car; however, in order to make this adjustment, it is also necessary to check the combined ball and thrust bearing preload.

1. Disconnect the pitman arm from the relay rod.

2. Loosen the pitman shaft adjusting screw lock nut and thread the adjusting screw out to the limit of its travel through the pitman shaft side cover.

3. Disconnect the horn wire at the relay, then remove the horn button or ornament from the steering wheel.

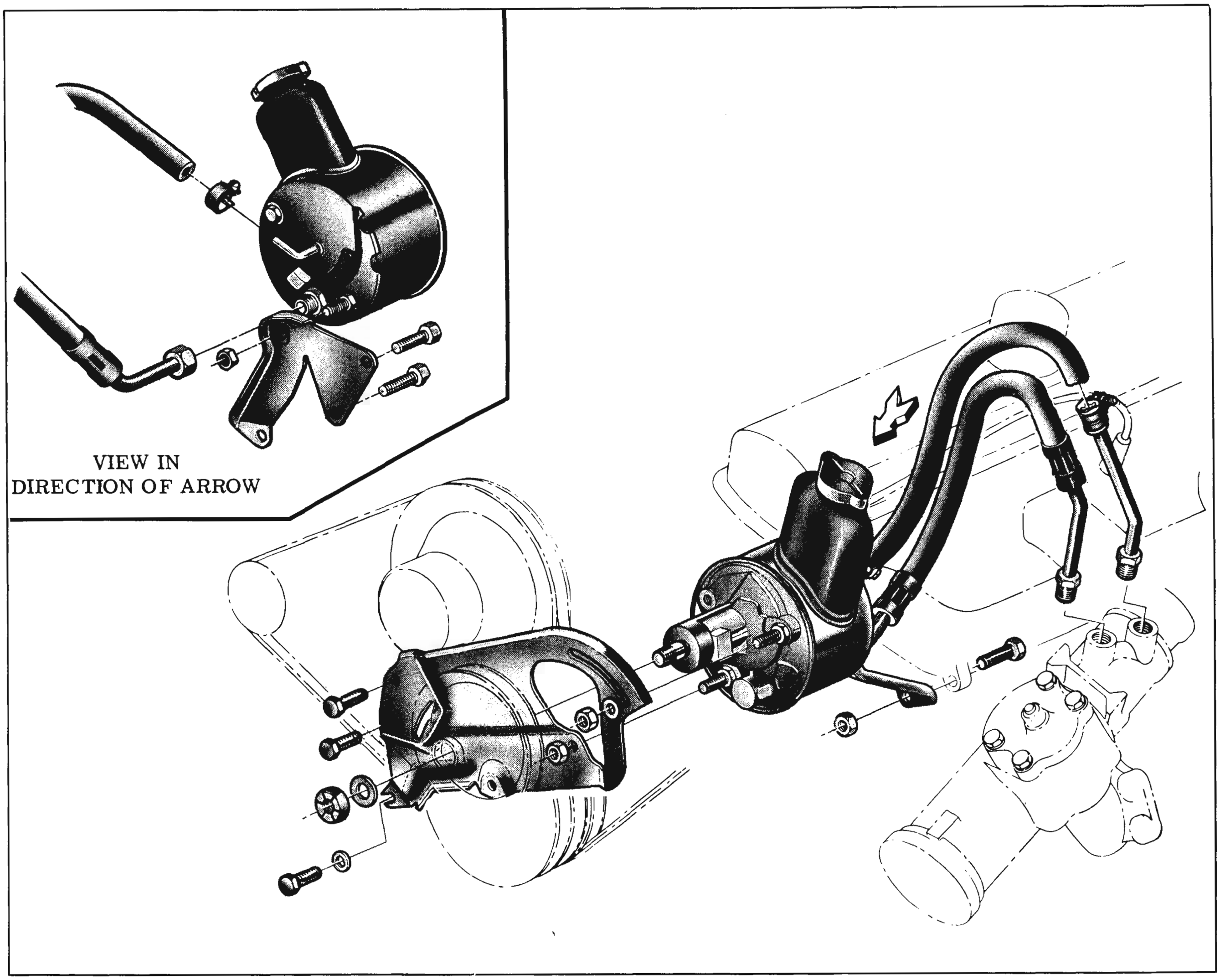


Fig. 4-230 Pump Removal and Installation

4. Turn the steering wheel through its full travel, then locate the wheel at its center of travel.
5. Check the combined ball and thrust bearing preload with an inch-pound torque wrench on the steering shaft nut by rotating through the center of travel. (Approximately 1/4 turn in each direction.) Note the highest reading.
6. Tighten the pitman shaft adjusting screw until the torque wrench reads 3 to 6 in. lbs. higher and the total preload not over 14 in. lbs.
7. While holding the pitman shaft adjusting screw, tighten the lock nut and recheck the adjustment.
8. Install the horn button or ornament and connect the horn wire. Connect the relay rod to the pitman arm.

POWER STEERING PUMP

Removal (Fig. 4-230)

1. Disconnect hoses and cap ends.
2. Remove pump pulley.
3. Remove 2 front pump to bracket nuts and remove belt.
4. Remove rear pump to bracket nut.
5. Remove rear bracket from engine and remove pump.

Installation (Fig. 4-230)

1. Place pump loosely in front bracket and position rear bracket to pump and engine.
2. Install the 2 rear bracket to cylinder head bolts and torque 25 to 35 ft. lbs. Install the rear bracket to engine block bolt and torque 25 to 35 ft. lbs.
3. Install pump to front bracket nuts finger tight.
4. Install pulley and torque pulley nut 40 to 45 ft. lbs.
5. Install belt and adjust tension using Tool BT-33-70. Tighten pump to front bracket nuts to 25 to 35 ft. lbs.

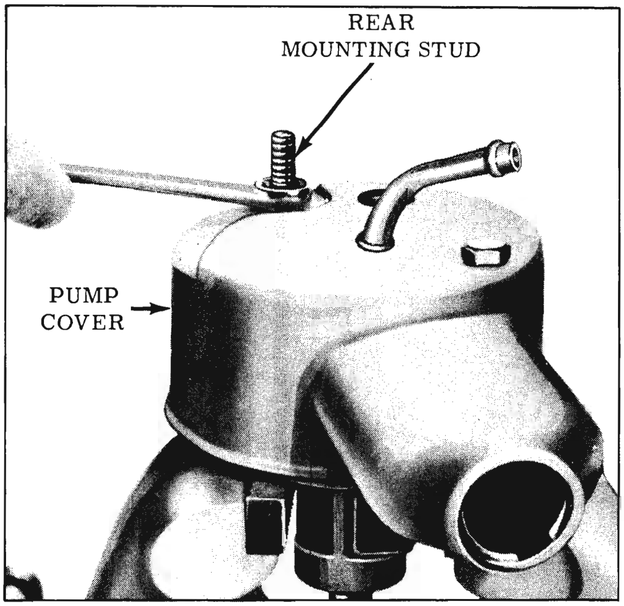


Fig. 4-231 Removing Reservoir

6. Connect hoses and replenish pump with Hydra-Matic Transmission fluid. Bleed system as outlined under "BLEEDING HYDRAULIC SYSTEM" on page 4-122.

Disassembly

CAUTION: In clamping pump in vise, be careful not to exert excessive force on front hub of pump as this may distort the bushing.

1. Remove union and seal.
2. Remove pump rear mounting studs. (Fig. 4-231)
3. Remove reservoir from housing by turning counterclockwise until reservoir can be lifted freely from housing.
4. Remove mounting stud "O" rings and union "O" rings.

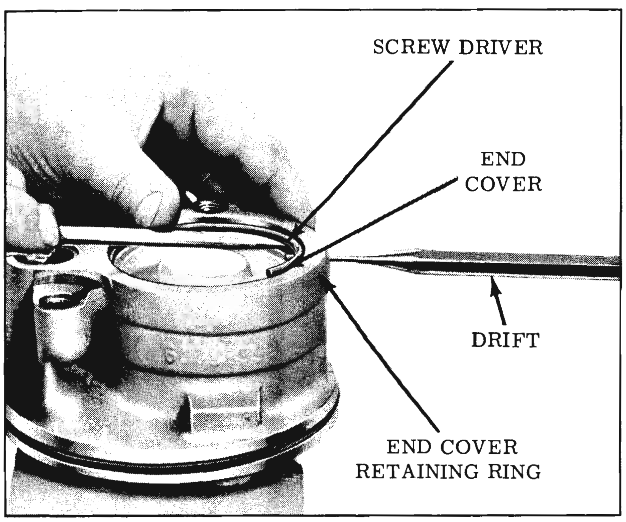


Fig. 4-232 Removing Cover Retainer

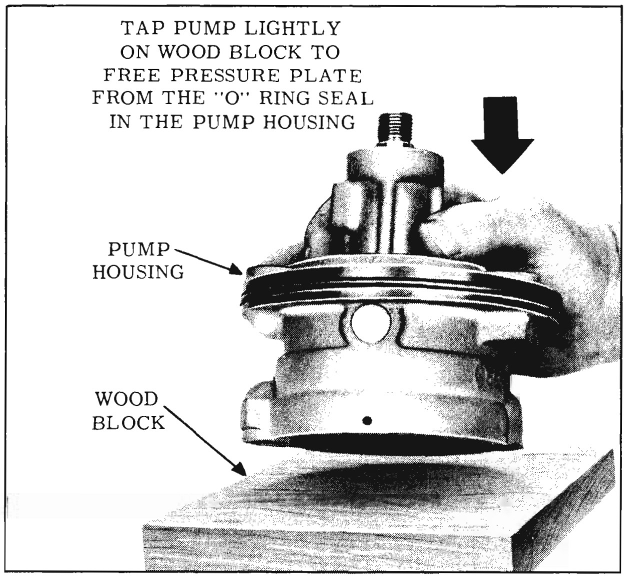


Fig. 4-233 Removing Pressure Plate

5. Rotate retainer ring so that one end is over hole in side of housing. Remove end cover retaining ring using 1/8" diameter hole in pump housing. When ring is in depressed position, remove as shown with screwdriver. (Fig. 4-232)
6. Remove end cover. The end cover is spring loaded and will generally be above the housing level. If sticking should occur, a slight rocking action will free the cover.
7. Remove end cover "O" ring.
8. With pump housing turned over, tap housing on wood block until pressure plate falls free. (Fig. 4-233) Flow control valve will come out also.
9. Remove pressure plate, pump ring and vanes, being careful not to drop parts. (Fig. 4-234)

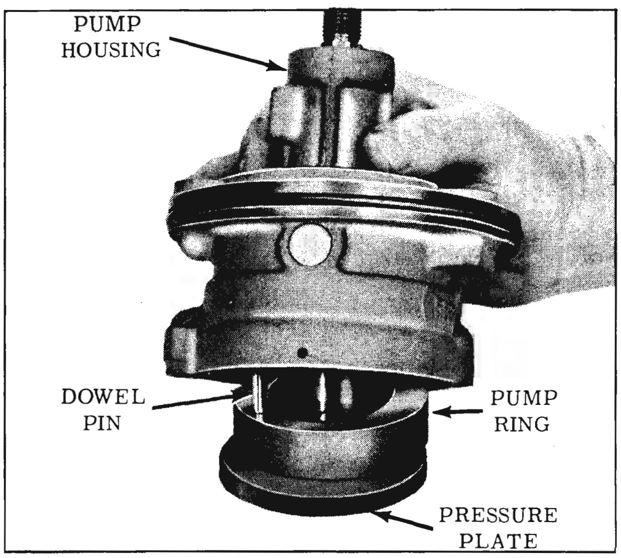


Fig. 4-234 Removing Pump Rings and Vanes

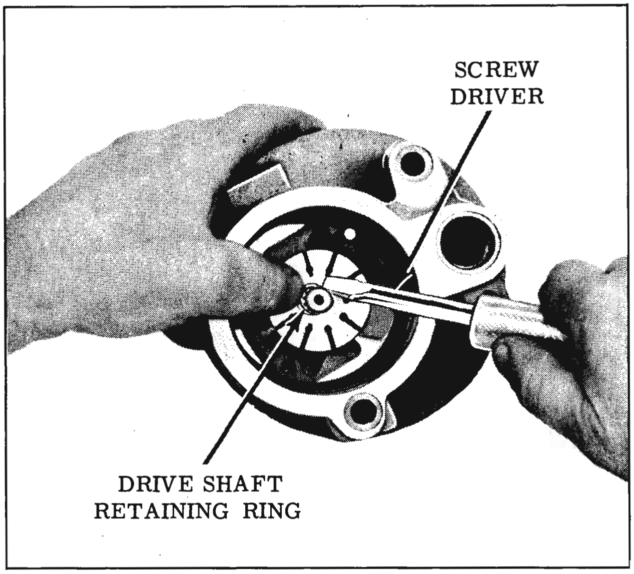


Fig. 4-235 Removing Snap Ring

10. Remount housing in vise and, using a suitable tool, remove snap ring on end of drive shaft. (Fig. 4-235)
11. Remove rotor and thrust plate. (Fig. 4-236)
12. Remove shaft through front of housing. (Fig. 4-237)
13. From the rear of the housing, drive the seal out the front with a small punch.

Cleaning

"O" rings should be replaced and the pump seal should not be cleaned in solvent.

Carefully clean all other parts in cleaning solvent. Lubricate new "O" ring seals and the drive shaft seal with petrolatum and install in proper location.

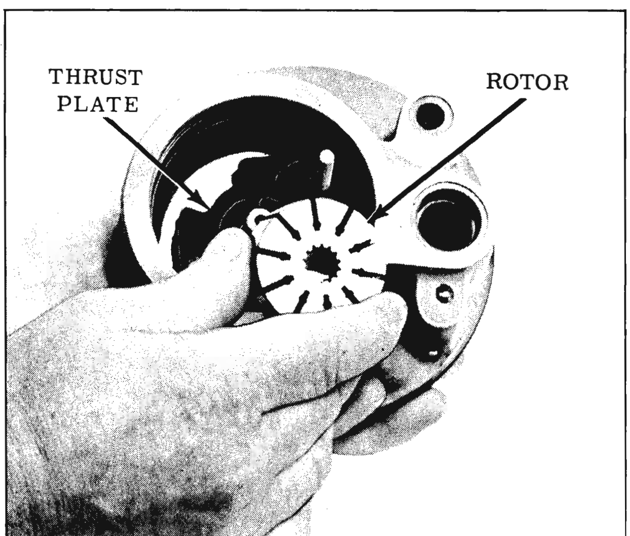


Fig. 4-236 Removing Rotor and Thrust Plate

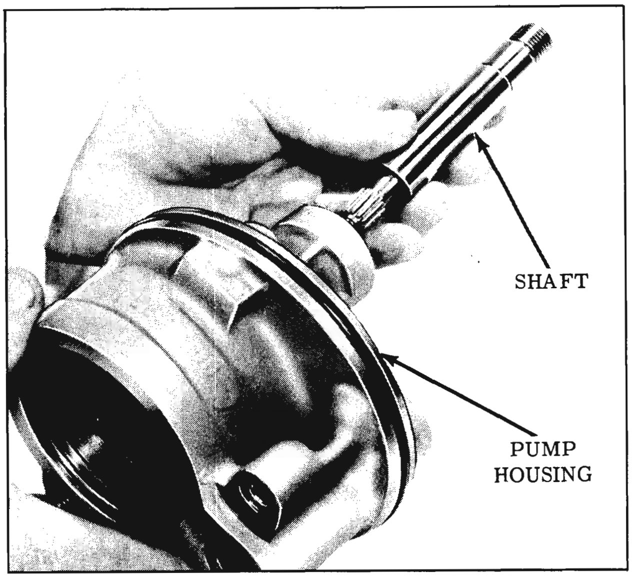


Fig. 4-237 Removing Shaft

Assembly

All parts must be kept clean during reassembly.

1. Insert shaft at hub end of housing, spline end entering mounting face side. (Fig. 4-238)
2. Insert dowels in holes in body. Install thrust plate on dowel pins with ported face to rear of pump housing. (Fig. 4-240)
3. Install rotor and be sure splines are free on pump shaft.

   NOTE: Assemble rotor with countersunk side toward shaft.
4. Using a suitable tool, install shaft retaining ring. (Fig. 4-241)
5. Install pump ring on dowel pins with direction of rotation arrow to the rear of the pump housing. (Fig. 4-242) Rotation is clockwise.

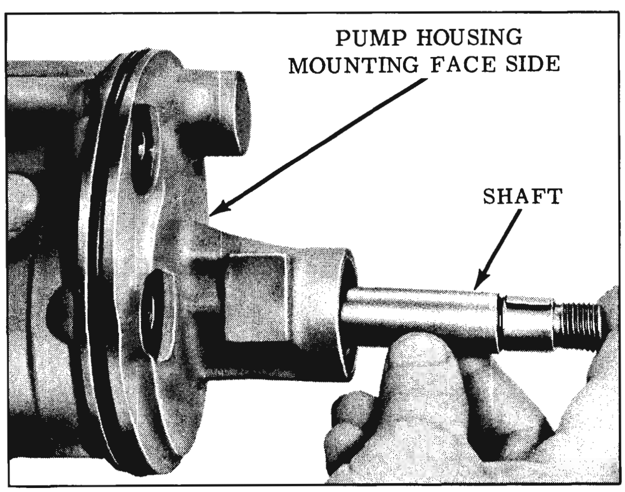


Fig. 4-238 Installing Shaft

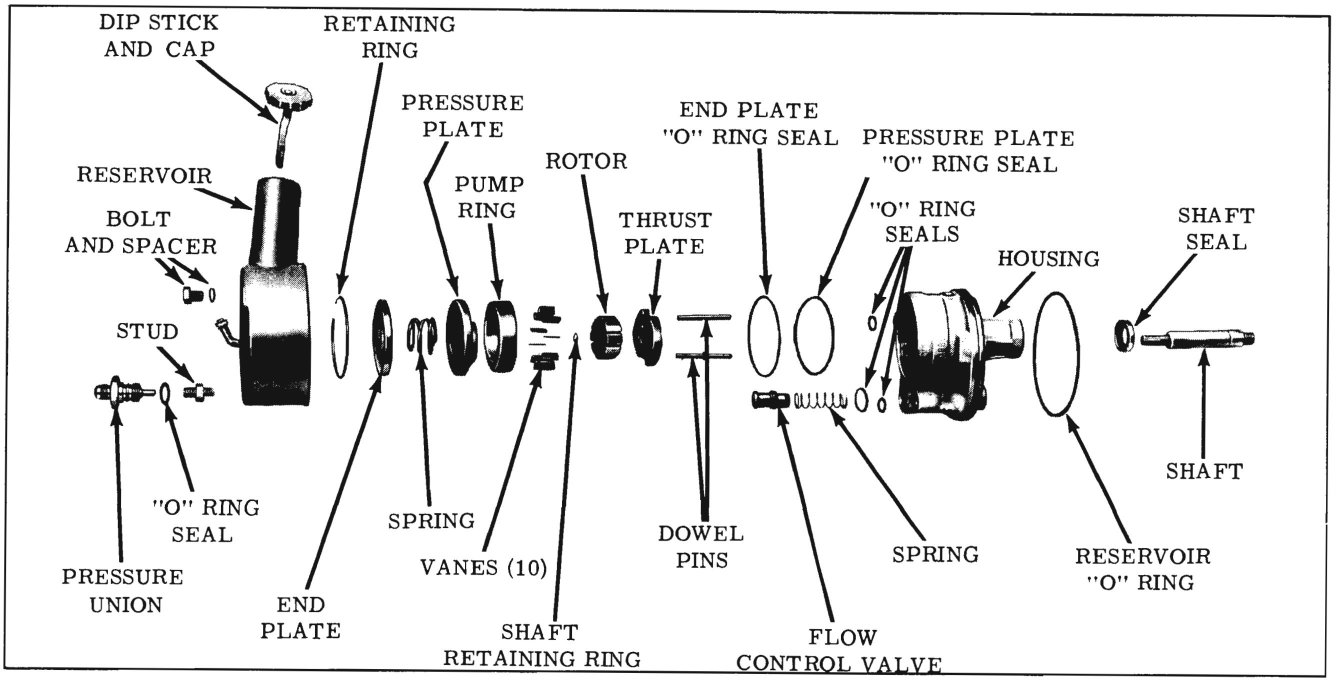


Fig. 4-239 Pump Assembly

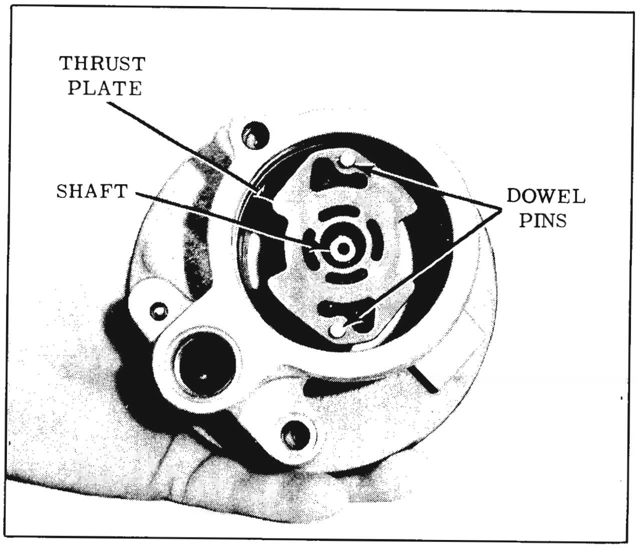


Fig. 4-240 Installing Dowel Pins

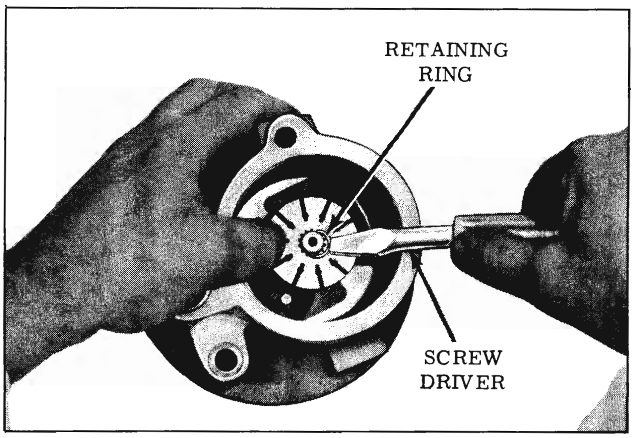


Fig. 4-241 Installing Rotor Snap Ring

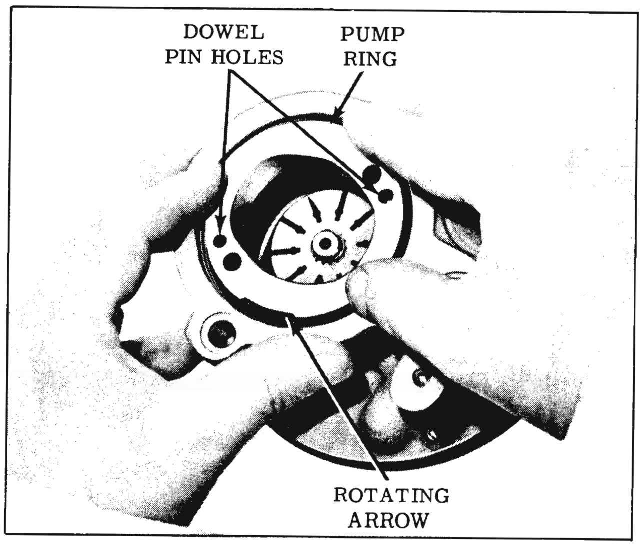


Fig. 4-242 Installing Pump Ring

6. Install vanes in rotor slots with radius edge towards outside as shown in Fig. 4-243.

7. Lubricate outside diameter and chamfer of pressure plate with petrolatum to insure against damaging "O" ring and install on dowel pins with ported face toward the pump ring. Using a 2-5/8" diameter tube to apply pressure to outer edge only, seat pressure plate by means of pressure on the sleeve with the use of an arbor press. Never press or hammer on the center of the pressure plate as this may cause permanent distortion resulting in pump failure. (Pressure plate will travel about 1/16" to seat) (Fig. 4-244)

8. Install end plate "O" ring, in second groove.

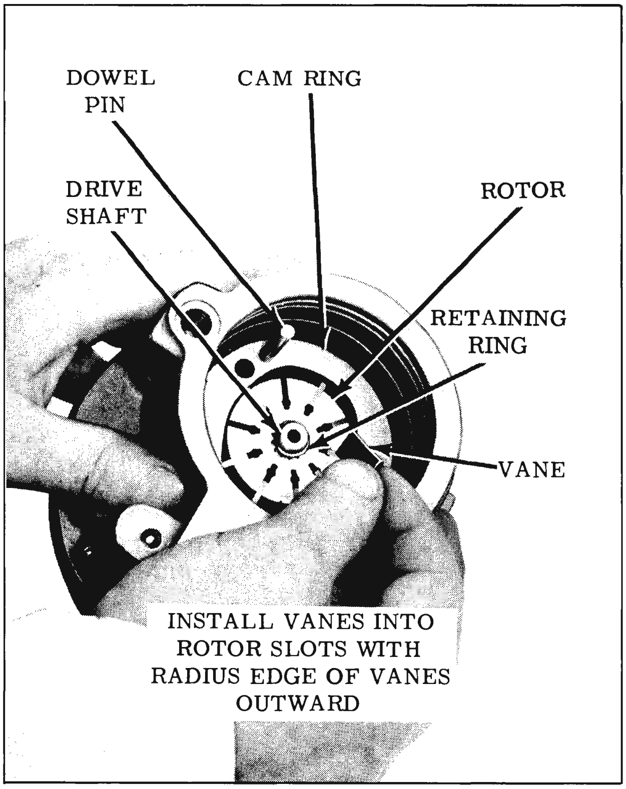


Fig. 4-243 Installing Vanes

9. Install pressure plate spring in recess of pressure plate. (Fig. 4-245)

10. Inspect outer edge of end cover and remove any nicks. Lubricate outside diameter and chamfer of end cover with petrolatum to insure against damaging "O" ring and install in housing using an arbor press.

11. Install end cover retaining ring while pump is in arbor press. Be sure it is completely seated in the groove of the housing.

12. Place two reservoir bolts and one flow control valve "O" ring in position.

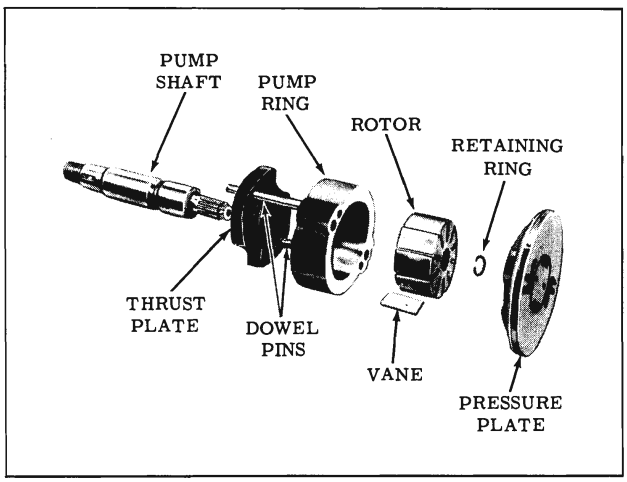


Fig. 4-244 Shaft and Rotor Assembly

Fig. 4-245 Installing Cover

13. Position reservoir cover on housing.

    NOTE: Reservoir must be seated before studs are installed.

14. Install reservoir studs, torque 25-30 ft. lbs., flow control spring and plunger with hex end in spring.

15. Carefully position new seal over shaft and install with tool J-8818 until front edge of seal is flush with front edge of seal bore.

16. Install union and torque to 20 ft. lbs. Install drive shaft key.

    NOTE: End play in pump shaft is permissible if not over 1/32".

BELT ADJUSTMENT

1. Loosen power steering bracket to power steering pump attaching bolts.

2. Adjust belt with Tool BT-33-70 and tighten nuts.

BLEEDING HYDRAULIC SYSTEM

1. Fill oil reservoir to proper level and let oil remain undisturbed for at least two minutes.

2. Start engine and run at idle for approximately 30 seconds.

3. Add oil if necessary.

    IMPORTANT: OIL LEVEL MUST BE AT MAXIMUM AT ALL TIMES.

4. Raise front end of vehicle so that the wheels are off the ground.

5. Set engine speed on fast idle and allow to run for one minute.

6. Turn the wheels right and left, lightly contacting the stops.

7. Lower the car and turn wheels right and left, on the ground.

8. Check oil level and refill as required.

9. Continue this process as long as required to bleed all air out of the system (until oil in reservoir is clear and shows no foam).

HOSES

The power steering hoses may be replaced individually as necessary.

They should be inspected at each lubrication for deterioration and leaks.

When installing hoses, care must be taken not to cross threads on pump union or in gear. It will be necessary to check fluid level after installation and bleed system as outlined on Page 4-122.

HOSE CONNECTORS

Removal

If the hose connections were leaking at the connector seats in the housing, remove one or both connector seats as follows:

1. Thread a nut and place a washer on a 5/16"-18 tap.

2. If the connector seat is being removed from an assembled gear, coat the end of the tap with petrolatum to prevent chips from entering the passage while tapping the seat.

3. With the steering gear in a vertical position, thread the tap into the connector seat not more than 3 turns. (Fig. 4-246)

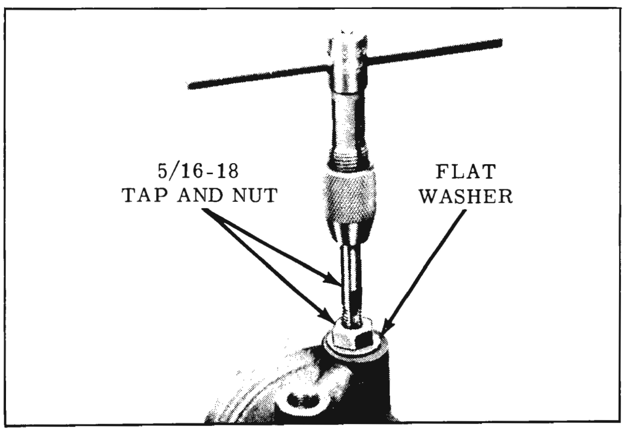


Fig. 4-246 Removing Hose Connector

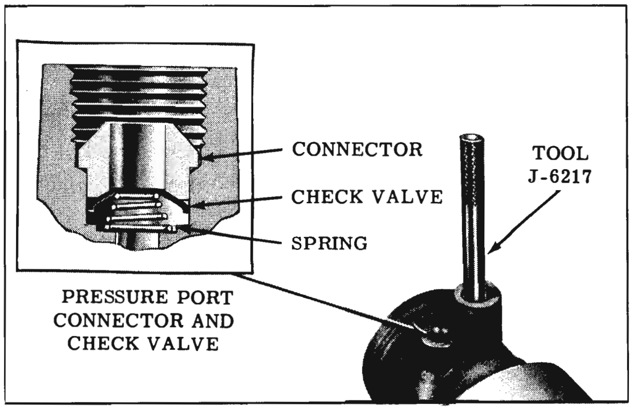


Fig. 4-247 Installing Hose Connector

4. Tighten the nut to remove the seat.

NOTE: A check valve and spring is located below the high pressure connector seat and can be replaced when seat is removed.

Installation

To install a new connector seat, low pressure only, use Tool J-6217 to seat it in the housing. (Fig. 4-247) For high pressure seat start in housing with a brass drift, then seat with hose by threading hose nut into housing. Do not use Tool J-6217 on high pressure side as it will hit check valve before connector is seated.

POWER STEERING GEAR

REMOVAL

1. Remove the two coupling flange attaching nuts and lock washers. (Fig. 4-248)

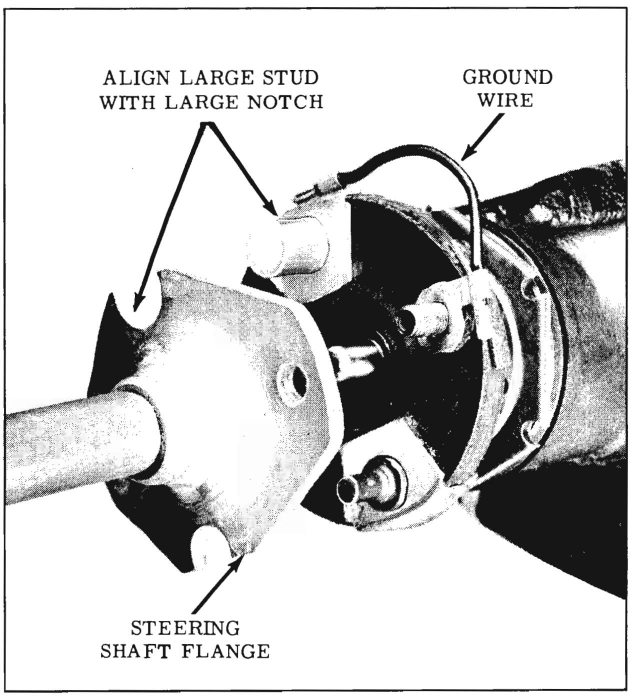


Fig. 4-248 Flexible Coupling

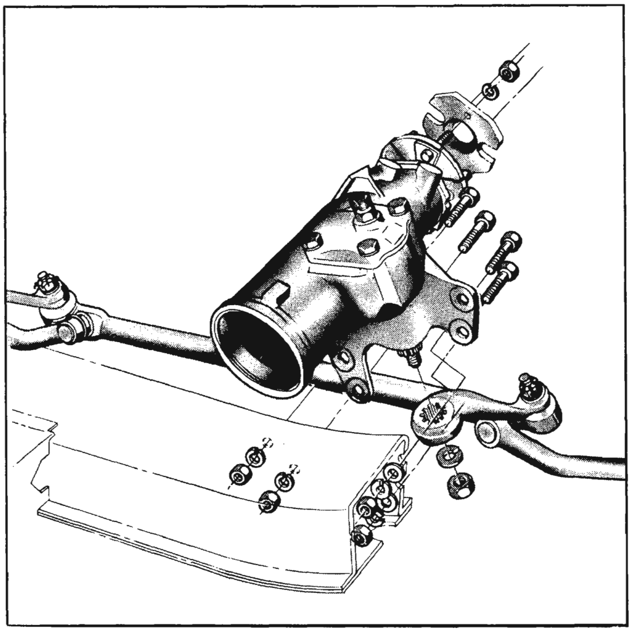


Fig. 4-249 Power Steering Gear Removal

2. Disconnect the hoses from the pump and gear. Cap the pump, hose fittings and gear connectors.

3. Raise steering shaft up as outlined in steps 1-8 of "MANUAL STEERING COUPLING REMOVAL," Page 4-137.

4. Hoist car and disconnect the pitman arm from the relay rod.

5 Remove the 4 bolts attaching the gear to the front suspension cross bar, then remove the gear from the car. (Fig. 4-249)

INSTALLATION

1. Check pitman arm to shaft nut torque. Torque should be 150-180 ft. lbs.

2. Apply a sodium soap fine fiber grease to gear mounting to prevent squeaks.

3. Install gear and tighten nuts 45-60 ft. lbs.

4. Lower steering shaft, and attach to coupling on gear. Reassemble steering shaft to column at upper end.

5. Connect hoses, check fluid level and bleed system. (Page 4-122)

DISASSEMBLY

NOTE: In many cases, complete disassembly of the gear will not be necessary since most of the component parts can be removed without complete disassembly of the gear. The following procedure outlines the disassembly of the gear, then the disassembly of the individual components.

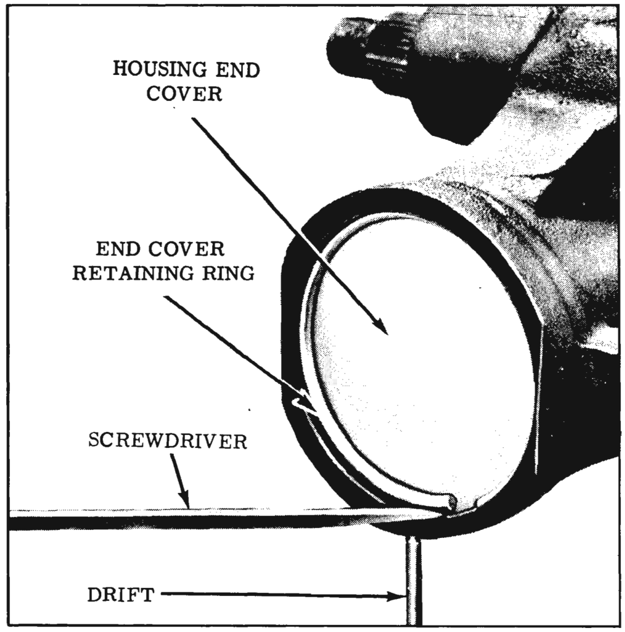


Fig. 4-250 Removing End Cover Retaining Ring

1. Rotate end cover retainer ring so that one end of the ring is over hole in side of housing then force end of ring from its groove and remove ring. (Fig. 4-250)

2. Turn the coupling flange counterclockwise until rack-piston just forces end cover out of housing; otherwise, the worm may thread out of the rack-piston and the balls will fall out of their circuit. Remove cover and discard "O" ring.

3. Remove the rack-piston end plug as shown in Fig. 4-251.

4. Remove the pitman shaft and side cover as follows:

a. Loosen the over-center adjusting screw

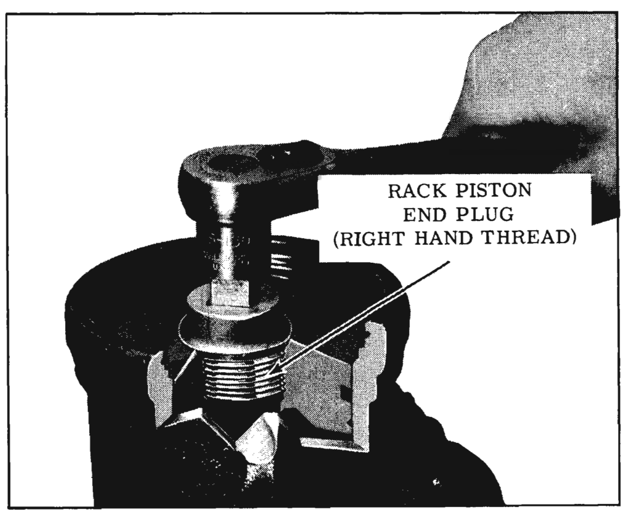


Fig. 4-251 Removing End Plug

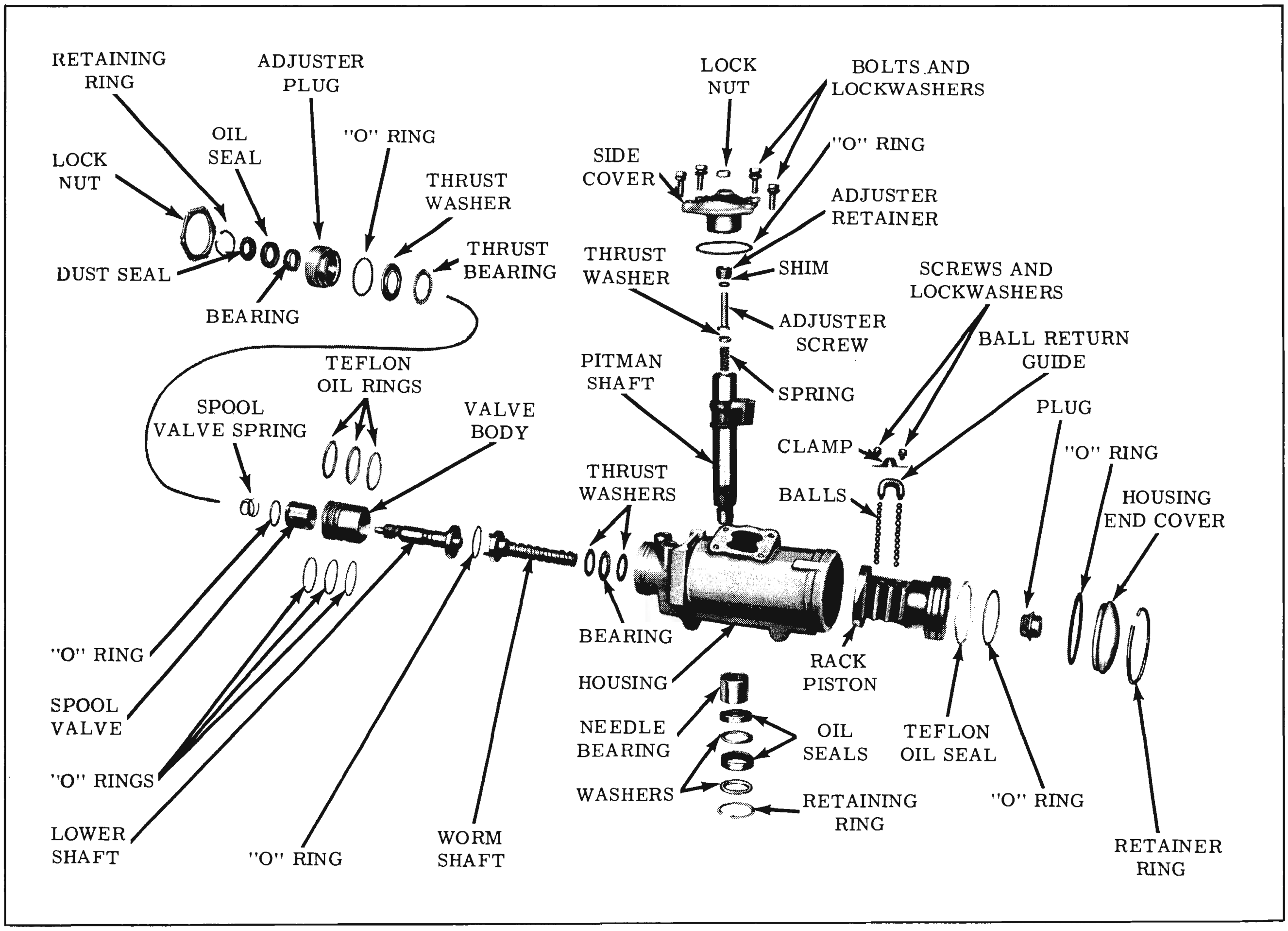


Fig. 4-252 Power Steering Gear

lock nut and remove the 4 side cover attaching bolts and lock washers.

b. Rotate side cover until the rack-piston and pitman shaft teeth are visible, then turn the coupling flange until the pitman shaft teeth are centered in the housing opening. Tap pitman shaft with a soft hammer and remove the pitman shaft and side cover from the housing. Remove the side cover "O" ring and discard.

5. Remove the rack-piston as follows:

a. Insert Ball Retainer Tool J-7539 into the rack-piston bore with pilot of tool seated in the end of the worm. (Fig. 4-253) Turn coupling flange counterclockwise while holding tool tightly against worm. The rack-piston will be forced onto the tool.

b. Remove the rack-piston with Ball Retainer Tool J-7539 from gear housing.

6. Remove the adjuster plug as follows:

a. Remove coupling flange attaching bolt and flange.

b. Loosen the adjuster plug lock nut with punch. (Fig. 4-254)

c. Remove adjuster plug assembly with Spanner Wrench J-7624. (Fig. 4-255) Remove and discard the plug "O" ring.

7. Grasp the lower shaft and pull the valve and shaft assembly from the housing bore. Separate worm and shaft and remove the lower shaft cap "O" ring and discard.

8. If the worm or lower thrust bearing and

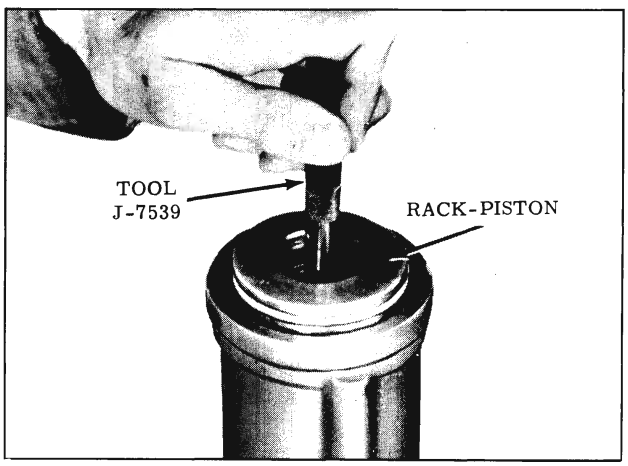


Fig. 4-253 Removing Rack Piston

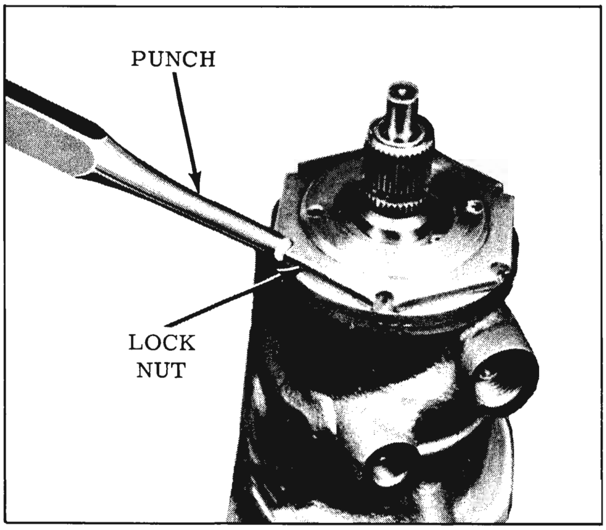


Fig. 4-254 Removing Lock Nut

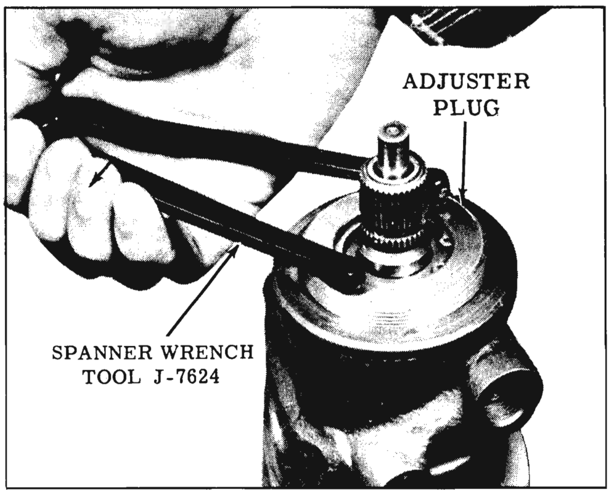


Fig. 4-255 Removing Adjuster Plug

race(s) remained in the gear housing, remove at this time.

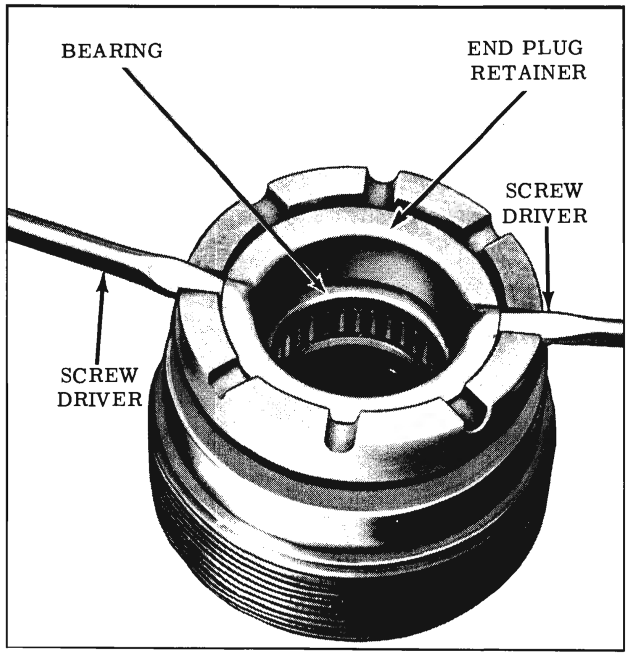


Fig. 4-257 Removing Retainer

SERVICING INDIVIDUAL UNITS

Adjuster Plug Assembly

Disassembly

1. If the seal ONLY is to be replaced and not the bearing, remove the retaining ring with internal pliers, then remove the dust seal. Pry the seal from the bore of the adjuster plug. (Fig. 4-256)

2. Remove the thrust bearing retainer by prying at the two raised areas with an awl or small screwdriver, remove the spacer, thrust bearing washer, thrust bearing and washer. (Fig. 4-257)

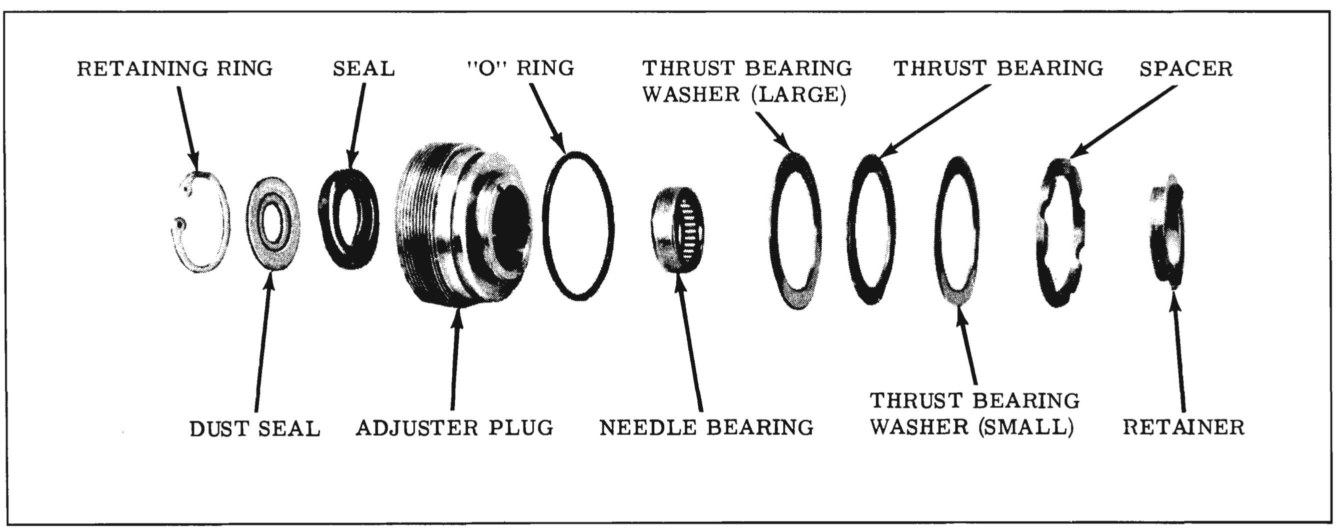


Fig. 4-256 Adjuster Plug Assembly

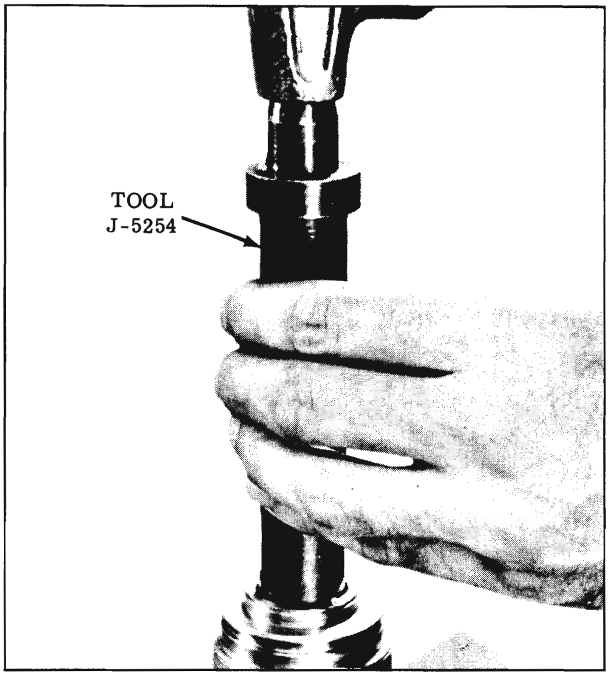


Fig. 4-258 Removing Bearing and Seal

3. If the needle bearing is to be replaced, remove the retaining ring using internal pliers, then drive the dust seal, seal and bearing from the adjuster plug with Tool J-5254. (Fig. 4-258)
4. Wash all parts in clean solvent and dry parts with compressed air.
5. Inspect thrust bearing spacer for wear or cracks. Replace if damaged.
6. Inspect thrust bearing rollers and washers for wear, pitting or scores. If any of these conditions exists, replace the bearing and washers.

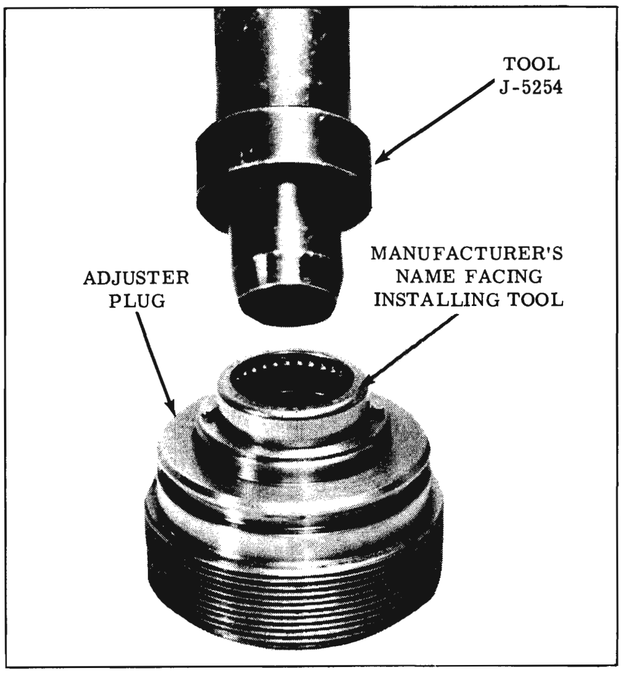


Fig. 4-259 Installing Bearing

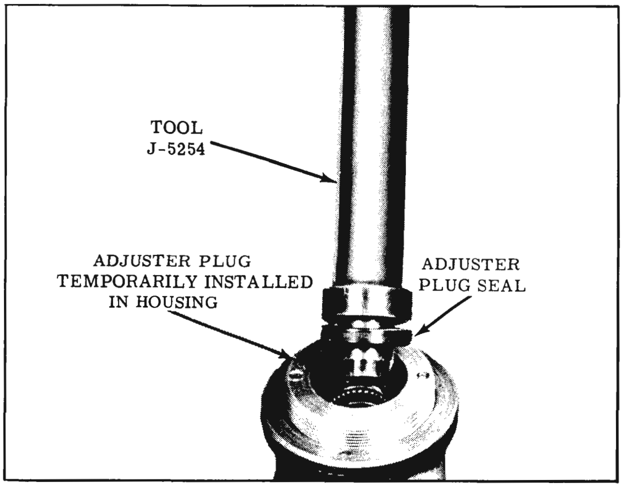


Fig. 4-260 Installing Seal

Assembly

1. If the needle bearing was removed, place new needle bearing over Tool J-5254 with the bearing manufacturer's identification against the tool and drive or press bearing until it is flush with the surface of the seal bore. (Fig. 4-259)
2. Temporarily install the adjuster plug in the gear housing and place dust seal and a new oil seal on Tool J-5254 (lip of seal away from tool). Lubricate seal with Hydra-Matic oil and drive or press seal into adjuster plug until seated. (Fig. 4-260) Tool J-5254 must be free of burrs that could scratch the seal.
3. Install retaining ring with internal pliers, then remove the adjuster plug from the housing.
4. Lubricate the thrust bearing assembly with Hydra-Matic oil. Place the large thrust bearing washer on the adjuster plug hub then install the upper thrust bearing, small bearing washer and spacer (grooves of spacer away from bearing washer).
5. Install a new bearing retainer on the adjuster plug by carefully tapping on the flat surface of the retainer. (Fig. 4-261)

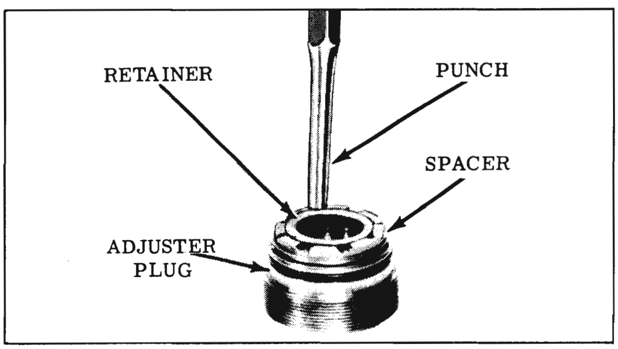


Fig. 4-261 Installing Retainer

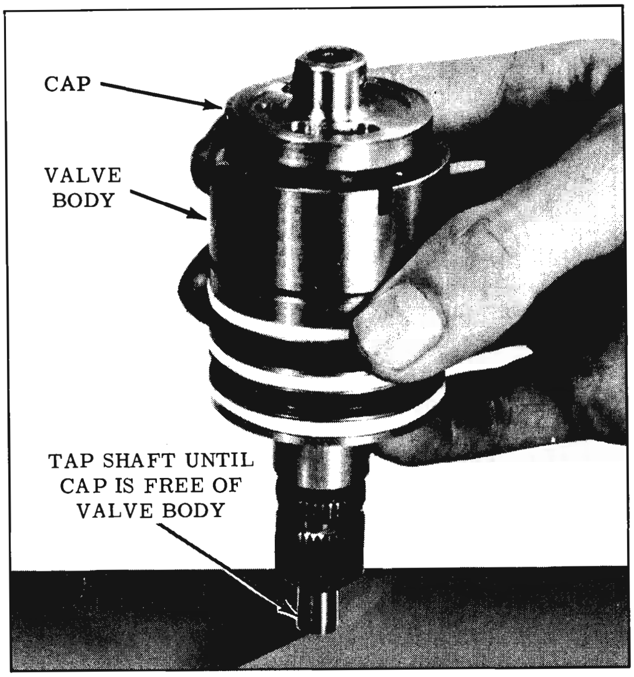


Fig. 4-262 Removing Lower Shaft

NOTE: The projections must not extend beyond the spacer when the retainer is seated. The spacer must be free to rotate.

Valve and Lower Shaft Assembly

Disassembly

1. Remove the spool valve spring by carefully prying top coil out of groove in the lower shaft, then slide the spring from the shaft. Be careful not to distort spring.

2. To remove the lower shaft assembly from the valve body, proceed as follows:

   a. While holding the assembly (lower shaft down), lightly tap the lower shaft against the bench until the shaft cap is free from the valve body. (Fig. 4-262) The spool valve should be held in the valve body while tapping the shaft.

   b. Carefully remove the lower shaft assembly so as not to cock the spool valve in the valve body.

3. Push the spool valve out of the flush end of the valve body until the dampener "O" ring is exposed, then carefully pull the spool from the valve body while rotating the valve. (Fig. 4-263) If the spool valve becomes cocked, carefully realign the spool valve then remove.

4. Remove the dampener "O" ring from the spool valve and discard.

5. If the teflon oil rings are to be replaced, cut the 3 teflon oil rings and "O" rings from the valve body and discard.

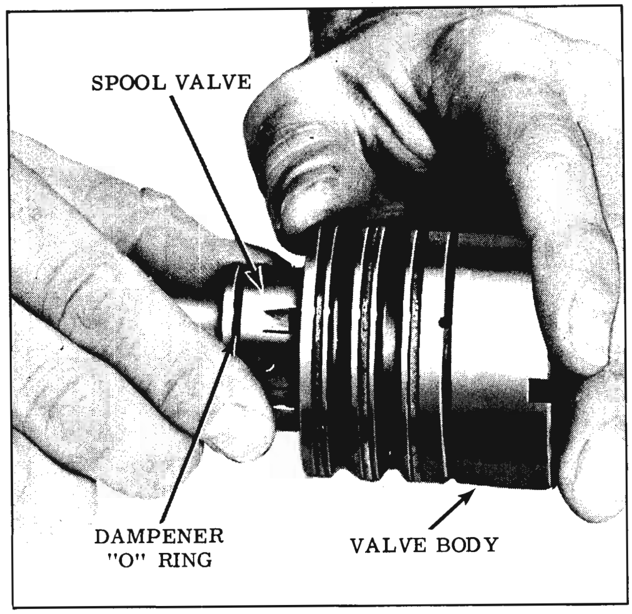


Fig. 4-263 Removing Spool Valve

Cleaning and Inspection

1. Wash all parts in clean solvent and blow out all oil holes with compressed air.

2. If the drive pin in the lower shaft or valve body is cracked, excessively worn or broken, replace the complete valve and shaft assembly.

3. If there is evidence of leakage between the torsion bar and the lower shaft, or scores, nicks, or burrs on the ground surface of the lower shaft that cannot be cleaned up with crocus cloth, the entire valve and shaft assembly must be replaced.

4. Check the outside diameter of the spool valve and the inside diameter of the valve body for nicks, burrs, or bad wear spots. If the irregularities cannot be cleaned up by the use of crocus cloth, the complete valve and shaft assembly will have to be replaced.

5. If the small notch in the skirt of the valve body is excessively worn, the complete valve and shaft assembly will have to be replaced.

6. Lubricate the spool valve with Hydra-Matic fluid and check the fit of the spool valve in the valve body (with the spool valve dampener "O" ring removed). If the valve does not rotate freely without binding, the complete valve and shaft assembly will have to be replaced.

7. Check the overall length of the spool valve spring. The spring should be approximately 3/4". If it is less than 11/16", replace the spring.

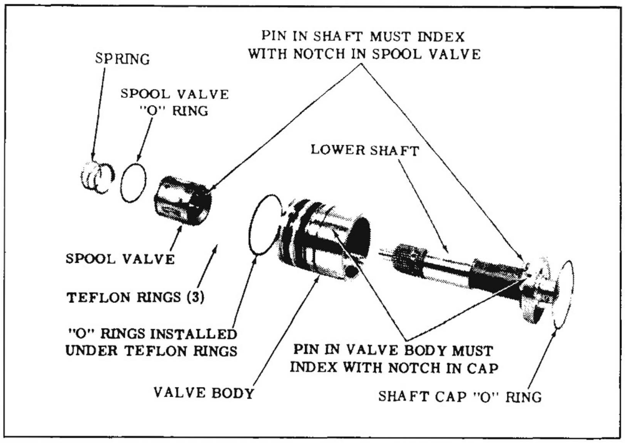


Fig. 4-264 Valve and Shaft Assembly

Assembly

1. If valve body "O" rings and teflon rings were removed, install "O" rings in the oil ring grooves and lubricate with Hydra-Matic oil.

2. Lubricate the 3 teflon oil rings with petrolatum and install in grooves over "O" rings.

   NOTE: The teflon rings may appear to be distorted, but the heat of the oil during operation of the gear will straighten them out.

3. Assemble the lower shaft assembly in the valve body so the notch in the lower shaft cap engages with the pin in the valve body and is seated. (Fig. 4-264)

4. Install the spool valve as follows:

   a. Lubricate the spool valve dampener "O" ring with petrolatum and install over spool valve.

   b. Lubricate the spool valve with Hydra-Matic oil and slide the valve over the lower shaft. (Notch in spool towards the valve body). Rotate the spool valve while pushing valve into valve body to align notch in spool with the pin in the lower shaft. (Fig. 4-264)

   c. Carefully press spool valve into body, engaging notch on pin. Extreme care must be taken not to cut "O" ring. The spool valve is properly seated when it is flush with the top of valve body.

5. Place a piece of shim stock over the shaft to protect the seal surface.

6. Slide the valve spring over the lower shaft, large end first, and down into the spool valve until the top coil of the spring is in the shaft groove. (Fig. 4-265)

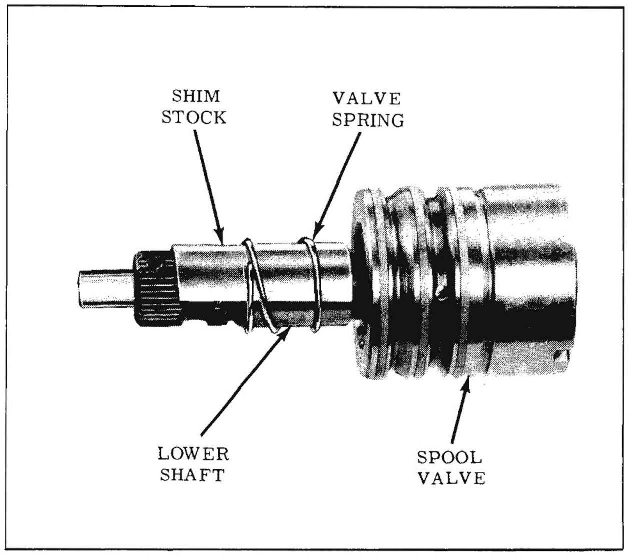


Fig. 4-265 Installing Valve Spring

Pitman Shaft and Side Cover

Disassembly

Remove the lock nut and side cover from the adjusting screw. Do not attempt to disassemble pitman shaft. Discard lock nut.

NOTE: The power steering gear is equipped with a self-adjusting type of pitman shaft which automatically keeps the over-center adjustment within specifications for a limited mileage (up to approximately 10,000 miles), regardless of the wear of the rack-piston and related parts. This is accomplished by the use of a wear washer and a heavy spring in the pitman shaft assembly. The wear washer is calibrated to wear at the same rate as the other components of the gear.

In cases where gear chucking or "clunk" cannot be corrected by performing the over-center adjustment, the trouble may be due to excessive wear in the pitman shaft or a broken spring in the pitman shaft. (Fig. 4-266)

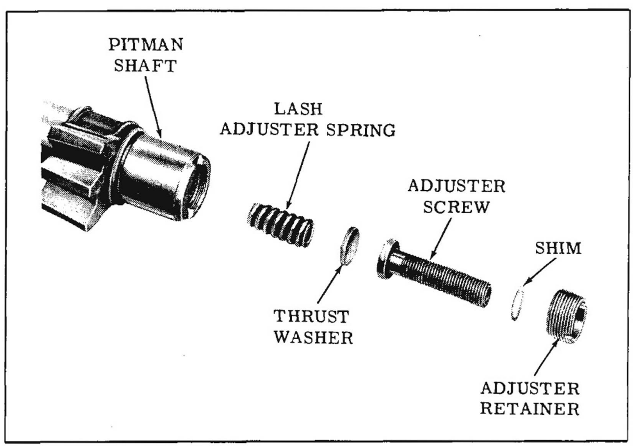


Fig. 4-266 Pitman Shaft

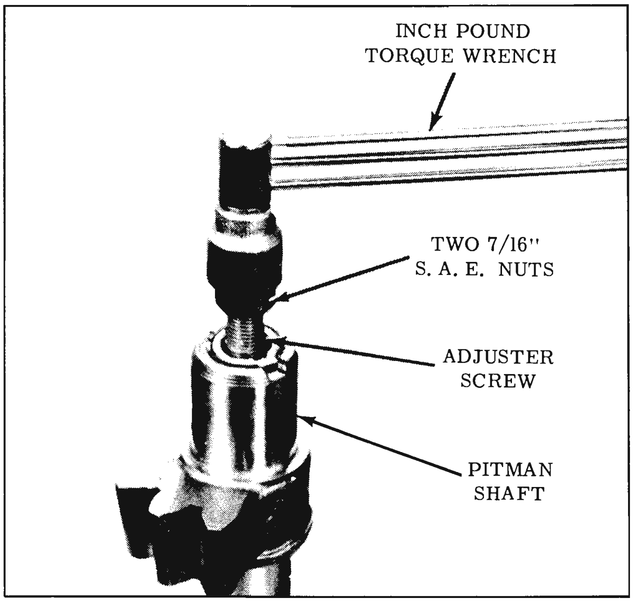


Fig. 4-267 Checking Pitman Shaft

To check the pitman shaft for excessive wear or a broken spring:

1. With the side cover removed from the pitman shaft, clamp the shaft in a vise and thread two 7/16" S.A.E. nuts on the adjusting screw. Tighten nuts so they are locked on the shaft.

2. Using a 5/8" socket and an inch-pound torque wrench, measure the torque required to turn the adjusting screw. (Fig. 4-267) Torque reading should be 1 to 15 inch pounds.

3. If the reading is not within this range, the complete pitman shaft assembly must be replaced. DO NOT ATTEMPT TO CORRECT READING BY DISASSEMBLING THE PITMAN SHAFT.

4. Remove the torque wrench and the two 7/16" nuts from the adjusting screw.

Cleaning and Inspection

1. Wash all parts in clean solvent and dry parts with compressed air.

2. Check pitman shaft bearing surface in the side cover for scoring. If badly worn or scored, replace the side cover.

3. Check the sealing and bearing surfaces of the pitman shaft for roughness, nicks, etc. If minor irregularities in surface cannot be cleaned by use of crocus cloth, replace the pitman shaft.

4. Replace pitman shaft assembly if teeth are damaged or if the bearing surfaces are pitted or scored.

Assembly

Thread the side cover onto the pitman shaft adjusting screw until it bottoms. Install a new adjusting screw lock nut, but do not tighten.

Rack-Piston

Disassembly

1. Check the ball preload as follows:

   a. Lightly clamp the rack-piston assembly in a brass jawed vise with Tool J-7539 still in place.

   b. Thread worm into rack-piston while holding Tool J-7539 tightly against worm so the balls will not fall out of the rack-piston. When the worm is in place, remove Tool J-7539.

   c. Clamp rack-piston (flanged end of worm up) in vise, then install the valve and lower shaft assembly so that the small notch in the valve body engages the drive pin in the worm. Locate the over-center position of the worm by slowly turning the worm and noting the area where the turning effort is highest. DO NOT THREAD THE WORM OUT TOO FAR SINCE THIS MAY CAUSE SOME OF THE BALLS TO DROP OUT OF THE RACK-PISTON.

   d. Using a torque wrench and a 3/4", 12 point socket, check the preload while rotating the torque wrench in a 120^{o} arc. The reading should be 1/2 to 3 in. lbs. (Fig. 4-268)

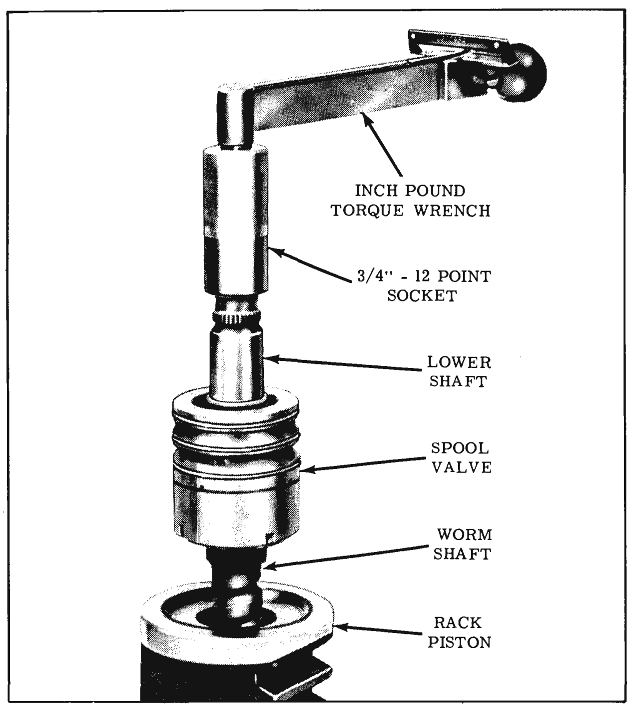


Fig. 4-268 Checking Preload

If a preload can be felt while rotating worm by hand, but it cannot be measured on a torque wrench, it will be acceptable.

e. If the preload is not within limits, a new set of balls must be installed upon re-assembly. Note the ball size stamped on the rack-piston and install the next size larger balls to increase the preload or the next size smaller balls to decrease the preload; black balls need not be replaced unless they are defective. A change of one ball size will change the preload approximately 1 in. lb.

NOTE: If no number is apparent, the ball size is number 7.

f. Remove the torque wrench and valve and shaft assembly.

2. Thread the worm out of the rack-piston, remove ball return guide clamp, ball guide and balls.

3. If necessary to replace the teflon oil seal and "O" ring remove at this time.

Cleaning and Inspection

1. Wash all parts in clean solvent and dry with compressed air.

2. Inspect the worm and rack-piston grooves and all the balls for scoring. If either the worm or rack-piston needs replacing, both must be replaced as a matched assembly.

3. Inspect ball return guide halves, making sure that the ends where the balls enter and leave the guides are not damaged.

4. Inspect lower thrust bearing and washers for scores or excessive wear. If any of these conditions are found, replace the thrust bearing and washers.

5. Inspect rack-piston teeth for scores or excessive wear. Inspect the external ground surfaces for wear, scoring or burrs.

Assembly

1. If the teflon oil seal and "O" ring was removed, install a new "O" ring and seal lubricated with Hydra-Matic oil in the groove of the rack-piston.

2. Slide the worm all the way into the rack-piston. It is not necessary to have the thrust bearing assembly on the worm at this time.

3. Turn the worm until the worm groove is aligned with the lower ball return guide hole. (Fig. 4-269)

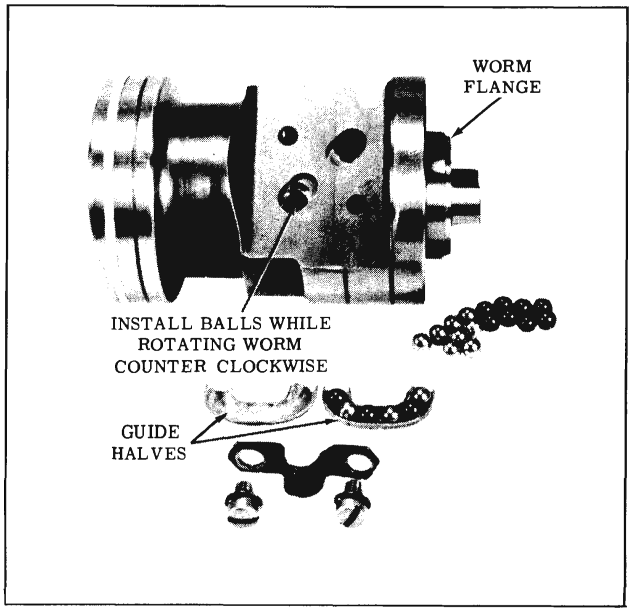


Fig. 4-269 Installing Balls in Rack-Piston

4. Lubricate the balls with Hydra-Matic oil, then feed 16 balls into the rack-piston, while slowly rotating the worm counterclockwise.

IMPORTANT: The black balls are .0005" smaller than the silver balls. The black and silver balls must be installed alternately into the rack-piston and return spring.

5. Alternately install 6 balls into the return guide and retain with petrolatum. Install balance of balls into piston alternating black and silver. It will be necessary to rotate worm while installing balls. Install the return guide assembly onto the rack-piston. Install the return guide clamp and tighten the 2 clamp screws 8 to 12 ft. lbs.

6. Check the ball preload if a new set of balls were installed. Refer to RACK-PISTON -- DISASSEMBLY, Step 1; Page 4-130.

7. Insert Bearing Retainer Tool J-7539 into the rack-piston, then while holding tool tightly against end of worm, thread worm out of the rack-piston.

PITMAN SHAFT NEEDLE BEARING AND SEALS

Removal

1. If pitman shaft seals ONLY are to be replaced, remove the seal retaining ring and outer steel washer, then pry out the outer seal. Remove the inner steel washer, then pry out the inner seal. (Fig. 4-270)

2. If pitman shaft needle bearing replacement is necessary, remove with Tool J-6278.

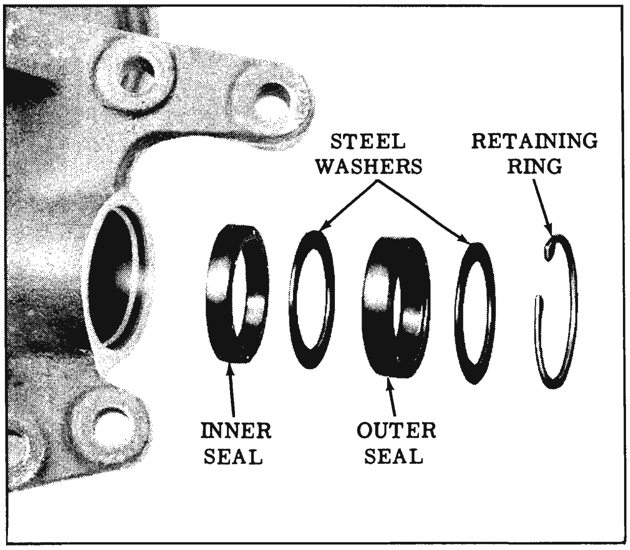


Fig. 4-270 Pitman Shaft Seals

Installation

1. If the pitman shaft needle bearing was removed, place Adaptor J-6278-2 over Tool J-6278; slide the new needle bearing on the tool with the bearing manufacturer's identification against the adaptor and drive the bearing into the housing until adaptor bottoms in housing. (Fig. 4-271)

2. Coat the lips of the oil seals with special lubricant (Part No. 567196).

3. Install the pitman shaft oil seals as follows:

   a. Place Adaptor J-6278-2 over Tool J-6278, then install the outer seal, inner steel washer, and inner seal with the lips of the seals facing away from the adaptor.

   b. Drive the seals into the housing until the top of Adaptor J-6278-2 is flush with the housing. (Fig. 4-272)

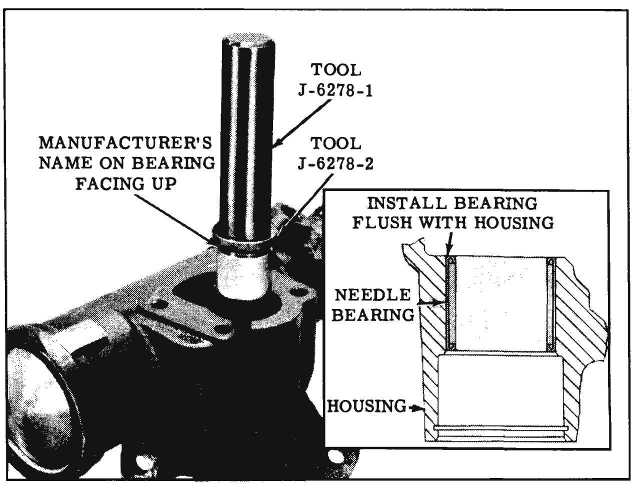


Fig. 4-271 Installing Pitman Shaft Bearing

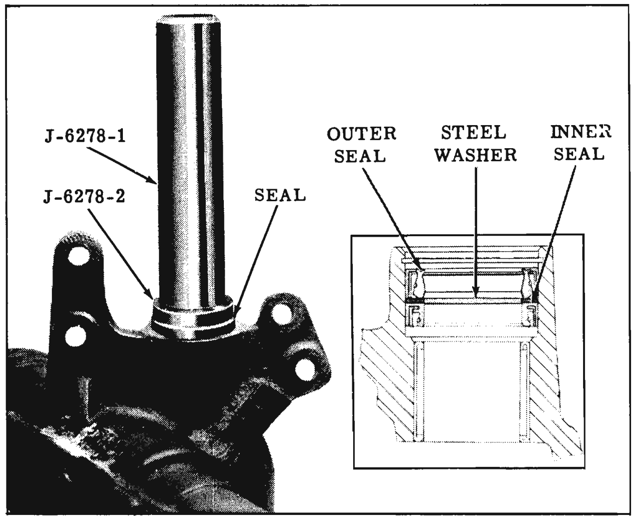


Fig. 4-272 Installing Pitman Shaft Seals

   c. Remove the tool and adaptor, then install the outer steel washer and seal retaining ring. The retaining ring will not seat in the groove at this time.

   d. Reinsert Tool J-6278 with Adaptor J-6278-2 and continue driving the seals until the retaining ring seats in its groove (Refer to Inset, Fig. 4-272), then remove the tool adaptor.

STEERING GEAR ASSEMBLY

1. Lubricate the worm, lower thrust bearing and the two thrust washers with Hydra-Matic oil, then install one thrust washer, the bearing, and the other thrust washer over the end of the worm. (Fig. 4-273)

2. Lubricate the valve body teflon rings and a new lower shaft cap "O" ring with petrolatum. Install the lower shaft cap "O" ring in the valve body so it is seated against the lower shaft cap. Align the NARROW NOTCH in the

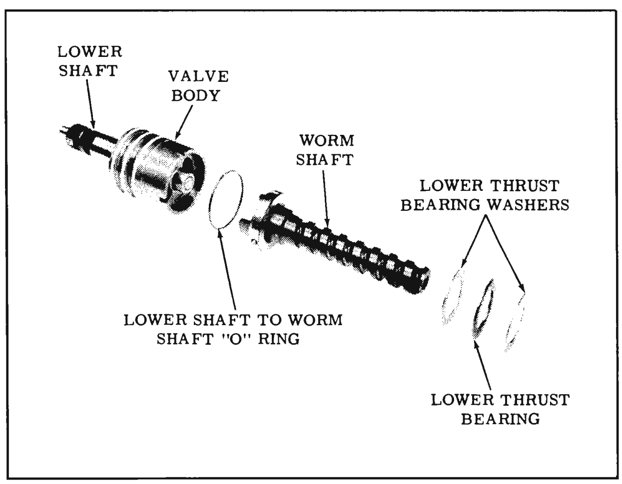


Fig. 4-273 Worm and Valve Body Assembly

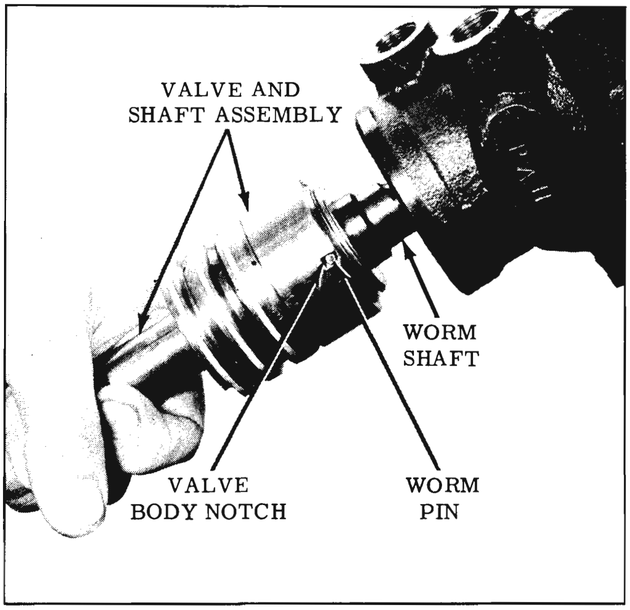


Fig. 4-274 Valve to Worm Alignment

valve body with the pin in the worm, then install the valve and shaft assembly in the gear housing. (Fig. 4-274) Apply pressure to the VALVE BODY when installing. If pressure is applied to the lower shaft during installation, the shaft may be forced out of the valve body. (Fig. 4-275)

3. Assemble worm to valve body.

4. With the valve bore of gear housing horizontal, insert the worm and valve assembly into the housing.

NOTE: The valve body is properly seated when the oil return hole in the housing is entirely uncovered. (Fig. 4-276)

5. Lubricate a new adjuster plug "O" ring with petrolatum and install in groove on adjuster

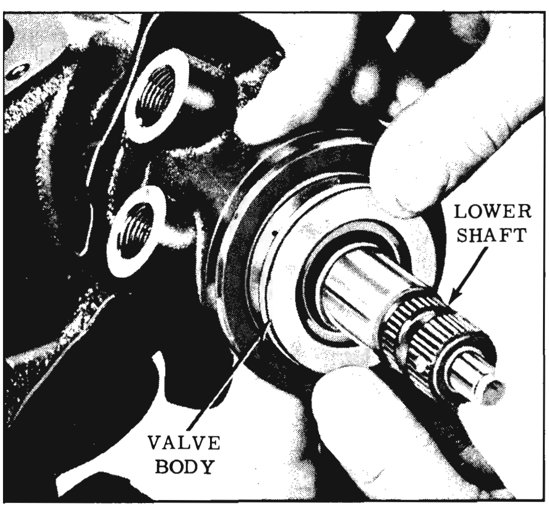


Fig. 4-275 Installing Valve Body

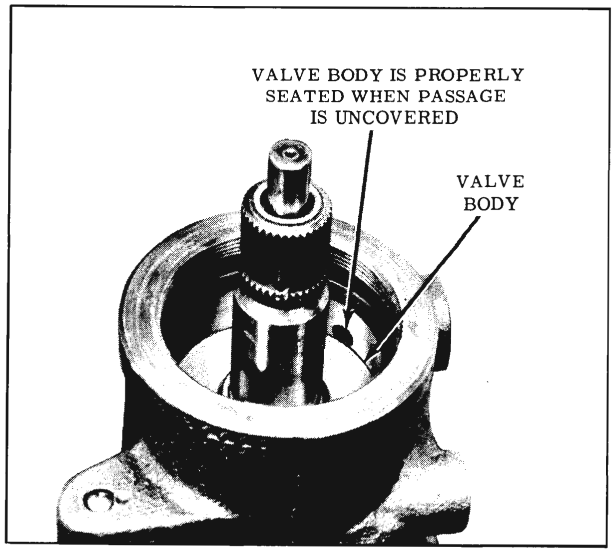


Fig. 4-276 Valve Body Position in Housing

plug. Place Seal Protector J-6222 over lower shaft, then install the adjuster plug assembly in the housing until it seats against the valve body. (Fig. 4-277) Remove Seal Protector. Do not adjust the thrust bearing preload at this time.

6. Install the rack-piston as follows:

   a. Lubricate the rack-piston teflon seal with petrolatum.

   b. Position Seal Compressor J-8947 against the shoulder in the housing.

   c. With Ball Retainer J-7539 in place in the rack-piston, push the rack-piston into the

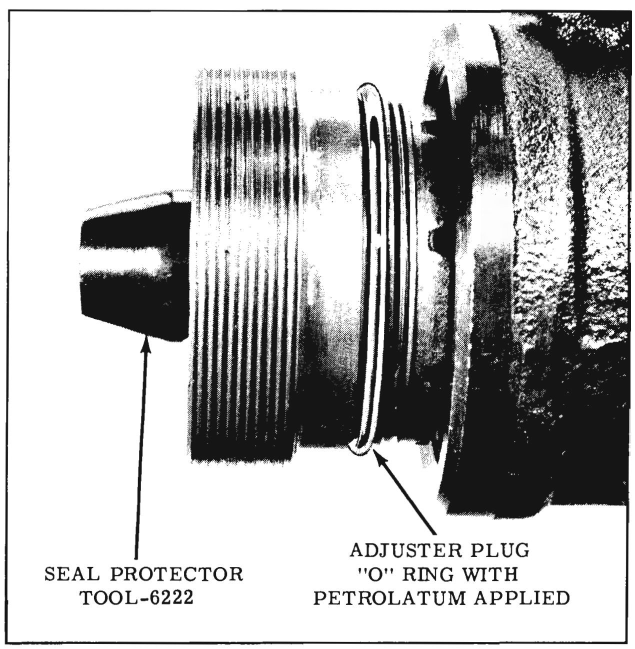


Fig. 4-277 Installing Adjuster Plug

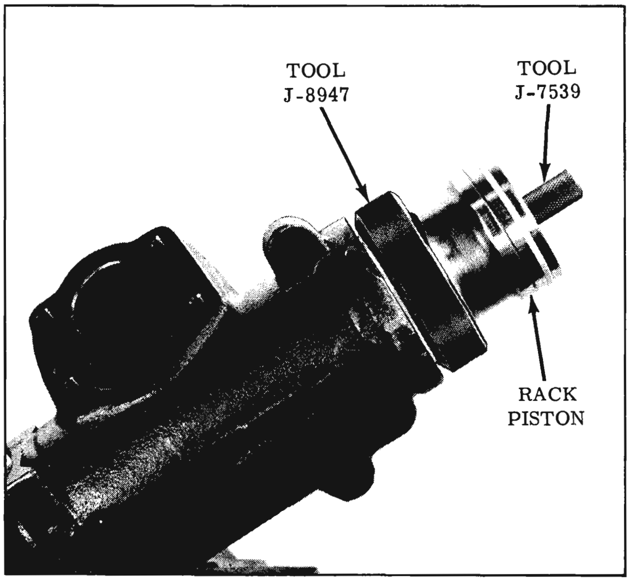


Fig. 4-278 Installing Rack-Piston

housing until Tool J-7539 contacts the center of worm. (Fig. 4-278)

d. Turn the lower shaft clockwise with a 3/4" twelve point socket or box end wrench to thread the rack-piston onto the worm while holding Tool J-7539 against the end of the worm.

e. When the rack piston is completely threaded on the worm, remove Ball Retainer J-7539 and Seal Compressor J-8947.

7. Install the rack-piston plug in the rack-piston.

8. Install a new housing end cover "O" ring and lubricate it with petrolatum, then install the end cover and retaining ring.

9. Install the pitman shaft and side cover as follows:

a. Install a new "O" ring in the pitman shaft side cover and retain with petrolatum.

b. Turn the lower shaft until the rack-piston teeth are centered in the pitman shaft opening, then install the pitman shaft and side cover so that the center tooth of the pitman shaft engages the center groove of the rack-piston.

c. Install the side cover bolts and lock washers and tighten 30-35 ft. lbs.

10. Adjust the thrust bearing preload as follows:

a. Using Spanner Wrench J-7624, tighten adjuster plug up snug (clockwise). Back adjuster plug off 1/8 turn and measure valve drag.

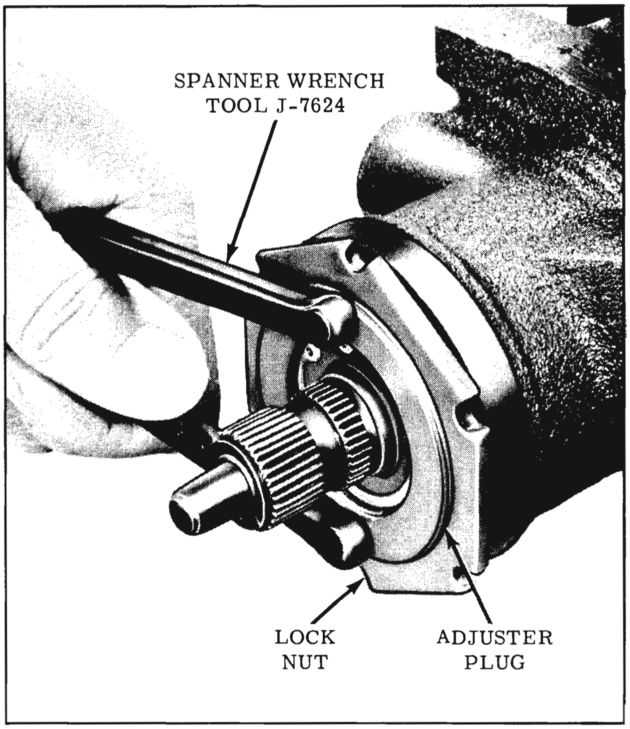


Fig. 4-279 Preload Adjustment

NOTE: Selective fit of worm, rack-piston nut and balls is designed to obtain 1/2 to 3 in. lbs. measured on center of worm at initial assembly. After wear-in, torque may be 0 to 3 in. lbs.

b. Adjust thrust bearing preload to obtain 1/2 to 2 in. lbs. in excess of valve assembly drag. Tighten adjuster plug lock nut 50-110 ft. lbs. using Spanner Wrench J-972-A while holding adjuster plug in position with Tool J-7624. (Fig. 4-279)

Total thrust bearing preload and seal drag should not exceed 7 in. lbs.

11. Adjust the over-center preload as follows:

a. Make sure the over-center adjusting screw is backed all the way out.

b. Install an inch-pound torque wrench with a 3/4", 12 point socket on the lower shaft splines.

c. Rotate the lower shaft from one stop to the other. Count the number of turns and locate the center of travel, then check the combined ball and thrust bearing preload by rotating the torque wrench through the center of travel. Note the highest reading.

d. Tighten the pitman shaft over-center adjusting screw until the torque wrench reads 3-6 in. lbs. higher than the reading. The total reading should not exceed 14 in. lbs.

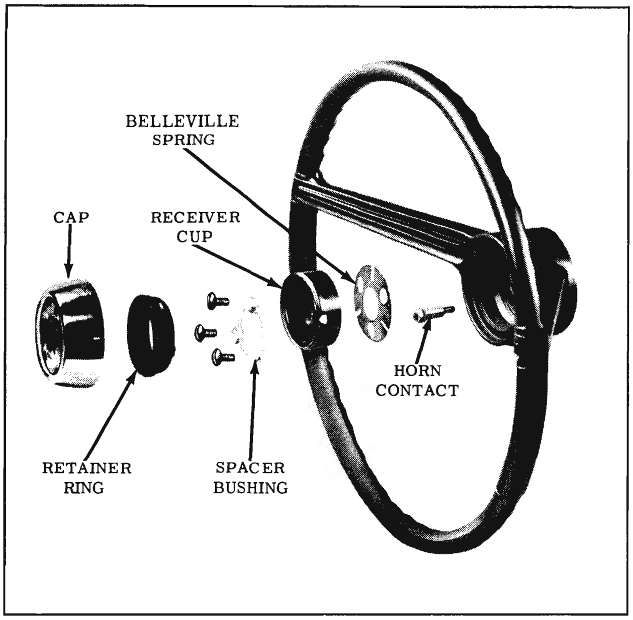


Fig. 4-280 Standard Steering Wheel

e. While holding the adjusting screw, tighten the lock nut 20-30 ft. lbs. and recheck the adjustment.

12. Position the coupling flange onto the lower shaft, then install the flange attaching bolt and lock washer. Position the flange so that there is 3/4" between the adjuster lock nut and the coupling to steering flange bolt heads. Tighten the coupling flange attaching bolt 20-35 ft. lbs.

STEERING WHEEL AND STEERING COLUMN

STEERING WHEEL

REMOVAL

1. The standard wheel cap is held in place by a

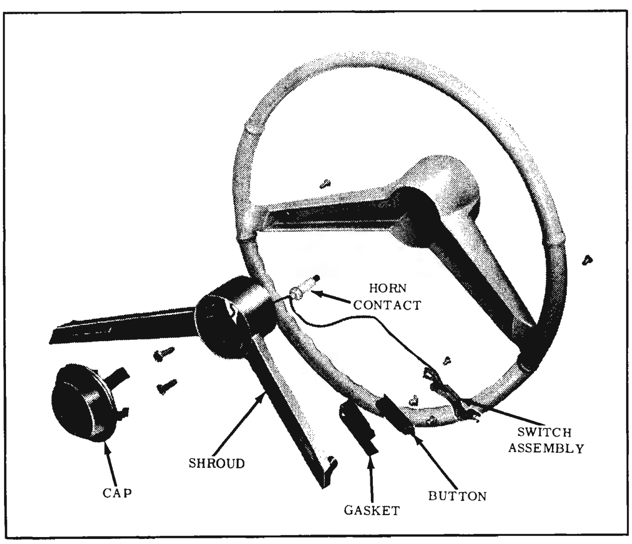


Fig. 4-281 Deluxe Steering Wheel

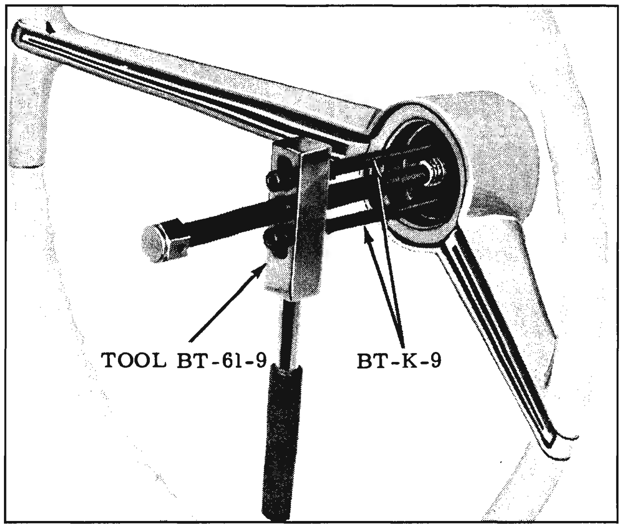


Fig. 4-282 Pulling Steering Wheel

rubber retainer ring. To remove the cap, gently pry the cap from the wheel. (Fig. 4-280) The deluxe wheel cap is held in place by spring steel clips. To remove the cap, gently pry the cap from the wheel. (Fig. 4-281)

2. Disconnect horn wire at harness.

3. Remove hex nut and flat washer from steering column shaft.

4. Using Tool BT-61-9, pull steering wheel from steering shaft. (Fig. 4-282)

INSTALLATION

1. Place steering wheel on splined steering shaft with alignment marks in line. (Fig. 4-283)

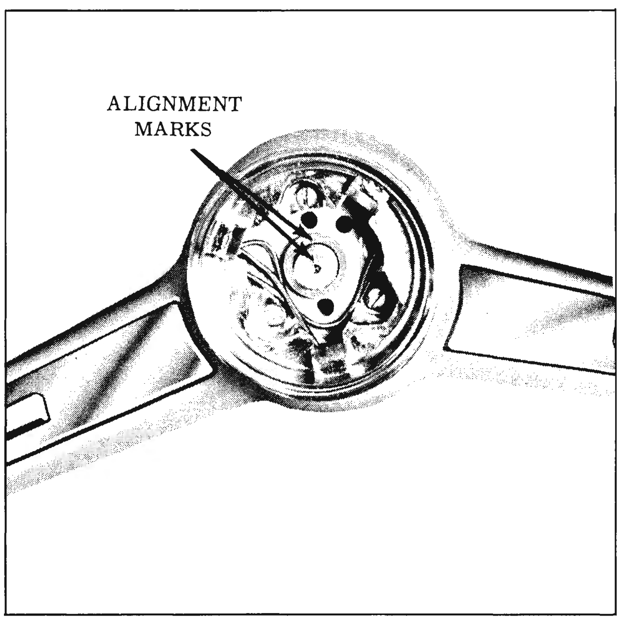


Fig. 4-283 Steering Wheel to Shaft Alignment

2. Install washer and nut on steering shaft. Torque nut 20-30 ft. lbs. and stake nut to steering shaft.

3. Reconnect horn wire to harness.

4. Install steering wheel cap. To facilitate installation of standard wheel cap over the rubber retainer ring, use a small amount of water only to lubricate retainer ring.

   CAUTION: Do not hammer on cap since this may distort the receiver cup which may result in a continually blowing horn.

STEERING SHAFT UPPER BEARING

REMOVAL

1. Remove steering wheel.

2. Disconnect horn wire from chassis wiring harness.

3. Lift horn contact assembly from steering shaft.

4. Remove retainer which holds bearing assembly in recess of turn signal actuator assembly.

5. Remove upper bearing "E" ring retainer, washer and spring.

6. Lift upper bearing from actuator assembly recess.

INSTALLATION

1. Position upper bearing in actuator assembly (flange up) with one notch of bearing race aligned with opening inside of bore of bearing recess as shown in Fig. 4-284. Notches in bearing flange must also be aligned on lug in actuator.

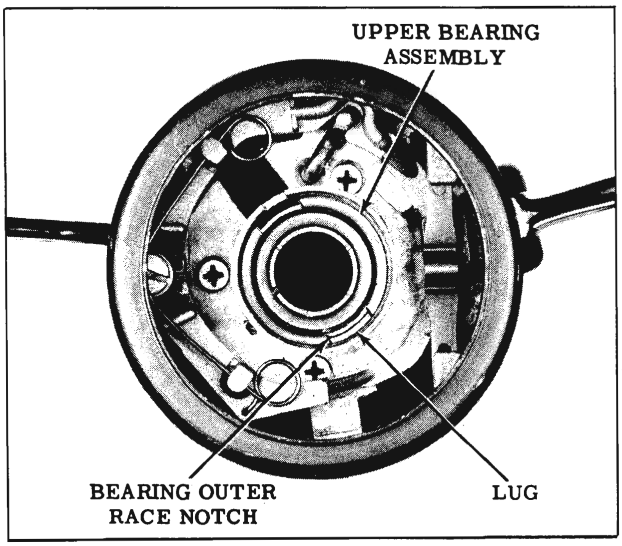


Fig. 4-284 Upper Bearing Position

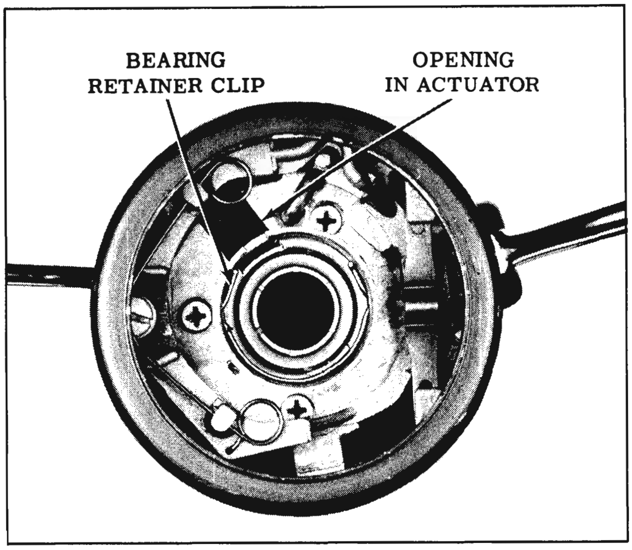


Fig. 4-285 Bearing Retainer Position

2. Install bearing retainer clip in the actuator assembly aligning retainer as shown in Fig. 4-285.

3. Install upper bearing spring, washer and "E" ring retainer on steering shaft.

4. Install horn contact plate guiding the horn wire through the actuator housing and down through the mast jacket as shown in Fig. 4-286.

5. Reconnect horn wire to harness.

6. Install steering wheel following steps 1 through 4 under STEERING WHEEL INSTALLATION, Page 4-135.

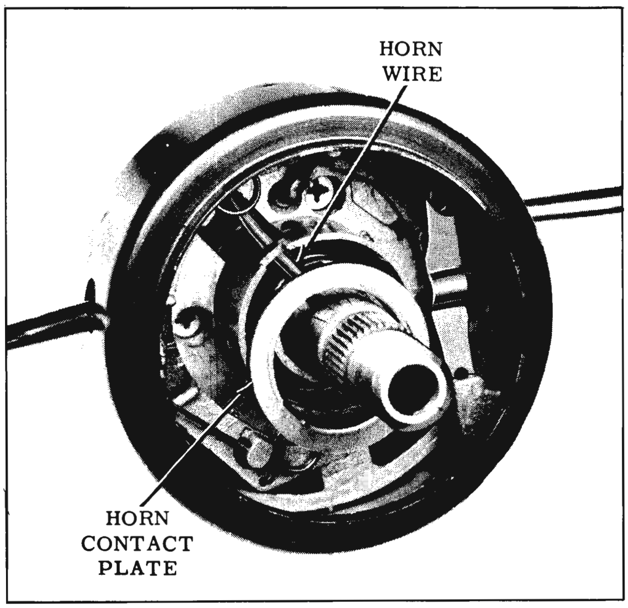


Fig. 4-286 Horn Contact Wire Installation

TURN SIGNAL ACTUATOR ASSEMBLY

REMOVAL

1. Remove steering wheel assembly, horn contact, turn signal actuator plate, and upper bearing.
2. Remove three phillips head screws from actuator retainer anchor plate.
3. Lift turn signal actuator assembly off of mast jacket.

STEERING SHAFT COUPLING

If the manual or power steering shaft coupling is to be removed, it will be necessary to raise the steering shaft in the mast jacket to provide clearance between the steering column shaft and the steering gear worm shaft for removal of the coupling.

MANUAL STEERING COUPLING

REMOVAL

1. Remove the steering shaft coupling clamp bolt and slide clamp off coupling housing onto steering gear worm shaft. Mark steering shaft in line with slot at coupling clamp surface.
2. Disconnect horn wire from harness.
3. Remove the horn cap from center of steering wheel.
4. Remove steering wheel to steering shaft nut and washer.
5. Using Tool BT-61-9, pull the steering wheel from the steering shaft.
6. Pull the horn contact plate up out of recess in actuator assembly sufficient to give clearance for removal of upper bearing to actuator assembly retaining clip.
7. Using a small screwdriver pry the upper bearing to actuator assembly retaining clip out of the actuator housing. (Fig. 4-285)
8. Pull steering shaft up out of steering column and block shaft up approximately two inches. This will be sufficient clearance to remove the coupling from the steering shaft or the steering gear from the suspension cross bar.
9. Remove coupling seal retaining ring. (Fig. 4-287)

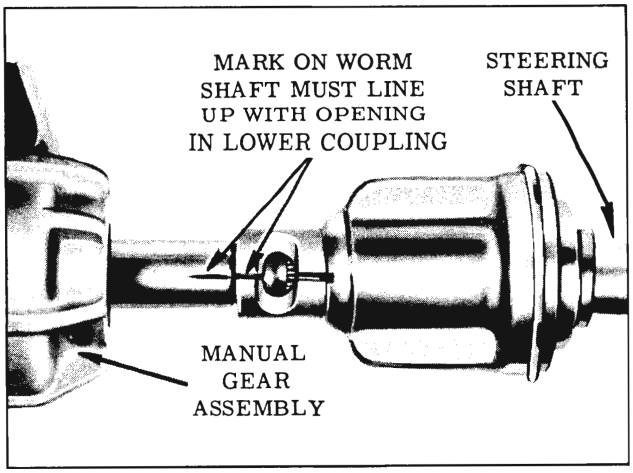


Fig. 4-287 Coupling to Steering Shaft Position

10. Position steering shaft so that steering shaft coupling pivot pin is in the horizontal plane. This will reduce the possibility of the coupling ball pivot bearings falling from the pivot pin.
11. Slide the coupling housing off shaft, holding one hand under coupling to catch internal parts if they should fall out of place.
12. Remove the anti-click spring and the two coupling ball pivot bearings from pivot pin.
13. Remove steel washer from shaft.
14. Clean and inspect parts for damage or abnormal wear.

INSTALLATION

1. Lubricate the coupling parts and pack the coupling housing with aluminum soap type chassis lubricant.
2. Position the steel seal retaining washer on the steering shaft above the pivot bearings. (Fig. 4-288) Install the pivot bearings and the anti-click spring and retain with grease.

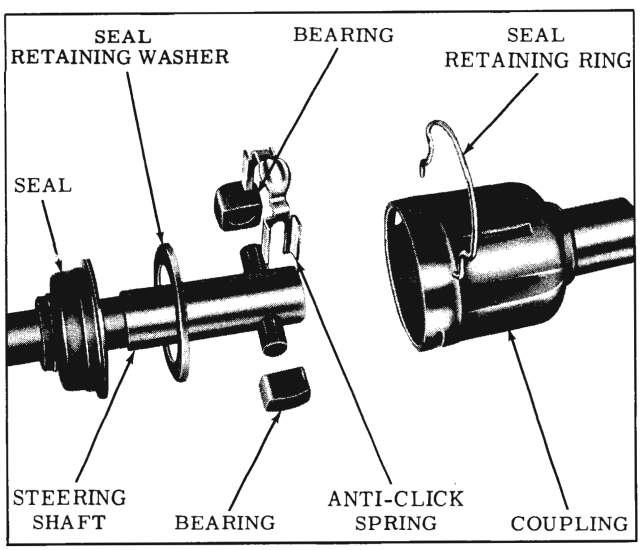


Fig. 4-288 Coupling Assembly

3. Install the pivot bearings on the pivot pin and align the two machined surfaces with the sides of the pivot groove. Install the coupling housing on the shaft with the slot of coupling clamp surface aligned with mark of steering shaft. Insert the rubber seal into the bore of the coupling housing and retain with the retaining ring.

4. Lower the steering shaft (guide upper bearing into actuator assembly) and connect the coupling to the worm shaft matching up the alignment marks on the worm shaft with slot of clamp surface of coupling. (Fig. 4-287)

5. Place the coupling clamp into position on the coupling, but do not tighten the clamp.

6. Install the upper bearing to actuator assembly retainer clip and place the horn contact plate in the actuator assembly.

7. Install the steering wheel on the steering shaft and install the washer and nut. Torque the nut 20 to 30 ft. lbs. and stake nut to steering shaft.

8. Check operation of coupling by turning steering wheel. There should be no binding or misalignment of coupling.

9. Install the horn cap and reconnect the horn wire to chassis wiring harness.

10. Tighten coupling clamp bolt and torque 35 to 40 ft. lbs.

11. If steering gear mounting bolts were loosened, retighten to 45 to 60 ft. lbs.

POWER STEERING COUPLING

REMOVAL

1. Remove the two flexible coupling to steering shaft attaching bolts.

2. Follow Steps 2 through 8 in the MANUAL STEERING COUPLING REMOVAL, on Page 4-137.

3. Remove the flexible coupling to worm shaft clamp bolt.

4. Pull the flexible coupling off of the worm shaft.

INSTALLATION

1. Place the flexible coupling on the worm shaft and install the clamp bolt. Torque 25-35 ft. lbs. Coupling will go on worm shaft in only one position.

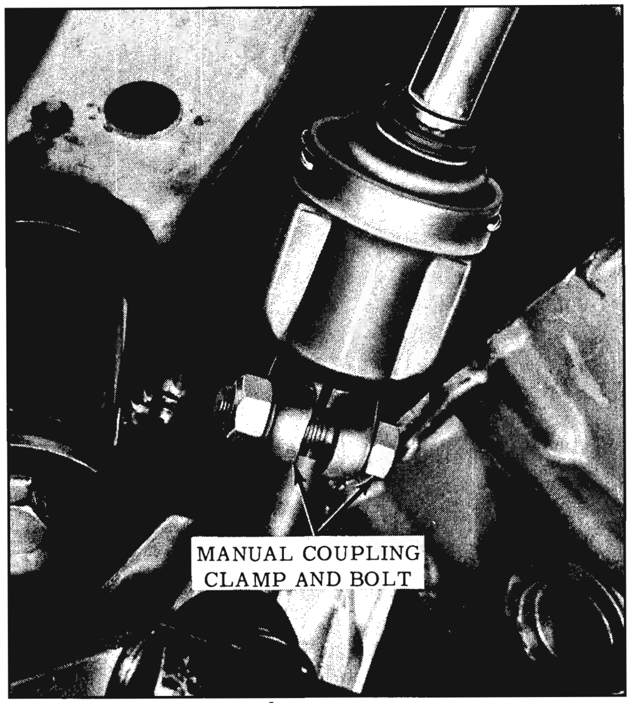


Fig. 4-289 Manual Steering Gear Coupling

2. Position the steering shaft into the actuator, then follow Steps 6 through 8 in the MANUAL STEERING COUPLING INSTALLATION, on Page 4-137.

STEERING COLUMN

REMOVAL

1. Disconnect steering shaft from steering gear at coupling.

   On manual steering equipped cars, loosen the steering shaft to gear worm shaft coupling clamp bolt as shown in Fig. 4-289.

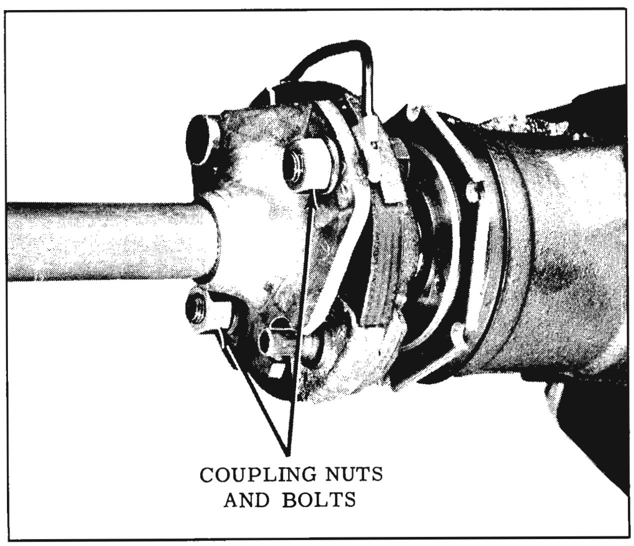


Fig. 4-290 Power Steering Gear Coupling

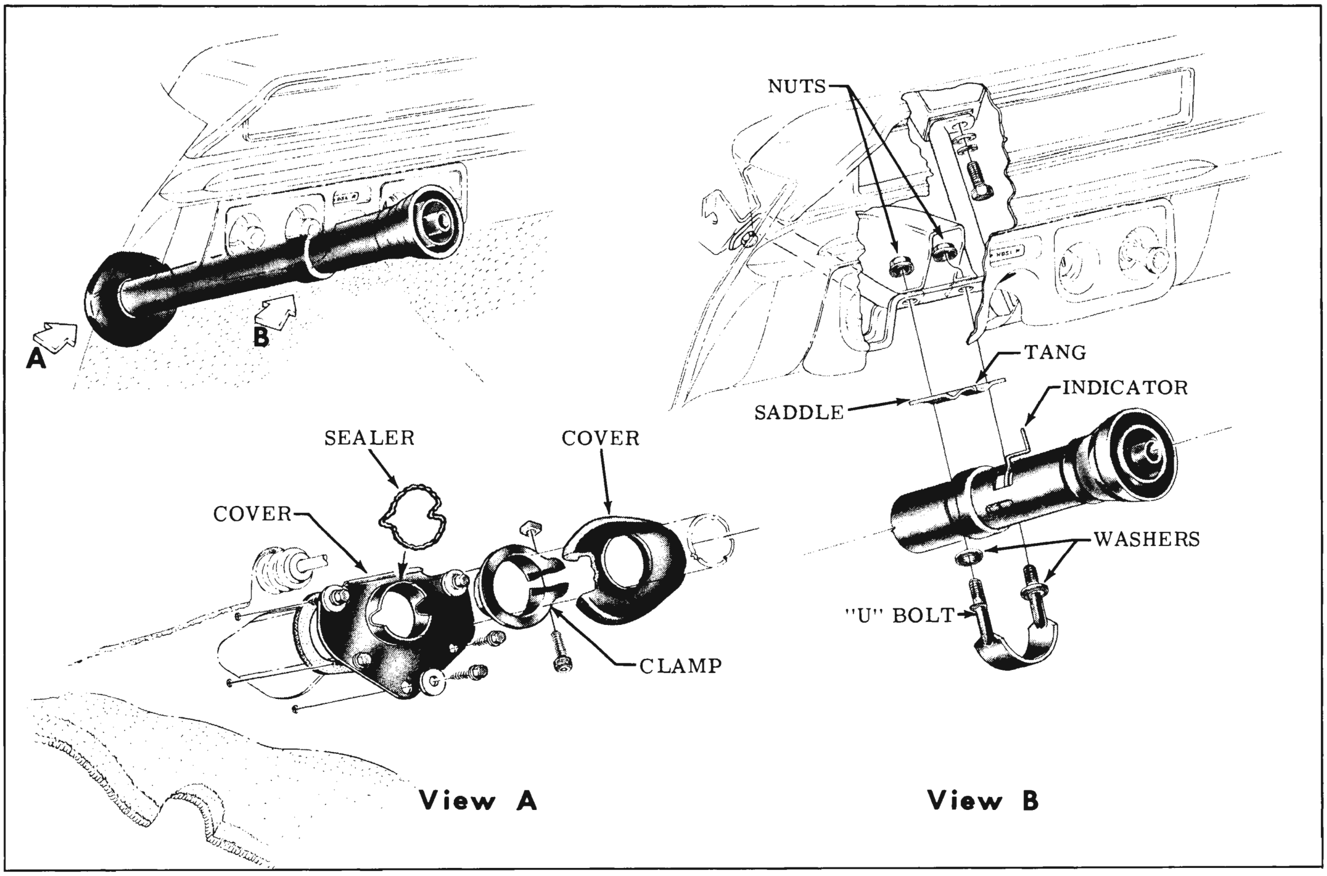


Fig. 4-291 Steering Column Installation

On power steering equipped cars, remove the two flexible coupling bolts and nuts as shown in Fig. 4-290.

2. Disconnect shift levers.

3. Disconnect horn wire, turn signal switch, and neutral safety switch (Hydra-Matic) from chassis wiring harness.

4. Remove cover to floor pan attaching screws. (Fig. 4-291)

5. Remove mast jacket to instrument panel "U" bolt clamp, Fig. 4-291, and remove steering column assembly.

   CAUTION: Use care when lowering column from instrument panel to avoid damage to indicator needle on Hydra-Matic transmission equipped cars.

INSTALLATION

1. Place column assembly in position with tang on saddle, engaged in column. (Fig. 4-291)

2. Install "U" bolt and nuts but do not tighten.

3. On manual steering equipped cars, adjust column up or down to obtain 4-3/4" as shown in Fig. 4-292. Coupling must align with

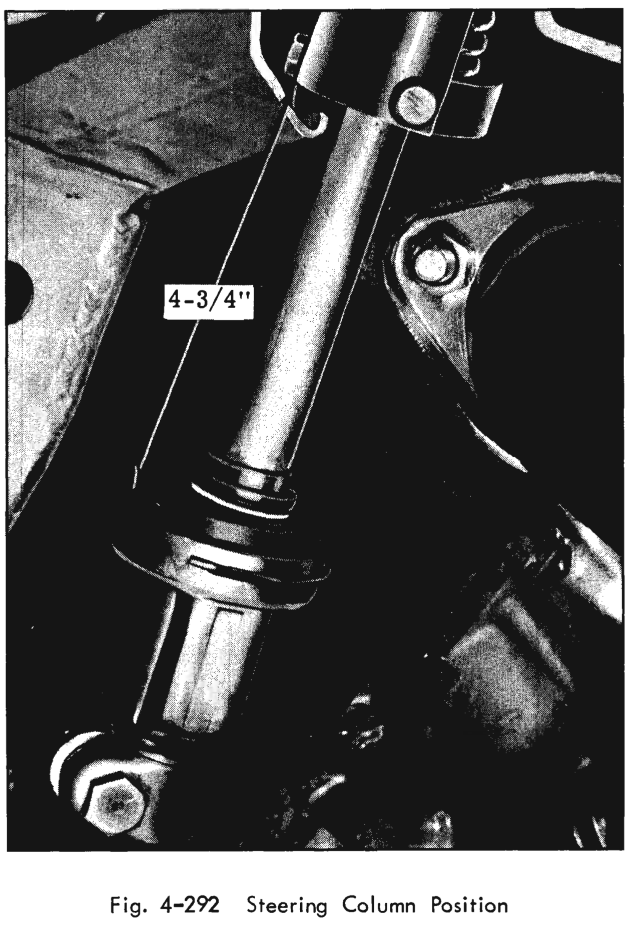


Fig. 4-292 Steering Column Position

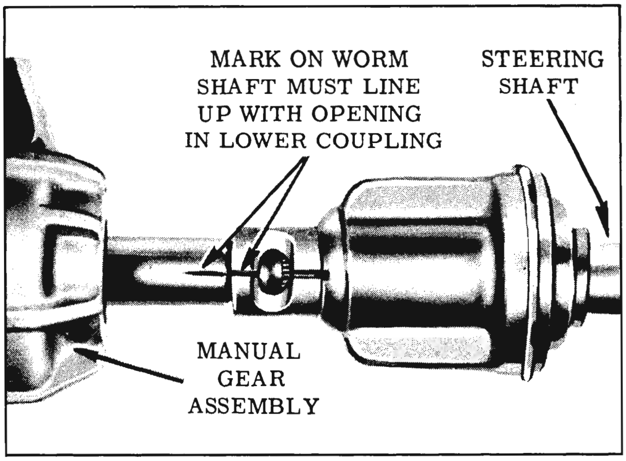


Fig. 4-293 Coupling to Steering Shaft Alignment

alignment mark on shaft. (Fig. 4-293) On power steering equipped cars, position the steering column to the flex coupling placing the guide pins in their corresponding grooves.

4. Attach column cover to floor pan. Torque screws 3-5 ft. lbs.

5. Torque column to dash "U" bolt nuts 8-12 ft. lbs.

DISASSEMBLY (Synchromesh)

With column removed from car and steering wheel removed from column, proceed with following steps.

1. Remove turn signal switch from mast jacket.

2. Slide horn wire grommet retainer from mast jacket.

3. Lift horn contact plate from shaft and pull horn wire up through mast jacket.

4. Remove turn signal switch actuator pin, spring and rod.

5. Remove upper bearing thrust spring "E" ring retainer and spring.

6. Slide shaft out of lower end of steering column assembly.

7. Remove upper bearing to actuator assembly retainer clip.

8. Lift upper bearing out of actuator assembly.

9. Remove the three turn signal actuator assembly retaining screws.

10. Lift turn signal actuator from mast jacket and remove thrust washer.

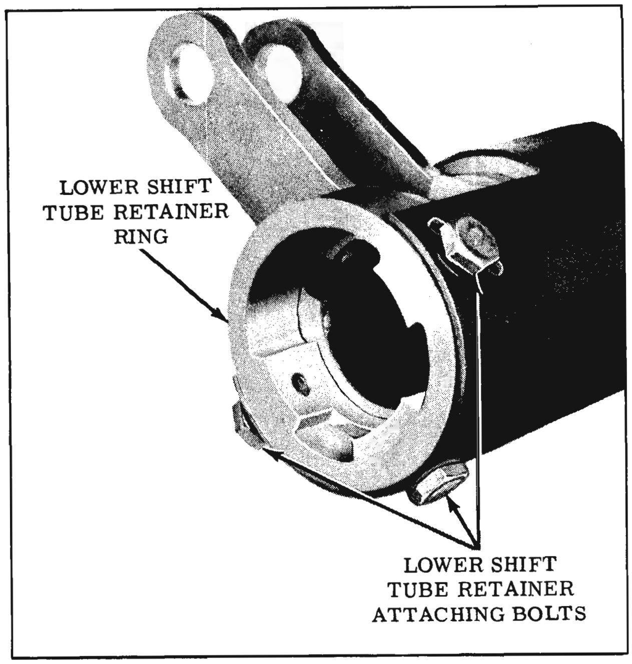


Fig. 4-294 Lower Shift Tube Retainer

11. Remove turn signal actuator lock plate from mast jacket.

12. Drive out shift lever pivot pin with a suitable drift. Support shifter bowl to prevent breakage.

13. Remove shift lever and anti-rattle spring.

14. Slide shifter bowl from shift tube.

15. Remove nylon washer, wave washer and shift tube spacer from shift tube.

16. Remove (3) bolts from lower shift tube retainer. (Fig. 4-294)

17. Slide shift tube out of bottom of the mast jacket assembly.

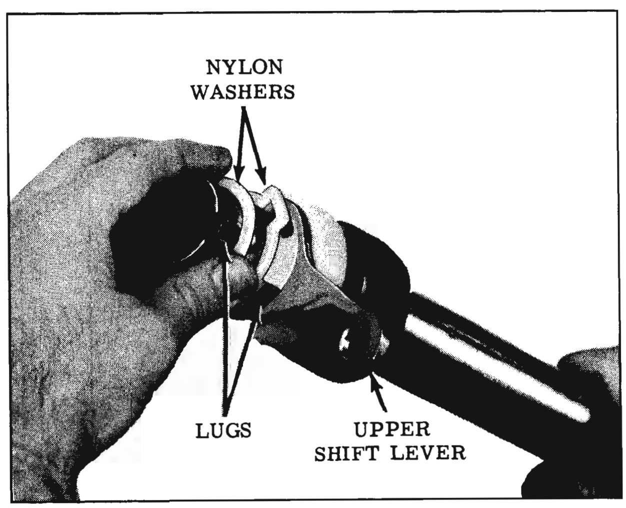


Fig. 4-295 Removing Upper Shift Lever

18. Slide lower shift lever from shift tube.

19. Push the nylon bearing onto the shift tube far enough to clear the second lug and rotate the bearing so that the bearing holds the spring in compression. (Fig. 4-295)

20. Remove the two nylon washers and the upper shift lever by guiding them over the locating lugs on the shift tube.

21. Compressing the spring with the nylon bearing, rotate the bearing to align the slot in the bearing and the lug on the shift tube and allow the spring to expand. Remove the bearing, spring and spring stop washer.

If manual steering coupling is to be disassembled, refer to MANUAL STEERING COUPLING, Page 4-137.

ASSEMBLY (Synchromesh)

1. Slide spring stop washer onto shift tube until washer seats against the shoulder on the shift tube.

2. Slide thrust spring onto shift tube.

3. Slide nylon bearing onto shift tube guiding it around the locator bosses. Push bearing onto the shaft far enough to compress the spring and rotate the bearing so that the second locator boss holds the bearing and spring in place. (Fig. 4-296)

4. Slide the upper shift lever onto the shift tube so the flange is nearest the lower end of the column assembly.

5. Slide one nylon washer onto the shift tube engaging the lug in the notch on the lever flange. (Fig. 4-297)

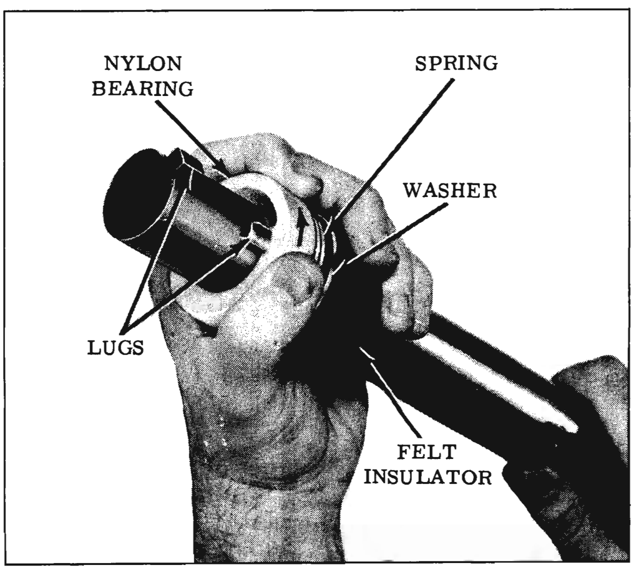


Fig. 4-296 Installing Nylon Bearing

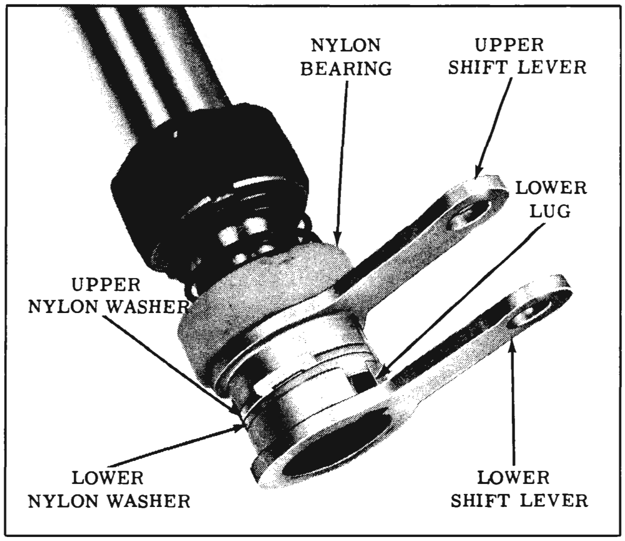


Fig. 4-297 Lever to Shift Tube Position

6. Slide the second nylon washer onto the shift tube with the locating lug toward the bottom of the column. (Fig. 4-297)

7. Slide the lower shift lever onto the shaft aligning the lever notch over the lower lug of the shift tube.

8. Position the lug of the lower nylon washer into notch of the lower shift lever and butt it against the lower shift tube lug.

9. Compressing the bearing thrust spring, rotate the bearing so that the groove of the bearing is over the upper lug of the shift tube and allow spring to seat bearing against the upper shift lever.

10. Insert shift tube into mast jacket, from the bottom end. The 3 bearing notches must align with the lugs in the mast jacket.

11. Insert lower shift tube retaining ring into mast jacket and install (3) retaining bolts finger tight. Position as shown in Fig. 4-294.

12. Position the upper shift tube washer over the shift tube and inside the mast jacket with the locating lug and notch aligned. (Fig. 4-298)

13. Install the wave washer and nylon washer over upper end of the shift tube.

14. Slide shifter bowl onto shift tube and over mast jacket aligning groove of shifter bowl with lug on shift tube.

15. Position anti-rattle spring onto shift lever and install shift lever in the shift tube. Install shift lever pivot pin. Support shifter bowl while installing shift lever pivot pin to minimize possibility of damage.

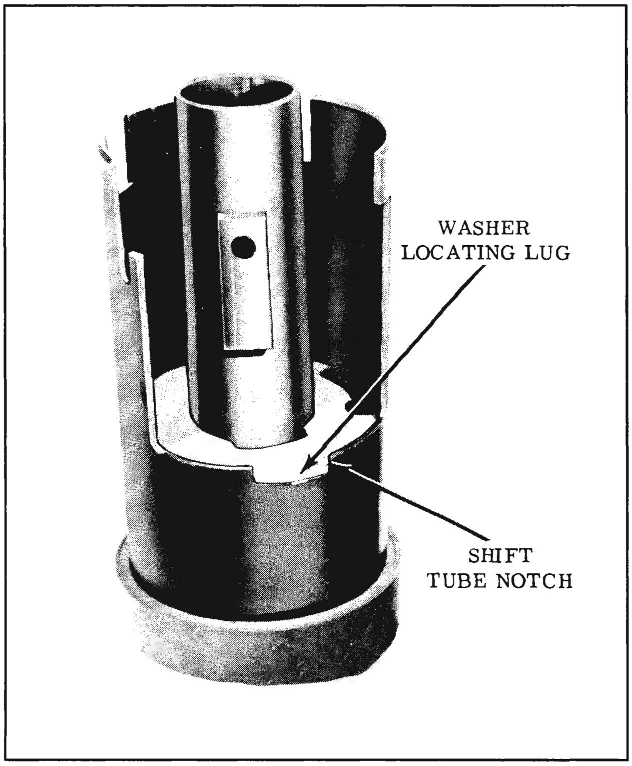


Fig. 4-298 Upper Shift Tube Washer

16. Position turn signal actuator lock plate over shift tube and inside the mast jacket. (Fig. 4-299) Position thrust washer on steering shaft and against tube.

17. Position turn signal actuator on column and install three retaining screws.

18. Install new upper bearing lower snap ring retainer onto the steering shaft and position in snap ring groove. (Fig. 4-300)

19. Insert steering shaft into the shift tube through the bottom end.

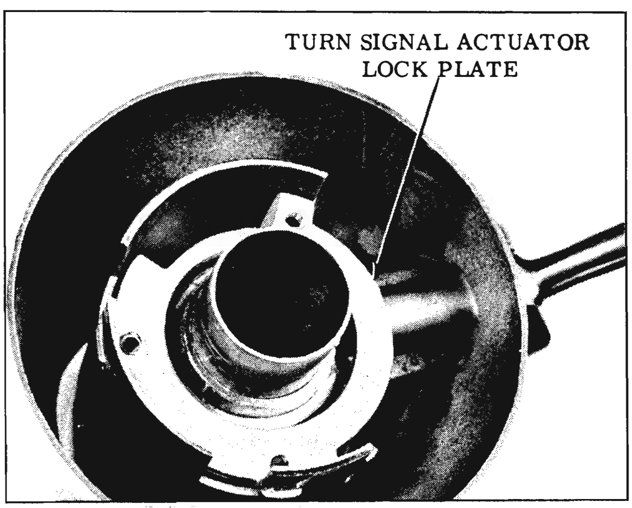


Fig. 4-299 Actuator Lock Plate Position

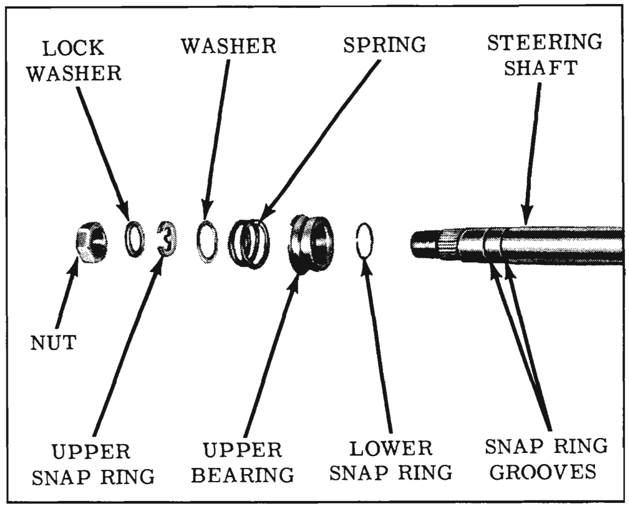


Fig. 4-300 Upper Shaft Assembly

NOTE: If manual steering coupling has been disassembled, position rubber grease seal on steering shaft before inserting shaft into shift tube.

NOTE: The felt seal between the steering shaft and shift tube at upper end of shift tube may have slid down on shift tube when steering shaft was removed. When installing steering shaft in shift tube, reposition upper felt seal near upper end of shift tube. Any suitable length of dowel or rod may be used to reposition seal.

20. Position bearing outer race notch over lug in inner diameter of the turn signal actuator frame. (Fig. 4-301)

21. Install upper bearing to actuator clip with opening aligned with slot in actuator to provide clearance for horn contact wire. (Fig. 4-302)

22. Slide upper bearing thrust spring, (large diameter against bearing) washer and upper

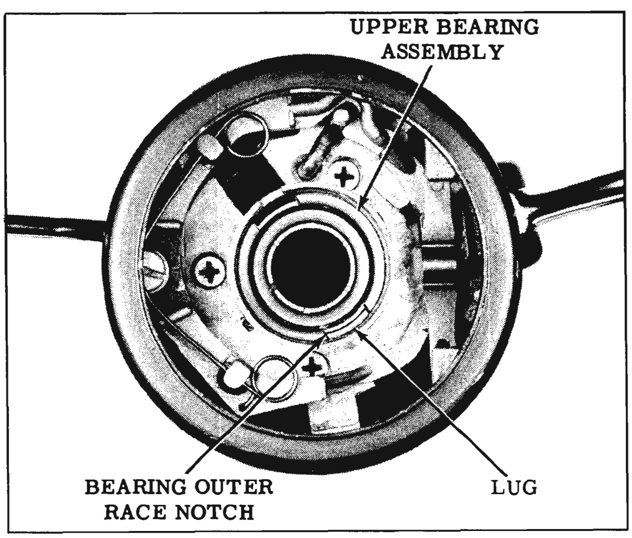


Fig. 4-301 Upper Bearing Position

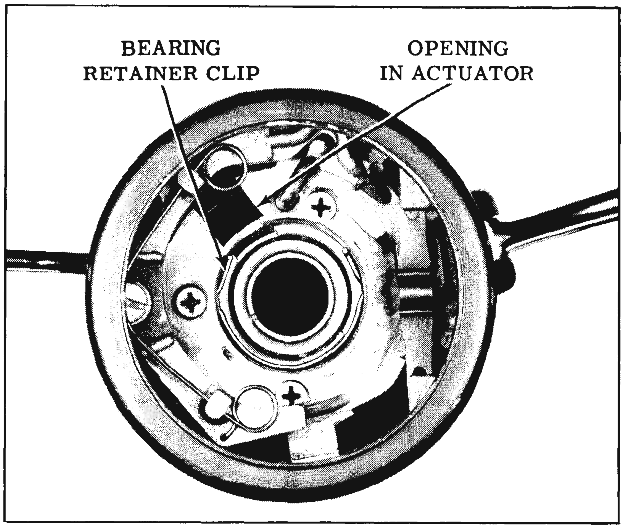


Fig. 4-302 Upper Bearing Retainer

"E" ring retainer onto steering shaft. (Fig. 4-300)

23. Install horn wire and contact plate.

24. Position turn signal actuator rod in jacket assembly.

25. Install rod spring and switch pin on rod.

    If manual steering coupling has been removed, refer to MANUAL STEERING COUPLING, Page 4-137.

26. Adjust clearance between lower shift lever and retaining ring to .005 inch by moving the retaining ring back and forth in slanted slot of mast jacket as shown in Fig. 4-294.

27. Tighten retainer ring attaching screws.

DISASSEMBLY (Hydra-Matic)

1. On Hydra-Matic equipped cars, remove the shift indicator cover by prying off from mast jacket. Loosen indicator set screw and remove shift indicator from shift tube.

2. To disassemble the steering column of a Hydra-Matic equipped car, follow steps 1 through 16 of the Synchromesh disassembly procedure. (Page 4-140)

3. Remove the shift tube spring and slide the shift tube out from the bottom of the mast jacket. It may be necessary to lightly tap shift tube from mast jacket.

ASSEMBLY (Hydra-Matic)

1. Slide the shift tube into the mast jacket at the bottom end of the mast jacket. The nylon bearing notches will fit mast jacket in only one position.

2. Position the shift tube spring over end of shift tube between the shift lever and retaining ring.

3. Install the shift tube retaining ring in bottom of mast jacket, compressing the spring. Position as shown in Fig. 4-294. Tighten shift tube retainer ring attaching bolts with bolts in uppermost position of slots.

4. Follow Steps 12 through 25 of the assembly procedure for a synchromesh equipped car (Page 4-141).

   NOTE: To reduce end play between the selector rod and the bushing in the shift lever, selective washers are available. Maximum end play should not exceed .020".

DIAGNOSIS OF MANUAL AND POWER STEERING

NOTE: Items identified by (M.S.) apply to manual steering only and items identified by (P.S.) apply to power steering only. All items not identified by (M.S.) or (P.S.) apply to both units.

HARD STEERING WHILE DRIVING OR POOR RETURN OF STEERING TO CENTER

CAUSE	CORRECTION
1. Tight steering shaft bearings.	1. Replace bearings.
2. Lower coupling flange rubbing against adjuster plug. (P.S.)	2. Loosen bolt and reposition for clearance.
3. Steering wheel rubbing against turn signal collar.	3. File edges of collar.
4. Steering adjustments tight.	4. Check adjustment by disconnecting pitman arm from gear. Readjust if necessary.
5. Tires not properly inflated.	5. Inflate to specifications.

DIAGNOSIS OF MANUAL AND POWER STEERING (Continued)

HARD STEERING WHILE DRIVING OR POOR RETURN OF STEERING TO CENTER (Continued)

CAUSE	CORRECTION
6. Tight steering linkage.	6. Lubricate or otherwise free up.
7. Tight over-center adjustment.	7. Adjust in car to specifications.
8. Thrust bearing adjustment too tight.	8. Remove gear and adjust to specifications.
9. Ball preload too tight. (P.S.)	9. Remove gear and change ball size as required.
10. Sticky spool valve. (P.S.)	10. Remove and clean valve or replace valve assembly.
11. Sticking pump flow control valve. (P.S.)	11. Remove valve and clean.
12. Steering shaft rubbing shift tube.	12. Align column.

CAR LEADS TO ONE SIDE OR THE OTHER

CAUSE	CORRECTION
1. Front end misaligned.	1. Adjust to specification.
2. Worn or damaged valve and shaft assembly. (P.S.) NOTE: If this is the cause, steering effort will be very light in direction of lead and heavy in opposite direction.	2. Replace valve and shaft assembly.

MOMENTARY INCREASE IN EFFORT WHEN TURNING WHEEL FAST TO THE RIGHT OR LEFT (P.S.)

CAUSE	CORRECTION
1. Low oil level in pump.	1. Check oil level in pump reservoir.
2. Pump belt slipping.	2. Tighten or replace belt.
3. Excessive internal leakage.	3. Replace rack-piston teflon seal and "O" ring, rack-piston end plug seal, and/or replace valve.

EXTERNAL OIL LEAKS
(WIPE GEAR THOROUGHLY AND MAKE SURE SOURCE OF LEAKAGE IS DETERMINED)

CAUSE	CORRECTION
1. Loose hose connections. (P.S.)	1. Tighten.
2. Damaged Hose. (P.S.)	2. Replace.
3. Side cover "O" ring seal. (P.S.)	3. Replace seal.
4. Pitman shaft seals.	4. Replace seals.
5. Housing end cover "O" ring seal. (P.S.)	5. Replace seal.
6. Adjuster plug seals. (P.S.)	6. Replace seals.
7. Torsion bar seal. (P.S.)	7. Replace valve and shaft assembly.
8. Pump reservoir "O" ring. (P.S.)	8. Replace "O" ring or reservoir damaged.

DIAGNOSIS OF MANUAL AND POWER STEERING (Continued)

GEAR NOISE (RATTLE OR CHUCKING)

CAUSE	CORRECTION
1. Loose over-center adjustment. NOTE: A slight rattle may occur on turns because of the increased lash off the "high point". This is normal and the lash must not be reduced below the specified limits to eliminate this slight rattle.	1. Adjust to specification.
2. Gear loose on crossbar.	2. Check gear to crossbar mounting bolts. Tighten bolts to specification.
3. Lack of lubricant at gear contact points.	3. Lubricate gear box to crossbar contact points.

GEAR NOISE ("HISSING" SOUND) (P.S.)

CAUSE	CORRECTION
There is some noise in all power steering systems. One of the most common is a "hissing" sound most evident at standstill parking. There is no relationship between the noise and performance of the gear. "Hiss" may be expected when steering wheel is at end of travel or when slowly turning at standstill.	Do not replace valve and shaft assembly unless "hiss" is extremely objectionable. Slight "hissing" is satisfactory and in no way affects steering. A replacement valve and shaft assembly may also exhibit slight noise and is not always a cure for the objection. Check clearance around safety drive bolts in flexible coupling. Be sure steering shaft and gear are aligned so the flexible coupling rotates in a flat plane and is not distorted as shaft rotates. Any metal to metal contact through the flexible coupling will transmit the valve "hiss" into the car.

EXCESSIVE WHEEL KICK-BACK OR LOOSE STEERING

CAUSE	CORRECTION
1. Lash in steering linkage.	1. Adjust parts affected.
2. Air in system. (P.S.)	2. Add oil to pump reservoir.
3. Excessive lash between pitman shaft and rack-piston.	3. Make over-center adjustment.
4. Loose thrust bearing adjustment.	4. Remove gear and adjust to specification.
5. Ball and worm preload incorrect. (P.S.)	5. Remove rack-piston and worm, and change balls to obtain specified preload.

STEERING WHEEL SURGES OR JERKS WHEN TURNING WITH ENGINE RUNNING, ESPECIALLY DURING PARKING (P.S.)

CAUSE	CORRECTION
1. Loose pump belt.	1. Adjust to specification.

DIAGNOSIS OF MANUAL AND POWER STEERING (Continued)

HARD STEERING WHEN PARKING

CAUSE	CORRECTION
1. Loose pump belt. (P.S.)	1. Adjust to specification.
2. Low oil level in reservoir. (P.S.)	2. Fill to proper level. If excessively low, check all lines and joints for evidence of external leakage.
3. Lack of lubrication in linkage or front suspension.	3. Add lubricant where needed.
4. Tires not properly inflated.	4. Inflate to recommended pressure.
5. Insufficient oil pressure. (P.S.)	5. If all of the above checks do not reveal the cause of hard steering, make the following tests of oil pressure.

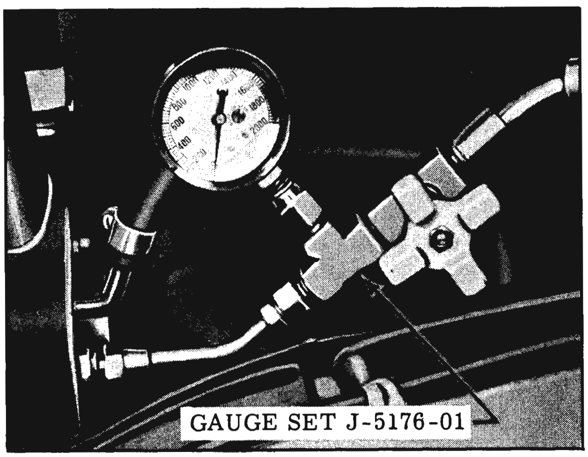


Fig. 4-303 Checking Pump Pressure

a. Disconnect the pressure line at pump, then install gauge set J-5176-01. (Fig. 4-303)

b. With engine at slow idle and gage valve open, note the oil pressure on the gage while turning steering wheel from one extreme position to the other. Especially note the maximum pressure which can be built up with the wheel held in either right or left extreme position.

CAUTION: Do not hold wheel in extreme position for an extended period of time because it will drastically increase the oil temperature and will cause undue wear on the pump.

c. With oil temperature between 150°F. and 170°F. (measured with a thermometer in the reservoir) oil pressure should not be less than 800 p.s.i. for satisfactory power steering operation.

d. If the maximum oil pressure is less than 800 p.s.i., it indicates trouble in the pump, hoses, steering gear, or a combination of these parts. To eliminate the hoses and gear, close the gage valve and quickly test pressure of the pump only with the engine at slow idle, then open the valve to avoid increasing oil temperature.

e. Comparing the maximum pressure obtained in these two tests will indicate source of trouble as follows:

(1) First test (step b) pressure low, and second test (step d) pressure normal - indicates faulty hoses or steering gear.

(2) First test (step b) and second test (step d) pressure equally low - indicates faulty oil pump.

DIAGNOSIS OF MANUAL AND POWER STEERING (Continued)

HARD STEERING WHEN PARKING (Continued)

CAUSE	CORRECTION
6. Low oil pressure due to restriction in hose. (P.S.)	6. Repair or replace as required.
7. Low oil pressure due to steering gear. (P.S.)	7. Remove steering gear for disassembly.
a. Pressure loss in cylinder due to worn rack-piston seal, damaged "O" ring or scored housing bore.	a. Inspect rack-piston seal and "O" ring and housing bore.
b. Leakage at valve rings, valve body to worm seal, rack-piston end plug seal.	b. Replace rings and seals.
c. Loose fit of spool in valve body or leaky valve body.	c. Replace valve and shaft assembly.

VALVE "SQUAWK" WHEN TURNING OR WHEN RECOVERING FROM A TURN (P.S.)

CAUSE	CORRECTION
1. Cut or worn dampener "O" ring on spool valve.	1. Replace dampener ring.
2. Loose or worn valve.	2. Replace valve and shaft assembly.

NO EFFORT REQUIRED TO TURN (P.S.)

CAUSE	CORRECTION
1. Broken torsion bar.	1. Replace valve and shaft assembly.

PUMP NOISE (P.S.)

CAUSE	CORRECTION
1. Loose belt.	1. Tighten belt.
2. Hoses touching other parts of car.	2. Adjust hose positions.
3. Low oil level.	3. Fill reservoir.
4. Air in the oil.	4. Locate source of air leak and correct.
5. Excessive back pressure caused by hoses or steering gear.	5. Locate restriction and correct.
6. Scored pressure plate.	6. Lap away light scoring. Replace heavily scored part.
7. Vanes not installed properly.	7. Install properly.
8. Vanes sticking in rotor slots.	8. Free up by removing burrs or dirt.
9. Extreme wear of pump ring.	9. Replace part.
10. Face of thrust plate scored.	10. Lap away light scoring. Replace heavily scored part.
11. Scored rotor.	11. Lap away light scoring. Replace heavily scored part.

DIAGNOSIS OF MANUAL AND POWER STEERING (Continued)

INOPERATIVE, POOR, OR NO ASSIST: (PUMP ASSEMBLY) (P.S.)

CAUSE	CORRECTION
1. Loose drive belt.	1. Tighten belt.
2. Low oil level.	2. Fill reservoir.
3. Air in the oil.	3. Locate source of air leak and correct.
4. Flow control valve stuck.	4. Remove burrs or dirt.
5. Vanes sticking in rotor slots.	5. Free up by removing burrs or dirt.
6. Faulty flow control valve assembly.	6. Clean and free up parts. Replace part(s) as necessary.

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specifications.

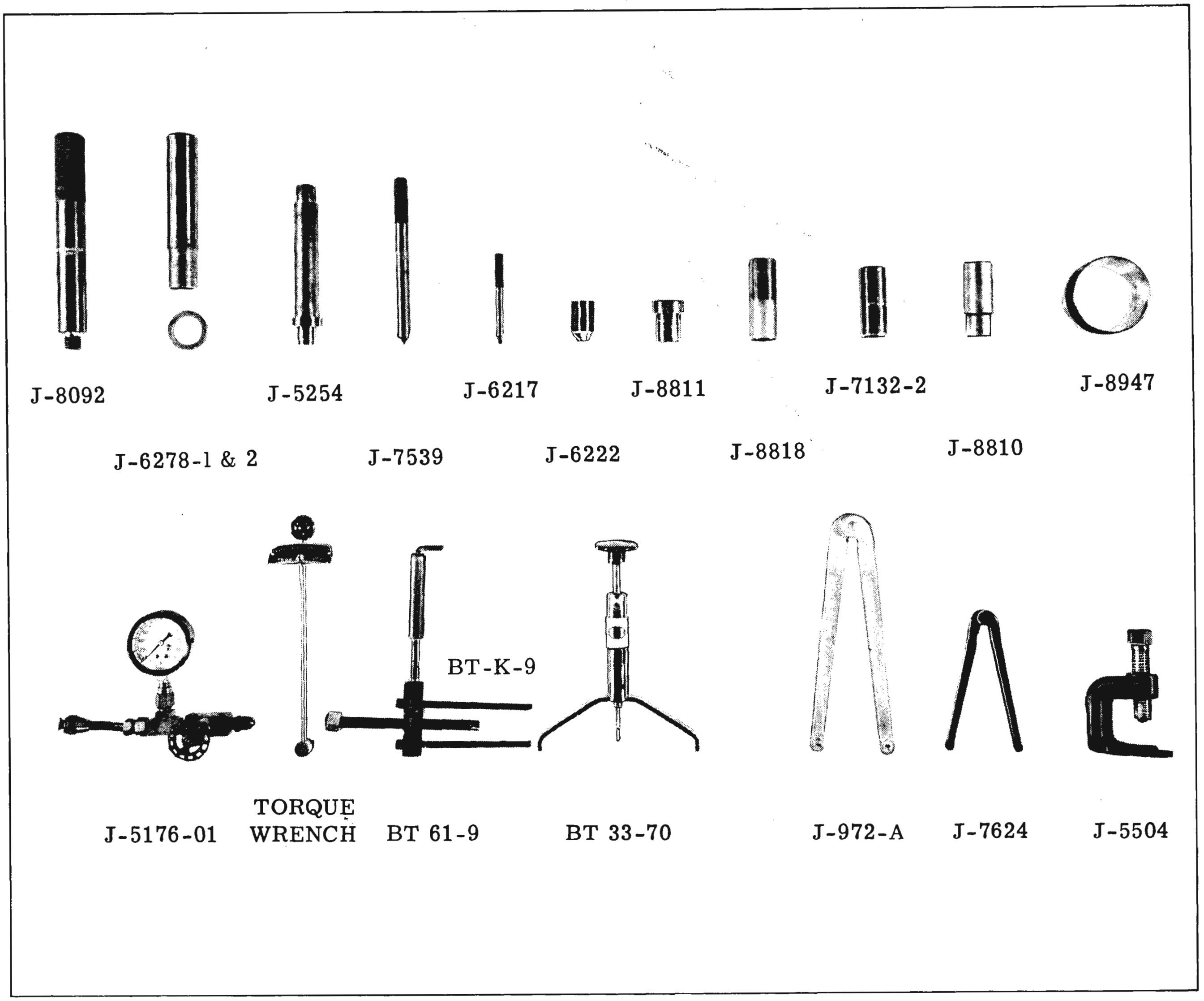
APPLICATION	FT. LBS.
STEERING LINKAGE	
Idler Arm Bracket to Cross Bar	35-45
Idler and Pitman Arms to Relay Rod	40-50
Idler Arm to Support Bracket	50-70
Tie Rod End to Steering Plain Arm	40-50
Steering Plain Arm to Steering Knuckle	55-80
Tie Rod to Relay Rod	50-70
Tie Rod Sleeve Clamp Bolts	20-25
MANUAL STEERING GEAR	
Steering Gear to Cross Bar	45-60
Pitman Arm to Pitman Shaft Nut	150-180
Side Cover Bolts	25-35
Pitman Shaft Adjusting Screw Lock Nut	18-27
Bearing Preload Adjuster Lock Nut	70-100
Filler Plug	5-10
Coupling Clamp Bolt	35-40
POWER STEERING PUMP	
Pulley Nut	40-45
Front Bracket to Cylinder Block	20-25
Front Bracket to Front Cover	25-35
Pump to Front Bracket Nuts	25-35
Rear Bracket to Cylinder Head	25-35
Rear Bracket to Cylinder Block	25-35
Pump to Rear Bracket Nut	25-35
Flow Control Valve Plug	4
Union	20
Reservoir to Pump Body Studs	25-30

TORQUE SPECIFICATIONS (Continued)

APPLICATION	FT. LBS.
POWER STEERING GEAR	
Steering Gear to Cross Bar	45-60
High Pressure Line Fitting (at gear)	20-30
Oil Return Line Fitting (at gear)	20-30
Pitman Arm to Pitman Shaft Nut	150-180
Pitman Shaft Adjusting Screw Lock Nut	20-30
Side Cover Bolts	25-35
Adjuster Plug Lock Nut	50-110
Coupling Flange Clamp Bolt	25-35
Return Guide Clamp Screws	8-12
STEERING COLUMN	
Steering Wheel to Steering Shaft	20-30 and Stake
Steering Column Cover to Floor Pan	3-5
Steering Column to Dash "U" Bolt Nuts	8-12

SPECIFICATIONS

MANUAL STEERING	
RATIO	22 to 1
LUBRICANT	SAE 80 Multi-Purpose Gear Lubricant
ADJUSTMENTS	
Worm Bearing Preload	4-7 in. lbs.
Over-Center	4-10 in. lbs. in excess of Worm Bearing Preload
Pitman Shaft Adjusting Screw End Clearance	.002" Max.
POWER STEERING	
RATIO	17.5 to 1
LUBRICATION	
Lubricant	Hydra-Matic Transmission Fluid
Capacity - Complete System	1 qt.
Capacity - Pump Only	3/4 qt. (approx.)
ADJUSTMENTS	
Ball Preload	Initially set at factory at 1/2 to 3 in. lbs. After wear-in, may be from 0 to 3 in. lbs.
Thrust Bearing Preload	1/2 to 2 in. lbs. in excess of initial ball preload. Total not to exceed 7 in. lbs.
Over-Center	3 to 6 in. lbs. in excess of combined ball and thrust bearing preload. Total not to exceed 14 in. lbs.



Inch Pound Torque Wrench	
BT 61-9	Steering Wheel Puller
BT 33-70	Belt Tension Gage
J-972-A	Differential Bearing Adjusting Wrench
J-5176-01	Pressure Gage
J-5254	Valve Cover Seal Installer
J-5504	Pitman Arm Puller
J-6217	Valve Connector Installer
J-6222	End Cover Seal Protector
J-6278-1 & 2	Pitman Shaft Bearing and Seal Remover and Installer
J-7132-2	Oil Seal Installer and Protector
J-7539	Rack Piston Ball Retainer
J-7624	Power Steering Gear Thrust Bearing Adjusting Wrench
J-8092	Driver Handle
J-8810	Pitman Shaft Bushing Remover and Installer
J-8811	Pitman Shaft Seal Installer
J-8818	Power Steering Pump Shaft Seal Installer
J-8947	Power Steering Gear Teflon Ring Compressor

Fig. 4-304 Tools

SUSPENSION

(FULL SIZE CAR)

CONTENTS OF SECTION 5

FRONT SUSPENSION

PERIODIC MAINTENANCE

For ball joint seal inspection and lubrication interval, refer to PERIODIC MAINTENANCE, Section 2.

A periodic front wheel bearing repack is not required. However, when major brake service is being performed, it is recommended that the front wheel bearings be cleaned and repacked with a sodium soap, fine fiber grease.

WHEEL BEARINGS (Fig. 5-3)

The proper functioning of the front suspension cannot be maintained unless the front wheel TAPER ROLLER BEARINGS are correctly adjusted. Cones must be a slip fit on the spindle and the inside diameter of cones should be lubricated to insure that the cones will creep. Spindle nut must be a free-running fit on threads.

ADJUSTMENT

The adjustment of front wheel bearings should be made WHILE REVOLVING THE WHEEL AT LEAST 3 TIMES THE SPEED OF NUT ROTATION when taking the torque readings as follows:

1. Tighten adjusting nut with a torque wrench 23 to 25 ft. lbs., to insure that all parts are properly seated and threads are free.

2. Back off nut 1/2 turn and retighten 15 to 17 ft. lbs.

3. If keyway in wheel spindle and a slot in the nut line up, back off nut one notch. If keyway in wheel spindle and a slot do not line up, back off nut to nearest slot. Install retainer.

HUB AND DRUM ASSEMBLY

REMOVE (WHEEL REMOVED)

1. Remove grease cap from hub.

   - CAUTION: Use care when removing the left front cap which contains the front wheel speedometer drive coupling.

2. Remove cotter pin or retainer, nut and washer from spindle.

3. Carefully pull hub and drum assembly from spindle.

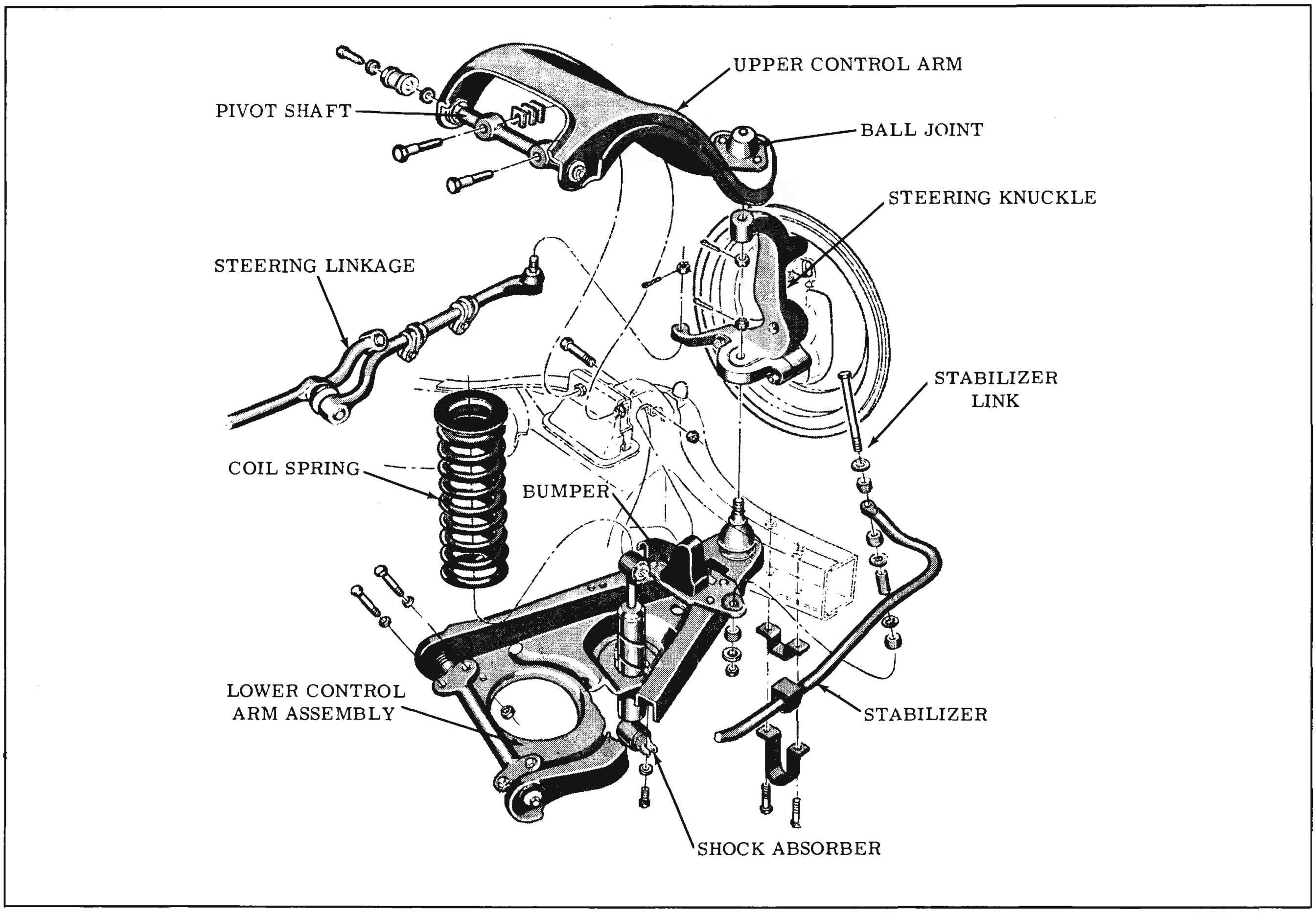


Fig. 5-1 Front Suspension Layout

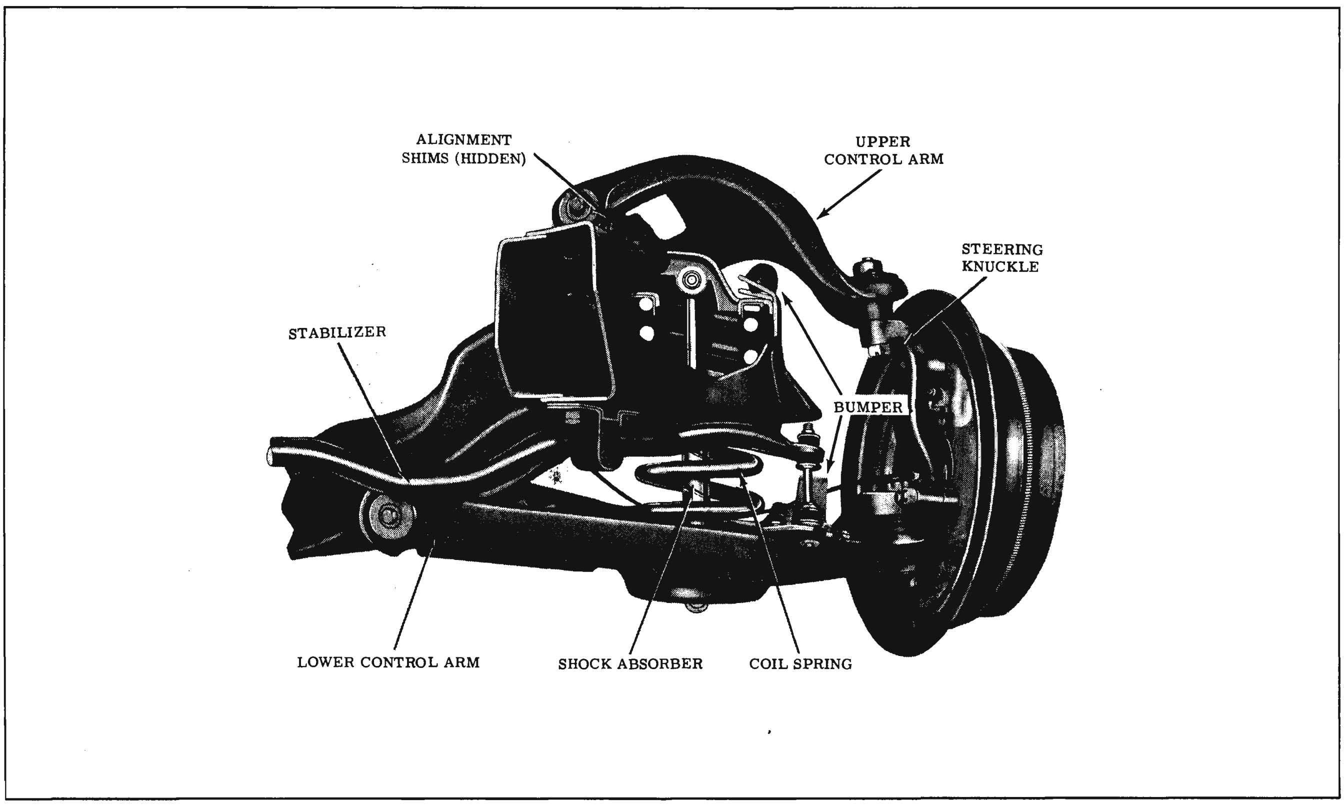


Fig. 5-2 Front Suspension Assembly

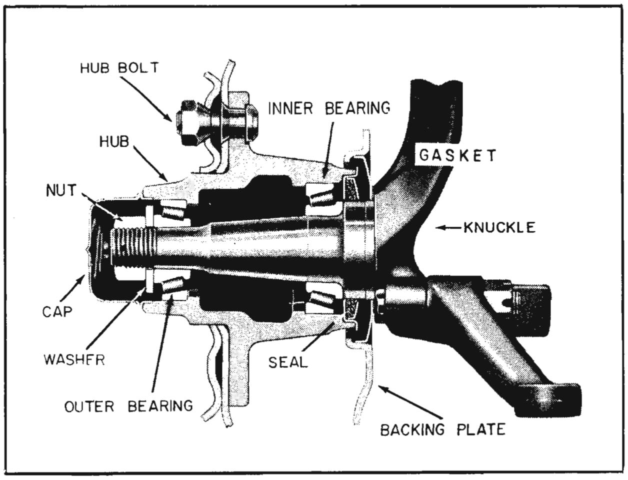


Fig. 5-3 Steering Knuckle and Hub Assembly (Right Front Shown)

NOTE: It may be necessary to back off the brake shoe adjustment before the hub and drum can be removed.

BEARING AND SEAL REMOVAL

1. Remove washer retaining the ball and separator assembly in the hub.
2. Remove the outer bearing inner race and the roller and separator assembly from hub.
3. Pry seal from hub, then remove inner bearing inner race and roller and separator assembly from hub.
4. If necessary to remove outer races, insert a brass drift into hub, indexing end of drift with notches in hub behind bearing outer race, and tap with a hammer.

CLEANING AND INSPECTION

NOTE: For inspection of front drums, refer to BRAKE DRUMS, Section 7.

1. Wash all parts in clean solvent with the exception of the roller and separator assemblies and races and air dry. Roller and separator assemblies should be washed in gasoline.
2. Check bearings for cracked separators and worn or pitted rollers.
3. Check bearing races for cracks, scores or a brinelled condition.

BEARING AND SEAL INSTALLATION

1. If the outer races were removed, drive or press the races into the hub as shown in Fig. 5-4 and 5-5.

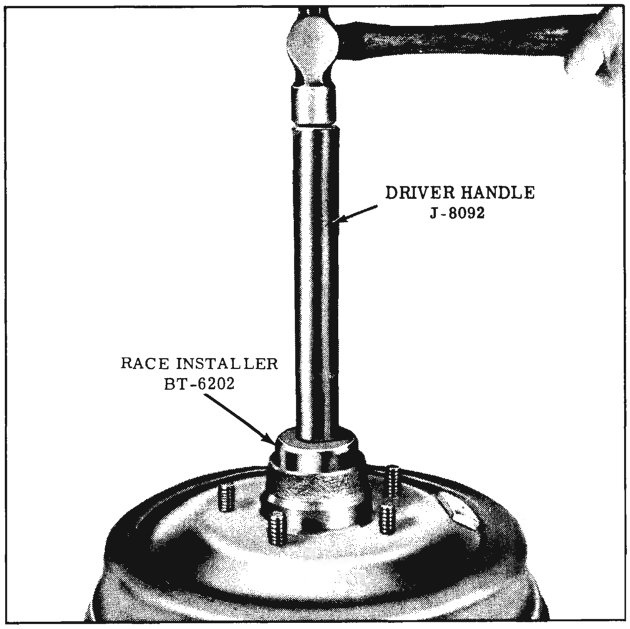


Fig. 5-4 Installing Outer Bearing Race

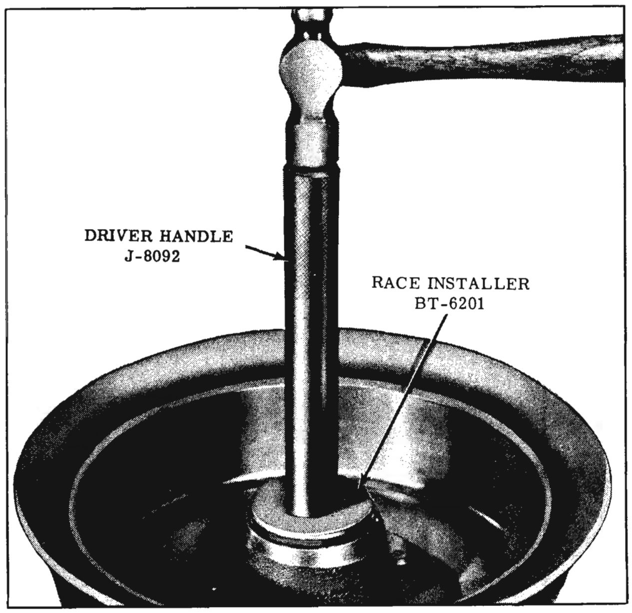


Fig. 5-5 Installing Inner Bearing Outer Race

2. Lubricate the bores of the inner races and fully pack the roller and separator assemblies with a sodium soap, fine fiber grease.
3. Install inner bearing roller and separator assembly into outer race, then install inner bearing inner race.
4. Carefully tap seal into hub.
5. Clean any traces of grease from brake lining and drum with fine sandpaper. If necessary to adjust brake linings, refer to Brake Linings Adjust, Section 7.
6. Position hub and drum assembly over spindle.

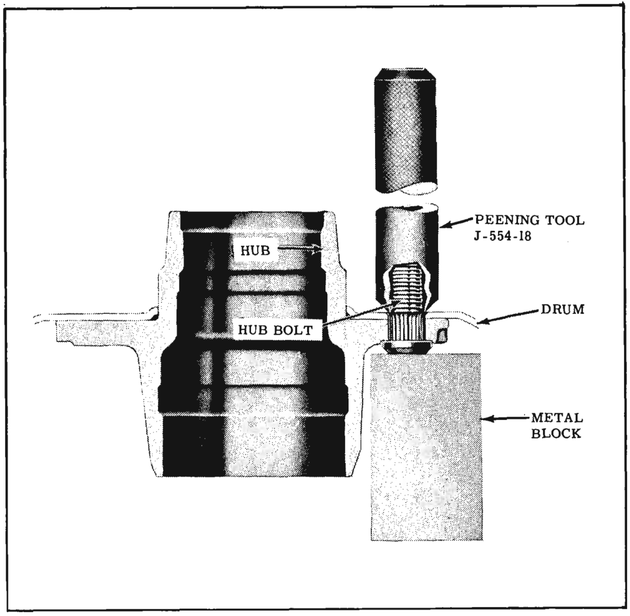


Fig. 5-6 Peening Hub Bolt

7. Install outer bearing roller and separator into hub.
8. Install outer bearing inner race over spindle, then install the washer and spindle nut. Draw spindle nut up snug and adjust bearing as outlined under WHEEL BEARING ADJUSTMENT.

HUB BOLT REPLACEMENT

1. With the hub and drum assembly removed, drill a 5/8" hole 1/4" deep into the head of the hub bolt.
2. Support hub and drum assembly and drive or press hub bolt out through the front of the hub and drum assembly.
3. Press a new hub bolt into the hub.
4. While supporting hub bolt, peen hub bolt into the countersunk area of drum with the use of Peening Tool J-554-18 until the drum is secure to the hub. (Fig. 5-6)

FRONT SHOCK ABSORBERS

A slight amount of fluid may bleed by the rod seal in cold weather and deposit a light film on the upper area of the shock absorber. This condition will not impair operation and should be considered normal. A shock absorber should never be checked horizontally or with the rod extension down.

For a complaint of a noisy or defective shock absorber, first check the mounting torque. If mounting is satisfactory, disconnect the lower mountings and pump the shock absorbers by hand in a vertical position. Compare both shock absorbers. If both shocks respond the same, it is unlikely that a defective shock absorber exists.

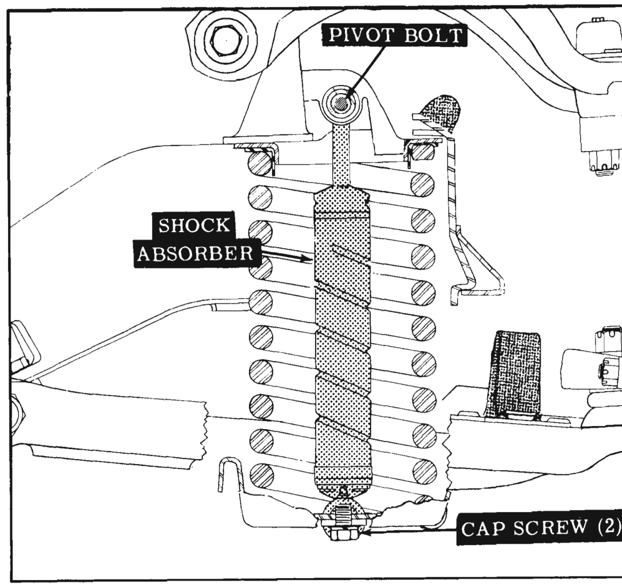


Fig. 5-7 Shock Absorber Mounting

THUMPING NOISE

A thumping noise usually occurs when a shock absorber is changing its direction of stroke.

1. The shock absorber should be pumped with a rapid change of stroke. If lag is felt when changing stroke, this unit will be noisy.
2. Completely extend the shock absorber and pull hard. If spring tension is felt, this shock absorber will be noisy and should be replaced.

SQUEAKY OR REED TYPE NOISE

Hand pump the shock absorber at different rates of speed. If noise is heard that changes from a deep grunt to a high-pitched squeak, the shock absorber needs replacement.

NOTE: A squealing noise could be attributed to seals. This is particularly true if the shock has been inoperative for a period of time. This noise will disappear after a few strokes of the shock absorber and is not a cause for rejection.

REMOVE AND INSTALL (Fig. 5-7)

1. Remove upper pivot bolt from the shock absorber.
2. Remove the two cap screws and lock washers attaching shock absorber to lower control arm and remove shock absorber.

To install shock absorber, reverse sequence of operations. Torque the pivot bolt nut 65 to 75 ft. lbs. and the cap screws 15 to 25 ft. lbs.

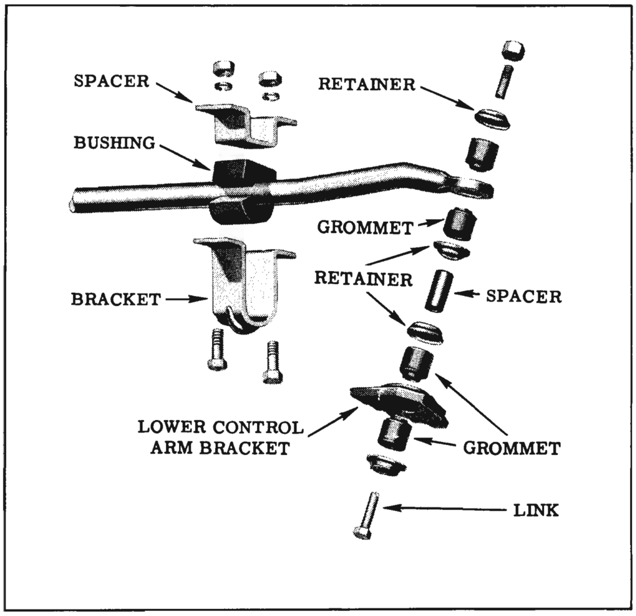


Fig. 5-8 Stabilizer Bar and Linkage

STABILIZER

REMOVE AND INSTALL (Fig. 5-8)

1. Disconnect each side of stabilizer linkage by removing nut from link bolt; pull bolt from linkage, and remove retainers, grommets, and spacer.

2. Remove bracket to frame bolts and remove stabilizer bar, rubber bushings, and brackets.

3. To replace, reverse sequence of operations. The rubber bushings should be positioned squarely in the brackets with the opening in the bushings facing the front of car. Torque stabilizer link nut 8 to 12 ft. lbs. and bracket bolts 25 to 45 ft. lbs.

IMPORTANT: Never lubricate stabilizer bar rubber bushings as they are dependent upon a bonding of the rubber to the bar for proper stabilizer action.

CONTROL ARMS

BALL JOINT LUBRICATION (Only In the Event of Noisy Joints)

1. Place car on hoist that provides free access under ball joints.

2. Visually examine seals for breaks, cuts, or grease leakage. (If defects are found, follow procedure for replacing seal.)

3. Thoroughly clean top of upper ball joint and bottom of lower ball joint to remove all foreign matter away from lubrication hole.

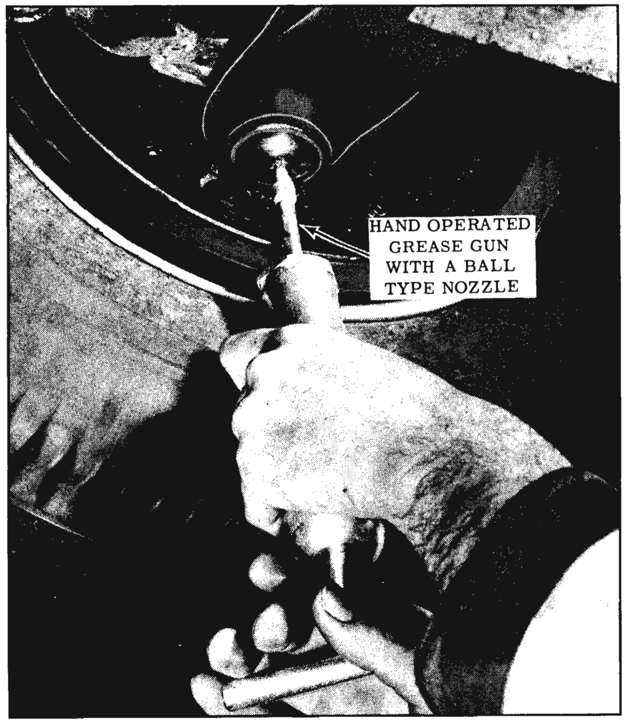


Fig. 5-9 Adding Lubricant to Ball Joint

4. Remove plug from lubrication hole.

   CAUTION: Prevent dirt or foreign material from getting into the lubrication hole.

5. Use a hand operated, ball type nozzle grease gun filled with Ball Joint Grease Part No. 585617. DO NOT SUBSTITUTE. Operate grease gun until grease begins to flow from tip.

   NOTE: Before using a new gun, first count the number of "turns" or "pumps" required to obtain .01 of a lb. of grease (approximately one teaspoonful).

6. Hold tip of grease gun firmly into lubrication hole and install correct amount of grease by counting the number of "turns" or "pumps". (Fig. 5-9)

   IMPORTANT: DO NOT OVERFILL BALL JOINT WITH GREASE. Excess grease will cause improper action of the seal and could result in early failure. .01 of a lb. of grease will adequately relubricate joint without overfilling it.

   NOTE: DO NOT INSTALL GREASE FITTING OR ATTEMPT TO FILL WITH PRESSURE GUN. Either method will result in overfill or mixing of greases which may harm the part.

7. Wipe away excess grease and install plug.

UPPER CONTROL ARM ASSEMBLY

CHECKING UPPER BALL JOINTS

To check the upper ball joint, it must be disconnected from the steering knuckle. Install a nut on the ball joint stud, and using an inch pound torque wrench, rotate the stud in a clockwise direction. The torque wrench reading should be 10-60 inch lbs. If the reading is not within these limits, the assembly should be replaced.

REMOVAL

1. Raise front of car and support lower control arm with floor stands.

   NOTE: Since the weight of the car is used to relieve spring tension on the upper control arm, the floor stands must be positioned between the spring seats and ball joints of the lower control arms for maximum leverage.

2. Remove wheel and front wheel speedometer cable from knuckle, then loosen the upper ball joint from the steering knuckle as follows:

   a. Remove the cotter pin from the upper ball joint stud and clean threads of stud.

   b. Loosen the upper ball joint nut and install Tool J-8806 as shown in Fig. 5-10.

   c. Apply pressure on stud by expanding the tool until the stud breaks loose.

   d. Remove Tool J-8806 and upper ball joint nut, then pull stud free from knuckle.

4. Disconnect ground strap from control arm. Support the hub and drum to prevent weight of the assembly from damaging the brake hose.

5. Using a 7/8" deep flex socket with a long extension, remove the pivot shaft to frame attaching nuts from under the fender. (Fig. 5-11) Remove wheel alignment shims, control arm and pivot shaft assembly from car.

   NOTE: Keep shims grouped so that they may be reinstalled in their original position.

INSTALL

1. Position pivot shaft on the frame, then install pivot shaft attaching bolts and nuts with the original alignment shims installed between the pivot shaft and frame on their respective bolts. Torque nuts 85 to 110 ft. lbs.

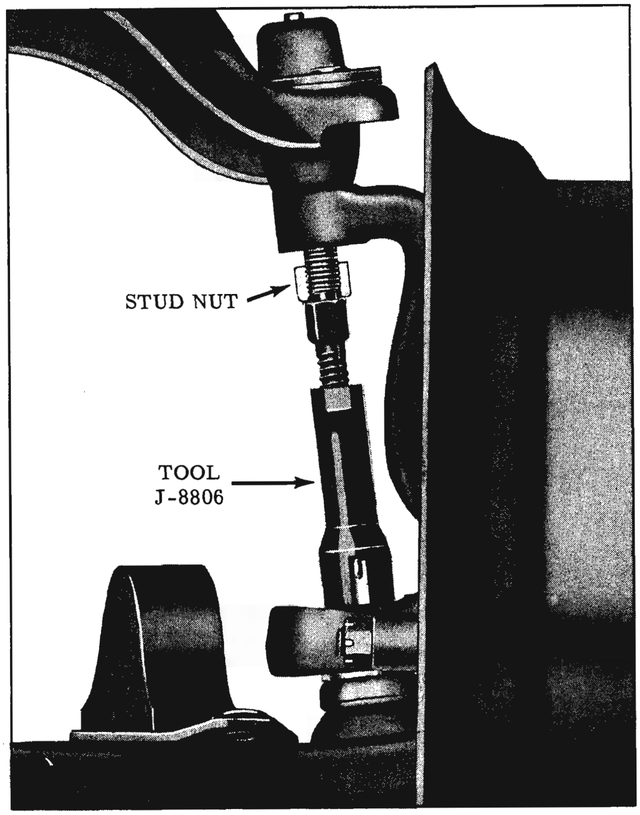


Fig. 5-10 Loosening Upper Ball Joint

2. Remove the temporary support from the hub and drum, then connect ball joint to steering knuckle. Torque nut 70 ft. lbs. (minimum) and install cotter pin. Tighten nut further, if necessary, to install cotter pin. Attach ground strap to control arm. (Fig. 5-10)

3. Install speedometer cable and wheel, then check wheel alignment and adjust if necessary.

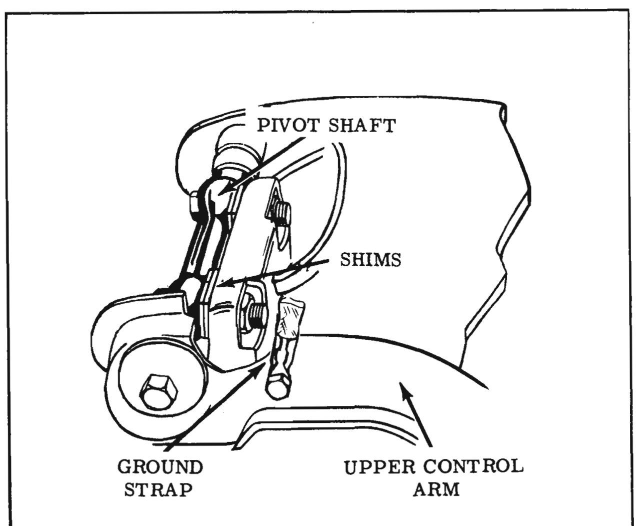


Fig. 5-11 Upper Control Arm Mounting

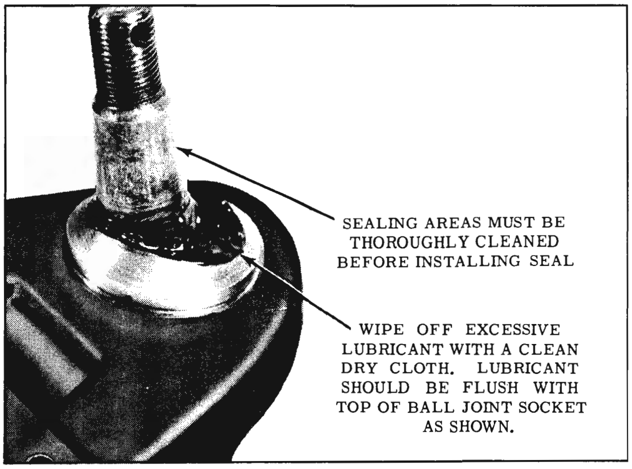


Fig. 5-12 Ball Joint Prior to Installing Seal

LOWER CONTROL ARM BALL JOINT SEAL REPLACEMENT

1. Support lower control arm and disconnect ball joint from steering knuckle.

2. Clean exterior of ball joint.

3. For Inland joints, drive seal retaining ring from ball joint and discard seal assembly.

   For Saginaw joints, pry garter spring from bottom of seal, then remove and discard seal and garter spring.

CAUTION: Exercise care while performing the following operations to prevent entry of dirt into the ball joints.

4. Clean joint pivot and stud thoroughly and wipe out as much old grease as possible.

5. Remove plug from ball joint cover.

6. Using a hand operated ball type nozzle grease gun filled with Ball Joint Grease, Part No. 585617, lubricate ball joint until clean grease completely fills the ball joint reservoir. (Figs. 5-12 and 5-13)

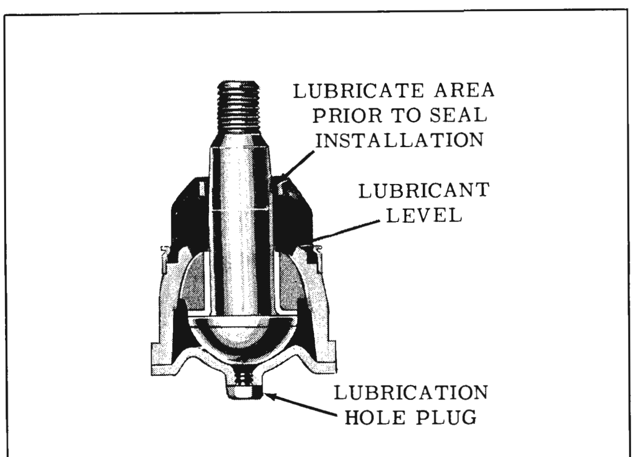


Fig. 5-13 Ball Joint Assembly

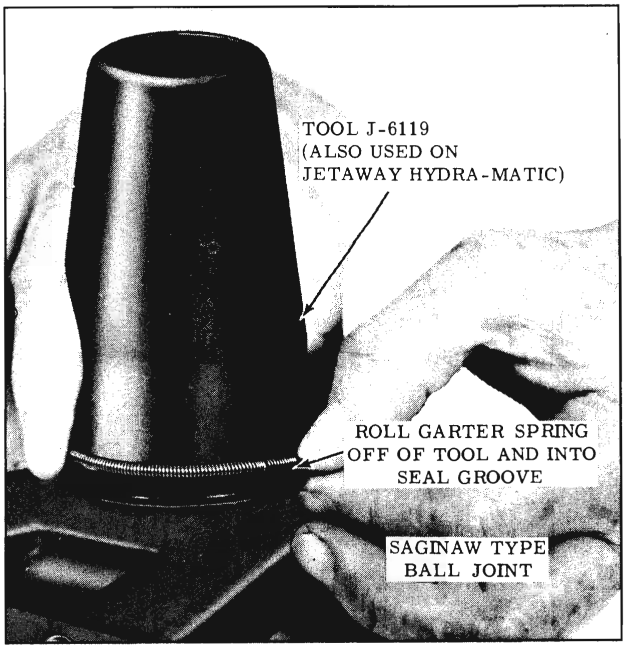


Fig. 5-14 Installing Saginaw Type Seal

7. Install plug in ball joint cover, then clean grease from ball joint stud and sealing area of joint with a clean dry cloth. (Figs. 5-12 and 5-13)

8. Apply a thin film of Ball Joint Grease to outside area of new seal to aid installation of Tool J-8761 (Inland) or Garter Spring Installer J-6119 (Saginaw).

9. The saw tooth area of the seal that fits around

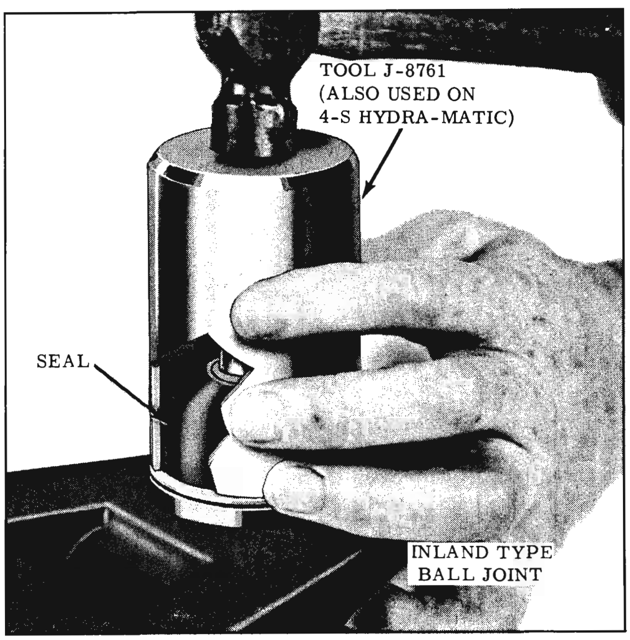


Fig. 5-15 Installing Inland Type Seal

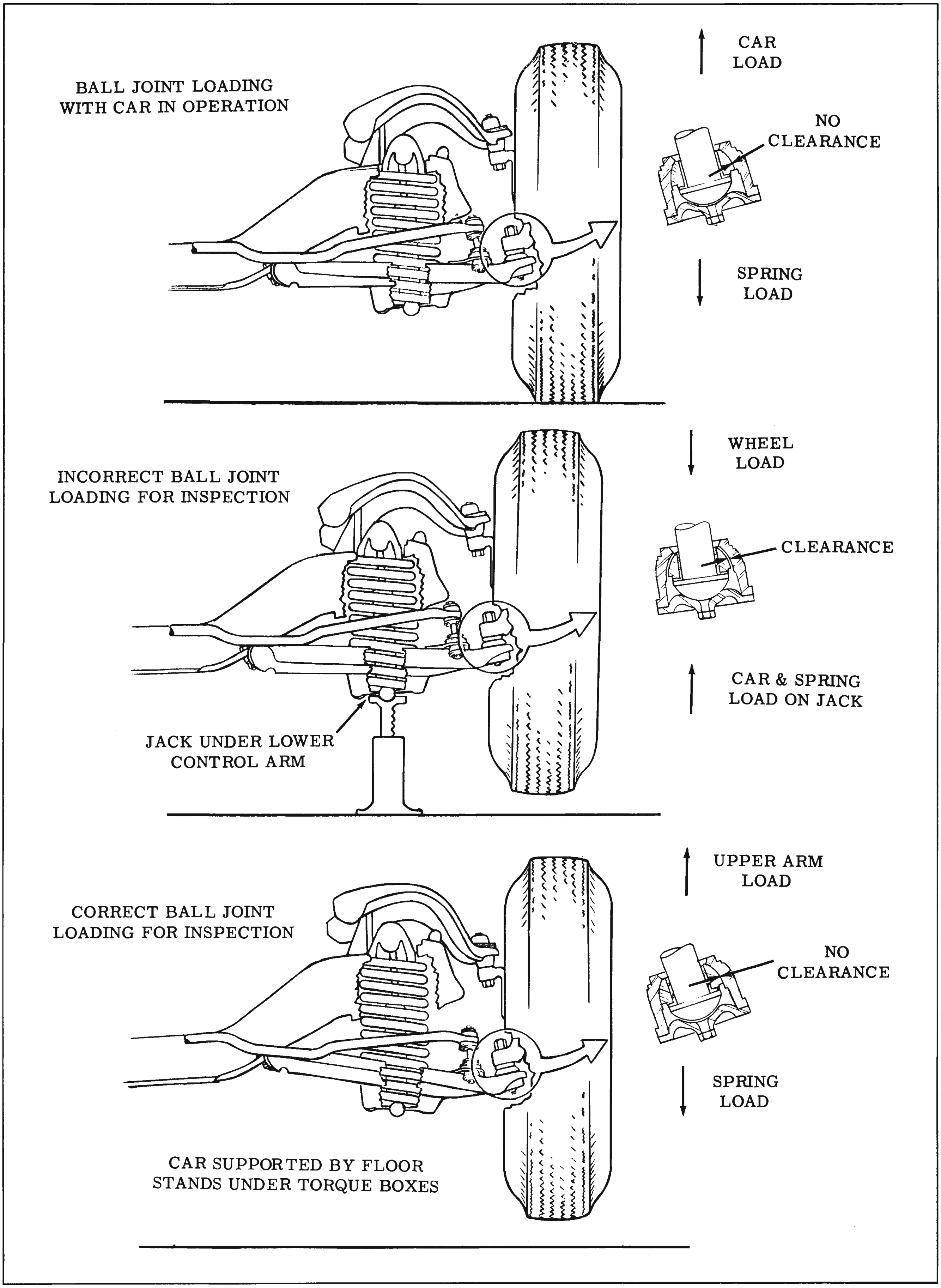


Fig. 5-16 Supporting Car While Checking Lower Control Arm Ball Joints

the ball stud should be coated with Ball Joint Grease. (Fig. 5-13)

10. For Saginaw type, stretch garter spring around Tool J-6119. Do not stretch garter spring any more than necessary when installing on tool. Place seal on ball joint and install garter spring as shown in Fig. 5-14.

    For Inland type, place seal inside of Seal Installing Tool J-8761, then drive seal onto ball joint as shown in Fig. 5-15. Make sure that seal is driven on squarely without cocking.

11. Reassemble ball joint stud to steering knuckle.

CHECKING LOWER CONTROL ARM BALL JOINTS (Fig. 5-16)

To check ball joints, the wheel bearings must be properly adjusted and the suspension must be freely suspended. The car should be supported on each side at the front torque box with floor stands. (DO NOT USE A JACK OR STANDS UNDER LOWER CONTROL ARMS.) Place a dial indicator at the lower vertical edge of the wheel as shown in Fig. 5-17. With one hand at the top and the other at the bottom of the tire, moderately rock the wheel at the top and bottom. If more than 1/16" movement appears at the dial indicator, the lower ball joint should be replaced.

LOWER CONTROL ARM BALL JOINT REPLACEMENT

1. Raise front of car, support outboard end of lower control arm with floor stand and remove wheel assembly.
2. Disconnect lower ball joint from steering knuckle using Tool J-8806.
3. Block steering knuckle, backing plate and hub and drum assembly away from the lower control arm to obtain accessibility.
4. Remove ball joint seal and press ball joint from control arm as shown in Fig. 5-18.
5. Install new ball joint assembly as shown in Fig. 5-19.

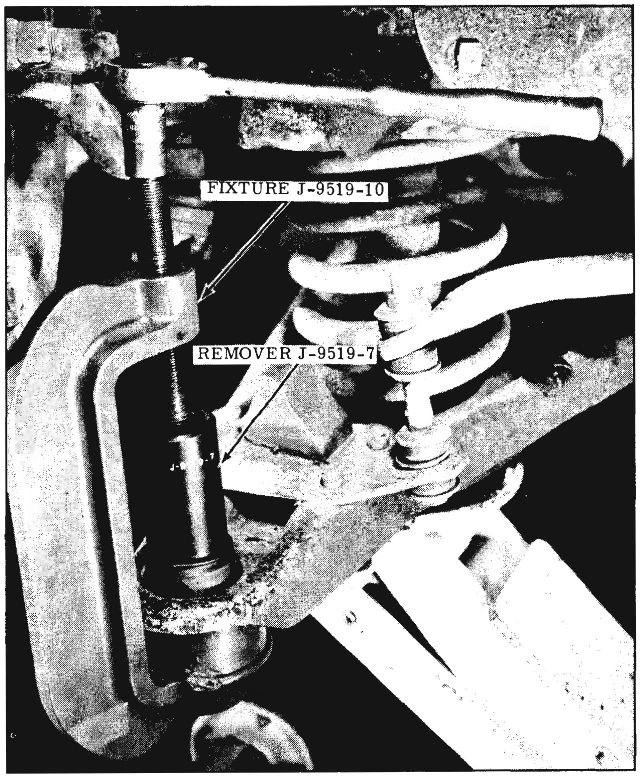


Fig. 5-18 Removing Lower Ball Joint

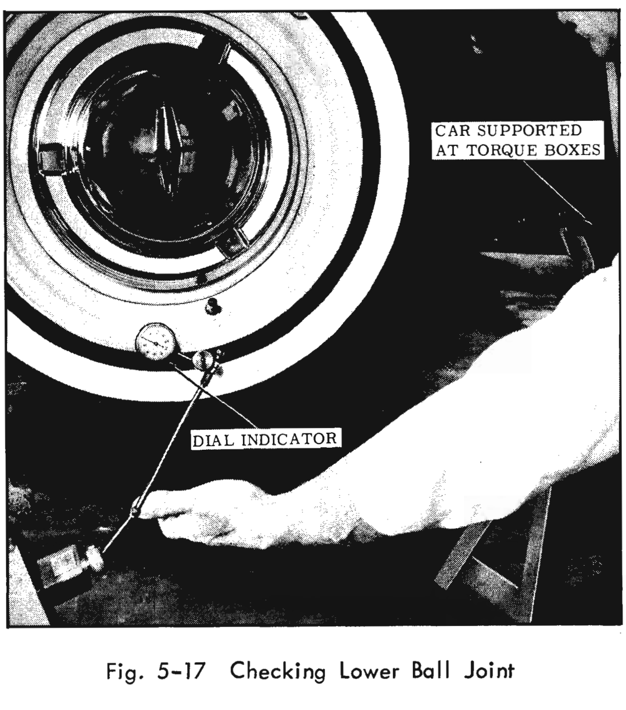


Fig. 5-17 Checking Lower Ball Joint

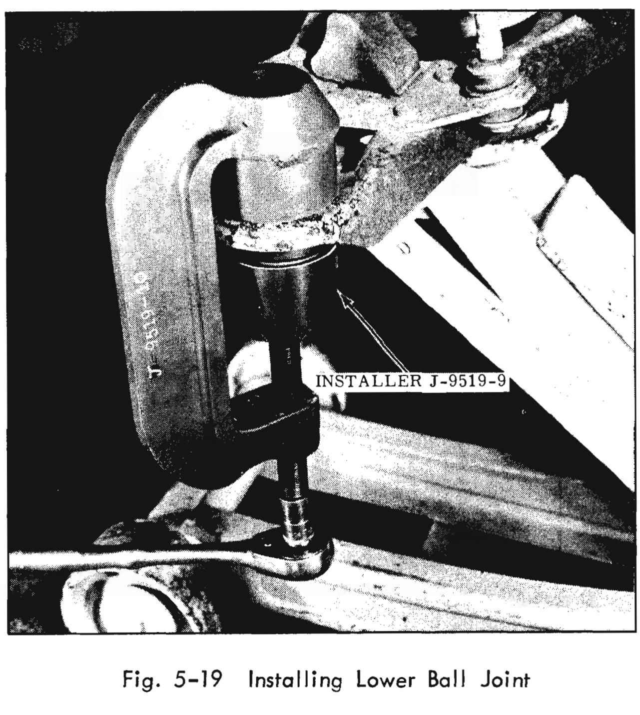


Fig. 5-19 Installing Lower Ball Joint

6. Reassemble suspension and torque ball joint stud nut to 70 ft. lbs. minimum and install cotter pin.

LOWER CONTROL ARM ASSEMBLY AND/OR COIL SPRING

REMOVE

1. Raise front of car and support frame with floor stands.
2. Remove wheel assembly and disconnect speedometer cable from steering knuckle (left side only).
3. Disconnect stabilizer link and speedometer cable clamp from lower control arm.
4. Remove shock absorber.
5. Position a floor jack under lower control arm between the spring seat and ball joint. Raise floor jack until it supports lower control arm.
6. Disconnect the lower control arm ball joint from the steering knuckle as follows:
   a. Remove the cotter pin from the lower ball joint stud and clean threads above nut.
   b. Loosen the lower ball joint nut, then install Ball Joint Removing Tool J-8806 as shown in Fig. 5-20.
   c. Apply pressure on stud by expanding the tool until the stud breaks loose from the steering knuckle.
   d. Remove Tool J-8806 and ball joint nut.
7. Slowly lower floor jack until spring is fully extended and remove spring.

   IMPORTANT: The left and right coil springs should not be interchanged. The coil spring part number is stamped on the outer side of the end coil.
8. If necessary to remove lower control arm, remove pivot shaft to cross member attaching bolts.

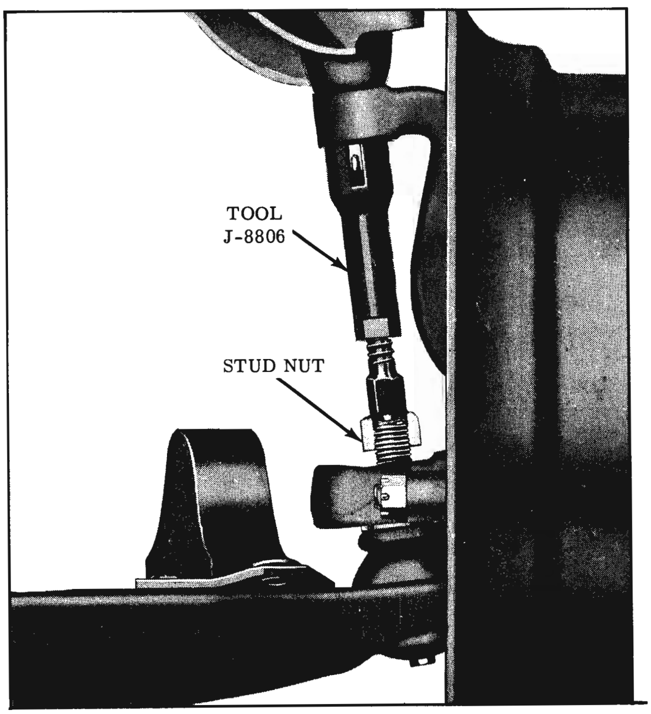


Fig. 5-20 Loosening Lower Ball Joint

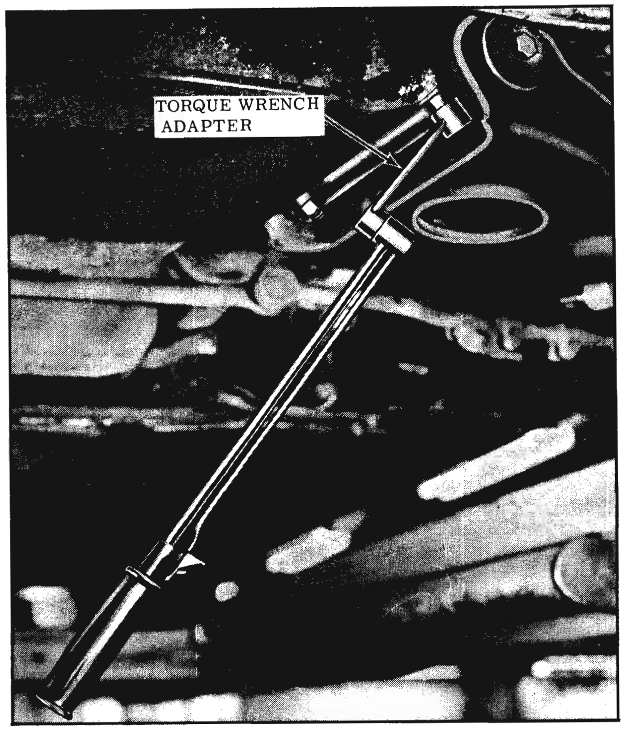


Fig. 5-21 Pivot Shaft Torque Operation

INSTALL

1. If the lower control arm was removed, connect control arm pivot shaft to frame cross member. Torque pivot shaft nuts 75 to 95 ft. lbs. using a torque wrench adapter. (Fig. 5-21)
2. Tape spring insulator to the top of spring in at least 6 places.

   IMPORTANT: The top of the spring may be identified by a flat coil which will allow the insulator to seat squarely on the top coil.
3. While holding spring and insulator against pilot in frame cross member, tilt spring so it will pilot in lower control arm. (Fig. 5-22) Rotate spring so the end of the bottom coil will index with edge of hole in control arm spring seat. The coil should not cover any portion of the hole.

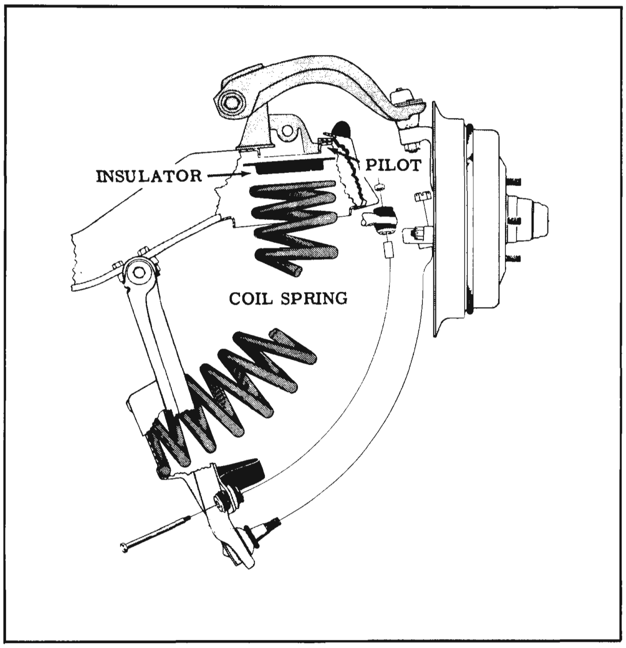


Fig. 5-22 Coil Spring Installation

4. Position floor jack between spring seat and ball joint. Chain the upper control arm to the base of the jack.

5. Raise control arm until the ball joint is tight in steering knuckle. Install ball joint nut and tighten to 70 ft. lbs. (minimum) and install cotter pin. Tighten nut further, if necessary, to install cotter pin.

   NOTE: A screwdriver slot is provided in the lower ball joint stud as a means of preventing the stud from turning when tightening the ball joint nut.

6. Install shock absorber and speedometer cable.

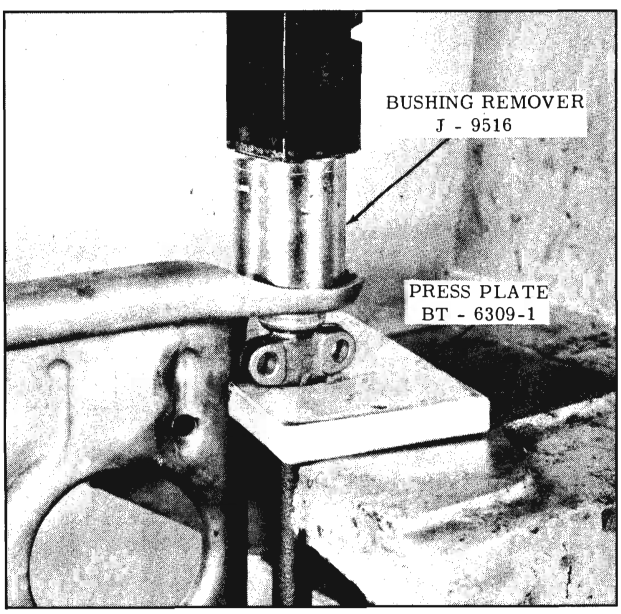


Fig. 5-23 Partial Pivot Shaft Bushing Removal

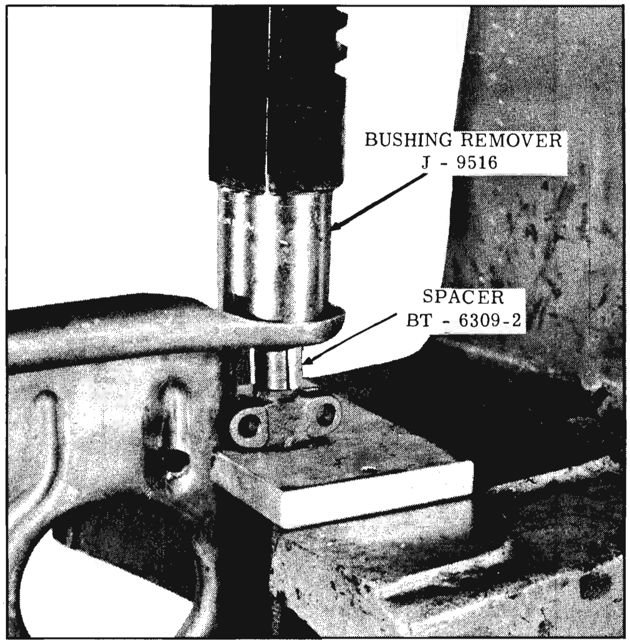


Fig. 5-24 Pivot Shaft Bushing Removal

7. Connect stabilizer link and speedometer cable clamp to lower control arm.
8. Install wheel and lower car.
9. Torque control arm shaft bushing bolts 50 to 60 ft. lbs. with weight of car on wheels.

LOWER CONTROL ARM PIVOT SHAFT BUSHING REPLACEMENT

1. Remove lower control arm assembly from car.
2. Remove bolts and washers from ends of pivot shaft.
3. Place control arm assembly and tools in a press as shown in Figure 5-23 and press bushing out of control arm as far as possible.
4. Repet Step 3 on other bushing.
5. Place spacer tool BT-6309-2 on pivot shaft between ears of pivot shaft and end of bushing.
6. Place control arm assembly in press as shown in Figure 5-24 and finish pressing bushing from control arm.
7. Repeat Steps 5 and 6 for other bushing.
8. To install bushings, place pivot shaft in control arm and press new bushing into control arm and over end of pivot shaft. (Fig. 5-25)
9. Repeat press operation of Step 8 for other bushing.
10. Assemble bolts and washers to ends of pivot shaft and torque pivot shaft bolts 50 to 60 ft. lbs.

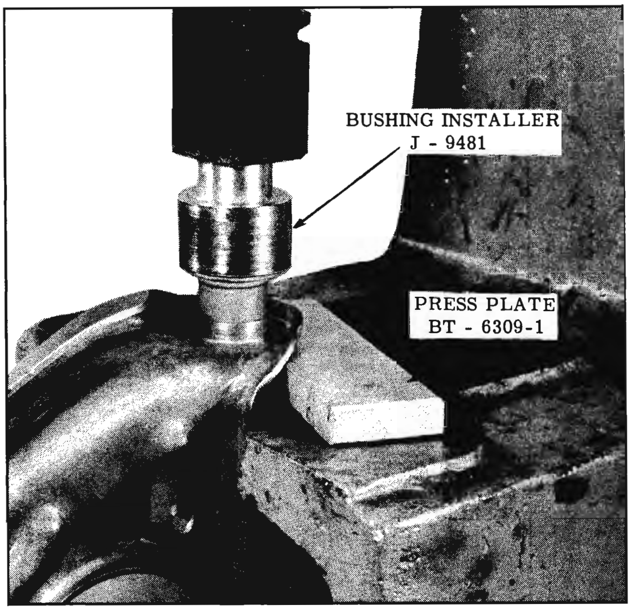


Fig. 5-25 Installing Pivot Shaft Bushing

11. Install lower control arm assembly on car.

STEERING KNUCKLE

REMOVE

1. Raise front of car and support lower control arms with floor stands.

   NOTE: Since the weight of the car is used to relieve the spring tension from the knuckle, the floor stands must be positioned between the spring seats and ball joints of the lower control arms for maximum leverage.

2. Remove front wheel, hub and drum assembly.
3. For left side, disconnect speedometer cable from steering knuckle.
4. Remove backing plate without disconnecting brake hose. Leave plain arm connected to tie rod end.

   NOTE: Support the backing plate assembly out of way to avoid any strain on brake hose.

5. Disconnect the control arm ball joints from the steering knuckle as outlined under CONTROL ARM REMOVAL. (Fig. 5-10 and 5-20)
6. Remove steering knuckle from car.

INSTALL

1. Connect the upper and lower ball joints to the steering knuckle.
2. Torque stud nuts 70 ft. lbs. (minimum) and install cotter pins. Tighten further, if necessary, to install cotter pin.
3. Install a new backing plate to steering knuckle gasket on the steering knuckle.

   NOTE: A screwdriver slot is provided in the lower ball joint stud as a means of preventing the stud from turning when tightening ball joint nut.

4. Install backing plate and plain arm to steering knuckle. Torque backing plate anchor bolt 120 to 145 ft. lbs. and bend lock plate against bolt head.
5. For left side, connect speedometer cable to steering knuckle.

   Torque plain arm to steering knuckle to backing plate nuts 80 to 130 ft. lbs.

6. Install wheel and hub and drum assembly. Adjust wheel bearings.
7. Lower car.
8. Check camber, caster and toe-in and adjust, if necessary.

WHEEL ALIGNMENT

The front wheel alignment factors are:

1. CASTER (Fig. 5-26)
2. CAMBER (Fig. 5-27)
3. TOE-IN (Fig. 5-28)
4. TOE-OUT (STEERING GEOMETRY) (Fig. 5-29)

Before any attempt is made to check or correct Caster, Camber, Toe-In or Toe-Out, the following preliminary checks and necessary corrections should be made on those parts which influence the steering of the car:

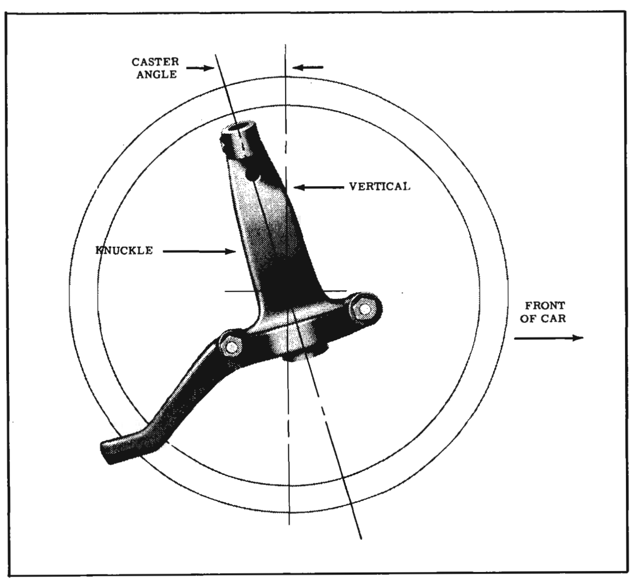


Fig. 5-26 Front Wheel Caster

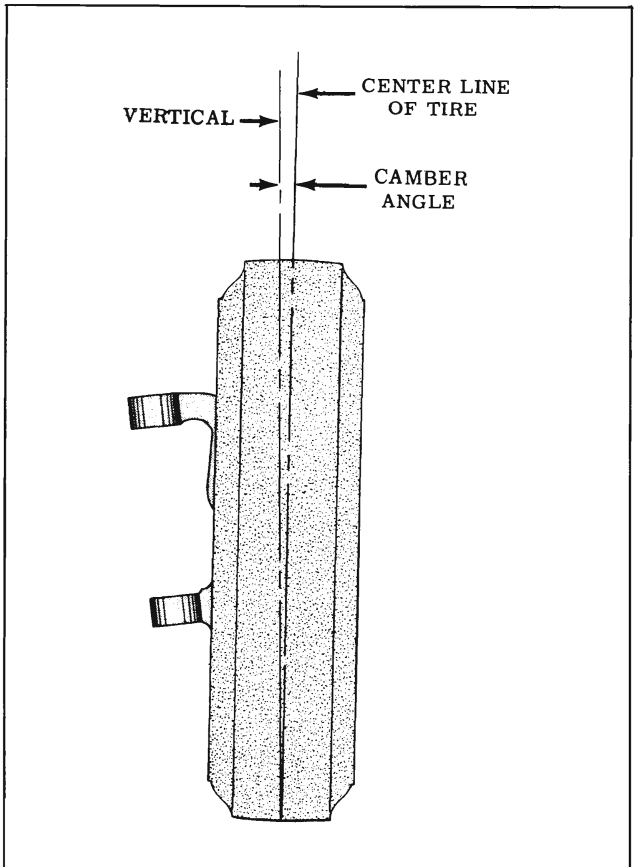


Fig. 5-27 Front Wheel Camber

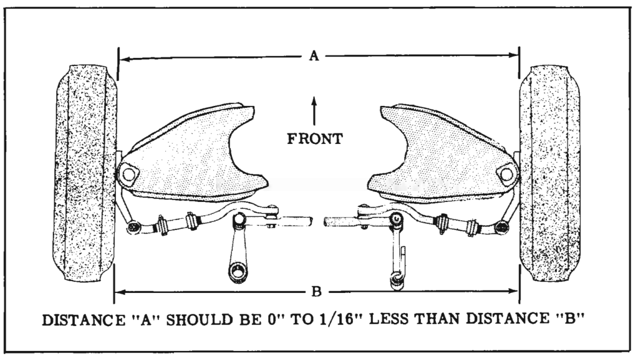


Fig. 5-28 Front Wheel Toe-In

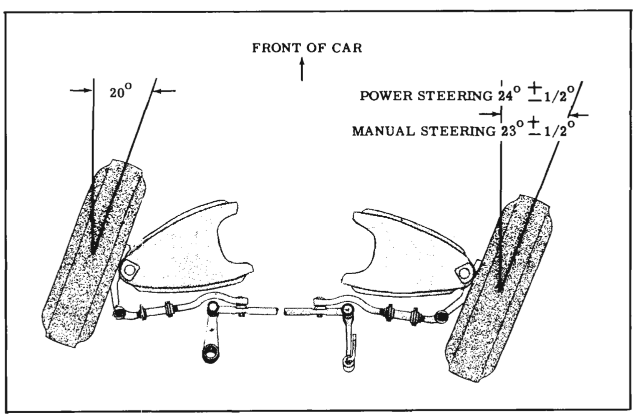


Fig. 5-29 Front Wheel Toe-Out

1. Inflate tires to recommended pressure.
2. Check front wheel bearings and steering gear for proper adjustments.
3. Check front wheel and tire assemblies for radial and lateral runout.
4. Grasp front bumper in center and raise and lower front end several times to allow frame to come to its normal level. Check for erratic shock absorber action.

The method of checking alignment will vary depending on the type of equipment being used. The instructions furnished by the manufacturer of the equipment should be followed.

NOTE: Check front wheel alignment without passengers or load in or on car and with car doors closed as the addition of load or shifting of weight will result in incorrect alignment. Camber angle of the right and left wheel should be within 1/2° of each other for best handling characteristics.

CASTER AND CAMBER ADJUSTMENT (Caster 0° to 1° –) (Camber ¼° – to ½° +)

Camber and Caster are adjusted by shims placed between the upper pivot shafts and the frame. (Fig. 5-30) Both caster and camber adjustments can be made at the same time after the wheel alignment checks have been completed.

In order to remove or install shims, do not remove weight from the front wheels. Loosen the pivot shaft to frame bolts using a 7/8" deep flex socket and a long extension.

NOTE: Loosen the top and rear fasteners on the fender filler plate aprons to gain access to

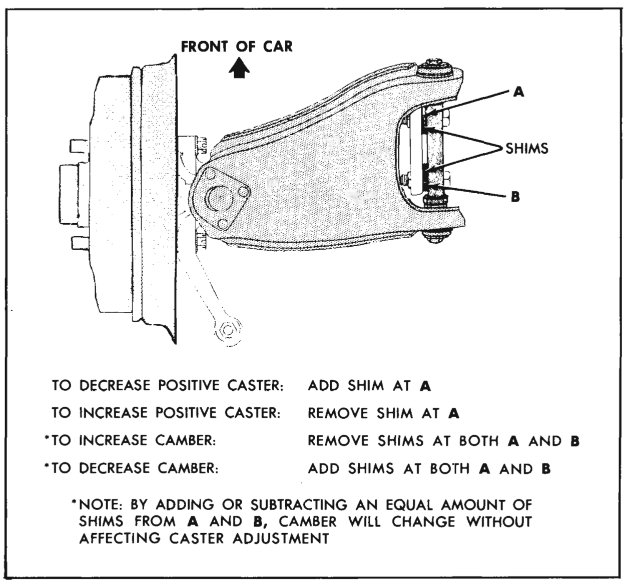


Fig. 5-30 Caster and Camber Adjustments

the pivot shaft bolts.

Refer to the shim chart to determine the amount of shims necessary to correct the adjustment. After the correct number of shims have been installed, torque the pivot shaft mounting nuts 85 to 110 ft. lbs. and recheck caster and camber.

Shim Thickness	One shim added to or subtracted from BOTH BOLTS will change camber	One shim added to or subtracted from FRONT BOLT ONLY will change caster
.020"	1/8°	5/16°
.050"	5/16°	1/2°
.120"	5/8°	1-3/8°

TOE-IN ADJUSTMENT (0" to 1/16") (Fig. 5-28)

1. Loosen the clamp bolts at each end of the steering tie rod adjustable sleeves.
2. With steering wheel set in straight ahead position, turn tie rod adjusting sleeves to obtain the proper toe-in adjustment.
3. When adjustment has been completed according to the recommended specification, and tie rod and ball studs are riding squarely in their seats, position inner clamps as shown in Fig. 5-31.

TOE-OUT (STEERING GEOMETRY) (Fig. 5-29)

To check, turn wheels to right until left wheel has been turned 20° from straight ahead position. Right wheel setting should be 23° ± 1/2° without power steering and 24° ± 1/2° with power steering on all models. Then follow same procedure with wheels turned to left.

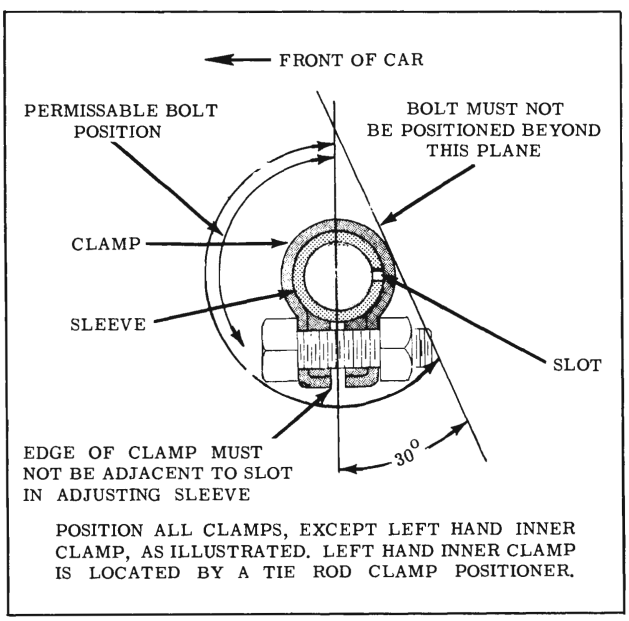


Fig. 5-31 Tie Rod Clamp Positioning

Errors found are usually due to bent plain arms or incorrect caster, camber or toe-in. If error is due to bent plain arm, replacement with new arm should be made. When replacements of this kind are made, it is important that other front end parts are checked and front wheels realigned.

FRONT SUSPENSION DIAGNOSIS

WHEEL BEARING NOISE

Wheel bearing noise may be confused with rear axle noise; however, front wheel bearing noise does not change when comparing "pull" and "coast". A bad bearing will cause a knock or click approximately every two revolutions of the wheel. To determine which wheel bearing is noisy, hoist the car and spin each wheel while listening at the hub cap.

HARD STEERING

Cause:

1. Low or uneven tire pressure.
2. Steering gear adjusted too tight.
3. Insufficient or incorrect steering gear lubricant used.
4. Improper caster.
5. Upper or lower control arms bent.
6. Frame bent or broken.
7. Steering knuckle bent.

EXCESSIVE PLAY OR LOOSENESS IN STEERING SYSTEM

Cause:

1. Steering gear adjusted too loosely or worn linkage.
2. Control arm ball joints worn.
3. Front wheel bearings worn or incorrectly adjusted.
4. Loose front stabilizer link or worn bushings.

ERRATIC STEERING ON APPLICATION OF BRAKE

Cause:

1. Low or uneven tire pressure.
2. Incorrect or uneven caster.
3. Steering knuckle bent.
4. Loose steering linkage or suspension.
5. Dirt or grease on brake lining.

FRONT WHEEL SHIMMY

Cause:

Front

1. Uneven tire pressure.
2. Steering linkage worn.
3. Front wheel bearings worn or incorrectly adjusted.
4. Shock absorbers worn or inoperative.
5. Control arm ball joints worn.
6. Toe-in incorrect.
7. Incorrect or uneven caster.
8. Steering knuckle bent.
9. Wheels, tires, or brake drums out of balance.
10. Excessive runout of wheels or tires.

CAR PULLS TO ONE SIDE

Cause:

1. Low or uneven tire pressure.
2. Rear wheels not tracking equally with front wheels.
3. Shock absorbers worn or inoperative.
4. Toe-in incorrect.
5. Incorrect or uneven caster or camber.
6. Frame or frame member bent or broken.

WORN TIRE TREAD EDGES

Cause:

1. Improper front end alignment.
2. High speed driving on curves.
3. Steering knuckle bent.
4. Steering plain arm bent.
5. Low tire pressure.

SCUFFED TIRES

Cause:

1. Tires improperly inflated.
2. Wheels or tires out of true.
3. Control arm ball joints worn.
4. Toe-in incorrect.
5. Uneven caster.
6. Incorrect toe-out on turns.
7. Steering gear incorrectly adjusted.
8. Eccentric or bulged tires.

FRONT OR REAR WHEEL TRAMP

Cause:

1. Wheels, tires, or brake drums out of balance.
2. Shock absorbers worn or inoperative.
3. Loose or worn front wheel bearings.

CAR WANDERS

Cause:

1. Low or uneven tire pressure.
2. Steering gear adjusted to loosely or worn linkage.

REAR SUSPENSION

REAR SHOCK ABSORBER

A slight amount of fluid may bleed by the rod seal in cold weather and deposit a light film on the upper area of the shock absorber. This condition will not impair operation and should be considered normal. A shock absorber should never be checked horizontally or with the rod extension down.

For a complaint of a defective or noisy shock absorber, first check the mounting torque. If mounting is satisfactory, disconnect the lower mountings and pump the shock absorber by hand

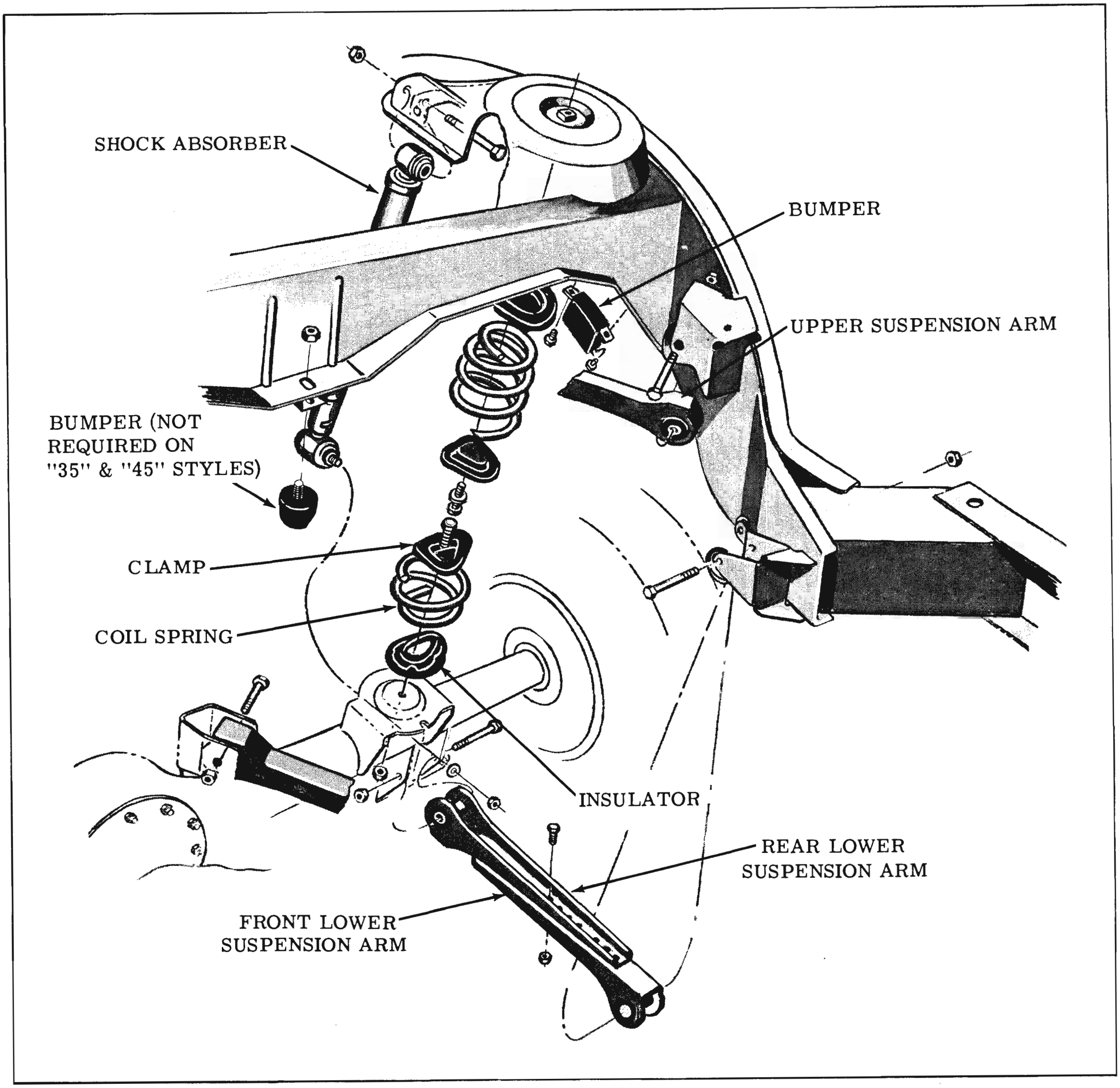


Fig. 5-32 Rear Suspension

in a vertical position. Compare both shock absorbers. If both shocks respond the same, it is unlikely that a defective shock absorber exists.

THUMPING NOISE

A thumping noise usually occurs when a shock absorber is changing its direction of stroke.

1. The shock absorber should be pumped with a rapid change of stroke. If lag is felt when changing stroke, this unit will be noisy.

2. Completely extend the shock absorber and pull hard. If spring tension is felt, this shock absorber will be noisy and should be replaced.

SQUEAKY OR REED TYPE NOISE

Hand pump the shock absorber at different rates of speed. If noise is heard that changes from a deep grunt to a high-pitched squeak, the shock absorber needs replacement.

NOTE: A squealing noise could be attributed to seals. This is particularly true if the shock has been inoperative for a period of time. This noise will disappear after a few strokes of the shock absorber and is not a cause for rejection.

REMOVE AND INSTALL (Fig. 5-32)

1. Remove shock absorber lower mounting nut

at axle housing lower suspension arm bracket.

2. Remove shock absorber upper pivot bolt from frame and remove shock absorber.

To install, loose-assemble shock absorber at both ends, then torque lower stud nut 30 to 46 ft. lbs. and the upper bolt and nut 45 to 55 ft. lbs.

REAR SUSPENSION ARMS (Fig. 5-32)

The rear axle housing is attached to the frame by 4 suspension arms. The lower arms are adjustable for length and control the differential nose angle. When removing and installing suspension arms, the frame and axle housing BOTH should be supported by floor stands or other suitable means. When installing a new lower arm, the same corresponding holes should be aligned as on the original arm. The upper arm and the lower arm front section must be installed with the open side of the channel facing downward. The lower arms are stamped "FRONT" and "REAR" for proper suspension installation.

CAUTION: Whenever a suspension arm is installed, torque the attaching bolts 65 to 75 ft. lbs. WITH THE CAR RESTING AT NORMAL CARRYING HEIGHT.

REAR SPRINGS

Remove (Fig. 5-32)

1. Hoist rear of car and disconnect shock absorbers from rear axle housing.

2. Loosen suspension arm bolts at frame and axle.

3. Support frame to relieve weight from springs.

4. Remove the upper and lower spring mounting bolts and clamps.

5. Remove the coil spring and insulators by dislodging spring from lower seat. (The coil spring will be under slight compression.)

INSTALL

1. Place upper insulator in coil spring and rotate insulators lightly so that insulator fits snugly in end of spring coil. (Fig. 5-33)

2. Position coil spring with insulator against upper seat and install clamp but do not tighten upper attaching bolt.

   IMPORTANT: Locate the clamp so that it nests in the insulator, (tang in notch) then torque the mounting bolt 35 to 45 ft. lbs.

3. Position lower end of coil spring on axle housing pad and raise axle housing to compress spring to normal carrying height.

4. Install Spring Holding Tool BT-6102 at front of spring. (Fig. 5-34)

5. Lower axle housing and position other spring insulator as in Step 1; then raise axle and install lower clamp.

6. Position lower clamp so that it nests in the insulator, then tighten the lower mounting bolt 35 to 45 ft. lbs.

7. Raise axle if necessary for the removal of Tool BT-6102.

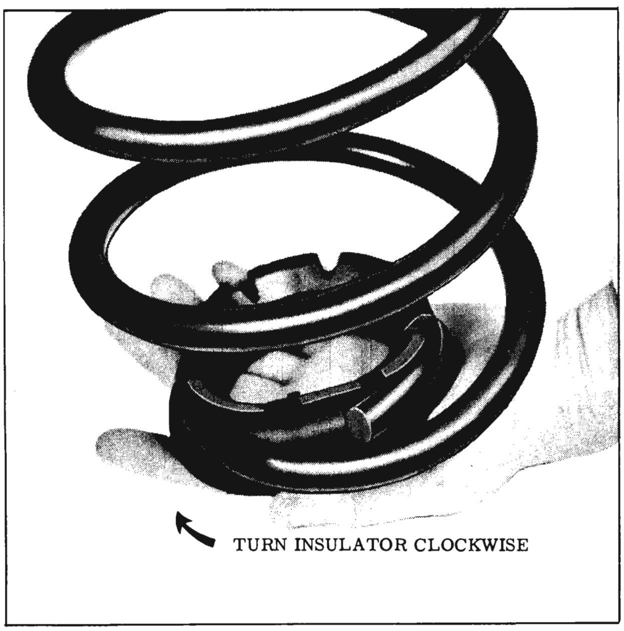


Fig. 5-33 Spring Insulator Installation

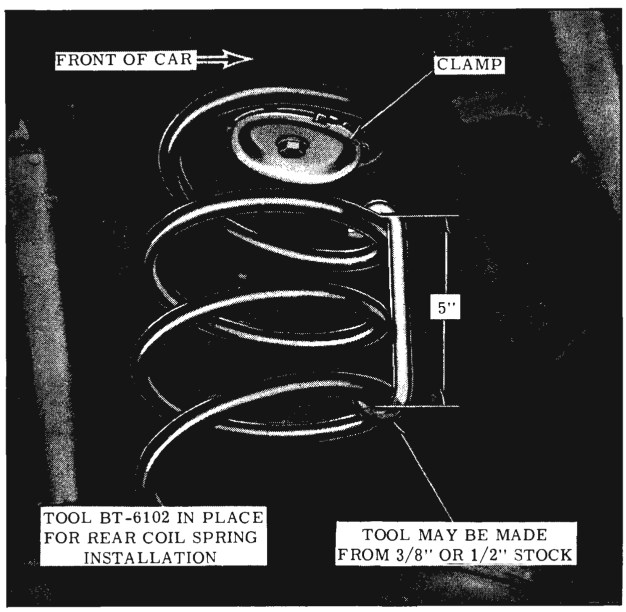


Fig. 5-34 Coil Spring Installation

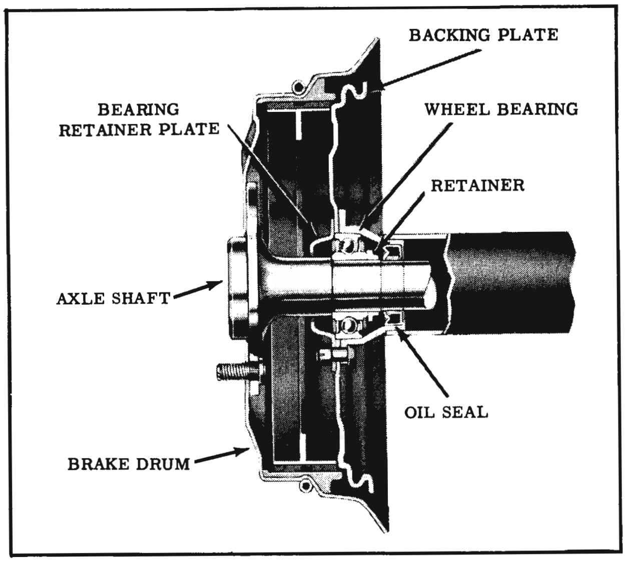


Fig. 5-35 Axle Shaft and Related Parts

8. Connect shock absorbers and torque suspension arm bolts 70 to 90 ft. lbs. with the weight of the car resting on the rear springs.

AXLE SHAFT BEARING AND OIL SEAL (Fig. 5-35)

AXLE SHAFT—REMOVE

1. Remove wheel.

   NOTE: Wheel nuts on left side of car have left hand threads.

2. Remove the two spring nuts from wheel studs which hold the brake drum in place and remove the drum.

3. Remove nuts from the four bolts attaching brake backing plate to axle housing.

4. Pull axle shaft bearing retainer plate away from backing plate, taking care not to dislodge backing plate as brake line may be damaged.

5. Pull axle shaft and bearing assembly from housing. Use Tool J-942-1 and Slide Hammer J-2619 if bearing is a tight press fit in the axle housing. (Fig. 5-36)

   NOTE: Extreme care must be exercised to prevent the axle shafts from dragging on oil seal. Bearings should then be covered by a clean cloth to prevent dirt getting into bearings.

6. Replace one backing plate attaching nut to hold plate in position.

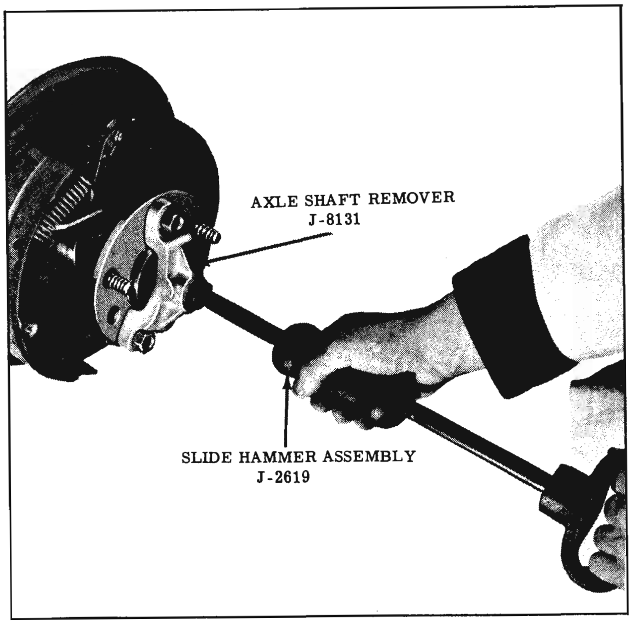


Fig. 5-36 Removing Axle Shaft

BEARING REMOVAL

The sealed rear wheel bearings are built with .012" to .015" end-play between balls and races and should not be rejected unless end-play is greater than .020" or definite roughness between ball and race can be felt when bearing is rotated by hand. The bearing should be checked for end-play and roughness before it is removed from the axle shaft because if bearing has been removed from the axle shaft, it cannot be used again.

NOTE: Tipping of either race can cause a large error in end-play reading.

1. With axle shaft removed, remove bearing retainer collar after splitting with cold chisel as shown in Fig. 5-37. Do not damage axle shaft.

2. Engaging outer race of bearing with Tool J-947-2, used in conjunction with J-947-1, press off bearing in arbor press, (Fig. 5-38). Remove bearing only when a new bearing is to be installed. (Tool J-947-2 is used during removal to prevent breakage of the bearing outer race which could result in personal injury.)

AXLE SHAFT FLANGE BOLT—REMOVE AND INSTALL

The axle shaft flange bolts can be removed by pressing bolts from axle flange. To install, press new bolts into flange using care not to damage threads. Support bolt head and peen bolt with Peening Tool J-554-18.

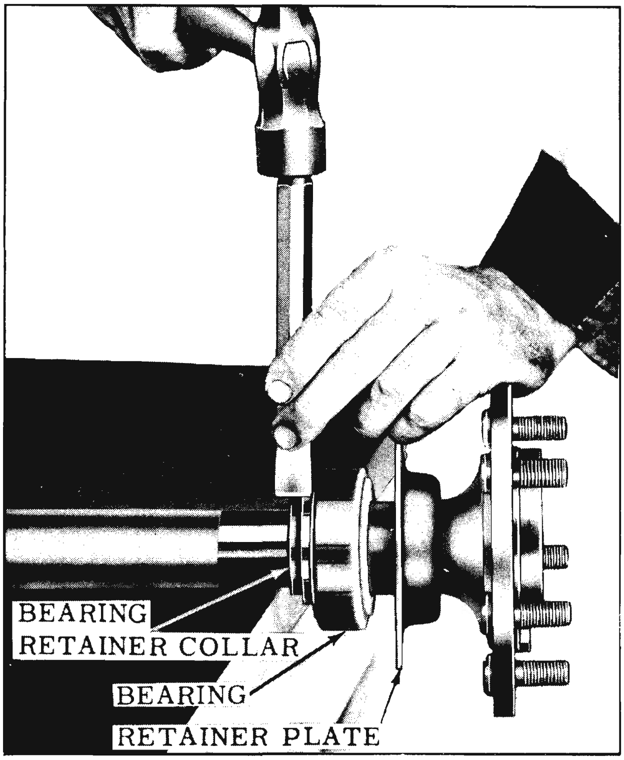


Fig. 5-37 Removing Bearing Retainer

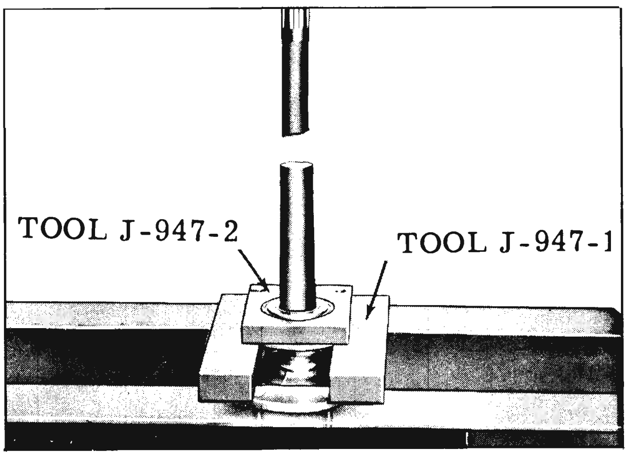


Fig. 5-38 Removing Axle Shaft Bearing

BEARING—INSTALL

Using Tool J-947-3 in conjunction with plate J-947-1, press bearing over axle shaft being sure that pressure is applied to inner race of bearing. After bearing has been pressed firmly against axle shaft shoulder, press new bearing retainer collar over axle shaft until it is firmly seated against bearing. (Fig. 5-39) Do not damage shaft oil seal surface.

AXLE SHAFT—INSTALL

Before installing axle shafts examine oil seals.

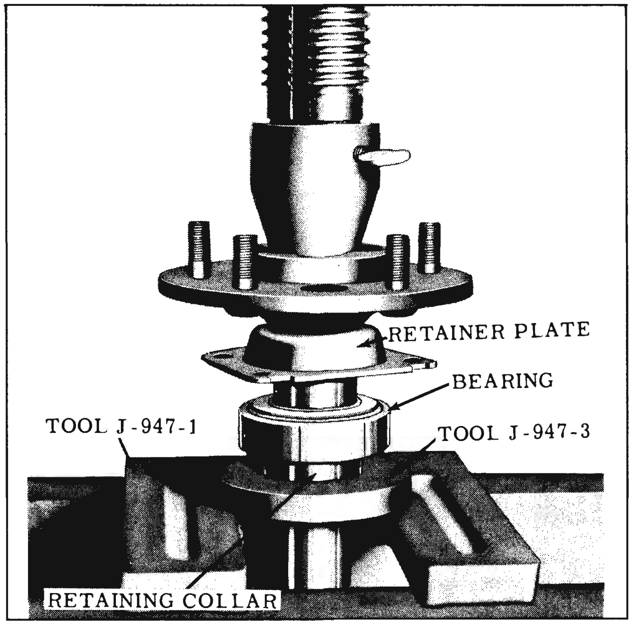


Fig. 5-39 Installing Axle Shaft Bearing Retainer

The oil seals have feather edges which form a tight seal around the axle shafts. If these feather edges are damaged in any way, the oil seals must be replaced.

Examine the surface of the shaft on which the seal wipes to make sure that it is smooth and free from tool marks. If necessary, dress down shaft with crocus cloth.

If roughness or excessive play is detected in wheel bearings, they should be replaced.

Axle shafts are serviced with wheel studs pressed into the flange of the shaft. The threads of these studs are left hand for the left hand side of the car and right hand for the right hand side of the car, thereby making the right and left hand shaft assemblies different for service.

1. Remove temporary nut holding backing plate to axle housing.
2. Clean inner surface of backing plate and place new gasket over backing plate mounting studs. Clean gasket side of retainer plate.
3. Slide axle shaft and bearing assembly into place. EXTREME CARE MUST BE EXERCISED WHEN SLIDING THE AXLE SHAFT THROUGH THE OIL SEAL TO AVOID DAMAGING THE SEAL.
4. Place retainer plate over backing plate mounting studs and install self-locking nuts. Torque 23 to 28 ft. lbs.
5. Replace brake drum and wheel assembly.

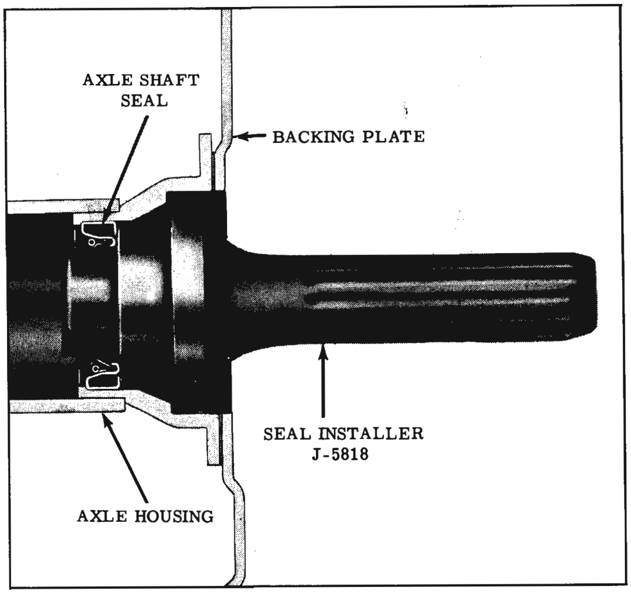


Fig. 5-40 Installing Rear Axle Oil Seal

OIL SEAL (AXLE SHAFT REMOVED)

REMOVE

1. Insert splined end of axle shaft into seal.

2. With splined end of axle shaft contacting upper I.D. of seal, press down on axle shaft until seal is removed from axle housing.

INSTALL

1. Apply sealer Part No. 557622 to O.D. of seal.

2. Position seal into axle housing. Drive seal into housing with Tool J-5818 until seal is fully seated. (Fig. 5-40)

AXLE HOUSING

ALIGNMENT

If rear tire wear indicates that the axle housing may be bent, the alignment can be checked as follows:

1. Back the car squarely onto an alignment machine.

2. Compensate for wheel run-out the same as for checking front wheel toe-in.

3. Check camber readings which should be $1/4^{o}$ negative to $1/2^{o}$ positive.

4. Check the amount of toe-out, which should be 1/16" to 3/16".

   NOTE: Due to the fact that the car is backed onto an alignment machine, the actual toe-out will be read on the scale as toe-in. However, if the toe-out is checked with a tram gauge, disregard the aforementioned.

5. If a tram gauge is used for checking toe-out, it will still be necessary to perform steps 1 and 2 in order to check camber.

The necessary straightening operations may be performed using frame straightening equipment without removing the axle housing from the car. This procedure will allow checks during the straightening operation to determine when the housing is within the prescribed limits.

WHEELS AND TIRES

DISMOUNTING TIRES

1. With wheel assembly removed, remove valve cap and core to deflate tires.

2. Use commercial type bead breaker to loosen tire sealing beads from rim.

   CAUTION: DO NOT use tire irons for breaking beads from rim as this may damage beads.

3. After beads have been loosened, remove the outside bead from the rim with two tire irons.

4. Turn the tire over and again use tire irons, one between the rim and bead to pry the rim out, the other to pry outward between the tire bead and rim as shown in Fig. 5-41.

VALVE REMOVAL AND REPLACEMENT (Tire Removed)

To remove a rubber "snap-in" valve from rim, force a small screwdriver blade between valve and edge of hole. Then, while prying on valve to start groove out of edge of hole, push the valve back through the rim.

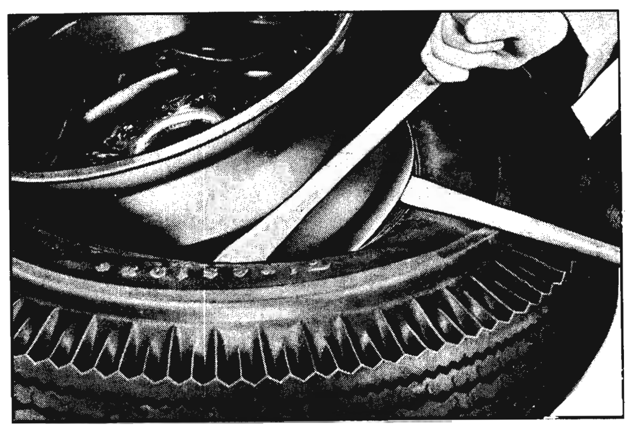


Fig. 5-41 Removing Tire

IMPORTANT: To insure against air leaking around the valve, always use a new valve once a valve is removed from the rim.

The one piece "snap-in" type rubber valve is installed as follows:

1. Clean all particles of foreign matter from around the area and the edges of the valve hole in the rim with steel wool.

2. Lubricate the outside of the valve with water or a very light film of tire lubricating soap.

   IMPORTANT: DO NOT USE GREASE OR DRY SOAP AS IT WILL DETERIORATE THE RUBBER.

3. Insert the "snap-in" type rubber valve through the hole in rim as far as it will go, then pull the valve through the hole with a tire valve fishing tool until the valve snaps into position. (Fig. 5-42)

   NOTE: Do not attempt to drive the valve into position with a hammer or pull the valve with pliers as damage to the valve may result.

MOUNTING TIRES

Tire mounting machines or tire irons can be used, however, extreme care must be exercised to prevent injury to the sealing bead and circumferential bead when forcing tire over rim.

1. If a new tire is to be mounted, remove the cardboard spacer.

2. Apply a light film of tire lubricating soap to sealing beads of tire.

   NOTE: DO NOT use excessive lubricant as this may lead to rim slippage and subsequent breakage of air seal.

3. Carefully mount inner bead in usual manner. If tire irons are used, take small "bites" around rim being careful not to injure the tire bead. (Fig. 5-43)

   CAUTION: DO NOT use a hammer, as damage to bead will result.

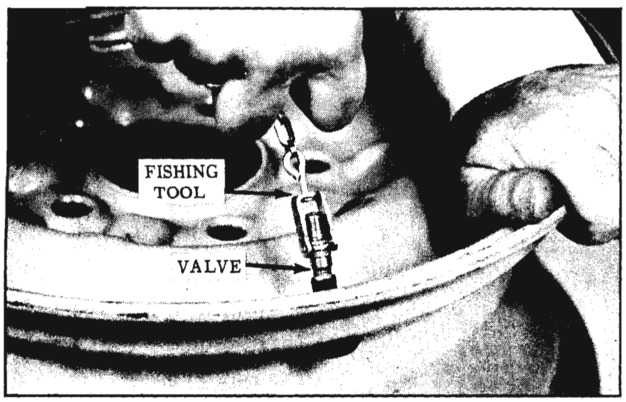


Fig. 5-42 Installing Valve

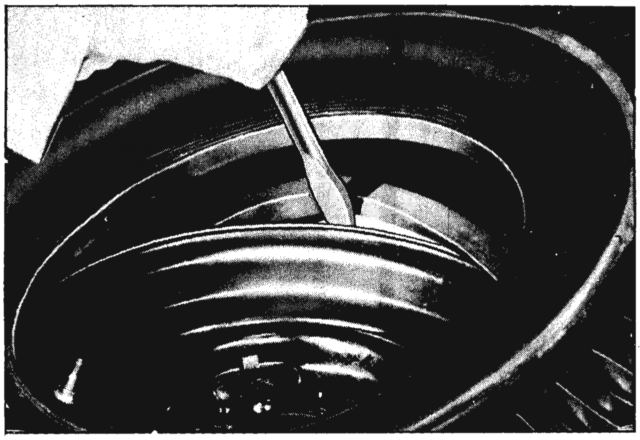


Fig. 5-43 Mounting Tire

4. Install outer bead in the same manner.

   Fig. 5-44 illustrates a tire mounting band slipped around the outside of the tire to compress center of tire tread to force bead out against the rim seat. A sash cord winched around a jack handle will serve the same purpose.

5. While holding the tire in upright position, press against the outside of the wheel. This will start the outside bead onto the bead seat.

6. Next, lean the tire so the weight of the wheel will help seat the inside bead.

7. Give a few quick "shots" of air to seat the tire beads on the bead seats.

   CAUTION: KEEP HANDS AWAY FROM TIRE BEAD RIM DURING THIS OPERATION.

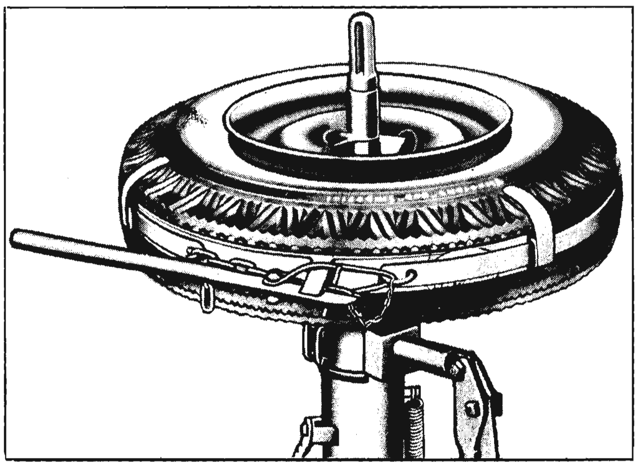


Fig. 5-44 Tire Mounting Band

8. Inflate tire to 40 pounds.

9. Check to be sure that the bead positioning rib (outer ring of tire) is visible evenly just above the rim flange all the way around tire, both sides.

10. Deflate to recommended air pressure.

TIRE INFLATION

Maintenance of the correct inflation pressure is one of the most important elements in tire care.

For recommended tire pressure (tires cold) refer to chart in GENERAL INFORMATION section.

Too great a tire pressure is detrimental, but not so much as under inflation. Higher inflation pressure than recommended will cause:

1. A harder riding car.
2. A tire more susceptible to various types of bruises.
3. Tire chatter, resulting in uneven wear.
4. Excessive wear at the center of the tire tread.

Even when a tire is properly inflated, it is flat where it contacts the road so that the car at all times is in effect being pushed up hill. This condition is exaggerated on an under-inflated tire.

Inflation pressures lower than recommended will result in:

1. Higher gasoline consumption.
2. Rapid and uneven wear on the edges of the tire tread.
3. A tire more susceptible to rim bruises and various types of rupture.
4. Increased cord fatigue or broken tire cords.
5. Hard steering.
6. High tire temperatures.
7. Car roll on sharp curves.
8. Tire squeal on curves.

TIRE NOISE

Complaints of axle noise are more frequently caused by tires than by differential gears, bearings, etc.

Tire noise is frequently diagnosed as axle noise. Tire noise is relative directly to the speed of the car and the road surface. Tests made for drive, float, and coast noise as used for differential testing will have little or no effect on noise level if tires are the cause.

VARIOUS TYPES OF TIRE WEAR

Under Inflation Wear

Under inflation results in abnormal wear of the tread shoulder, caused by the tires rolling on the shoulders with a wiping action. (Fig. 5-45)

In addition, under-inflated tires are subjected to continual flexing, causing high internal temperatures and cracking of the sidewall.

Over Inflation Wear

Over inflation causes the center section of the tread to receive excessive driving and braking, therefore, the center section is worn more than the shoulders. (Fig. 5-46) An over inflated tire is subject to breaks in the fabric from severe impacts and is more easily cut or punctured.

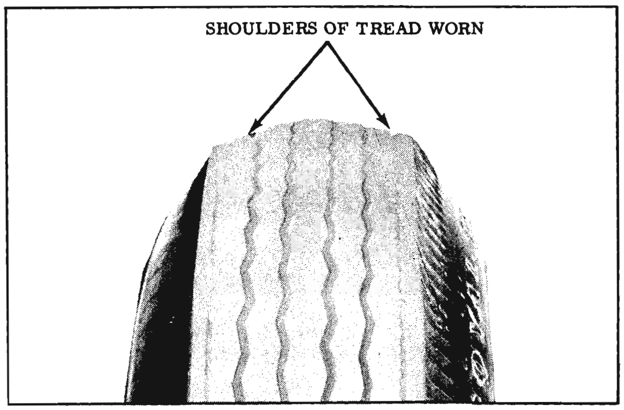


Fig. 5-45 Under Inflation Wea-

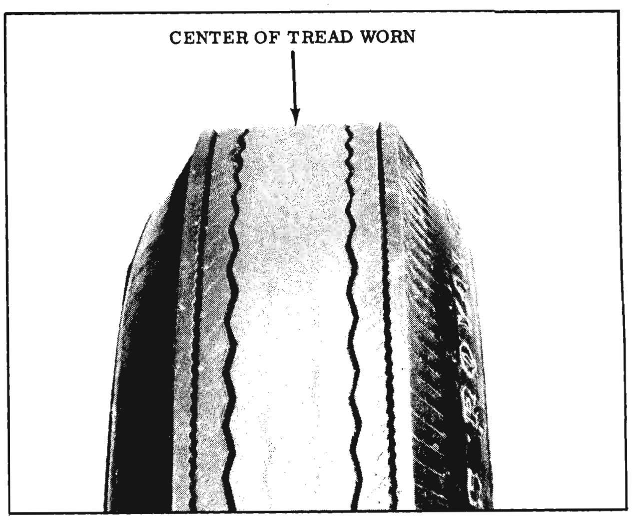


Fig. 5-46 Over Inflation Wear

Toe-in or Toe-out Wear

Excessive toe-in or toe-out has the effect of dragging the tires sideways down the road, which results in feathering the raised portions of the tread.

Improper toe-in is indicated by feather edges on the inner side of the tread. (Fig. 5-47) Toe-out is indicated by the feather edges on the outer side of the tread.

Camber Wear

Excessive positive camber will cause wear on the outer side of the tread. (Fig. 5-48) Excessive negative camber will cause wear on the inner side of the tread. Camber wear may also be evident if the car is driven continually on highly crowned roads.

Wear Due to Driver Habits

Owner driving habits may cause cornering wear, rear tire inside wear, and front tire heel and toe wear even though all wheel alignment factors are within specifications and tires are properly inflated.

Cornering wear, caused by high speeds on turns, is identified by the rounded shoulders of the tire and small rough abrasions and fins raised by cornering friction against the road. (Fig. 5-49)

Rear tire inside wear is caused by rapid acceleration which causes the axle to bend slightly in a horizontal plane to toe-in the rear tires. This results in excessive wear on the inner shoulders of the rear tires and is similar in appearance as camber wear. (Fig. 5-48)

Wear Due to Mechanical Conditions

Loose parts of the front suspension system such as worn ball joints, mountings of the upper and lower control arms, inoperative shock absorbers and unbalanced wheels and tires, will cause flat spots, cups, gouges and wavy wear. (Fig. 5-50)

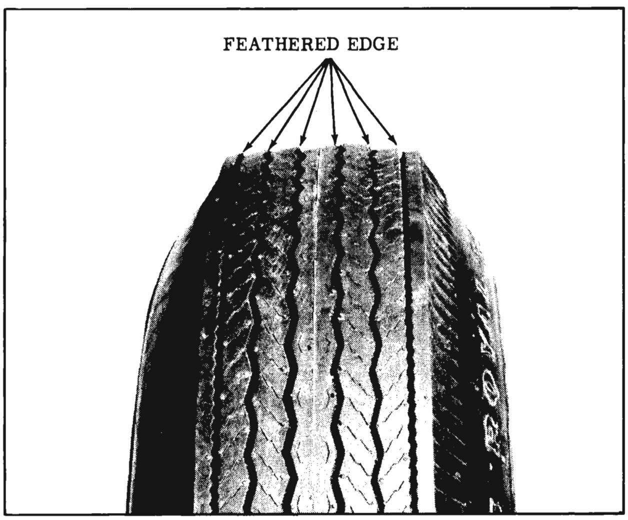


Fig. 5-47 Toe-In Wear

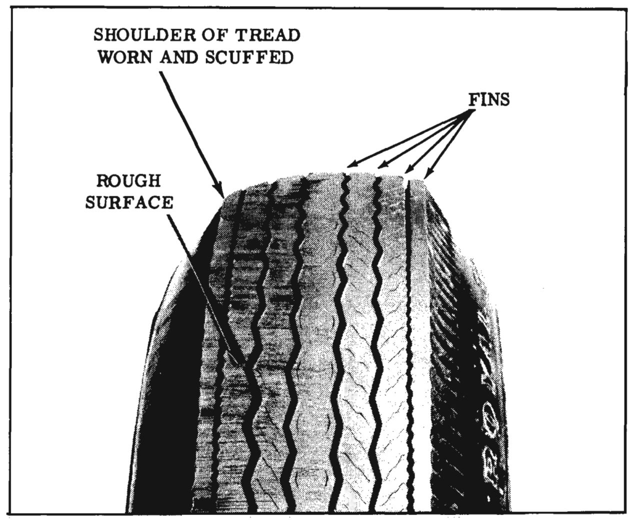


Fig. 5-49 Cornering Wear

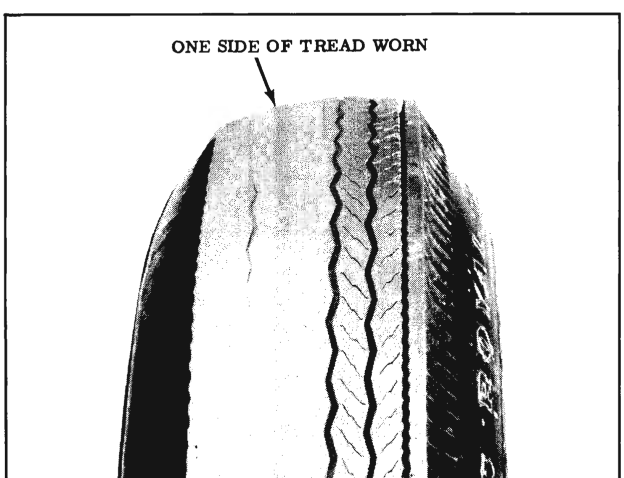


Fig. 5-48 Camber Wear

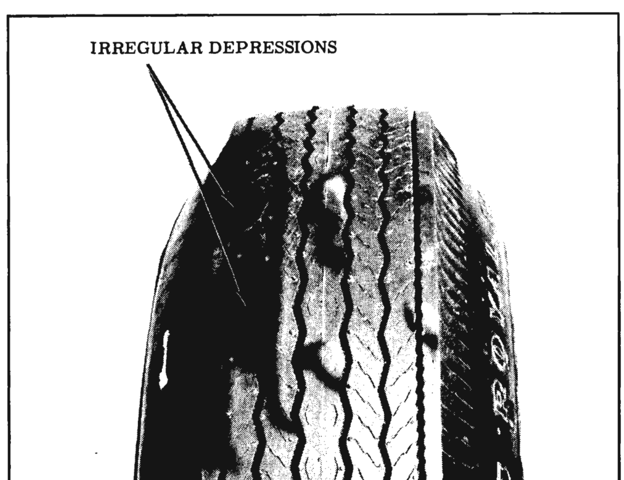


Fig. 5-50 Wear Due To Mechanical Conditions

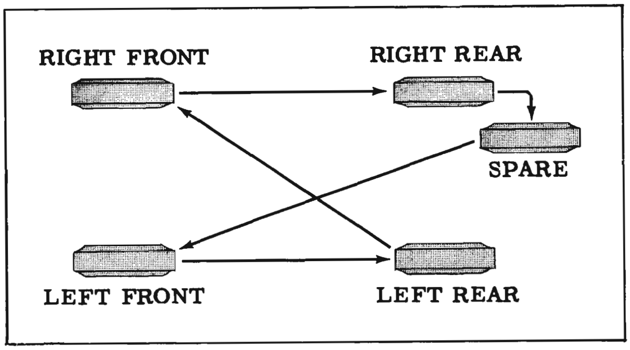


Fig. 5-51 Tire Rotation

TIRE ROTATION

In order to obtain maximum tire tread life and keep the spare tire from deteriorating due to lack of use, tires should be rotated at 6,000 mile intervals as shown in (Fig. 5-51).

TIRE AND WHEEL RUNOUT

Wheel and tire assemblies may be checked for runout with a dial indicator at points shown in Fig. 5-52. Runout should not exceed the following limits:

Tire Runout:	Radial	.080"
	Lateral	.100"
Wheel Runout:	Radial	.035"
	Lateral	.045"

NOTE: Tire runout should be checked as soon as possible after car has been driven to avoid false readings due to the tendency of tires to take a temporary "set" after standing for a few hours.

WHEEL AND TIRE BALANCE

Wheel, tire, and brake drum balance must be maintained within certain limits; otherwise, wheel tramp and high speed shimmy will result.

Front wheel "tramp" and front wheel "shimmy"

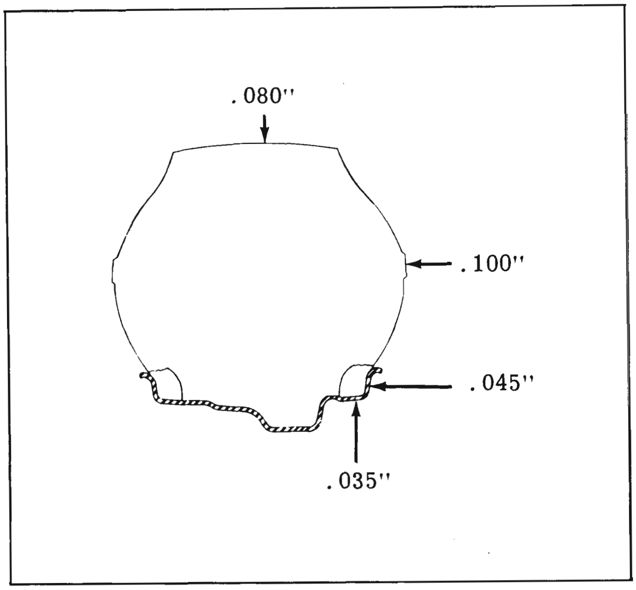


Fig. 5-52 Wheel and Tire Runout Specifications

are two entirely different conditions. Front wheel "tramp", which usually occurs at high speed, is a wheel "hop" caused from an unbalanced condition of wheels, loose linkage in the front end, or improperly operating shock absorbers.

"Shimmy" may occur at the lower speeds and is a wobbly condition of the front wheels caused from an unbalanced condition, loose front end linkage, loose steering gear parts, or faulty steering gear adjustment. "Tramp" and "shimmy" will be felt in the whole car, however, "shimmy" can also be felt at the steering wheel. "Shimmy" is a front wheel condition entirely, whereas it is possible to have "tramp" in front or rear wheels.

Due to the irregularities in tread wear caused by sudden brake application, misalignment, low inflation pressure, or tire repair, etc., a wheel and tire assembly may lose its original balance. Consequently, if front end instability develops, the tire and wheel assembly should be checked for static and dynamic balance.

SPECIFICATIONS

FRONT SUSPENSION

1.	CASTER ANGLE (DEGREES)	0^{o} to 1^{o}-
2.	CAMBER (DEGREES)*	$1/4^{o}$- to $1/2^{o}$+
3.	TOE-IN	0" to 1/16"
4.	TOE-OUT ON TURNS	
	MANUAL STEERING	20^{o}=23^{o} ± $1/2^{o}$
	POWER STEERING	20^{o}=24^{o} ± $1/2^{o}$
5.	BALL JOINT INCLINATION	11^{o}
6.	TREAD	62.2"
7.	CARRYING HEIGHT	(Refer to Fig. 5-53)

*Maximum Camber variation between either side of the car should not exceed 1/2°.

REAR SUSPENSION

1.	REAR AXLE	
a.	Tread	61"
b.	Road Clearance at Differential	7.05"
c.	Allowable Out-of-True of Housing on the Vertical (At Rear Wheel)	$1/4^{o}$ neg. to $1/2^{o}$ pos. camber
d.	Allowable Out-of-True of Housing on the Horizontal (At Rear Wheel)	1/16" to 3/16" Toe-Out
2.	CARRYING HEIGHT	(Refer to Fig. 5-53)

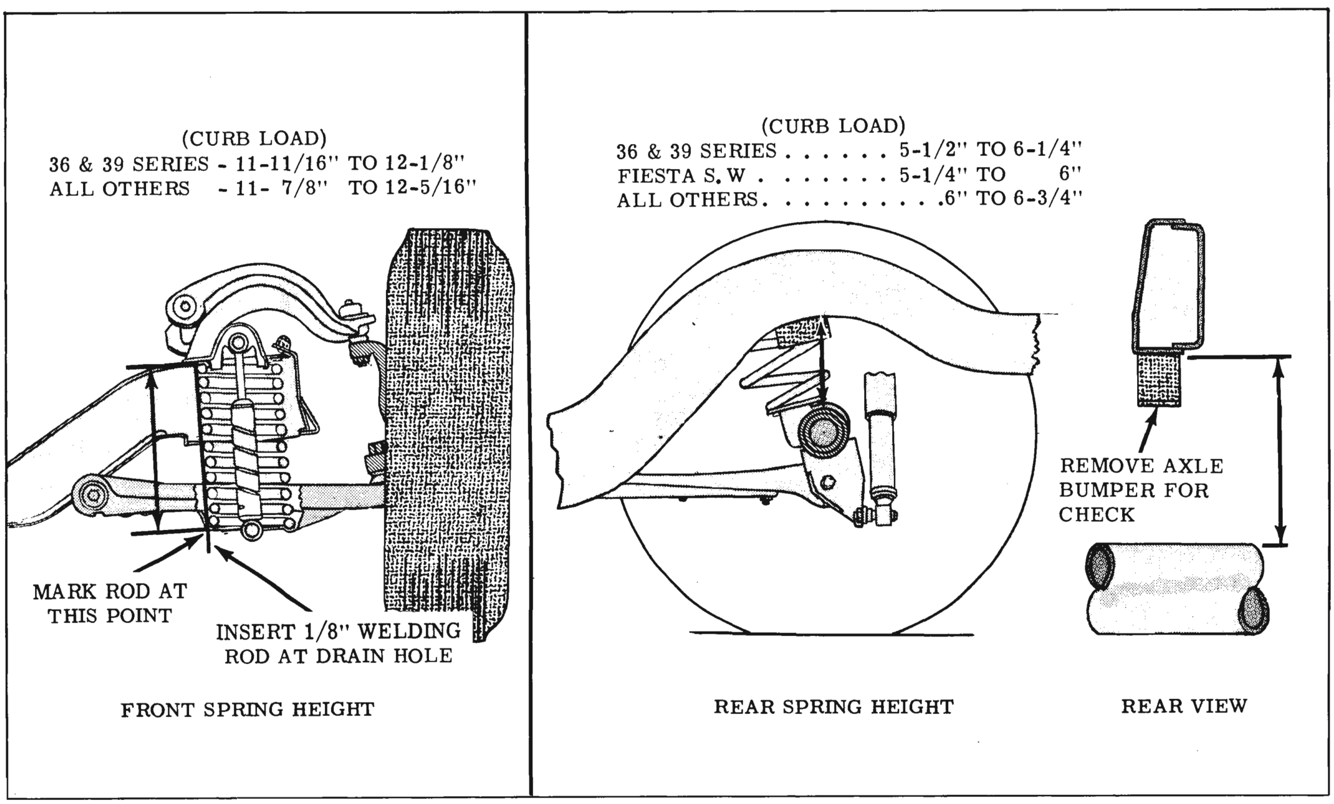


Fig. 5-53 Spring Carrying Heights

SPECIFICATIONS (Cont'd.)

WHEELS AND TIRES

1. WHEEL BASE

   a. 32, 35 & 36 Series . . . . 122.9"
   b. 38 & 39 Series . . . . 125.9"

2. WHEELS

   a. Rim Diameter . . . . 14"
   b. Rim Width . . . . 6"
   c. Radial Runout* . . . . .035" Max.
   d. Lateral Runout* . . . . .045" Max.

3. TIRES

   a. Radial Runout* . . . . .080" Max.
   b. Lateral Runout* . . . . .100" Max.

*Total Indicator Reading

TIRE SIZES

Series	Standard	Optional
88, S88 & Starfire Coupe Without Factory Installed Air Conditioning	800 x 14	850 x 14
88, S88 & Starfire Coupe With Factory Installed Air Conditioning	850 x 14	----
Starfire Convertible & 98 Without Factory Installed Air Conditioning	850 x 14	900 x 14
Starfire Convertible & 98 With Factory Installed Air Conditioning	900 x 14	----

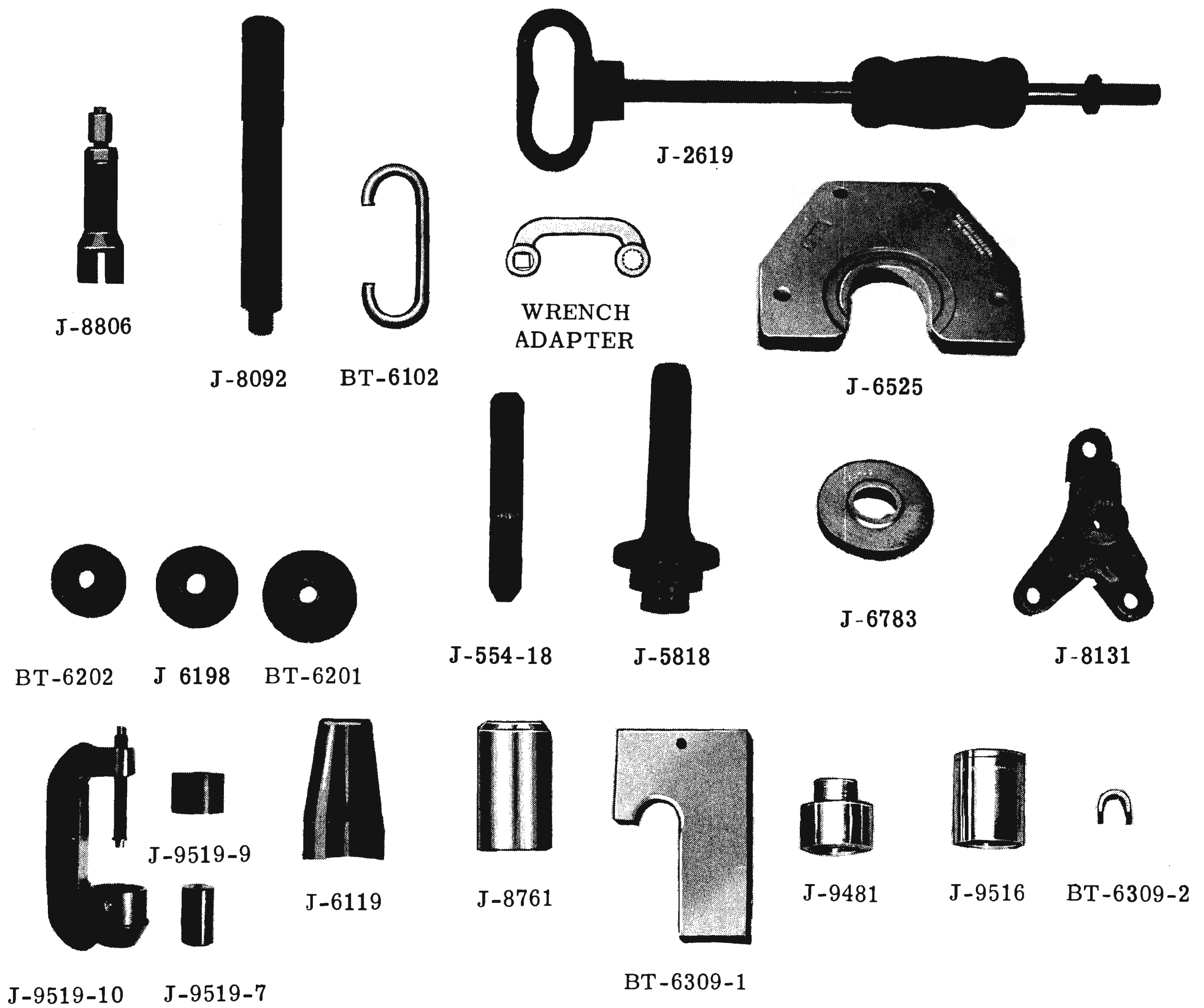
TORQUE TIGHTNESS CHART

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specifications.

Application	Ft. Lbs.
FRONT SUSPENSION	
Stabilizer	
Stabilizer Link Nut	13 to 17
Stabilizer Bar Bracket to Frame Bolt & Nut	25 to 45
Shock Absorber	
Shock Absorber Upper Pivot Bolt & Nut	65 to 75
Shock Absorber to Control Arm Bolts	15 to 25
Control Arms	
Upper Control Arm Pivot Shaft to Frame Bolts & Nuts	85 to 110
Lower Control Arm Pivot Shaft to Frame Bolts & Nuts	
Allen Head Bolts	90 to 110
Standard Bolts	65 to 80
Upper Arm to Pivot Shaft Bolt	35 to 45
Lower Arm to Pivot Shaft Bolt	50 to 60

TORQUE TIGHTNESS CHART (Cont'd.)

Ball Joints	
Ball Joints to Steering Knuckle Nuts	70 Min.
Steering Knuckle	
Backing Plate to Steering Knuckle (Anchor Bolt)	120 to 145
Plain Arm to Steering Knuckle to Backing Plate Bolts (1/2")	80 to 130
Wheel Bearing Adjustment Nut	(Refer to Wheel Bearing Adj.)
REAR SUSPENSION	
Shock Absorber	
Upper Pivot Bolt & Nut	45 to 55
Lower Stud Nut	30 to 46
Suspension Arms	
Pivot Bolts & Nuts	70 to 90
Lower Arm Front & Rear Section Bolts & Nuts	45 to 60
Rear Spring	
Upper & Lower Bolt	35 to 45
Backing Plate	
Backing Plate Attaching Bolts	23 to 28
MISCELLANEOUS	
Wheel Nuts	70 to 85



BT-6102 Rear Spring Installer

BT-6201 Front Sheel Bearing Inner Race Installer

BT-6202 Front Wheel Bearing Outer Race Installer

BT-6309-1 Pivot Shaft Bushing Press Plate

BT-6309-2 Pivot Shaft Bushing Remover Spacer

J-554-18 Hub Bolt Peening Tool

J-2619 Slide Hammer Assembly (Used to Remove Axle Shafts)

J-5818 Axle Shaft Oil Seal Installer

J-9516 Pivot Shaft Bushing Remover

J-6198 Front Pinion Bearing Cup Installer (Used to Install Outer Bearing Inner Race Retainer)

J-6525 (J-947-1 and J-947-2) Axle Shaft Bearing Remover

J-6783 (J-947-3) Axle Shaft Bearing Retainer Installer

J-8092 Driver Handle (Used with J-6198, J-7578 and J-7585)

J-8131 (J-942-1) Axle Shaft Remover

J-8806 Ball Joint Remover

J-9481 Pivot Shaft Bushing Installer

J-9519-10 Ball Joint Fixture

J-9519-7 Ball Joint Remover

J-9519-9 Ball Joint Installer

Pivot Shaft Torque Wrench Adapter (Available on the open market)

Fig. 5-54 Suspension Tools

SUSPENSION

(F-85)

CONTENTS OF SECTION 5

MAINTENANCE RECOMMENDATIONS

For lubrication information refer to PERIODIC MAINTENANCE Section 2.

During an oil change the ball joint seals should be observed for cracks or cuts. If a seal is damaged, it can be replaced by referring to FRONT SUSPENSION BALL JOINT.

Periodic lubrication of the front wheel bearings is not required, however, when brake maintenance requires removal of the front drums, the bearings should be cleaned and repacked with a sodium soap, fine fiber grease.

DESCRIPTION

The front suspension system of the Oldsmobile F-85 is of the ball joint, independent type. It differs from the conventional Oldsmobile system in that it is attached to the body by three isolation mounts. The engine is supported by two mounts attached to the cross bar of the front suspension system. The complete system can be removed from the car as a single unit. Most parts can be serviced with the complete unit in its position attached to the body.

ISOLATION MOUNTS

The three isolation mounts used to attach the front suspension system to the body frame are large rubber and steel bushings. These are positioned in their brackets on the cross bar. (Fig. 5-101)

FRONT MOUNT

Removal

1. Install engine support Tool J-8974.
2. Hoist car.

   NOTE: If frame contact hoist is used, and front suspension is raised off the floor, stands must be used to support suspension system.

3. Disconnect steering gear from shaft and remove the 3 isolation mount bolts.
4. Lower front cross bar enough to allow clearance to change the front mount.
5. It will be necessary to drive the mount from the bottom out the top. Care must be taken not to damage inside of mount bracket.

Installation

1. Place the new mount in position at top of bracket.
2. With a large washer on top of the mount, place a long bolt through the mount so the bolt head will be on the washer. Place one piece of steel bar across the bottom of the bracket with a

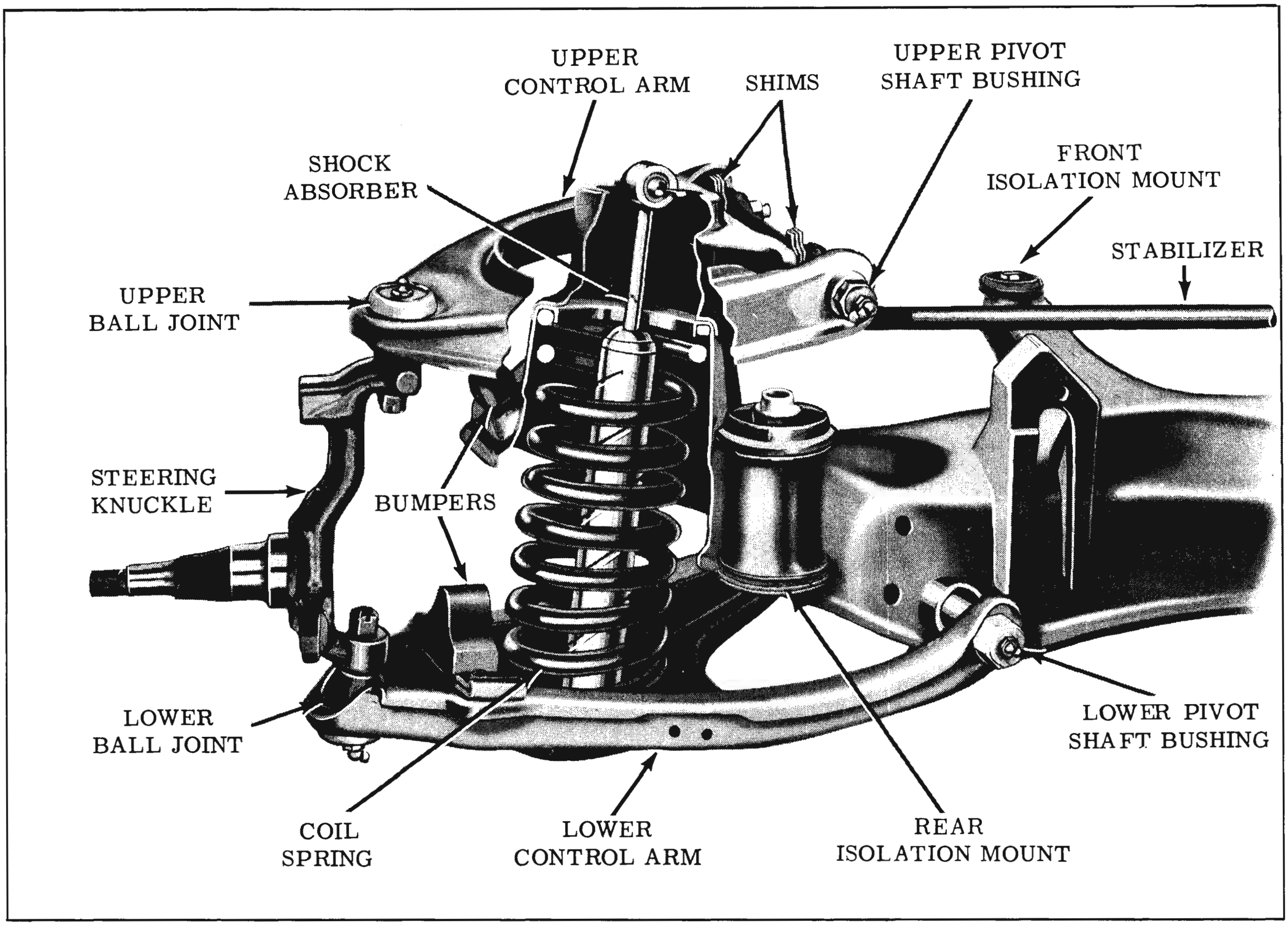


Fig. 5-101 Front Suspension

hole in it the size of the bolt. Place the bolt through this hole and put a nut on the bolt. Tighten the nut to pull the mount into the bracket.

NOTE: When placing the cross bar back in position, the protruding mount bushing must be properly positioned in the frame.

3. Install isolation mount bolts and connect steering gear. Torque bolts 60-80 ft. lbs.

4. Remove engine support tool.

REAR MOUNTS

Removal

1. Install engine support Tool J-8974.

2. Hoist car.

3. Disconnect steering shaft from steering gear.

4. Remove engine mount to cross bar bolts.

5. Disconnect stabilizer links and brake hoses.

NOTE: Place stands under cross bar or body, depending on what type of hoist is being used. If using a frame contact type lift, lower the car until the front wheels are on the floor.

6. Remove the 3 isolation mount bolts being careful the suspension system does not tip.

7. Slowly lower cross bar or raise body enough to remove the mount by driving from the bottom.

Installation

Install the isolation mounts as outlined under "FRONT MOUNT -- INSTALLATION".

STABILIZER

The stabilizer shaft is attached to the body frame as illustrated in Fig. 5-102. Torque stabilizer link nuts 13-17 ft. lbs. Torque bracket bolts 25 to 45 ft. lbs. Do not lubricate bracket bushings as they are dependent upon a bonding of the rubber to the shaft for proper stabilizing action.

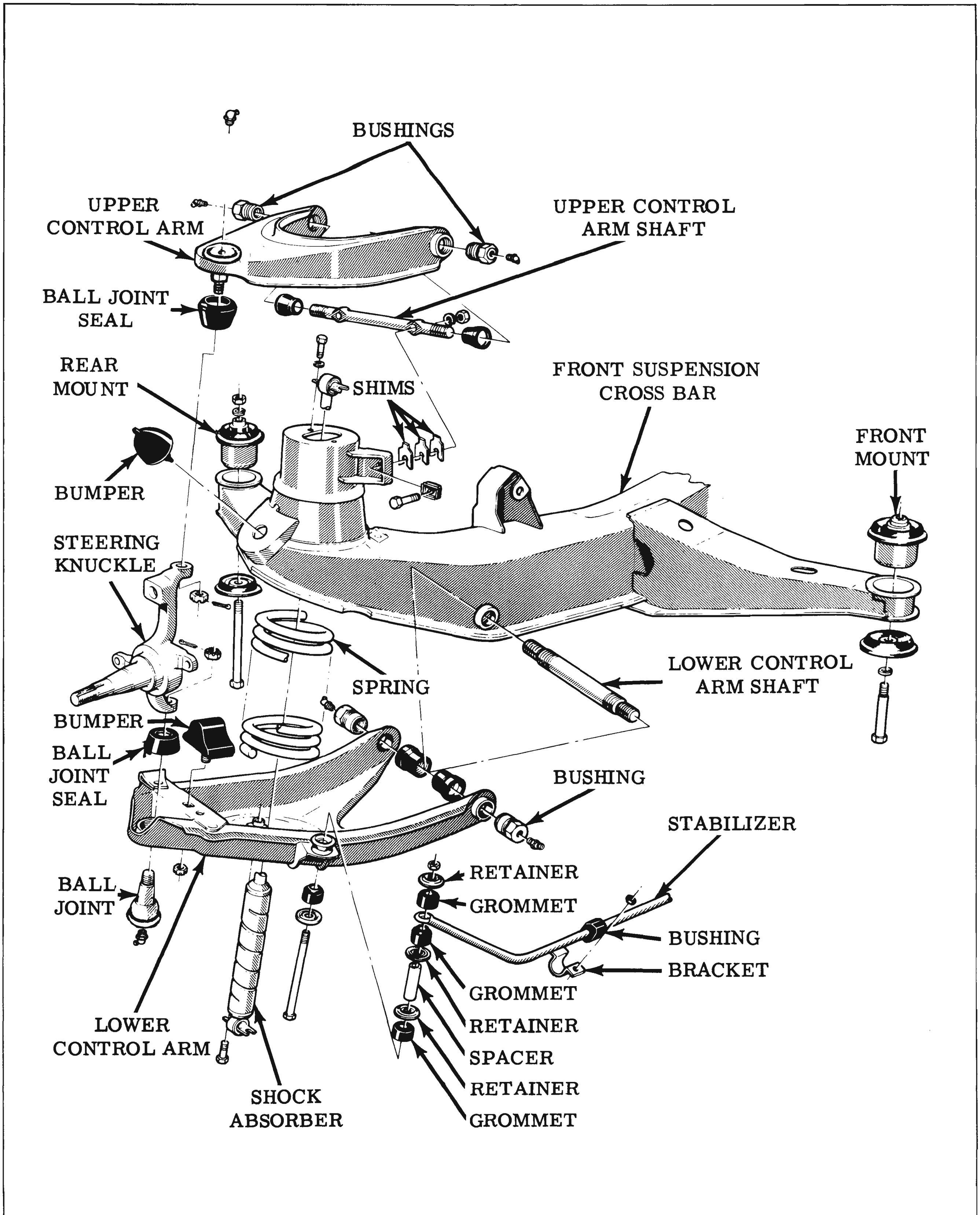


Fig. 5-102 Front Suspension - Exploded View

SHOCK ABSORBER

Shock absorbers are sealed when manufactured. If found defective they must be replaced.

CHECKING

1. Inspect mountings.
2. If mountings are satisfactory, disconnect the

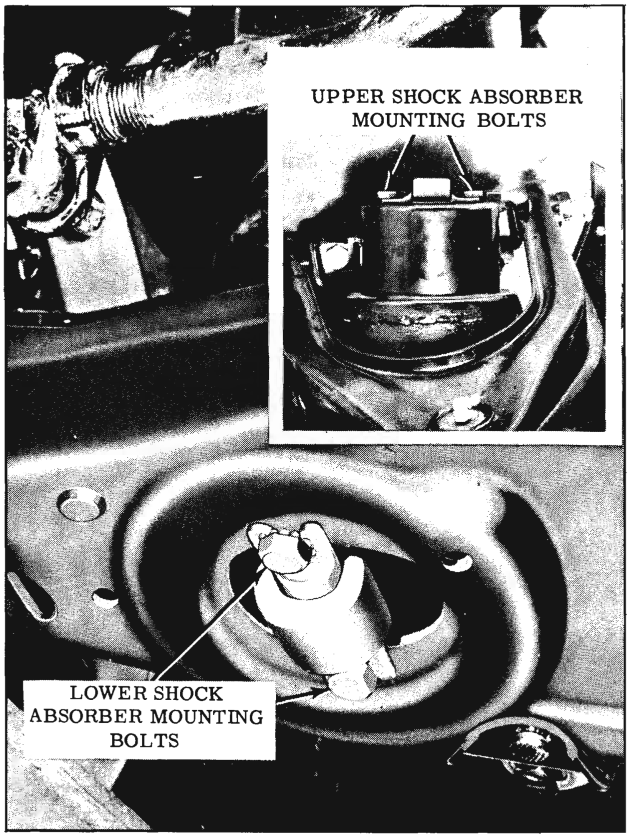


Fig. 5-103 Shock Absorber Attachment

lower mount and pump VERTICALLY several times. If smooth hydraulic resistance is present in both directions, the shock absorber is satsfactory. (Fig. 5-103)

DO NOT PUMP HORIZONTALLY IF SHOCK IS OFF CAR.

3. If a lag is felt when changing stroke, this will usually indicate a noisy shock on the car.

4. With the shock fully extended, pull hard. If spring tension is felt, this will usually indicate a noisy shock on the car.

5. Pump at different rates of speed. If a noise is heard from a deep to a high pitched squeak, this will indicate a noisy shock on the car.

   NOTE: If a shock has been inoperative for a period of time, the seals may cause a squeak. This will disappear after a few strokes and the seal becomes lubricated.

6. If a shock is believed to be weak, it should be compared with the shock on the other side of the car. If both shocks test the same, it is unlikely they are defective.

7. Oil on the shock does not necessarily indicate a leak. It should be wiped dry and allowed to remain over night and again checked. A short drive will assist to determine if a leak is present.

Removal

1. Remove the 2 lower and 2 upper shock attaching bolts. (Fig. 5-103)

2. Raise car, (support on wheels) and remove shock from bottom through lower control arm.

Installation

Rubber bushings are an integral part of the shock mounting bracket. When installing, torque cap screws 15-20 ft. lbs.

STEERING KNUCKLE

Removal

1. Raise front of car and support with floor stands under cross bar.

   NOTE: Spring tension is needed to assist in breaking ball joint studs loose from steering knuckle. Do not place stands under lower control arm.

2. Remove front wheel, hub and drum assembly.

3. Remove backing plate without disconnecting brake hose. Leave plain arm connected to tie rod end.

   NOTE: Support the backing plate assembly out of the way to avoid any strain on brake hose.

4. Disconnect the control arm ball joints from the steering knuckle by:

   a. Removing cotter pins from ball joint studs.

   b. Loosen the upper and lower joint nuts, two turns, do not remove, then tap knuckle with a brass drift at ball joint stud. (Fig. 5-104) This will loosen stud from steering knuckle.

      NOTE: After studs break loose from steering knuckle, position a floor jack under lower control arm and relieve spring tension. This will permit removal of ball joint nuts.

5. Remove steering knuckle from car.

Installation

1. Connect the upper and lower ball joints to the steering knuckle.

2. Torque stud nuts 35-60 ft. lbs. and install

cotter pins. Tighten further, if necessary, to install cotter pin.

3. Install backing plate and plain arm to steering knuckle. Torque nuts 55-80 ft. lbs.
4. Install wheel and hub and drum assembly. Adjust wheel bearings.
5. Check camber, caster and toe-in and adjust if necessary.

COIL SPRING

Removal

1. Raise front of car and support by frame with floor stands.
2. Remove wheel assembly.
3. Disconnect stabilizer link from lower control arm.
4. Remove shock absorber.
5. Position a floor jack to support lower control arm, between spring seat and ball joint.
6. Disconnect the lower control arm ball joint from the steering knuckle. (Fig. 5-104)
7. Slowly lower floor jack until spring is fully extended and remove spring.

Installation

IMPORTANT: The top of the spring may be identified by a flat coil which will allow the spring to seat squarely.

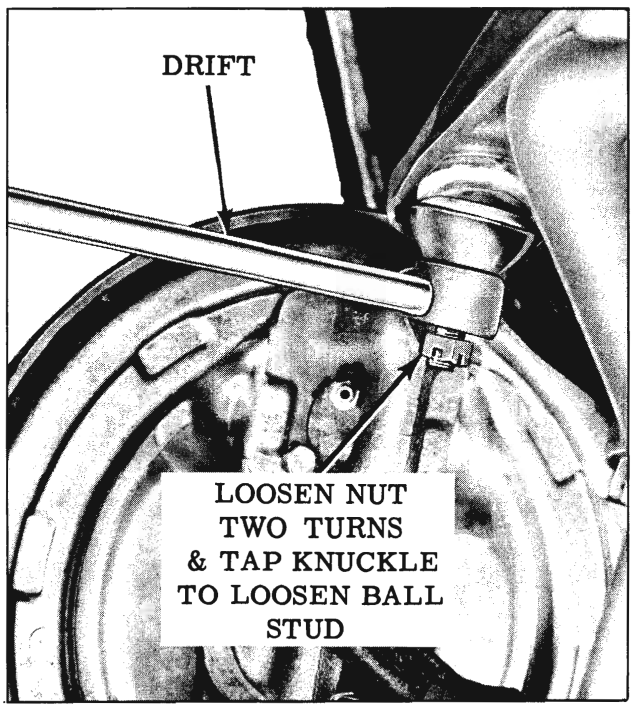
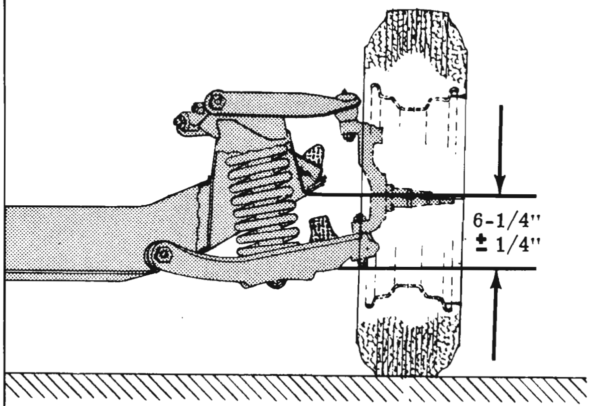


Fig. 5-104 Removing Ball Joint Stud



CARRYING HEIGHT AT CURB HEIGHT TO BE MEASURED FROM LOWER SIDE OF GAGE HOLE IN LOWER CONTROL ARM TO METAL SURFACE OF UPPER SPRING HOUSING.

Fig. 5-105 Front Spring Carrying Height

1. While holding spring against pilot in front cross bar, tilt spring so it will pilot in lower control arm. Rotate spring so the end of the bottom coil will index with edge of hole in control arm spring seat. The coil should not cover any portion of the hole.
2. Position floor jack between spring seat and ball joint.
3. Raise control arm until the ball joint is tight in steering knuckle. Install ball joint nut, torque 35-60 ft. lbs. and install cotter pin. If necessary, nut may be tightened further to install cotter pin.
4. Install shock absorber. Torque bolts 15-20 ft. lbs.
5. Connect stabilizer link to lower control arm. Torque nut 13-17 ft. lbs.
6. Install wheel and lower car.

FRONT SPRING CARRYING HEIGHT

Front spring carrying height is controlled by the front spring length and tension and may be checked as indicated in Fig. 5-105.

WHEEL BEARING

(Refer to BRAKE SECTION)

Wheel Bearing Adjustment

The proper functioning of the front suspension cannot be maintained unless the front wheel bearings are correctly adjusted. Bearings must be a

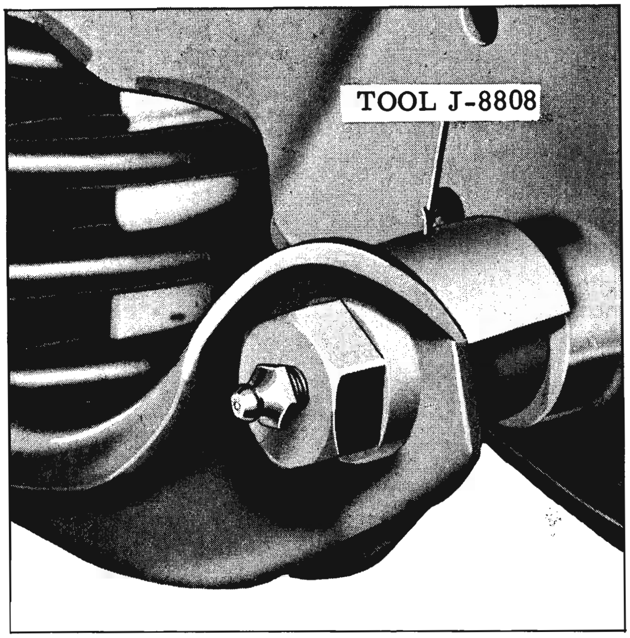


Fig. 5-106 Installing Lower Control Arm

slip fit on the spindle and the inside diameter of cones should be lubricated to insure that the cones will creep. Knuckle nut must be a free-running fit on threads.

The adjustment of front wheel bearings should be made as follows:

1. Tighten adjusting nut with a torque wrench to approximately 10-15 ft. lbs. while revolving wheels to insure that all parts are properly seated and threads are free.

2. Back nut off 1/6 to 1/4 turn maximum, then install pin.

LOWER CONTROL ARM

Removal

To replace the lower control arm, all the steps in COIL SPRING replacement must be performed. After completing these, proceed as follows:

1. Remove pivot shaft bushings from control arm assembly. This will permit removal of control arm from shaft.

Installation

1. Install the rubber bumper on the control arm if not damaged. Torque 25-40 ft. lbs.

2. Place spacer Tool J-8808 in position on shaft. (Fig. 5-106) Spacer must be raised off shaft enough to allow bushing to pass under it.

3. Apply chassis lubricant to pivot shaft threads and install rubber seals on shaft.

4. Position control arm on shaft, holding arm against spacer, start bushings on shaft and into arm.

   NOTE: Bushings may be threaded in more easily if a coating of lubriplate is applied to the outside diameter of the bushing.

5. Tighten bushings until the hex of bushings are solidly seated against the arm.

6. Remove spacer Tool, and install opposite bushings as explained in steps 2 through 6.

   NOTE: Shaft package includes bushings and seals.

7. Lubricate bushing fittings. Lubricate ball joint fitting until grease appears at the seal.

LOWER CONTROL ARM SHAFT

Removal

The lower control arm shaft is threaded into bushings that are welded to the cross bar. The shafts may be replaced if necessary, however, they are factory installed in a new cross bar.

1. Remove control arm.

2. Place Tool J-8907 on rear end of shaft. Adjust lock bolt so tool will not thread tightly and bind on shaft. (Fig. 5-107)

3. Turn shaft clockwise to remove through front of cross member.

Installation

The shaft is stamped "F" which means front of car.

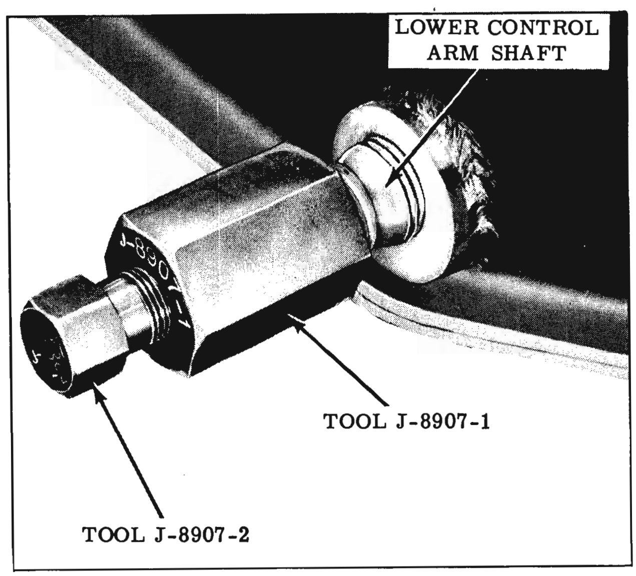


Fig. 5-107 Replacing Lower Shaft

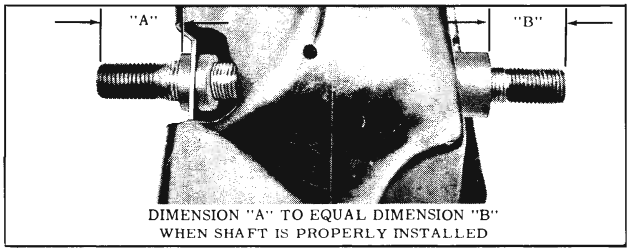


Fig. 5-108 Position of Lower Shaft

1. Position shaft through front bushing and into rear bushing with "F" toward the front. The shaft is a smaller diameter on the rear end.
2. Place Tool J-8907 on front of shaft and adjust lock bolt so tool will not thread tightly and bind on shaft.
3. Coat threads of shaft with lubriplate.
4. Thread shaft into cross bar until it extends equal distance out the front and rear of cross bar, approximately 1-11/16". (Fig. 5-108) It must be measured for accuracy.

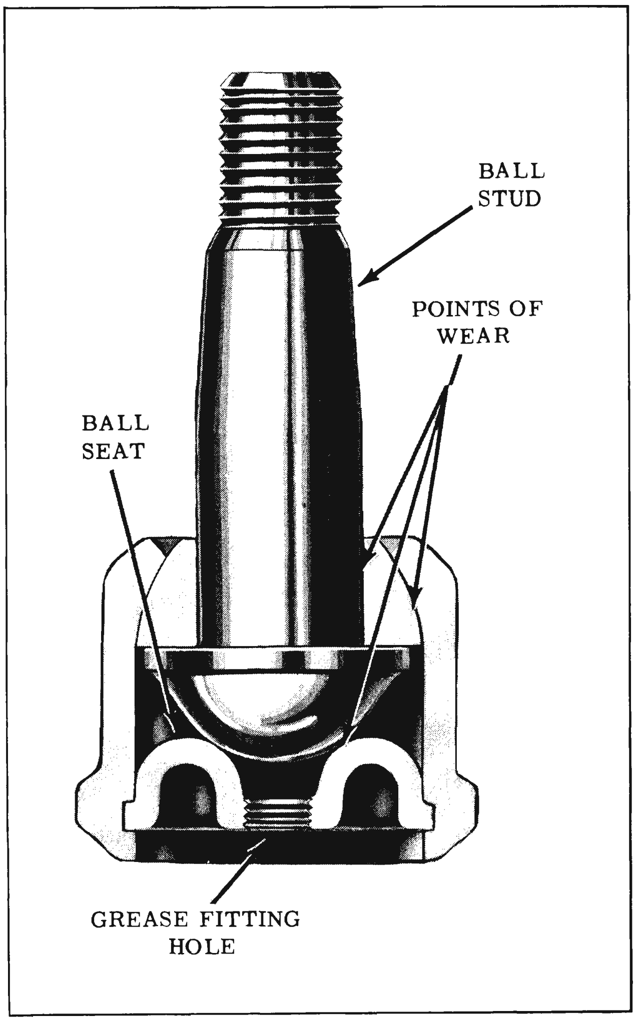


Fig. 5-109 Lower Ball Joint

5. Assemble balance of suspension and lubricate fittings.

SHAFT SEALS

Removal and Installation

1. Remove lower control arm.
2. Clean off excess grease and remove seals.
3. Install new seals over cross shaft.
4. Install the control arm on the cross shaft.
5. Using Tool J-8808 to position control arm, install the two bushings and lubricate fittings.

BALL JOINTS

The lower ball joints can be replaced if checking indicates they are worn. (Fig. 5-109)

CHECKING BALL JOINTS

To check ball joints the wheel bearings must be properly adjusted and the suspension must be freely suspended. The car should be supported at the frame rails on each side at the front end. (Fig. 5-110)

(DO NOT USE A JACK OR STANDS UNDER LOWER CONTROL ARMS.) Place a dial indicator at the lower vertical edge of the wheel as shown in Fig. 5-110. With one hand at the top and the other at the bottom of the tire, moderately rock the wheel at the top and bottom. If more than 1/16" movement appears at the dial indicator, the lower ball joint should be replaced. Refer to 88, S-88 & 98 Fig. 5-16 of this service manual for ball joint loading.

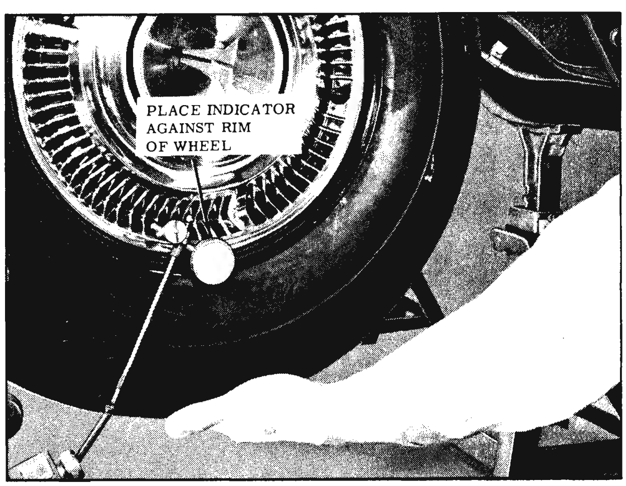


Fig. 5-110 Checking Lower Ball Joint

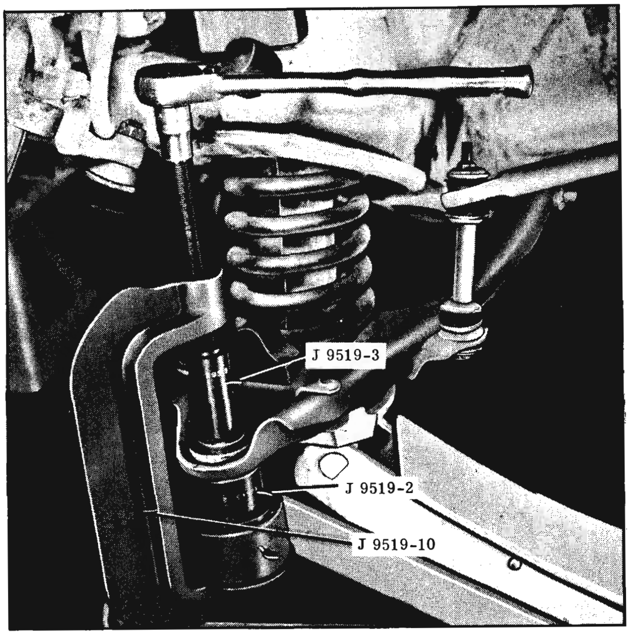


Fig. 5-111 Removing Ball Joint

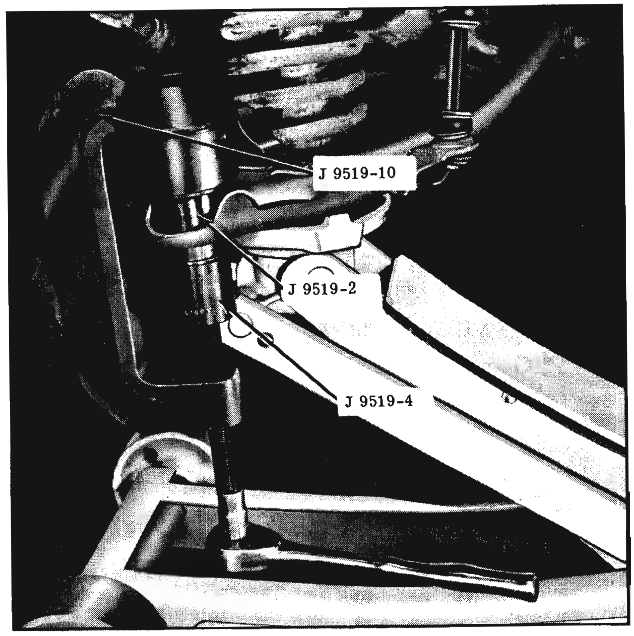


Fig. 5-112 Installing Ball Joint

REMOVAL (LOWER ONLY)

1. Raise car, support with floor stand.
2. Remove wheel.
3. Place floor jack under control arm.
4. Remove ball joint cotter pin and loosen the nut two turns, do not remove the nut, then tap knuckle with a brass drift at ball joint stud. This will loosen stud from steering knuckle.
5. After stud breaks loose, raise control arm to relieve spring tension, remove stud nut and ball joint seal.
6. Block brake drum out of the way by placing a wooden block between cross bar and upper control arm.
7. Install tools as shown in Fig. 5-111 and press out ball joint.

INSTALLATION

1. Position ball joint into lower control arm and press in until it bottoms on the control arm using tools as illustrated in Fig. 5-112.
2. Install the ball joint seal.
3. Install ball joint stud into steering knuckle. Torque nut 35-60 ft. lbs. and install cotter pin.
4. Lubricate ball joint fitting until grease appears at the seal.

BALL JOINT SEALS (UPPER AND LOWER)

The ball joint seals can be installed with the control arm either on or off the car and both upper and lower are replaceable.

Removal

1. Remove cotter pin and nut from ball joint stud.
2. Remove ball joint stud from steering knuckle as shown in Fig. 5-104 or with the use of Tool BT-61-21.
3. Wipe grease from ball joint and stud.

Installation

1. Position the seal squarely over the ball joint stud.
2. Install the ball joint stud through the steering knuckle. Install ball joint nut and cotter pin, torque nut 35-60 ft. lbs.
3. Lubricate the ball joint fitting until grease appears at the seal.

UPPER CONTROL ARM

The upper control arm is attached to the cross bar by a cross shaft and bushings on the inner end and a ball joint on the outer end which is attached to the steering knuckle.

Removal

1. Raise car and support under lower control arm.

2. Remove wheel, upper ball joint cotter pin, and loosen nut.

3. Disconnect ball joint from knuckle by tapping knuckle with a drift at the stud. (Fig. 5-104)

4. Support hub assembly, remove inner shaft to cross bar bolts and remove arm assembly.

Installation

If arm and shaft are being replaced new as an assembly, center shaft in arm as shown in Fig. 5-113 before attaching to cross bar.

Place original shims in position, install bolts and torque 60-85 ft. lbs.

If the arm or shaft is being re-used, it will be necessary to assemble shaft to arm before attaching to cross bar.

1. Position arm on shaft.

2. Lubricate bushings with lubriplate and thread on shaft and into arm.

3. Center shaft in arm. (Fig. 5-113)

4. Attach arm assembly to cross bar using original shims. Torque bolts 60-85 ft. lbs.

5. Install ball joint stud into the steering knuckle. Torque nut 35-60 ft. lbs. and install cotter pin.

6. Lubricate bushing fittings. Lubricate ball joint fitting until grease appears at the ball joint seal.

UPPER CONTROL ARM SHAFT

The inner shaft may be replaced by referring to the preceding steps 1, 2, and 3, under "Installation, UPPER CONTROL ARM". It is suggested that the arm be removed from the car.

SHAFT SEALS

1. Remove upper control arm.

2. Clamp control arm cross shaft in vise.

3. Remove the two bushings and seals.

4. Clean cross shaft.

5. Install new seals onto the shaft.

6. Install the two bushings.

7. Install control arm.

8. Lubricate shaft bushing fittings.

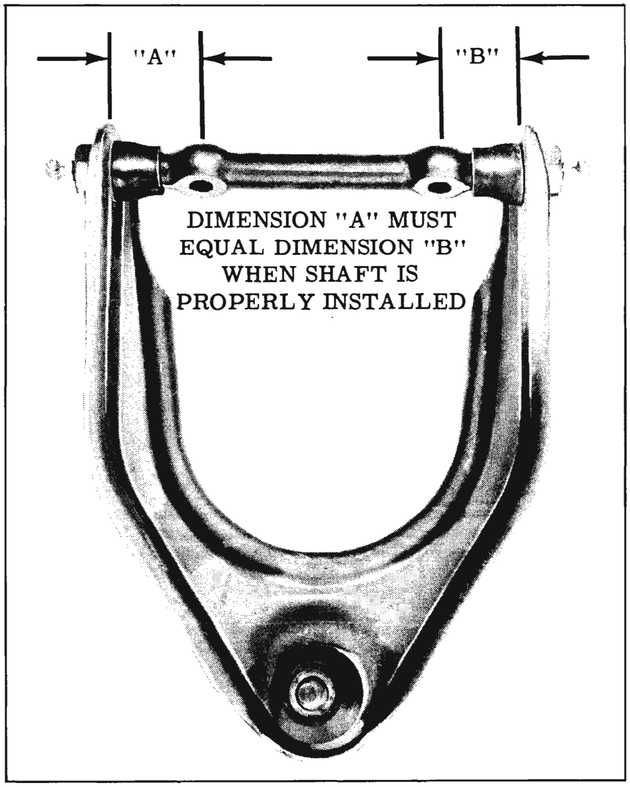


Fig. 5-113 Upper Control Arm Shaft

CHECKING UPPER BALL JOINTS (Fig. 5-114)

To check the upper ball joint, it must be disconnected from the steering knuckle. Install a nut on the ball joint stud, and using an inch pound torque wrench, rotate the stud in a clockwise direction. The torque wrench reading should be 2-30 in. lbs. If the reading is not within these limits, the control arm should be replaced.

CROSS MEMBER

In some cases it may be necessary to replace the crossmember. This may be done by performthe following operations, and where necessary refer to the individual component procedures previously mentioned in this section.

Removal

1. Install engine Support Tool J-8974 and disconnect engine mounts.

2. Disconnect steering shaft, brake lines, and stabilizer.

3. Remove the coil springs at this time. Lift car until weight is off front suspension and remove isolation mount bolts. This will detach suspension system from frame.

CAUTION: Care must be taken to avoid damage to steering shaft.

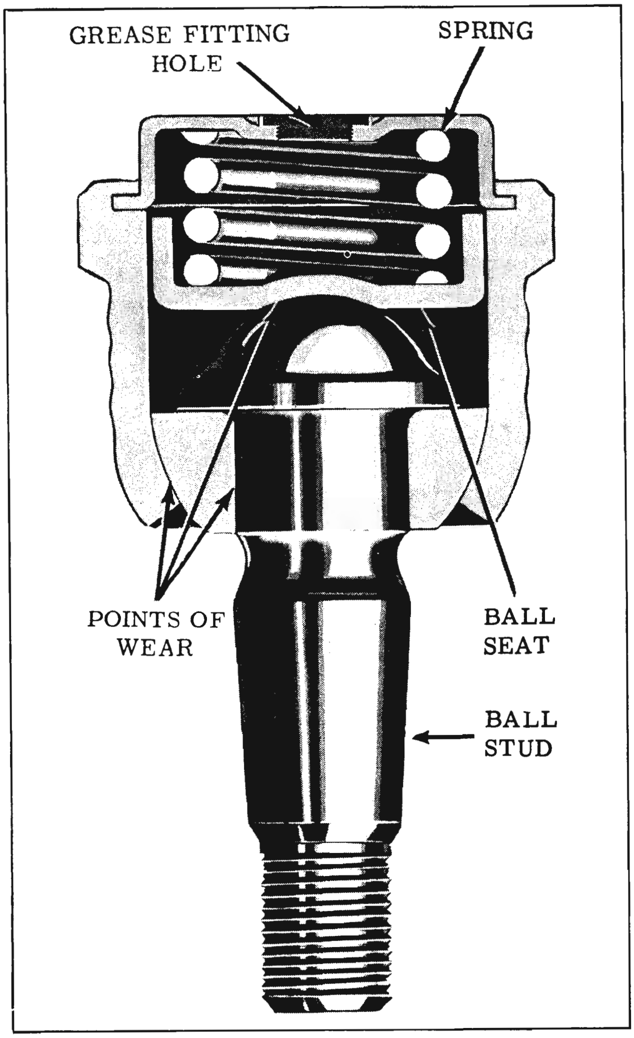


Fig. 5-114 Upper Ball Joint

The balance of the parts attached with the exception of the lower control arm shaft which will be installed in the new cross member, may now be easily removed. When assembling parts to new cross member, use same amount of alignment shims in upper inner control arm.

Installation

Refer to torque specifications at the back of this section for proper torque.

After attaching suspension system to the body, install coil springs, attach engine support pads and remove engine support tool. It will be necessary to check front end alignment and lubricate.

NOTE: Consult steering section for correct steering wheel and gear alignment.

WHEEL ALIGNMENT

Front wheel alignment is the mechanics of adjusting all the interrelated factors affecting the running and steering of the front wheels of the automobile. Incorrect alignment of front wheels will result in hard steering and abnormal tire wear.

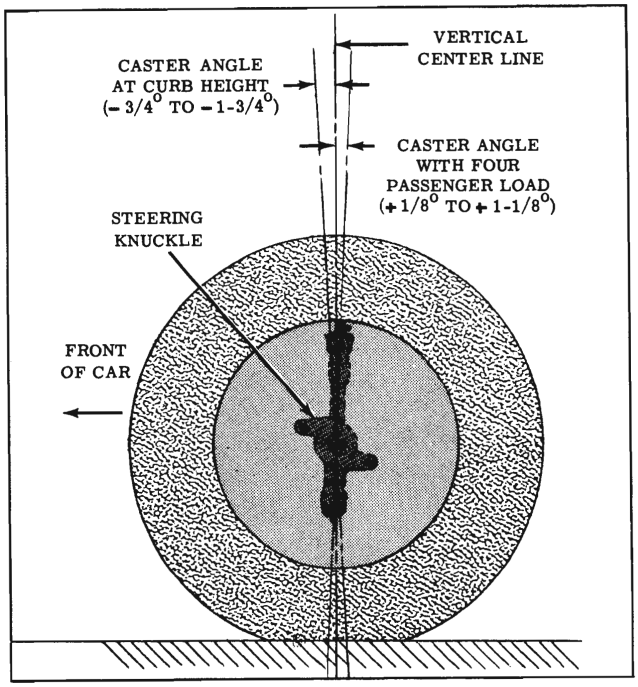


Fig. 5-115 Front Wheel Caster

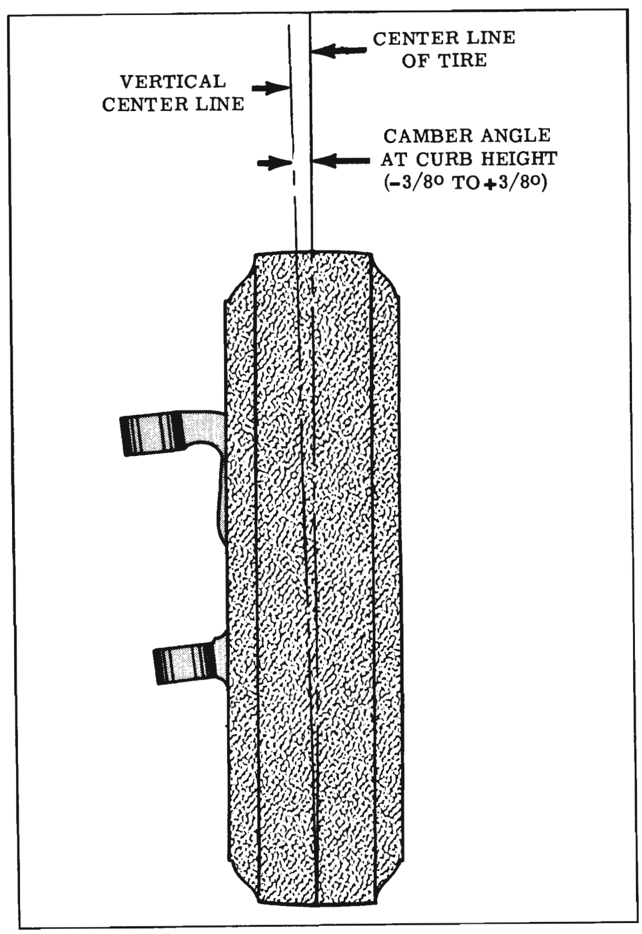


Fig. 5-116 Front Wheel Camber

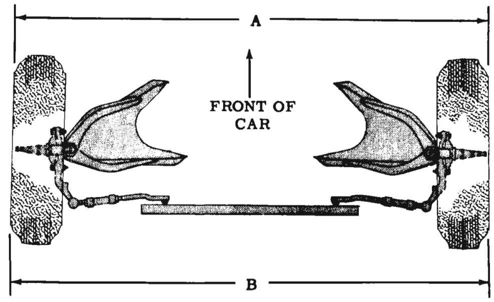


Fig. 5-117 Front Wheel Toe-In

The front wheel alignment factors are:

1. CASTER (Fig. 5-115)
2. CAMBER (Fig. 5-116)
3. TOE-IN (Fig. 5-117)
4. TOE-OUT (STEERING GEOMETRY) (Fig. 5-118)

Before any attempt is made to check or correct Caster, Camber, Toe-In or Toe-Out, the following preliminary checks and necessary corrections should be made on those parts which influence the steering of the car:

1. Inflate tires to recommended pressure.
2. Check front wheel bearings and steering gear for proper adjustments.
3. Check front wheel and tire assemblies for radial and lateral runout.
4. Grasp front bumper in center and raise and lower front end several times to allow car to come to its normal level. Check for erratic shock absorber action.

The method of checking alignment will vary depending on the type of equipment being used. The instructions furnished by the manufacturer of the equipment should be followed.

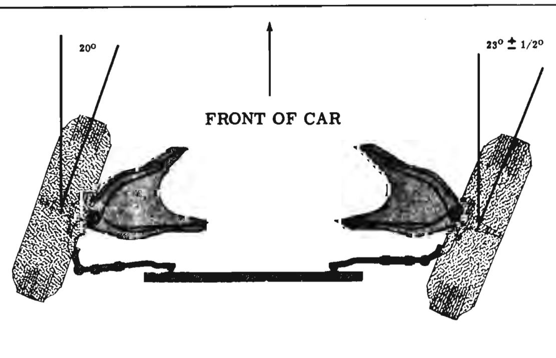


Fig. 5-118 Front Wheel Toe-Out

NOTE: Check front wheel alignment without passengers or load in or on car. Camber angle of the right and left wheel should be within 1/2° of each other for best handling characteristics.

CASTER AND CAMBER ADJUSTMENT

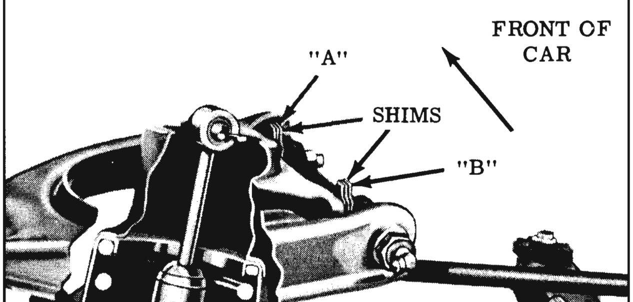
(CASTER) CURB - -3/4° to -1-3/4°
(CAMBER) CURB - -3/8° to +3/8°

Camber and Caster are adjusted by shims placed between the upper pivot shafts and the cross bar. (Fig. 5-119) Both caster and camber adjustments can be made at the same time after the wheel alignment checks have been completed.

In order to remove or install shims, loosen the pivot shaft to cross bar bolts.

Refer to the shim chart to determine the approximate thickness necessary to correct the adjustment. After the correct number of shims have been installed, torque the pivot shaft mounting nuts 60-85 ft. lbs. and recheck caster and camber.

Shim Thickness	One shim added to or subtracted from BOTH BOLTS will change CAMBER	One shim added to or subtracted from FRONT BOLT ONLY will change CASTER
.030	1/4°	1/2°
.060	1/2°	1°
.120	7/8°	2°



TO MAKE CASTER MORE NEGATIVE: ADD SHIMS AT "A".

TO MAKE CASTER MORE POSITIVE: REMOVE SHIMS AT "A".

* TO MAKE CAMBER MORE POSITIVE: REMOVE SHIMS AT BOTH "A" & "B".

* TO MAKE CAMBER MORE NEGATIVE: ADD SHIMS AT BOTH "A" & "B".

* NOTE: BY ADDING OR SUBTRACTING AN EQUAL AMOUNT OF SHIMS FROM "A" AND "B", CAMBER WILL CHANGE WITHOUT AFFECTING CASTER ADJUSTMENT.

Fig. 5-219 Front End Alignment Shims

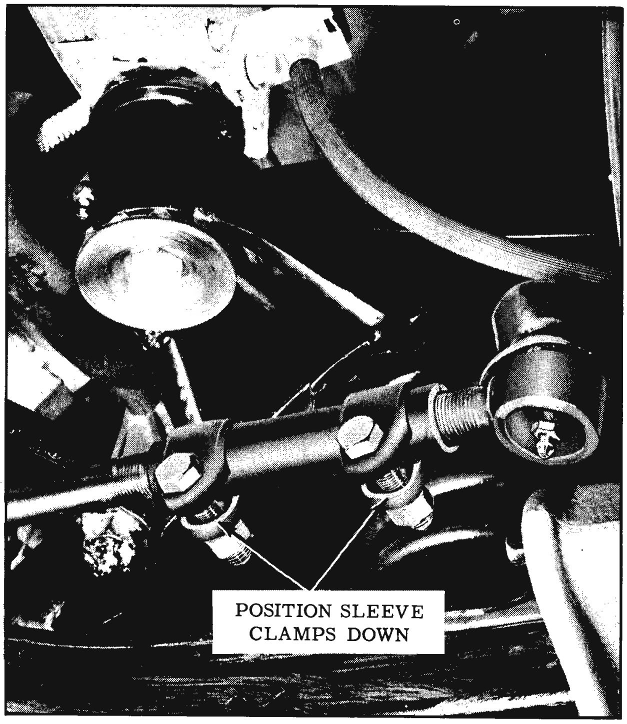


Fig. 3-120 Adjusting Clamp Position

TOE-IN ADJUSTMENT

1. Loosen the clamp bolts at each end of the steering tie rod adjustable sleeves.

2. With steering wheel set in straight ahead position, turn tie rod adjusting sleeves to obtain the proper Toe-In adjustment at curb load, 1/16". (Fig. 5-117)

3. When adjustment has been completed according to the recommended specification, position inner clamps as shown in Fig. 5-120. Torque nut 20-25 ft. lbs.

TOE-OUT (STEERING GEOMETRY)

Toe-Out is the mechanics of keeping the front wheels in proper relative alignment as the wheels are turned right or left. When turning, the wheels go into a toe-out position, (further apart at the front of the tire than they are at the back). This condition increases with the increase of the turn.

To check, turn wheels to right until left wheel has been turned 20^{o} from the straight ahead position. Right wheel setting should be 23^{o} on all models. Then follow same procedure with wheels turned to left. Errors found are usually due to bent plain arms or incorrect caster, camber, or toe-in. If error is due to bent plain arm, replacement with new arm should be made. When replacements of this kind are made, it is important that other front end parts are checked and front wheels realigned.

DIAGNOSIS

WHEEL BEARING NOISE

Wheel bearing noise may be confused with rear axle noise; however, front wheel bearing noise does not change when comparing "pull" and "coast". A bad bearing will cause a knock or click approximately every two revolutions of wheel since the bearing rollers do not travel at the same speed as the wheel. To determine which wheel bearing is noisy, hoist the car and spin each wheel while listening at the hub cap.

HARD STEERING

Cause:

1. Low or uneven tire pressure.
2. Steering gear or linkage adjusted too tight.
3. Insufficient or incorrect lubricant used.
4. Improper caster.
5. Upper or lower control arms bent.
6. Frame bent or broken.
7. Steering knuckle bent.

EXCESSIVE PLAY OR LOOSENESS IN STEERING SYSTEM

Cause:

1. Steering gear or linkage worn.
2. Control arm ball joints worn.
3. Front wheel bearings worn or incorrectly adjusted.
4. Loose front stabilizer.

ERRATIC STEERING ON APPLICATION OF BRAKE

Cause:

1. Low or uneven tire pressure.
2. Brakes incorrectly or unevenly adjusted.
3. Incorrect or uneven caster.
4. Steering knuckle bent.
5. Loose steering linkage or suspension.
6. Dirt or grease on brake lining.

FRONT WHEEL SHIMMY

Cause:

1. Uneven tire pressure.
2. Steering linkage worn or incorrectly adjusted. Loose adjusters on tie rods.
3. Front wheel bearings worn or incorrectly adjusted.
4. Shock absorbers inoperative or leaking.
5. Control arm ball joints worn.
6. Toe-In incorrect.
7. Incorrect or uneven caster.
8. Steering knuckle bent.
9. Wheels, tires, or brake drums out of balance.
10. Excessive runout of wheels or tires.

CAR PULLS TO ONE SIDE

Cause:

1. Uneven tire pressure.
2. Rear wheels not tracking with front wheels.
3. Brakes incorrectly or unevenly adjusted.
4. Shock absorbers worn or inoperative.
5. Toe-In incorrect.
6. Incorrect or uneven caster or camber.

WORN TIRE TREAD EDGES

Cause:

1. Improper front end alignment.
2. High speed driving on curves.
3. Steering knuckle bent.
4. Steering plain arm bent.
5. Low tire pressure.

SCUFFED TIRES

Cause:

1. Tires improperly inflated.
2. Wheels or tires out of true.
3. Control arm ball joints worn.
4. Toe-In incorrect.
5. Uneven Caster.
6. Incorrect toe-out on turns.
7. Steering gear incorrectly adjusted.
8. Eccentric or bulged tires.

FRONT OR REAR WHEEL TRAMP

Cause:

1. Wheels, tires, or brake drums out of balance.
2. Shock absorbers inoperative.
3. Loose or worn front wheel bearings.

CAR WANDERS

Cause:

1. Low or uneven tire pressure.
2. Steering gear or linkage worn.

DESCRIPTION

The rear suspension is of the link type with coil springs. It uses four suspension arms that attach the rear axle assembly to the body. The lower arm supports the coil spring, the top of which is positioned under the frame rail. The upper arms are attached to the top of the differential and extend forward to the body. The lower arm is used to obtain differential nose angle by shimming at the forward end. Two shocks are attached to the body and to brackets on the axle housing. (Fig. 5-121)

UPPER SUSPENSION ARMS

Removal

1. Remove nut from rear arm to differential housing bolt. (Fig. 5-122)
2. Remove bolt by rocking differential.
3. Front nut and bolt may now be removed.
4. Inspect bushings for damage.

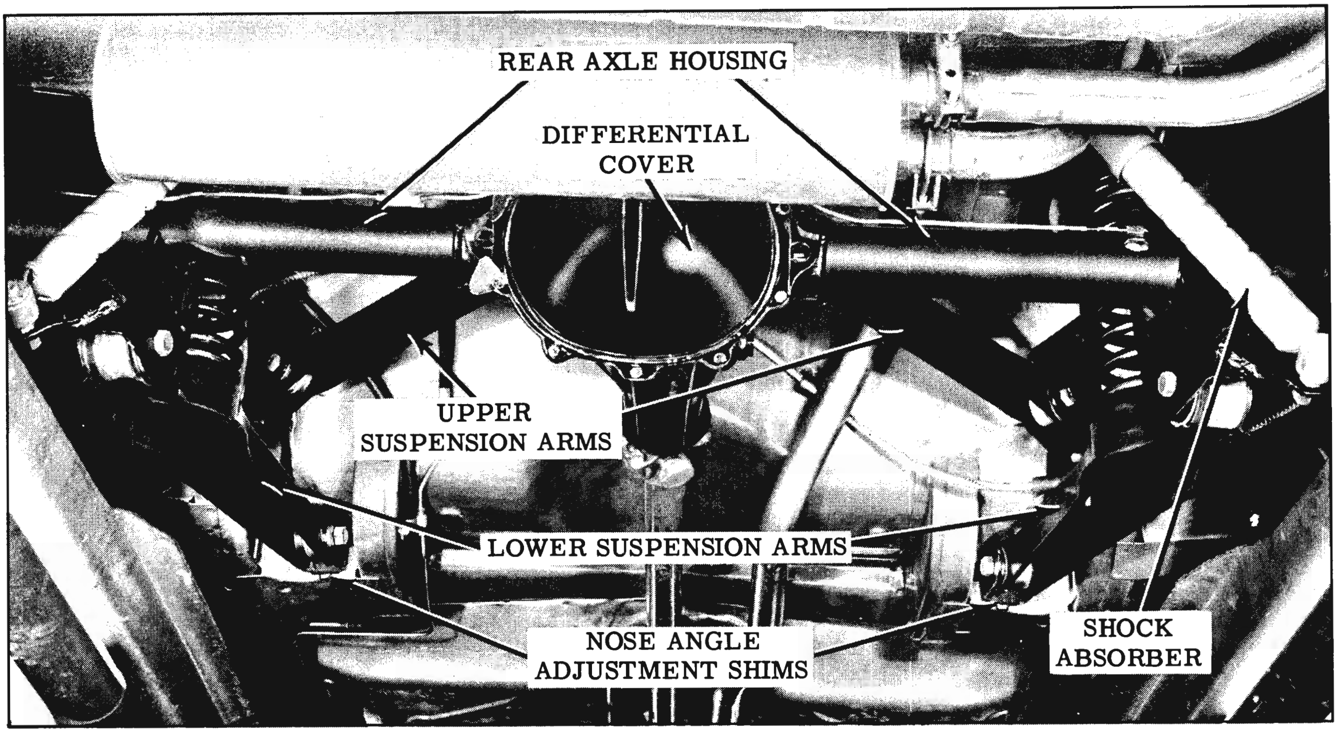


Fig. 5-121 Rear Suspension

Installation

When installing new arm, it is suggested it be attached at the body bracket first then the differential. The arm is reversible but best clearance is obtained when the two manufacturing tabs on the side of the arm are facing outboard. Torque arm bolt nuts to 45-60 ft. lbs.

LOWER SUSPENSION ARMS

Removal

The lower suspension arms support the coil spring and are used for the adjustment of the differential angle. Care must be taken when servicing this arm because of the constant spring tension on the arm.

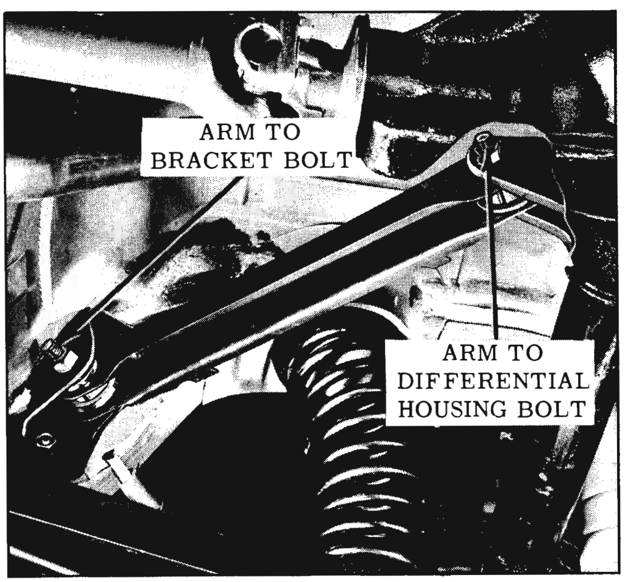


Fig. 5-122 Upper Suspension Arm

1. Disconnect lower shock stud from axle housing bracket.

2. Raise rear of car until coil spring can be easily removed.

3. Remove rear arm to axle housing bolt.

4. Remove two front arm bracket to body bolts.

   NOTE: When removing the two front bracket bolts, the same amount of shims must be reinstalled.

Installation

Before installing arm, inspect coil spring insulator for damage. To replace arm, reverse the above sequence of operations. Torque nuts to 45-60 ft. lbs. Install spring on lower arm with end coil correctly positioned.

BUSHINGS

Bushings are serviced by replacing complete arms only.

COIL SPRINGS

Removal

1. Disconnect shock from lower bracket.

2. Lift car at rear, by frame rail. This will allow suspension to drop far enough to remove the spring.

Installation

1. Place coil spring insulator in position.

2. Lower car and attach shock to lower bracket. Torque shock nut 30-45 ft. lbs.

When installing springs, top insulator should be replaced, if damaged.

CARRYING HEIGHT

The rear spring carrying height is controlled by spring length. It may be checked as shown in Fig. 5-123.

SHOCK ABSORBERS

The double action shock absorbers are mounted to a body bracket at the top and to a bracket welded on the axle housing. (Fig. 5-124)

To thoroughly check shock absorbers, refer to Front Suspension Shock Absorbers.

Removal

If found necessary to replace, raise car, supporting rear axle, and remove upper and lower attaching nuts. The upper end has a bolt through the shock bushing. The lower end has a stud which is an integral part of the shock.

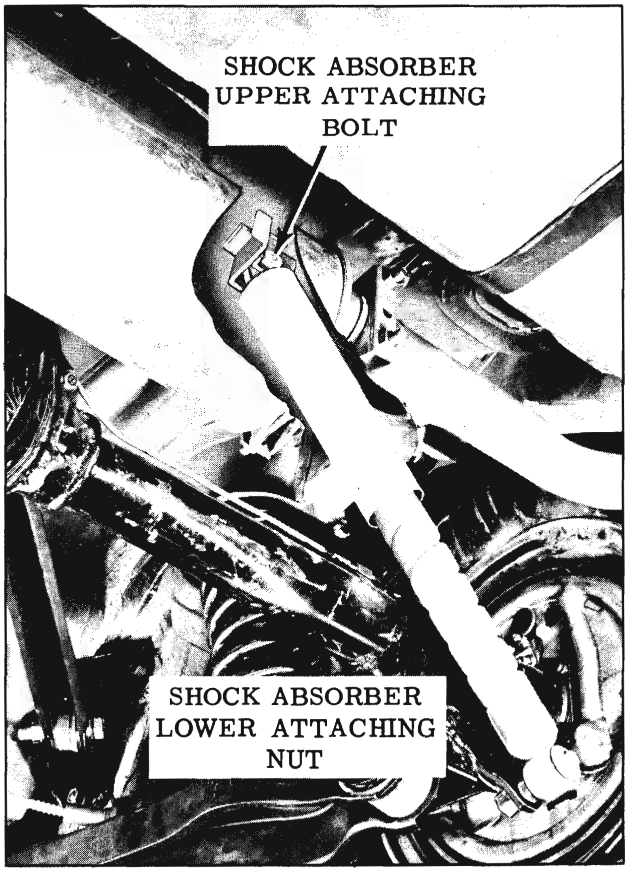


Fig. 5-124 Rear Shock Absorber

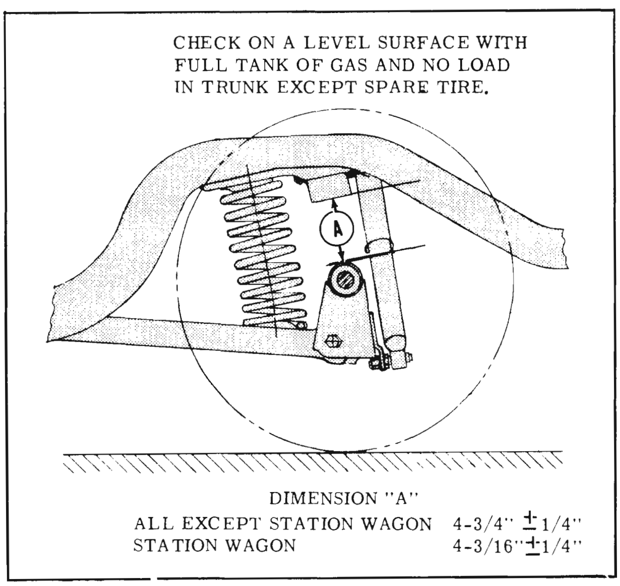


Fig. 5-123 Rear Spring Carrying Height

Installation

Loosely attach shock to both brackets before tightening nuts. Torque lower stud nut to 30-45 ft. lbs. and upper bolt nut 60-80 ft. lbs.

AXLE HOUSING

Removal

1. Disconnect shock from lower bracket.

2. Disconnect propeller shaft, brake line, and parking brake cable equilizer.

3. Disconnect upper suspension arm from differential.

4. Slowly raise car at rear and remove coil springs.

5. Disconnect lower suspension arms.

This will separate axle housing assembly from the body. If replacing the housing with another, the components may be changed following the procedures outlined for these units in their respective sections.

Installation

After installing the assembly, it will be necessary to bleed the rear wheel brake cylinders, check brake and parking brake adjustment, and check differential nose angle if a new housing has been installed.

BUMPER

The rear axle housing bumper is located above the axle housing and is attached by one cap screw. If found deteriorated or damaged, it must be replaced.

WHEELS AND TIRES

MAINTENANCE RECOMMENDATIONS

Correct inflation pressure is of the most importance in tire care and service.

	6.50 x 13 & 6.00 x 15		OVERSIZE 6.50 x 14	
	FRONT	REAR	FRONT	REAR
COUPE & SEDAN	*22	*22	22	22
STATION WAGON	*22	24	22	22
CONVERTIBLE	24	22	24	22
JETFIRE	24	22	24	22
*INCREASE TO 24 P.S.I. ON AIR CONDITIONED CARS				

Tire rotation every 6,000 miles will aid in longer life and prevent excessive uneven wear that may result in shimmy, vibrations, noise, bumpy or rough riding. (Fig. 5-125)

Tires used by Oldsmobile have an inner liner which, when punctured, forms a temporary seal until the object is removed.

The tire should be repaired after a puncture in accordance with the tire manufacturer's recommendations in this section.

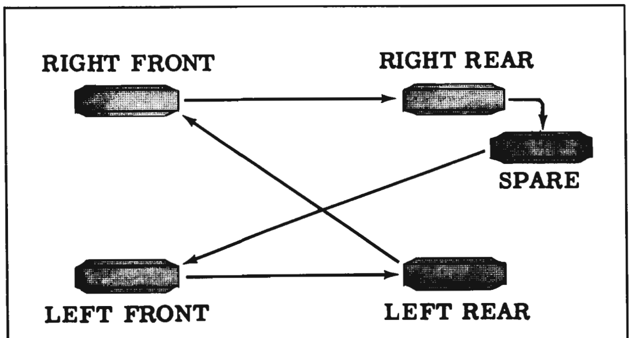


Fig. 5-125 Tire Rotation

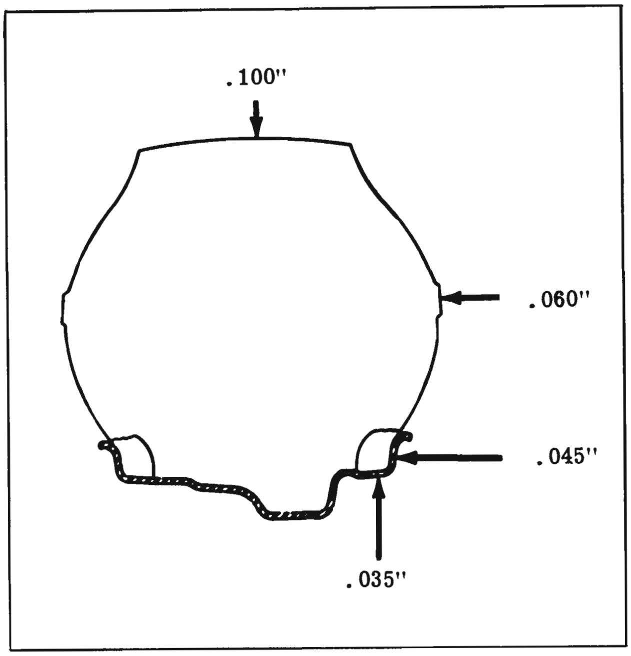


Fig. 5-126 Tire and Wheel Runout

TIRE AND WHEEL RUNOUT

Inflate tires to recommended pressure. Tire should be checked as soon as possible after car has been driven to avoid false readings due to the tendency of tires to take a temporary "set" after standing for a period of time.

Wheels and tires can be checked for runout at points indicated and should not exceed the following limits. (Fig. 5-126)

Tire & Wheel Assembly -	Radial	.063"
	Lateral	.081"
Wheel	Radial	.035"
	Lateral	.045"

WHEEL AND TIRE BALANCE

Wheel, tire, and brake drum balance must be maintained within certain limits, otherwise, wheel tramp and high speed shimmy will result.

NOTE: When installing wheel weights on cars with wheel discs, use a weight of such size that it will not interfere with disc.

Front wheel "tramp" and front wheel "shimmy" are two entirely different conditions. Front wheel "tramp", which usually occurs at high speed, is a wheel "hop" caused from an unbalanced condition of wheels, loose linkage in the front end, or improperly operating shock absorbers.

"Shimmy" may occur at the lower speeds and is a wobbly condition of the front wheels caused from an unbalanced condition, loose front end linkage, loose steering gear parts, or faulty steering gear adjustment. "Tramp" and "shimmy" will be felt in the whole car; however, "shimmy" can also be felt at the steering wheel. "Shimmy" is a front wheel condition entirely, whereas, it is possible to have "tramp" in front or rear wheels.

Due to the irregularities in tread wear caused by sudden brake application, misalignment, low inflation pressure, or tire repair, etc., a wheel and tire assembly may lose its original balance. Consequently, if front end instability develops, the tire and wheel assembly should be checked for static and dynamic balance.

DISMOUNTING AND MOUNTING

Several types of bead breakers are available to loosen tire from rim.

DO NOT USE TIRE IRONS AS THIS MAY DAMAGE SEALING BEADS.

Tire mounting machines or irons may be used to mount tires, but extreme care must be taken not to damage sealing beads.

Tire lubricating soap should be used on beads, but an excessive amount may cause tire slippage on wheel.

Inflate tire to approximately 40 pounds to seat sealing beads. Be sure bead position is even all around, then deflate to recommended pressure.

TIRE REPAIRING

There are several methods of repairing tubeless tires. Oldsmobile recommends the Hot Patch or Self Vulcanizing Method. These methods are not recommended for punctures over 3/16" diameter. For repairs larger than this, consult the tire manufacturer's recommendations.

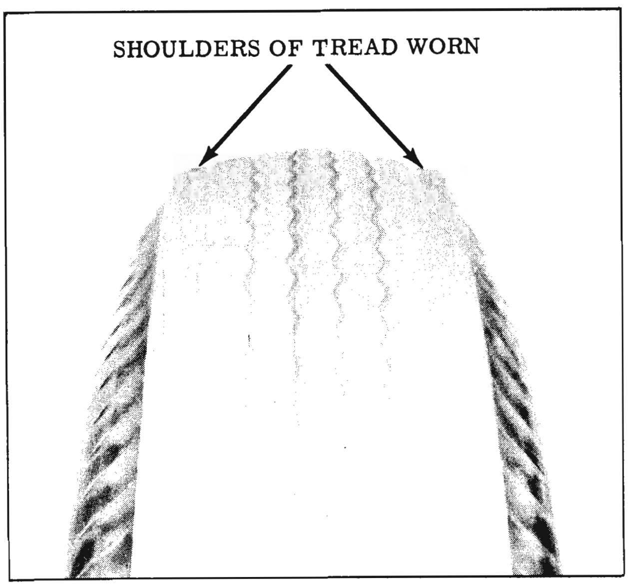


Fig. 5-127 Under Inflation Wear

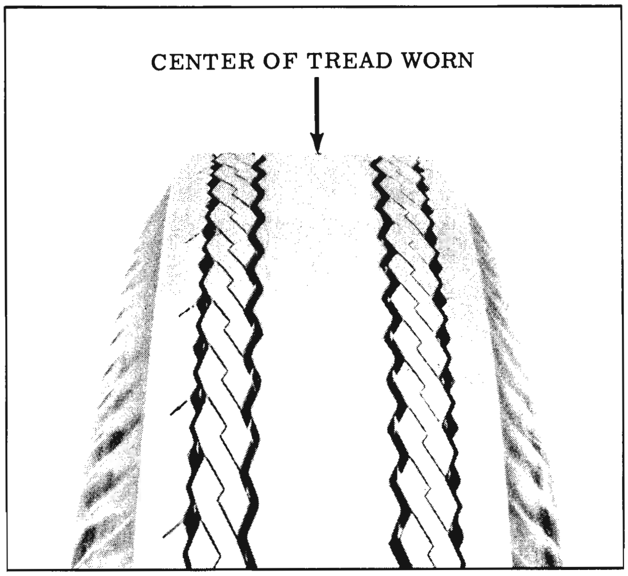


Fig. 5-128 Over Inflation Wear

TIRE WEAR

Several illustrations are shown that reveal common tire wear patterns generally resulting from conditions noted.

AXLE HOUSING ALIGNMENT

Rear tire wear may indicate that the axle housing may be out of alignment. It can be checked as follows:

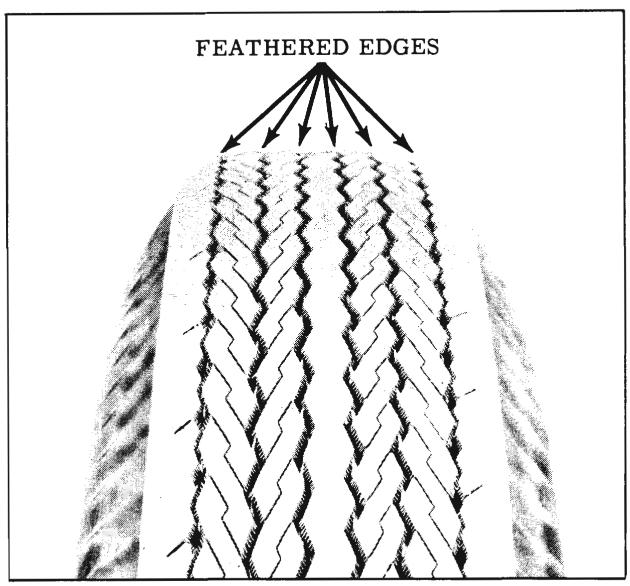


Fig. 5-129 Toe-In Wear

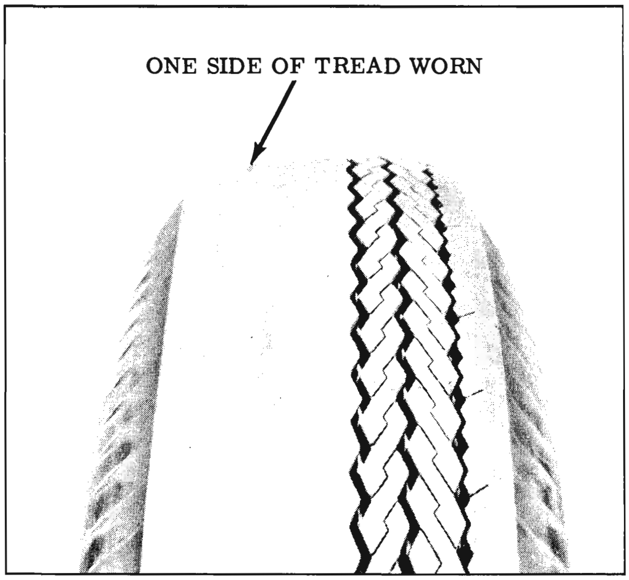


Fig. 5-130 Camber Wear

1. Back the car squarely onto an alignment machine.

2. Compensate for wheel run-out the same as for checking front wheel toe-in.

3. Check camber readings which should be: $1/4^{o}$ negative to $1/2^{o}$ positive.

4. Check the amount of toe-out, which should be 3/64" to 5/32".

   NOTE: Due to the fact that the car is backed onto an alignment machine, the actual toe-out will be read on the scale as toe-in. However, if the toe-out is checked with a tram gauge, disregard the aforementioned.

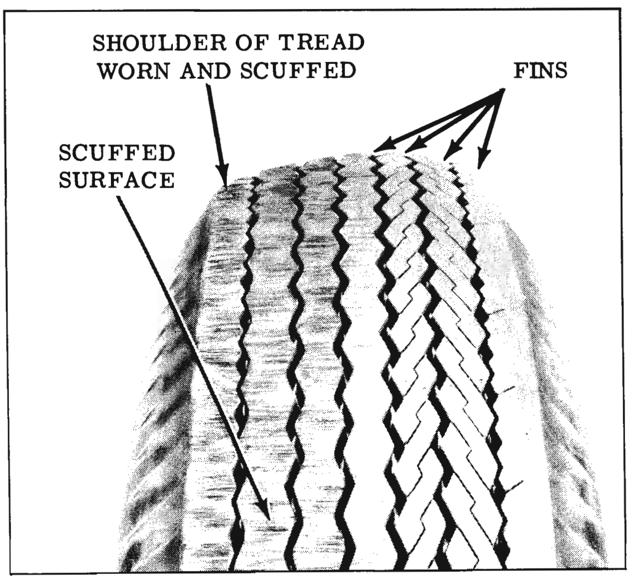


Fig. 5-131 Cornering Wear

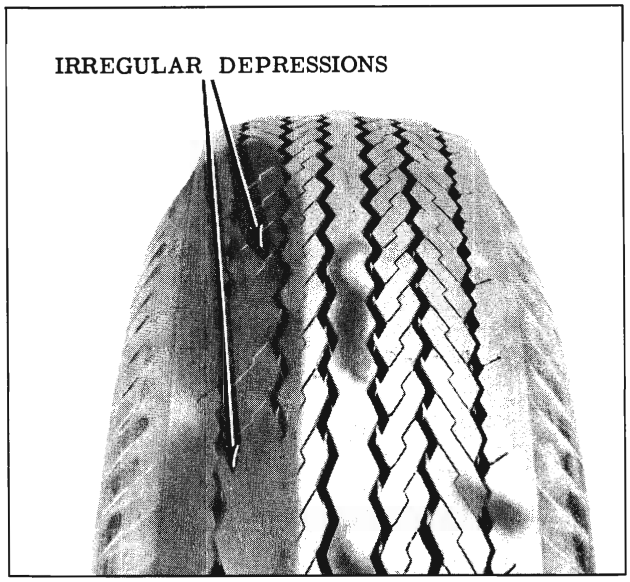


Fig. 5-132 Mechanical Condition Wear

5. If a tram gauge is used for checking toe-out, it will still be necessary to perform steps 1 and 2 in order to check camber.

The necessary straightening operations may be performed using frame straightening equipment without removing the axle housing from the car. This procedure will allow checks during the straightening operation to determine when the housing is within the prescribed limits.

DIFFERENTIAL NOSE ANGLE

The differential nose angle may be checked with Tool BT-30-2. Install tool at front arm of front cross bar as shown in Fig. 5-133.

The line to engine spacer is installed after rear bracket has been attached to the differential.

Place indicator against the pinion companion flange and cable must be in the notch marked F-85.

If cable is below the notch, remove shim from front of lower suspension arm. If cable is above notch, add shims.

NOTE: The same amount of shims must be added to both sides. 1/8" shim will raise or lower nose angle approximately 1/16".

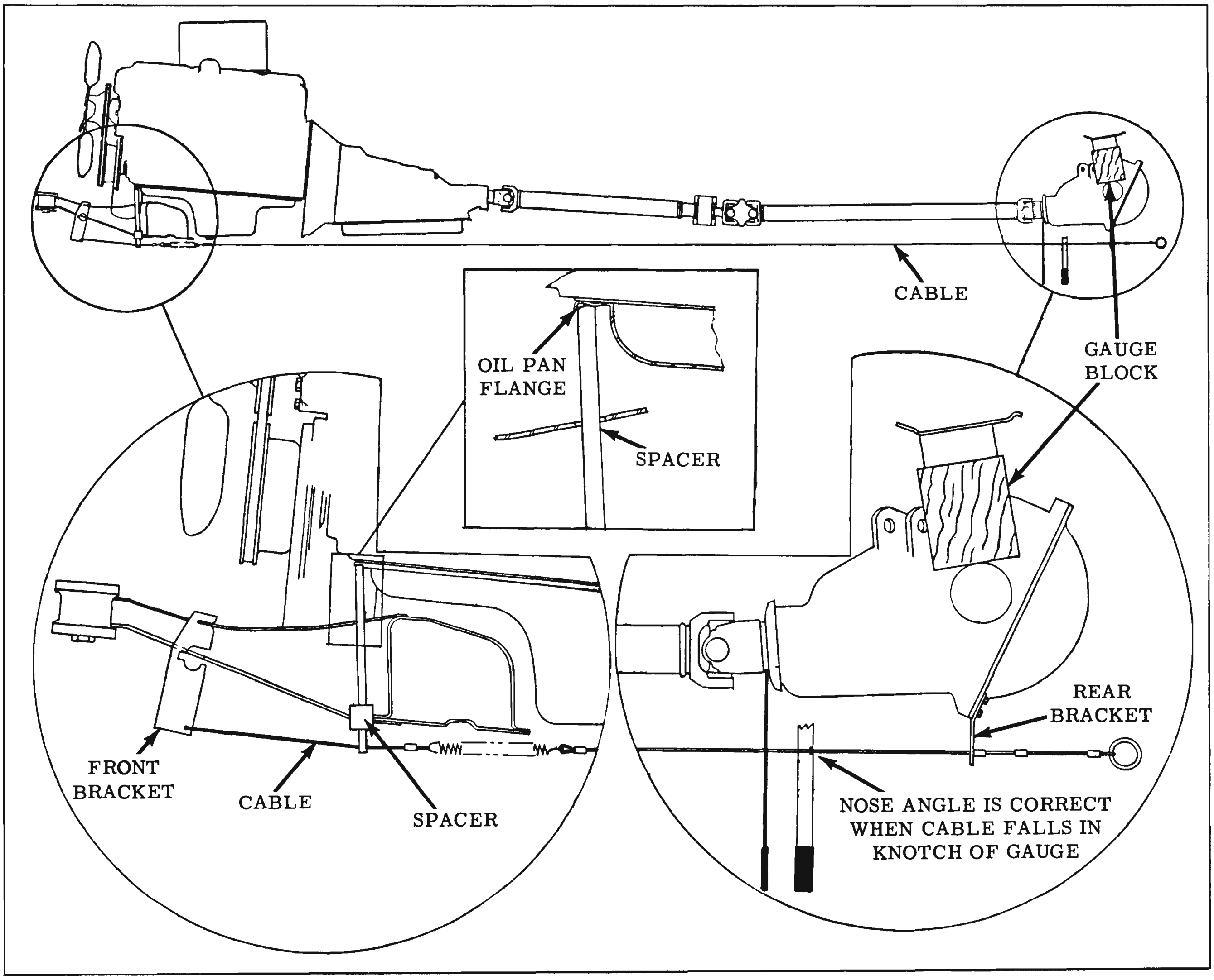


Fig. 5-133 Nose Angle Adjustment

WHEELS AND TIRES

WHEELS

Rim Diameter	13", 14" & 15"
Rim Width	4-1/2"
Radial Runout	Max. .035"
Lateral Runout	Max. .045"

TIRES & WHEEL ASSEMBLY

Radial Runout	Max. .063"
Lateral Runout	Max. .081"

TIRE SIZES

All Series	Standard	Optional
Without Factory Installed Air Conditioning	6.50 x 13	6.00 x 15* 6.50 x 14
With Air Conditioning	6.50 x 13	6.00 x 15* 6.50 x 14
With Air Conditioning - 3147 & 3167 Models	6.50 x 14	
*Not available on "67" Styles		

SPECIFICATIONS

REAR SUSPENSION	
Tread	56"
Allowable Out-of-True of Housing on the Vertical (at rear wheel)	1/4° neg. to 1/2° pos.
Allowable Out-of-True of Housing on the Horizontal (at rear wheel)	3/64" to 5/32" toe-out
Carrying Height	
Sedans	(curb) 4-3/4" ± 1/4"
Station Wagons	(curb) 4-3/16" ± 1/4"

TORQUE SPECIFICATIONS

REAR SUSPENSION	FT. LBS.
Shock Absorber	
Upper Pivot Bolt & Nut	60 to 80
Lower Stud Nut	30 to 46
Rear Suspension Arm	
Upper Arm to Body Bracket	45 to 60
Upper Arm to Axle Housing	45 to 60
Lower Arm to Body Bracket	45 to 60
Lower Arm to Axle Housing	45 to 60
Backing Plate	
Backing Plate Attaching Bolts	45 to 60
Wheel Nuts	55 to 70

SPECIFICATIONS

FRONT SUSPENSION	
CASTER ANGLE (DEGREES)	$-3/4^{\circ}$ to $-1\text{-}3/4^{\circ}$
CAMBER (DEGREES)*	$-3/8^{\circ}$ to $+3/8^{\circ}$
TOE-IN	0 to 1/8
TOE-OUT ON TURNS	23°
BALL JOINT INCLINATION	$7^{\circ}30'$
TREAD	56"
CARRYING HEIGHT	6" to 6-1/2"

*MAXIMUM CAMBER VARIATION BETWEEN EITHER SIDE OF CAR SHOULD NOT EXCEED $1/2^{\circ}$

TORQUE SPECIFICATIONS

APPLICATION	Ft. Lbs.
FRONT SUSPENSION	
Stabilizer	
Stabilizer Link Nut	13 to 17
Stabilizer Shaft Bracket to Frame Bolt & Nut	25 to 45
Shock Absorber	
Shock Absorber to Cross Bar	15 to 20
Shock Absorber to Lower Control Arm	15 to 20
Control Arms	
Upper Control Arm Pivot Shaft to Cross Bar Bolts & Nuts	60 to 85
Rubber Bumper to Lower Control Arm	25 to 40
Ball Joints	
Ball Joints to Steering Knuckle Nuts	35 to 60
Steering Knuckle	
Steering Knuckle to Backing Plate Bolts	55 to 80
Plain Arm to Steering Knuckle to Backing Plate Bolts	80 to 130
Wheel Bearing Adjustment Nut	(Refer to Wheel Bearing Adj.)
Wheel Nuts	55 to 70
Isolation Mounts to Body Frame	60 to 80

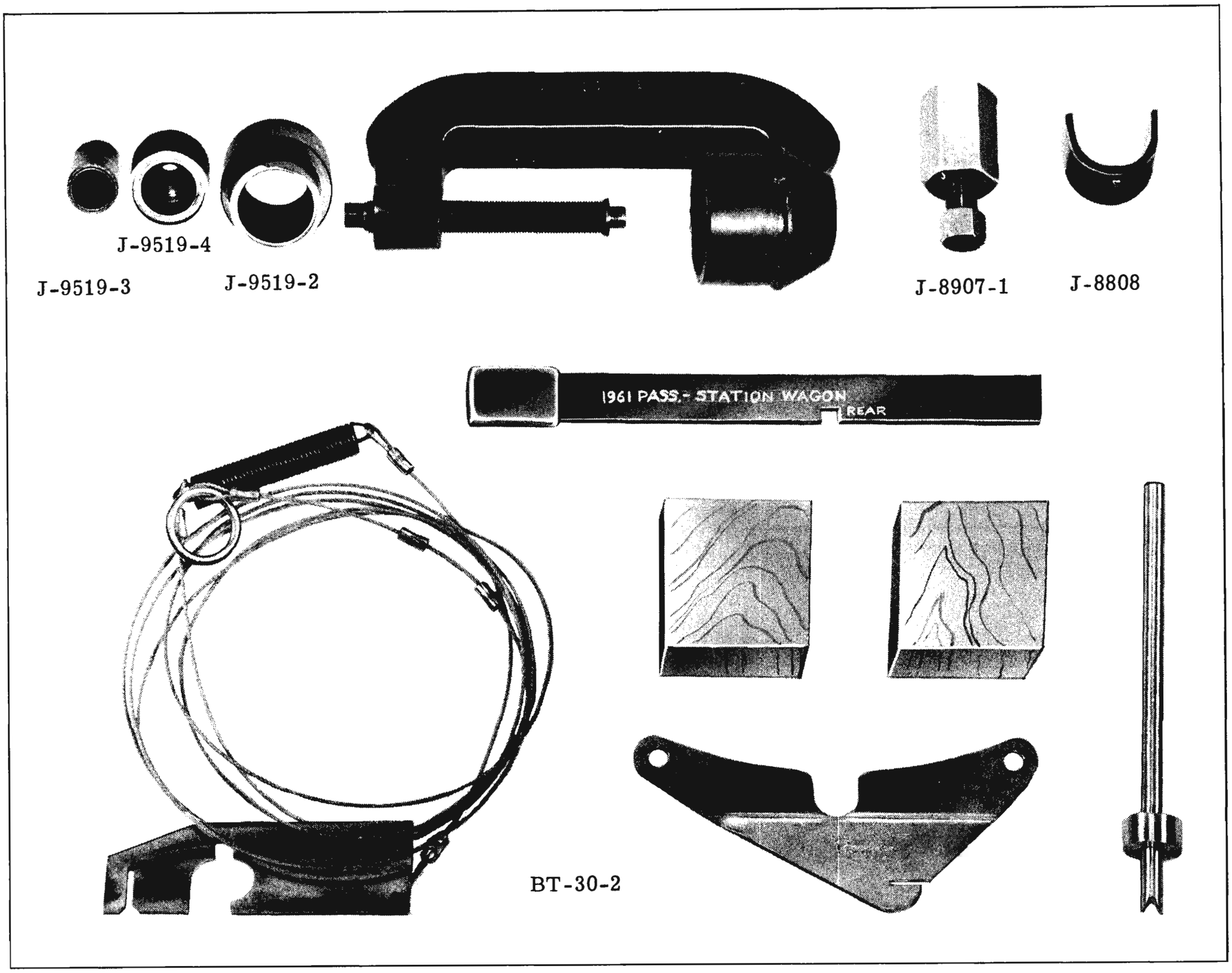


Fig. 5-134 Tools

BT-30-2	Differential Angle Gauge
J-8808	Lower Control Arm Spacer
J-8907-1	Lower Control Arm Shaft Remover and Replacer
J-9519-10	Ball Joint Removing & Installing Fixture
J-9519-3	Ball Joint Remover
J-9514-4	Ball Joint Installer
J-9519-2	Ball Joint Back-Up

PROPELLER SHAFT AND DIFFERENTIAL

CONTENTS OF SECTION 6

PROPELLER SHAFT

PERIODIC MAINTENANCE

The propeller shaft slip yoke does not require a scheduled lubrication interval. However, if at high mileage a tendency for stickiness should develop at the slip yoke it should be lubricated with Seal Lubricant (Part No. 567196) until lubricant appears at the vent hole. Universal joints, under both hot and cold weather conditions, do not require a scheduled lubrication interval.

DESCRIPTION (Fig. 6-1)

The rear yoke shaft is bonded in rubber to the inside of the propeller shaft tube and cannot be removed for service.

Both Saginaw and Spicer propeller shaft assemblies are used, refer to Fig. 6-2 for identification.

The propeller shaft assembly is a balanced unit and should be kept free of under coating or other material which could upset the balance.

REMOVE AND INSTALL

1. Straighten lock tangs away from the four "U" bolt nuts and remove the "U" bolts from the differential companion flange.

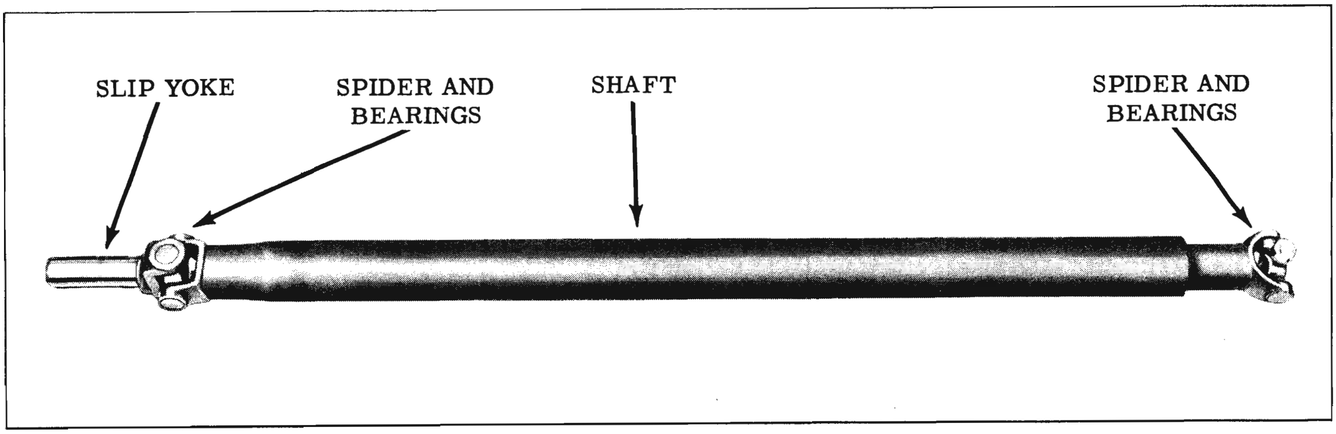


Fig. 6-1 Propeller Shaft Assembly

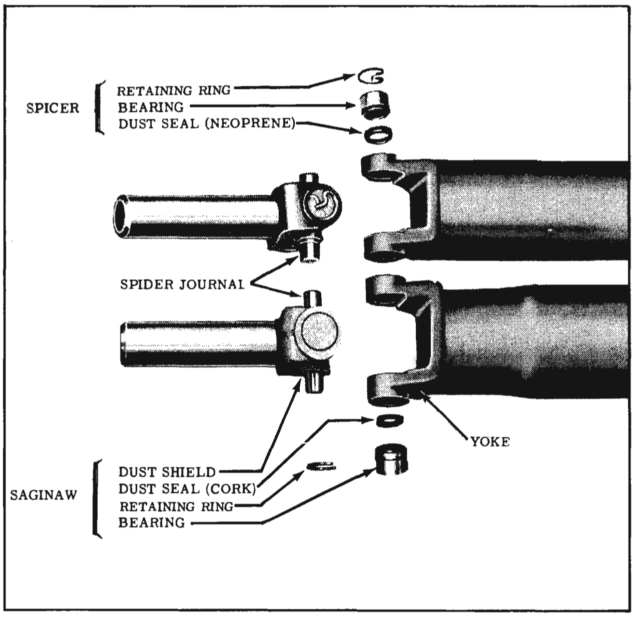


Fig. 6-2 Propeller Shaft Identification

2. If the companion flange "U" joint bearings are not retained with a metal retaining strap, use a piece of wire or tape to hold bearings on their spider journals.

3. Lower the rear of the shaft and slide rearward.

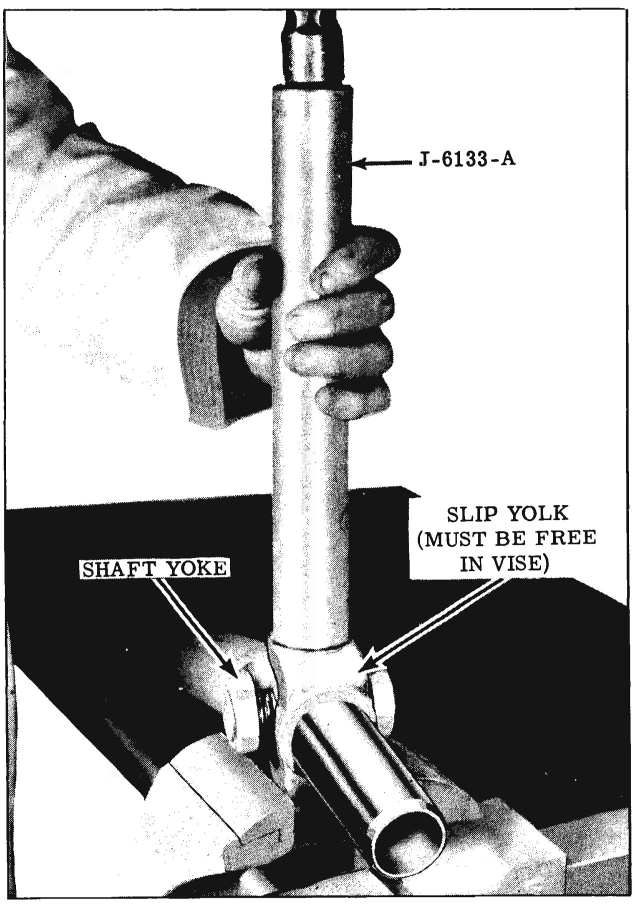


Fig. 6-3 Partial Bearing Removal (Saginaw)

To install, apply one ounce of Seal Lubricant, Part No. 567196, to the splines of the slip yoke (Hydra-Matic only). Using new companion flange "U" bolt locks, torque "U" bolt nuts 14 to 18 ft. lbs. then bend the lock tangs against the nuts.

UNIVERSAL JOINT BEARINGS—REMOVE (Fig. 6-2)

(Saginaw Type)

1. With propeller shaft removed from the car, remove all bearing retaining rings.

   NOTE: Mark both yoke and shaft so that the units may be reassembled in their original position in order to maintain the original balance.

2. Position the slip yoke end of propeller shaft on a vise so that the shaft yoke rests on top of the vise jaws. The slip yoke must be free to move vertically between jaws of vise.

3. Apply force on yoke around bearing. (Fig. 6-3) This will drive the slip yoke down causing spider to force bearing partially out of the yoke.

4. Clamp the partially exposed bearing in a brass jawed vise, then tap yoke until bearing is removed. (Fig. 6-4) Remove bearing from vise.

   NOTE: The use of Tool J-4174 will facilitate removal of bearings. (Inset, Fig. 6-4)

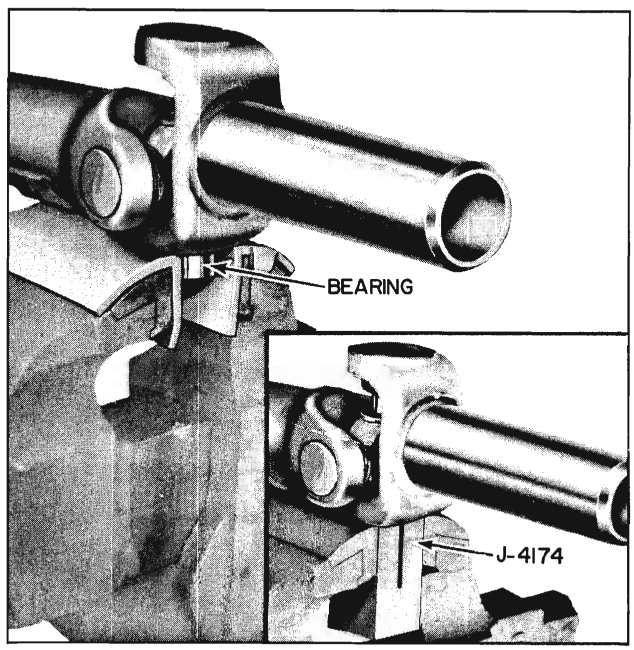


Fig. 6-4 Bearing Removal (Saginaw)

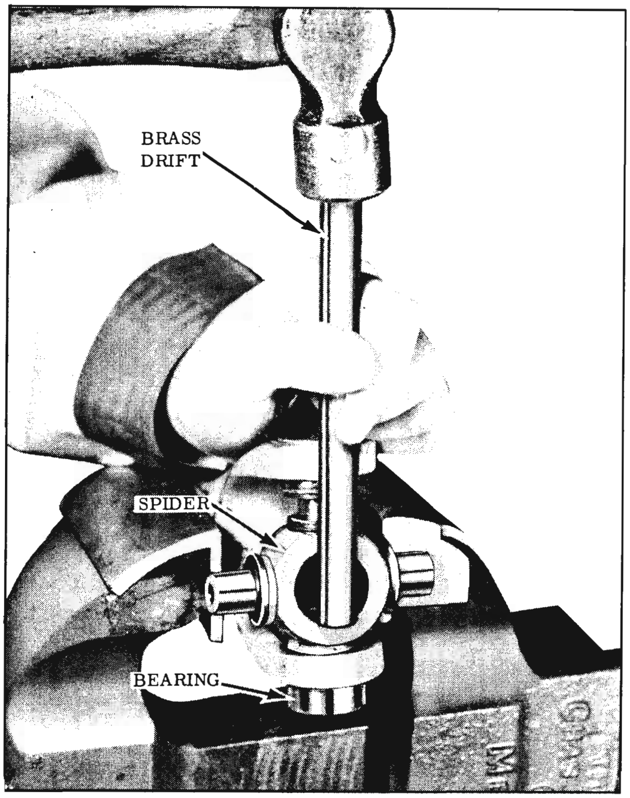


Fig. 6-5 Partial Bearing Removal (Saginaw)

6. Remove slip yoke from spider.

7. Clamp shaft yoke in vise.

   NOTE: Do not clamp the propeller shaft tube in a vise.

8. Drive on spider until bearing is partially forced out of yoke. (Fig. 6-5)

9. Clamp partially exposed bearing in a brass jawed vise and tap on yoke until bearing is removed.

10. To remove opposite bearing, repeat Steps 7, 8 and 9.

11. Remove spider from shaft yoke.

12. Remove rear spider and bearings.

(Spicer Type)

1. With propeller shaft removed, remove all retaining rings that retain bearings in the yoke.

   NOTE: Mark slip yoke and shaft yoke, so that the units may be reassembled in their original position to maintain original balance.

2. Press the bearings from the yoke as shown in Fig. 6-6. Continue pressing until bearing which is pushed by the 9/16" socket clears inner side of yoke.

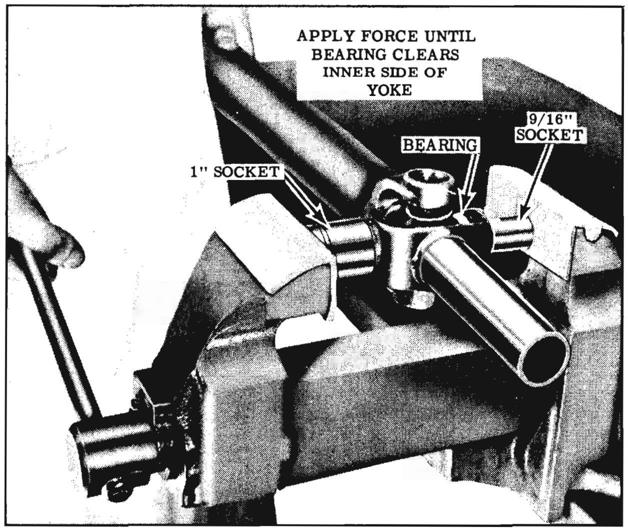


Fig. 6-6 Pressing Bearing From Yoke (Spicer)

3. Remove propeller shaft and sockets from vise.

4. If exposed bearing on the outer side of yoke is still tight, clamp bearing in a brass jawed vise and tap yoke until bearing is free.

5. Remove slip yoke from spider. Remove bearing from spider journal.

6. To remove bearings from shaft yoke, repeat Step 2.

7. Clamp exposed bearing in a brass jawed vise and tap yoke until bearing is free.

8. Remove spider from shaft yoke.

9. Remove spider and bearings from rear yoke.

CLEANING AND INSPECTION

1. Wash all parts thoroughly in cleaning solvent.

   NOTE: Bearings and spiders should be washed in clean gasoline, not light oil. If bearings are washed in light oil, the grease will not adhere to the bearings and the bearings will run dry.

2. Inspect dust seals and shields for damage. Replace if necessary. Cork seals should be flexible. If brittle or hard, replace seals.

3. Inspect roller bearing surfaces of spider journals, inner bearing surfaces of outer races and rollers for wear, scores, flat spots, or any other visible damage.

UNIVERSAL JOINT BEARINGS—INSTALL

(Saginaw and Spicer)

1. Lubricate each needle bearing assembly and

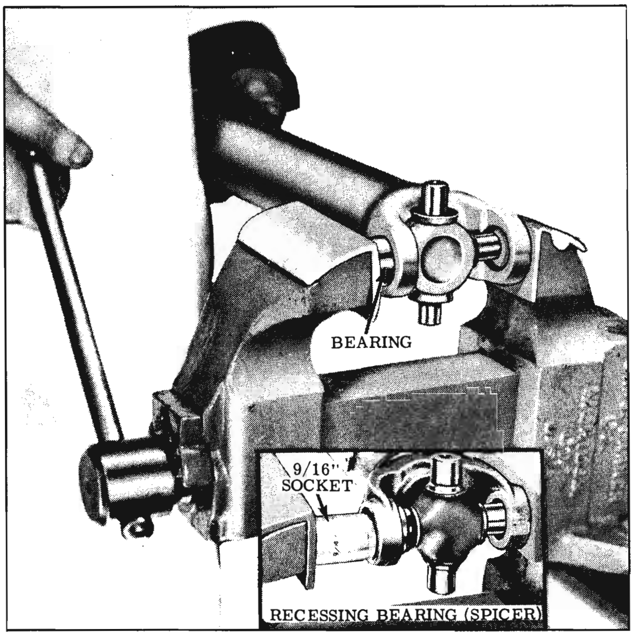


Fig. 6-7 Installing Bearings

fill the reservoir in each spider journal with a sodium soap, fine fiber grease.

2. Press cork dust seal into recess of Saginaw bearings. Install neoprene dust seals on Spicer bearings.

3. If new dust shields are to be installed on Saginaw spiders, install at this time.

4. Position a spider journal in a shaft yoke.

5. Press a bearing into one side of yoke until retaining ring can be installed. (Fig. 6-7)

   NOTE: On Spicer units the bearing must be recessed into the yoke so that the retaining ring can be installed. The bearing can be recessed with a 9/16" socket and vise. (Inset, Fig. 6-7)

6. Install retaining ring. Retaining rings on Saginaw units must be installed with the gap toward the yoke.

7. Repeat Steps 5 and 6 on opposite bearing. As the bearing is installed, align spider journal with the bearing.

8. To install the slip yoke, position the yoke over the spider journal with scribe marks aligned and repeat Steps 5, 6 and 7.

9. Position bearings which attach to a companion flange, onto the spider journals and retain with wire or tape.

DIFFERENTIAL

PERIODIC MAINTENANCE

Periodic or seasonal lubricant changes are not recommended. The lubricant level should be checked at each oil change interval. If lubricant addition is required, add:

Conventional Differential: Special Lubricant (Part No. 531536) or S.A.E. 90 Hypoid Gear Lubricant meeting the requirements of military specifications MIL-L-2105B.

Anti-Spin Differential: Only Special Lubricant (Part No. 531536).

IMPORTANT: Use of other than the above mentioned type of lubricant in the Anti-Spin Differential may cause chatter. If the wrong type of lubricant is used in the Anti-Spin, it will require draining the differential and installing the recommended lubricant (Part No. 531536). It may be necessary to drive Anti-Spin equipped cars for distances of 50 miles or more to allow the new lubricant to work through the plates before the chatter will disappear.

MINOR SERVICE OPERATIONS

PINION OIL SEAL REPLACEMENT

1. Disconnect propeller shaft from differential companion flange and support shaft up in body tunnel by wiring propeller shaft to the exhaust pipe. If "U" joint bearings are not retained by a retainer strap, use a piece of wire to hold bearings on their spider journals.

2. Mark the position of the companion flange, pinion shaft and nut so that they can be reinstalled in the same position.

3. Remove companion flange nut, using Tool J-6544 to hold flange. (Fig. 6-8) Remove washer.

4. Remove companion flange using puller J-6295-01. (Fig. 6-9)

5. Remove oil seal by driving it out of carrier with a blunt chisel.

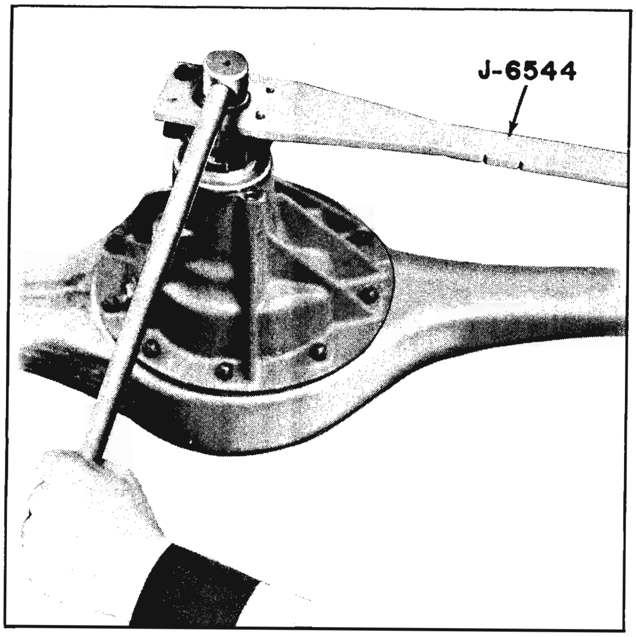


Fig. 6-8 Removing Companion Flange Nut

6. Examine surface of companion flange for tool marks, nicks, or damaged surface. If damaged, replace flange as per instructions under COMPANION FLANGE REPLACEMENT.

7. Examine carrier bore and remove any burrs that might cause leaks around the O.D. of the seal.

8. Coat outside diameter of new seal sparingly with sealer, Part No. 557622 and install seal using driver J-5395-01 to properly locate seal in carrier. (Fig. 6-10)

9. Apply Special Seal Lubricant (Part No. 567196) to the O.D. of the companion flange and sealing lip of new seal.

10. Install companion flange and tighten nut to the same position as marked in step 2, while holding companion flange with Tool J-6544. Tighten nut 1/16" beyond alignment marks.

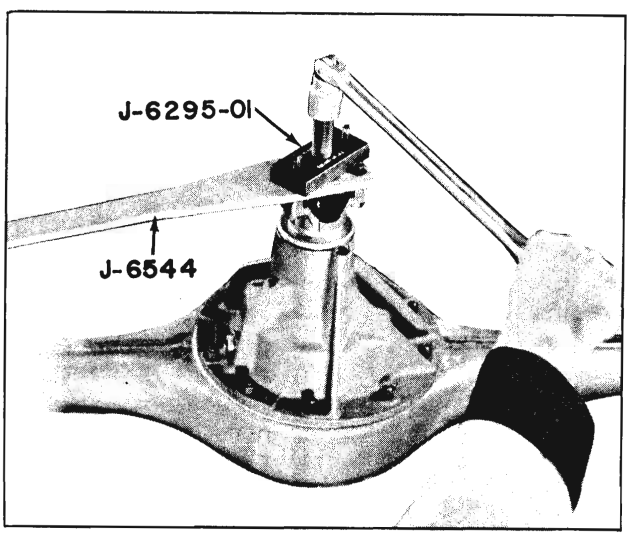


Fig. 6-9 Removing Companion Flange

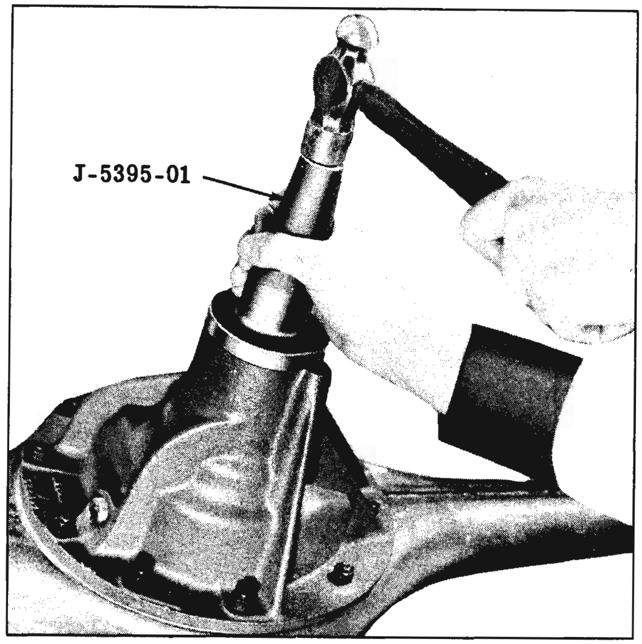


Fig. 6-10 Installing Pinion Oil Seal

COMPANION FLANGE REPLACEMENT

1. Remove both rear wheels and brake drums.

2. Remove both axle shafts BEING CAREFUL NOT TO DRAG THE AXLE SHAFTS ACROSS THE SEALS.

3. Disconnect rear universal joint and support propeller shaft by tying propeller shaft to exhaust pipe. If "U" joint bearings are not retained by a retainer strap, use a piece of wire to hold bearings on their spider journals.

4. Remove companion flange nut using Holding Tool J-6544 to hold flange. (Fig. 6-8)

5. Remove washer and then remove companion flange using puller J-6295-01. (Fig. 6-9)

6. Apply Special Seal Lubricant (Part No. 567196) to the O.D. of the new companion flange, then install companion flange, washer and companion flange nut finger tight.

7. While holding companion flange with Tool J-6544, tighten the nut a little at a time and turn drive pinion several revolutions after each tightening to seat the rollers. Check the pre-load of bearings each time with an inch pound torque wrench or with Spring Scale J-544-A until pre-load is 10 to 15 inch pounds. (See CARRIER DISASSEMBLY, step 1)

NOTE: The bearing pre-load should never

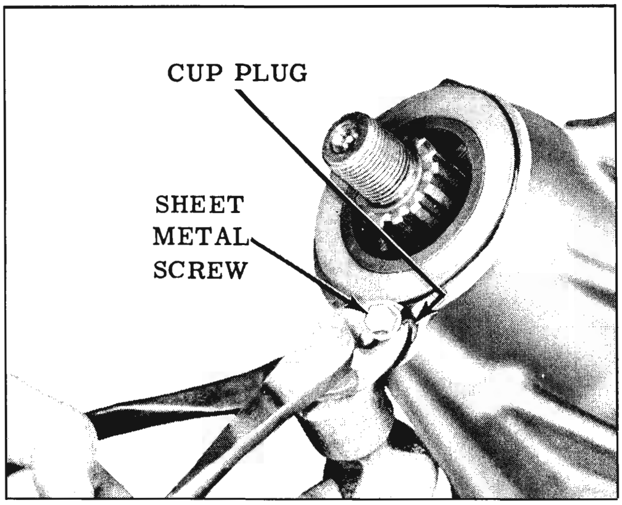


Fig. 6-11 Removing Cup Plug

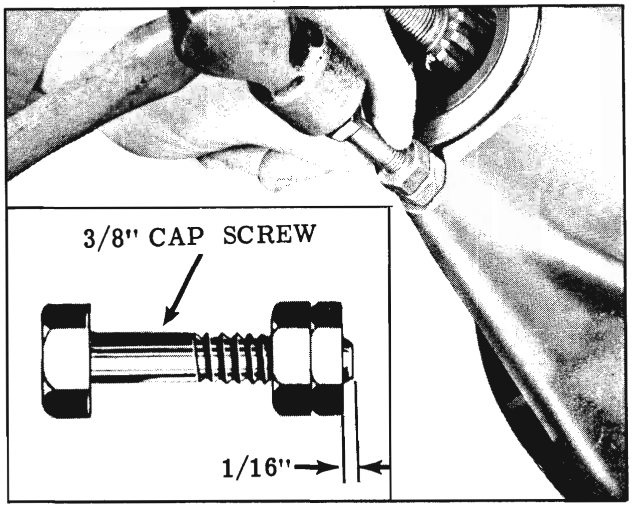


Fig. 6-12 Installing Cup Plug

exceed 25 inch pounds if the differential has been in use.

8. Connect rear universal joint to differential companion flange.

9. Install axle shafts carefully to avoid dragging shafts across seals. Torque 23 to 28 ft. lbs.

10. Install drums and wheels.

OIL GALLEY PLUG REPLACEMENT

1. Remove companion flange. (See COMPANION FLANGE REPLACEMENT, steps 1 thru 5)

2. Center punch and drill hole in plug to receive sheet metal screw.

3. Remove plug as shown in Fig. 6-11.

4. Clean metal particles from oil galley.

5. Coat O.D. of a new plug with sealer, Part No. 557622, then drive plug into oil drain galley until it is FLUSH with carrier. (Fig. 6-12)

6. Install companion flange (see COMPANION FLANGE REPLACEMENT, steps 6 thru 10).

DIFFERENTIAL—REMOVE

1. Remove the axle shafts.

2. Clean the differential carrier and the axle housing around carrier to prevent dirt from entering the housing or falling on the gears.

3. Remove the companion flange "U" bolts. If "U" joint bearings are not retained by a retainer strap, use a piece of wire or a rubber band to hold "U" joint bearings on the spider. Support the propeller shaft by tying it to the exhaust pipe.

4. Drain the oil by removing nuts from carrier mounting studs and moving carrier away from axle housing.

   CAUTION: Do not clean the differential until it has been disassembled. This will avoid washing dirt into the bearings.

DIFFERENTIAL—INSTALL

IMPORTANT: Differential gears that have failed or bearings that are damaged by chipping are certain to leave particles of metal in the housing. These particles must be thoroughly cleaned from the housing before installing the carrier to prevent repeat failure.

Bearings that are not chipped, but are loose (lapped-in) are an indication of dust, grit, or dirt in the oil that caused the bearings to wear. This too must be thoroughly cleaned from the housing before installing the differential to prevent excessive bearing wear.

To assure that the housing is clean, thoroughly wash the interior of the housing with clean solvent. Loosen any particles that may be lodged by tapping the housing its entire length, then wipe the inside of housing dry to remove all particles.

1. Clean the gasket surface on housing and install a new gasket.

2. Align the differential with the housing and carefully install the differential over the mounting studs. Install nuts on studs and tighten evenly.

3. Torque nuts 50 to 60 ft. lbs.

4. Install axle shafts. Torque 23 to 28 ft. lbs.

5. Install brake drums and wheels. Connect propeller shaft to differential companion flange.

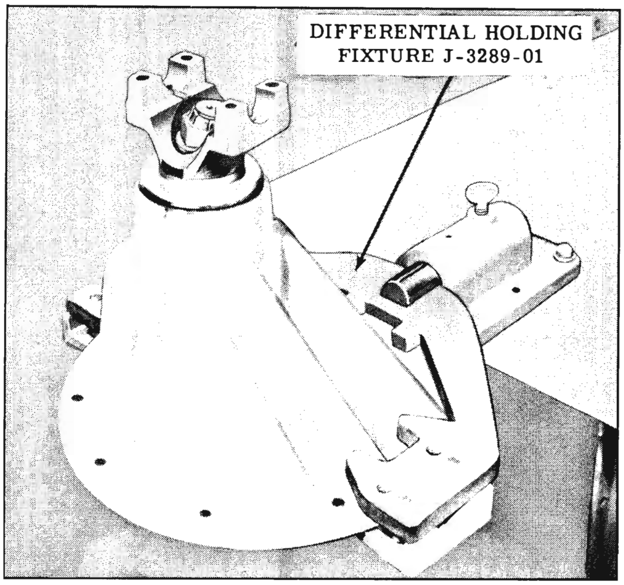


Fig. 6-13 Holding Fixture

6. With car level, fill the rear axle housing to filler plug level with Special Lubricant (Part No. 531536).

CAUTION: If new gears and/or bearings are installed, the owner should be advised NOT TO DRIVE CAR OVER 50 MILES PER HOUR OR USE FULL THROTTLE FOR THE FIRST 50 MILES. This will permit proper "break-in" of the gears and bearings.

DIFFERENTIAL—DISASSEMBLY

Careful inspection of the differential while disassembling the unit will assist in determining the cause of axle noise, as in many instances improper bearing pre-load and/or ring gear to pinion backlash are the basic causes of the noise.

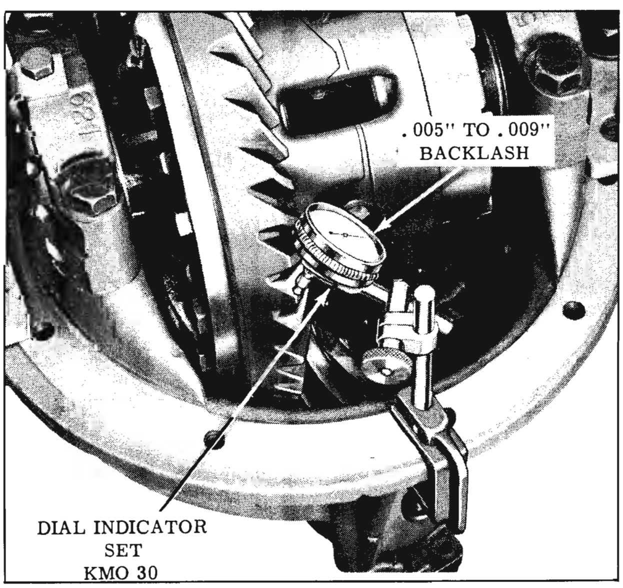


Fig. 6-14 Measuring Backlash

1. Mount differential in Holding Fixture J-3289-01. (Fig. 6-13)

2. If original pinion gear and ring gear are to be reinstalled, install dial indicator set KMO-30 as shown in Fig. 6-14. Measure backlash at two points (180° apart). The lowest reading should be within .005" to .009".

3. Mark the right side bearing adjusting nut, bearing cap, and carrier with two punch marks as shown in Fig. 6-15, also mark the left side in the same manner using one punch mark. These marks will serve for location and adjusting purposes when rebuilding differential with the original gear set.

4. Remove bearing cap lock screws and locks.

5. To determine if the side bearing pre-load is correct:

   a. Loosen each bearing cap attaching bolt (1/4 to 1/2 turn) just enough to turn adjusting nut. (Tap lightly on bearing cap to assure freeness of nut in threads.)

   b. Back off the right hand adjusting nut (one opposite ring gear) with Tool J-972-A and watch the outer race of the bearing.

   NOTE: If the side bearing pre-load is correct, the outside bearing race should start to turn the instant the adjusting nut is loosened. It should continue to turn until the adjusting nut is loosened 2 to 3 notches. Count and record the notches between the punch marks on the nut and those on the carrier where bearing race stopped turning.

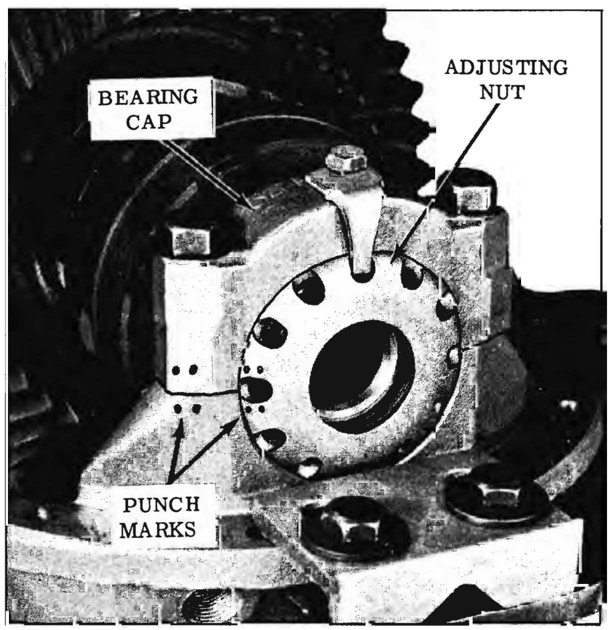


Fig. 6-15 Adjusting Nut Markings

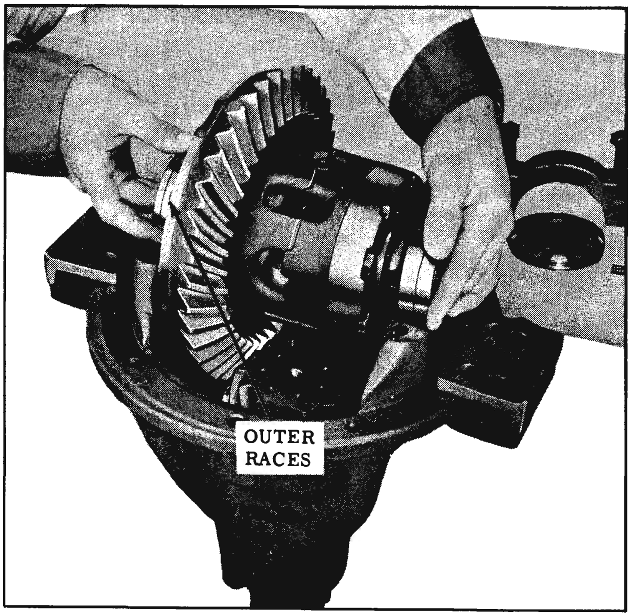


Fig. 6-16 Removing Differential Case (Anti-Spin Shown)

6. Remove the bearing cap bolts, bearing cap, and adjusting nuts.

7. Lift the differential case from the carrier while holding the side bearing outer races against rollers. (Fig. 6-16) Remove bearing outer races.

IMPORTANT: DO NOT DROP OR MIX THE DIFFERENTIAL SIDE BEARING OUTER RACES AS THEY MUST BE ASSEMBLED TO THE SAME BEARING FROM WHICH THEY WERE REMOVED.

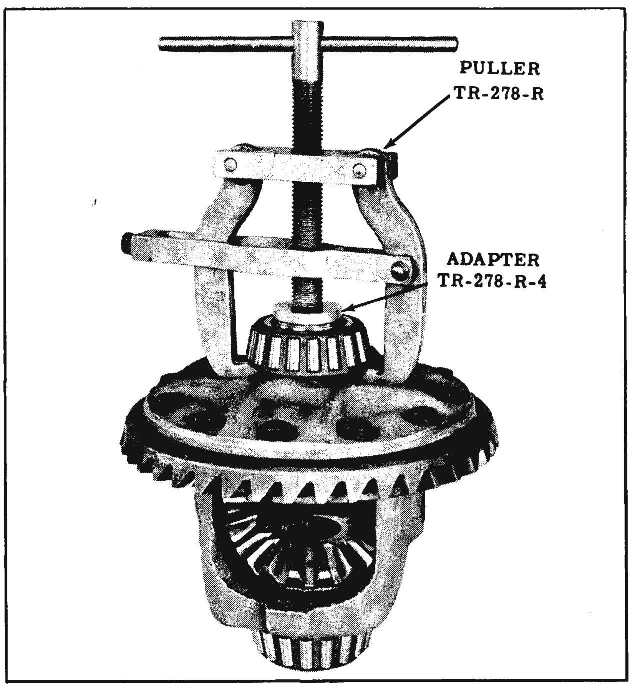


Fig. 6-17 Removing Side Bearings

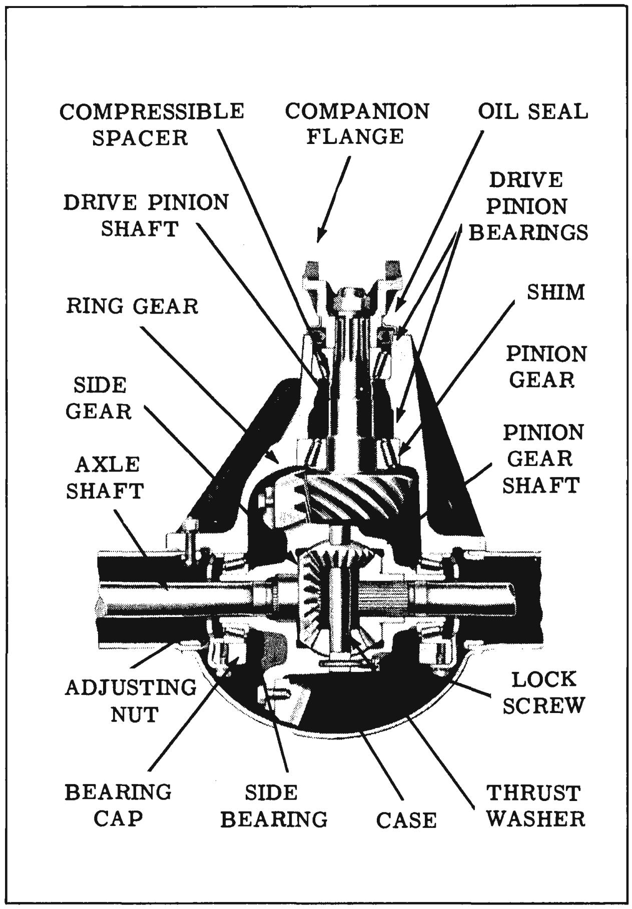


Fig. 6-18 Differential Assembly (Standard)

CASE—DISASSEMBLY
(Conventional Differential Only)

1. If side bearings are to be removed, use Differential Side Bearing Remover TR-278-R and Adapter TR-278-R-4 as shown in Fig. 6-17. Be sure ends of puller are placed in recess in differential case.

2. If the ring gear or differential case is to be replaced, remove ring gear from case.

3. Remove lock screw and pinion gear shaft, then remove the pinion gears, side gears and thrust washers from case.

CARRIER—DISASSEMBLY

1. Check pinion bearing pre-load with an inch-pound torque wrench as shown in Fig. 6-19. Pre-load should be within 10 to 15 in. lbs. for old bearings, 24 to 32 in. lbs. for new bearings.

If an inch pound torque wrench is not available, Spring Scale J-544-A may be used by hooking to Companion Flange Holding Tool J-6544 at a point 10 inches from pinion shaft center, as shown in Fig. 6-20. The reading in pounds, multiplied by 10 will give inch-pounds.

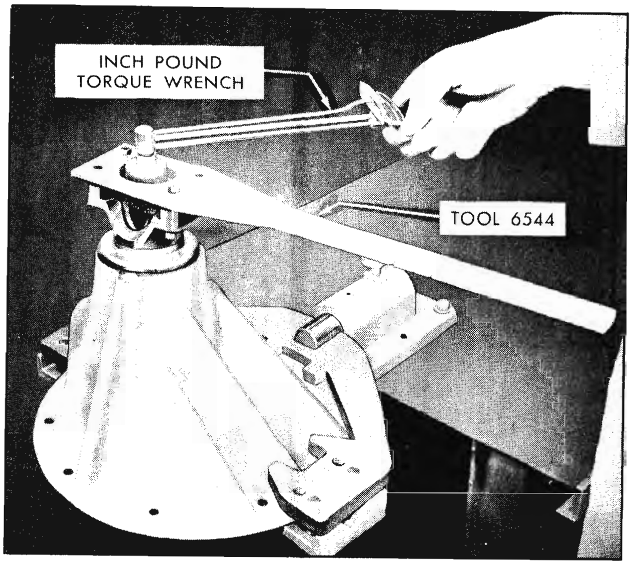


Fig. 6-19 Measuring Bearing Preload With Torque Wrench

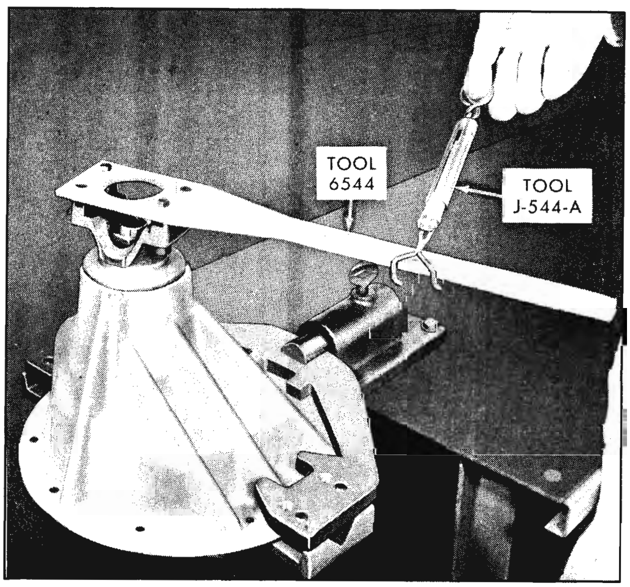


Fig. 6-20 Measuring Bearing Preload With Spring Scale

Thus 3 pounds on the scale will indicate 30 in. lbs. The reading BETWEEN POUND GRADUATIONS must be read in TENTHS rather than ounces. Example: 2 lbs., 8 oz., is read 2.5 lbs., which equals 25 in. lbs.

2. Turn the assembly to a horizontal position as shown in Fig. 6-21, then, using Tool J-6544 to hold companion flange, remove the companion flange nut using a 1-1/4" socket.

3. Remove washer.

CAUTION: To avoid possibility of dropping the drive pinion assembly, leave the carrier in a horizontal position until the pinion assembly is removed.

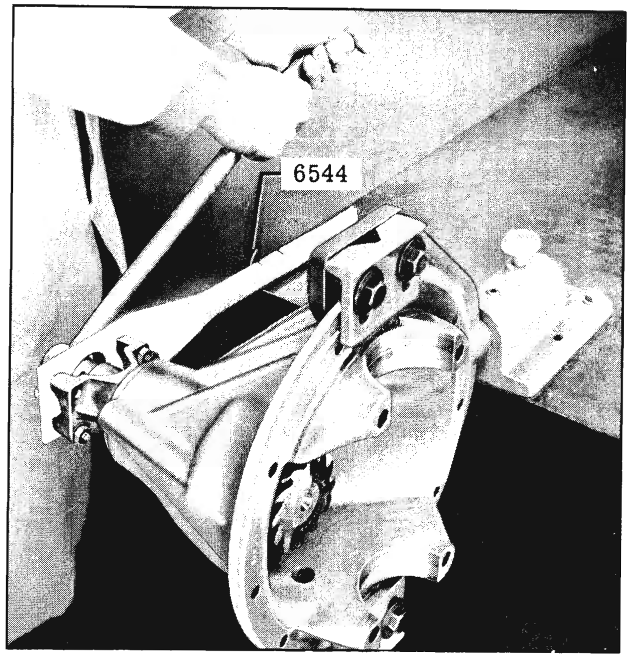


Fig. 6-21 Removing Companion Flange Nut

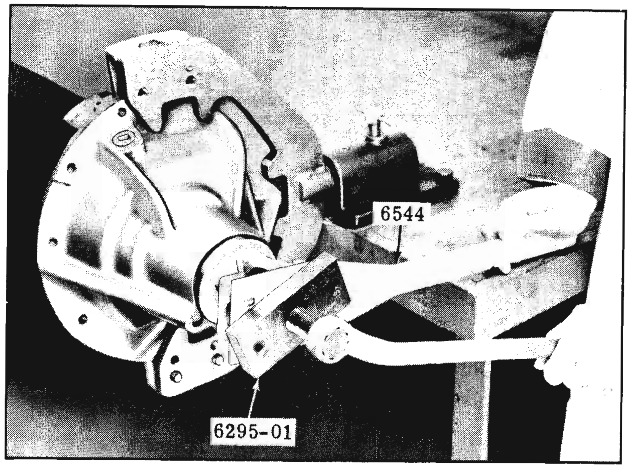


Fig. 6-22 Removing Companion Flange

4. Using companion flange puller J-6295-01 and holding Tool J-6544, remove companion flange. (Fig. 6-22)

5. Remove the drive pinion, rear bearing, and spacer by one of the following methods:

   a. Remove the drive pinion by hand if it has a sliding fit in front bearing.

   b. If the drive pinion has a light press fit in the front bearing, lightly tap the pinion free with a composition hammer.

   c. If drive pinion has a tight press fit in front bearing, remove with an arbor press.

   NOTE: In some cases, a shim washer

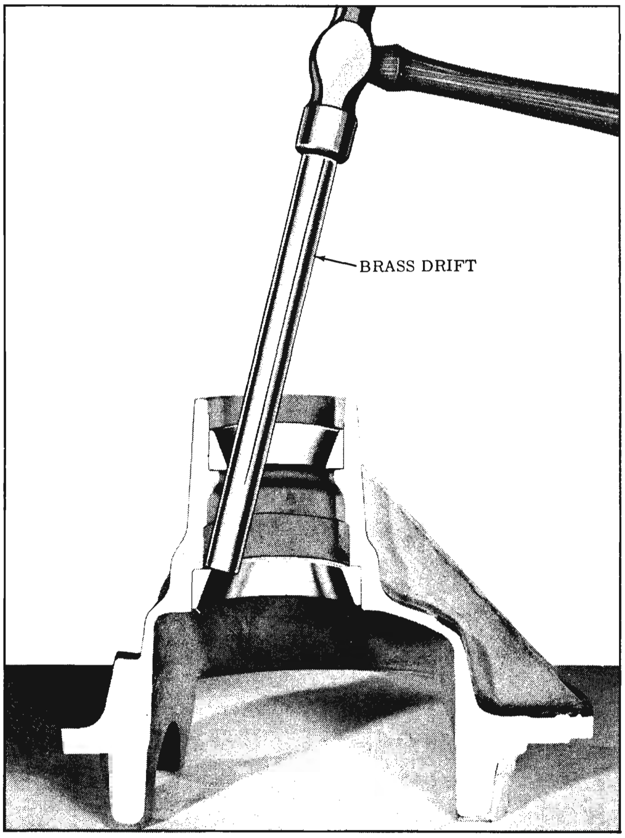


Fig. 6-23 Removing Rear Bearing Outer Race

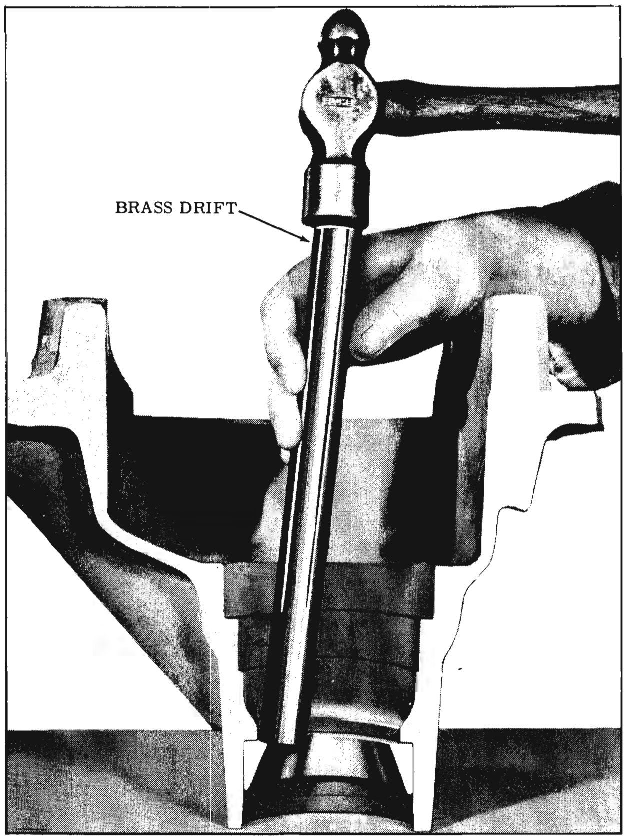


Fig. 6-24 Removing Front Bearing Outer Race

.037" to .045" thick will be found between the compressible spacer and inner race of the front drive pinion bearing. This shim is used in production to salvage the compressible spacer should the recommended pre-load be exceeded.

It can be used in assembly in the same manner, and its use will be covered later. No more than 1 shim is to be used.

6. Remove the oil seal by driving it out of the carrier with a blunt chisel.

7. Remove the front inner race and roller assembly.

8. Drive rear bearing outer race from carrier. (Fig. 6-23)

9. Drive the front bearing outer race from carrier. (Fig. 6-24)

10. If the rear pinion bearing or shims are to be replaced, use an arbor press as shown in Fig. 6-25 to press the rear bearing inner race and roller assembly off the pinion shaft.

NOTE: The shims between the pinion bearing and the pinion gear are the selective shims used to locate the drive pinion gear with the ring gear.

CLEANING AND INSPECTION

1. Clean all differential bearings thoroughly in clean solvent (do not use a brush). Examine bearings visually and by feel. All bearings should feel smooth when oiled and rotated while applying as much hand pressure as possible.

NOTE: Minute scratches and pits that appear on rollers and races at low mileage are

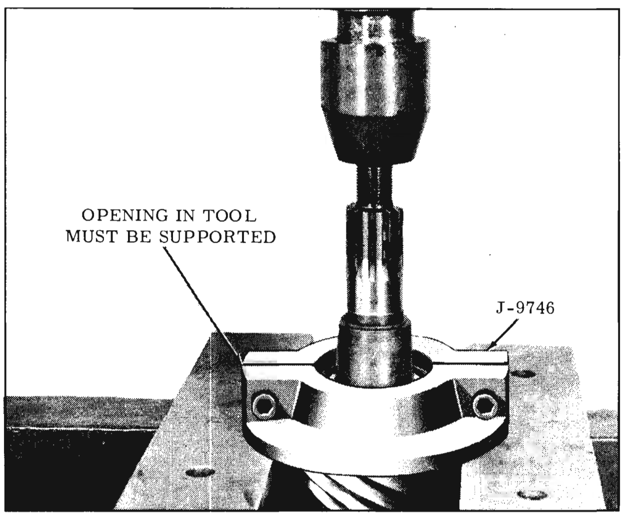


Fig. 6-25 Removing Rear Bearing

due to the initial pre-load, and bearings having these marks should not be rejected.

2. Examine sealing surface of companion flange for nicks, burrs, or rough tool marks which would cause damage to seal and result in an oil leak. Replace if damaged.

3. Examine carrier bore and remove any burrs that might cause leaks around the O.D. of the seal.

4. Examine the differential ring gear and drive pinion teeth for nicks, burrs and scoring. Any of these conditions will require replacement of the gear set.

5. Inspect the differential pinion gear shaft for unusual wear; also, the pinion and side gears and thrust washers.

6. Check the press fit of the side bearing inner race on the differential case hub by prying against the shoulder at the puller recess in the case. Side bearings must be a tight press fit on the hub.

7. Remove oil galley plug at front of carrier, clean passage, and install new plug as outlined under OIL GALLEY PLUG REPLACEMENT.

8. Diagnosis of a differential failure such as: chipped bearings, loose (lapped-in) bearings, chipped gears, etc., is a warning that some foreign material is present; therefore, the axle housing must be cleaned.

DIFFERENTIAL—ASSEMBLY

DIFFERENTIAL CASE ASSEMBLY (Conventional Differential Only)

1. If the ring gear was removed, position the gear on the case flange and install the attaching bolts. Tighten the attaching bolts evenly and alternately across the diameter in progressive stages. Torque 55 to 65 ft. lbs.

2. If side bearings were removed, install as shown in Fig. 6-26.

3. Lubricate the side gears, pinion gears and thrust washers.

4. Place the side gear thrust washers over gear hubs and install side gears in case.

5. While holding the upper side gear up into its bore, position one pinion gear (without a washer) between side gears and rotate gears until pinion gear is directly opposite from loading opening in case.

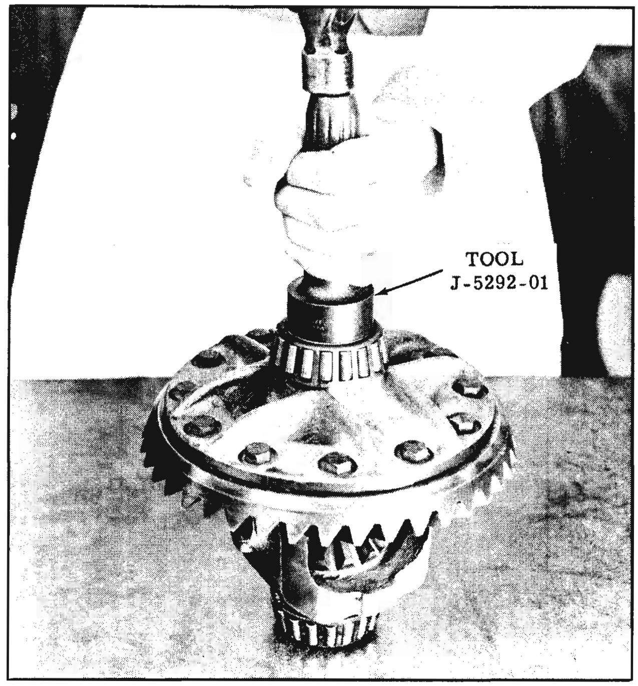


Fig. 6-26 Installing Side Bearings

6. Place the other pinion gear in position between side gears so that the pinion gear shaft holes are in line.

7. Rotate the pinion gears in position to assure pinion gear shaft holes in gears are lined up with shaft holes in case. If not, pinion will require repositioning in side gear teeth.

8. With gears properly meshed, rotate assembly just enough to permit working the pinion thrust washers into position between gears and case.

9. Install the pinion gear shaft and lock it in place with lock screw and lock washer.

CARRIER—ASSEMBLY

Marking on Differential Carrier and Pinion

Before installing the drive pinion, the correct number of shims to locate the drive pinion properly must be determined from markings on the differential carrier and end of pinion gear. Drive pinions ground to zero specifications are not marked as they are considered "0".

The differential carrier is marked on the face of the flange. (Fig. 6-27) "D" means "deep" and "S" means "shallow" depth of carrier bore to the shoulder for the rear pinion bearing. The digit following the letter designates the number of thousandths "deep" or "shallow".

If shims are required to correct an error in pinion machining, a number will be ETCHED on the end of the drive pinion indicating in thousandth of an inch the correction required to position

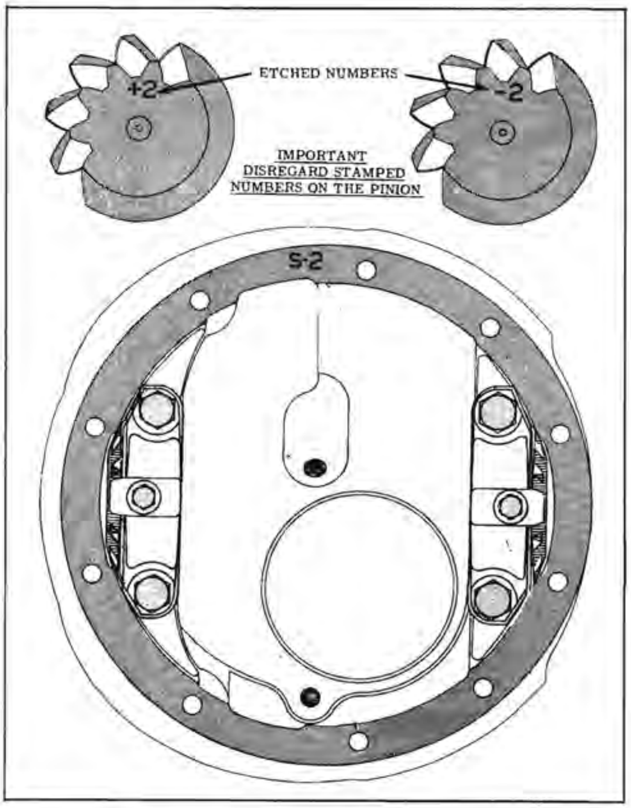


Fig. 6-27 Pinion and Carrier Markings

pinion in carrier. Examples: +2 requires .002" added shim thickness and -2 requires .002" less shim thickness. (Fig. 6-27) Disregard numbers which are STAMPED on end of pinion. They are for manufacturing control and DO NOT REFER TO SHIMS.

CAUTION: Always use the shim chart to correctly position the pinion when rebuilding a differential using new gears, pinion bearings or carrier. (Fig. 6-28)

How To Use The Shim Chart

Read the markings STAMPED on the carrier and ETCHED on drive pinion (Fig. 6-27) and then refer to the "SHIM CHART". (Fig. 6-28)

In the column "Carrier Marking" read to the right to the "Pinion Marking" vertical column. The intersection of these columns show the correct total shim thickness for this particular carrier and pinion.

Notice on the chart, the shim requirement for a carrier marked "O" together with an unmarked pinion is .016". This means that any "Plus" or "Minus" markings or "Shallow" or "Deep" markings, represent the variation in shim thickness from the starting point of .016".

Example: Carrier which is marked "D-1" with a pinion not marked requires total shim thickness of .017". Use shim thickness chart to identify (by notches) thickness of shims. If necessary, measure shims with a micrometer.

CARRIER MARKING	PINION MARKING		
MARK	-2	0	+2
S-5	.009	.011	.013
S-4	.010	.012	.014
S-3	.011	.013	.015
S-2	.012	.014	.016
S-1	.013	.015	.017
0	.014	.016	.018
D-1	.015	.017	.019
D-2	.016	.018	.020
D-3	.017	.019	.021
D-4	.018	.020	.022
D-5	.019	.021	.023

Fig. 6-28 Pinion Shim Chart

NOTE: Due to the tolerances of the bearings used in production, the shim thickness as found in differentials with original bearings may vary slightly from the service shim chart. However, always use the shim chart when installing new bearings, as service bearings are within the standard height range.

If new bearings are not installed when a new pinion or carrier is installed, any variation from the chart must be taken into consideration when determining the new shim requirements.

Example: If a differential with original bearings had an unmarked pinion and a carrier marked "O", the shim requirements according to the shim chart would be .016". If only .013" shim thickness was found in the differential, then obviously the bearing accounted for the .003" variation. This variation will have to be taken into consideration when installing a new pinion or carrier.

When to Use a New Compressible Spacer

A washer with the old compressible spacer or a new compressible spacer should be used under the following conditions:

a. When a new drive pinion gear and/or pinion bearings or carrier is installed.

b. When the required pre-load has been exceeded during the adjustment.

NOTE: If a washer was found between the spacer and outer pinion bearing assembly, the washer should be discarded and a new compressible spacer used.

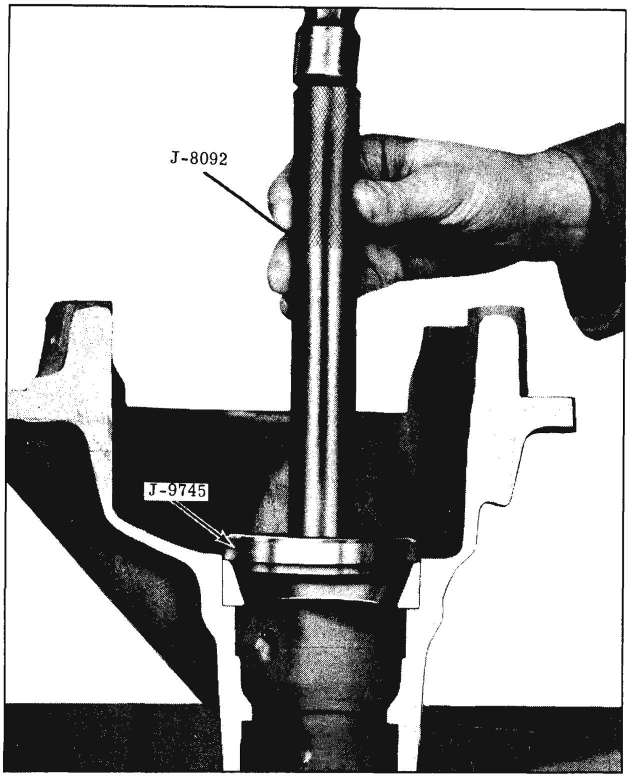


Fig. 6-29 Installing Rear Bearing Outer Race

1. Press outer race of rear pinion bearing firmly in place against shoulder in the carrier. (Fig. 6-29)

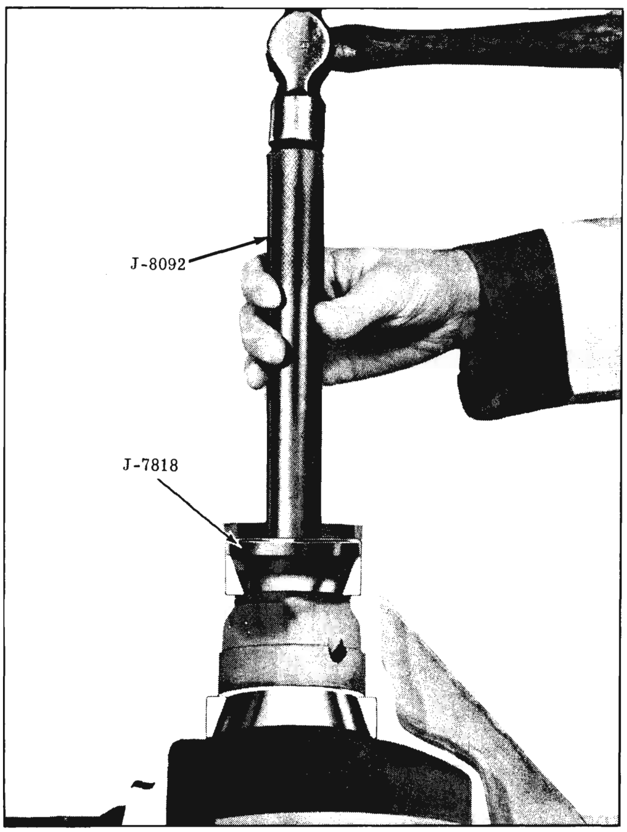


Fig. 6-30 Installing Front Bearing Outer Race

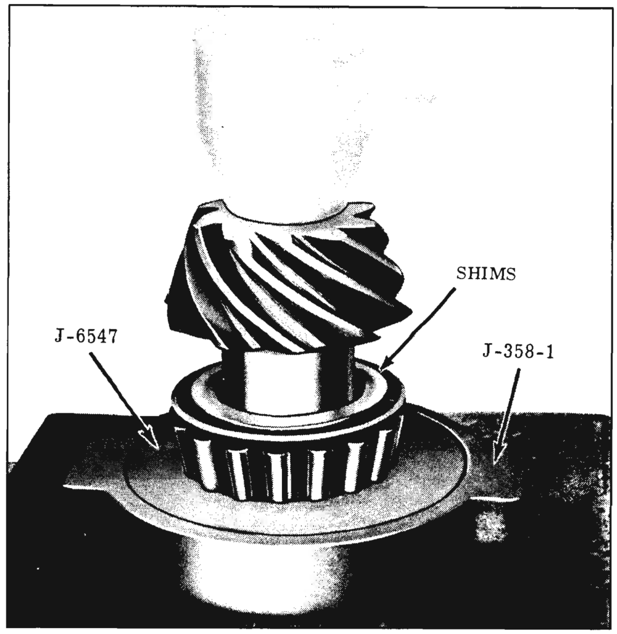


Fig. 6-31 Installing Bearing on Pinion Shaft

2. Press outer race of front pinion bearing firmly against shoulder in carrier. (Fig. 6-30)

3. Install correct number of pinion adjusting shims against shoulder of drive pinion shaft.

4. Lubricate the rear bearing roller assembly, then press the rear bearing inner race and roller assembly firmly in place against the shims on pinion shaft. (Fig. 6-31)

5. Place the compressible spacer over the drive pinion shaft (with the large diameter against drive pinion shaft shoulder). Install washer if original spacer is reused.

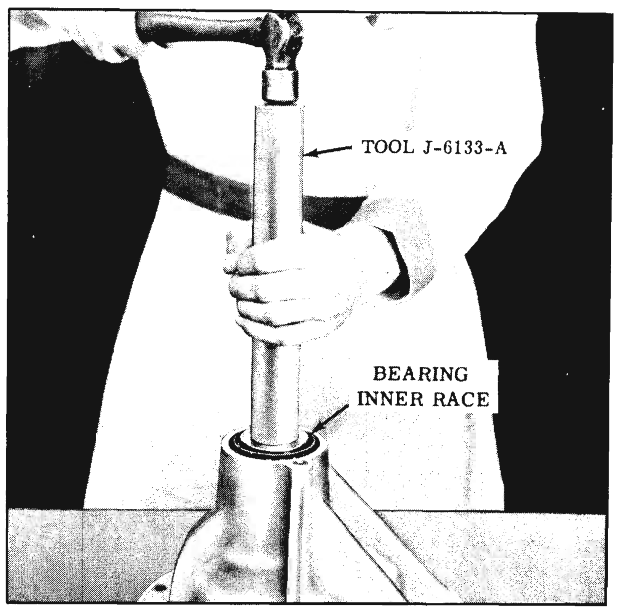


Fig. 6-32 Installing Front Pinion Bearing Inner Race

6. Place the drive pinion assembly into position in the carrier. Lubricate the front bearing roller assembly and slide over the pinion shaft. Install front bearing inner race.

   NOTE: If the drive pinion shaft is a press fit in the front bearing, install the roller and race using Tool J-6133-A to press or drive the assembly onto the pinion shaft while supporting pinion gear. (Fig. 6-32)

7. Coat the outer diameter of a new pinion oil seal sparingly with sealer Part No. 557622.

8. Just start the seal into carrier by tapping lightly and then finish driving the seal in place with Pinion Seal Installer J-5395-01. (Fig. 6-33)

9. Apply a coating of Special Lubricant (Part No. 567196) to the O.D. of the companion flange and the sealing lip of the new seal.

10. While supporting the drive pinion shaft, tap the companion flange onto the drive pinion shaft.

11. Oil the flat washer and threads of drive pinion shaft and then install the washer and nut but do not tighten.

12. Adjust pinion bearing pre-load.

Adjusting Pinion Bearing Pre-Load

CAUTION: Extreme care must be used in tightening companion flange nut to pre-load pinion bearings correctly. Incorrect pre-load may result in bearing failure. Never back off nut to secure proper pre-load if specified pre-load has been exceeded. If specified maximum pre-load is exceeded, it will be necessary to use a washer, or use a new compressible spacer.

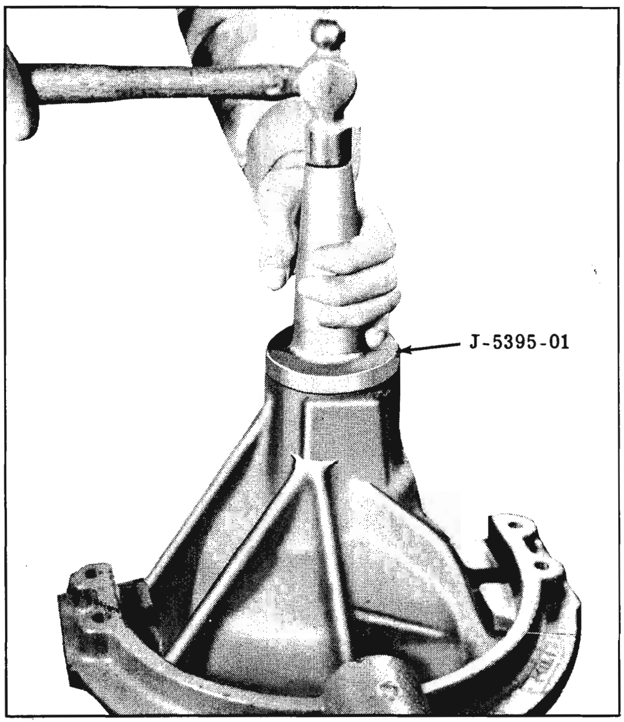


Fig. 6-33 Installing Pinion Oil Seal

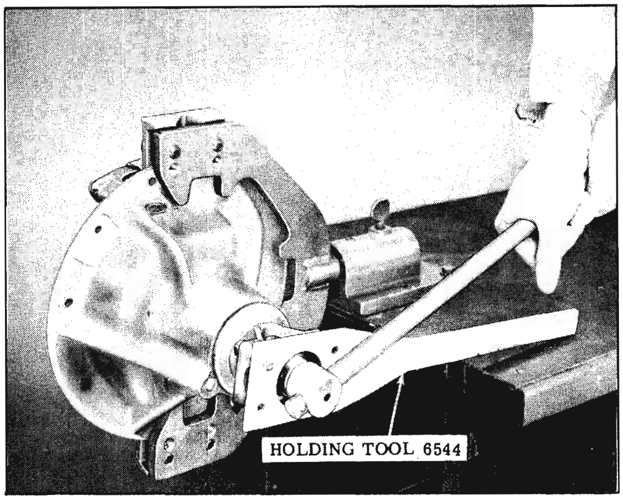


Fig. 6-34 Tightening Companion Flange Nut

Position carrier assembly as shown in Fig. 6-34 and tighten companion flange nut using Flange Holding Tool J-6544 and a heavy duty socket until all end play in drive pinion assembly is removed. Continue to tighten nut carefully, not more than 1/6 turn at a time, then turn drive pinion shaft several revolutions to seat rollers and check bearing pre-load with an inch-pound torque wrench (Fig. 6-35) or spring scale J-544-A. (Fig. 6-36)

NOTE: If spring scale J-544-A is used to check pre-load, it should be hooked to companion flange holding Tool J-6544 at a point 10 inches from drive shaft center. (Fig. 6-36) Readings in

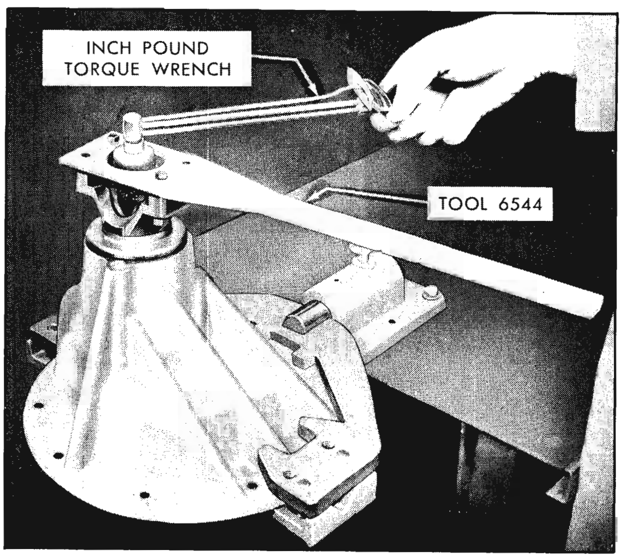


Fig. 6-35 Measuring Bearing Preload With Torque Wrench

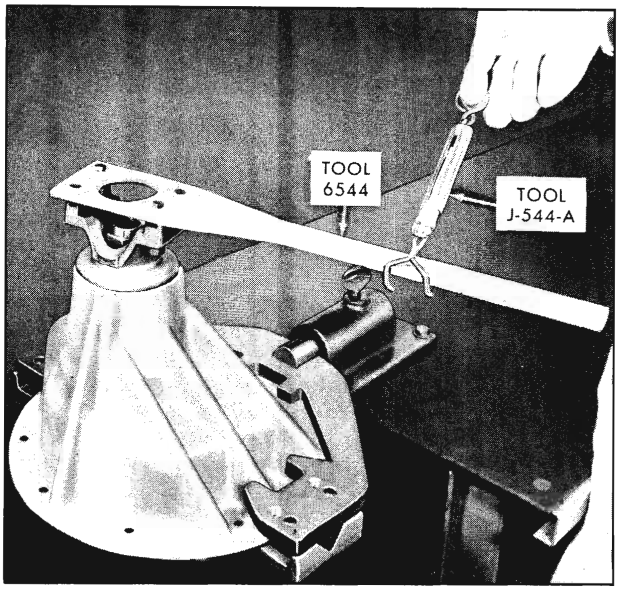


Fig. 6-36 Measuring Bearing Preload With Spring Scale

pounds times 10 will give inch-pounds. Readings between pound graduations must be read in tenths rather than in ounces; for example: 2 lbs. 8 oz., is read 2.5 lbs. times 10 = 25 inch-pounds.

Repeat tightening and checking until pre-load is 24 to 32 inch-pounds for new bearings, or 10 to 15 inch-pounds for old bearings.

DIFFERENTIAL CASE—INSTALL

1. Lubricate the side bearings, side gears and pinion gears.

2. Hold the differential side bearing outer races in position over the side bearings and carefully lower the differential case and ring gear assembly into carrier pedestal, engaging the ring gear with the drive pinion gear teeth.

3. Move the assembly toward the pinion until the lash between the ring gear and pinion is taken up.

4. Place the adjusting nuts (right and left) in position squarely against the bearing outer races and into the threads of carrier pedestal.

   NOTE: Rotate the adjusting nuts back and forth a few times by hand to be sure they are free and correctly positioned in threads. Leave the nuts snug against the bearings.

5. Install the bearing caps as marked.

   CAUTION: Make sure the adjusting nuts are properly seated, threads not crossed, and pedestal caps not interchanged.

6. Install the cap screws (no washers are used) and draw them down only sufficiently to lightly hold the caps in place. This can be done by drawing them down snugly and then loosening them approximately 1/4 to 1/2 turn.

7. Adjust backlash and side bearing pre-load.

Adjusting Backlash and Side Bearing Pre-Load

NOTE: Whenever new parts, such as gear sets, bearings, etc., are installed, the markings on the carrier and adjusting nuts (indicating the original position of gears and side bearing pre-load) should be disregarded. Whenever original parts are installed, the markings can be used to reset the adjustments providing the original settings were correct.

With bearing caps tightened just snug, proceed as follows:

1. Using Tool J-972-A, back off the right hand adjusting nut (one opposite ring gear) approximately three turns (just enough so lash between ring gear and pinion can be removed).

2. Tighten the left hand adjusting nut to move ring gear into mesh with pinion until all lash is removed, then back off adjusting nut three notches.

   NOTE: This is only a starting point and may need to be readjusted depending on the backlash present after making the following adjustments.

3. Tighten the right hand adjusting nut while watching the outer race of bearing. When the bearing race starts to turn along with the adjusting nut, indicating pre-load on bearing, tighten two additional notches. Tighten adjusting nut to align closest notch in nut with

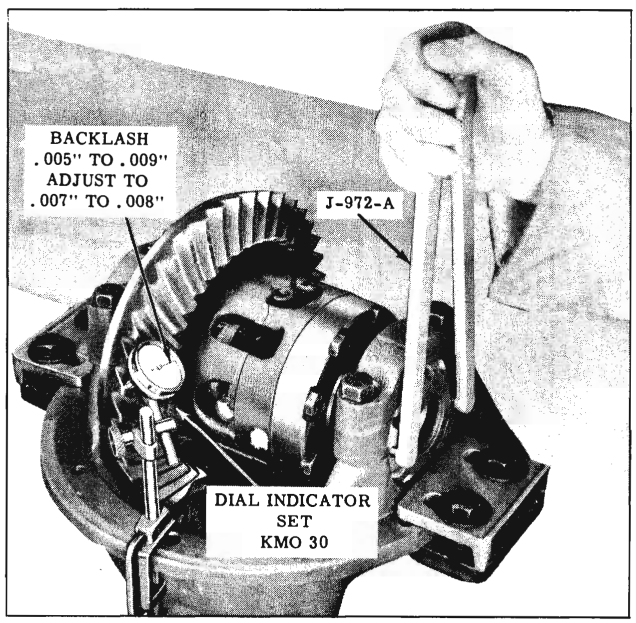


Fig. 6-37 Adjusting Backlash (Anti-Spin Shown)

cap screw hole in bearing cap. Do not loosen nut to align notch with hole in bearing cap.

4. Tighten bearing cap bolts 65 to 85 ft. lbs.

5. Clamp dial indicator to differential carrier and check backlash between ring gear and drive pinion, using Dial Indicator Set KMO-30. (Fig. 6-37) If the same ring gear and pinion were installed, the backlash should be adjusted according to markings on the bearing caps and adjusting nuts providing the differential was not disassembled to correct a noise complaint.

   NOTE: If backlash is not within .005" to .009", it will be necessary to adjust backlash .007" to .008". To do this, and at the same time retain the two notches pre-load on the side bearing, proceed as follows:

6. Loosen bearing cap bolts slightly, then move both adjusting nuts in the same direction one notch at a time until correct backlash is obtained. For example, if left nut is backed off one notch, right nut must be tightened one notch.

   NOTE: To increase backlash, move ring gear away from drive pinion gear. To decrease backlash move ring gear toward drive pinion gear.

   Be sure bearing cap bolts are tightened 65 to 85 ft. lbs. each time backlash is checked.

7. After side bearing pre-load is correct, install bearing cap locks and lock bolts.

ANTI-SPIN DIFFERENTIAL CASE

NOTE: Service procedures and specifications for the Anti-Spin Differential are the same as the conventional differential except for the Anti-Spin case assembly unless otherwise specified.

GENERAL DESCRIPTION

The conventional differential divides the driving force equally to both rear wheels. The driving force is limited by the wheel which has the least amount of traction; therefore, if one wheel is on snow or mud, the wheel will spin and the driving force is lost.

The Anti-Spin Differential (optional on all series) through the use of gears and clutches directs the driving force to the wheel with the best traction thus improving the ability of the car to pull out of mud or snow.

Anti-Spin Differentials can be identified by the anti-spin lubrication tag attached by a carrier to

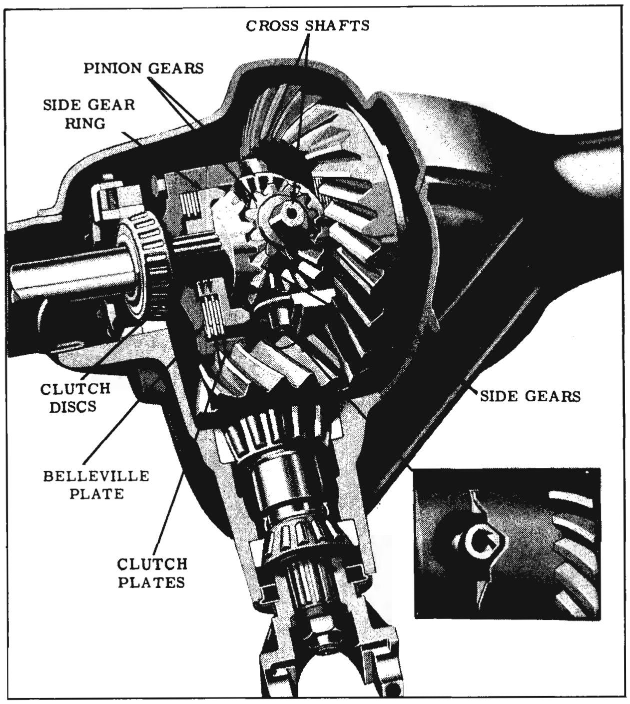


Fig. 6-38 Anti-Spin Differential

axle housing nut and also by the letter "L" on the axle ratio pad. (Fig. 6-49)

CAUTION: ON CARS EQUIPPED WITH ANTI-SPIN DIFFERENTIALS, DO NOT RUN ENGINE WITH ONE REAR WHEEL OFF THE GROUND AND TRANSMISSION IN GEAR.

OPERATION (Fig. 6-38)

The Anti-Spin Differential transmits torque from the drive pinion gear to the ring gear and to the case and cross shafts in the same manner as the conventional differential. In addition, the Anti-Spin Differential incorporates the use of clutches which tend to lock the axle shafts to the case or, in effect, to each other.

The mechanism that actuates the clutches consists of 4 pinion gears positioned in the case on 2 cross shafts which are at right angles to each other. Both ends of the shafts have 2 flat surfaces which mate with ramps in the differential case and case cover.

When driving force is applied at the differential case, the cross shafts, pinion gears and side gears (splined to the axle shafts) begin to rotate as an assembly in the same direction as the case. Although traction at the rear wheels may not be equal, their resistance to turning forces the cross shafts to slide up the ramps in the differential case and case cover (see inset Fig. 6-38), pushing the cross shafts apart. As the cross shafts move away from each other, the pinion gears on each cross shaft bear against the side gear rings (splined to the axle shaft and the clutch plates) to apply the clutches, which are preloaded by Belleville plates, and to lock the axle shafts to the case. Thus, both rear wheels turn at an equal speed and driving force is not lost by the wheel with poor traction.

When turning a corner, the action is essentially that of a conventional differential.

ANTI-SPIN CONVERSION INFORMATION

The case assembly (less ring gear and side bearings) is available for converting a conventional differential to Anti-Spin. The ring gear and side bearings of the conventional differential, if in good condition, can be used with the Anti-Spin case assembly.

CASE DISASSEMBLY (Fig. 6-41)

1. If side bearings are to be removed, use Differential Side Bearing Remover TR-278-R and Adapter TR-278-R-4 as shown in Fig. 6-40. Be sure ends of puller are placed in recess in differential case or case cover.

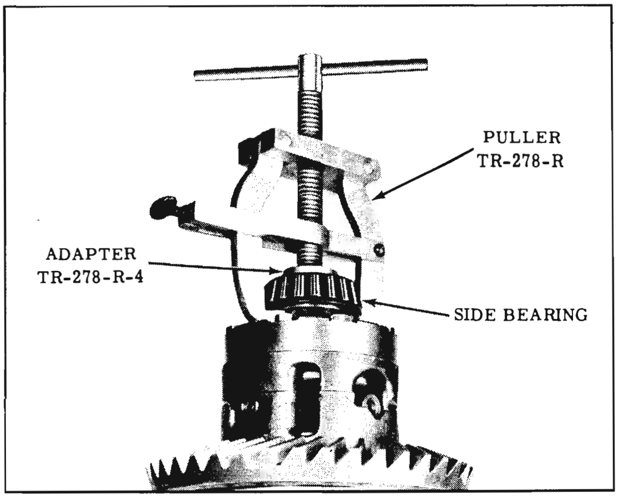


Fig. 6-40 Removing Side Bearing

2. If the ring gear or differential case is to be replaced, remove ring gear from case.

3. Clamp the case assembly in a BRASS JAWED VISE by the ring gear or case flange. (Fig. 6-42)

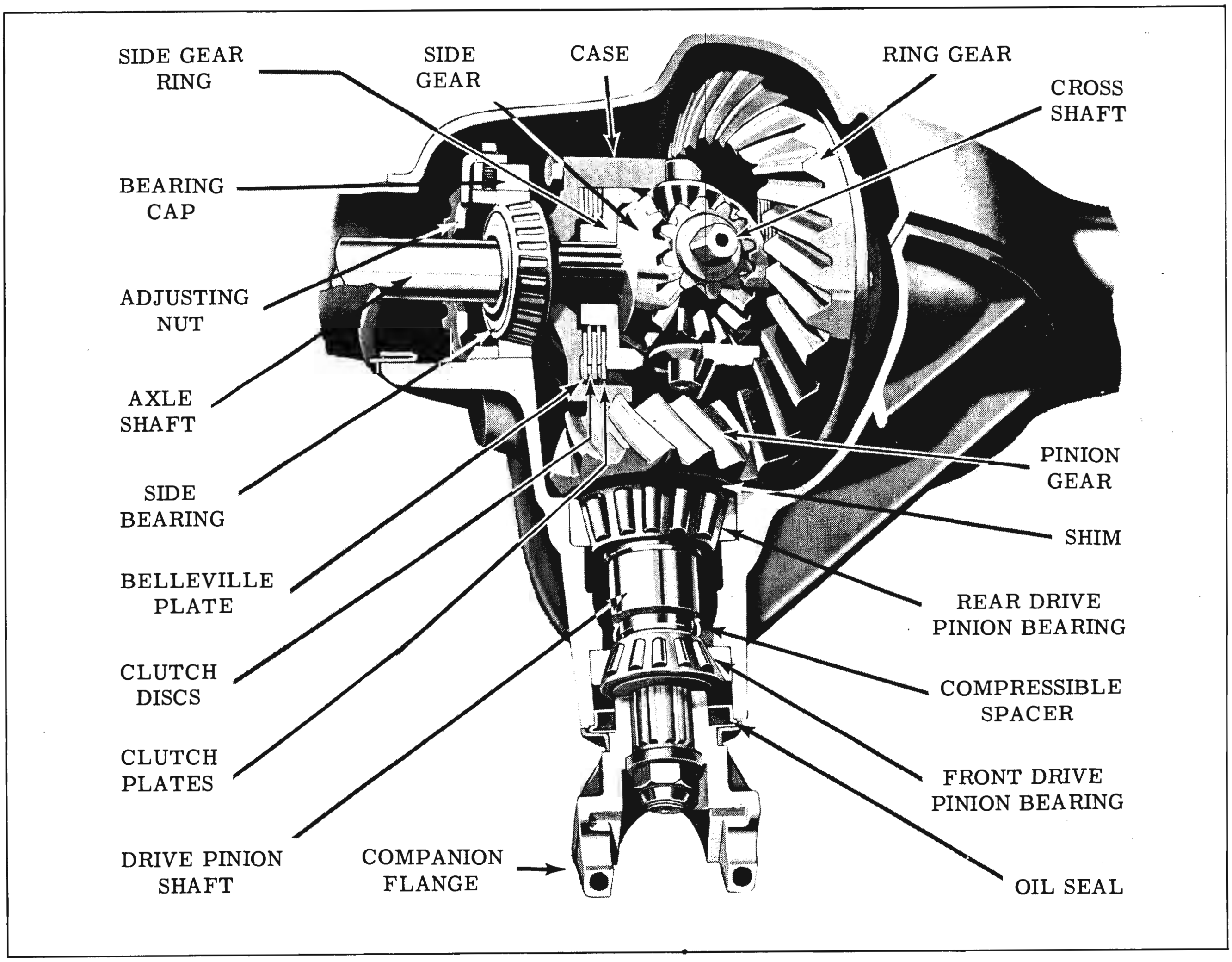


Fig. 6-39 Anti-Spin Differential Assembly

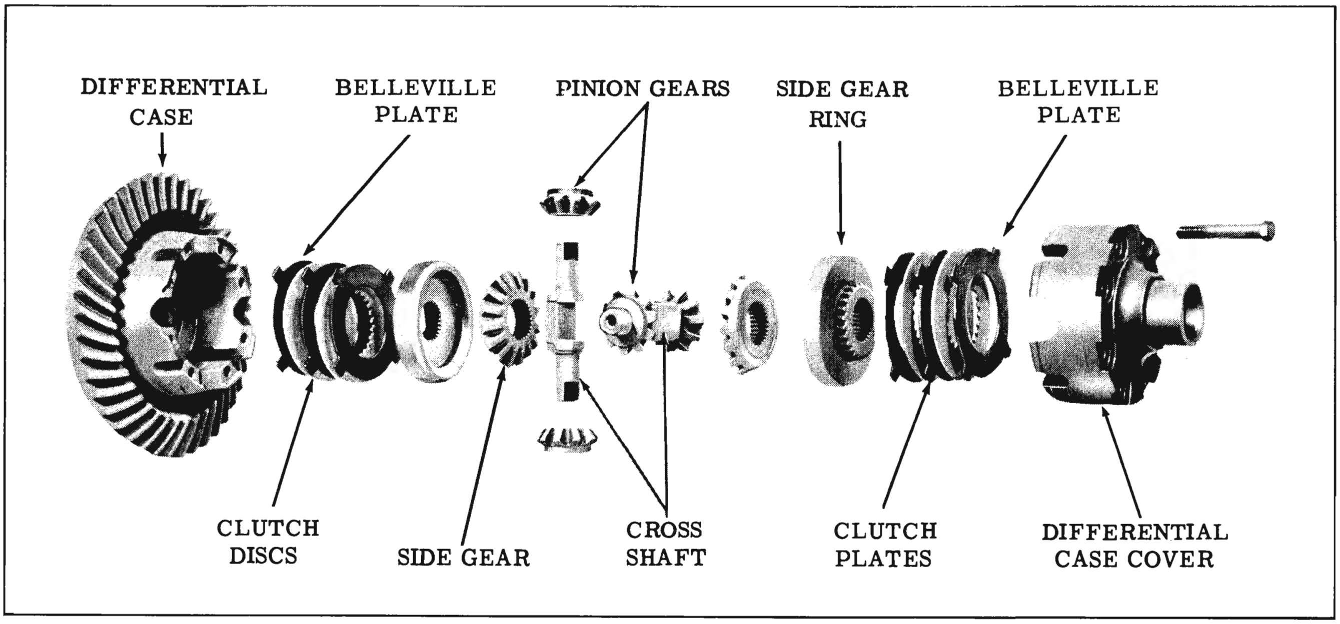


Fig. 6-41 Differential Case (Anti-Spin)

4. Mark differential case and case cover with a center punch to provide alignment when assembling. (Fig. 6-42) If the cross shafts are to be reused, observe ends of shafts and case for daubs of paint identifying location. If they are not marked, it will be necessary to mark one end of each shaft as well as the case.

5. Loosen the differential case to case cover attaching bolts, then place assembly on bench and remove bolts.

6. Lift the differential case cover from differential case. Clutch discs, plates and side gear ring may remain in differential case or may remain in cover.

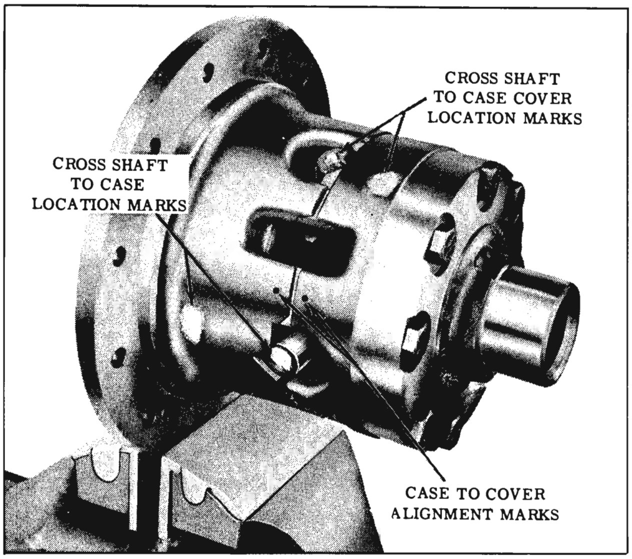


Fig. 6-42 Alignment Marks

NOTE: Keep all parts removed from each case half together so they can be reinstalled in their original position.

7. Remove side gear ring, 2 clutch discs, 2 clutch plates and Belleville plate from case cover.

8. Remove side gear and cross shafts with pinions.

9. Remove side gear, side gear ring, 2 clutch discs, 2 clutch plates and Belleville plates from case.

CLEANING AND INSPECTION OF CASE

1. Clean side bearings thoroughly in clean solvent (do not use a brush). Examine bearings visually and by feel. Bearings should feel smooth when oiled and rotated while applying as much hand pressure as possible.

   NOTE: Minute scratches and pits that appear on rollers and races at low mileage are due to the initial pre-load, and bearings having these marks should not be rejected.

2. Examine the ring gear and drive pinion teeth for nicks, burrs, or scoring. Any of these conditions will require replacement of the gear set.

3. Inspect cross shafts, pinion and side gears. Replace if parts are excessively scored, pitted or worn.

4. Check the press fit of the side bearing inner race on the differential case. Side bearings must be a tight press fit on the hub.

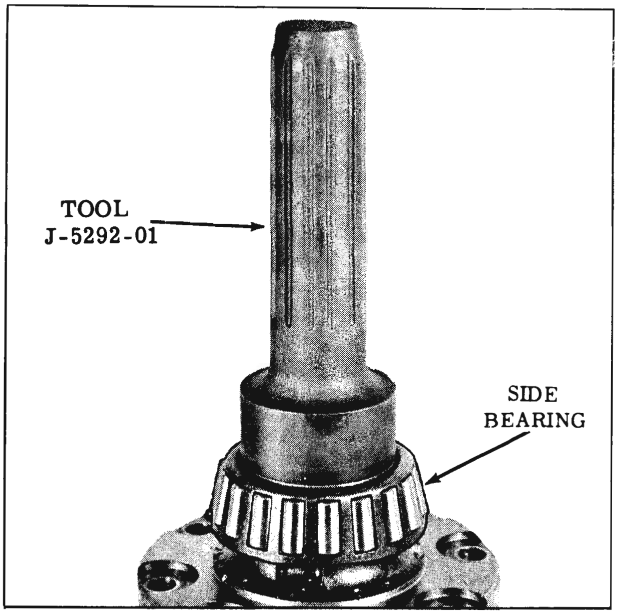


Fig. 6-43 Installing Side Bearings

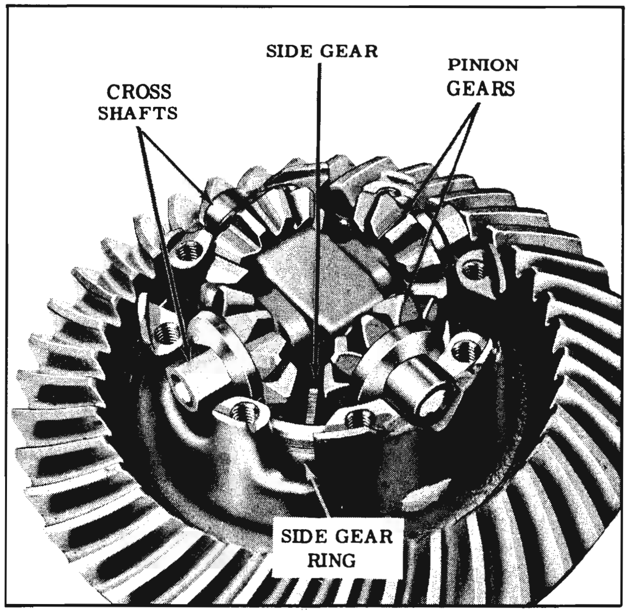


Fig. 6-44 Cross Shaft Installation

5. Inspect clutch discs and plates for scored, worn, cracked or a distorted condition. If any of these conditions exist, new clutch discs and plates must be installed.

6. Inspect side gear rings and differential case halves for scoring. Replace damaged parts.

DIFFERENTIAL CASE—ASSEMBLY

1. If the ring gear was removed, position the gear on the case flange and install the attaching bolts. Tighten the attaching bolts evenly and alternately across the diameter in progressive stages. Torque 55 to 65 ft. lbs.

2. If side bearings were removed, lubricate the bearings and install on case and case cover hubs as shown in Fig. 6-43.

3. Place the differential case on bench with opening up.

4. Oil clutch plates and discs with Special Lubricant (Part No. 531536). Install the Belleville plate in the differential case with the dished side of plate facing away from the case. Align external lugs on the plate with notches in the case.

5. Install a clutch plate (with external lugs) onto side gear ring, then install a clutch disc (splined) onto the side gear ring.

6. Install a clutch plate on clutch disc and align lugs with plate previously installed on side gear ring, then install a clutch disc (splined).

7. Hold flange half of the differential case on its side and install side gear ring and clutch plate assembly into case with lugs aligned with notches.

   NOTE: Make sure that the side gear ring is seated in its bore.

8. Install side gear (teeth up) in side gear ring.

9. Install two pinion gears on one cross shaft and install the assembly into its original position in the case (notch in shaft up) with ends of cross shaft in largest openings in the case. (Fig. 6-44)

10. Install two pinion gears on the other cross shaft and install the assembly into its original position in the case (notch in shaft down) with ends of shaft in the ramps.

11. Install side gear onto pinion gears.

12. Place side gear ring onto side gear. Oil clutch plates and discs with Special Lubricant (Part No. 531536) as they are alternately installed on side gear ring, starting with a clutch plate and finishing with the Belleville plate. Belleville plate must be installed with the dished side facing the clutch disc. (Fig. 6-45)

13. Align clutch plate lugs so they are in line with clutch plate lugs in case.

14. Place case cover over clutch assembly, engaging with clutch plate lugs and with punch marks on case aligned.

15. Install the eight cover to case attaching bolts, THEN INSTALL THE AXLE SHAFTS TO ALIGN THE SPLINES OF THE SIDE GEARS AND THE SIDE GEAR RINGS. With axle shafts

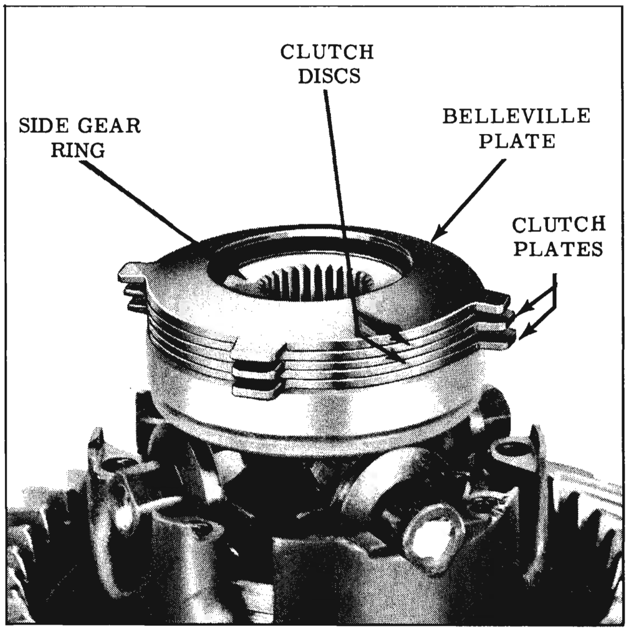


Fig. 6-45 Clutch Plate Installation

installed tighten the cover to case attaching bolts evenly, then torque 35 to 45 ft. lbs. Remove axle shafts from case assembly.

DIAGNOSIS

ANTI-SPIN OPERATION

If an anti-spin differential is suspected of not providing positive traction to the non-slipping wheel, the condition can be checked as follows:

1. Place the transmission in neutral.
2. Raise one wheel off the floor and place a block in the front and rear of the opposite wheel.
3. Remove hub cap or wheel disc and apply a torque wrench as shown in Fig. 6-46.
4. Disregard breakaway torque and observe only the torque required to continuously turn the wheel smoothly.

   If the torque reading is less than 40 ft. lbs., the unit should be disassembled and the case assembly should be repaired as necessary.

DIFFERENTIAL NOISE

When a differential assembly is suspected of being noisy, a thorough road test should be made to make sure that the noise is not being caused by tires, road surface, wheel bearings, engine, transmission, muffler, body or propeller shaft.

TIRE NOISE

Different types of road surfaces will affect tire noise but will not affect rear axle noise. For road testing, select a level tarvia or asphalt road, as this type road surface practically eliminates tire noise. For test purposes only, inflating all tires to approximately 50 lbs. pressure will materially alter noise caused by tires, but will not affect noise caused by the rear axle. Rear axle noise usually ceases when coasting with transmission in neutral at speeds under 30 m.p.h., however, tire noise continues with lower tone as car speed is reduced. Rear axle noise always changes when comparing "pull" and "coast", but tire noise remains about the same.

WHEEL BEARING NOISE

Wheel bearing noise may be confused with differential noise; however, a rough rear wheel bearing produces a vibration or growl which continues with car coasting with transmission in neutral. A bad bearing may cause a knock or click approximately every two revolutions of the wheel since the bearing rollers do not travel at the same speed as the rear axle shaft. To determine which front wheel bearing is noisy, hoist the car and spin each wheel while listening at the hub cap. To determine which rear wheel bearing is noisy, hoist car and start engine. With transmission in gear, use a piece of rubber hose or stethoscope BT-37 at the axle housing to locate the noise.

ENGINE AND TRANSMISSION NOISE

Note speed at which noise occurs, and with car standing and transmission in neutral, accelerate the engine to approximate speed where noise was noticed. If a similar noise is produced with the car standing, it cannot be due to the rear axle.

DIFFERENTIAL SIDE AND PINION GEAR NOISE

Differential side gears and pinions seldom cause noise because their movements is negligible on

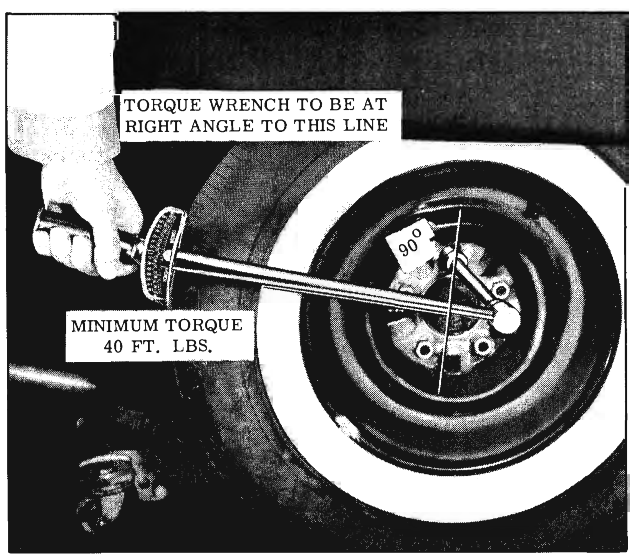


Fig. 6-46 Checking Anti-Spin

straight ahead driving.

RING GEAR AND PINION GEAR NOISE

These generally show up as drive noise, coast noise, or float noise. Drive noise is most pronounced on constant acceleration through the speed range. Coast noise is most pronounced when the car is allowed to coast through the speed range while in gear. Float noise is the most pronounced while holding the car speed constant at various speeds. Drive, coast, and float noises will be very rough and irregular if the differential side bearings or drive pinion bearings are rough, worn, or loose.

DRIVE PINION BEARING AND SIDE BEARING NOISE

Rough or brinnelled bearings produce a continuous whine starting at a relatively low speed. The noise is most noticeable with a light pull between 18 to 25 miles per hour.

DIFFERENTIAL CLUTCH CHATTER (Anti-Spin Only)

Improper lubricant can cause the clutch plates to grab and release intermittently resulting in chatter when the car is turning a corner slowly. Special Lubricant (Part No. 531536) MUST be used for initial fill of the differential, small amounts of S.A.E. 90 Multi-Purpose Gear Lubricant meeting the requirements of military specifications MIL-L-2105B can be added to bring the lubricant up to filler plug level.

DRIVE LINE VIBRATION

Drive line vibration can be caused by propeller shaft out of balance, worn or bad "U" joints and bearings, or differential alignment. To correct the differential nose angle the following procedure should be used.

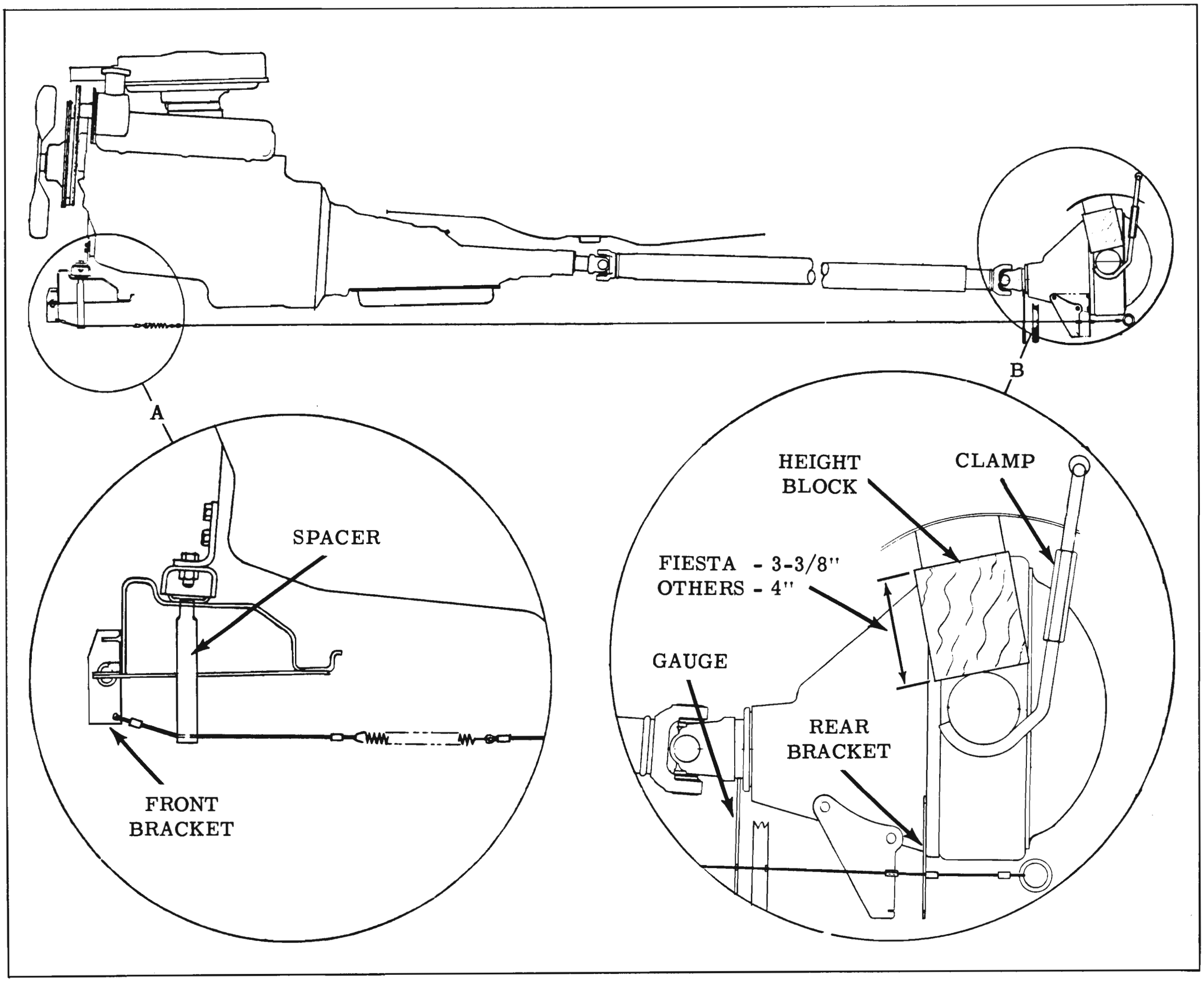


Fig. 6-47 Checking Differential Nose Angle

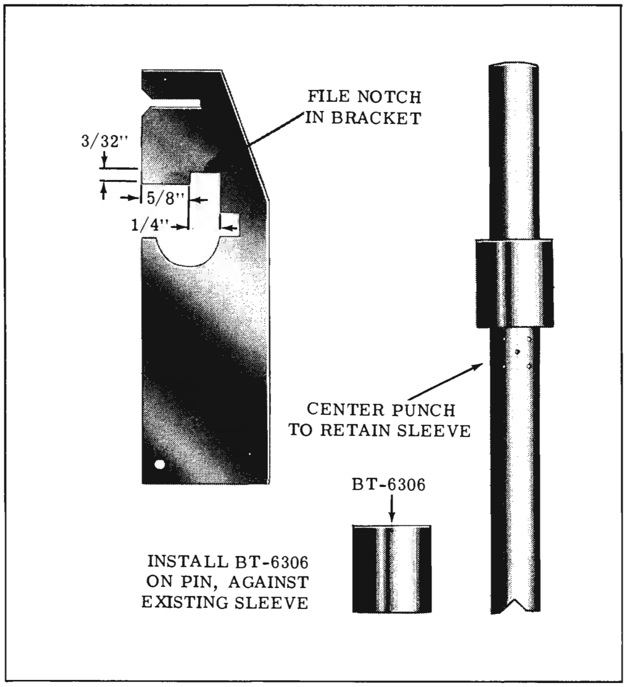


Fig. 6-48 Nose Angle Tool Modifications

CHECKING AND ADJUSTING DIFFERTNTIAL NOSE ANGLE (USING TOOL BT-30-1 AND BT-30-2) (FIG. 6-47)

CAUTION: Before checking nose angle, make sure tools have been modified as shown in Fig. 6-48.

1. Connect cable at front frame cross member. (Fig. 6-47, Inset "A")

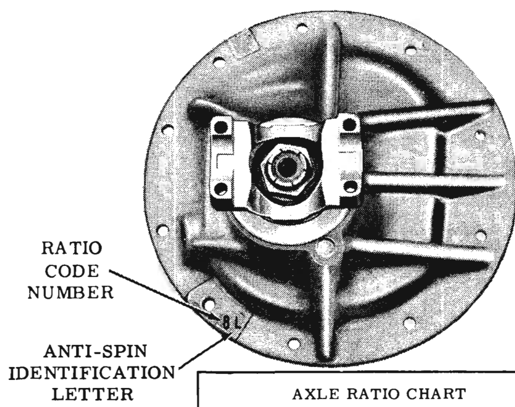
2. Install rear bracket on the two lower right studs on differential carrier. (Fig. 6-47, Inset "B")

3. Hook cable in upper hole on rear bracket, then install spacer between cable and bottom of front engine mount.

4. Install wooden blocks between rear axle housing and rubber bumpers. Refer to directions on blocks. Install hold down clamps around axle housing (the lower hook end should point toward front of car). Install upper hook into the 3/4" hole in frame immediately above axle housing. (Fig. 6-47, inset "B") Adjust turn buckles on clamps until wooden blocks fit snugly between axle housing and rubber bumpers. It may be necessary to lift up on the car to install the wooden blocks.

5. Position gauge as shown in Fig. 6-47 and check differential nose angle alignment.

If the cable is not within limits of the gauge notch, the differential nose angle can be corrected by lengthening or shortening the lower suspension arms.



AXLE RATIO CHART

CODE	RATIO
2	43:16 (2.69:1)
3	41:16 (2.56:1)
7	43:15 (2.87:1)
8	41:12 (3.42:1)
9	42:13 (3.23:1)
0	40:13 (3.08:1)

Fig. 6-49 Axle Ratio Code

AXLE RATIOS

Series	Type	Ratio Code (Fig. 6-49)	Remarks
3200 & 3500 Series Synchromesh			
All Body Styles	Standard	9	Including Air Conditioning
3200 Series Hydra-Matic			
Body Styles			
39,47,67,69	Standard	3	Except Air Conditioning
39,47,67,69	Standard	2	Air Conditioning
35,45	Standard	2	Including Air Conditioning
39,47,67,69	Plains	3	Air Conditioning
35,45	Plains	3	Including Air Conditioning
39,47,67,69	Mountain	2	Including Air Conditioning
ALL	Mountain	0	Export Option
39,47,67,69	HC Opt. Engine	7	Except Air Conditioning
39,47,67,69	HC Opt. Engine	0	Air Conditioning
35,45	HC Opt. Engine	0	Including Air Conditioning
ALL	HC Opt. Engine Plains	2	Including Air Conditioning
39,47,67,69	LC Opt. Engine	2	Except Air Conditioning
39,47,67,69	LC Opt. Engine	7	Air Conditioning
35,45	LC Opt. Engine	7	Including Air Conditioning
ALL	LC Opt. Engine Plains	3	Including Air Conditioning
ALL	Standard	0	Including Air Conditioning
3500 Series Hydra-Matic			
Body Styles			
39,47,69	Standard	7	Except Air Conditioning
35,39,47,69	Plains	2	Including Air Conditioning
39,47,69	Standard	0	Air Conditioning
35	Standard	0	Including Air Conditioning
3600 Series Hydra-Matic			
All Body Styles	Standard	8	Including Air Conditioning
3800 Series Hydra-Matic			
All Body Styles	Standard	0	Except Air Conditioning
All Body Styles	Plains	2	Including Air Conditioning
All Body Styles	Standard	9	Air Conditioning
3900 Series Hydra-Matic			
All Body Styles	Standard	8	Including Air Conditioning

SPECIFICATIONS

PROPELLER SHAFT

1. Length (From Center Line of Front U-Joint to Center Line of Rear U-Joint)

   a. 32, 35 and 36 Series (Except Fiestas) . . . . 58.00"

   b. 32 and 35 Series (Fiesta) . . . . 56.83"

   c. 38 and 39 Series . . . . 61.00"

DIFFERENTIAL

LUBRICATION

1. Capacity . . . . 5 Pts. (Approx.)

2. Drain and Refill . . . . Special Lubricant Part No. 531536

3. Replenish . . . . Special Lubricant Part No. 531536 or S.A.E. 90 Multi-Purpose Gear Lubricant meeting requirements of Military specification MIL-L-2105B.

ADJUSTMENTS

4. Backlash (.005" to .009") . . . . Adjust to .007" to .008"

5. Drive Pinion Bearing Pre-Load

   a. New Bearings . . . . 24 to 32 in. lbs.

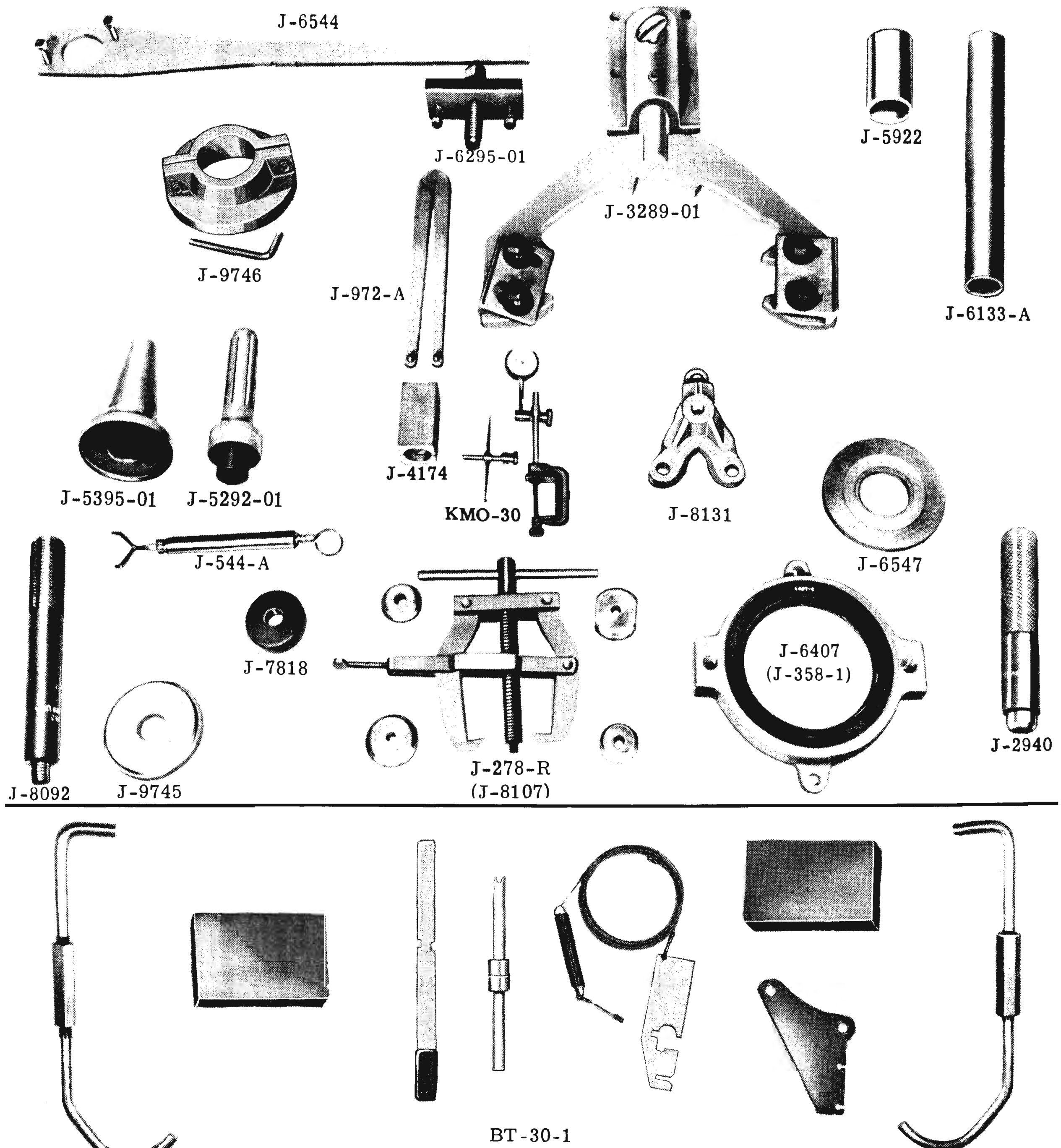
   b. Old Bearings . . . . 10 to 15 in. lbs.

6. Side Bearing Pre-Load . . . . 2 to 3 notches

TORQUE SPECIFICATIONS

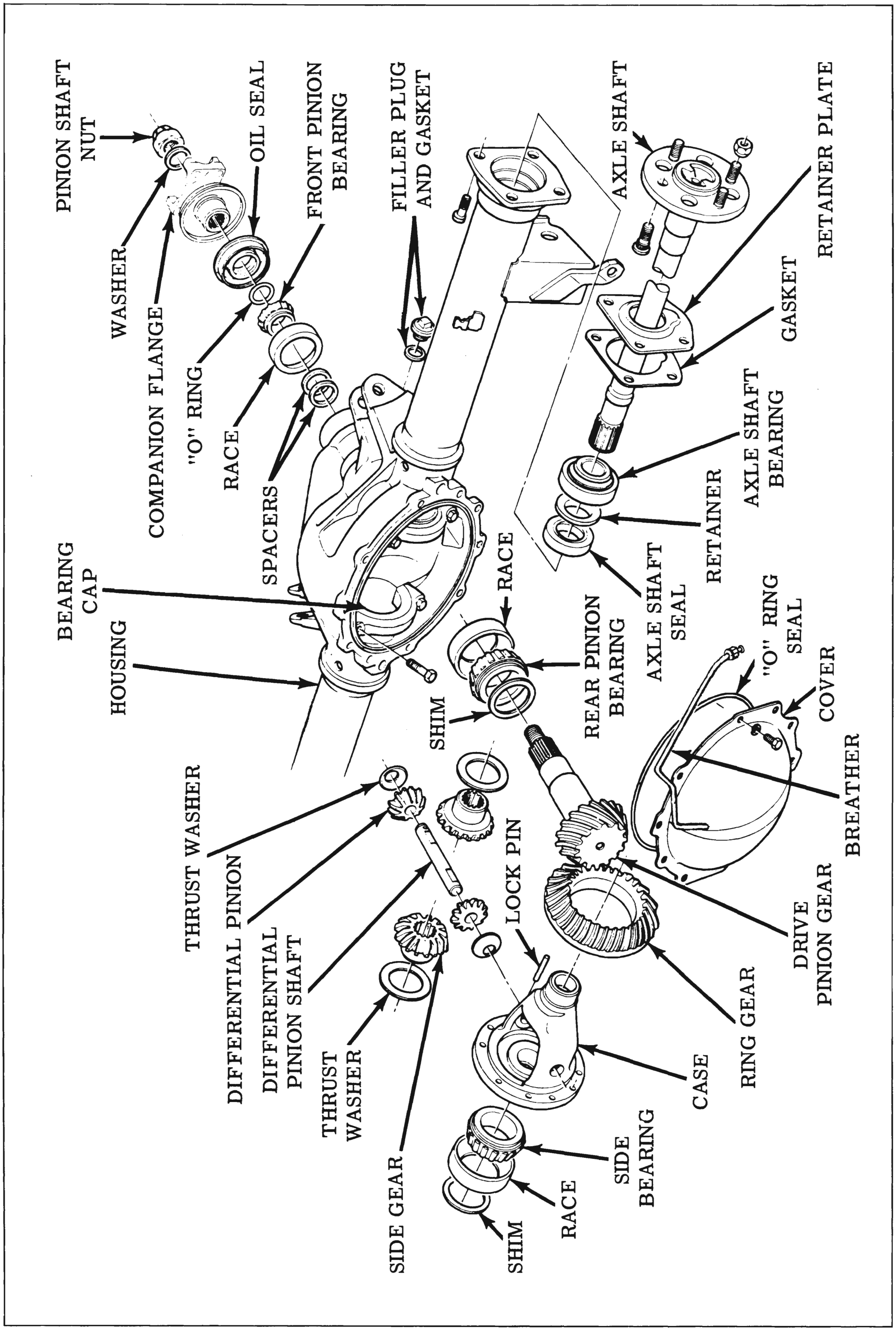
NOTE: Specified torque is for installation of parts only. Checking torque during inspection may be 15% below specified minimum.

APPLICATION	FT. LBS.
PROPELLER SHAFT	
Companion Flange "U" Bolts	14 to 18
DIFFERENTIAL	
Carrier to Axle Housing Nuts	50 to 60
Bearing Cap Bolts	65 to 85
Ring Gear Cap Screws	55 to 65
Cover to Case Cap Screws	35 to 45



BT-30-1 & BT-30-2	Differential Nose Angle Check
KMO-30	Dial Indicator Set
J-8107	Differential Side Bearing Puller
J-544-A	Spring Scale
J-942-1 (J-8131)	Axle Shaft Puller Adapter
J-972-A	Differential Adjusting Nut Wrench
J-2935	Rear Pinion Bearing Outer Race Press Plate
J-2940	Driver Handle
J-3289-01	Differential Holding Fixture
J-4174	"U" Joint Bearing Remover
J-5292-01	Differential Side Bearing Installer
J-5395-01	Pinion Seal Installer
J-5922	Air Conditioning Compressor Oil Seal Installer (Used for Installing Prop. Shaft Center Bearing)
J-6133-A	H. M. Rear Oil Pump Bearing & Speedometer Gear Installer (Used for Front Pinion Inner Race Installer)
J-6295-01	Companion Flange Puller
J-6407 (J358-1)	Press Plate Holder
J-6525 (J-947-2)	Axle Shaft Bearing Remover and Installer
J-6544	Companion Flange Holding Tool
J-7818	Front Pinion Bearing Outer Race Installer
J-8092	Driver Handle
J-9745	Rear Pinion Bearing Outer Race Installer
J-9746	Rear Pinion Bearing Remover

Fig. 6-50 Propeller Shaft and Differential Tools



F-85 Rear Axle and Differential Assembly

DIFFERENTIAL AND PROPELLER SHAFT

(F-85)

CONTENTS OF SECTION 6

MAINTENANCE RECOMMENDATIONS

Periodic or seasonal lubricant changes are not recommended. However, if for any reason it does become necessary to make a complete lubricant change, it will be necessary, on anti-spin differentials, to use only Special Lubricant (Part No. 531536) and, on conventional differentials it will be permissible to use either Special Lubricant (Part No. 531536) or S.A.E. 90 Multi-Purpose Gear Lubricant meeting the requirements of Military Specifications MIL-L-2105B. The lubricant level should be checked at each oil change interval. If lubricant addition is required, add:

Conventional differential: Special Lubricant (Part No. 531536) or S.A.E. 90 Multi-Purpose Gear Lubricant meeting the requirements of Military Specifications MIL-L-2105B.

Anti-Spin differential: Only special lubricant (Part No. 531536).

IMPORTANT: Use of other than the above mentioned type of lubricant in the Anti-Spin differential may cause chatter. If the wrong type of lubricant is used in the Anti-Spin, it will require draining the differential and installing the recommended lubricant (Part No. 531536). It may be necessary to drive Anti-Spin equipped cars for distances of 50 miles or more to allow the new lubricant to work through the plates before the chatter will disappear.

GENERAL DESCRIPTION

The conventional differential divides the driving force equally to both rear wheels. The driving force is limited by the wheel which has the least amount of traction; therefore, if one wheel is on snow or mud, the wheel will spin and the driving force is lost.

The Anti-Spin differential (optional on all series) through the use of gears and clutches directs the driving force to the wheel with the best traction thus improving the ability of the car to pull out of mud or snow.

Anti-Spin differentials can be identified by a stainless steel plate around the filler plug and by the letter "X" inside a circle stamped on the right hand edge of the cover flange. (Fig. 6-101)

CAUTION: ON CARS EQUIPPED WITH ANTI-SPIN DIFFERENTIALS, DO NOT RUN ENGINE WITH ONE REAR WHEEL OFF THE GROUND AND TRANSMISSION IN GEAR.

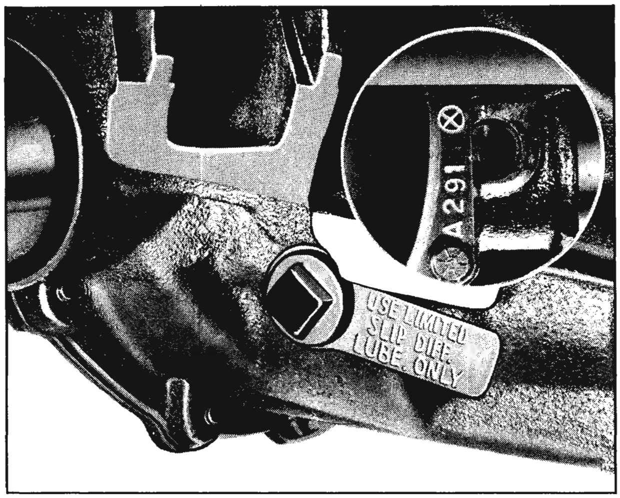


Fig. 6-101 Anti-Spin Identification

ANTI-SPIN OPERATION

The Anti-Spin Differential transmits torque from the drive pinion gear to the ring gear and to the case and cross shafts in the same manner as the conventional differential. In addition, the

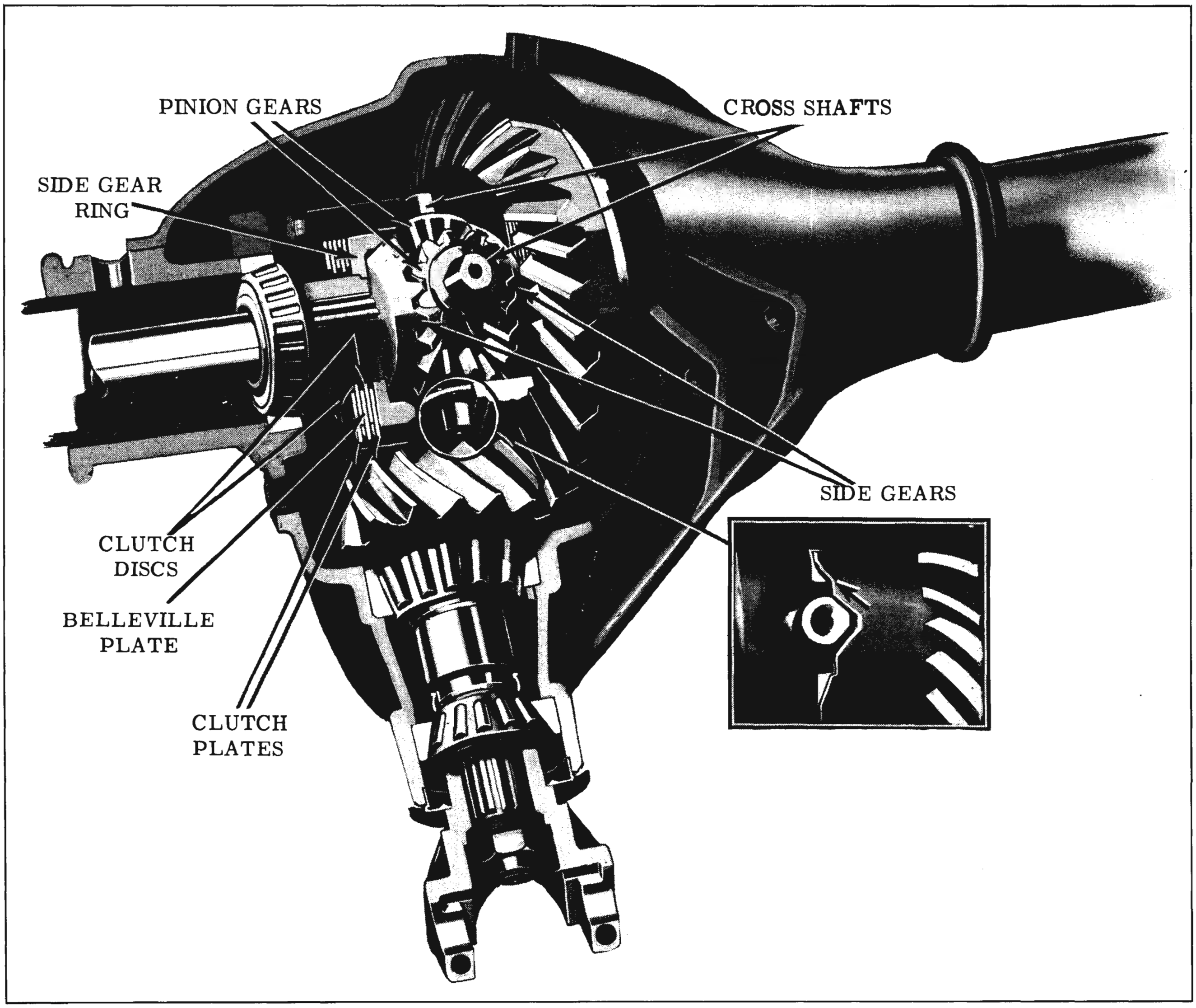


Fig. 6-102 Anti-Spin Differential

Anti-Spin Differential incorporates the use of clutches which tend to lock the axle shafts to the case or, in effect, to each other.

The mechanism that actuates the clutches consists of 4 pinion gears positioned in the case on 2 cross shafts which are at right angles to each other. Both ends of the shaft have 2 flat surfaces which mate with ramps in the differential case and case cover.

When driving force is applied at the differential case, the cross shafts, pinion gears and side gears (splined to the axle shafts) begin to rotate as an assembly in the same direction as the case. Although traction at the rear wheels may not be equal, their resistance to turning forces the cross shafts to slide up the ramps in the differential case and case cover (see inset Fig. 6-102), pushing the cross shafts apart. As the cross shafts move away from each other, the pinion gears on each cross shaft bear against the side gear rings (splined to the side gears and the clutch plates) to apply the clutches, which are preloaded by Belleville plates, and tend to lock the axle shafts to the case. Thus, both rear wheels tend to turn at an equal speed and driving force is not lost by the wheel with poor traction.

When turning a corner, the action is essentially that of a conventional differential.

ANTI-SPIN CONVERSION INFORMATION

The case assembly (less ring gear and side bearings) is available for converting a conventional differential to Anti-Spin. The ring gear and side bearings of the conventional differential, if in good condition, can be used with the Anti-Spin case assembly.

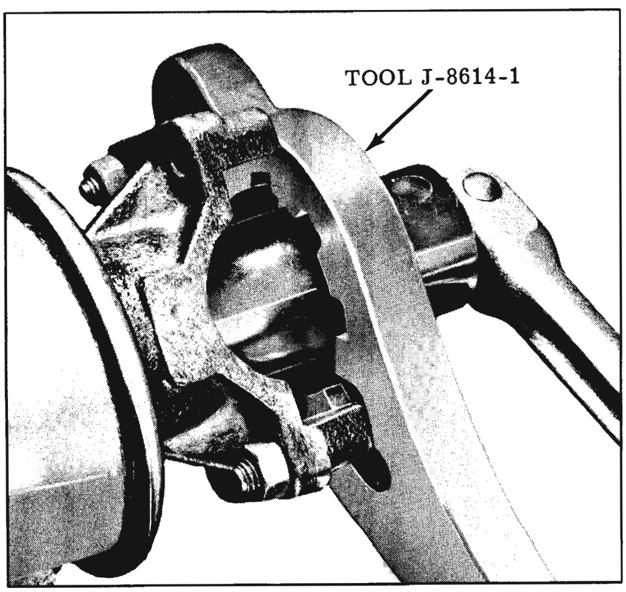


Fig. 6-103 Removing Pinion Nut

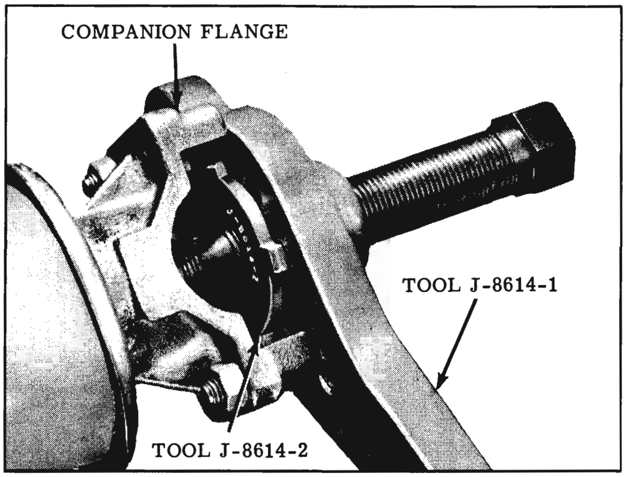


Fig. 6-104 Removing Companion Flange

COMPANION FLANGE

REMOVAL

1. Disconnect the propeller shaft from the companion flange.

2. Attach Tool J-8614-1 with notches towards companion flange. (Fig. 6-103) Center Tool J-8614-1 on flange using Tool J-8614-2, then remove J-8614-2. Tool J-8614-1 to companion flange bolts MUST BE TIGHT.

3. Remove pinion nut.

4. Using Tool J-8614-1 and J-8614-2, remove flange. (Fig. 6-104)

INSTALLATION

1. Inspect seal surface of companion flange for nicks and wear. Lubricate seal surface with 567196 lubricant when installing.

2. With Tool J-8614-1 attached to flange, place flange on pinion enough to allow nut to start on threads. Thread nut on pinion without washer, then remove nut and install washer.

3. Tighten pinion nut to 200 ft. lbs.

PINION SEAL

REMOVAL

1. Remove companion flange.

2. Remove seal with a chisel. (Fig. 6-105)

INSTALLATION

1. Coat outer edge of new seal with a sealing compound such as P.O.B. #3.

2. Drive seal into housing, using Tool J-8613. (Fig. 6-106)

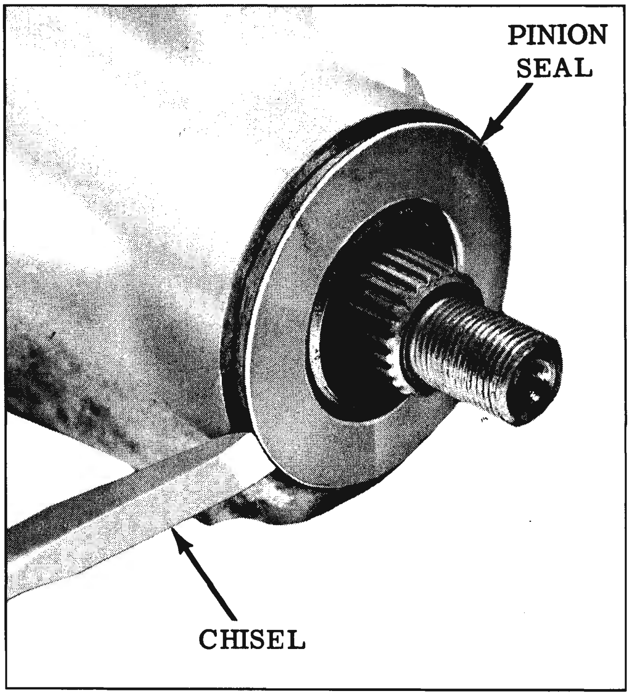


Fig. 6-105 Removing Pinion Seal

DIFFERENTIAL CASE

REMOVAL

To remove the differential case assembly from the axle housing, the following procedure may be followed whether the housing is still attached to the car or it is removed and on the bench. The following procedure applies to both the conventional and anti-spin differential.

1. Drain oil, and remove inspection cover.
2. Disconnect the propeller shaft.
3. Raise rear of car and support with floor stands.
4. Remove wheels, brake drums, and axle shafts. (Refer to AXLE SHAFT REMOVAL in this section.)

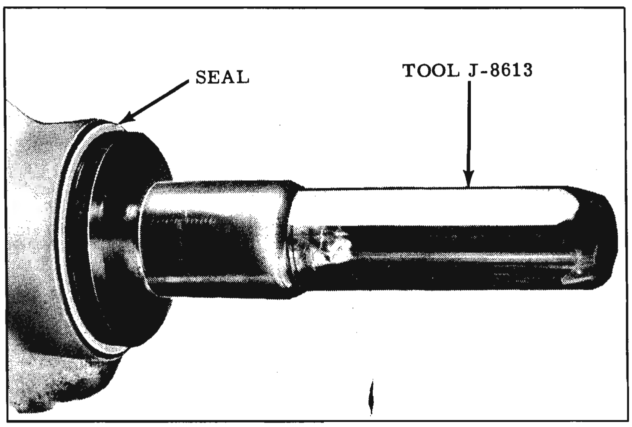


Fig. 6-106 Installing Pinion Seal

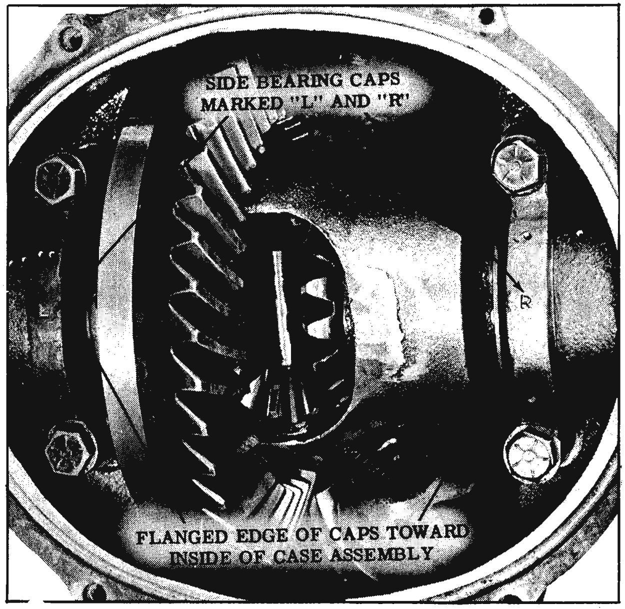


Fig. 6-107 Side Bearing Caps

5. Remove four side bearing cap bolts. (Fig. 6-107) Note: caps are marked "R" and "L" and the beveled side goes to inside of differential assembly.
6. Attach Tool J-8925 with Slide Hammer J-2619 to ring gear. (Fig. 6-108)
7. Pull case assembly from carrier keeping side bearings and shims in their respective positions.

CASE INSTALLATION AND SIDE BEARING PRELOAD ADJUSTMENT

When setting side bearing preload, the pinion gear must be removed.

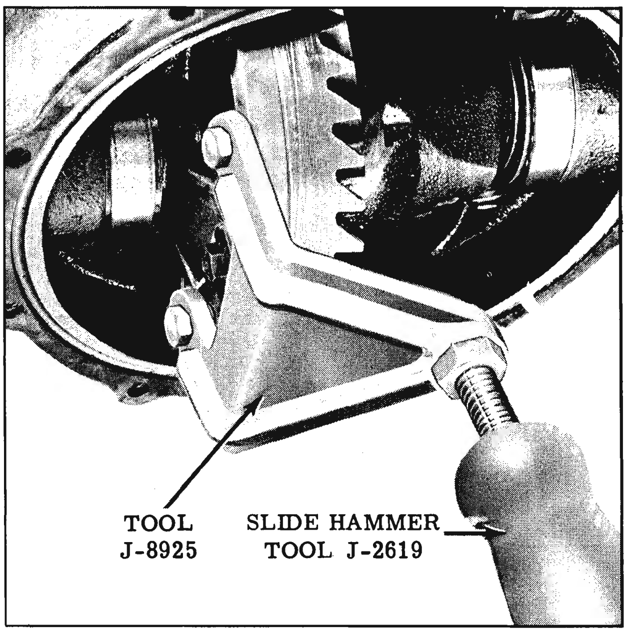


Fig. 6-108 Removing Case Assembly

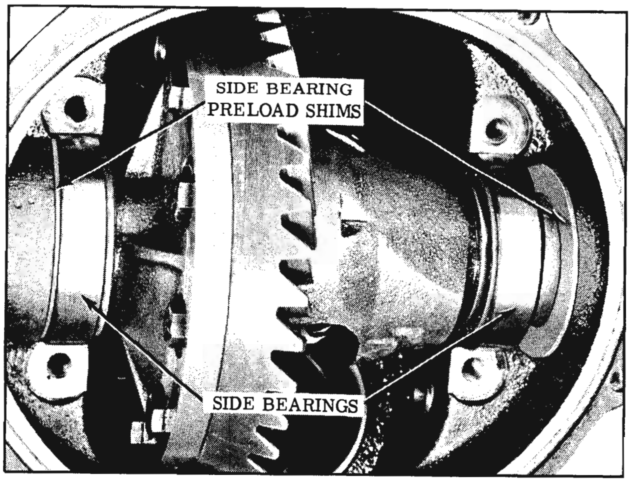


Fig. 6-109 Side Bearing Shims

1. Side bearing surfaces in carrier must be free of burrs.

   NOTE: If new side bearings are used, use original shims as a starting guide to preload adjustment.

   If original side bearings are used, add a shim .002" thicker than those removed on each side.

   Equal amounts of shims must be added to each side.

2. Place case assembly in carrier with bearings and left shim in position. (Fig. 6-109)
3. Tap right shim into position with a plastic hammer.
4. Rotate case several turns to seat bearings.
5. With an in. lb. torque wrench on ring gear bolt, (Fig. 6-110), the reading should be 10-20 in. lbs. with original bearings or 20-30 in. lbs. with new bearings.

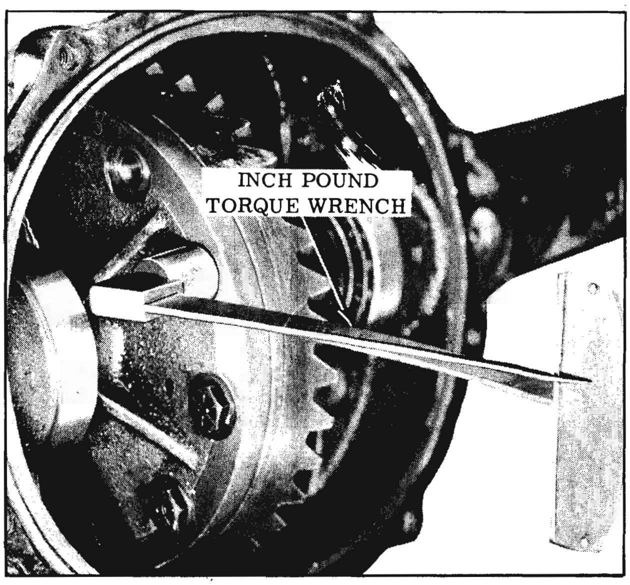


Fig. 6-110 Measuring Preload

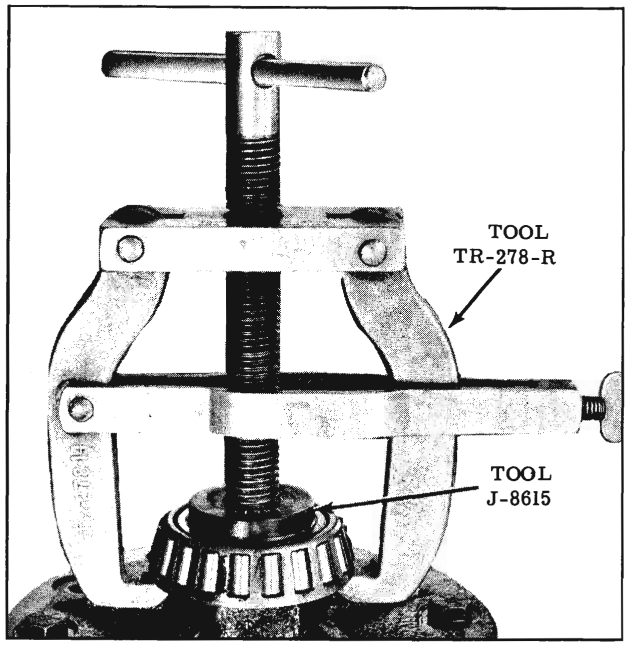


Fig. 6-111 Removing Side Bearings

NOTE: Adding or subtracting .002" on each side will change in. lb. readings approximately 10 in. lbs. EQUAL AMOUNTS OF SHIMS MUST BE ADDED OR SUBTRACTED FROM EACH SIDE.

6. After the correct preload is set, the case may be removed, and set aside. Use extreme care not to mix bearings and shims.
7. Install pinion gear.
8. Install case assembly and torque side bearing cap bolts 70-80 ft. lbs.

SIDE BEARING REMOVAL

1. Insert Adapter J-8615 and pull bearing using Puller TR-278. (Fig. 6-111)

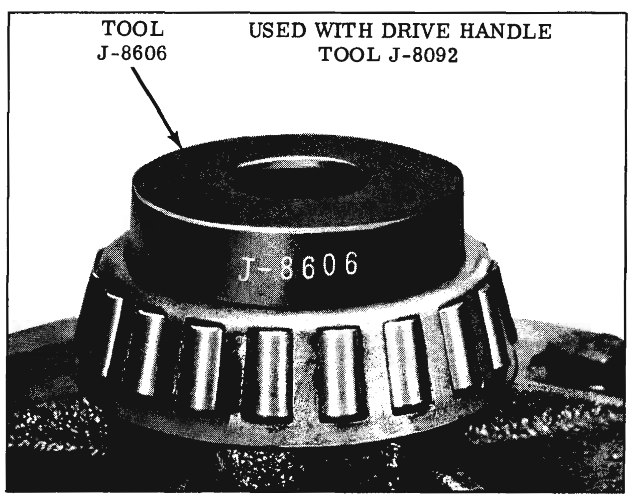


Fig. 6-112 Installing Side Bearings

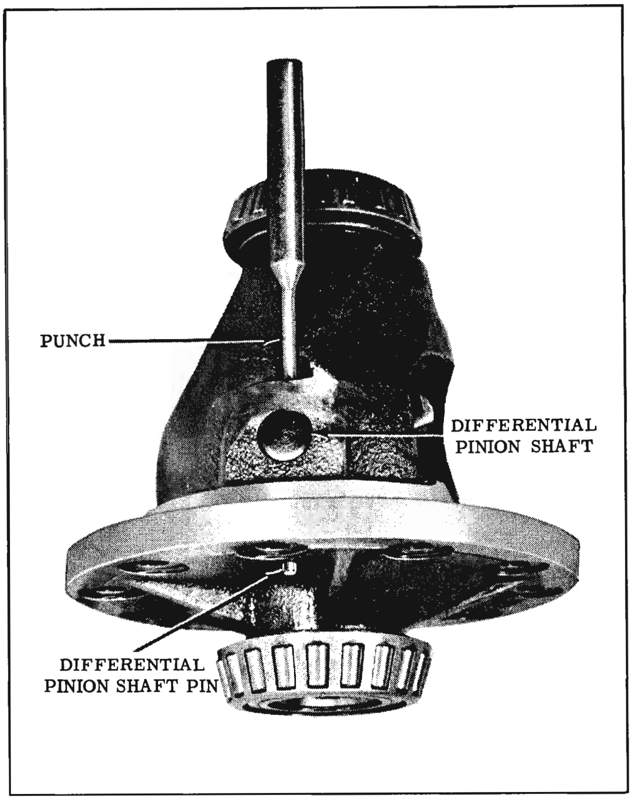


Fig. 6-113 Removing Shaft Pin

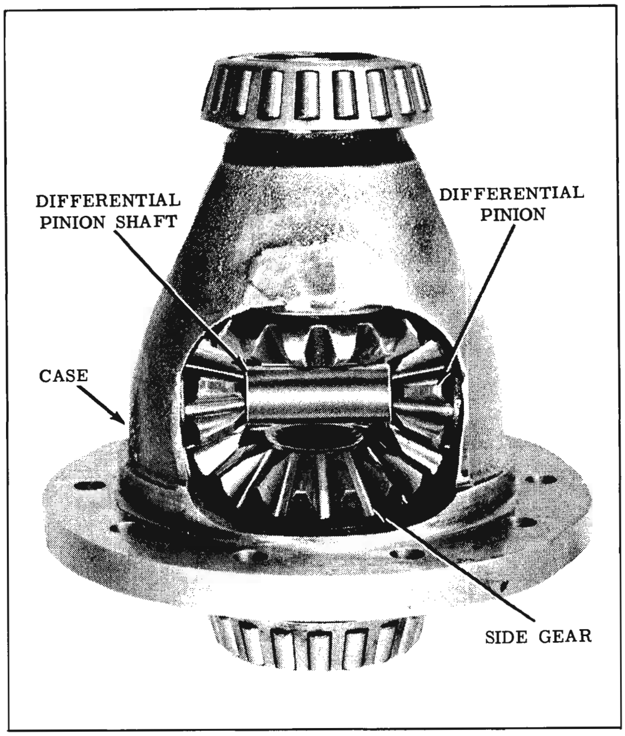


Fig. 6-114 Case Assembly

SIDE BEARING INSTALLATION

Install bearings using Tool J-8606 and J-8092. (Fig. 6-112) Drive bearing onto case until seated.

NOTE: Be sure bearing is seated against shoulder on case.

CASE DISASSEMBLY (CONVENTIONAL)

1. Remove ring gear to case attaching bolts and remove the ring gear from the case.
2. Drive pinion shaft spring pin from case. (Fig. 6-113)
3. Drive the pinion shaft from the case.
4. Remove pinions, side gears and thrust washers. Keep all parts identified so they may be reinstalled in their original position.

CLEANING AND INSPECTION OF CASE

Clean and examine wearing surfaces of all parts for scoring or unusual wear patterns, and lubricate with gear lube before reassembly.

CASE ASSEMBLY (CONVENTIONAL)

1. Place side gear thrust washers over side gears and install. If parts are reused, place in original position.
2. Position one pinion (without washer) between side gears and rotate gears until pinion is directly opposite from loading opening in case. (Fig. 6-114) Place other pinion between side gears so that pinion shaft holes are in line, then rotate gears to make sure holes in pinions will line up with holes in case.
3. If holes line up, rotate pinions back toward loading opening just enough to permit installation of pinion thrust washers.
4. Install pinion shaft and align shaft hole with hole in case. Drive spring pin through hole in shaft until centered in shaft.

CASE DISASSEMBLY (ANTI-SPIN)

1. Clamp case assembly in a brass jawed vise by ring gear or by case flange.
2. Mark case and cover with a center punch or paint to provide alignment when assembling. If cross shafts are to be reused, see that they have a paint daub on one end of each shaft matching a similar paint daub on the case to assure assembly in proper location. (Fig. 6-115)
3. Loosen 8 bolts holding cover to case. Remove assembly from vise, place on bench with bolt heads up and remove bolts.
4. Lift cover from case. Remove cover cross shaft, pinions, side gear, side gear ring, clutch plates and discs. Keep with cover so they can be reinstalled in their original positions.

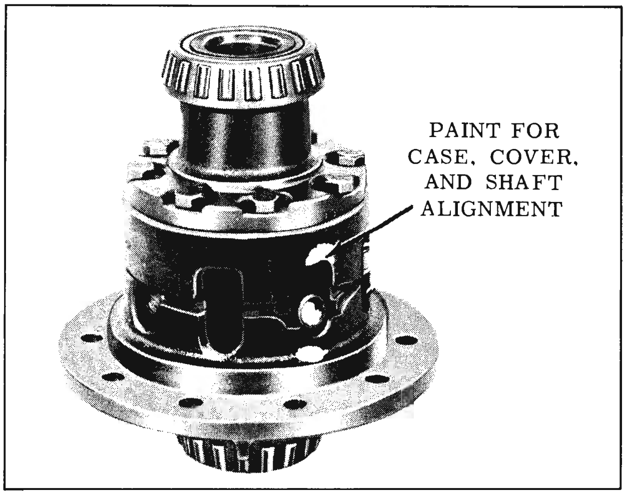


Fig. 6-115 Anti-Spin Case Assembly Alignment

5. Remove corresponding parts from case and keep with case.

CLEANING AND INSPECTION OF CASE

1. Clean side bearings thoroughly in clean solvent (do not use a brush). Examine bearings visually and by feel. Bearings should feel smooth, when oiled and rotated, while applying as much hand pressure as possible.

   NOTE: Minute scratches and pits that appear on rollers and races at low mileage are due to the initial pre-load, and bearings having these marks should not be rejected.

2. Inspect cross shafts, pinion and side gears. Replace if parts are excessively scored, pitted or worn.

3. Inspect side gear rings and differential case halves for scoring. Replace damaged or excessively worn parts. Both halves of case must be replaced if one half is damaged or worn.

4. Inspect clutch discs and plates for scored, worn, cracked or a distorted condition. If any of these conditions exist, new clutch discs and/or plates must be installed.

CASE ASSEMBLY (ANTI-SPIN) (Fig. 6-116)

1. If a differential side bearing assembly was removed, install bearing assembly on case using Tools J-8606 and J-8092 as shown in Fig. 6-112. Drive bearing onto case until seated.

2. Oil clutch plates, discs, side gear rings, and side gears with Special Lubricant. (Part No. 531536)

3. The two clutch packs in the Anti-Spin differential each contain two plates of different thickness. The inboard clutch plate in each pack, which is adjacent to the side gear ring, is .095" thick. The outboard plate, which is adjacent to the differential case, is .060" thick. These plates must not be interchanged. The correct stack-up of parts in the clutch pack is shown in Fig. 6-117.

4. If inspection showed plates and discs to be in good condition, stack original clutch packs on each side gear as shown in Fig. 6-117. If any plates or discs were defective, install the necessary parts.

5. Install proper clutch pack and side gear stack in the case, aligning clutch plate lugs with notches in case. (Fig. 6-118)

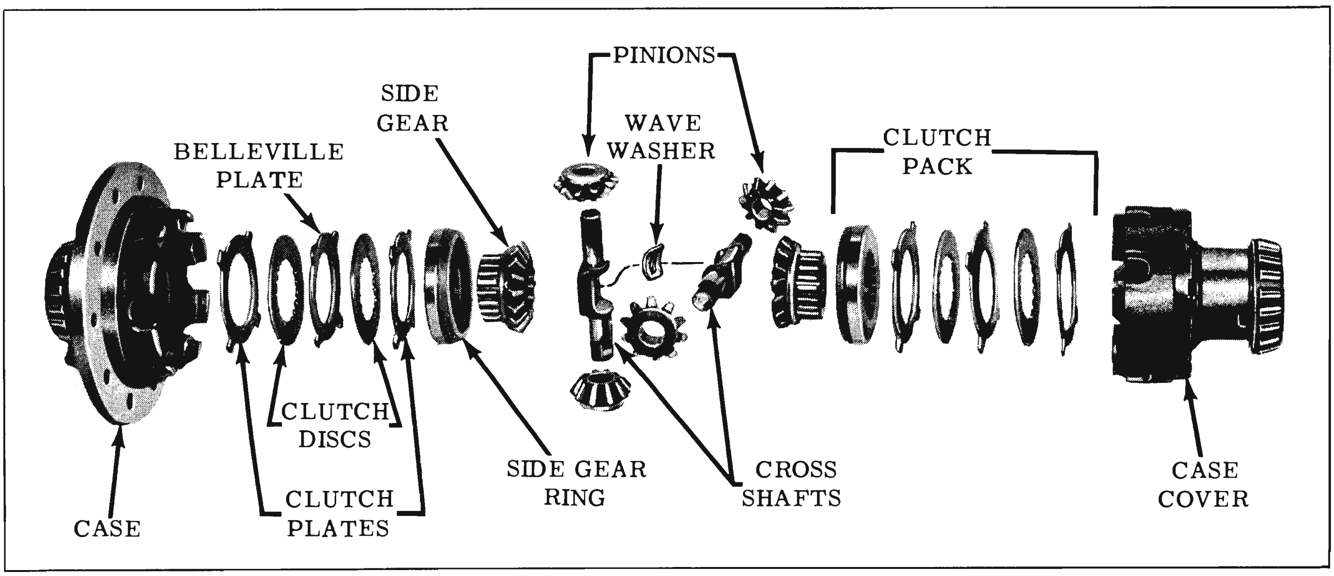


Fig. 6-116 Anti-Spin Case Assembly

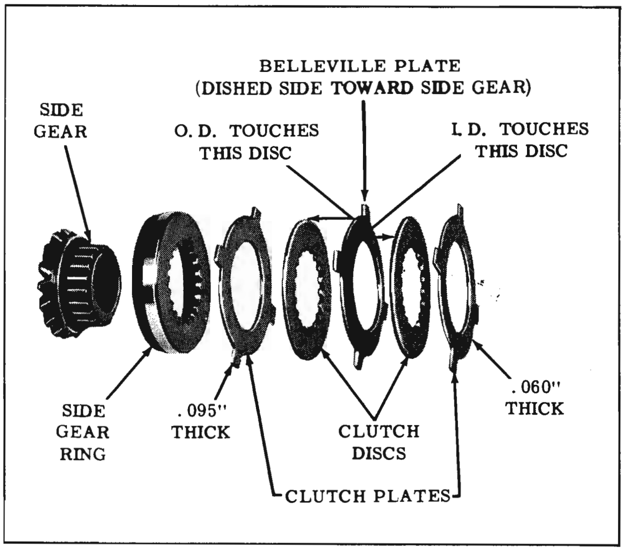


Fig. 6-117 Clutch Pack

6. Position pinions on proper cross shafts. Install cross shaft assemblies in original position in case with beveled sides of shafts matching ramps in case and cover as shown in Fig. 6-119.
7. Place remaining side gear and clutch pack assembly in position on pinions.
8. Note location of alignment marks on case, cover and cross shaft and install cover on case engaging cover notches with lugs on clutch plates.
9. Install eight cover to case bolts and tighten evenly and alternately to 30-40 ft. lbs. torque. (Fig. 6-120)

RING AND PINION GEAR SET

The ring gear and pinion gear are only replaced in matched sets. Therefore, if for any reason it becomes necessary to replace one or the other,

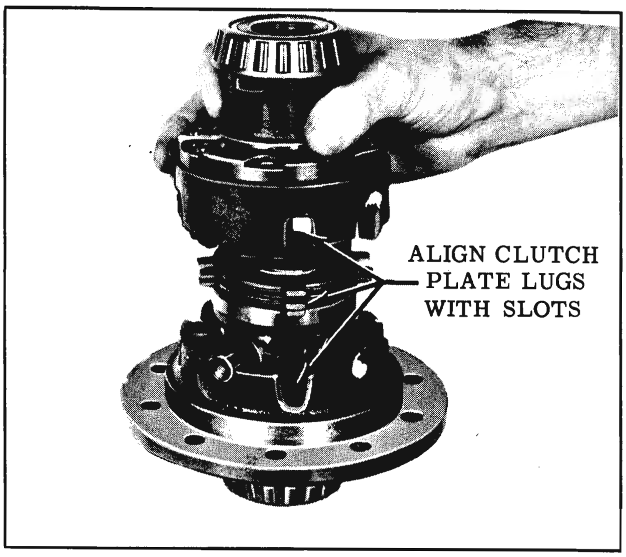


Fig. 6-118 Positioning Clutch Plates in Case

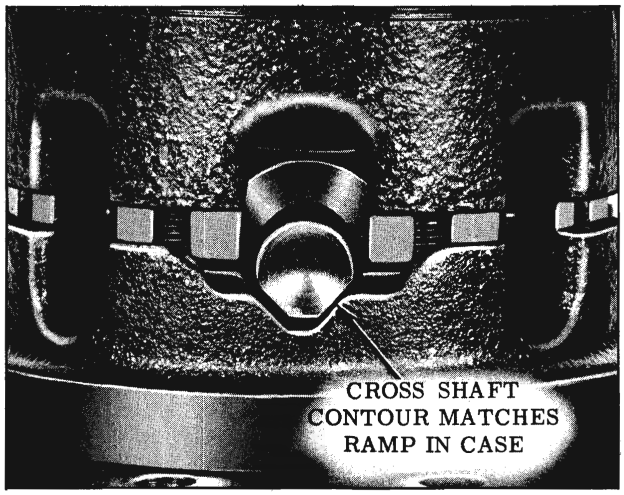


Fig. 6-119 Matching Cross Shafts and Case Ramps

both must be replaced. If a ring gear or pinion gear failure is suspected, examine the ring gear and pinion gear teeth for excessive wear or scoring. If any scoring is found, replacement of the gear set will be necessary.

It will be necessary to check and record the pinion bearing pre-load before removing the pinion gear. The companion flange to pinion nut must be torqued to 200 ft. lbs. and the case assembly must be removed from the carrier before measuring the preload.

Measuring Pinion Bearing Preload

1. Rotate the pinion gear using an inch pound torque wrench (Fig. 6-121). Disregard the starting torque and measure the torque required to maintain uniform rotation of the pinion gear. The reading should be 15-25 in. lbs. with the old bearings; however, with new bearings the reading would be 25-35 in. lbs. Record the preload reading.

Pinion Gear Removal

1. Using Tool J-8614-1, remove companion flange nut.

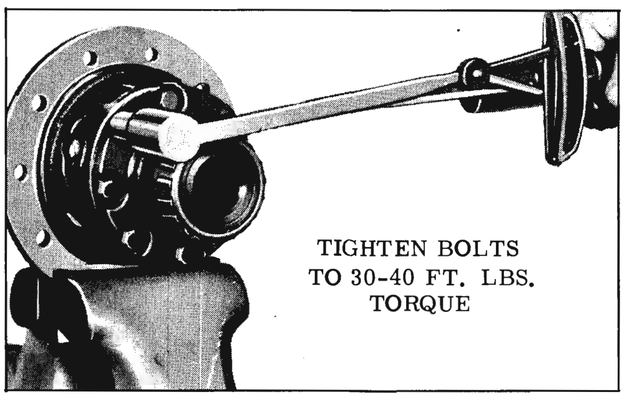


Fig. 6-120 Torqueing Cover to Case Bolts

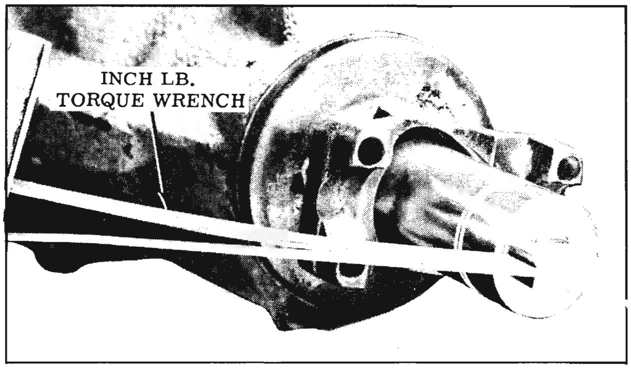


Fig. 6-121 Measuring Pinion Gear Preload

2. Remove companion flange using Tools J-8614-1 and J-8614-2.

3. Carefully remove pinion gear from the rear of the carrier housing.

4. If the bearing is to be reused, remove it from the pinion using remover J-8612.

Ring Gear Removal

1. With the case assembly removed from the carrier, remove the ring gear to case attaching bolts and remove ring gear from case.

Ring Gear Installation

1. After making sure that mating surfaces of case and ring gear are clean and free of burrs, thread two studs J-8618-1 through opposite sides of the ring gear and into the case. (Fig. 6-122) THESE STUDS MUST BE USED OR BOLTS MAY STRIP DUE TO IMPROPER ALIGNMENT.

2. Install ring gear attaching bolts finger tight, then tighten bolts alternately in progressive stages to 50 ft. lbs. torque.

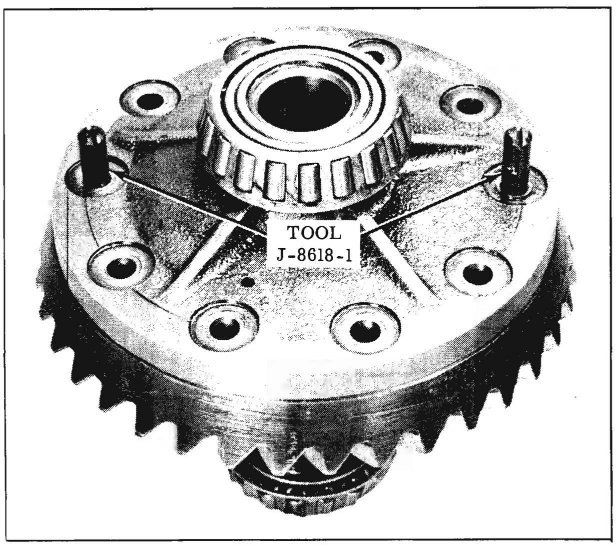


Fig. 6-122 Installing Ring Gear

3. Remove the two studs J-8618-1 and install and torque the remaining attaching bolts.

Pinion Gear Installation and Preload Adjustment

The preload adjustment must be made before attempting to set the pinion depth. If a new pinion gear or new bearings are to be used, always install a new pinion seal. If a new pinion gear or bearing is to be installed, it will be necessary to use the original preload shims to establish a reference from which to make the preload adjustment.

1. Remove old pinion seal using a chisel (Fig. 6-105).

2. Coat outer edge of new seal with a sealing compound such as P.O.B. #3. Drive seal into carrier housing using Tool J-8613 (Fig. 6-106).

3. Place the original preload spacer on gear (Fig. 6-123).

4. Lubricate the seal with gear lube and install the pinion gear into the carrier.

5. Install the companion flange and torque the nut to 200 ft. lbs. using Tool J-8614-1 to hold the flange.

6. Tap both ends of the pinion gear lightly with a plastic hammer and rotate several times to seat bearings.

7. Remove Tool J-8614. Rotate pinion gear using an inch pound torque wrench. With old bearings the reading should be 15-25 in. lbs. and with new bearings the reading should be 25-35 in. lbs.

Pinion bearing preload spacers are available in .001" increments between .200" and .210" and

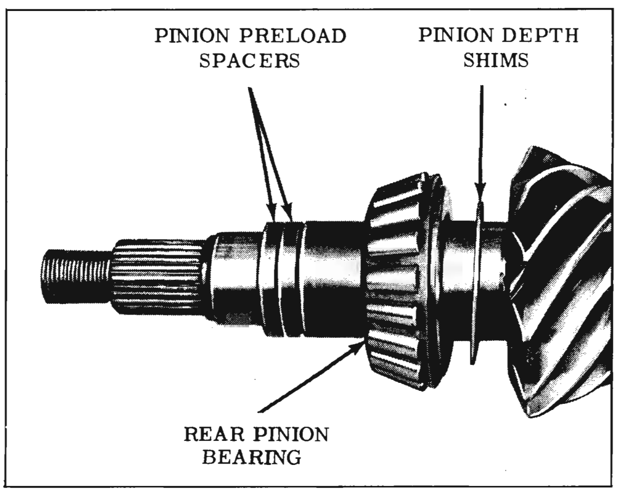


Fig. 6-123 Pinion Gear Shims

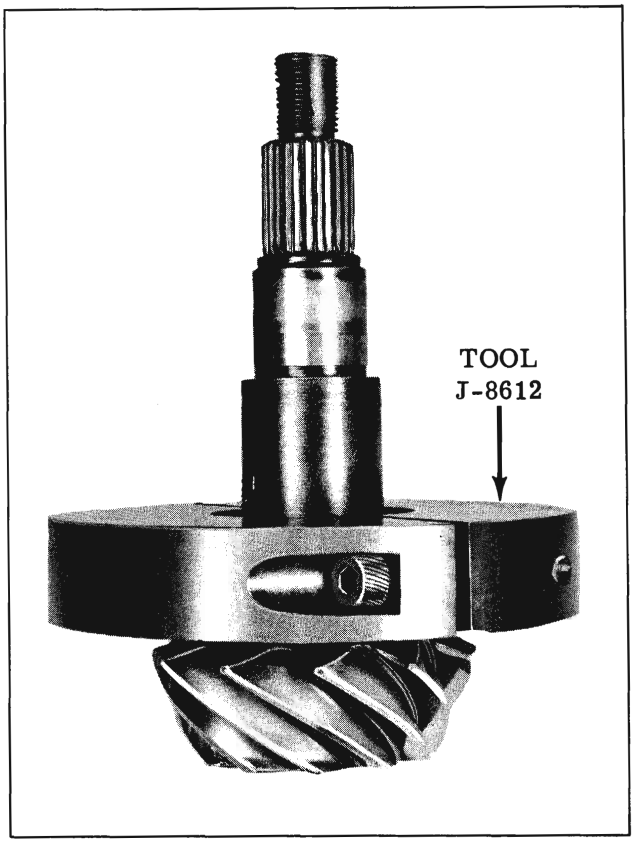


Fig. 6-124 Removing Pinion Bearing

in .010" increments between .210" and .260". The preload is increased by subtracting from the spacer thickness and it is decreased by adding to the spacer thickness. If the preload is not within the specified limits, it will be necessary to select the proper preload spacer or spacers to bring the preload into specifications.

FRONT PINION BEARING

REMOVAL

1. With drive pinion removed from carrier, pry oil seal from housing and remove front pinion bearing.
2. If bearing is to be replaced, remove outer race with a brass drift.

INSTALLATION

1. Install outer race with Tool J-8611 and Handle J-8092.
2. Lubricate the bearing with gear lube and position in outer race.
3. Coat outside diameter of seal with a sealer such as P.O.B. #3. Install seal with Tool J-8613. (Fig. 6-106)

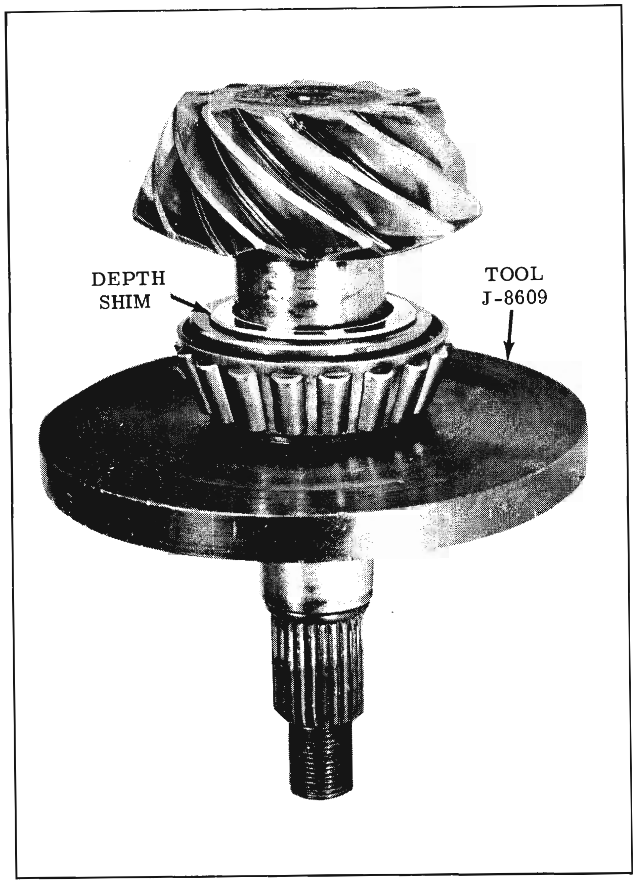


Fig. 6-125 Installing Pinion Bearing

REAR PINION BEARING

The rear pinion bearing must be removed when it becomes necessary to change the pinion depth adjustment.

REMOVAL

1. With drive pinion removed from carrier, press bearing off from pinion gear using remover J-8612. (Fig. 6-124)
2. If bearing is to be replaced, remove the rear bearing outer race from the carrier. Use a brass drift in slots provided for this purpose.

INSTALLATION

1. Install outer race using Tool J-8608 and Handle J-8092.
2. Install bearing onto pinion using Tool J-8609. (Fig. 6-125)

PINION DEPTH ADJUSTMENT

The pinion depth adjustment should only be made after the preload has been measured and corrected.

1. After the preload has been established, set the depth setting gauge, J-8619 and J-5647-5,

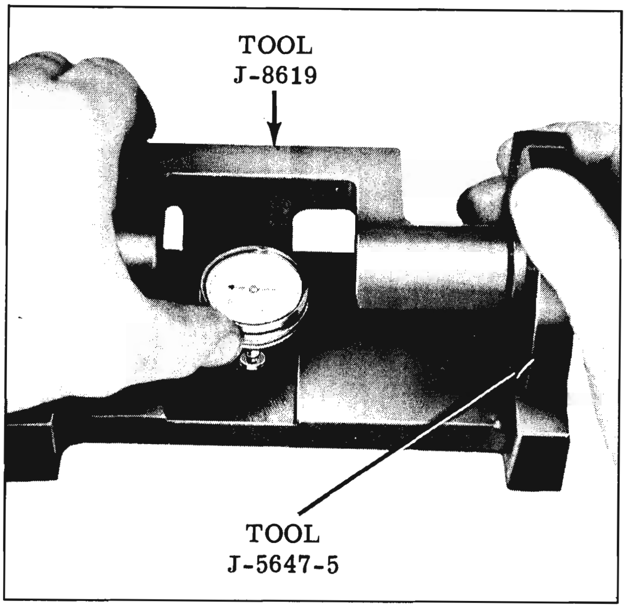


Fig. 6-126 Setting Depth Gauge

to "Zero". (Fig. 6-126) The yoke centering pin must be centered in the gauge checking fixture recess. Holding rollers J-5647-5 down firmly, rotate the gauge to place needle on zero. Avoid pressing on yoke since this may cause the yoke to deflect resulting in an erroneous reading.

2. Make sure carrier bearing support bores are free of burrs and foreign material. Check pinion center and remove any foreign material.

3. Rotate pinion to position gauging tooth as shown in Fig. 6-127. The gauging tooth is the blank tooth between the marked teeth.

4. Place gauge in carrier with rollers in bearing support bores and with indicator pin con-

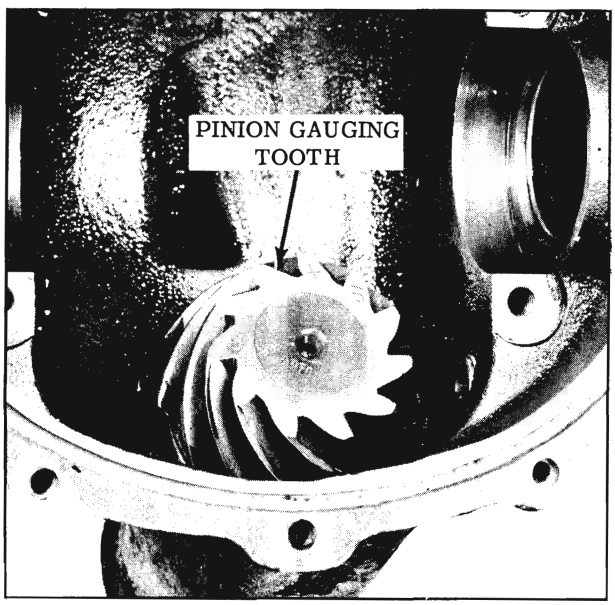


Fig. 6-127 Pinion Gauging Tooth

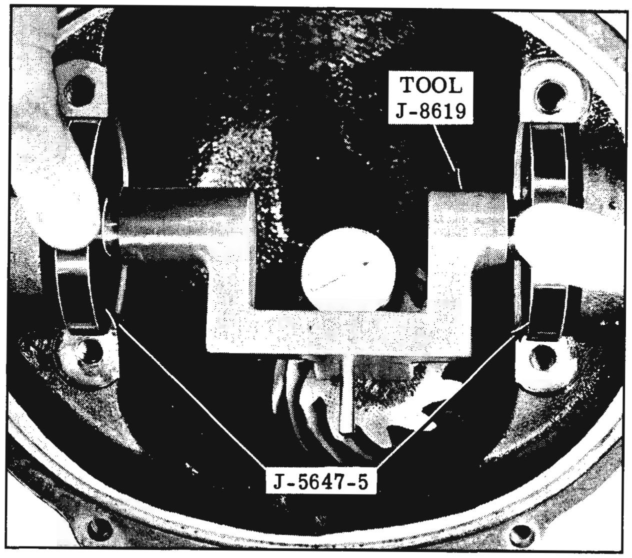


Fig. 6-128 Gauging Pinion Depth

tacting gauge tooth (Fig. 6-128). Gauge guide pin must be in center of pinion for proper location.

5. Press gauge rollers, J-5647-5, firmly down against carrier side bearing seats and read dial indicator, noting whether the needle has moved clockwise or counterclockwise from the zero mark. (Fig. 6-129) If the depth adjustment is correct, the reading on the gauge will match the number on the pinion. Counterclockwise readings are minus and clockwise readings are plus.

6. Using the gauge reading and the pinion marking, refer to Fig. 6-130 for the amount the shim thickness must be changed.

The pinion depth is adjusted by changing the shim between the rear pinion bearing and pinion gear.

Pinion depth shims are available in increments of .002" between .040" and .070".

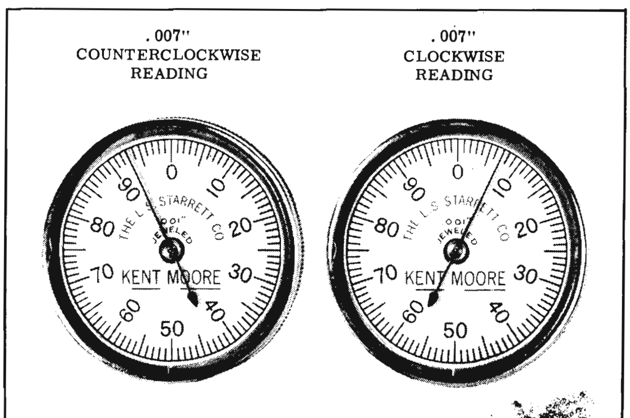


Fig. 6-129 Reading Gauge

PINION MARK	GAUGE READING																														
	When needle reads Clockwise from O																When needle reads Counter-Clockwise from O														
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
+15	-30	-29	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0
+14	-29	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-8	-6	-5	-4	-3	-2	-1	0	+1
+13	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2
+12	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3
+11	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4
+10	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
+9	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6
+8	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7
+7	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8
+6	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9
+5	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
+4	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11
+3	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12
+2	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13
+1	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14
0	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15
-1	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16
-2	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17
-3	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18
-4	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19
-5	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20
-6	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21
-7	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22
-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23
-9	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24
-10	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24	+25
-11	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24	+25	+26
-12	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24	+25	+26	+27
-13	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24	+25	+26	+27	+28
-14	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24	+25	+26	+27	+28	+29
-15	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24	+25	+26	+27	+28	+29	+30

Minus (-) signs - remove that amount of shim thickness (in thousandths of inches).
Plus (+) signs - add that amount of shim thickness (in thousandths of inches).
Correct gauge reading if pinion is properly set is as follows:
For (+) mark on pinion, gauge should read that amount counterclockwise.
For (-) mark on pinion gauge should read that amount clockwise.

Fig. 6-130 Pinion Depth Shim Corrections

The specifications allow .0015" tolerance either side of the mark on the pinion. This allows a range of .003". When making a correction where the gauge indicates that an addition of .003" is required, either .002" or .004" addition would bring the correction within the specifications.

Using the Chart in Fig. 6-130

Minus (-) figures on the chart indicate that the shim thickness should be reduced. Plus (+) figures indicate that the shim thickness should be increased.

Suppose the pinion is marked a plus (+) 8 and the gauge needle indicates counterclockwise 5. Locate +8 in the column titled, "Pinion Mark". Locate "Counterclockwise 5" in the row of shaded numbers across the top of the chart. Now, locate the intersection of a horizontal and vertical line extended across the chart. This point is the amount of shim required to correct the shim depth. Using the above numbers, the chart shows a minus (-) 3. This means that .003" must be removed from the shims. By removing .002" or .004" from the depth shim the pinion depth would be brought back into the .003" specification range. Suppose, further, that the original depth shim was .050" thick. By removing the .050" shim and replacing it with either a .046" or .048" thick shim the depth is brought back into specification.

If the pinion has been marked a minus (-) 8 and the gauge had indicated a clockwise reading of 5, the chart would show a plus (+) 3. This would mean that in order to bring the depth into specification, an addition of .003" to the shim would be required. If the original depth shim had been .050", a shim of .052" or .054" would return the depth to specification.

It is important to note that whenever the pinion depth is changed, the bearing preload spacer must be changed an equal amount in the same direction in order to maintain the preload previously set. More specifically, if .002" is added to the depth shim, then .002" must be added to the preload spacer. Conversely, if .002" is removed from the pinion depth shim, then .002" must be removed from the preload spacer.

BACKLASH

1. With pinion and case in carrier and all bolts torqued, install the clamp and dial indicator as shown in Fig. 6-131.

2. Rotate ring gear in each direction bumping pinion teeth, noting reading on gauge. It should be within .007"-.009". Pinion gear must not move.

3. If correction is needed, it is made by shifting the case. This is done by ADDING thicker side bearing shims to one side and REMOVING the SAME amount from the other side. To INCREASE backlash, move ring gear AWAY from pinion gear. To DECREASE, move ring gear TOWARD pinion gear. Moving the case assembly .002" will change backlash approximately .001".

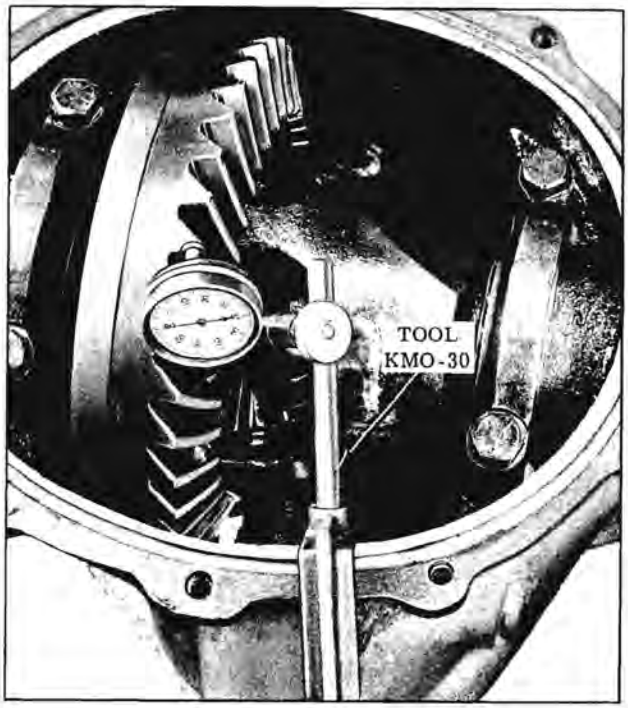


Fig. 6-131 Adjusting Backlash

AXLE SHAFT AND BEARING

REMOVAL

1. Remove wheel and brake drum.

   NOTE: Wheel nuts on left side of car have left hand threads and the right side has right hand threads.

2. Remove 4 axle bearing retainer nuts.

3. Attach Puller J-2619 with Adapter J-8617 and pull axle from housing. Care must be taken not to loosen backing plate from housing as it may damage brake line. (Fig. 6-132)

   NOTE: Do not drag shaft over seal as this may damage seal.

4. Attach one axle bearing retainer nut to hold backing plate in position.

INSTALLATION

Before installing axle, examine the oil seal. The seals have feathered edges which form a tight seal around the shaft. If these feather edges are damaged in any way the oil seal must be replaced.

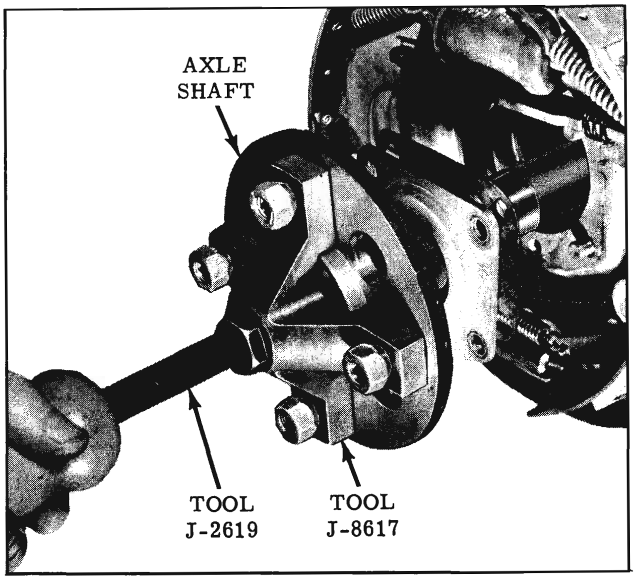


Fig. 6-132 Removing Axle Shaft

Examine the seal surface on the shaft. It must be smooth. If necessary, dress down with very fine emery cloth.

1. Remove nut holding backing plate to axle housing.
2. Clean bearing retainer gasket surface of backing plate and install new gasket. Clean gasket surface of bearing retainer.
3. Grease outside diameter of axle bearing, seal surface on axle shaft, and bore of axle housing with differential lubricant, and slide axle shaft and bearing assembly into place. EXTREME CARE MUST BE TAKEN NOT TO DAMAGE SEAL.
4. Place gasket and bearing retainer over studs, install nuts and torque 45-60 ft. lbs.

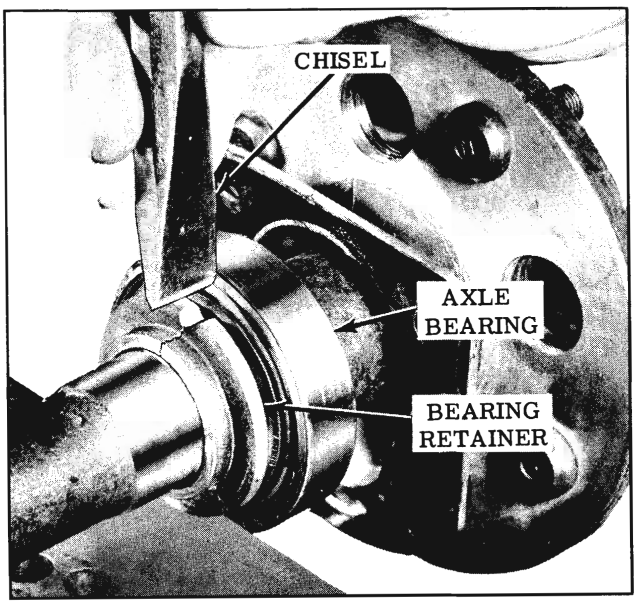


Fig. 6-133 Removing Axle Bearing Retainer

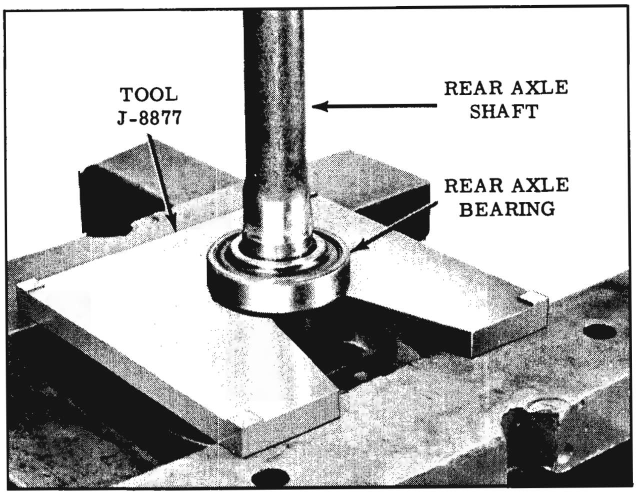


Fig. 6-134 Removing Axle Bearing

BEARING REMOVAL

Bearings should be replaced if found to be rough or have greater than .020" end play. Remove bearing only when a new bearing is to be installed.

1. With axle shaft removed from housing, split retainer with a chisel as shown in Fig. 6-133.
2. With Tool J-8877 press bearing off shaft. (Fig. 6-134)

   NOTE: Use Tool J-8621 if using bench type hydraulic press.

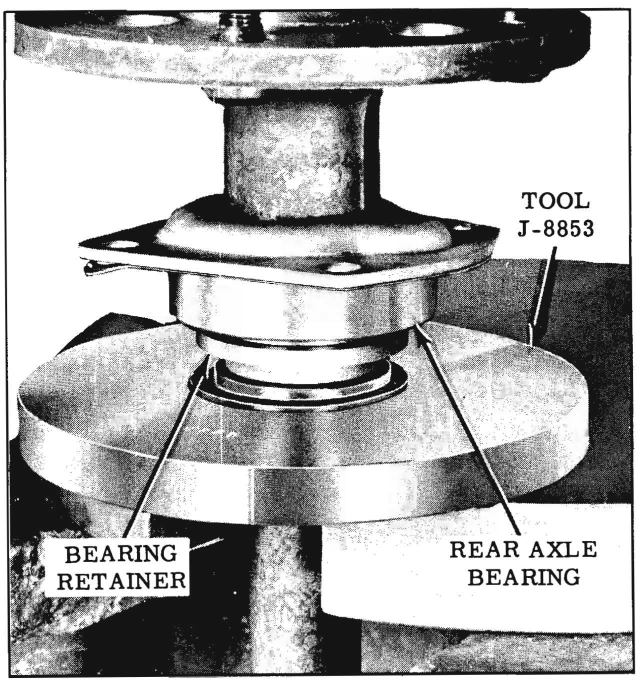


Fig. 6-135 Installing Axle Bearing

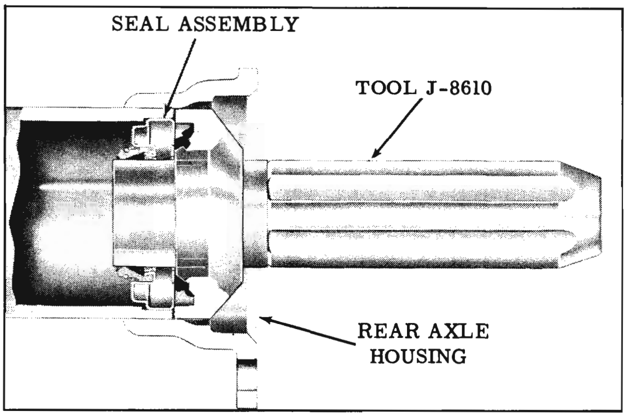


Fig. 6-136 Installing Axle Shaft Oil Seal

NOTE: For safety, an old brake drum can be placed over bearing, should bearing break while pressing off.

BEARING INSTALLATION

With Tool J-8853 press bearing on shaft (Fig. 6-135) making sure bearing is being pressed on inner race.

IMPORTANT: BEARING MUST BE INSTALLED BEFORE RETAINER.

Press retainer on shaft with Tool J-8853 (Fig. 6-135) until it is firmly against bearing.

FLANGE BOLTS

Axle flange bolts may be removed if damaged, by pressing them out of the flange.

They may be installed by pressing them in, then using Tool J-554-3-7/16" to peen the shoulder. The head of the bolt must be backed up when peening.

AXLE SHAFT OIL SEAL

REMOVAL

1. Insert splined end of axle shaft into seal.
2. Press down on shaft until seal is removed.

INSTALLATION

1. Apply a sealer such as Permatex #2 to outside diameter of seal.
2. Position seal at axle housing and drive in with Tool J-8610 until tool is firmly seated. (Fig. 6-136) This will properly position seal.

DIAGNOSIS

ANTI-SPIN OPERATION

If an anti-spin differential is suspected of not providing positive traction to the non-slipping wheel, the condition can be checked as follows:

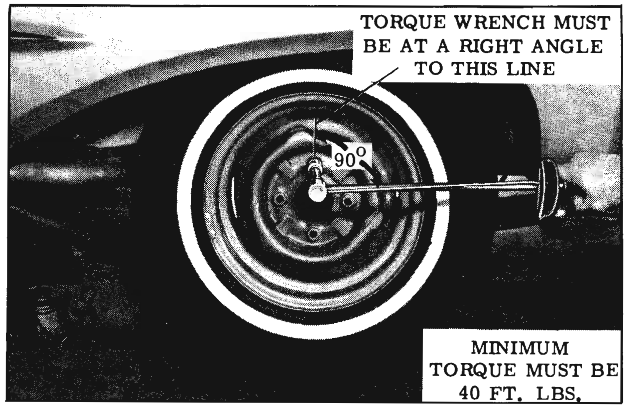


Fig. 6-137 Checking Anti-Spin

1. Place the transmission in neutral.
2. Raise one wheel off the floor and place a block in the front and rear of the opposite wheel.
3. Remove hub cap or wheel disc and apply a torque wrench as shown in Fig. 6-137.
4. Disregard breakaway torque and observe only the torque required to continuously turn the wheel smoothly.

   If the torque reading is less than 40 ft. lbs., the unit should be disassembled and the case assembly should be repaired as necessary.

DIFFERENTIAL NOISE

When a differential assembly is suspected of being noisy, a thorough road test should be made to make sure that the noise is not being caused by tires, road surface, wheel bearings, engine, transmission, muffler, body or propeller shaft.

TIRE NOISE

Different types of road surfaces will affect tire noise but will not affect rear axle noise. For road testing, select a level tarvia or asphalt road. For test purposes only, inflating all tires to approximately 50 lbs. pressure will materially alter noise caused by tires, but will not affect noise caused by the rear axle. Rear axle noise usually ceases when coasting with transmission in neutral at speeds under 30 m.p.h., however, tire noise continues with lower tone as car speed is reduced. Rear axle noise always changes when comparing "pull and coast", but tire noise remains about the same.

WHEEL BEARING NOISE

Wheel bearing noise may be confused with differential noise; however, a rough rear wheel bearing produces a vibration or growl which continues with car coasting with transmission in neutral. A bad bearing may cause a knock or click approximately every two revolutions of the wheel since the bearing rollers do not travel at the same speed as the rear axle shaft. To determine which front wheel bearing is noisy, hoist the car and spin each wheel while listening at the hub cap. To determine which rear wheel bearing is noisy, hoist car and start engine. With transmission in gear, use a piece of rubber hose or stethoscope BT-37 at the axle housing to locate the noise.

ENGINE AND TRANSMISSION NOISE

Note speed at which noise occurs, and with car standing and transmission in neutral, accelerate the engine to approximate speed where noise was noticed. If a similar noise is produced with the car standing, it cannot be due to the rear axle.

DIFFERENTIAL SIDE AND PINION GEAR NOISE

Differential side gears and pinions seldom cause noise because their movements are negligible on straight ahead driving.

RING GEAR AND PINION GEAR NOISE

These generally show up as drive noise, coast noise, or float noise. Drive noise is most pronounced on constant acceleration through the speed range. Coast noise is most pronounced when the car is allowed to coast through the speed range while in gear. Float noise is the most pronounced while holding the car speed constant at various speeds. Drive, coast, and float noises will be very rough and irregular if the differential side bearings or drive pinion bearings are rough, worn, or loose.

DRIVE PINION BEARING AND SIDE BEARING NOISE

Rough or brinnelled bearings produce a continuous whine starting at a relatively low speed. The noise is most noticeable with a light pull between 18 to 25 miles per hour.

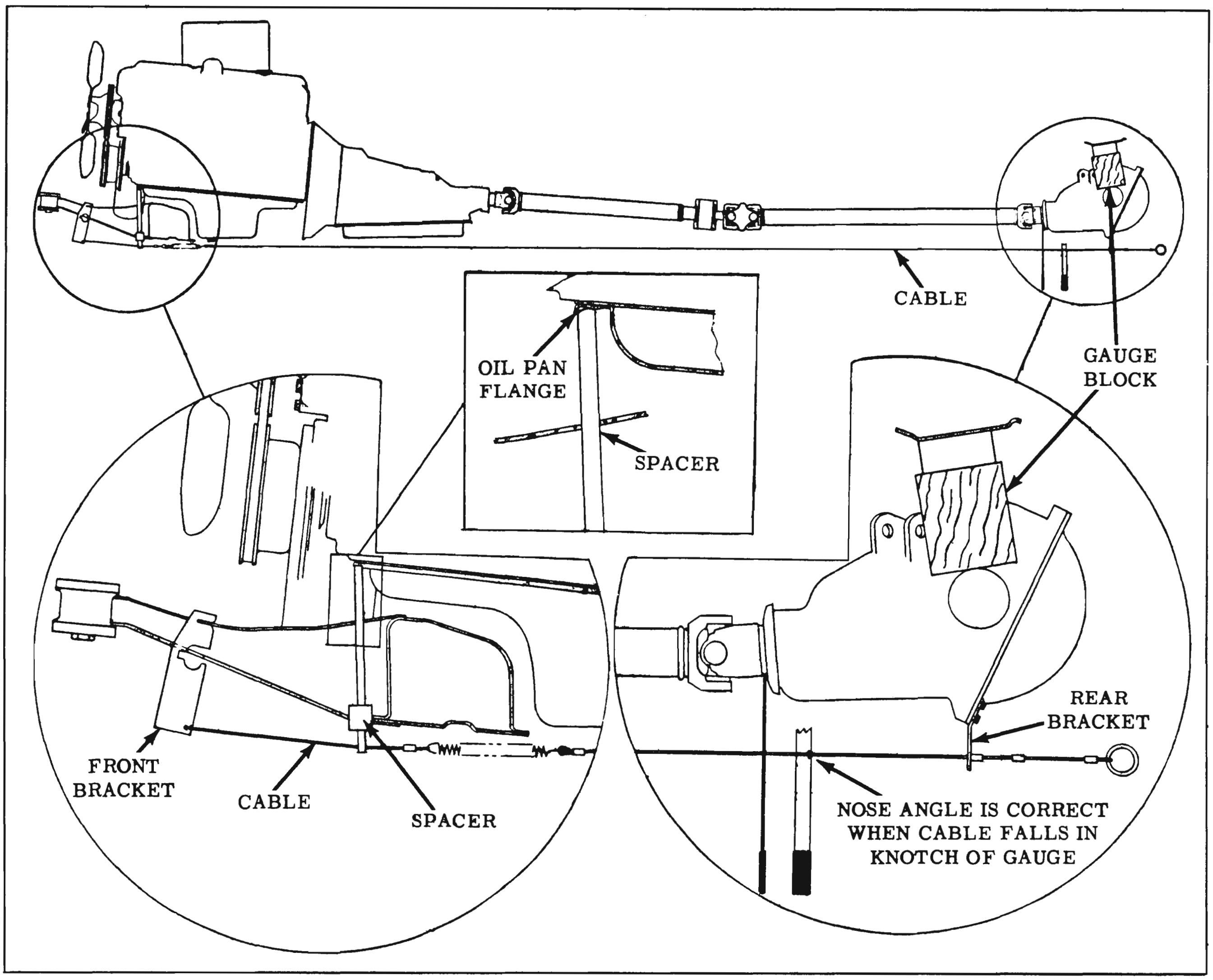


Fig. 6-138 Nose Angle Adjustment

DIFFERENTIAL CLUTCH CHATTER (Anti-Spin Only)

Improper lubricant can cause the clutch plates to grab and release intermittently resulting in chatter when the car is turning a corner slowly. Special Lubricant (Part No. 531536) MUST be used for initial fill of the differential and for addition to the differential.

DRIVE LINE VIBRATION

Drive line vibration can be caused by propeller shaft out of balance, worn or bad "U" joints and bearings, or differential alignment. To correct the differential nose angle the following procedure should be used.

DIFFERENTIAL NOSE ANGLE

The differential nose angle may be checked with Tool BT-30-2. Install tool at front arm of front cross bar as shown in Fig. 6-138.

The line to engine spacer is installed after rear bracket has been attached to the differential.

Place indicator against the pinion companion flange. Cable must be in the notch marked F-85. If cable is below the notch, it will be necessary to remove shims from front of lower suspension arm. If cable is above notch, add shims.

NOTE: The same amount of shims must be added to both sides. 1/8" shim will raise or lower nose angle approximately 1/16 inch.

AXLE AND SPEEDOMETER RATIOS

Series	Trans-mission	Body Style	Axle Ratio Identification: Axle Ratio	Gear Ratio	Code	Tire Size	Number of Speedometer Gear Teeth: Drive	Driven
3000	SM	All	40:13 Std.	3.08	A	6.50 x 13 Std.	8	20
3000	SM	All	40:13 Std.	3.08	A	6.50 x 14 (Opt.)	8	19
3000	SM	All	37:11 Mountain	3.36	C	6.50 x 13 Std.	7	19
3000	SM	All	37:11 Mountain	3.36	C	6.50 x 14 (Opt.)	7	19
3000	SM	All	37:11 Mountain	3.36	C	6.00 x 15 (Opt.)	8	21
3000	SM	All	40:13 Plains	3.08	A	6.00 x 15 (Opt.)	8	19
3000	SM	All	37:11 4bbl. Eng.	3.36	C	6.50 x 13 Std.	7	19
3000	SM	All	37:11 4bbl. Eng.	3.36	C	6.50 x 14 (Opt.)	7	19
3000	SM	All	42:13 Std.	3.23	B	6.00 x 15 (Opt.)	8	20
3000	SM	All	37:11 4bbl. Eng.	3.36	C	6.00 x 15 (Opt.)	8	21
3000	FS	All	40:13 Std.	3.08	A	6.50 x 13 Std.	8	20
3000	FS	All	40:13 Std.	3.08	A	6.50 x 14 (Opt.)	8	20
3000	FS	All	37:11 Mountain	3.36	C	6.50 x 13 Std.	8	22
3000	FS	All	37:11 Mountain	3.36	C	6.50 x 14 (Opt.)	8	22
3000	FS	All	37:11 Mountain	3.36	C	6.00 x 15 (Opt.)	8	21
3000	FS	All	40:13 Plains	3.08	A	6.00 x 15 (Opt.)	8	19
3000	FS	All	37:11 4bbl. Eng.	3.36	C	6.50 x 13 Std.	8	22
3000	FS	All	37:11 4bbl. Eng.	3.36	C	6.50 x 14 (Opt.)	8	22
3000	FS	All	42:13 Std.	3.23	B	6.00 x 15 (Opt.)	8	20
3000	FS	All	37:11 4bbl. Eng.	3.36	C	6.00 x 15 (Opt.)	8	21
3000	HMT	All	42:13 Std.	3.23	B	6.50 x 13 Std.	9	23
3000	HMT	All	42:13 Std.	3.23	B	6.50 x 14 (Opt.)	9	23
3000	HMT	All	37:11 Mountain	3.36	C	6.50 x 13 Std.	9	24
3000	HMT	All	37:11 Mountain	3.36	C	6.50 x 14 (Opt.)	9	24
3000	HMT	All	40:13 Plains	3.08	A	6.50 x 13 Std.	9	22
3000	HMT	All	40:13 Plains	3.08	A	6.50 x 14 (Opt.)	9	22
3000	HMT	All	42:13 Plains	3.23	B	6.00 x 15 (Opt.)	9	22
3000	HMT	All	37:11 4bbl. Eng.	3.36	C	6.50 x 13 Std.	9	24
3000	HMT	All	37:11 4bbl. Eng.	3.36	C	6.50 x 14 (Opt.)	9	24
3000	HMT	All	37:11 Std.	3.36	C	6.00 x 15 (Opt.)	9	23
3000	HMT	All	37:11 4bbl. Eng.	3.36	C	6.00 x 15 (Opt.)	9	23
3100	SM	19,35	40:13 Std.	3.08	A	6.50 x 13 Std.	8	20
3100	SM	19,35	40:13 Std.	3.08	A	6.50 x 14 (Opt.)	8	19
3100	SM	17,47,67	37:11 Std.	3.36	C	6.50 x 13 Std.	7	19
3100	SM	17,47,67	37:11 Std.	3.36	C	6.50 x 14 (Opt.)	7	19
3100	SM	47,67	37:11 Air Cond.	3.36	C	6.50 x 14 Std.	7	19
3100	SM	19,35	37:11 Mountain	3.36	C	6.50 x 13 Std.	7	19
3100	SM	19,35	37:11 Mountain	3.36	C	6.50 x 14 (Opt)	7	19
3100	SM	19,35	37:11 Mountain	3.36	C	6.00 x 15 (Opt.)	8	21

AXLE AND SPEEDOMETER RATIOS (Cont'd.)

Series	Trans-mission	Body Style	Axle Ratio Identification: Axle Ratio	Axle Ratio Identification: Gear Ratio	Axle Ratio Identification: Code	Tire Size	Number of Speedometer Gear Teeth: Drive	Number of Speedometer Gear Teeth: Driven
3100	SM	19,35	40:13 Plains	3.08	A	6.00 x 15 (Opt.)	8	19
3100	SM	19,35	37:11 4bbl. Eng.	3.36	C	6.50 x 13 Std.	7	19
3100	SM	19,35	37:11 4bbl. Eng.	3.36	C	6.50 x 14 (Opt.)	7	19
3100	SM	19,35	37:11 4bbl. Eng.	3.36	C	6.00 x 15 (Opt.)	8	21
3100	SM	17,45	37:11 Std.	3.36	C	6.00 x 15 (Opt.)	8	21
3100	SM	19,35	42:13 Std.	3.23	B	6.00 x 15 (Opt.)	8	20
3100	FS	19,35	40:13 Std.	3.08	A	6.50 x 13 Std.	8	20
3100	FS	19,35	40:13 Std.	3.08	A	6.50 x 14 (Opt.)	8	20
3100	FS	17,47,67	37:11 Std.	3.36	C	6.50 x 13 Std.	8	22
3100	FS	17,47,67	37:11 Std.	3.36	C	6.50 x 14 (Opt.)	8	22
3100	FS	47,67	37:11 Air Cond.	3.36	C	6.50 x 14 Std.	8	22
3100	FS	19,35	37:11 Mountain	3.36	C	6.50 x 13 Std.	8	22
3100	FS	19,35	37:11 Mountain	3.36	C	6.50 x 14 (Opt.)	8	22
3100	FS	19,35	37:11 Mountain	3.36	C	6.00 x 15 (Opt.)	8	21
3100	FS	19,35	40:13 Plains	3.08	A	6.00 x 15 (Opt.)	8	19
3100	FS	19,35	37:11 4bbl. Eng.	3.36	C	6.50 x 13 Std.	8	22
3100	FS	19,35	37:11 4bbl. Eng.	3.36	C	6.50 x 14 (Opt.)	8	22
3100	FS	19,35	37:11 4bbl. Eng.	3.36	C	6.00 x 15 (Opt.)	8	21
3100	FS	17,47	37:11 Std.	3.36	C	6.00 x 15 (Opt.)	8	21
3100	FS	19,35	42:13 Std.	3.23	B	6.00 x 15 (Opt.)	8	20
3100	HMT	19,35	42:13 Std.	3.23	B	6.50 x 13 Std.	9	23
3100	HMT	19,35	42:13 Std.	3.23	B	6.50 x 14 (Opt.)	9	23
3100	HMT	17,47,67	37:11 Std.	3.36	C	6.50 x 13 Std.	9	24
3100	HMT	17,47,67	37:11 Std.	3.36	C	6.50 x 14 (Opt.)	9	24
3100	HMT	47,67	37:11 Air Cond.	3.36	C	6.50 x 14 Std.	9	24
3100	HMT	19,35	37:11 Mountain	3.36	C	6.50 x 13 Std.	9	24
3100	HMT	19,35	37:11 Mountain	3.36	C	6.50 x 14 (Opt.)	9	24
3100	HMT	19,35	40:13 Plains	3.08	A	6.50 x 13 Std.	9	22
3100	HMT	19,35	40:13 Plains	3.08	A	6.50 x 14 (Opt.)	9	22
3100	HMT	19,35	42:13 Plains	3.23	B	6.00 x 15 (Opt.)	9	22
3100	HMT	19,35	37:11 4bbl. Eng.	3.36	C	6.50 x 13 Std.	9	24
2100	HMT	19,35	37:11 4bbl. Eng.	3.36	C	6.50 x 14 (Opt.)	9	24
3100	HMT	19,35	37:11 4bbl. Eng.	3.36	C	6.00 x 15 (Opt.)	9	23
3100	HMT	17,19, 35 & 47	37:11 Std.	3.36	C	6.00 x 15 (Opt.)	9	23

PROPELLER SHAFT

MAINTENANCE RECOMMENDATIONS

SLIP YOKE

The slip yoke should be lubricated when the propeller shaft is disassembled for other reasons, or at high mileage if "sticking" is detected. Use Special Lubricant, Part No. 567196, until lubricant appears at the rear of the slip yoke. A grease fitting plug is provided for lubrication.

UNIVERSAL JOINTS

Universal joints, under both hot and cold weather conditions, no longer require a scheduled lubrication interval.

The needle bearings in the universal joints are prepacked with lubricant at the time of manufacture.

DESCRIPTION

The propeller shaft assembly consists of the front propeller shaft, rear propeller shaft and the center bearing support assembly. The front and rear propeller shafts are connected to each other by a slip yoke and a constant velocity type universal joint.

The center bearing support is attached to a support cross member which in turn is attached to the floor pan side rails through two insulators as shown in Fig. 6-139.

The front propeller shaft connects to the transmission through a universal joint and a companion flange. The rear end of the front propeller shaft is connected to the rear shaft by a splined slip yoke supported by the center bearing support assembly. The rear propeller shaft is attached to the differential by a universal joint and companion flange.

To remove either the front or rear propeller shaft or the center bearing, it is necessary to remove the complete propeller shaft assembly from the car. The propeller shaft assembly is a balanced unit and should be kept free of undercoating or other material which could destroy the balance. The front and rear shafts are not serviced separately.

PROPELLER SHAFT ASSEMBLY

REMOVAL

1. Remove the two center bearing support to cross member bolts, nuts and lock washers. It is not necessary to remove the cross member when removing the propeller shaft.
2. Scribe alignment marks on companion flanges and propeller shaft "U" joints.
3. Remove the companion flange "U" bolts at transmission and differential and remove propeller shaft from rear side of cross member. (Fig. 6-139)

   IMPORTANT: When handling the drive shaft assembly, care must be taken not to let one shaft "flop" around loosely since this may result in damage to the constant velocity universal joint center ball seat.

INSTALLATION

1. Position center bearing support on bearing insulator making certain that edges of insulator do not fold or roll over as shown in Fig. 6-140.
2. Position propeller shaft assembly to transmission, center support cross member, and differential aligning marks previously scribed.
3. Install companion flange "U" bolts and tighten each side uniformly to 14-18 ft. lbs. torque. Bend lock tangs over nuts.
4. Install the cross member center support attaching bolts. Torque bolts to 20-30 ft. lbs.

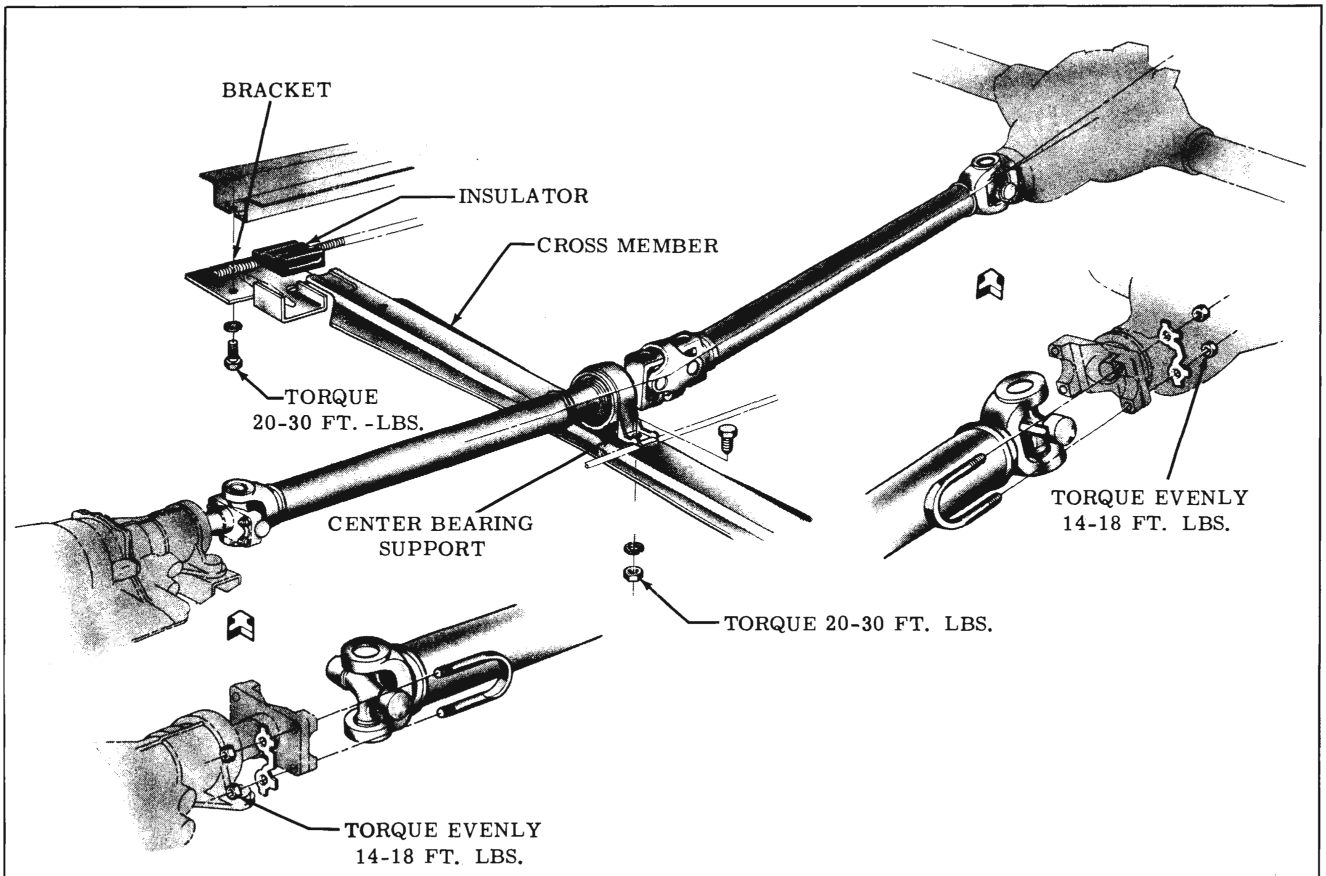


Fig. 6-139 Propeller Shaft and Center Bearing Support Installation

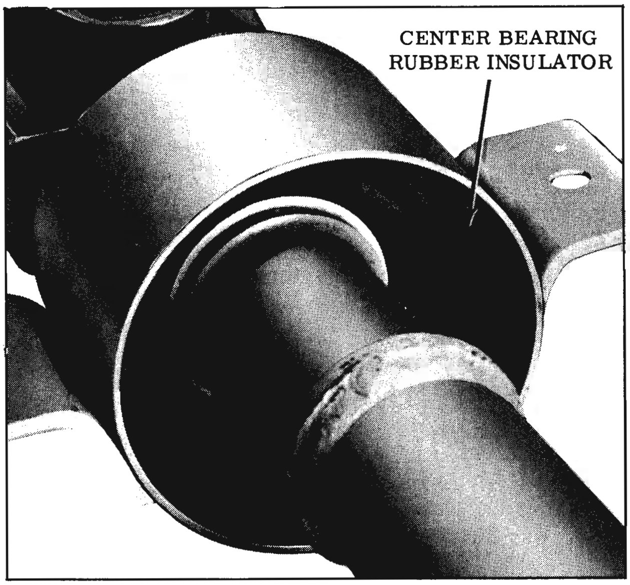


Fig. 6-140 Center Bearing Support

CENTER BEARING SUPPORT CROSS MEMBER

REMOVAL

1. Remove propeller shaft assembly.
2. Remove cross member brackets from each side rail and remove cross member and insulators.

INSTALLATION

1. Position the R.H. insulator on the R.H. end of the cross member and the L.H. insulator on the L.H. end as shown in Fig. 6-141.
2. Position cross member between side rails and install cross member brackets. Tighten bracket attaching bolts to 20-30 ft. lbs. torque.
3. Reinstall propeller shaft assembly.

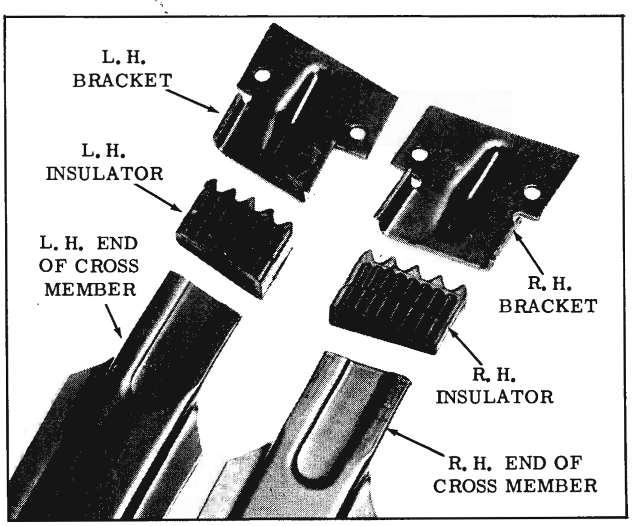


Fig. 6-141 Cross Member Insulator Installation

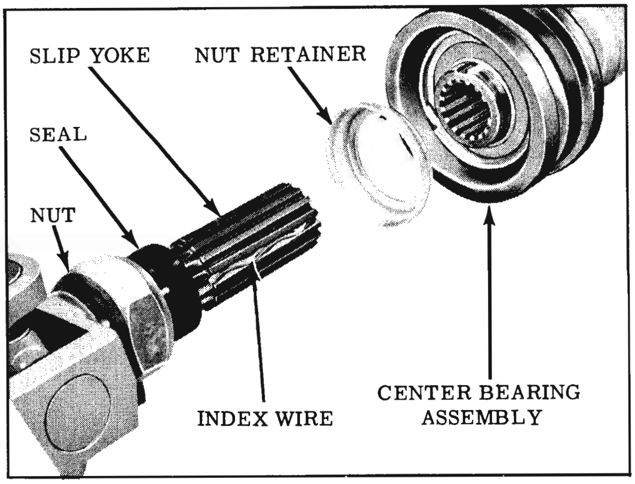


Fig. 6-142 Disassembly of Slip Yoke

CENTER BEARING AND SUPPORT

DISASSEMBLY (SHAFT REMOVED) (Fig. 6-144)

1. Slide bearing to body mounting bracket forward off bearing and insulator assembly.
2. Pry crimped area of slip yoke nut retainer away from nut, then unscrew nut until it is free of threads.
3. Pull rear propeller shaft from front propeller shaft.

   NOTE: Watch for index wire in one spline of slip yoke. It is important that this wire be kept in same spline. (Fig. 6-142) Remove nut retainer and rear spacer.

4. If slip yoke seal is to be removed, it can be removed at this time.

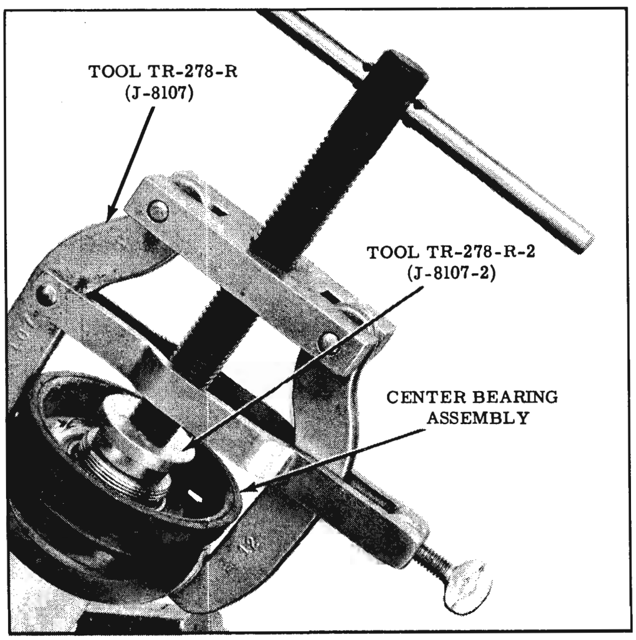


Fig. 6-143 Removing Center Bearing Assembly

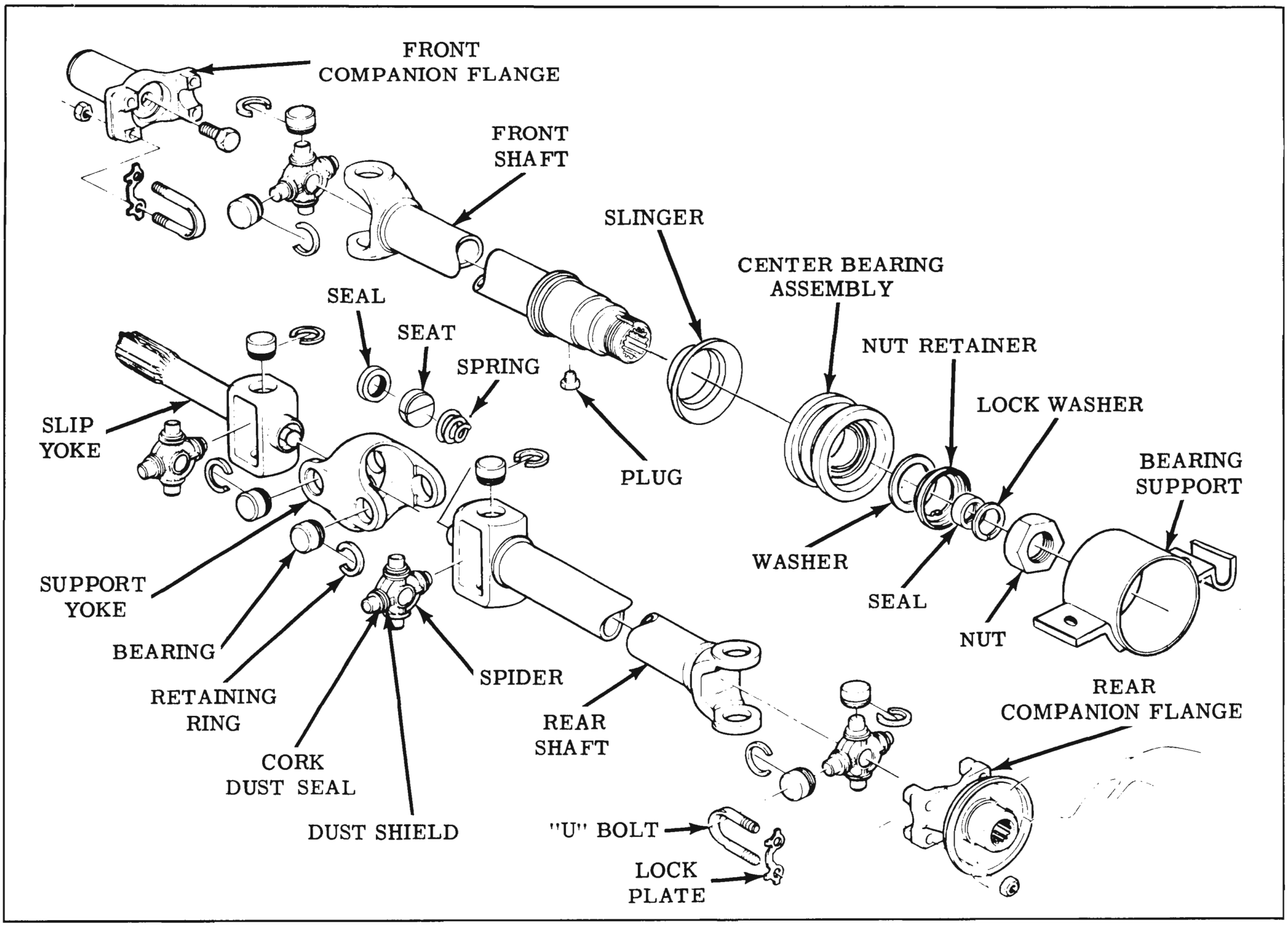


Fig. 6-144 Propeller Shaft Assembly

5. Remove the center bearing and insulator assembly using Puller TR-278-R and Adapter TR-278-R-2 as shown in Fig. 6-143. The bearing and insulator can then be replaced as an assembly or only the bearing may be replaced separate from insulator. If bearing is to be removed from insulator, continue with Step 6.

6. Bend bearing retainer tabs out to permit removal of bearing. Position wheel bearing race (Part No. 909666), small diameter up, on open jaws of vice as shown in Fig. 6-145. This will back up the retaining tab side of the retainer while bearing is being removed. Drive out bearing with a hammer and Tools J-9575 and J-8092.

ASSEMBLY

1. Position a 2nd type 1958 center bearing retainer (Part No. 5672054) on the open jaws of a vise to back up the metal portion of the bearing retainer. Drive new bearing into retainer using Tools J-9481 and J-8092 as shown in Fig. 6-146. Rebend tabs on the retainer to original position.

2. Pack the groove between the bearing and the

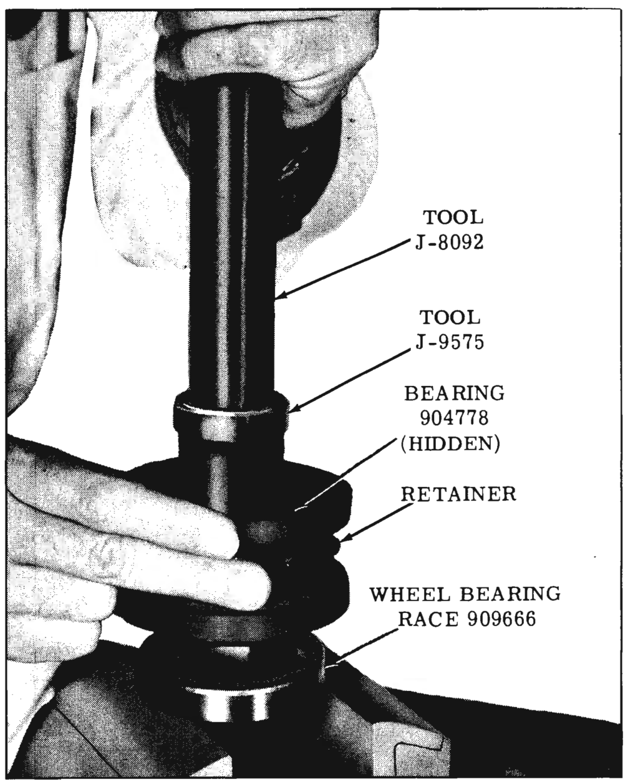


Fig. 6-145 Removing Bearing From Insulator

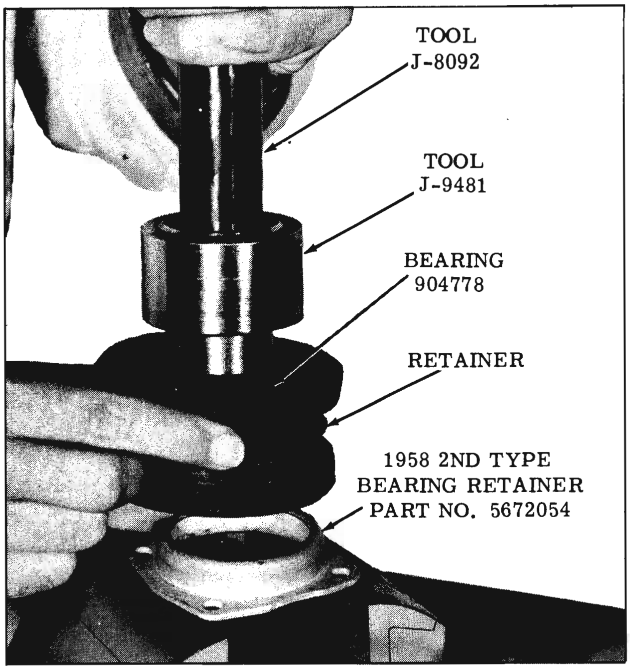


Fig. 6-146 Installing Bearing In Insulator

front of the bearing retainer with waterproof grease. (Fig. 6-147)

3. Drive center bearing assembly onto shaft until seated with Tool J-5922. (Fig. 6-148)

4. Place rear spacer, then nut retainer on the front propeller shaft with the tang of the retainer indexing the slot of the propeller shaft. The cupped side of the nut retainer must face rearward. (Fig. 6-142)

5. Apply Special Lubricant (Part No. 571035) to

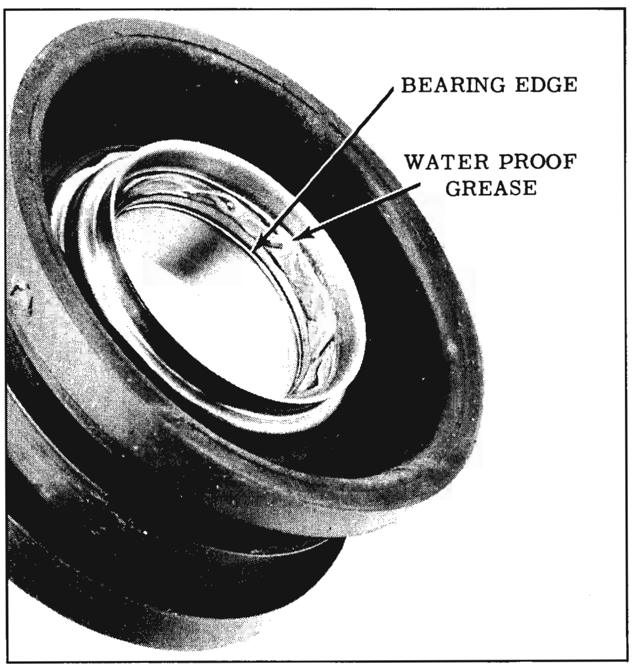


Fig. 6-147 Sealing Center Bearing

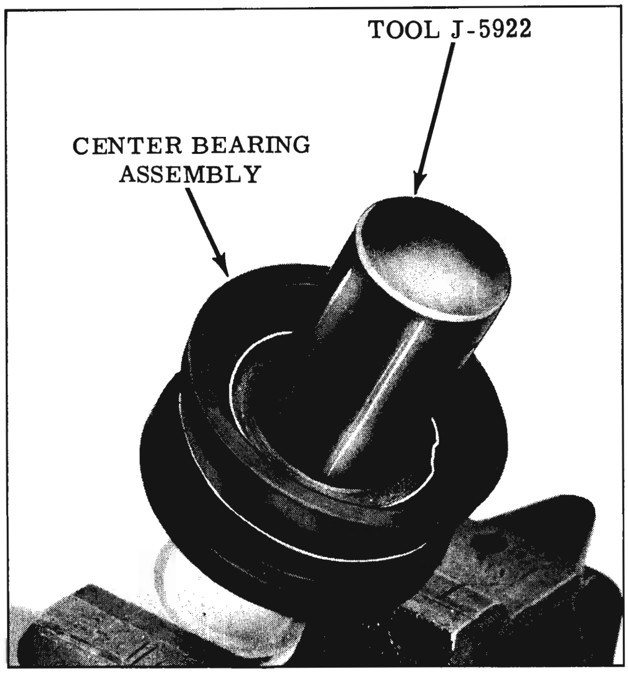


Fig. 6-148 Installing Center Bearing

the splines in the front propeller shaft.

6. If slip yoke seal was removed install a new seal at this time.

7. Align slip yoke index spring wire with the wide serration in the front propeller shaft, then insert slip yoke into front propeller shaft.

8. Torque slip yoke lock nut 50-75 ft. lbs. Crimp nut retainer against the nut in two places.

UNIVERSAL JOINTS

REMOVAL

1. With propeller shaft removed, remove all retaining rings that retain bearings in the yoke.

   NOTE: Mark all splined and shaft yokes (and joints if new joints are not to be installed) so that the units may be reassembled in their original position in order to maintain balance.

2. Position one end of propeller shaft on a vise so that the shaft yoke rests on the top of the vise jaws. The splined yoke or slip yoke must be free to move vertically between jaws of vise.

3. Apply force on yoke around bearing. This will drive splined or slip yoke down causing spider to force bearing partially out of the yoke.

   NOTE: When disassembling center support, the rear propeller shaft must be held above the horizontal to allow spider to move downward.

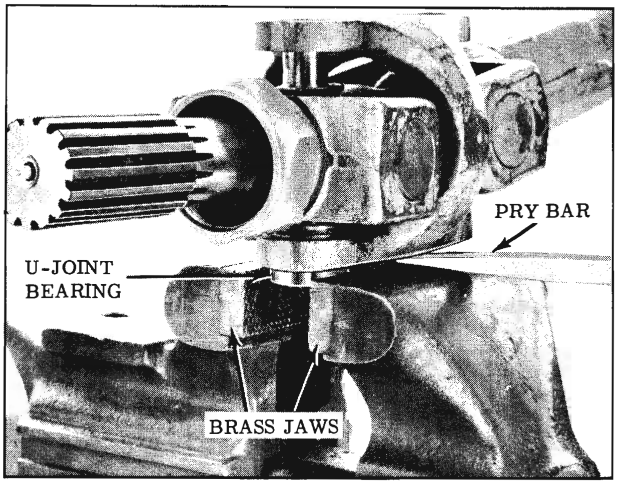


Fig. 6-149 Removal of "U" Joint Bearing

4. Clamp the partially exposed bearing in a brass jawed vise, then tap or pry yoke upward (Fig. 6-149), until bearing is removed. Remove bearing from vise.

5. To remove opposite bearing, rotate shaft one-half turn and repeat steps 2, 3, and 4.

6. Remove yoke or housing from spider.

7. Clamp shaft yoke in a vise.

   NOTE: Do not clamp the propeller shaft tube in a vise.

8. Drive on spider until bearing is partially forced out of yoke. (Fig. 6-150)

9. Clamp partially exposed bearing in a brass jawed vise and tap or pry upward on yoke until bearing is removed.

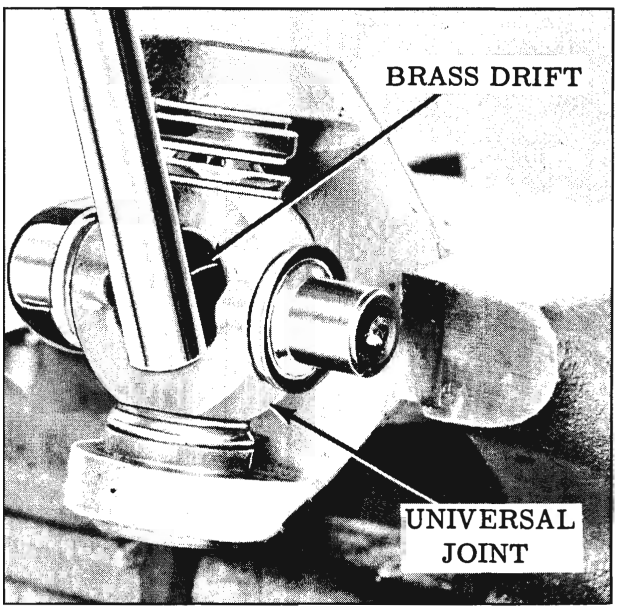


Fig. 6-150 Removing "U" Joint

10. To remove opposite bearing, repeat steps 1, 2, 3, 8 and 9.

11. Remove spider from shaft yoke.

CLEANING AND INSPECTION

1. Wash all parts thoroughly in cleaning solvent. Parts must be free of all grease and dry before relubrication.

2. If propeller shafts were separated, clean slip yoke splines thoroughly.

3. Inspect dust seals and shields for damage. Replace if necessary. Cork seals should be flexible. If brittle or hard replace seals.

4. Inspect roller bearing surfaces of spider journals, inner bearing surfaces of outer races and rollers for wear, scores, flat spots, or any other visible damage.

INSTALLATION

1. Lubricate each needle bearing assembly and fill the reservoir in each spider journal with a sodium soap, fine fiber grease.

2. Press cork dust seal into recess of bearings.

3. If new dust shields are to be installed, install at this time.

4. Position spider journal in a shaft yoke. Place joint in same position it was when removed if new joint is not used.

5. Press a bearing into one side of yoke, Fig. 6-151, until retaining ring can be installed.

6. Install retaining ring with the gap toward the yoke.

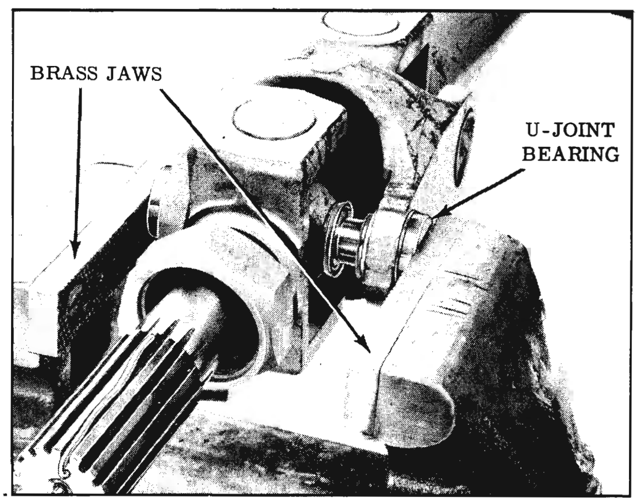


Fig. 6-151 Installing "U" Joint

7. Repeat steps 5 and 6 on opposite bearing. As the bearing is installed, align spider journal with the bearing.

8. To install a splined yoke or slip yoke onto a spider journal, position the yoke over the spider journal with scribe marks aligned, and repeat steps 5, 6, and 7.

9. Position bearings which attach to a companion flange, onto the spider journals and retain with wire or tape.

SLIP YOKE BALL SEAT

The slip yoke ball seat may be replaced by prying out the seal. The seat, spring and washer may then be removed.

When installing new seat, lubricate with wheel bearing grease and install new seal flush. Lubricate seal with waterproof grease.

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified minimum.

APPLICATION	FT. LBS.
DIFFERENTIAL	
Case Cover to Case Bolts (Anti-Spin)	30 to 40
Companion Flange to Differential Pinion	200
Differential Filler Plug	20 to 30
Propeller Shaft to Differential Companion Flange	14 to 18
Rear Axle Housing Cover to Carrier	25 to 28
Ring Gear Bolts	50 to 60
Side Bearing Cap Bolts	70 to 80
AXLES	
Rear Axle Bearing Retainer to Housing	45 to 60
Rear Wheel Hub Bolts	55 to 70
PROPELLER SHAFT	
Center Bearing Support to Cross Bar	20 to 30
Center Bearing Support Cross Bar Bracket to Side Rail	20 to 30
Propeller Shaft Center Bearing Slip Yoke Nut	50 to 75
Propeller Shaft to Front Companion Flange	14 to 18
Propeller Shaft to Rear Companion Flange	14 to 18

SPECIFICATIONS

DIFFERENTIAL	
LUBRICATION	
Capacity	2 pts. Approx.
Replenish (Conventional)	S.A.E. 90 Multi-Purpose Gear Lubricant Meeting Military Specification MIL-L-2105B
Replenish (Anti-Spin)	Special Lubricant Part No. 531536
ADJUSTMENTS	
Backlash	.007" to .009"
Drive Pinion Bearing Preload	
New Bearings	25 to 35 in. lbs.
Old Bearings	15 to 25 in. lbs.
Side Bearing Preload	
New Bearings	20 to 30 in. lbs.
Old Bearings	10 to 20 in. lbs.

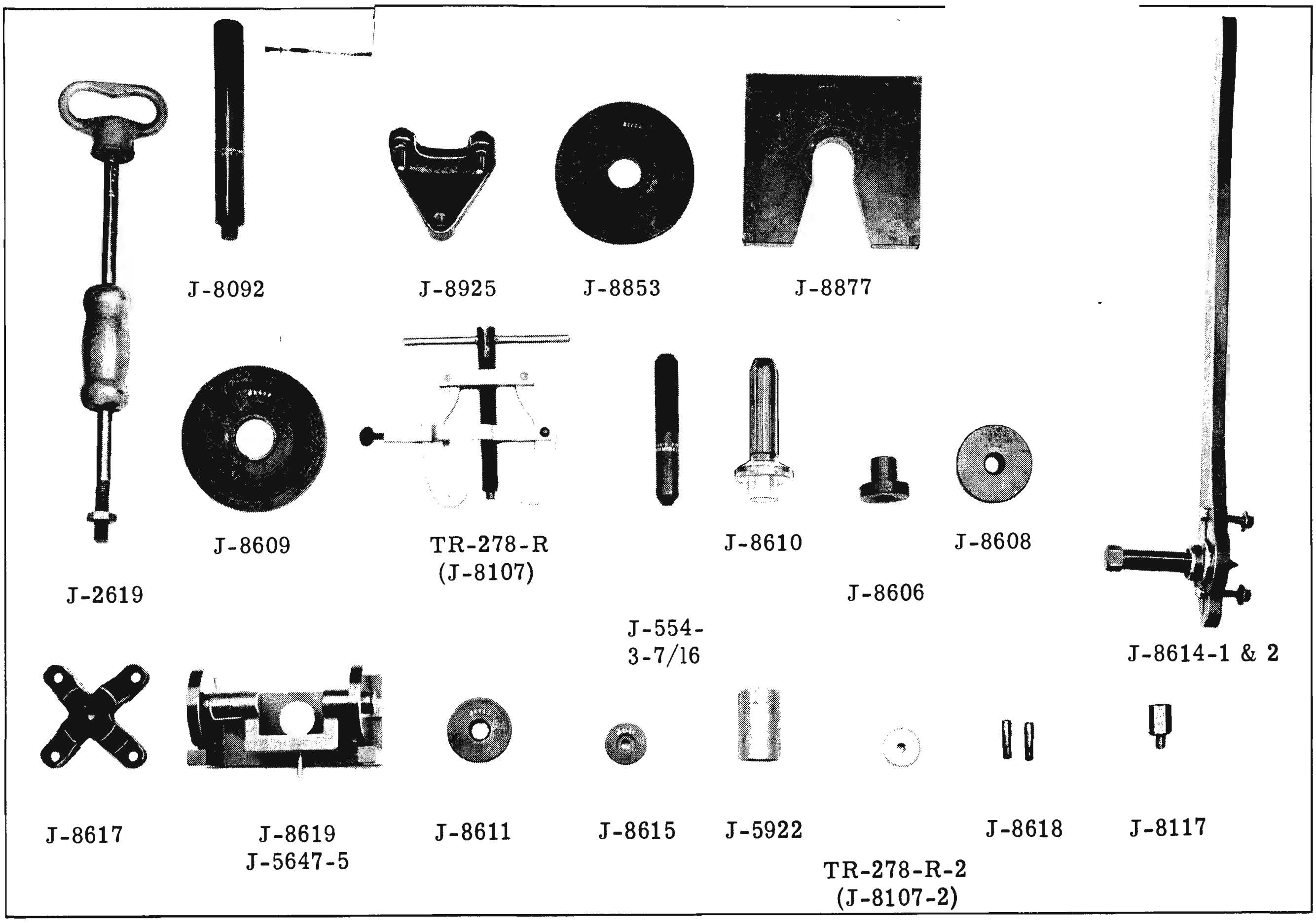


Fig. 6-152 Tools

TR-278-R&2	(J-8107 & 2) Differential Side Bearing Puller
J-554-3-7/16	Hub Bolt Peening Tool
J-2619	Slide Hammer Assembly
J-5647-5	Pinion Setting Gauge Disc (2)
J-5922	Seal Installer (Used for Installing Propeller Shaft Center Bearing)
J-8092	Driver Handle
J-8117	Adapter
J-8606	Differential Side Bearing Installer
J-8608	Rear Pinion Bearing Cup Installer
J-8609	Rear Pinion Bearing Installer
J-8610	Axle Bearing Seal Installer
J-8611	Front Pinion Bearing Cup Installer
J-8614-1&2	Companion Flange Holder and Remover
J-8615	Adapter Plug Side Bearing Remover
J-8617	Axle Shaft Remover
J-8618	Ring Gear to Case Alignment Studs
J-8619	Pinion Setting Gauge
J-8853	Axle Bearing Installer Plate
J-8877	Axle Bearing Puller Plate
J-8925	Differential Case Assembly Puller

BRAKES

(FULL SIZE CAR)

CONTENTS OF SECTION 7

PERIODIC MAINTENANCE

Each time the car is in the service department, the brake pedal height should be observed. If the brake pedal travel from the released to the fully applied position (engine running, power brakes) exceeds 1-7/8" or 4" on standard brakes. The car should be driven alternately forward and backward, and the brakes applied moderately each time to operate the self-adjuster until proper pedal height is obtained. If brake pedal travel cannot be reduced in this manner, the drums should be removed and the self-adjusting mechanism inspected for the cause of inoperation.

The fluid in the master cylinder reservoir should be checked at every engine oil change interval. Fluid level should be 1/4 inch on Moraine and 3/4 inch on Bendix below the reservoir opening. Replenish as necessary with Brake Fluid, Super No. 11.

Brake hoses and lines should be inspected for chafing, deterioration or other damage.

Brake linings should be periodically inspected for wear. The frequency of this inspection depends upon driving conditions such as traffic or terrain, and also the driving techniques of individual owners.

DESCRIPTION

The braking system consists of hydraulically operated brakes that apply the brake shoes simultaneously at all four wheels, and a mechanically operated parking brake that applies the brake shoes at the rear wheels only.

HYDRAULIC BRAKE

When the hydraulic brake pedal is depressed, the piston in the master cylinder forces fluid under pressure to a wheel cylinder at each wheel, which in turn push the brake shoes against the brake drum. As the shoes contact the drum, the friction between the shoes and the rotating drum moves the primary shoe downward against the adjusting screw which acts as a link to transmit the force of the primary shoe to the lower end of the secondary shoe. With the upper end of the secondary shoe being held by the stationary anchor pin, the secondary shoe is "wedged" against the drum. This "wedging" action, due to frictional force,

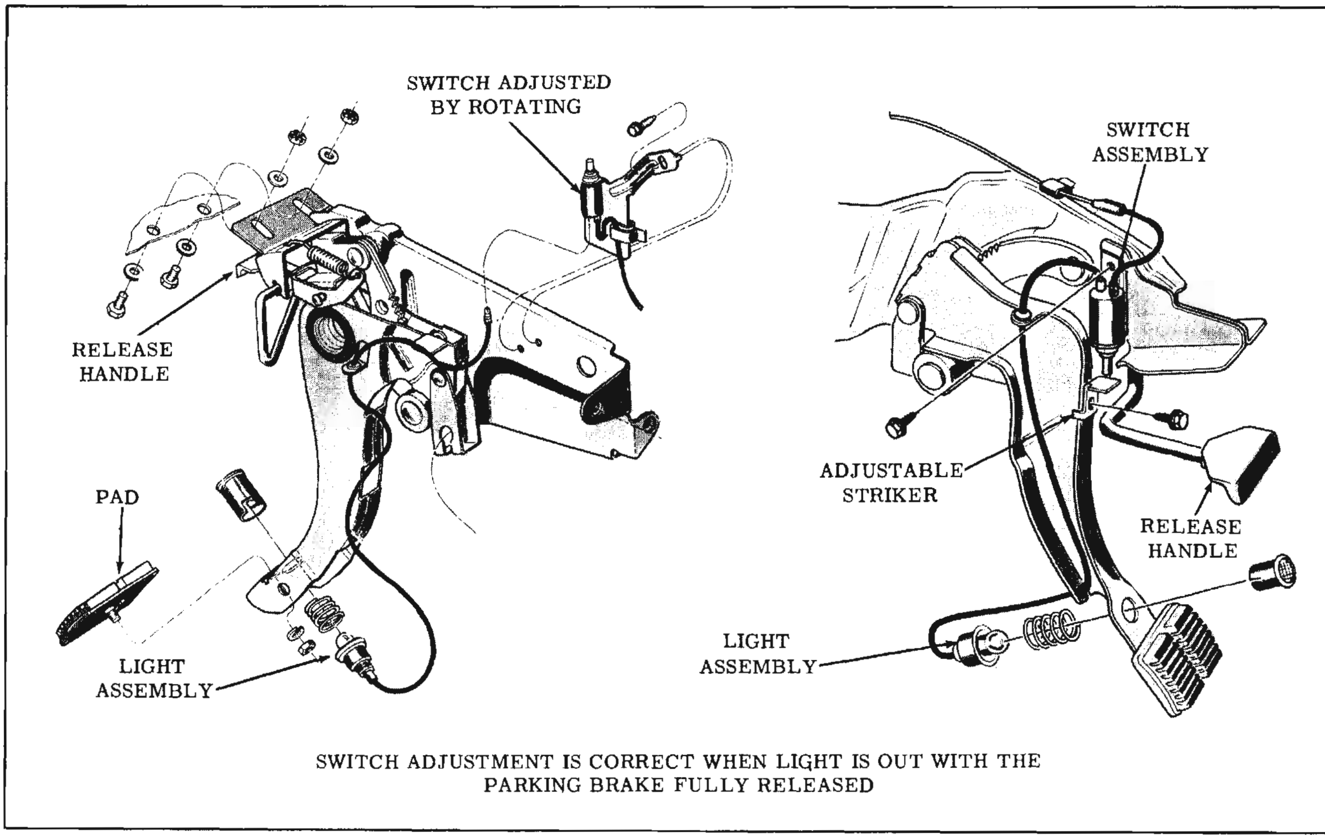


Fig. 7-1 Parking Brake

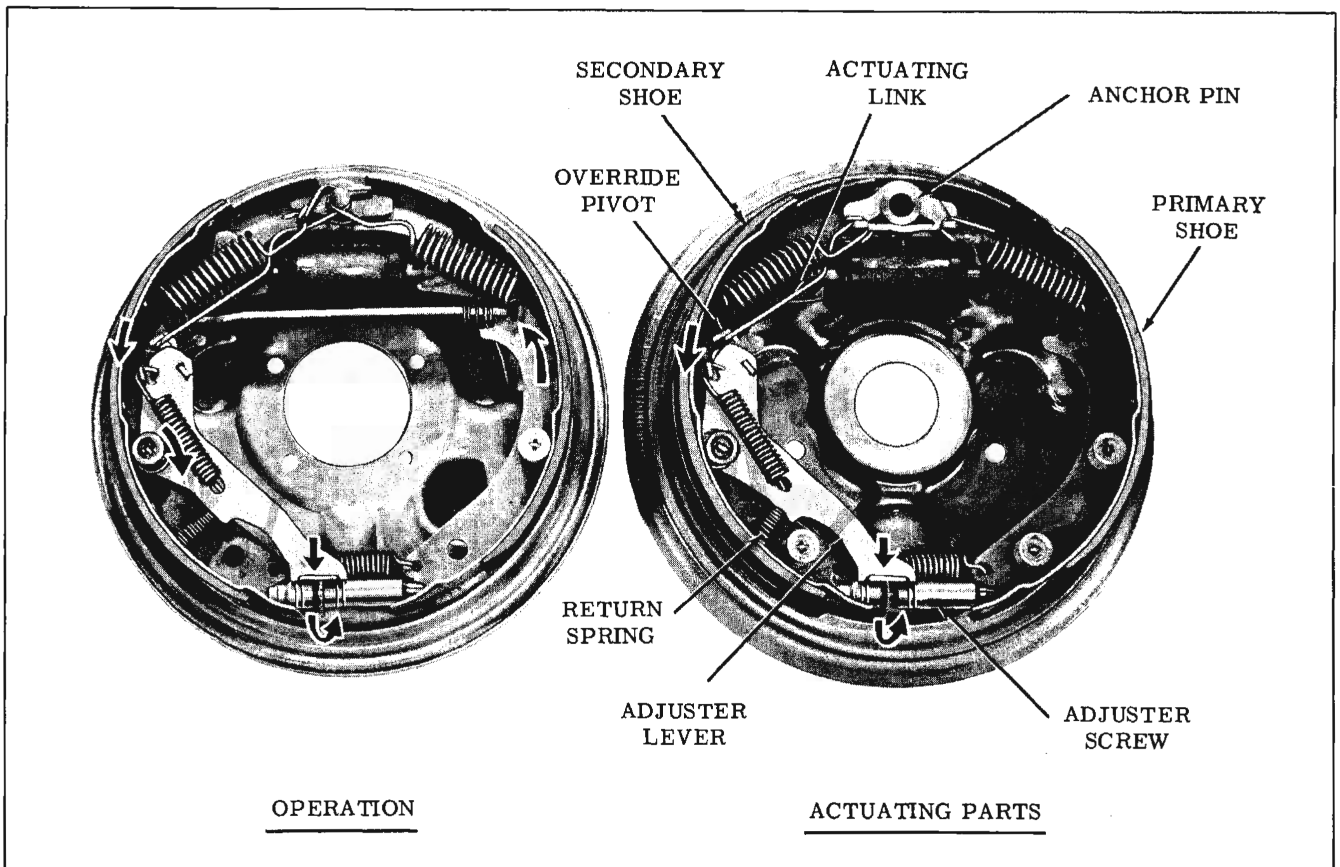


Fig. 7-2 Self Adjusting Brakes

imparts the self energizing action to the braking effort and thereby decreases the effort required by the driver to stop the car.

PARKING BRAKE (Fig. 7-1)

The parking brake applies the rear brakes through cable and linkage by means of a foot operated parking brake pedal mounted below the instrument panel. The parking brake is released by lifting the release handle.

SELF ADJUSTING BRAKE

General Description

All cars are equipped with self-adjusting brakes. The self-adjusting brake mechanism consists of an actuating link, adjuster lever, adjuster lever return spring, override spring and override pivot.

Operation (Fig. 7-2)

The self-adjusting brake mechanism operates only when the brakes are applied while the car is moving rearward and only when the secondary shoe moves a pre-determined distance toward the brake drum.

As the car moves rearward and the brakes are applied, friction between the primary shoe and the drum forces the primary shoe against the anchor pin. Hydraulic pressure in the wheel cylinder forces the upper end of the secondary shoe away from the anchor pin. As the secondary shoe moves away from the anchor pin, the upper end of the adjuster lever is prevented from moving by the actuating link. This causes the adjuster lever to pivot on the secondary shoe forcing the adjuster lever against the adjusting screw sprocket. If the brake linings are worn enough to allow the secondary shoe to move the pre-determined distance, the adjuster lever will turn the adjusting screw sprocket one or two teeth, depending on lining wear. If the secondary shoe does not move the pre-determined distance, movement of the adjuster lever will not be great enough to rotate the adjusting screw sprocket.

When the brakes are released, the adjusting lever return spring will move the adjusting lever into the adjusting position on the sprocket.

An override feature is built into the self-adjusting brake which allows the secondary shoe to be applied in reverse in the event the adjusting screw becomes "frozen" preventing the self-adjuster from operating.

When the car is moving forward and the brakes are applied, the upper end of the secondary shoe is forced against the anchor pin due to the self-energizing action of the brakes, and the self-adjuster does not operate.

PARKING BRAKE LIGHT SWITCH

The parking brake light switch is bolted to the pedal mounting bracket and is actuated by a striker on the pedal.

To adjust switch, refer to Fig. 7-1.

STOPLIGHT SWITCH

The stoplight switch is bolted to the brake pedal bracket and is actuated by an adjustable contact screw mounted on the brake pedal arm.

Adjustment

The stop light switch must be checked whenever brake pedal height has been changed. Adjustment is made with an adjustable contact screw on the pedal arm. To obtain proper operation of the stop lights, adjust the screw as follows:

1. With brake pedal in the fully released position, turn adjusting screw until stop lights just go "off"; then back-up adjusting screw three turns.
2. Check stop light switch operation by applying and releasing the brake, making certain that stop lights go "off" when brake pedal is in fully released position.

BRAKE SHOE ADJUSTMENTS

A brake shoe adjustment is required only when new linings are installed or whenever the length of the brake shoe adjusting screw has been manually changed.

1. With the brake drums removed, position Gauge BT-6211 over the brake linings as shown in Fig. 7-3 (Gauge is offset for oversize linings.)

NOTE: To determine if linings are oversize or standard, position Gauge BT-6211 over side of brake drum. Diameter of brake drum will be an indication as to the size of the linings.

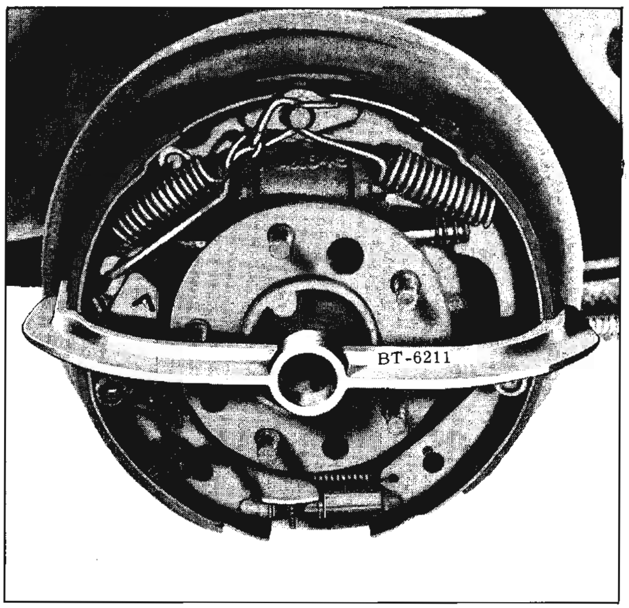


Fig. 7-3 Brake Shoe Gauge

2. Adjust brake shoes until gauge is a snug fit on linings. Rotate gauge slightly to insure that gauge is contacting the linings at the largest diameter.

   NOTE: If it is necessary to back off the brake shoe adjustment, it will be necessary to hold the adjuster lever away from the sprocket.

3. Remove the gauge.

BRAKE PEDAL ADJUSTMENTS (Standard Brakes)

An incorrectly adjusted brake pedal can hold the master cylinder piston from fully returning to its released position, which will result in brake drag or lock-up.

1. Remove the pedal return spring and the master cylinder push rod clevis pin.

2. Turn back floor mat and check pedal height (from floor pan to top of pedal pad). If dimension is not 7-15/16" ± 1/8", loosen lock nut and adjust stop screw. (Fig. 7-4) Tighten lock nut and recheck adjustment.

3. To adjust the master cylinder push rod, lightly push the master cylinder push rod until it contacts the hydraulic piston.

4. Loosen lock nut and adjust push rod until clevis pin can be freely installed into the brake pedal, then shorten push rod one turn for proper free play.

5. Tighten lock nut and connect push rod to brake pedal.

   NOTE: Whenever the brake pedal height has been changed, the stop light switch adjustment should be checked and adjusted if necessary.

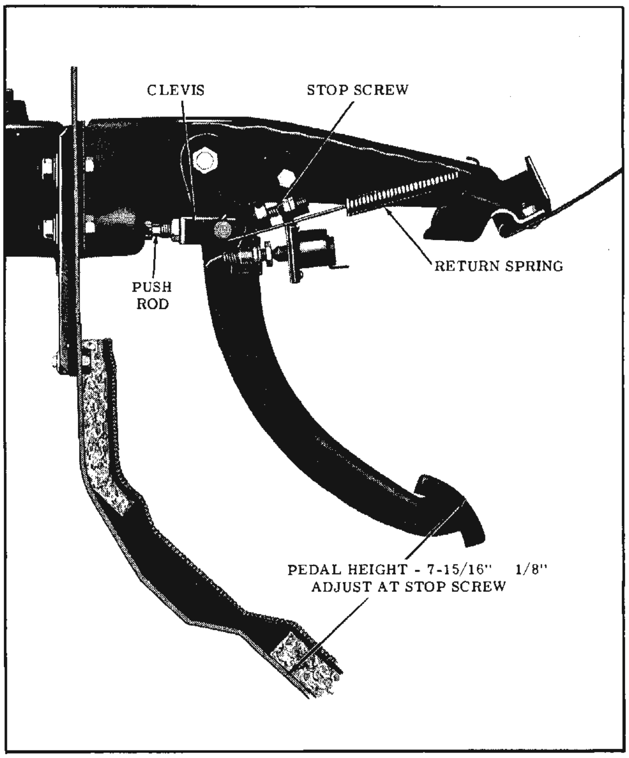


Fig. 7-4 Brake Pedal Adjustment

PARKING BRAKE ADJUSTMENT

1. Release parking brake.

2. Be sure hydraulic brake pedal travel is within specifications before adjusting parking brake.

3. Adjust rear cables by first tightening equalizer adjusting nut until a heavy resistance is felt when rotating rear wheels forward, then loosen equalizer adjusting nut 10 full turns. (Fig. 7-5)

MINOR SERVICE OPERATIONS

BRAKE PEDAL AND BRACKET (Standard Brakes)

The brake pedal is suspended from a mounting bracket under the instrument panel. Nylon bushings between the pivot bolt and the pedal eliminates periodic lubrication. The pedal is connected to the master cylinder push rod by a clevis.

BRAKE PEDAL—REMOVE AND INSTALL (Fig. 7-6)

1. Disconnect the pedal return spring. Remove clevis pin.

2. On synchromesh equipped cars, remove the L.H. pivot bolt nut and flat washer, then loosen the pivot bolt until it is free of the R.H. nut (welded to the bracket).

   The brake pedal can now be removed without removing the clutch pedal by pulling the pivot bolt to the left until it clears the brake pedal.

3. On Hydra-Matic equipped cars, loosen the pivot bolt nut, then remove the pivot bolt and brake pedal.

   To install, lubricate inside of nylon bushings, clevis pin and stoplight switch bolt head with lubricant, Part No. 567196 and reverse the procedure. Torque pivot bolt nut 10 to 18 ft. lbs. Adjust brake pedal as outlined under BRAKE PEDAL ADJUSTMENTS (Standard Brakes).

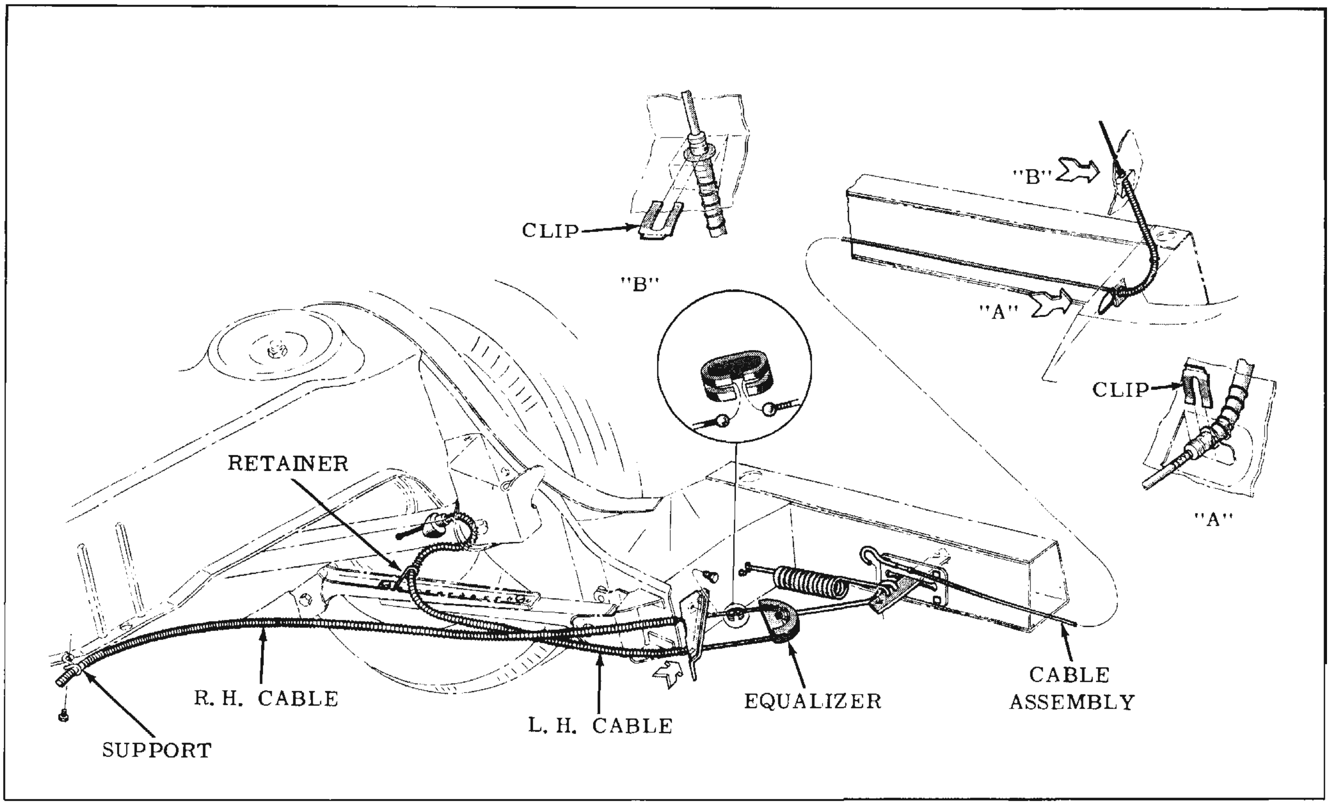


Fig. 7-5 Parking Brake Linkage

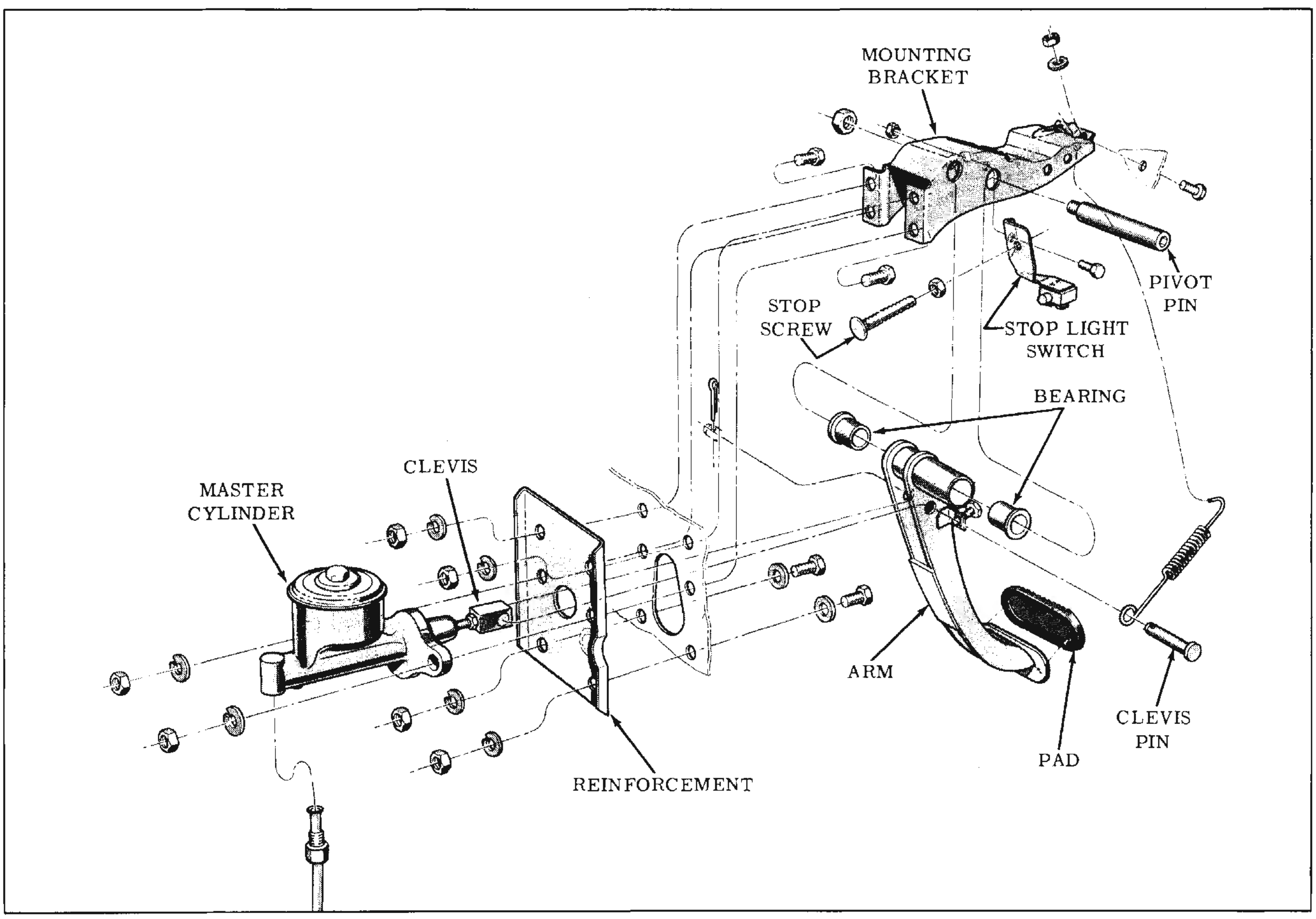


Fig. 7-6 Standard Brake Layout

HYDRAULIC SYSTEM

BLEEDING OF LINES

Whenever a line is disconnected from any wheel, it is necessary that the wheel cylinder be bled. If the hydraulic line is disconnected from the master cylinder or the brake pedal has a spongy feeling, each wheel cylinder must be bled to expel air from the system.

NOTE: Power brakes can be bled in the same manner as a standard brake system. If pressure bleeding equipment is not available, DO NOT use the vacuum assist. With the engine shut off, the vacuum reserve should be depleted by applying the brakes several times before starting the bleeding procedure.

The system can be bled manually or by using pressure bleeding equipment.

To bleed the system, the following procedure is recommended:

The correct sequence for bleeding is left front, right front, left rear, right rear.

1. If brakes are to be bled manually, fill the brake reservoir with Brake Fluid Super No. 11 and KEEP AT LEAST ONE-HALF FULL OF FLUID DURING THE BLEEDING OPERATION.

2. If brakes are to be bled with pressure equipment, connect the tank to the brake reservoir and raise the pressure in the brake system to 20 to 30 p.s.i.

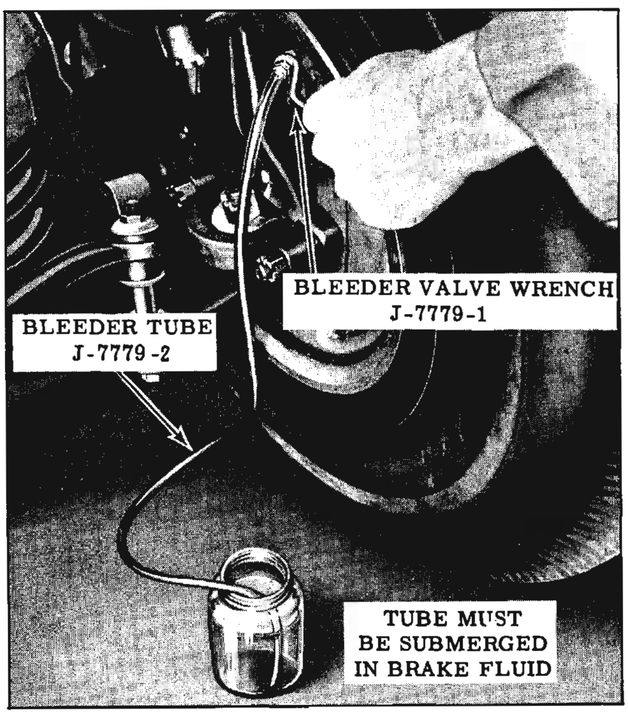


Fig. 7-7 Bleeding Brakes

3. Attach Bleeder Tube J-7779-2 to bleeder valve. (Fig. 7-7) THE TUBE MUST HANG SUBMERGED IN A CLEAN CONTAINER PARTIALLY FILLED WITH BRAKE FLUID SUPER NO. 11 DURING THE BLEEDING OPERATION.

4. Unscrew bleeder valve three quarters of a turn with a wrench such as J-7779-1 and watch flow of fluid from bleeder tube. When all air bubbles cease to appear and fluid is clear, close bleeder valve.

   NOTE: If brakes are bled without the aid of pressure equipment, the brake pedal must be operated during this operation to force the fluid from the bleeder hose. To do this, open the bleeder valve, fully depress the brake pedal, then slowly release pedal until it is in the fully released position. Continue operating pedal until liquid, containing no air bubbles, emerges from bleeder tube. Close bleeder valve.

5. Remove bleeder tube.

6. Repeat steps on the remaining wheel cylinders if the entire system is to be bled.

7. If the brakes were bled manually, check fluid in reservoir and replenish if necessary, after the bleeding operation has been completed.

FLUSHING HYDRAULIC SYSTEM

Whenever mineral oil has been introduced into the hydraulic system, the entire system must be thoroughly flushed with brake Flushing Fluid and all rubber parts must be replaced. The brake Flushing Fluid is introduced into the master cylinder reservoir and expelled at each wheel cylinder in the same manner as the bleeding operation (See BLEEDING OF LINES).

When flushing is completed, bleed the hydraulic system with Brake Fluid Super No. 11 until all flushing fluid and air is expelled from the lines.

MASTER CYLINDER

STANDARD AND POWER

The standard brake master cylinder can be removed without disconnecting the push rod and clevis. The hydraulic master cylinder, on cars equipped with power brakes, can be removed and serviced without removing the vacuum cylinder from the car. Power brake units can be identified by the bronze Moraine vacuum cylinder and the black Bendix vacuum cylinder.

REMOVE (Fig. 7-6)

1. Be sure area around master cylinder is clean,

then disconnect the hydraulic line at the master cylinder. Plug or tape end of line to prevent entrance of dirt.

2. Remove master cylinder by removing the attaching nuts.

3. Drain master cylinder.

INSTALL

1. To install the standard brake master cylinder:

   a. Lubricate push rod with a light film of lubricant, Part No. 567196 to facilitate positioning of rubber boot on push rod after master cylinder is installed.

   b. Position master cylinder against cowl, push boot onto push rod and guide push rod into master cylinder piston cavity.

   c. Install the attaching nuts and lock washers. Torque nuts 20 to 28 ft. lbs.

   d. From inside car, pull boot along push rod toward clevis until boot is fully extended. Check brake pedal as outlined under BRAKE PEDAL ADJUSTMENTS (Standard Brake).

2. To install the power brake master cylinder:

   a. Position a new master cylinder to vacuum cylinder "O" ring on flange of master cylinder. Lubricate "O" ring with a light film of clean brake fluid.

   b. Position master cylinder so that push rod enters cavity in master cylinder piston.

   NOTE: If a new push rod was installed, adjust push rod as outlined under PUSH ROD ADJUSTMENT.

   c. Install master cylinder attaching nuts and lock washers. Torque 15 to 20 ft. lbs.

3. Install hydraulic line to master cylinder.

4. Fill master cylinder resevroir with Brake Fluid Super No. 11 and bleed all wheel cylinders as outlined under BLEEDING OF LINES.

DISASSEMBLY (Figs. 7-8 and 7-9)

1. Standard brake - remove boot from master cylinder.

2. Remove the piston retaining ring from the bore of the master cylinder and remove piston.

3. Remove the primary cup, spring and residual check valve from bore of master cylinder.

4. On Moraine power and standard master cylinder, remove the rubber valve seat washer from cylinder bore with a wire hook.

5. Power brake - remove master cylinder to vacuum cylinder "O" ring.

CLEANING AND INSPECTION

1. Wash all parts in brake flushing fluid and blow out all passages with compressed air. Be sure compensating port is open.

2. Inspect cups, residual check valve, valve seat washer and secondary seals for a swelling or distorted condition. Replace if damaged. If such a condition exists, the entire system should be flushed (See FLUSHING HYDRAULIC SYSTEM) and all rubber parts in the wheel cylinders should be inspected and replaced if damaged.

3. Inspect the master cylinder bore for scores, rust, pits or etches. If any of these conditions exist, the complete master cylinder must be serviced as an assembly.

   CAUTION: Do not attempt to hone the master cylinder bore as a means of salvaging the cylinder assembly. Reconditioning of the bore leaves the walls sufficiently rough to cause premature failure of the rubber cups. It also enlarges the bore to the extent that the standard size piston and seals will not fit properly.

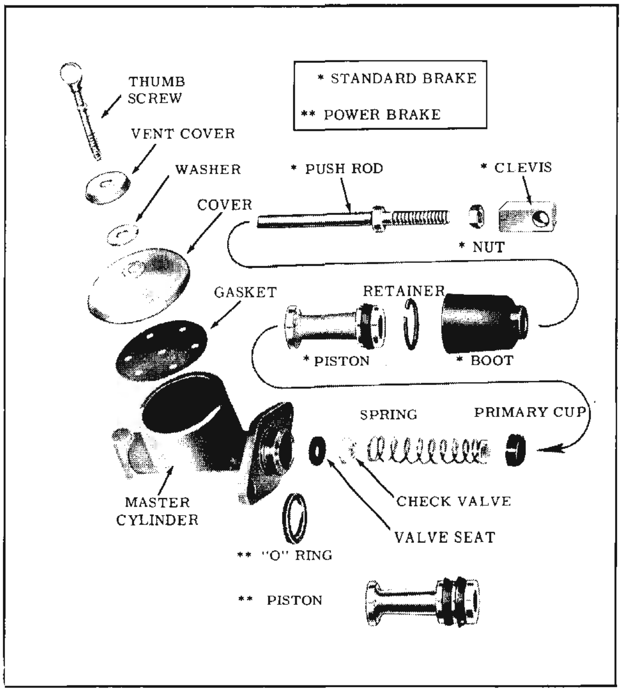


Fig. 7-8 Master Cylinder (Moraine)

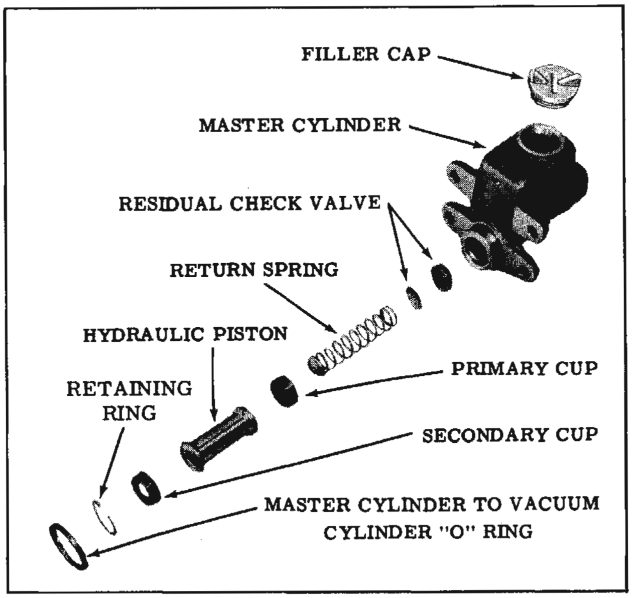


Fig. 7-9 Master Cylinder (Bendix)

ASSEMBLY (Figs. 7-8 and 7-9)

1. Lubricate master cylinder bore and all rubber parts with Brake Fluid Super No. 11.
2. Install check valve rubber washer against the shoulder inside the master cylinder bore.
3. Install large end of spring over residual check valve, then install the assembly into the bore (check valve end first).
4. Install primary cup over end of spring (dish side toward spring).
5. Install piston into bore and while compressing spring, install retaining ring.
6. Standard brake - install boot over lip of master cylinder casting.
7. Bendix and Moraine power brake - install the master cylinder to vacuum cylinder "O" ring on the flange of the master cylinder.

WHEEL CYLINDERS (Fig. 7-10)

REMOVE AND INSTALL

1. Remove brake drums and shoes as outlined under DRUM AND BRAKE ASSEMBLIES, REMOVE.
2. Front Wheel cylinder:
   a. Remove brake line from brake hose.
   b. Remove the brake hose retainer clip at the frame bracket.

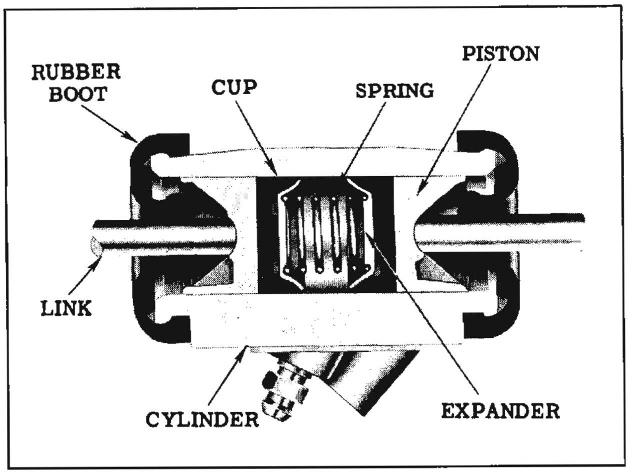


Fig. 7-10 Wheel Cylinder

   c. Remove brake hose from wheel cylinder.
3. Rear wheel cylinder - remove the brake line from the wheel cylinder.
4. Remove the wheel cylinder to backing plate attaching bolts and remove wheel cylinder.

To install, reverse the removal procedure, torque wheel cylinder to backing plate bolts 10 to 18 ft. lbs. and bleed the lines. (See BLEEDING OF LINES)

DISASSEMBLY

1. Remove links and rubber boots.
2. Remove pistons, cups, expanders and spring from wheel cylinder bore.

CLEANING AND INSPECTION

1. Wash all metal parts in brake flushing fluid and blow out all passages with compressed air.
2. Inspect cups for a swelling or distorted condition, replace if damaged. If a swelling condition exists, the entire hydraulic system should be flushed (see FLUSHING HYDRAULIC SYSTEM) and all the rubber parts in the hydraulic system should be inspected and replaced if damaged.
3. Inspect the wheel cylinder bore for scores, rust, pits or etches. If any such conditions exist, the complete wheel cylinder will have to be replaced as an assembly.

   CAUTION: Do not attempt to recondition a wheel cylinder bore as a means of salvaging the cylinder. Reconditioning of the bore leaves the walls sufficiently rough to cause premature failure of the rubber cups. It also enlarges the bore to the extent that the standard size pistons and seals will not fit properly.

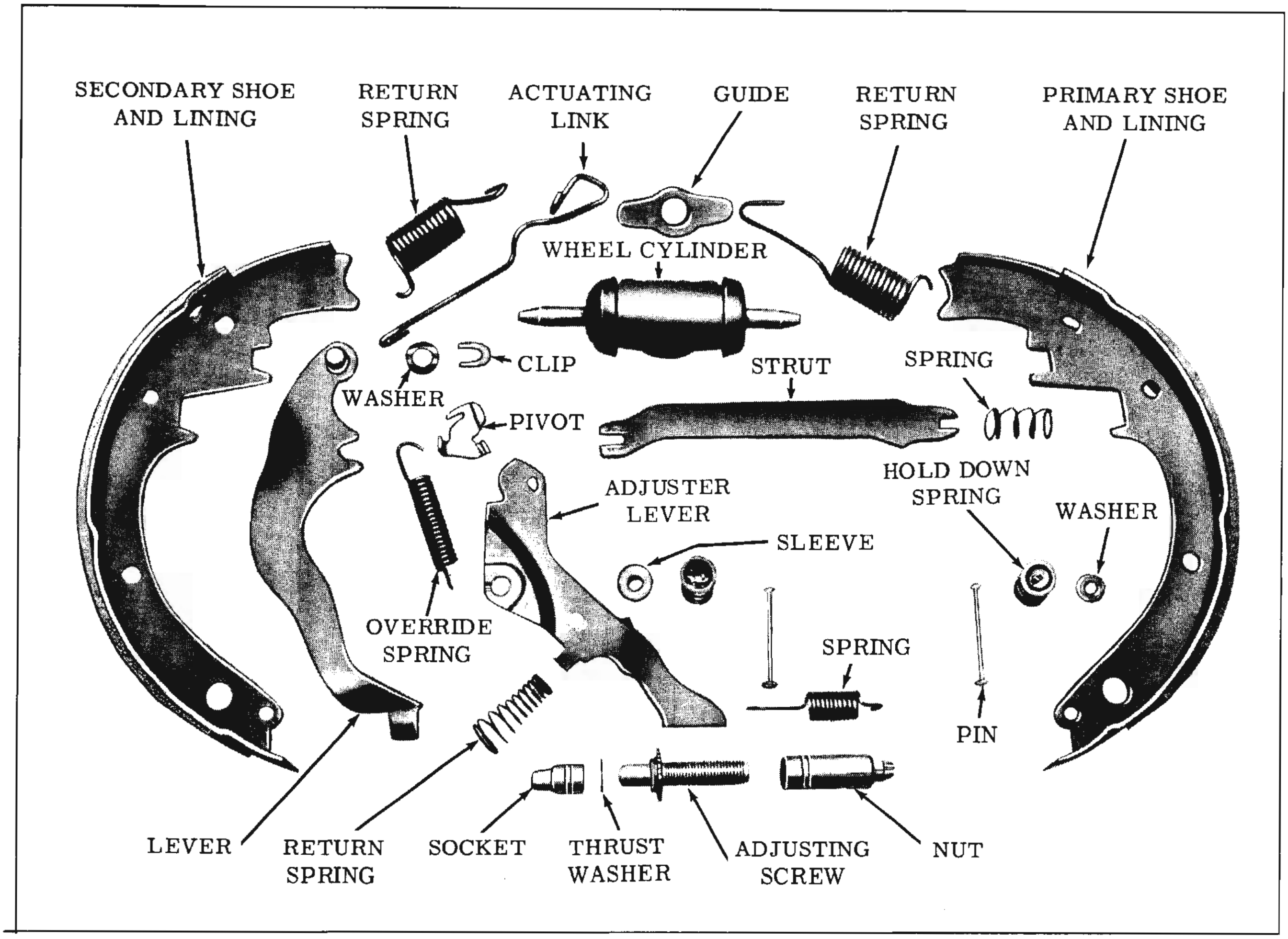


Fig. 7-11 Brake Assembly (Rear Shown)

ASSEMBLY

Lubricate the bore of the wheel cylinder and all rubber parts with Brake Fluid Super No. 11 and assemble as shown in Fig. 7-10.

DRUMS AND BRAKE ASSEMBLIES

INSPECTION

Whenever brake drums are removed, they should be inspected for scores, deep grooves, cracks and out of round.

Cracked drums must be replaced, however, cracks running circumferentially at the back corner of drum where the cast iron blends into the steel portion of the drum are of no consequence and drums should not be replaced.

NOTE: Grooves extending around the entire braking surface of the brake drum are permissible providing the edges of the grooves that contact the shoes are smooth.

Drum out of round can be measured with a dial indicator and extension rod. Out of round measurements exceeding .005" front drum and .006" rear drum, (total indicator reading) require turning or replacement of drum.

TURNING DRUMS

If irregularities in the braking surface of the drum cannot be removed with emery cloth or out of round exceeds .005" front drum and .006" rear drum (total indicator reading), the drum should be turned to .060" greater than the original inside diameter; that is, after being turned the diameter should be 11.060". Oversize brake linings must be used with turned drums.

REPLACING DRUMS

Whenever new drums are to be installed, the braking surface of the drum must be thoroughly cleaned with lacquer thinner to remove the rust proof coating.

BRAKE LINES

When replacing a damaged brake line, the damaged section should be cut out and repaired with steel brake tubing, listed under Group 8.964 in the Chassis Parts Book. Flare connections must be a double lap. Follow Flaring Tool Manufacturer's instructions for proper flaring of the double lap flare.

BRAKE LINING (Fig. 7-11)

If linings are worn nearly flush with the rivets, new linings should be installed.

When brake lining replacement is necessary, it is recommended that all the linings be replaced. In some cases where there is extremely low mileage on the brake lining, it is permissible to replace the lining on one wheel when brake fluid or other foreign material has caused premature damage to the lining.

FRONT BRAKE AND BACKING PLATE

Remove

1. Hoist car.
2. Remove the hub and drum assembly and the inner bearing inner race from the steering knuckle.

   NOTE: It may be necessary to back-off the brake shoe adjustment before the brake drum can be removed. To back off the brake shoe adjustment, refer to Fig. 7-12.

3. Remove the primary and secondary shoe return springs and the actuating link.
4. Remove the brake shoe hold down springs, pins and washers and the adjuster lever and return spring.
5. Spread shoes to clear wheel cylinder links, then remove the primary and secondary shoes as an assembly.
6. Remove the primary to secondary shoe spring and the adjusting screw.
7. If the front backing plate is to be removed, proceed as follows:

   a. Loosen lock tab from anchor pin, then remove the anchor pin bolt.

   b. Remove the brake hose from the brake line.

   c. Remove the wheel cylinder and brake hose from the backing plate.

   d. Remove the plain arm to steering knuckle to backing plate bolts and nuts, then remove the backing plate.

REAR BRAKE AND BACKING PLATE

Remove

1. Hoist car, remove wheel and brake drum.

   NOTE: It may be necessary to back off the brake shoe adjustment before the brake drum can be removed. To back off brake shoe adjustment, refer to Fig. 7-12.

2. Disconnect the parking brake cable from the operating lever.
3. Remove the brake shoe return springs, actuating link and guide.
4. Remove the brake shoe hold down springs, the adjuster lever and return spring and the parking brake lever strut and spring.
5. Spread shoes to clear wheel cylinder links, then remove the brake shoes as an assembly.
6. If necessary to remove the rear backing plate, proceed as follows:

   a. Remove the axle shaft. (Refer to AXLE SHAFT-REMOVE, SECTION 6)

   b. Remove brake line from wheel cylinder, remove wheel cylinder from backing plate.

   c. Disconnect the parking brake cable from the backing plate.

   d. Remove the backing plate.

CLEANING AND INSPECTION

1. Inspect linings for wear. If linings are worn

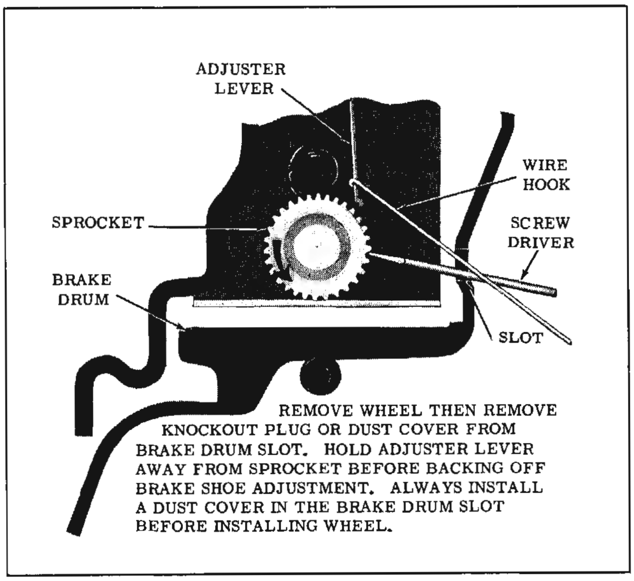


Fig. 7-12 Backing Off Brake Shoe Adjustment

nearly flush with rivets, new linings should be installed.

2. Loosen wheel cylinder boot and inspect wheel cylinder for brake fluid leakage. If leak exists, remove wheel cylinder for service or replacement.

3. Clean inner surfaces of brake backing plates and all shoe contacting points.

4. Clean exposed portions of parking brake cables.

5. Disassemble the adjusting screw assembly. Clean and inspect as follows:

   a. Check thrust washer and mating surfaces for burrs or excessive wear.

   b. Inspect teeth on sprocket for wear.

   c. Remove all foreign material from adjusting screw and nut. Nut must rotate freely on threads.

6. Check the foot of the adjuster lever for wear. Replace if necessary.

7. Check the override pivot for wear or deformed parts.

8. Check brake drum for build-up of rust and dirt at outer circumference. Remove build-up so that drums can be installed over pre-adjusted linings. Check drum for cracks and an out of round condition.

FRONT BRAKE AND BACKING PLATE

Install

1. If the front backing plate was removed, install as follows:

   a. Position the backing plate on the steering knuckle. Install the two plain arm to steering knuckle to backing plate bolts and nuts. Torque nuts 80 to 130 ft. lbs.

   b. Install the wheel cylinder. Torque attaching nuts 8 to 12 ft. lbs. Connect brake hose to brake line. Tighten brake line fittings 8 to 12 ft. lbs.

   c. Install the brake hose retainer.

   d. Position a new lock tab over the anchor pin bolt and install bolt.

   e. Align the slot in the lock tab with the boss on the wheel cylinder. Torque anchor pin bolt 120 to 145 ft. lbs. Bend lock tab down until it contacts the anchor pin bolt head.

2. Lubricate the adjusting screw threads, thrust washer mating surfaces and backing plate ledges with brake lubricant, Part No. 987786.

3. Assemble the adjusting screw.

4. Attach the primary to secondary shoe spring to the shoes, and install the adjusting screw. The primary to secondary shoe spring must not contact the adjusting screw sprocket.

   IMPORTANT: THE RIGHT FRONT ADJUSTING SCREWS HAVE LEFT HAND THREADS IDENTIFIED BY TWO V-GROOVES ON THE NUT. THE LEFT FRONT ADJUSTING SCREWS HAVE RIGHT HAND THREADS IDENTIFIED BY TWO FLAT GROOVES ON THE NUT. ALL ADJUSTING SCREWS MUST BE INSTALLED WITH THE SOCKET TOWARD THE SECONDARY SHOE.

5. Position shoe assembly on the backing plate. Be sure wheel cylinder links are properly positioned in the shoe notches.

6. Position the upper end of the actuating link on the brake shoe guide.

7. Engage the actuating link with the override pivot then position the adjuster lever and return spring on the secondary shoe. Fasten with the red hold down spring assembly.

   NOTE: The front brake uses 4 hold down springs. The spring retaining pins are identified with the numeral 1 stamped on the outer face.

8. Install the remaining hold down springs.

9. Install the primary and secondary brake shoe return springs.

10. Adjust brake shoes as outlined under ADJUSTMENTS - BRAKE SHOE.

11. Install the front hub and drum assembly. Adjust wheel bearings as outlined under WHEEL BEARING ADJUSTMENT, Section 5.

12. If wheel cylinder was removed, bleed brakes.

13. Check fluid level in master cylinder. Fluid level should be 1/4" on Moraine and 3/4" on Bendix below the reservoir opening.

14. Check brake pedal travel to be sure it is within specifications, then road test car for proper operation of the brake system.

REAR BRAKE AND BACKING PLATE

Install

1. If backing plate was removed, install as follows:

a. Install wheel cylinder on backing plate. Torque attaching bolts 8 to 12 ft. lbs.

b. Position backing plate on axle housing and install the axle shaft. Torque the backing plate to axle housing bolts 23 to 28 ft. lbs.

c. Install the parking brake cable on the backing plate.

2. Lubricate the adjusting screw threads, thrust washer mating surfaces and backing plate ledges with brake lubricant, Part No. 987786.

3. Pull parking brake cables forward and rearward through conduits, lubricate freely with Lithium Soap Grease and return cable to normal position. Remove any excess lubricant.

4. Install the parking brake lever to the secondary shoe.

5. Assemble the adjusting screw.

6. Attach the primary to secondary shoe spring to the shoes, and install the adjusting screw. The primary to secondary shoe spring must not contact the adjusting screw sprocket.

   IMPORTANT: THE RIGHT REAR ADJUSTING SCREWS HAVE LEFT HAND THREADS IDENTIFIED BY TWO V-GROOVES ON THE NUT. THE LEFT REAR ADJUSTING SCREWS HAVE RIGHT HAND THREADS IDENTIFIED BY TWO FLAT GROOVES ON THE NUT. ALL ADJUSTING SCREWS MUST BE INSTALLED WITH THE SOCKET TOWARD THE SECONDARY SHOE.

7. Position shoe assemblies on the backing plate. Be sure wheel cylinder links are properly positioned in the shoe notches. Install the parking brake strut and spring.

8. Position the upper end of actuating link over the anchor pin.

9. Engage the actuating link with the override pivot, then position the adjuster lever and return spring on the secondary shoe. Fasten with the red hold down spring assembly.

   NOTE: The rear brake uses 2 hold down springs, with the retaining pins being identified with the numeral 8 stamped on the outer face.

10. Install the remaining hold down spring.

11. Install the parking brake cable on the parking brake lever.

12. Install the primary and secondary brake shoe return springs.

13. Adjust brake shoes as outlined under ADJUSTMENTS-BRAKE SHOE.

14. Install the rear brake drums and wheels.

15. Adjust the parking brake.

16. If the wheel cylinder was removed, bleed brakes.

17. Check fluid level in master cylinder. Fluid level should be 1/4" on Moraine, 3/4" on Bendix below the reservoir opening.

18. Check brake pedal travel to be sure it is within specifications, then road test car for proper operation of the brake system.

POWER BRAKES

DESCRIPTION

Two types of power brake units are used, Bendix and Moraine. The Bendix unit can be identified by the black colored vacuum cylinder and the end plate to vacuum cylinder attaching screws. Moraine units can be identified by the bronze colored vacuum cylinder and the slot and tang vacuum cylinder to end plate attachment. Internally the Bendix and Moraine vacuum units differ in construction, but both units are designed to seal off the vacuum from the units when the brake pedal is in the released position. The hydraulic master cylinder on the Bendix and Moraine units are similar in construction-and-service to the standard brake master cylinder. For removal and service of the power brake master cylinder refer to MASTER CYLINDER.

The power brake unit combined with a vacuum check valve, traps manifold vacuum in the reservoir at the highest manifold vacuum available, making possible three to five normal brake applications after the engine has been shut off for several hours or more. If the engine should stall, several applications of the brakes can still be made with vacuum assist. After the vacuum supply is exhausted brake applications can still be made, however, more effort is required due to the lack of vacuum assist.

MINOR SERVICE OPERATIONS

BRAKE PEDAL OR BRACKET

Remove and Install (Fig. 7-13)

1. Disconnect the power brake operating rod from the brake pedal.

2. Remove the pivot bolt nut, lock washer, flat washer, then remove the pivot bolt and brake pedal.

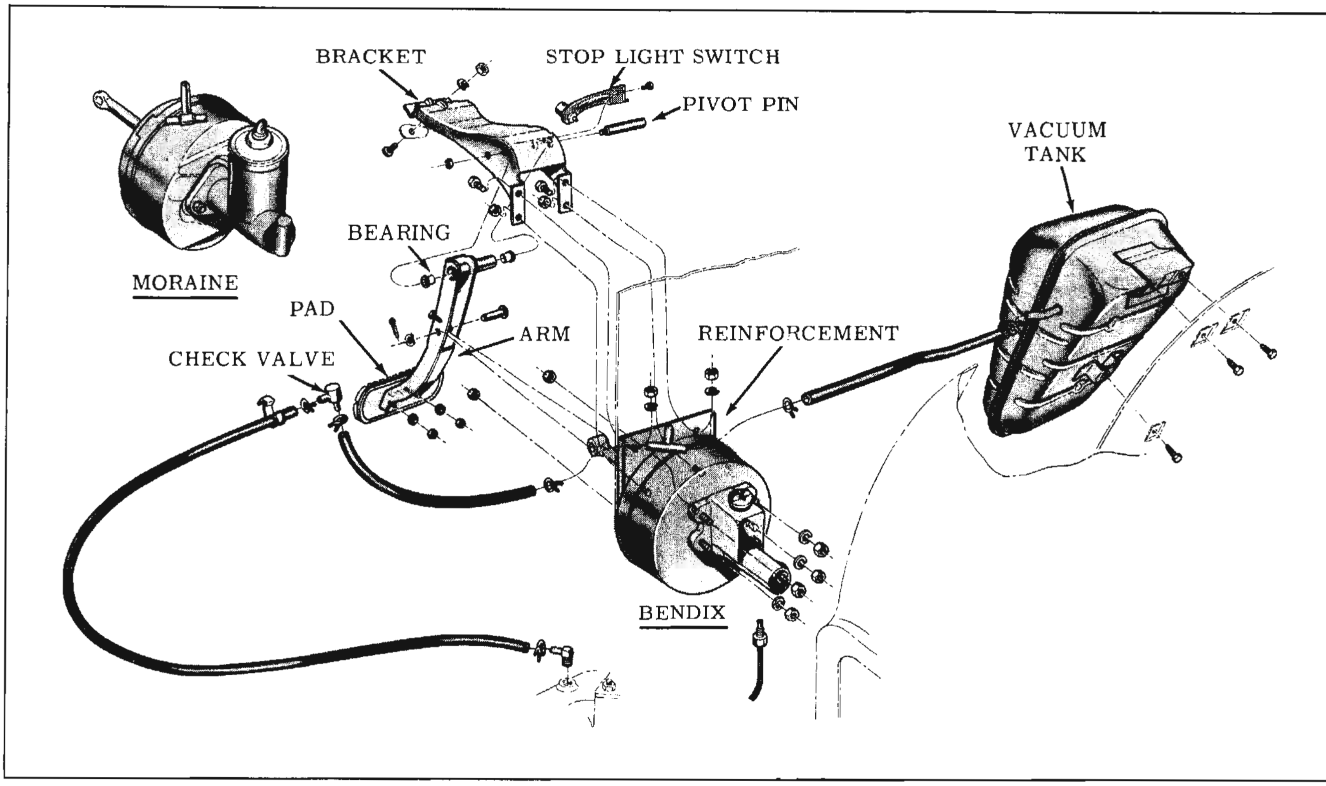


Fig. 7-13 Power Brake Layout

3. The brake pedal mounting bracket can be removed by disconnecting it from the instrument panel and cowl.

To install, lubricate nylon bushings, clevis pin and stoplight switch bolt head with lubricant, Part No. 567196 and reverse the above procedure. Torque pivot bolt nut 10 to 18 ft. lbs. Adjust stop light switch.

VACUUM RESERVE TANK

The vacuum reserve tank is located under the left front fender on the fender filler plate. No service is required other than replacement in case of leakage. To remove the vacuum reserve tank, remove the L.H. hood hinge assembly. Fender filler plate to reserve tank bolt torque is 8 to 10 ft. lbs.

POWER BRAKE UNIT

Remove and Install (Fig. 7-13)

1. Disconnect hydraulic line. Plug or tape line to prevent dirt from entering the hydraulic system.

2. Disconnect vacuum lines from the vacuum cylinder.

3. Disconnect the operating rod from the power brake pedal.

4. Remove the four vacuum cylinder unit to cowl attaching nuts.

5. To install reverse removal procedure. Torque the vacuum cylinder to cowl bolts 8 to 16 ft. lbs. Fill master cylinder with Brake Fluid Super No. 11 and bleed entire system. (See BLEEDING OF LINES)

NOTE: After unit is installed on the car, the engine must be started and vacuum allowed to build up before any brake applications are made.

MORAINE POWER BRAKE

PRINCIPLES OF OPERATION

Released Position (Fig. 7-14)

In the released position, both sides of the vacuum piston (16) are open to atmospheric pressure. This allows the vacuum piston to be held in the released position by the vacuum piston return spring (3). This is accomplished as follows:

Vacuum is shut off within the piston since the floating valve (7) is held on its seat (18) by the floating valve return spring (17). The air valve (9) and the operating rod (10) are held in the released position by the air valve return spring, (14) which opens the atmospheric port (8). Atmospheric pressure, after passing through the

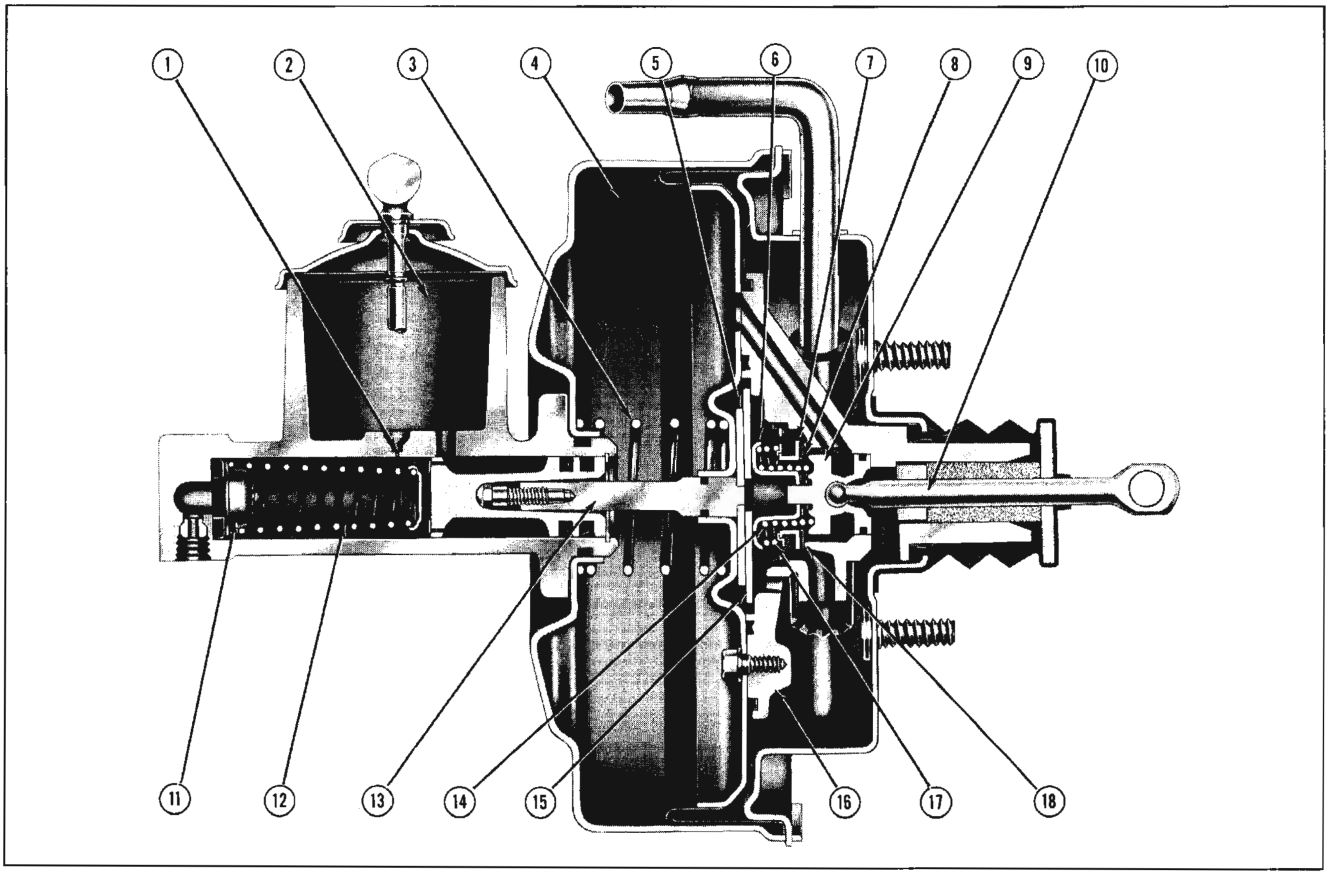


Fig. 7-14 Released Position

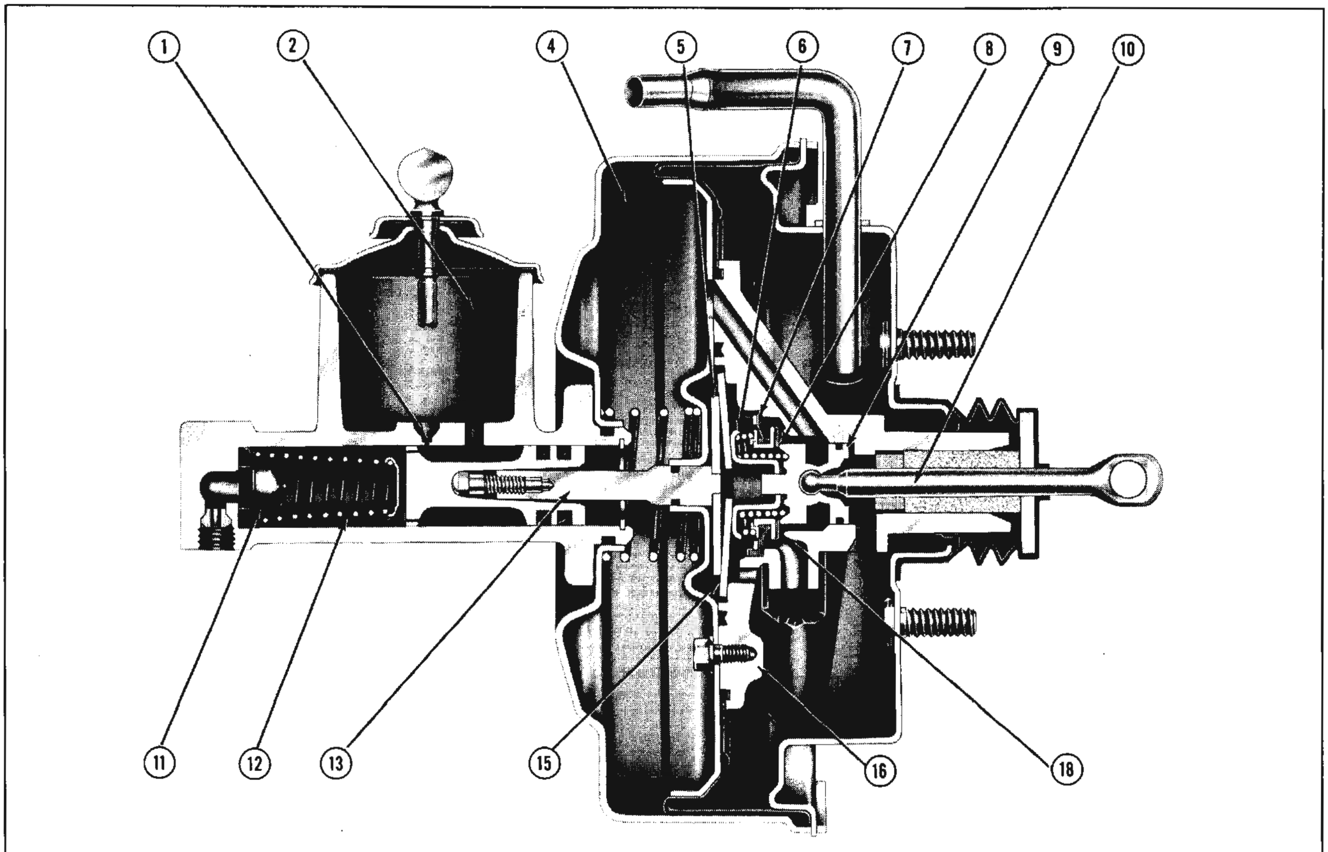


Fig. 7-15 Applied Position

power brake air filter, enters the vacuum cylinder at the rear of the vacuum piston. It then passes through the open atmospheric port (8) where it enters the forward side (4) of the vacuum piston. Atmospheric pressure is now equal on both sides of the vacuum piston, allowing the vacuum piston return spring to hold the vacuum piston in the released position.

The floating valve return spring (17) holds the air valve reaction extension (6) against the three reaction levers (15). This forces the master cylinder piston reaction plate (5) against its stop and the three reaction levers against their pivot points on the vacuum piston. Initial movement of the operating rod and the air valve does not move the reaction mechanism.

The master cylinder piston push rod (13) being attached to the vacuum piston assembly is also held in the released position by the vacuum piston return spring. In the released position the compensating port (1) is open and fluid can flow in either direction between the master cylinder (12) and the fluid reservoir (2). A slight pressure is maintained in the lines by the residual check valve (11).

Applied Position (Fig. 7-15)

As the brakes are applied, the operating rod (10) and air valve (9) move forward in the vacuum piston (16) to close the atmospheric port (8). Further movement allows the air valve to unseat the floating valve (7) and open the vacuum port (18). Vacuum can now communicate through the vacuum piston to the forward side of the vacuum piston (4). With vacuum on the forward side and atmospheric pressure on the rear of the vacuum piston, a force is developed which moves the vacuum piston and the master cylinder piston push rod (13) in the apply direction.

The initial movement of the master cylinder piston in the apply direction closes the compensating port (1), sealing off the fluid reservoir (2) from the master cylinder (12). Further movement of the master cylinder piston in the apply direction increases pressure in the master cylinder, forcing fluid past the residual check valve (11) through the lines and into the wheel cylinders to apply the brakes.

As the pressure in the master cylinder increases, the force on the end of the master cylinder piston causes the piston push rod reaction plate (5) to move away from its stop and press against the reaction levers (15). The levers in turn pivot and press against the air valve reaction extension (6). This action moves the air valve and operating rod slightly to allow the floating valve (7) to close the vacuum port (18). The force

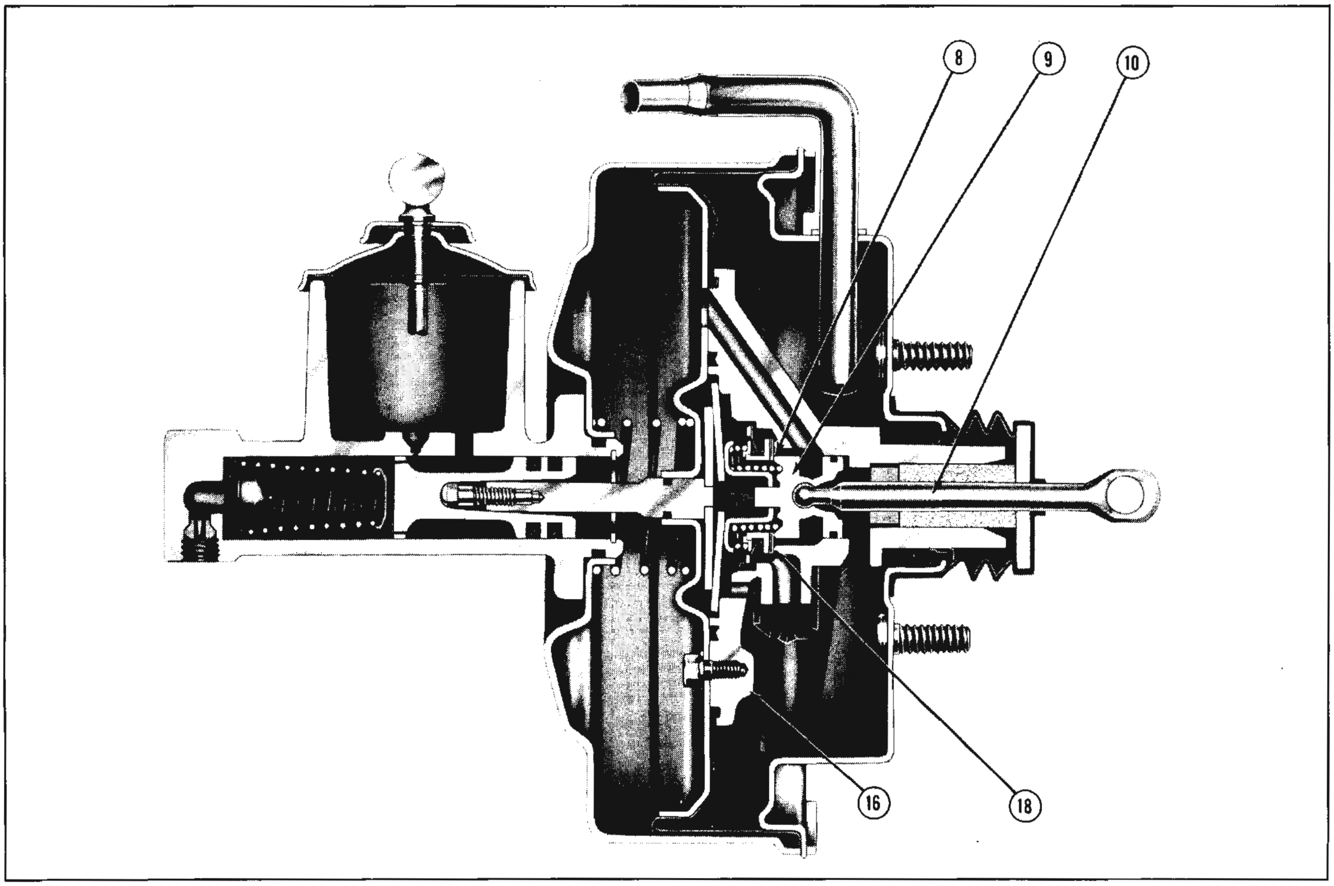


Fig. 7-16 Holding Position

on the master cylinder piston is transferred back through the air valve and operating rod to give the driver brake "feel".

Holding (Fig. 7-16)

When the desired brake pedal force has been reached, the driver stops increasing the brake pedal force, which in turn holds the push rod (10) and air valve (9) stationary. The vacuum piston (16) will continue to move forward until the vacuum port (18) is closed. At this point the atmospheric port (8) is also closed and no further movement of the vacuum piston (16) takes place until the force on the brake pedal is either decreased or increased.

Releasing (Fig. 7-14)

As the force on the brake pedal is released, the floating valve return spring (17) and air valve return spring (14) force the air valve (9) and operating rod (10) away from the floating valve (7), allowing the floating valve to seat on the vacuum piston (16). This closes the vacuum port (18) and allows the atmospheric port (8) to open. Both sides of the vacuum piston are now open to atmospheric pressure and the vacuum piston return spring (3) forces the vacuum piston (16) together with the master cylinder piston push rod (13) into the released position. Brake fluid, under pressure, in the lines now flows back through the residual check valve (11) and into the master cylinder reservoir (2).

DISASSEMBLY OF MORAINE POWER BRAKE (Fig. 7-17)

NOTE: Use extreme care to keep mineral oil or grease from coming in contact with hydraulic parts.

1. Clean the outside of the power brake unit. Remove filler cap then empty brake fluid from master cylinder reservoir.

2. Clamp master cylinder in a vise, with the operating rod up.

3. Scribe an alignment mark on the end plate and vacuum cylinder, then using two wrenches, rotate end plate counterclockwise to separate end plate from vacuum cylinder. (Fig. 7-18)

   If end plate cannot be readily loosened, tap the lugs lightly with a punch and hammer.

   NOTE: Four pieces of heater hose slipped over the four attaching studs will protect the stud threads. Do not apply pressure on plastic tube part of vacuum piston.

4. Remove end plate and vacuum piston assembly from the vacuum cylinder.

5. Remove rubber boot, silencer, air filter and fiber spacer from the operating rod. Pull end plate away from vacuum piston, disconnect vacuum hose from vacuum inlet and remove end plate.

6. Remove the two vacuum inlet attaching screws, then remove the vacuum inlet and gasket from the end plate.

7. Remove rubber bearing from end plate.

8. Remove the vacuum piston return spring from vacuum cylinder.

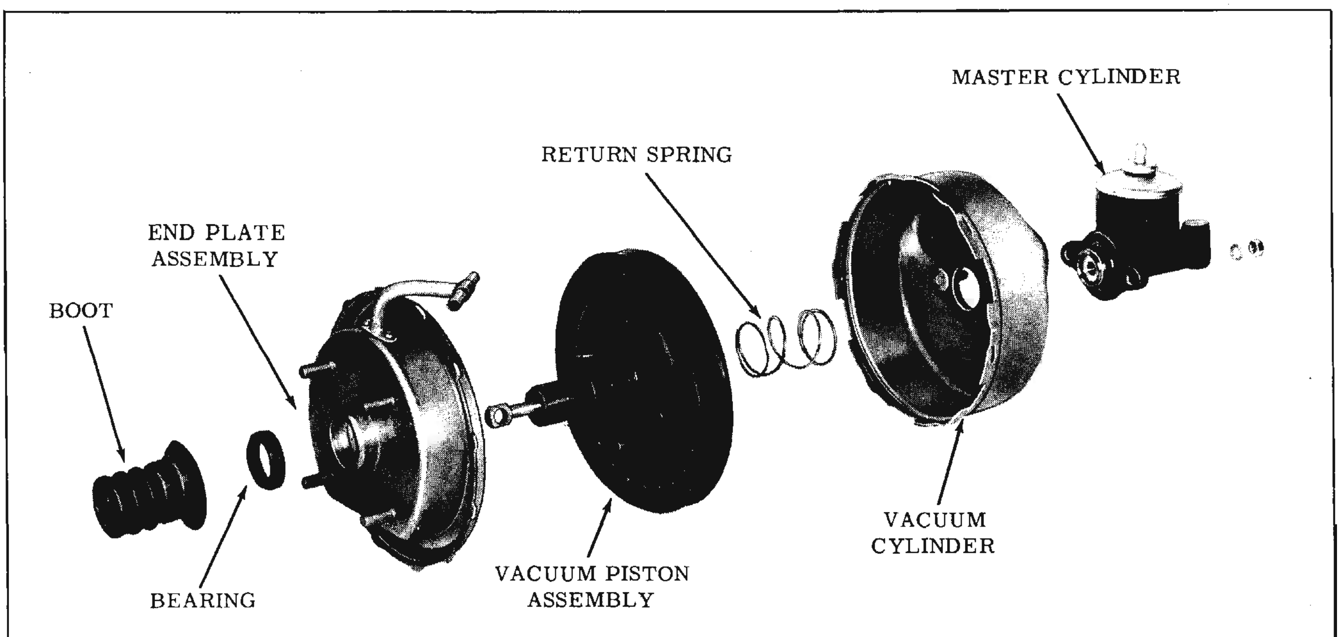


Fig. 7-17 Moraine Power Brake

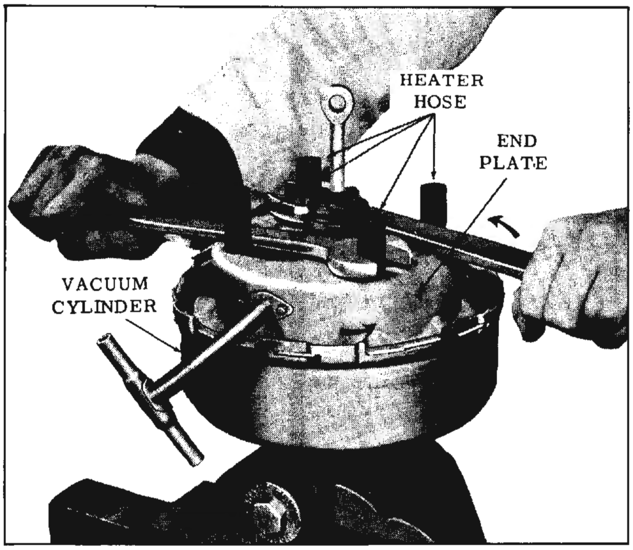


Fig. 7-18 Removing Vacuum Cylinder End Plate

9. Remove the master cylinder to vacuum cylinder attaching nuts and remove vacuum cylinder.

DISASSEMBLY OF VACUUM PISTON (Fig. 7-19)

1. Remove the support plate and diaphragm from the vacuum piston assembly by removing the four attaching screws. Separate diaphragm from support plate. (Fig. 7-20)

2. Remove the master cylinder push rod from the support plate.

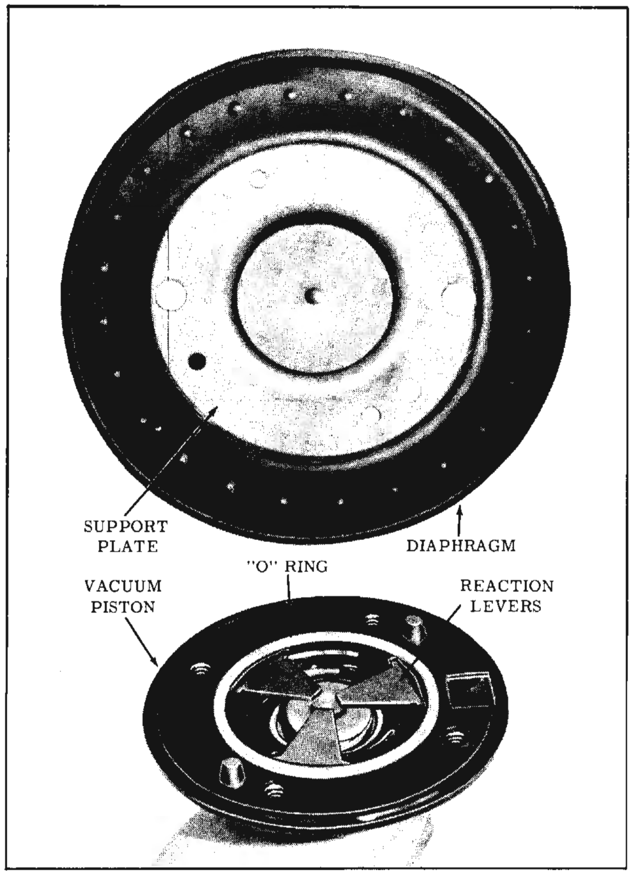


Fig. 7-20 Removing Support Plate from Piston

3. Remove the square cut ''O'' ring and the three reaction levers from the vacuum piston.

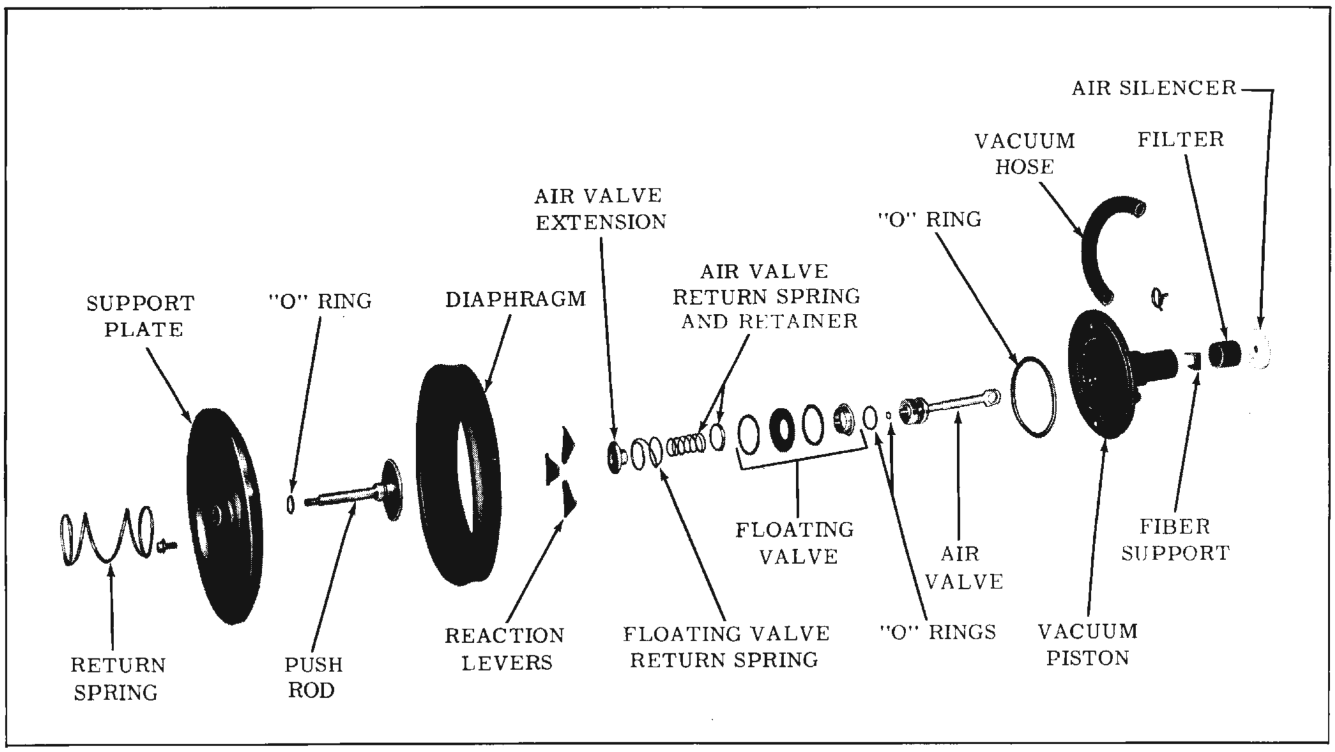


Fig. 7-19 Vacuum Piston Assembly

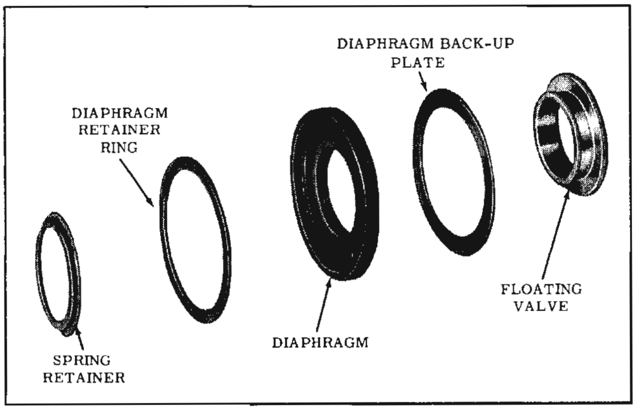


Fig. 7-21 Floating Valve Assembly

4. Push the air valve and operating rod from floating valve side of the vacuum piston. This will dislodge the floating valve from its seat.

5. Rotate the air valve extension and unlock it from the air valve. Remove the air valve return spring, floating valve return spring and the floating valve.

6. Remove the two "O" rings from the air valve.

7. Remove vacuum hose from vacuum piston using Hose Clamp Pliers J-8404.

8. Disassemble the floating valve. (Fig. 7-21)

   NOTE: The diaphragm backup plate may have remained in the vacuum piston.

CLEANING AND INSPECTION

1. Thoroughly wash all parts in alcohol, blow out all passages and air dry. Place parts on clean paper.

2. Inspect vacuum cylinder for scoring, pitting, dents or nicks. Small imperfections may be smoothed out with fine crocus cloth. Replace if damaged.

3. Inspect vacuum piston diaphragm for deterioration or abrasions. Replace if damaged.

4. Inspect air valve for scratches, nicks, distortion or corrosion. Check seat for smoothness. Valve should have a free sliding fit when inserted in the vacuum piston bore. Replace if worn or damaged.

5. Check floating valve assembly for distortion of metal parts and deterioration or abrasions of rubber parts. Replace if worn or damaged.

6. Check vacuum piston for cracks, distortion, damaged reaction lever seats or rough and uneven floating valve seat. Be sure all openings and passages are clean.

7. Check reaction levers for distortion. The levers may be straightened with a mallet if not too badly distorted.

8. Replace air filter if it is dirty or torn.

ASSEMBLY OF MORAINE POWER BRAKES

For assembly of master cylinder refer to MASTER CYLINDER - ASSEMBLY.

VACUUM PISTON (Fig. 7-19)

1. Coat a new "O" ring with lubricant, Part No. 567196 and install on push rod.

2. Insert push rod through the support plate from the side opposite the flange. (Fig. 7-22)

3. Assemble the floating valve as follows. (Fig. 7-21)

   a. Assemble the diaphragm into the groove on the flange of the floating valve, flat side toward the valve face.

   b. Insert the diaphragm retaining ring under the lip of the diaphragm.

4. Coat two new "O" rings with lubricant, Part No. 567196, and install on air valve.

5. Position floating valve assembly on the air valve, so that the rubber face of the valve seats on the air valve.

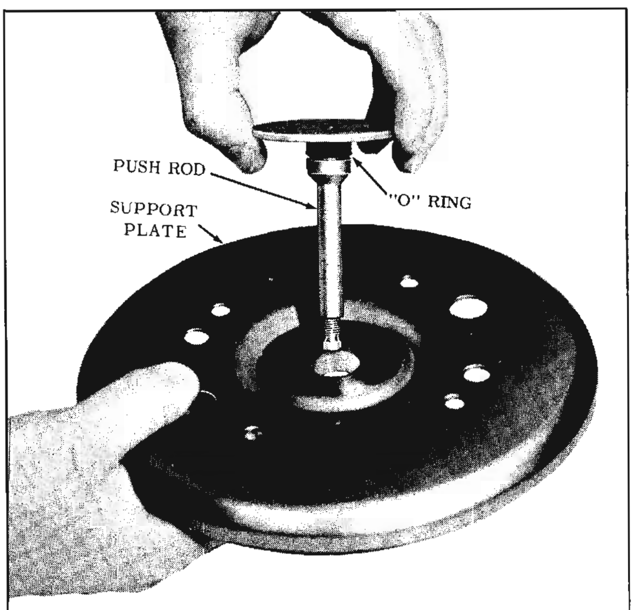


Fig. 7-22 Installing Push Rod Into Support Plate

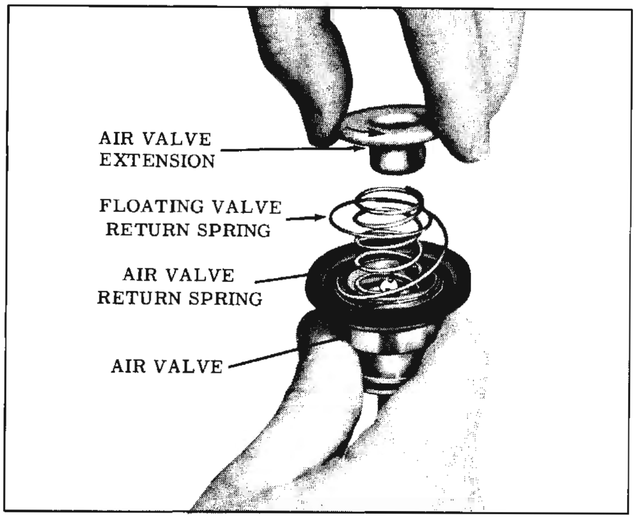


Fig. 7-23 Assembling Operating Rod

6. Snap the floating valve return spring on its retainer and place over the hub of the floating valve.

7. Position the air valve return spring inside the floating valve return spring so that it rests on the air valve.

8. Position the air valve reaction extension over the springs. Compress springs, then rotate reaction extension until it locks on the air valve. (Fig. 7-23)

9. Place the vacuum piston on the open jaws of a vise. Do not clamp.

10. Insert the floating valve support plate into the air valve bore of the power piston.

11. Apply a light film of lubricant, supplied with the parts package or lubricant, Part No. 567196 to the outside diameter of the floating valve diaphragm.

12. Insert the operating rod assembly into the vacuum piston. (Fig. 7-24) Depress the end of the air valve until it seats firmly in the vacuum piston.

NOTE: Check that floating valve diaphragm is not distorted by pressing valve into position.

13. Install the vacuum piston to support plate "O" ring in the groove on the vacuum piston.

14. Coat both sides of the reaction levers very lightly with the lubricant supplied in the parts package or lubricant, Part No. 567196, and position levers in their slots in the vacuum piston.

15. Place diaphragm on the vacuum piston so that the inner bead of diaphragm is positioned in outer groove of vacuum piston.

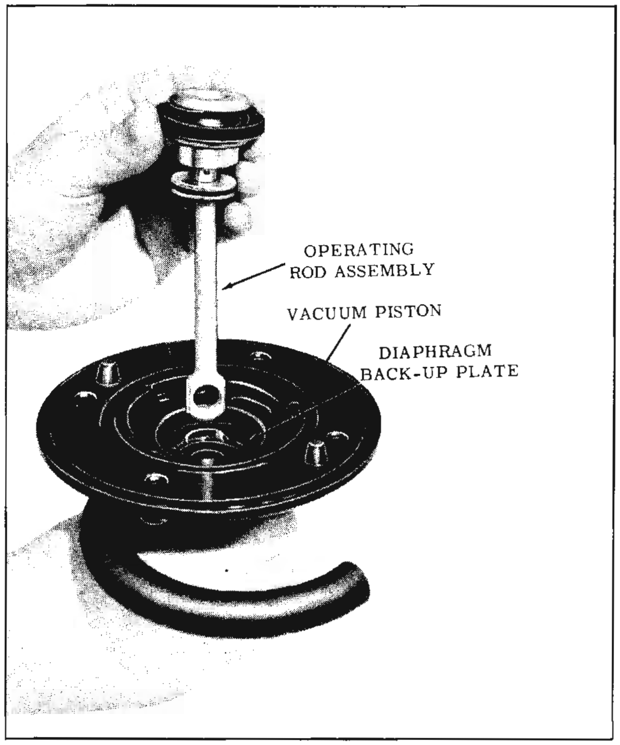


Fig. 7-24 Installing Operating Rod Assembly

NOTE: Do not lubricate vacuum piston diaphragm. Diaphragm should be coated sparingly with talcum powder.

16. Position support plate on the vacuum piston diaphragm and align the two lugs on the power piston with the holes in the support plate.

17. Depress the support plate, being careful that the reaction levers and the diaphragm maintain their positions. Install the four screws and torque 6 to 8 ft. lbs.

18. Position vacuum hose on vacuum piston and retain with hose clamp. Ends of hose clamp must be parallel with the face of the vacuum piston.

ASSEMBLY OF POWER BRAKE UNIT

1. If master cylinder was not overhauled, position a new master cylinder to vacuum cylinder "O" ring on the flange of the master cylinder. Coat "O" ring with a light film of lubricant, Part No. 567196.

2. Install the vacuum piston return spring over hub of the vacuum cylinder.

3. Install the vacuum inlet and gasket on the end plate with the "T" facing away from the mounting studs. Torque 15 to 20 inch lbs.

4. Apply lubricant, Part No. 567196 to the I.D. of the vacuum piston to end plate bearing and install bearing into end plate.

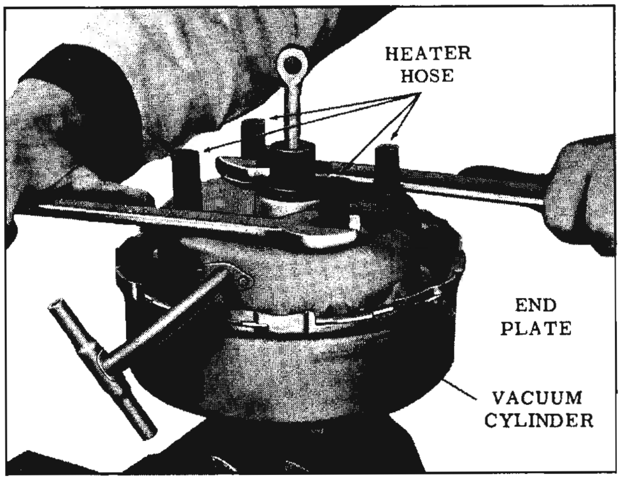


Fig. 7-25 Installing End Plate

5. Position end plate over vacuum piston operating rod and install the vacuum hose on the vacuum inlet. Seat the end plate against the diaphragm and support plate.

6. Pull the skirt of the diaphragm over the end plate until the bead of the diaphragm seats against the end plate flange.

7. Place the vacuum piston assembly in the vacuum cylinder with scribe marks aligned.

8. Depress and rotate end plate clockwise until end plate is locked to vacuum cylinder. (Fig. 7-25)

9. Form fiber spacer around operating rod and push down into the vacuum piston tube. Install filter element over operating rod. Install the air silencer into the last fold of the rubber boot. Install boot over the operating rod.

10. Check the push rod adjustment as outlined under PUSH ROD ADJUSTMENT.

11. Install master cylinder on vacuum cylinder. Tighten attaching nuts 15 to 20 ft. lbs.

12. Remove hoses from mounting studs and install master cylinder filler cap.

PUSH ROD ADJUSTMENT (Fig. 7-26)

The push rod incorporates a self locking adjusting screw to provide a means of maintaining correct relationship between the vacuum piston and the master cylinder piston. The relationship between the pistons is important because the compensating port must be open when the vacuum piston is in the released position.

Under normal service conditions the push rod does not require any attention provided that the adjustment has not been changed and the push rod remains in the original vacuum unit.

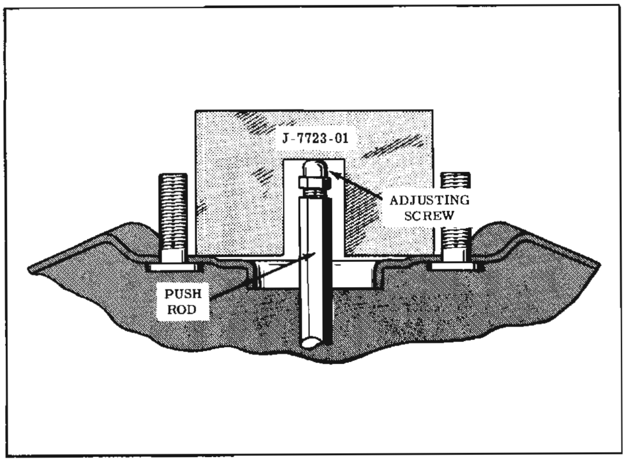


Fig. 7-26 Push Rod Adjustment

When a new push rod is used or the push rod is transferred to another unit, the push rod adjustment must be checked as follows:

a. With the vacuum unit assembled and the master cylinder removed, position Gauge J-7723-01 over the push rod with the legs of Gauge resting on the vacuum cylinder. The adjustment is correct if the push rod adjusting screw contacts the gauge or if the legs of the gauge are .020" from the vacuum cylinder.

b. If necessary to adjust, rotate the adjusting screw until the correct adjustment is obtained.

BENDIX POWER BRAKE

PRINCIPLES OF OPERATION

Released Position (Fig. 7-27)

In the released position both sides of the vacuum piston (5) are open to atmospheric pressure. This allows the vacuum piston to be held in the released position by the vacuum piston return spring (6). This is accomplished as follows:

The operating rod (1) and air valve (2) are held in the released position by the air valve return spring (3). This allows th. floating valve return spring (4) to seat the floating valve (12), shutting off vacuum to the vacuum piston. With the air valve in the released position the atmospheric port (10) is open. Atmospheric pressure, after passing through the air cleaner, enters the vacuum cylinder at the rear of the vacuum piston. It then passes through the vacuum piston to the air valve where it enters the forward side of the vacuum piston. Atmospheric pressure is now equal on both sides of the vacuum piston, allowing the piston return spring to hold the vacuum piston in the released position.

With the vacuum piston in the released position, the hydraulic piston (15) is moved to the released position by the hydraulic piston return spring (17). The compensating port (8) in the master cylinder is open and fluid can flow in either direction between the hydraulic cylinder (16) and the fluid reservoir (7). A slight pressure is maintained in the lines by the residual check valve (9).

Applying Position (Fig. 7-28)

As the brakes are applied, the operating rod (1) and air valve (2) move forward in the vacuum piston (5) to close the atmospheric port (10). Further movement in the applied direction allows the air valve to unseat the floating valve (12) and open the vacuum port (11). Vacuum can now communicate through the vacuum piston to the forward side of the vacuum piston. With vacuum at the forward side and atmospheric pressure at the rear of the vacuum piston, a force is developed which moves the vacuum piston (5), push rod (14) and the hydraulic piston (15) in the apply direction.

The initial movement of the hydraulic piston in the apply direction closes the compensating port (8), sealing off the fluid reservoir (7) from the hydraulic cylinder (16). Further movement of the hydraulic piston in the apply direction increases pressure in the master cylinder, forcing fluid past the residual check valve (9), through the lines and into the wheel cylinders to apply the brakes.

As fluid pressure increases in the master cylinder, a reaction force is transmitted through the push rod (14) to the reaction disc (13) to apply a pressure on the air valve. This reaction force moves the air valve slightly rearward in relation to the vacuum piston to close off the vacuum port (11). The reaction force is in proportion to the fluid pressure in the hydraulic system and balances the force exerted on the operating rod, providing the driver with brake "feel".

Holding Position (Fig. 7-29)

When the desired brake application has been reached, the driver stops increasing the brake pedal force, which in turn holds the push rod (14) and air valve (2) stationary. The vacuum piston (5) will continue to move forward until the vacuum port (11) is closed. At this point the atmospheric port (10) is also closed and no further movement of the vacuum piston takes place until the force on the brake pedal is either decreased or increased.

DISASSEMBLY OF BENDIX POWER BRAKE (Fig. 7-30)

NOTE: Use extreme care to keep mineral oil

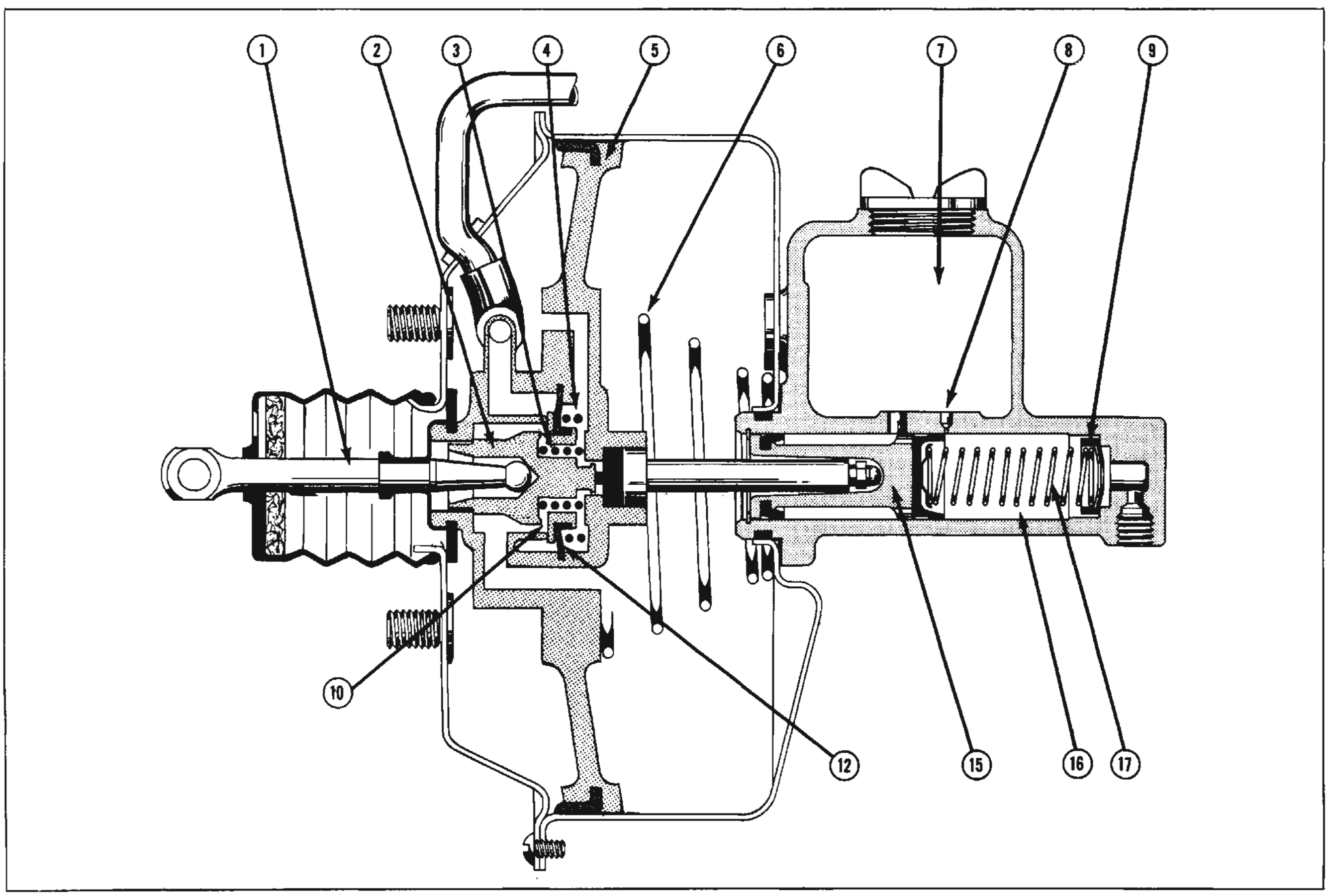


Fig. 7-27 Released Position

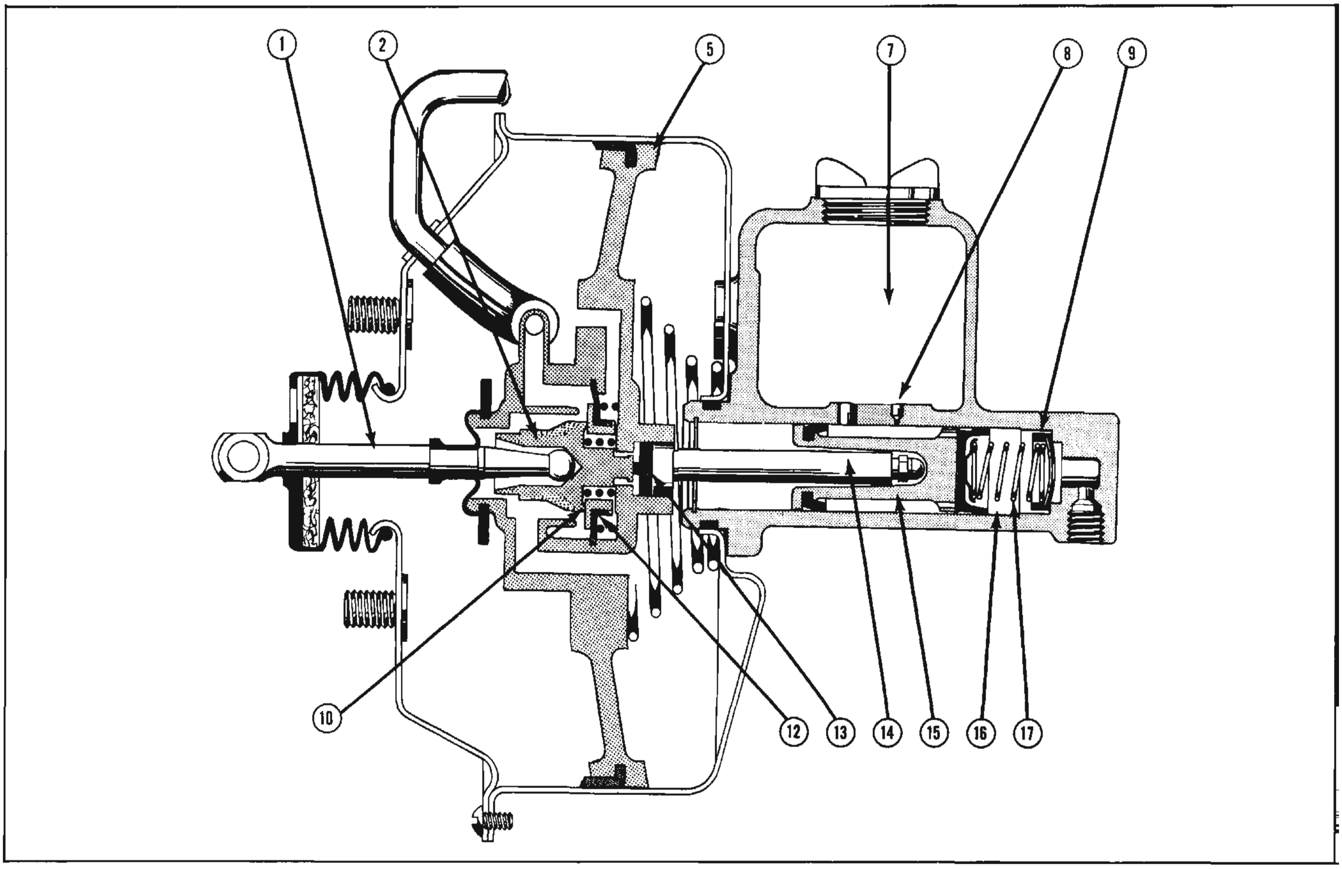


Fig. 7-28 Applying Position

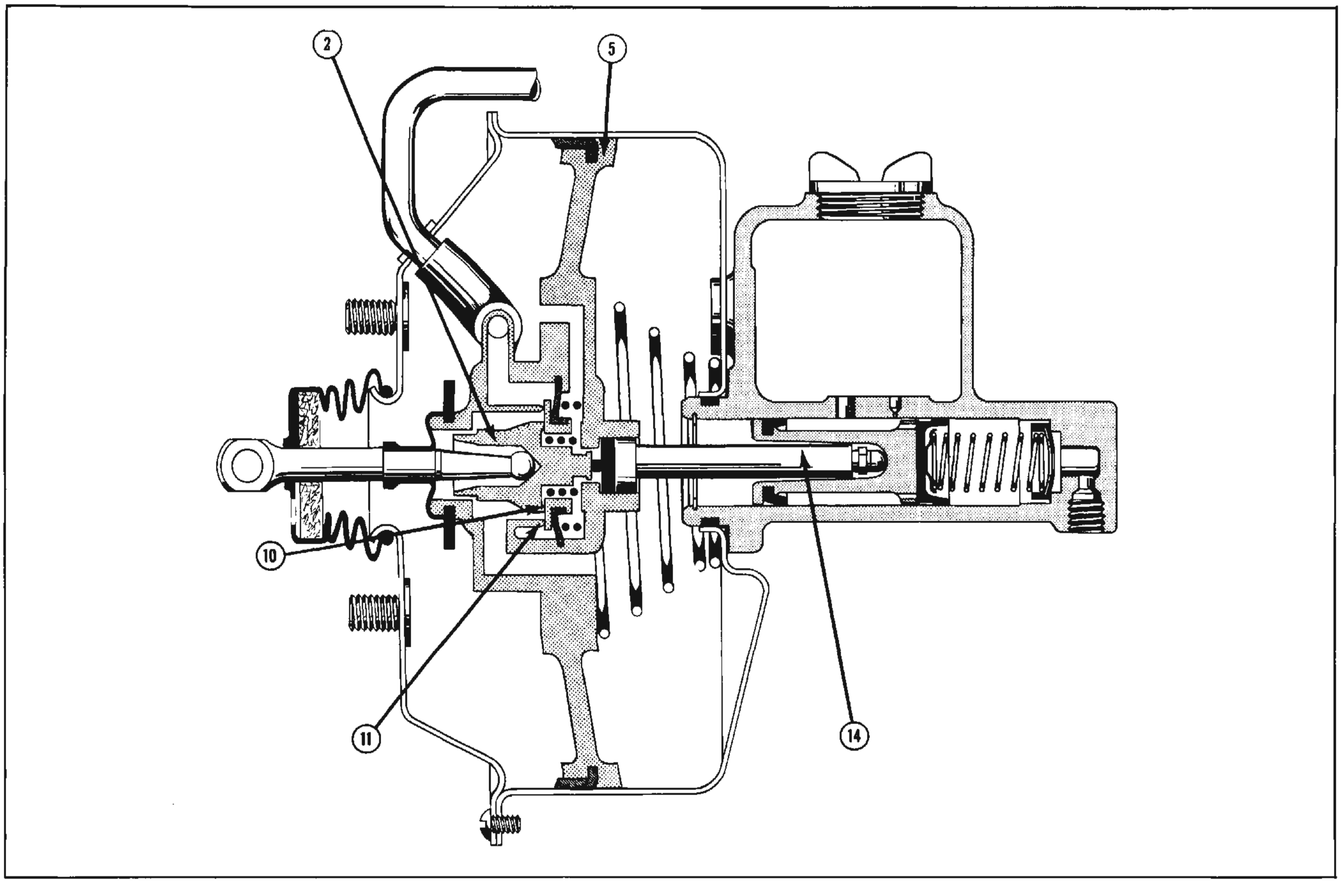


Fig. 7-29 Holding Position

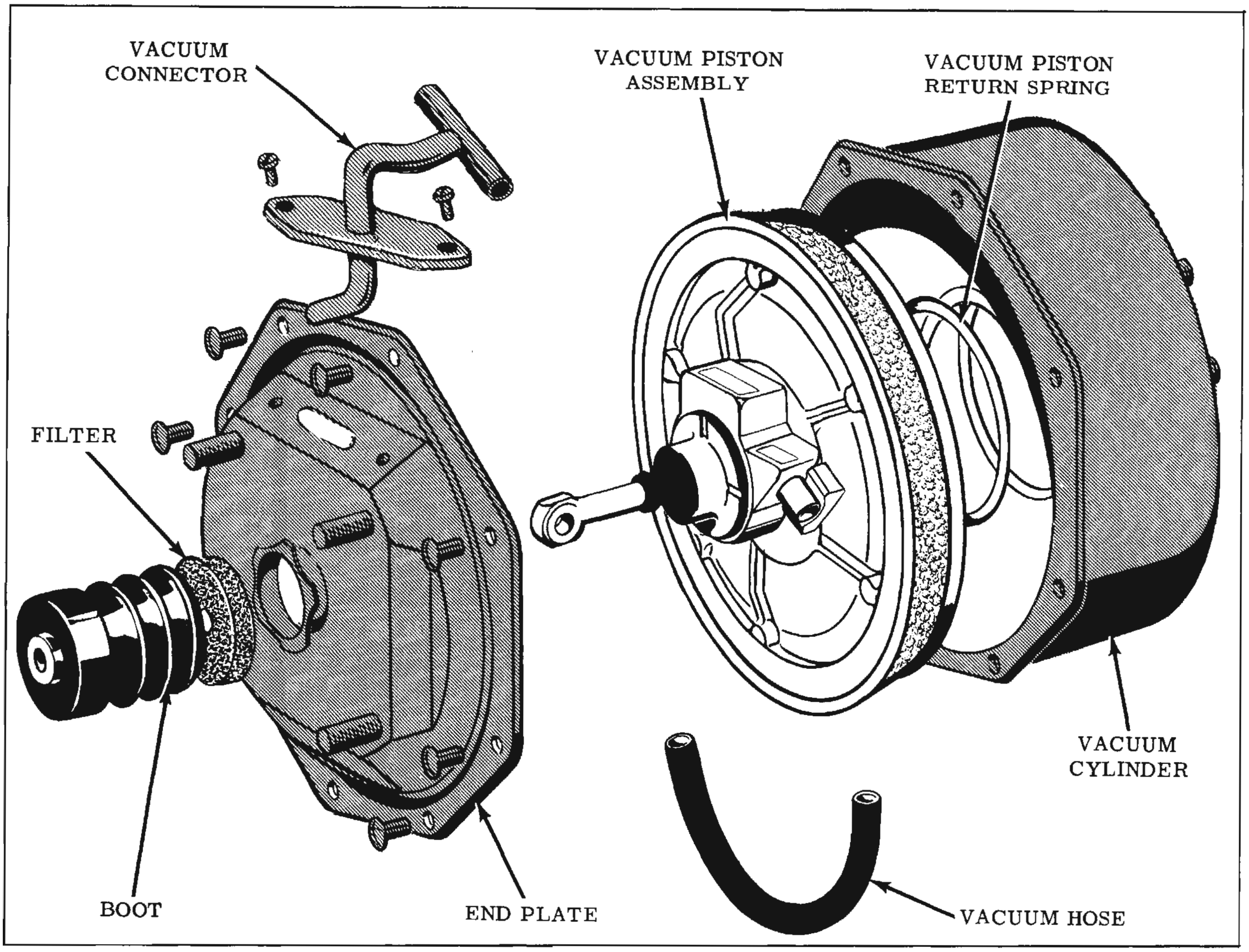


Fig. 7-30 Bendix Power Brake

or grease from coming in contact with hydraulic parts.

1. Clean the outside of the power brake unit. Remove filler cap then empty brake fluid from master cylinder reservoir.

2. Clamp master cylinder in a vise with the operating rod up.

3. Scribe a line across the end plate and the vacuum cylinder. Loosen the end plate attaching screws, depress end plate and remove the screws.

4. Scribe a mark on the face of the piston to correspond with the mark on the end plate. Remove end plate and vacuum piston assembly from the vacuum cylinder.

   NOTE: When removing end plate and vacuum piston assembly, use care so that the hydraulic cylinder piston push rod does not drop out of the vacuum piston.

5. Remove boot and filter from the operating rod. Pull end plate away from the vacuum piston, disconnect vacuum hose from the vacuum inlet and remove end plate.

6. Remove the vacuum inlet attaching screws, then remove the vacuum inlet and gasket from the end plate.

7. Remove piston return spring.

8. Remove the master cylinder to vacuum cylinder attaching nuts and separate master cylinder from vacuum cylinder.

DISASSEMBLY OF VACUUM PISTON (Fig. 7-31)

1. Remove the push rod seal and the vacuum hose from the vacuum piston.

2. Remove wick and expander from around the rear piston plate.

3. Invert vacuum piston, remove the six piston plate attaching screws and separate the front plate from the rear piston plate.

4. Remove the air valve return spring, floating valve return spring, the diaphragm back-up plate and the leather packing from the rear piston plate.

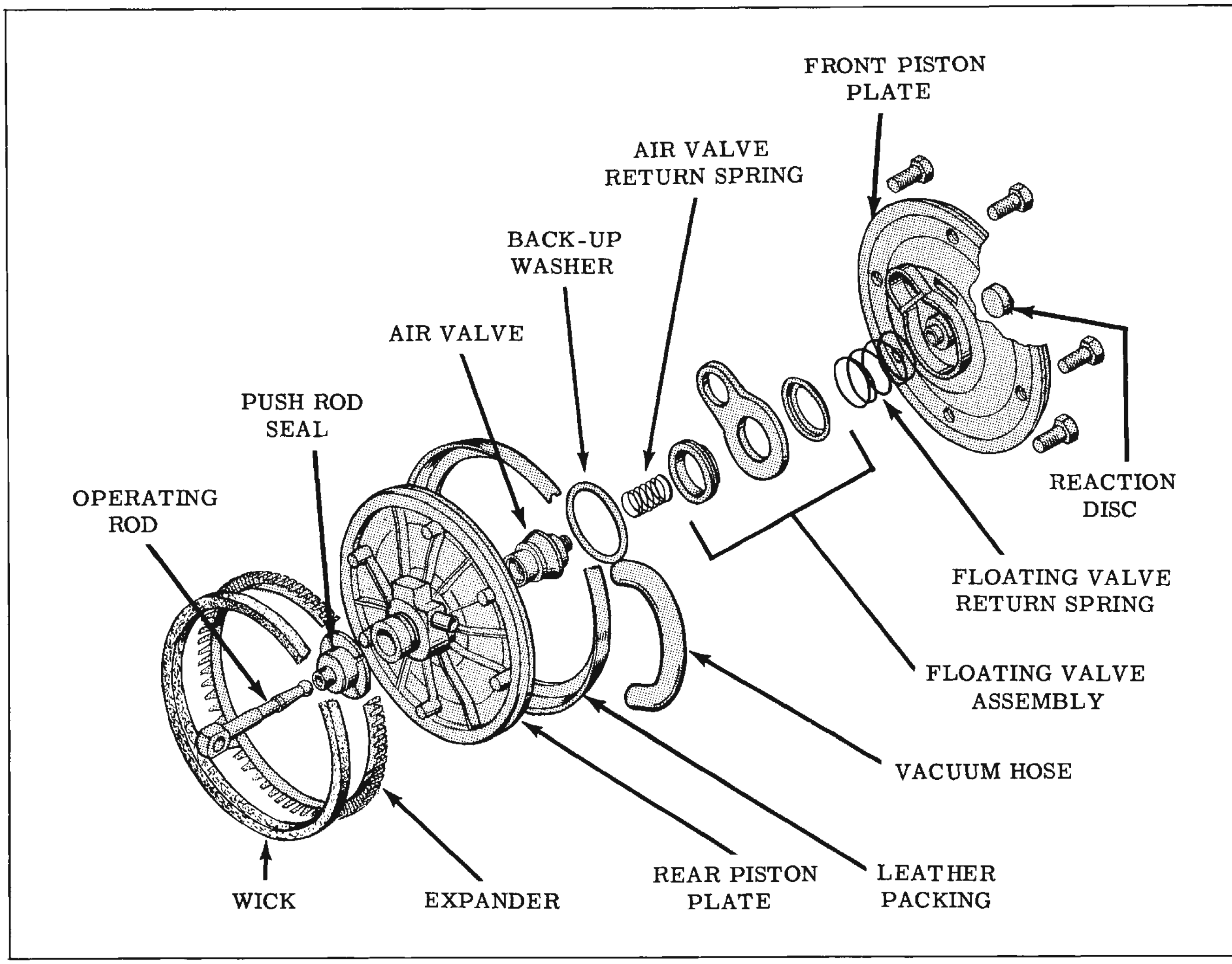


Fig. 7-31 Vacuum Piston Assembly

5. If necessary, disassemble the floating valve.

6. Remove the rubber reaction disc from the front piston plate. NOTE: It may be necessary to use a small rod having a smooth flat end to push the reaction disc out of the piston.

7. Remove the operating rod and air valve from the rear piston plate.

8. To replace either the operating rod or the air valve, hold assembly with air valve down and inject alcohol into the cavity around the operating rod to lubricate the rubber lock in the air valve. The valve can then be pried off.

CLEANING AND INSPECTION

1. Thoroughly wash all metal parts in cleaner. Use ONLY alcohol or brake flushing fluid on plastic or rubber parts. Blow out all passages and air dry. Place parts on clean paper.

2. Inspect vacuum cylinder for scoring, pitting, dents or nicks. Small imperfections may be smoothed out with fine crocus cloth. Replace if damaged.

3. Inspect air valve for scratches, nicks, or breakage. Check seat for smoothness and flatness. Valve should have a free sliding fit when inserted in the vacuum piston bore. Replace valve if damaged.

4. Check floating valve for distortion of metal parts and deterioration or abrasions of rubber parts. Replace if worn or damaged.

5. Check front and rear vacuum piston plates for cracks or rough or uneven floating valve seat. Be sure all openings and passages are clean.

6. Check all rubber and leather parts. Replace if damaged.

7. Check all springs and expanders for distortion. Replace as necessary.

8. Replace air filter element if dirty.

NOTE: When overhauling a unit, use all the parts furnished with the parts kit. Discard all old rubber parts.

ASSEMBLY OF BENDIX POWER BRAKE

For assembly of master cylinder refer to MASTER CYLINDER - ASSEMBLY.

VACUUM PISTON (Fig. 7-31)

1. If the operating rod and air valve were separated, dip the air valve in alcohol and assemble to the ball end of the operating rod. Make certain air valve is locked to the operating rod.

2. Install the rubber reaction disc into the front piston plate.

3. If the floating valve was disassembled, assemble as shown in Fig. 7-32.

4. Insert the operating rod into the rear piston plate.

5. Place the rear piston plate in a vise, operating rod down, then install leather packing on piston plate with lip down.

6. Install the diaphragm back-up washer into the rear piston plate, then position the floating valve into the piston plate on top of the back-up washer, spring seat up.

7. Install the air valve return spring over the air valve and install the floating valve return spring on the floating valve return spring seat.

8. Position and align the front piston plate over the rear piston plate and loosely install the six attaching screws. (Fig. 7-32)

9. Position vacuum piston on a bench with the operating rod up.

10. Place wick inside of expander, saturate wick with shock absorber fluid, then install wick and expander against leather packing with fingers of expander facing up.

11. Tighten the front to rear piston plate attaching screws 4 to 6 ft. lbs.

12. Install the push rod seal onto the vacuum piston.

13. Apply super weatherstrip adhesive to the inside of the vacuum hose and install hose to vacuum piston with the hose lying parallel to the piston.

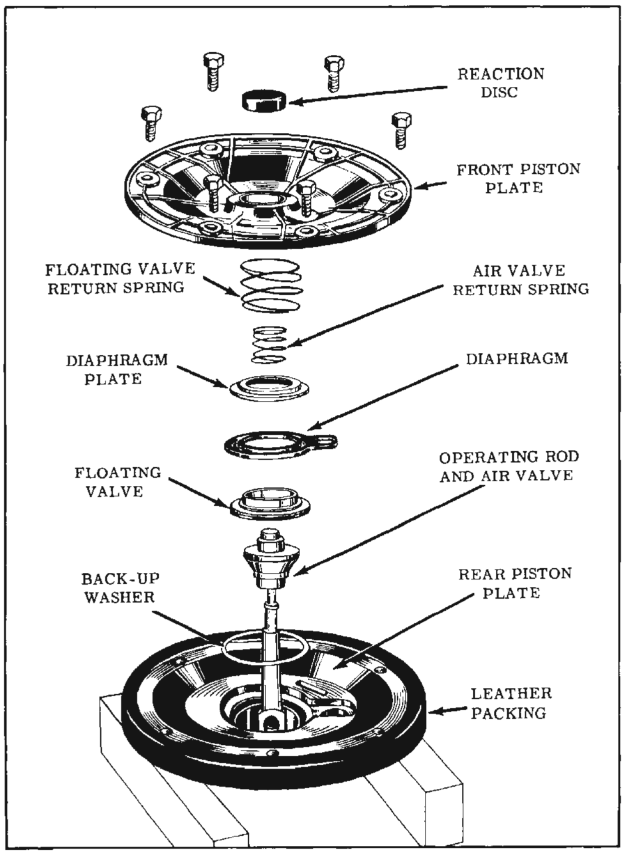


Fig. 7-32 Assembly of Vacuum Piston

ASSEMBLY OF POWER BRAKE UNIT (Fig. 7-33)

1. Install the vacuum inlet on the end plate, with the "T" facing away from the mounting studs.

2. Position the end plate over the operating rod and push the vacuum hose approximately 5/8" on the vacuum inlet.

3. Lightly clamp end plate and vacuum piston in a vise with the operating rod down.

4. Install the vacuum piston return spring over the push rod with the small end up.

5. Apply a thin film of brake fluid to the inside of the vacuum cylinder and position vacuum cylinder over the vacuum piston. Align the mark on the vacuum cylinder with the alignment mark on the end plate, depress vacuum cylinder and install the end plate to vacuum cylinder attaching screws.

6. Install the air filter into the boot, positioning the filter into the last fold of the rubber boot.

7. Position the boot over the operating rod, then install boot on end plate making sure filter is properly positioned.

8. Check the push rod adjustment as outlined under PUSH ROD ADJUSTMENT.

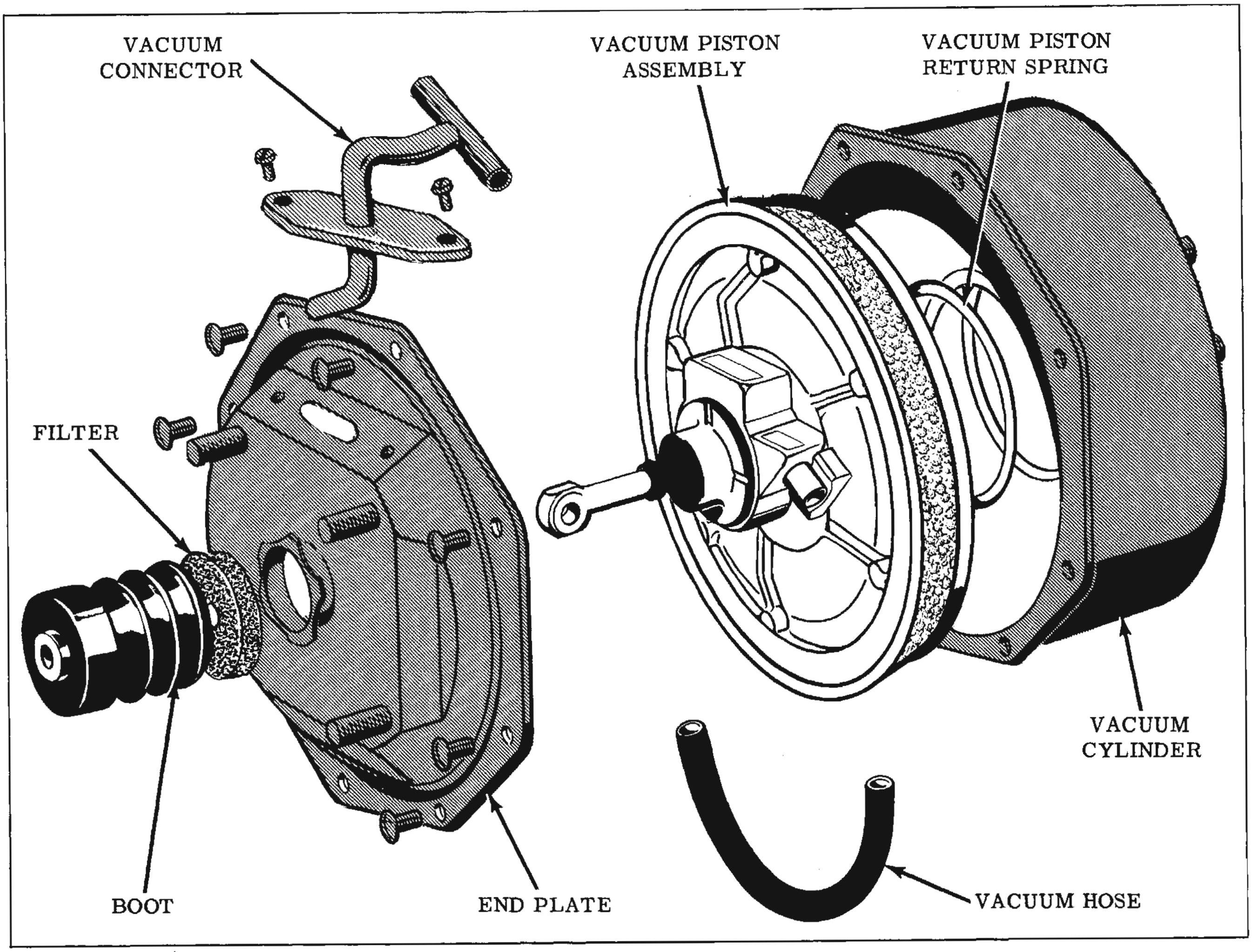


Fig. 7-33 Bendix Power Brake

9. If master cylinder was not disassembled, install a new master cylinder to vacuum cylinder "O" ring on the flange of the master cylinder. Coat "O" ring with a light film of lubricant, Part No. 567196 and install master cylinder onto vacuum cylinder. Torque attaching nuts 15 to 20 ft. lbs.

PUSH ROD ADJUSTMENT (Fig. 7-34)

The push rod incorporates a self locking adjusting screw to provide a means of maintaining correct relationship between the vacuum piston and the master cylinder piston. The relationship between the pistons is important because the compensating port must be open when the vacuum piston is in the released position.

Under normal service conditions, the push rod does not require any attention, provided that the adjustment has not been changed and the push rod remains in the original vacuum unit.

When a new push rod is used or the push rod is transferred to another unit, the push rod adjustment must be checked as follows:

a. With the vacuum unit assembled, position Gauge J-7723-01 over the push rod with the legs of Gauge resting on the vacuum cylinder. The push rod adjusting screw should just touch the Gauge.

b. If necessary to adjust, rotate the adjusting screw until the adjusting screw just touches the gauge.

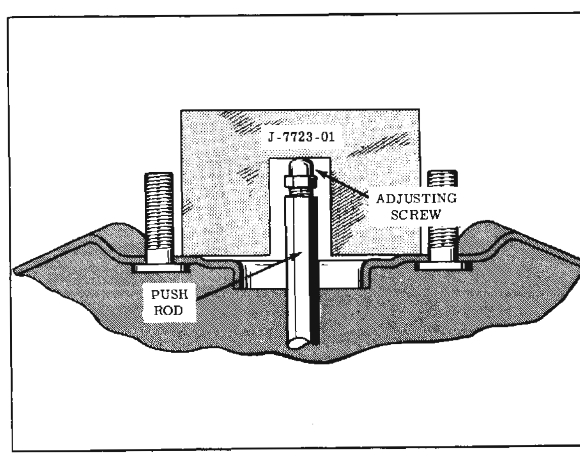


Fig. 7-34 Push Rod Adjustment

POWER BRAKE TESTING

Any time a power brake unit has been removed or a new unit installed on a car, vacuum and hydraulic leakage tests as well as operational tests should be made to determine whether the unit is operating properly.

NOTE: The power brake hydraulic and vacuum systems can be checked for leakage or operational tests without the aid of special testing equipment. Such tests, however, will only indicate that the power brake system is leaking. To isolate the leak without unnecessary removal of parts, Tester BT-500 should be used. Use of Tester BT-500 can also pin point malfunctions which would not be apparent if the tester was not used. For procedures pertaining to the use of Tester BT-500 refer to TESTING WITH BT-500.

TESTING WITHOUT BT-500

Road test the brakes by making a brake application at about 20 m.p.h. to determine if the vehicle stops evenly and quickly. If the pedal has a spongy feel when applying the brakes, air is present in the hydraulic system. Bleed the system at each wheel cylinder.

With the engine stopped and the transmission in neutral, apply the brake several times to exhaust all vacuum in the system. While depressing the brake pedal, start the engine. If the vacuum system is operating, the pedal will tend to move away under foot pressure, and less pressure will be required to hold the pedal in the applied position. If no action is felt, the vacuum system is not functioning.

Stop the engine and again exhaust all vacuum in the system. Without starting the engine, depress the brake pedal and hold foot pressure on the pedal. If the pedal gradually falls away under foot pressure, the hydraulic system is leaking.

TESTING WITH BT-500

VACUUM SYSTEM CHECKS (ON CAR)

The power brake vacuum system, including the

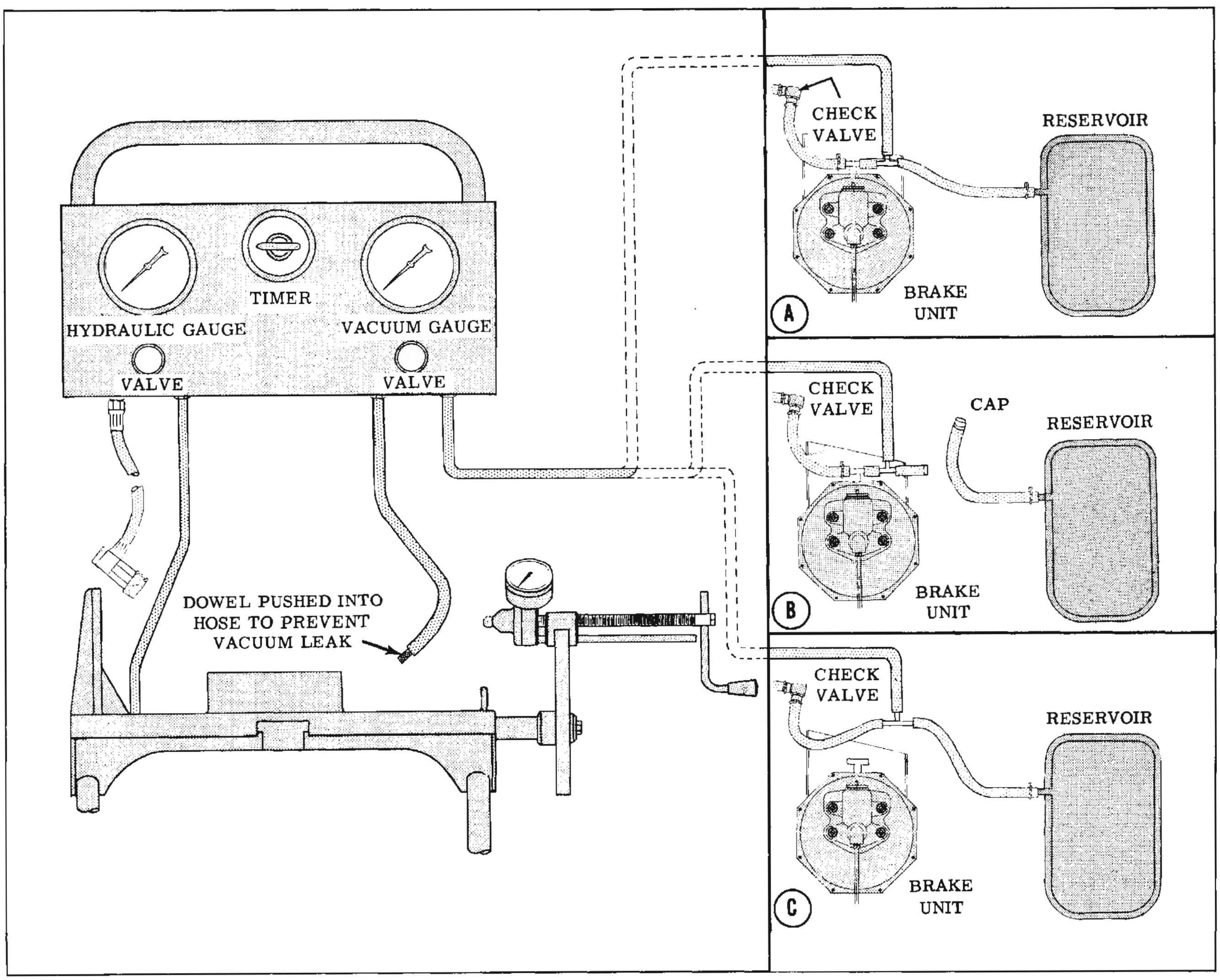


Fig. 7-35 Hose Connections (Testing on Car)

power brake unit, the vacuum check valve, the reserve tank and the connecting hoses, can be checked on the car for leaks with the system at rest, using Tester BT-500. By following the procedures, the leak can be isolated so that unnecessary removal of any of the power brake system units is eliminated.

Before proceeding with the tests, inspect all power brake system vacuum hoses and tighten all connections.

A. Testing Vacuum System (Complete)

1. Connect tester hoses as shown in Fig. 7-35, Inset A.
2. Start the engine and set it on slow idle.
3. Open the vacuum gauge valve. Tap the gauge to stabilize the reading. The vacuum gauge should read 19" to 21".
4. Shut off the engine and set the timer at 15 seconds. There should be no drop in vacuum during this period. If there is a drop in vacuum, a leak exists. To isolate the leak, proceed with Test B.

B. Testing Vacuum System (Less Vacuum Reservoir)

1. Connect tester hose as shown in Fig. 7-35, Inset B.
2. Start the engine and set it on slow idle.
3. With vacuum gauge valve open, tap the gauge to stabilize the reading. The vacuum gauge should read 19" to 21".
4. Shut off the engine and set the timer at 15 seconds. There should be no drop in vacuum during this period. If there is no drop in vacuum, the leak is at the reserve tank. If there is a drop in vacuum, the check valve or the power brake unit is leaking. To determine which of these two units is at fault; proceed with Test C.

C. Testing Vacuum System (Less Power Brake Unit)

1. Connect test hoses as shown in Fig. 7-35, Inset C.
2. Start the engine and set it on slow idle.
3. With the vacuum gauge valve open, tap the gauge to stabilize the reading. The vacuum gauge should read 19" to 21".
4. Shut off the engine and set the timer at 15 seconds. There should be no drop in vacuum during this period.
   a. If there is a drop in vacuum, the leak is in the check valve.
   b. If there is no drop in vacuum during this period, the power brake unit is leaking since the rest of the system has proven to be satisfactory.
5. Disconnect the tester hoses from the car.

POWER BRAKE UNIT TESTING PROCEDURE (ON TEST STAND)

When a power brake unit is removed from a car because of a vacuum leak at rest, or for any other vacuum or hydraulic malfunction, install the unit on the test stand and make the following tests.

These tests can be used for diagnosis and for comparison with the test results obtained after making the necessary corrections in the power brake unit.

Preparation for Testing

1. Install the power brake unit on the modified test stand.
2. Make sure the operating rod load gauge bracket is properly adjusted so that the operating rod gauge is aligned with the power brake unit operating rod.
3. Fill the master cylinder with Brake Fluid Super No. 11.
4. Connect tester hoses as shown in Fig. 7-36.
5. Start the engine and set it on slow idle.
6. Open the hydraulic gauge valve and vacuum gauge valve. Bleed the master cylinder by operating the power brake operating rod by hand until air bubbles have disappeared from the hydraulic hose.
7. Close the hydraulic gauge valve. Vacuum and hydraulic checks can now be made.

A. Vacuum Check at Rest

This check is made to determine whether there is a vacuum leak with the unit in the released position.

1. With tester hoses connected as shown in Fig. 7-36, open the vacuum gauge valve. With the engine on slow idle, the gauge, should read 19" to 21".
2. Close the vacuum gauge, tap the gauge to stabilize the reading and set the timer at 15 seconds. There should be no drop in vacuum during this period. If there is a drop in vacuum, a leak exists at one or more of the following points:

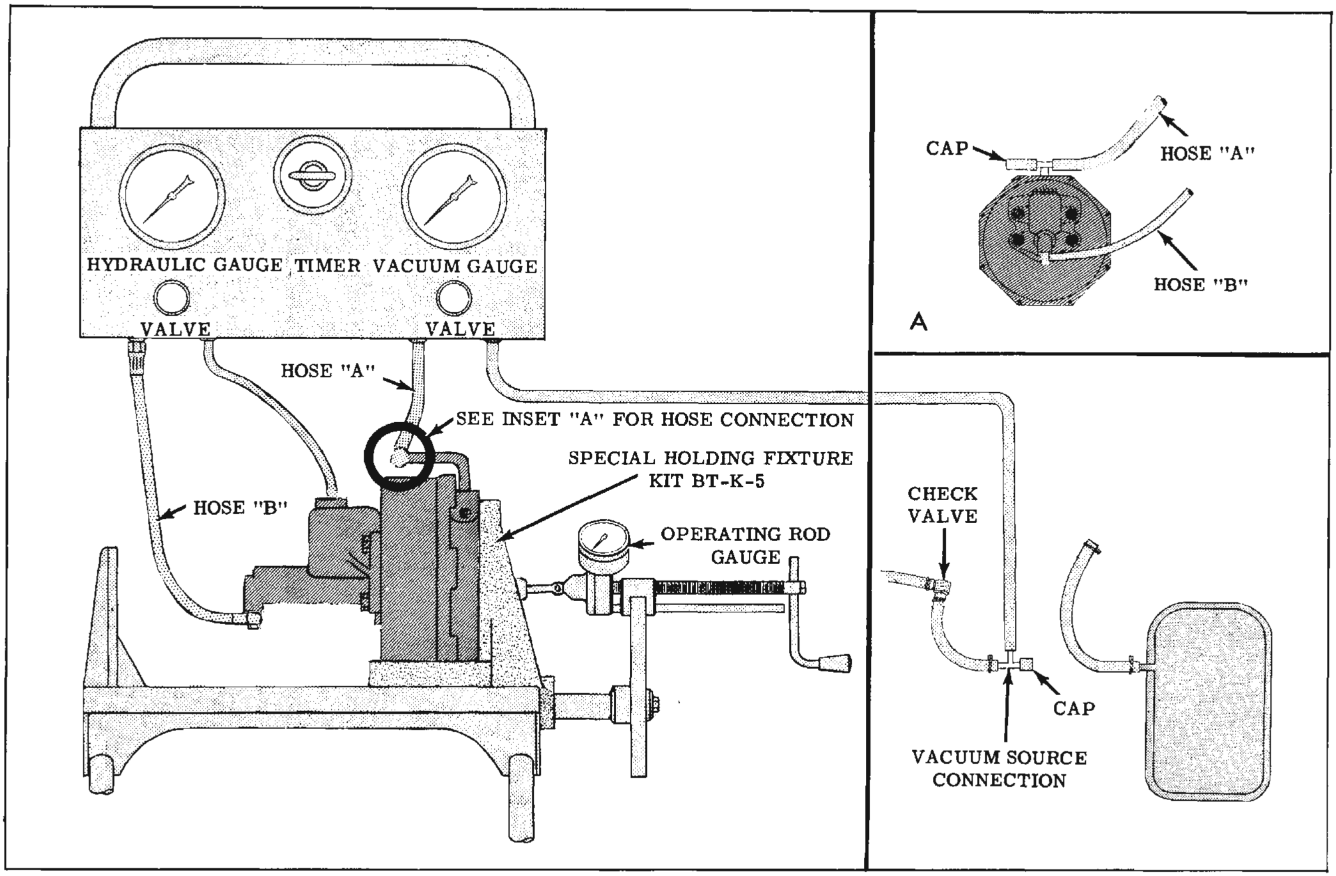


Fig. 7-36 Hose Connections (Testing on Test Stand)

a. Internal vacuum hose.

b. Floating valve seat.

c. Floating valve diaphragm.

B. Vacuum Check Under Load

This check is made to test the condition of all vacuum seals, many of which cannot be tested with the unit in the released position.

1. With tester hoses connected as shown in Fig. 7-36, open the tester vacuum gauge valve. With the engine running at slow idle, the gauge should read 19" to 21".

2. Apply a 120 lb. load to the power brake operating rod by turning the crank until the operating rod gauge reads approximately 120 lbs., cycling it several times between 120 lbs. and 140 lbs., then bring it down to 120 lbs. This procedure prevents a drop in load due to normal resistance in the unit.

3. Close the vacuum gauge valve and set the timer at 30 seconds. If the drop in vacuum is greater than 1-1/2" there is a leak at one or more of the following points.

MORAINE

a. Vacuum diaphragm.

b. Floating valve.

c. Master cylinder to vacuum cylinder "O" ring.

d. Master cylinder push rod to support plate "O" ring.

e. Support plate to vacuum piston "O" ring.

f. Leak around master cylinder attaching bolts.

g. Floating valve diaphragm.

h. Secondary cup.

i. Vacuum piston to end plate bearing.

BENDIX

a. Leather packing.

b. Floating valve.

c. Master cylinder to vacuum cylinder "O" ring.

d. Floating valve diaphragm.

e. Internal hose.

f. Leak around master cylinder attaching bolts.

g. Secondary cup.

C. Hydraulic Check

This check is made to determine whether there is an internal or external leak in the hydraulic system and is made without vacuum assist.

1. With tester hoses connected as shown in Fig. 7-36, close the vacuum gauge valve and operate the brake operating rod until vacuum gauge drops to zero.

2. Apply a 100 lb. load to the power brake operating rod by turning the crank until the operating rod gauge reads approximately 100 lbs., cycling it several times between 100 lbs. and 120 lbs., then bringing it down to 100 lbs. This procedure prevents a drop in load due to normal resistance in the unit.

3. Set the timer at 30 seconds and watch the operating rod gauge. There should be no drop in gauge reading during this period. If the operating rod gauge reading drops, it indicates an internal or external leak in the hydraulic system.

   a. An external leak could be at the hydraulic line connections. Make a visual inspection at this point.

   b. An external leak could also be due to a defective secondary cup.

   c. An internal leak would be at the primary cup in the master cylinder.

D. Performance Check

Three checks are made to determine whether the hydraulic pressure is within specified limits for a given amount of force on the power brake operating rod.

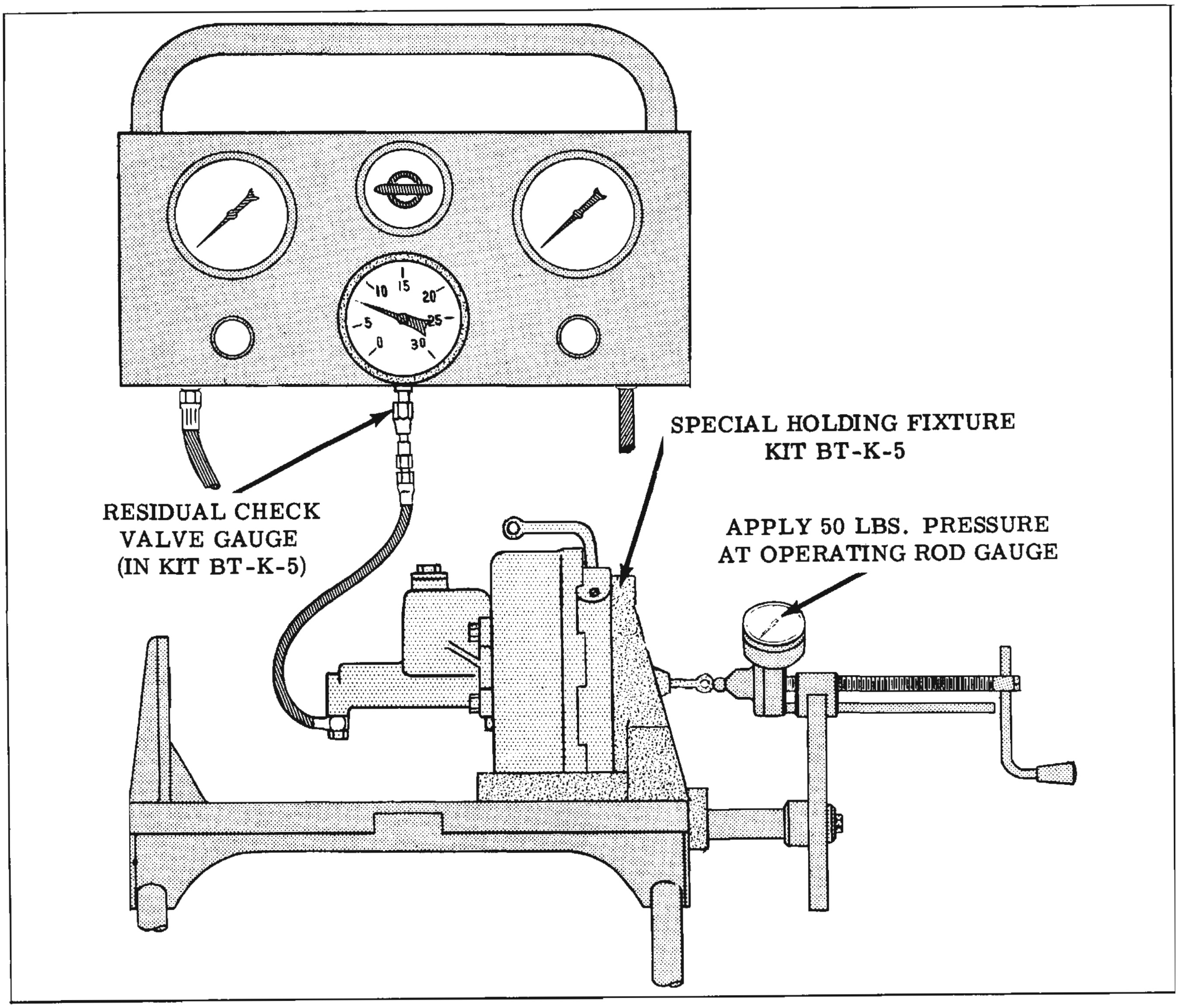


Fig. 7-37 Checking Residual Check Valve

With the tester hoses connected as shown in Fig. 7-36, the test is made with the engine running at slow idle, the vacuum gauge valve open and the hydraulic gauge valve closed. The vacuum gauge should read 19" to 21".

Check No. 1 (Fig. 7-36)

Apply a 40 lb. load to the operating rod. Be sure to stabilize the load gauge by cycling it several times between 40 lbs. and 60 lbs. before adjusting it to 40 lbs. The hydraulic pressure gauge should now read between 200 and 250 p.s.i.

Check No. 2

Apply an 80 lb. load to the operating rod. Be sure to stabilize the load gauge by cycling it several times between 80 lbs. and 100 lbs. before adjusting it to 80 lbs. The hydraulic pressure gauge should now read between 450 and 500 p.s.i.

Check No. 3

Apply a 100 lb. load to the operating rod. Be sure to stabilize the load gauge by cycling it several times between 100 lbs. and 120 lbs. before adjusting it to 100 lbs. The hydraulic pressure gauge should now read between 575 and 625 p.s.i.

If the power brake unit fails one or more parts of the performance test, the trouble may be due to air in the hydraulic system, caused by improper bleeding, or to a mechanical condition causing excessive resistance to movement of the vacuum piston and hydraulic plunger.

E. Residual Check Valve Check

1. Hook up gauge as shown in Fig. 7-37.
2. Apply a 50 lb. load to the operating rod. Release the load completely then reapply the 50 lb. load. This allows the fluid to enter the gauge line.
3. Release the load on the operating rod and observe the reading on the gauge.
4. Reading should be 5 to 16 lbs. and hold steady for 30 seconds. If gauge reading drops, check all connections and repeat steps 2 and 3. If gauge reading still drops, the residual check valve is leaking and must be replaced. (See MASTER CYLINDER DISASSEMBLY).
5. If gauge reading is steady but below 5 lbs., the spring in the master cylinder is weak.

BRAKE DIAGNOSIS

The following diagnosis applies to both power brakes and standard brakes unless otherwise specified.

1. Hard Pedal Feel May Be Caused By:

A. Power brake vacuum failure due to:

(1) Faulty vacuum check valve.

(2) Collapsed vacuum hose.

(3) Plugged or loose vacuum hose or fittings.

(4) Leaking vacuum reserve tank.

B. Bound up pedal mechanism.

C. Glazed linings.

D. Grease on brake drum or linings.

E. Power brake unit trouble due to:

(1) Internal vacuum hose loose or restricted.

(2) Vacuum leak in vacuum piston assembly or past the leather packing (Bendix) or vacuum diaphragm (Moraine).

(3) Leak at vacuum cylinder to master cylinder "O" ring.

(4) Restricted air filter.

(5) Malfunctioning air valve.

(6) Leaking past floating valve or air valve.

2. "Grabby" or Severe Brakes Caused By:

A. Grease or brake fluid on linings.

B. Scored drums.

C. Burned linings.

D. Power brake unit trouble due to:

(1) Sticking air valve.

(2) Binding master cylinder piston.

3. Pedal Goes to Floor (or almost to floor) Caused By:

A. Self-adjuster not operating.

B. Air in hydraulic system.

C. Hydraulic leak in line or at wheel cylinders.

D. Low fluid level in master cylinder reservoir.

E. Leak at primary cup.

F. Sand hole or crack in master cylinder.

G. Worn brake linings.

4. Brake Lock Up Caused By:

A. Restricted compensator port.

B. Incorrect push rod adjustment (Power).

C. Incorrect pedal free travel (Standard).

5. Excessive Lining Wear Rear Brakes

A. Parking brake improperly adjusted.

GENERAL SPECIFICATIONS

BRAKE ASSEMBLIES AND DRUMS

1. BRAKING AREA . . . . 191.7 sq. in.
2. RATIO (Percentage of Braking Effect)
   a. Front Brakes 56%
   b. Rear Brakes 44%
3. DRUMS
   a. Inside Diameter . . . . 11"
   b. Out of Round (Total Indicator Reading)
      (1) Front . . . . .005"(Max)
      (2) Rear . . . . .006"(Max)
4. LININGS
   a. Length - Primary Shoes . . . . 9-3/8"
   b. Length - Secondary Shoes . . . . 12-1/32"
   c. Width - Front Brake . . . . 2-1/2"
   d. Width - Rear Brake . . . . 2"
   e. Thickness . . . . 7/32"

HYDRAULIC SYSTEM

1. FLUID TYPE . . . . Super No. 11
2. FLUID LEVEL (Standard or Power)
   a. Moraine . . . . 1/4" Below Master Cylinder Fill Opening
   b. Bendix . . . . 3/4" Below Master Cylinder Fill Opening
3. MASTER CYLINDER BORE . . . . 1"
4. WHEEL CYLINDER BORE
   a. Front . . . . 1-1/8"
   b. Rear . . . . 1"

ADJUSTMENTS

1. BRAKE SHOE (Standard and Power) . . . . Self-adjusting
2. PEDAL HEIGHT - Standard Brake (from floor pan to pedal pad) . . . . 8" ± 1/8"
3. FREE TRAVEL - Standard Brakes . . . . Refer to Brake Pedal Adjustments
4. MAXIMUM ALLOWABLE BRAKE PEDAL TRAVEL
   a. Standard . . . . 4"
   b. Power . . . . 1-7/8"
5. PARKING BRAKE (Adjust with parking brake released)
   a. Equalizer . . . . Tighten equalizer adjusting nut until heavy drag is felt at rear wheels, then loosen nut 10 turns.

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified.

Application	Ft. Lbs.
1. Brake Line Fittings	8 to 12
2. Anchor Pin To Steering Knuckle Bolt	120 to 145
3. Plain Arm To Steering To Backing Plate Bolts and Nuts	80 to 130
4. Rear Brake Backing Plate to Axle Housing Nuts	23 to 28
5. Wheel Cylinder to Backing Plate Cap Screws	10 to 18
6. Wheel Nuts	70 to 85
Parking Brake	
7. Brake Lever Assembly to Cowl Cap Bolts	8 Max.
8. Brake Lever Assembly to Instrument Panel Cap Screws	8 Max.
Standard Brakes	
9. Pedal Mounting Bracket to Instrument Panel Cap Screws	8 Max.
10. Pedal Mounting Bracket and Master Cylinder Bolts to Cowl	20 to 28
11. Pedal Pivot Bolt Nut (Synchromesh)	10 to 18
12. Master Cylinder Reservoir Cap	Finger Tight
Power Brakes	
13. Master Cylinder Reservoir Cap	Finger Tight
14. Master Cylinder to Vacuum Cylinder	20 to 27
15. Vacuum Cylinder to Cowl	20 to 27
16. Support Plate to Vacuum Piston (Moraine)	6 to 8
17. Front to Rear Piston Plate (Bendix)	4 to 6

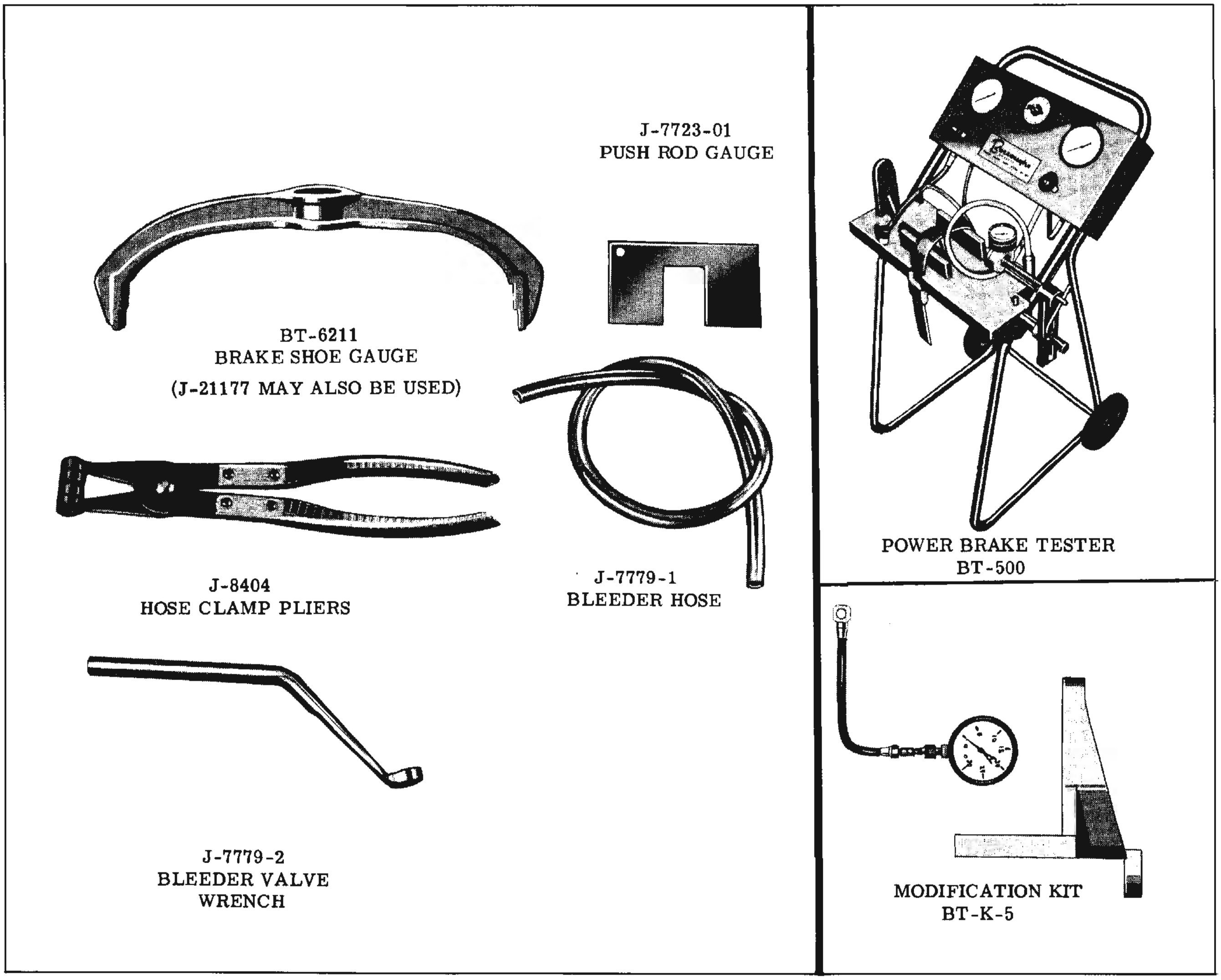


Fig. 7-38 Brake Tools

BRAKES

(F-85)

CONTENTS OF SECTION 7

PERIODIC MAINTENANCE

BRAKE FLUID

Check level of brake fluid in reservoir; fluid level should be 1/4" below master cylinder filler cap. Replenish as necessary with Super 11 Brake Fluid. If addition of fluid is frequent, inspect the brake hose, lines, master cylinder and wheel cylinders for leakage or damage.

FRONT WHEEL BEARINGS

Front wheel bearings should be repacked when brake maintenance necessitates removal of the front drums. Use a sodium soap, fine fiber grease. Adjust wheel bearings as outlined under Adjustments.

PERIODIC SERVICE

If the pedal free travel, from the released to fully applied position exceeds 2" on power brake equipped cars with engine running; and 4" on standard brakes, the car should be driven alternately forward and backward, and the brake applied each time to operate the self-adjuster until proper height is obtained. If the brake cannot be adjusted properly in this manner, it will be necessary to remove drums and inspect for the cause of inoperation.

Brake linings should be periodically inspected for wear. The frequency of this inspection depends upon driving conditions such as traffic or terrain, and also the driving techniques of individual owners.

DESCRIPTION (Fig. 7-101)

The braking system consists of hydraulically operated brakes that apply the brake shoes simultaneously at all four wheels, and a mechanically operated parking brake that applies the brake shoes at the rear wheels only.

When the brake pedal is depressed, the piston in the master cylinder forces fluid under pressure to a wheel cylinder at each wheel which in turn pushes the brake shoes against the brake drum. (Fig. 7-102) As the shoes contact the drum, the friction between the shoes and the rotating drum moves the primary shoe downward against the adjusting screw which acts as a link to transmit the force of the primary shoe to the lower end of the secondary shoe. With the upper end of the secondary shoe being held by the stationary anchor pin, the secondary shoe is "wedged" against the drum. This "wedging" action, due to frictional

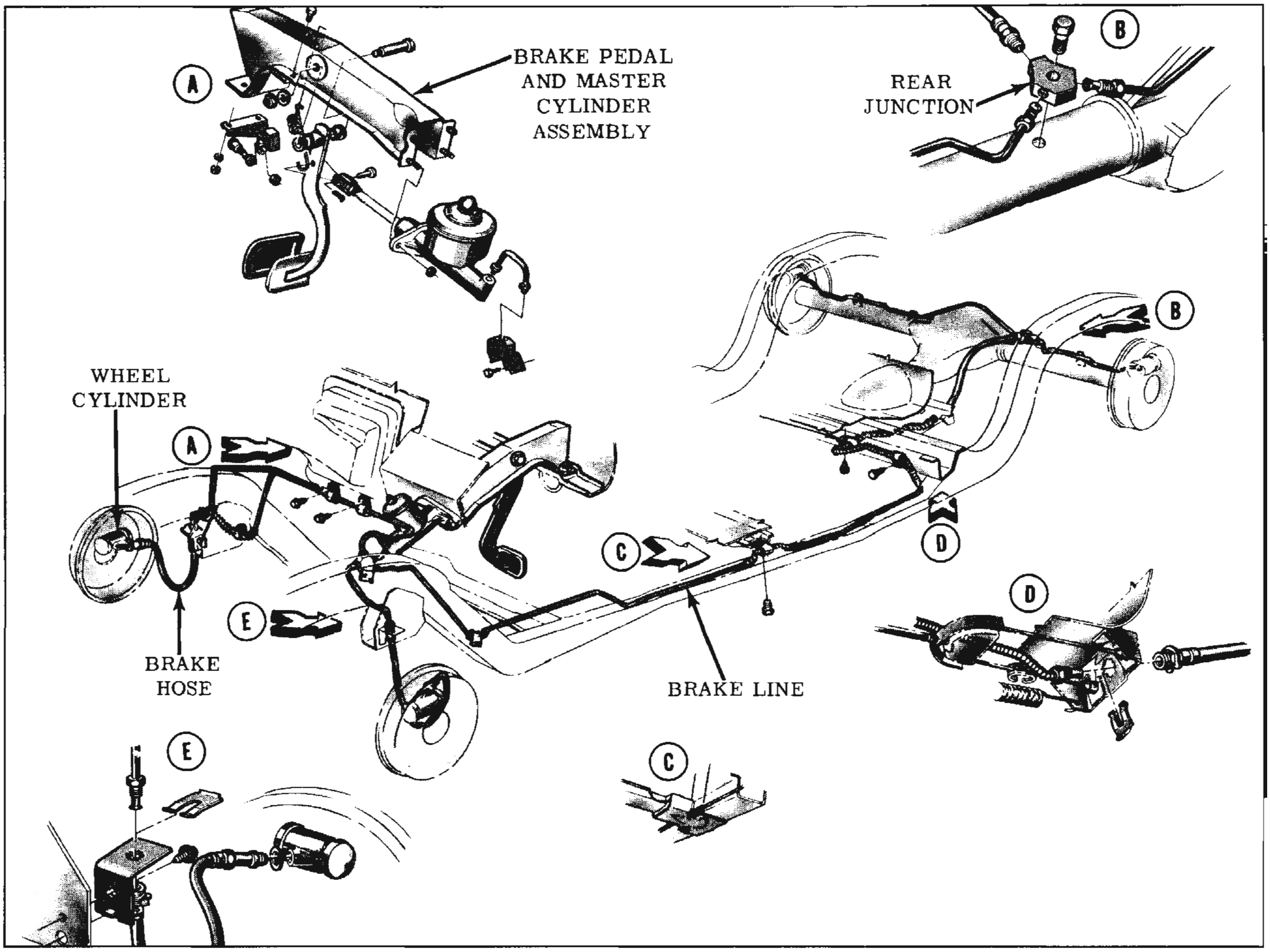


Fig. 7-101 Brake System

force, imparts self-energizing action to the braking effort and thereby decreases the effort required by the driver to stop the car.

The parking brake applies the rear brakes through cables and linkage. The parking brake handle is mounted below the instrument panel to the right of the steering column. The parking brake is applied by pulling the lever out from the dash and is released by turning the handle clockwise and releasing to the forward position.

DESCRIPTION (SELF-ADJUSTING) (Fig. 7-103)

The self-adjusting brake mechanism operates only when the brakes are applied while the car is moving rearward and only when the secondary shoe moves a predetermined distance toward the brake drum.

As the car moves rearward and the brakes are applied, friction between the primary shoe and the drum forces the primary shoe against the anchor pin. Hydraulic pressure in the wheel cylinder forces the upper end of the secondary shoe away from the anchor pin. As the secondary shoe moves away from the anchor pin, the upper end of the adjuster lever is prevented from moving by the actuating link. This causes the adjuster lever to pivot on the secondary shoe forcing the adjuster lever against the adjusting screw sprocket. If the brake linings are worn enough to allow the secondary shoe to move the predetermined distance, the adjuster lever will turn the adjusting screw sprocket one or two teeth, depending on lining wear. If the secondary shoe does not move the predetermined distance, movement of the adjuster lever will not be great enough to rotate the adjusting screw sprocket.

When the brakes are released, the actuating lever return spring will move the actuating lever into the adjusting position on the sprocket.

An override feature is built into the self-adjusting brake which allows the secondary shoe to be applied in reverse in the event the adjusting screw becomes "frozen" preventing the self-adjuster from operating.

When the car is moving forward and the brakes are applied, the upper end of the secondary shoe is forced against the anchor pin due to the self-energizing action of the brakes, and the self-adjuster does not operate.

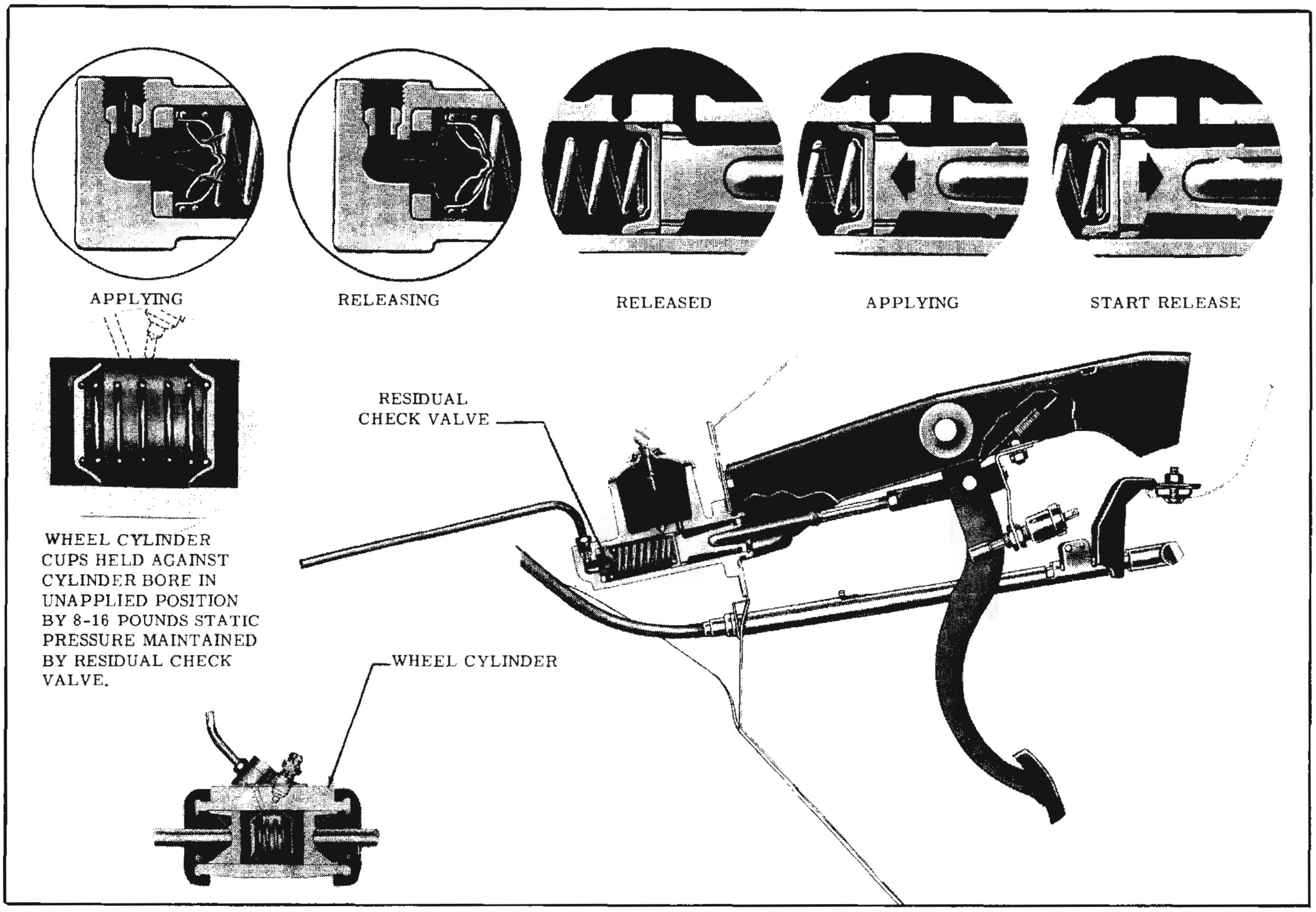


Fig. 7-102 Hydraulic System

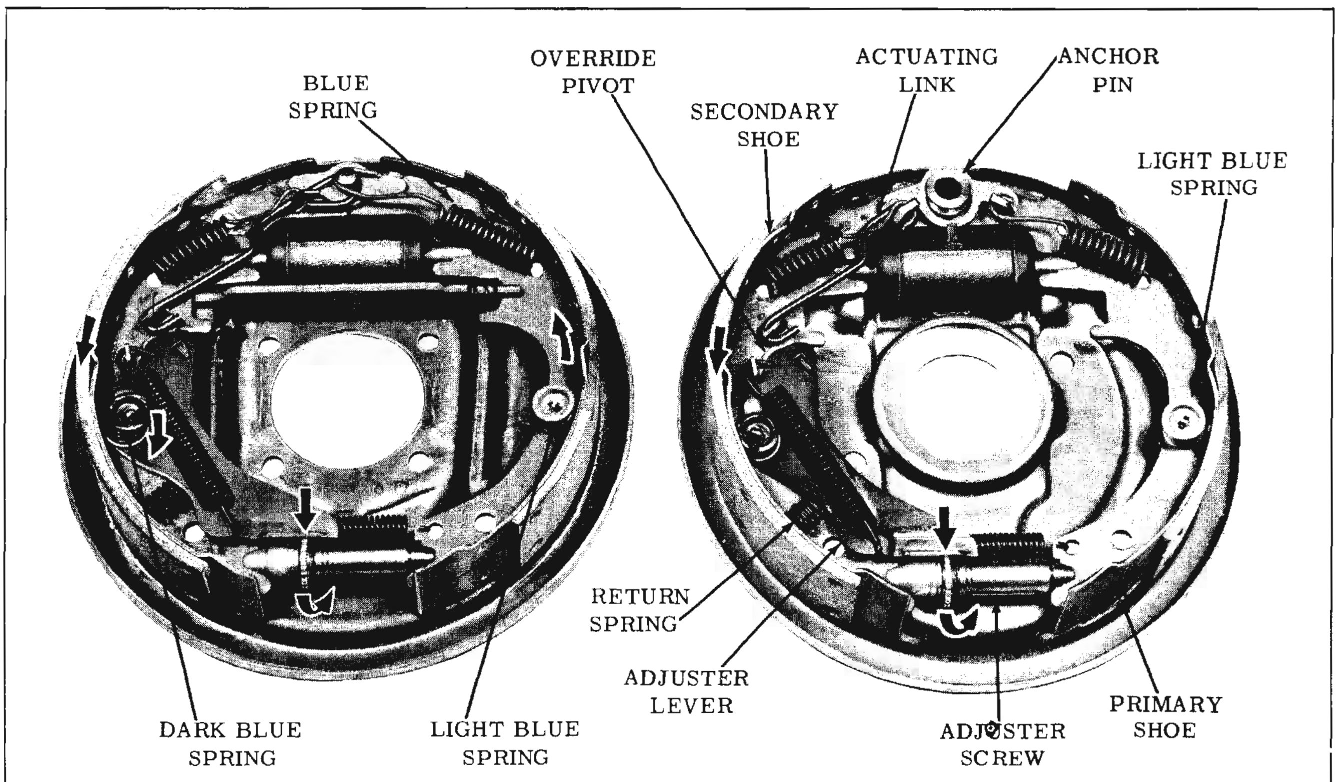


Fig. 7-103 Self-Adjusting Brake

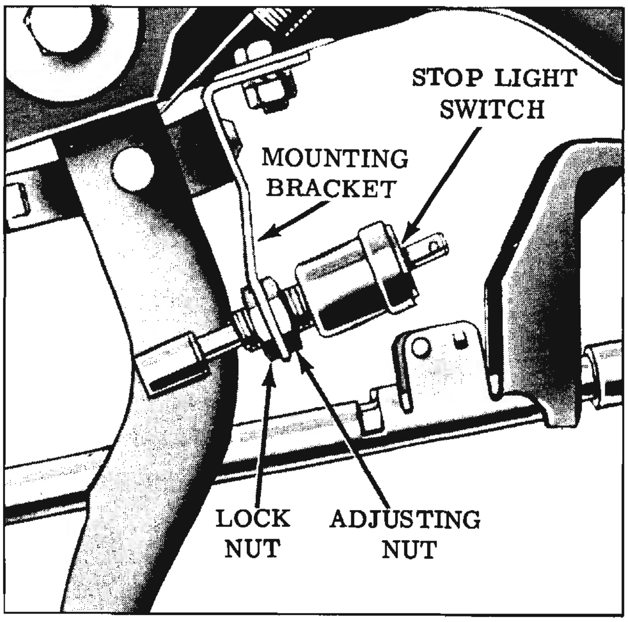


Fig. 7-104 Stoplight Switch Adjustment

STOP LIGHT SWITCH

The stop light switch is attached to the brake pedal bracket below the dash as shown in Fig. 7-104. It is actuated by the forward movement of the brake pedal. The switch can be adjusted in and out of the mounting bracket by loosening the locking nuts and moving the switch in the bracket and then retightening the nuts.

ADJUSTMENTS

BRAKE SHOE

A brake shoe adjustment is required only when new linings are installed or, if for any reason, it becomes necessary to change the length of the brake shoe adjusting screw.

1. With the brake drums removed, position the drum end (inside diameter measuring caliper) of the Brake Drum and Shoe Gauge, Tool J-21177, to the inside diameter of the drum and tighten clamp screw. (Fig. 7-105)

2. Position the brake shoe end (outside diameter measuring caliper) of Tool J-21177 over the brake shoes as shown in Fig. 7-105. Rotate gauge slightly around shoes to insure that gauge contacts the linings at the largest diameter. Adjust brake shoes until gauge is a snug fit on linings at the point of largest lining diameter.

   NOTE: If it is necessary to back off the brake shoe adjustment, it will be necessary to hold the adjuster lever away from the sprocket.

3. Remove the gauge.

BRAKE PEDAL PUSH ROD (STANDARD BRAKE)

An incorrectly adjusted brake pedal can hold the master cylinder piston from fully returning to its released position, which may result in brake drag or lockup. Brake drag at the time of shoe adjustment, may be caused by improper adjustment of shoes. Therefore, the free pedal adjustment should be inspected before brake shoe adjustment is made.

Since there is no clutch pedal return stop

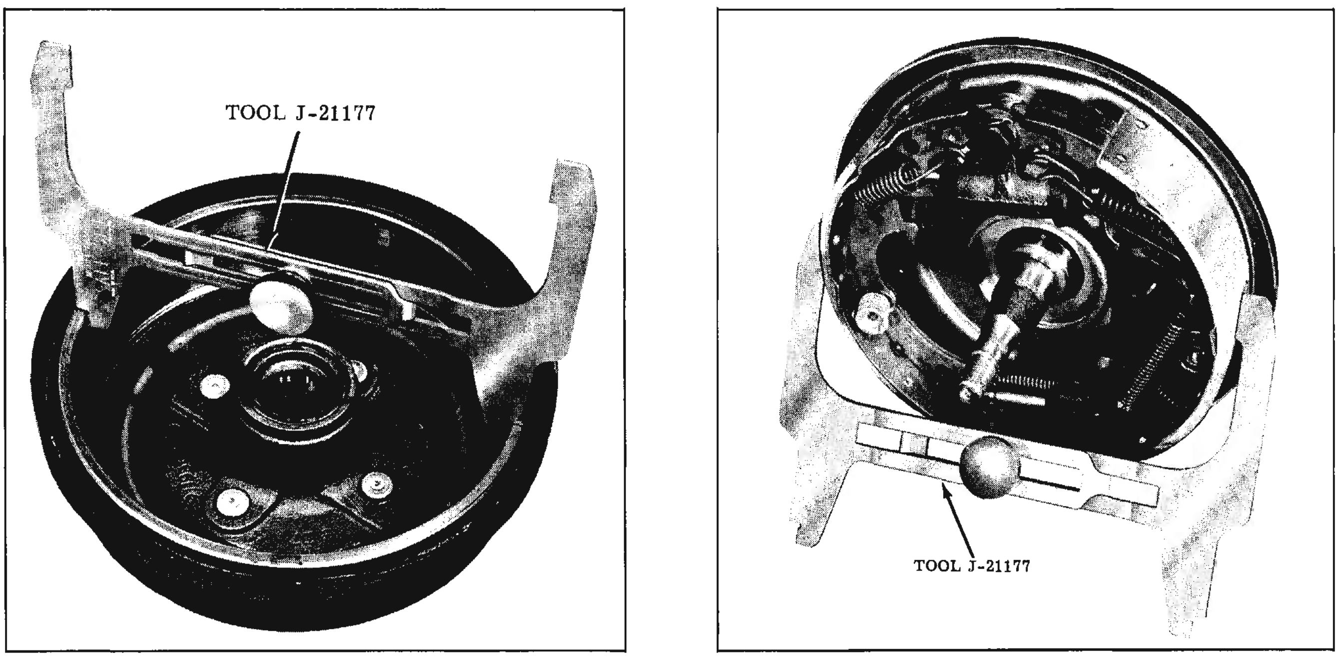


Fig. 7-105 Brake Shoe Gauge

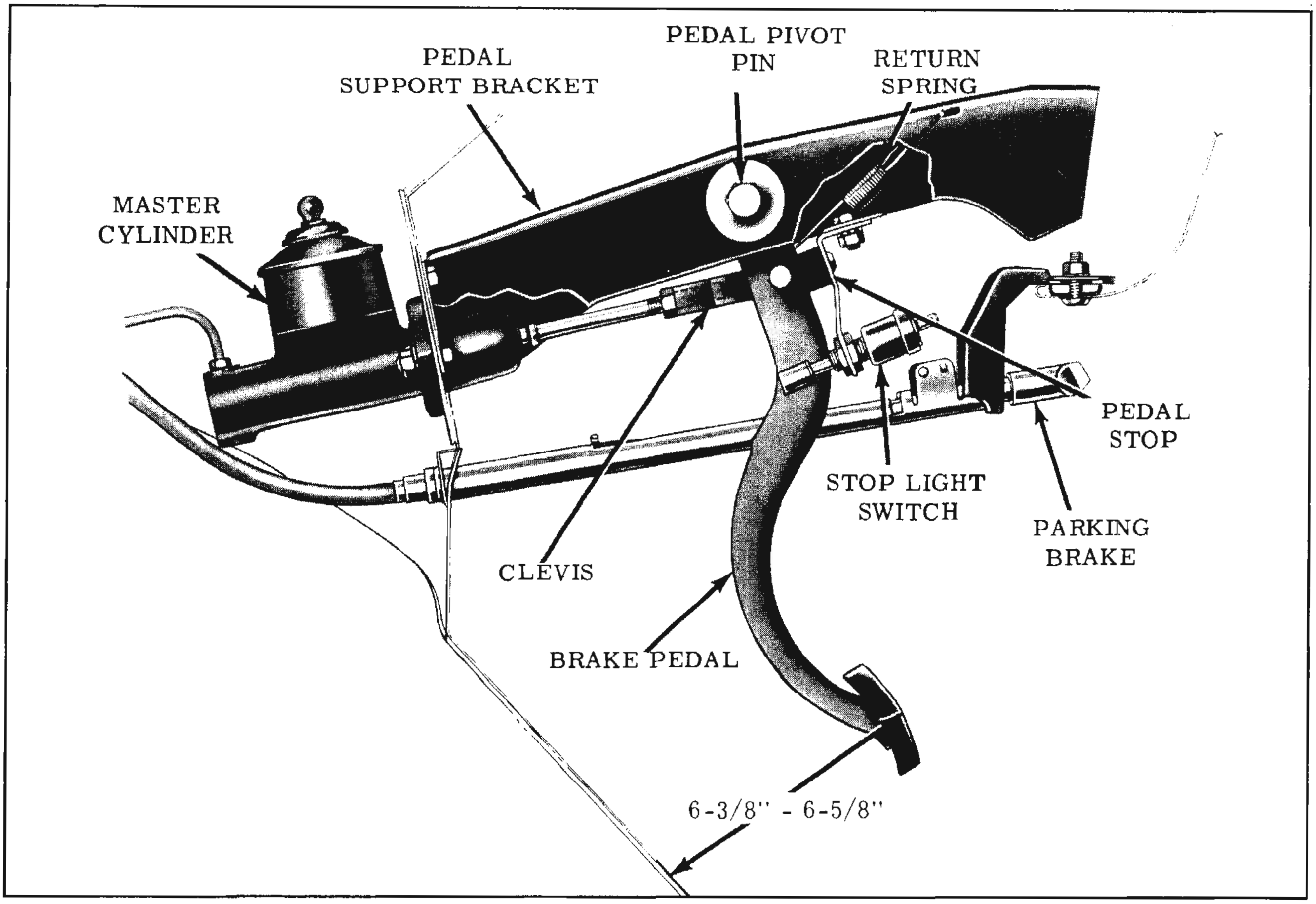


Fig. 7-106 Brake Pedal and Support

adjustment; it becomes necessary on Synchromesh equipped cars, to adjust the brake pedal return stop so that the released brake pedal height matches the clutch pedal released height. Any change in the brake pedal return stop requires that adjustment of the free travel and stop light switch be made. Therefore brake pedal adjustment shall be broken down into two sections, Hydra-Matic and Synchromesh.

HYDRA-MATIC

1. Turn back floor mat and check pedal height (from floor pan to top of pedal pad). If dimension is not 6-1/2" ± 1/8", loosen lock nut and adjust stop bracket on pedal support bracket. Tighten lock nut. (Fig. 7-106)
2. Disconnect the brake pedal return spring from brake pedal.
3. Remove the cotter pin from the push rod clevis pin and remove clevis pin.
4. To adjust the master cylinder push rod, lightly push the master cylinder push rod until it contacts the hydraulic piston.
5. Turn the push rod in or out of the clevis until the clevis pin can be freely installed into the brake pedal, then shorten the push rod one full turn to obtain proper free play.
6. Install new cotter key in clevis pin.
7. Attach pedal return spring to pedal.
8. Check operation of stop light switch and, if necessary, adjust.

SYNCHROMESH

1. Adjust pedal return stop by moving bracket on pedal support bracket. Adjust so that the pedal, when in the fully released position, is in line with the clutch pedal at its fully released position.
2. Disconnect the pedal return spring from the pedal.
3. Remove cotter key from push rod clevis pin, and remove clevis pin.
4. To adjust the master cylinder push rod, lightly push the master cylinder push rod forward until it contacts the hydraulic piston.
5. Turn the push rod in or out of the clevis until the clevis pin can be freely installed into the brake pedal, then shorten the push rod one full turn to obtain proper free play.

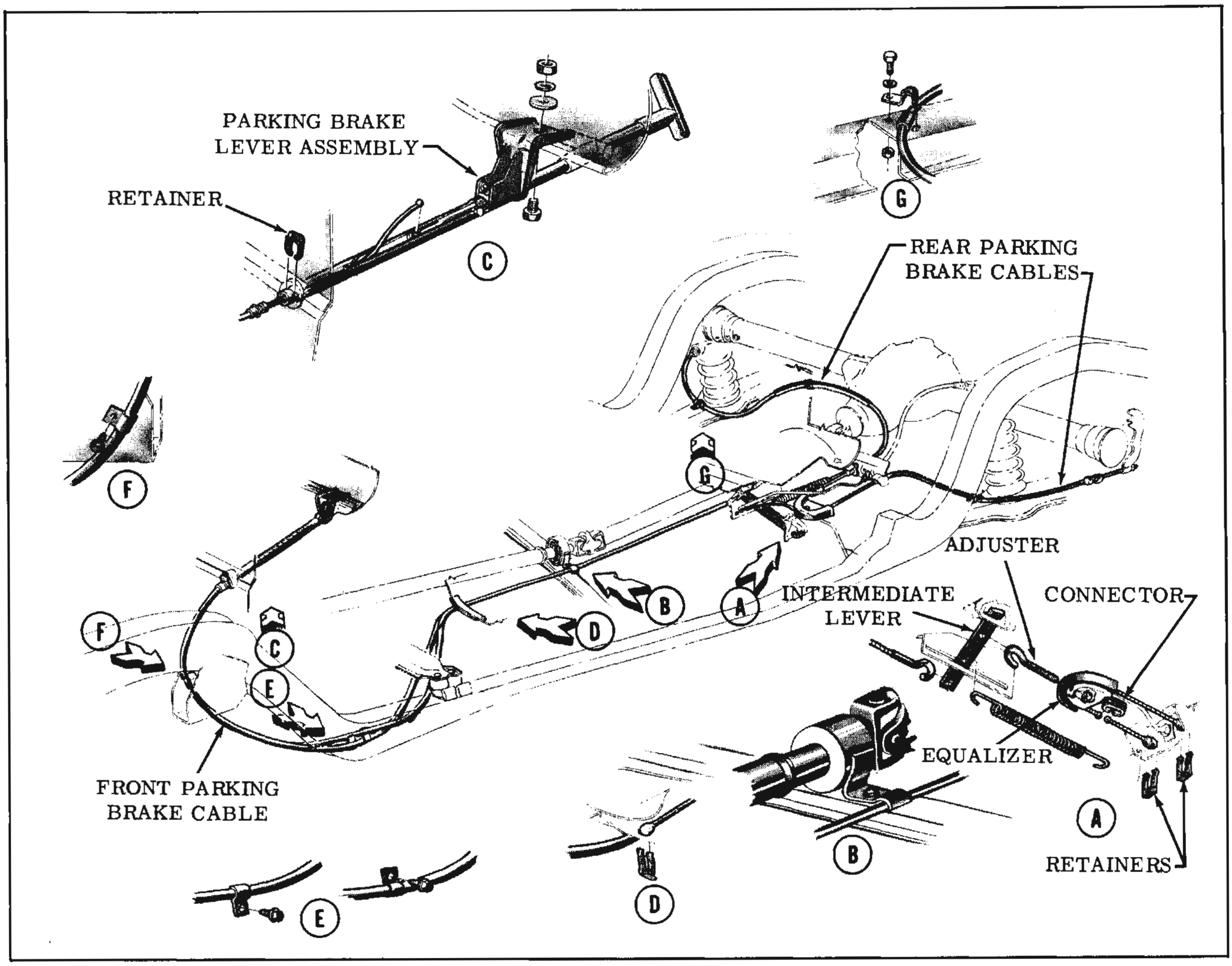


Fig. 7-107 Parking Brake Layout

6. Install a new cotter key in the clevis pin.
7. Attach the pedal return spring to the pedal.
8. Check operation of the stop light switch and, if necessary, adjust.

PARKING BRAKE

1. Release the parking brake.

   NOTE: Brake pedal clearance must be within specifications before adjusting parking brake. See PERIODIC SERVICE.

2. Adjust brake shoes if the service brake pedal travel from the release to the fully applied position exceeds 4" on standard brakes and 2" on power brakes with engine running. See BRAKE SHOE ADJUSTMENT.
3. Adjust rear cables by first tightening the equalizer adjusting nut until rear wheels cannot be turned freely, then loosen the equalizer adjusting nut nine full turns. (Fig. 7-107)

FRONT WHEEL BEARINGS

1. Tighten adjusting nut 18-20 ft. lbs. while rotating wheel, to insure that all parts are properly seated and threads free.
2. Back off 1/2 turn.
3. Retighten nut to 8-12 ft. lbs.
4. Back off nut 1/6 turn minimum to 1/4 maximum and install cotter pin.

BRAKE PEDAL (STANDARD)

The brake pedal is suspended from a support bracket under the instrument panel. Nylon bushings between the pivot pin and the pedal eliminate periodic lubrication. The pedal is connected to the master cylinder push rod by a clevis.

Removal

1. Disconnect stop light switch wiring from terminals.
2. Disconnect the pedal return spring.

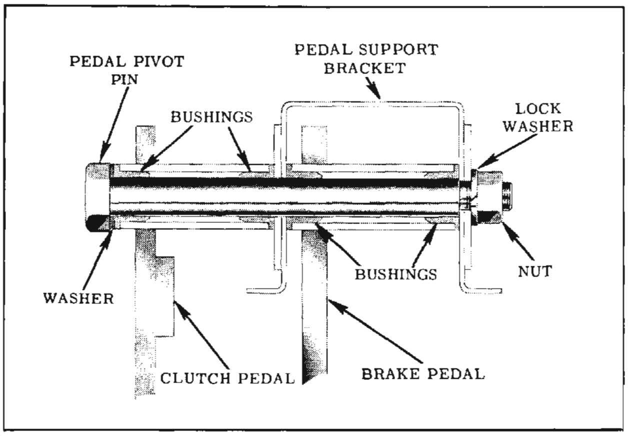


Fig. 7-108 Synchromesh Brake Pedal Attachment

3. Remove master cylinder push rod clevis pin.

4. On Synchromesh equipped cars, disconnect the clutch return spring from the clutch pedal.

5. Remove nut and lock washer from pedal pivot shaft pin.

6. Slide pedal pivot pin to the left sufficiently to allow the brake pedal assembly to fall from bracket. The clutch pedal on Synchromesh equipped cars need not be removed when removing the brake pedal.

Installation

1. Lubricate nylon bushings with Lubriplate and insert bushings into pedal mounting bracket. (Figs. 7-108, 7-109)

2. Position the brake pedal in the support, insert the pedal pivot pin, and install the lock washer and nut. Torque the pivot pin nut to 8-16 ft. lbs.

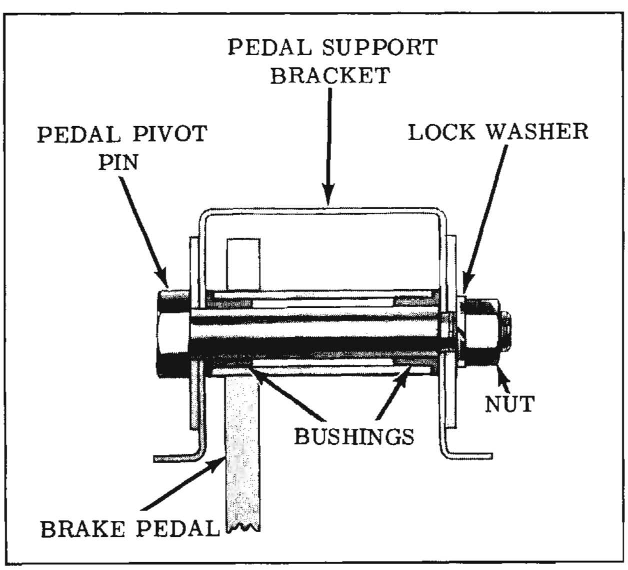


Fig. 7-109 Hydra-Matic Brake Pedal Attachment

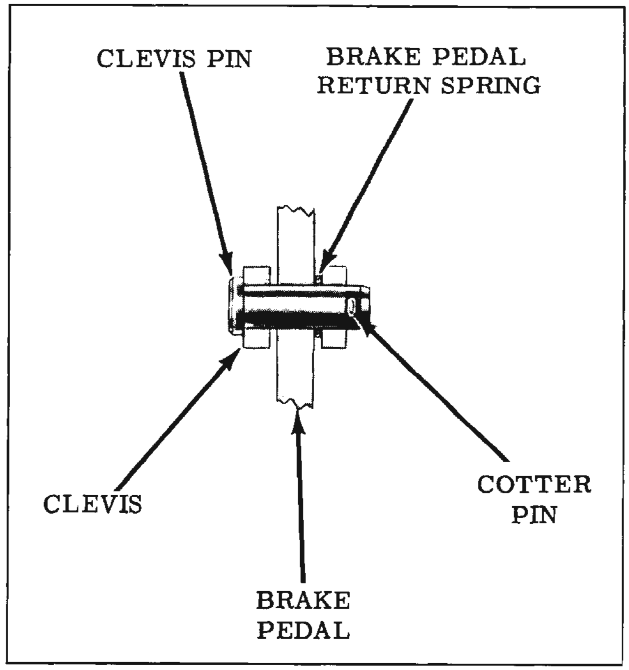


Fig. 7-110 Brake Pedal Clevis Pin

3. Install the clevis pin. (Fig. 7-110)

4. Attach the clutch pedal return spring to the clutch pedal and the brake pedal return spring to the brake pedal.

5. Connect stop light switch wiring to switch.

6. Check, and if necessary, adjust brake pedal stop, free play, and stop light switch.

BRAKE PEDAL SUPPORT BRACKET

The brake pedal support bracket is attached to the dash panel and instrument panel by cap screws on each end.

Removal

1. If Synchromesh equipped, disconnect the clutch pedal return spring and rod.

2. Disconnect the master cylinder push rod.

3. Remove attaching bolts from each end.

Installation

1. Torque cap screw nuts 20-28 ft. lbs.

2. Connect master cylinder push rod, clutch pedal rod and return spring.

3. Check clutch and brake pedal free travel and adjust if necessary.

PARKING BRAKE CABLES

FRONT

Removal

1. Disconnect intermediate lever return spring. (Fig. 7-107)
2. Remove retainer at body bracket end of hand lever.
3. Loosen propeller shaft center bearing support at cross member. ("B" in Fig. 7-107)
4. Remove cable clips at points "E" and "F", Fig. 7-107.
5. Remove cable.

Installation

1. Attach the cable to the hand lever. Route and attach the cable to the intermediate lever. Attach the return spring to the intermediate lever.
2. Install clips and retainer. Tighten propeller shaft center bearing support.
3. Check the hydraulic brake pedal height to be sure it is within specification; and, if necessary, adjust the parking brake cable length as follows:

   Tighten equalizer adjusting nut until rear wheels cannot be turned freely, then loosen the adjusting nut nine (9) full turns. (Fig. 7-107)

REAR

Removal

1. Loosen nut at equalizer. Remove equalizer for left hand cable removal. Remove retainer clips from left and right hand cables at body bracket ("A" in Fig. 7-107) Remove right hand cable clamp from lower right suspension arm. ("G" in Fig. 7-107)
2. Remove wheel and drum.
3. Remove cable from parking brake lever on brake shoe.
4. Depress cable to backing plate retaining clip and remove cable.
5. Remove left hand cable in same manner as right hand cable.

Installation

1. Reverse removal procedure when installing cables.
2. When cables are installed, adjust the brake shoes to within specifications and then adjust the parking brake.

MASTER CYLINDER

Removal

1. Disconnect the hydraulic line at the master cylinder.
2. Remove the master cylinder by removing the two attaching nuts. The master cylinder can be removed without disconnecting the push rod and clevis. (Figs. 7-106 and 7-111)

Installation

1. Lubricate push rod with a light film of Lubriplate to facilitate positioning of rubber boot on push rod after master cylinder is installed.
2. Position the master cylinder against cowl, push boot onto push rod and guide push rod into master cylinder piston cavity.
3. Install the attaching nuts. Torque nuts 20-28 ft. lbs.
4. From inside car, pull boot along push rod toward clevis until boot is fully extended. Check brake pedal height as outlined under BRAKE PEDAL ADJUSTMENTS.
5. Install hydraulic line to master cylinder.
6. Fill master cylinder reservoir with Super 11 Brake Fluid and bleed all wheel cylinders as outlined under BLEEDING OF LINES.

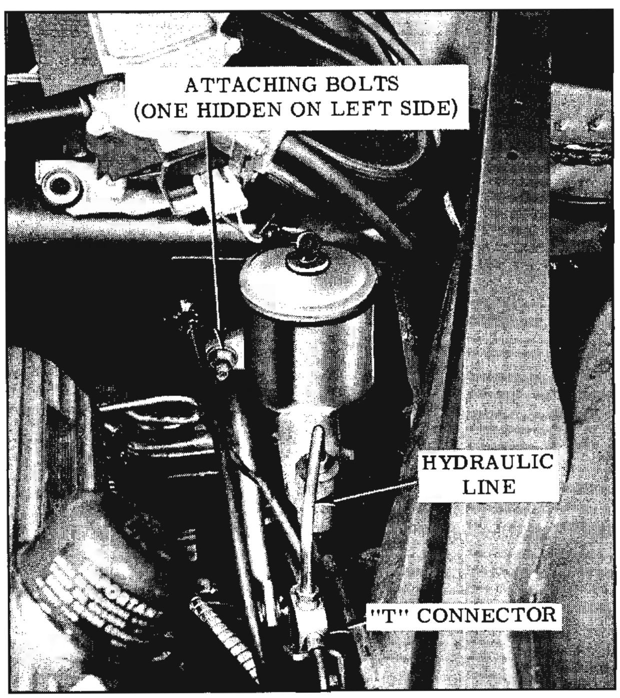


Fig. 7-111 Master Cylinder Attachment

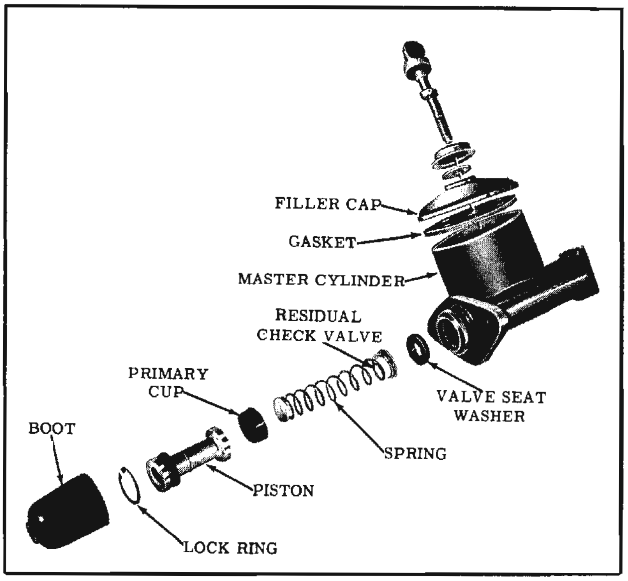


Fig. 7-112 Master Cylinder

Disassembly (Fig. 7-112)

1. Remove boot from master cylinder.
2. Remove the piston retaining ring from the bore of the master cylinder using internal pliers and remove piston.
3. Remove the primary cup, spring and residual check valve from bore of master cylinder.
4. Pry the rubber valve seat washer from cylinder bore.

CLEANING AND INSPECTION

1. Wash all parts in Declene Flushing Fluid and blow out all passages with compressed air. Be sure compensating port is open.
2. Inspect cups, residual check valve, valve seat washer and seals for a swelling or distorted condition. Replace if damaged. If such a condition exists, the entire system should be flushed (see FLUSHING HYDRAULIC SYSTEM) and all rubber parts in the wheel cylinders should be inspected and replaced if damaged.
3. Inspect the master cylinder bore for scores, rust, pits or etching. If any of these conditions exist, the complete master cylinder must be replaced as an assembly.

CAUTION: Do not attempt to hone the master cylinder bore as a means of salvaging the cylinder assembly. Reconditioning of the bore may leave the walls sufficiently rough to cause premature failure of the rubber cups. It may also enlarge the bore to the extent that the piston will no longer fit properly. Oversize pistons and cups are not available.

Assembly

1. Lubricate the master cylinder bore and all rubber parts with Super 11 Brake Fluid.
2. Install residual check valve rubber washer against the shoulder inside the master cylinder bore. (Fig. 7-112)
3. Install large end of spring over residual check valve and then install the assembly into the bore (check valve end first).
4. Install the primary cup over the end of the spring (concave side toward spring).
5. Install the piston into the bore and while compressing the spring, install the retaining ring.
6. Install boot over lip of master cylinder housing.

WHEEL CYLINDERS

FRONT

Removal

1. Remove hub and drum assembly.
2. Disconnect brake shoe return springs.
3. Remove shoe hold down springs and pins, and remove brake shoes.
4. Disconnect the brake line from the brake hose.
5. Remove the brake hose retainer clip at the line connection. (Inset "E" in Fig. 7-101)
6. Remove 2 wheel cylinder to backing plate cap screws and washers.
7. Remove wheel cylinder.

REAR

1. Remove wheel and drum.
2. Disconnect the brake shoe return springs.
3. Remove the shoe hold down springs and pins, and move brake shoe assembly out of the way.
4. Disconnect the brake line from the wheel cylinder.
5. Remove 2 wheel cylinder mounting screws.
6. Spread brake shoes apart and remove wheel cylinder.

Installation

When installing wheel cylinders, tighten attaching bolts 10-12 ft. lbs. and bleed air from lines.

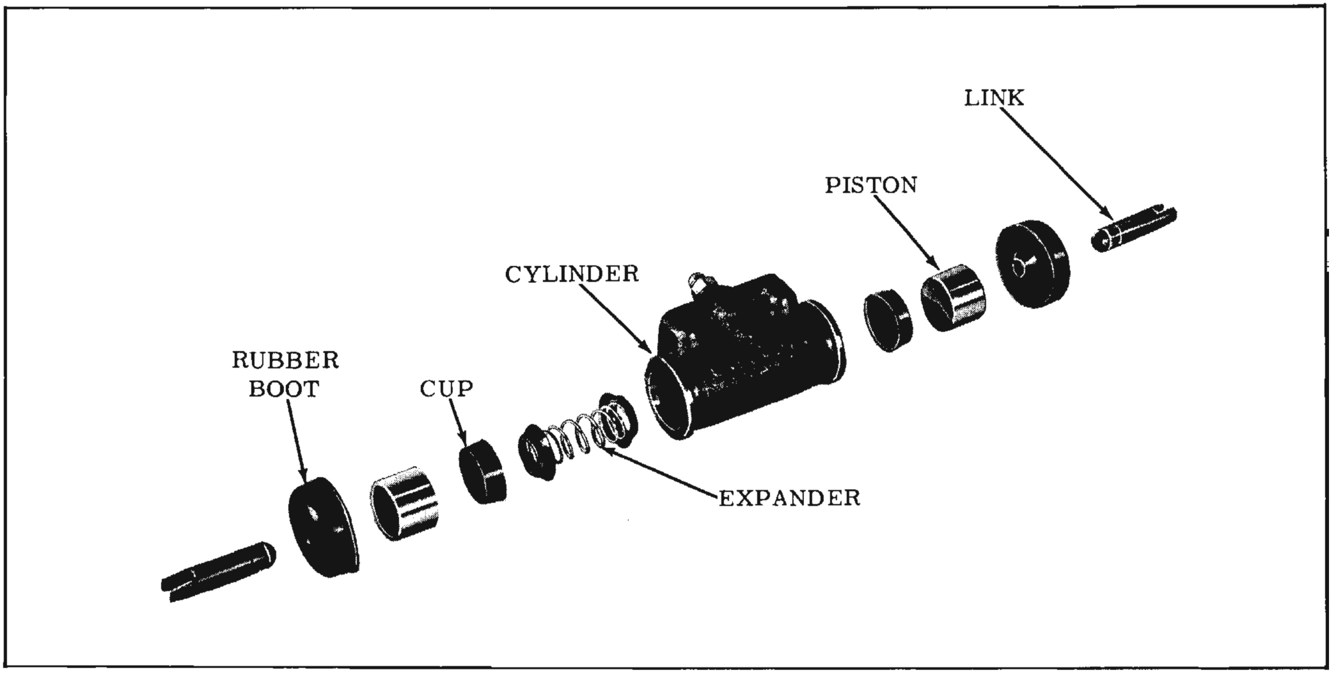


Fig. 7-113 Wheel Cylinder

This procedure is found under BLEEDING OF LINES. On front wheels, after installing wheel and drum assembly, adjust the front wheel bearing as outlined under ADJUSTMENTS—FRONT WHEEL BEARINGS.

Disassembly (Fig. 7-113)

1. Remove links and rubber boots.
2. Remove pistons, cups, and expander assembly from wheel cylinder bore.

Cleaning and Inspection

1. Wash all parts in Declene Flushing Fluid and blow out all passages with compressed air.
2. Inspect cups for a swelling or distorted condition, replace if damaged. If a swelling condition exists, the entire hydraulic system should be flushed (see FLUSHING HYDRAULIC SYSTEM) and all the rubber parts in the hydraulic system should be inspected and replaced if damaged.
3. Inspect the wheel cylinder bore for scores, rust, pits or etching. If any such conditions exist, the complete wheel cylinder must be replaced.

   CAUTION: Do not attempt to recondition a wheel cylinder bore as a means of salvaging the cylinder. Reconditioning of the bore may leave the walls sufficiently rough to cause premature failure of the rubber cups. It may also enlarge the bore to the extent that the pistons will no longer fit properly. Oversize pistons and cups are not available.

Assembly

Lubricate the bore of the wheel cylinder and all rubber parts with Super 11 Brake Fluid and assemble as shown in Fig. 7-113.

BLEEDING HYDRAULIC SYSTEM

Whenever a line is disconnected from any wheel cylinder, it is necessary that the wheel cylinder be bled. If the hydraulic line has been disconnected from the master cylinder or the brake pedal has a spongy feeling, each wheel cylinder must be bled to expel air from the system.

The system can be bled manually, or by using pressure bleeding equipment.

NOTE: Power brakes can be bled in the same manner as a standard brake system. If pressure bleeding equipment is not available, DO NOT use the vacuum assist. With the engine shut off the vacuum reserve should be depleted by applying the brakes several times before starting the bleeding procedure.

To bleed the system, the following procedure is recommended:

NOTE: It is suggested that the rear cylinders be bled first:

1. If the brakes are to be bled manually, fill the brake reservoir with Super 11 Brake Fluid and KEEP RESERVOIR AT LEAST ONE-HALF FULL OF FLUID DURING THE BLEEDING OPERATION.
2. If brakes are to be bled with pressure equipment, connect the tank to the brake reservoir

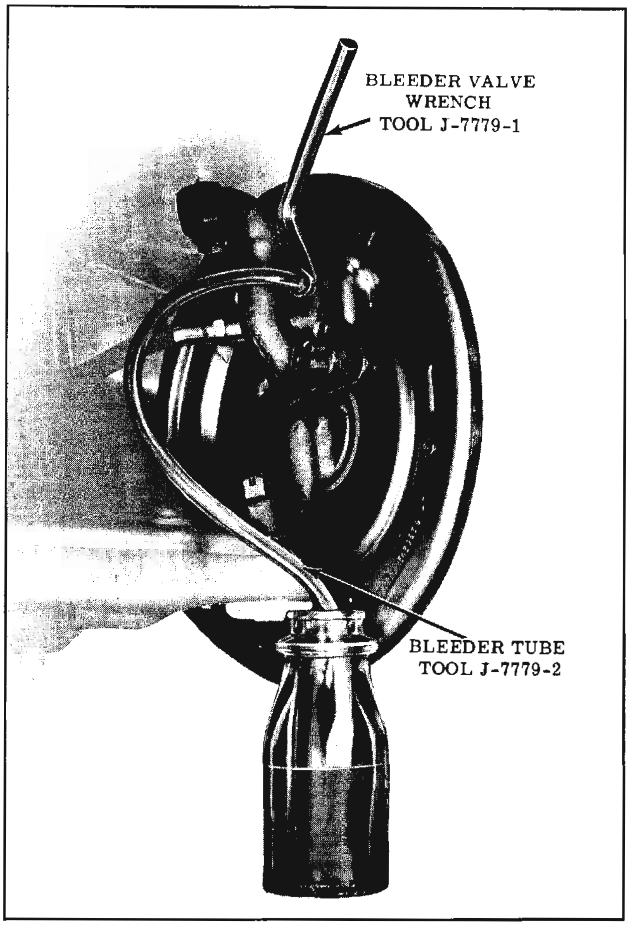


Fig. 7-114 Bleeding Brakes

and raise the pressure in the brake system to BRAKE BLEEDER MANUFACTURER'S SPECIFICATIONS, OR APPROXIMATELY 20 TO 30 P.S.I.

3. Attach Bleeder Tube J-7779-2 to wheel cylinder bleeder valve. (Fig. 7-114)

   THE TUBE MUST BE SUBMERGED IN A CLEAN CONTAINER PARTIALLY FILLED WITH SUPER 11 BRAKE FLUID DURING THE BLEEDING OPERATION.

4. Unscrew bleeder valve three quarters of a turn with a wrench such as J-7779-1 and watch flow of fluid from bleeder tube. When all air bubbles cease to appear, close bleeder valve.

   NOTE: If brakes are bled without the aid of pressure equipment, the brake pedal must be operated during this operation to force the fluid from the bleeder hose. Care must be taken to maintain fluid in the master cylinder at all times. To do this, open the bleeder valve, fully depress the brake pedal, then slowly release pedal until it is in the fully released position. Continue operating pedal until liquid, containing no air bubbles, emerges from bleeder tube. Close bleeder valve.

5. Remove bleeder tube.

6. Repeat the above steps on the remaining wheel cylinders if the entire system is to be bled.

7. After the bleeding operation has been completed, check the fluid level in the reservoir and replenish if necessary.

FLUSHING HYDRAULIC SYSTEM

Whenever mineral oil has been introduced into the hydraulic system, or foreign material has discolored or thickened the brake fluid, the entire system should be thoroughly flushed with Declene Flushing Fluid. The Declene Flushing Fluid is introduced into the master cylinder reservoir and expelled at each wheel cylinder in the same manner as the bleeding operation (see BLEEDING OF LINES) except that the flushing fluid is forced through the system until the fluid emerges clear at the wheel cylinders.

When flushing is completed, bleed the hydraulic system with Super 11 Brake Fluid as outlined under BLEEDING OF LINES until all flushing fluid and air is expelled from the lines.

DRUMS

INSPECTION

Whenever brake drums are removed, they should be inspected for scores, deep grooves, cracks and out of round.

Cracked drums must be replaced, however, cracks running circumferentially at the back corner of drum where the cast iron blends into the steel portion of the drum are of no consequence and drums should not be replaced.

NOTE: Grooves extending around the entire braking surface of the brake drum are permissible providing the edges of the grooves that contact the shoes are smooth.

Drum out of round can be measured with a dial indicator and extension rod. Out of round measurements exceeding .005" front and .006" rear (total indicator reading) require turning or replacement of drum.

TURNING DRUMS

If irregularities in the braking surface of the drum cannot be removed with emery cloth or out of round exceeds .005" front and .006" rear (total indicator reading), the drum should be turned to .060" greater than the original inside diameter; that is, after being turned the diameter should be 11.060". Oversize brake linings must be used with turned drums.

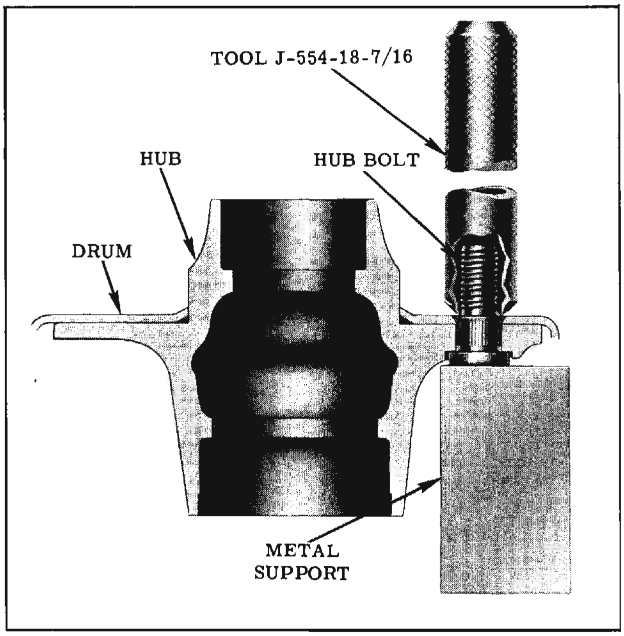


Fig. 7-115 Peening Hub Bolt

REPLACING DRUMS

Whenever new drums are to be installed, the braking surface of the drum must be thoroughly cleaned with lacquer thinner to remove the rust proof coating.

BRAKE LINE

When replacing a damaged brake line, the damaged section should be cut out and repaired with steel brake tubing, listed under Group 8.964 in the Chassis Parts Book. Flare connections must be a double lap. Follow Flaring Tool Manufacturer's instructions for proper flaring of the double lap flare.

FRONT HUB BOLT REPLACEMENT

The following procedure should be followed whenever it is necessary to install a new hub bolt into the hub and drum assembly.

1. With the hub and drum assembly removed drill a 7/16" hole 1/4" deep into the head of the hub bolt.

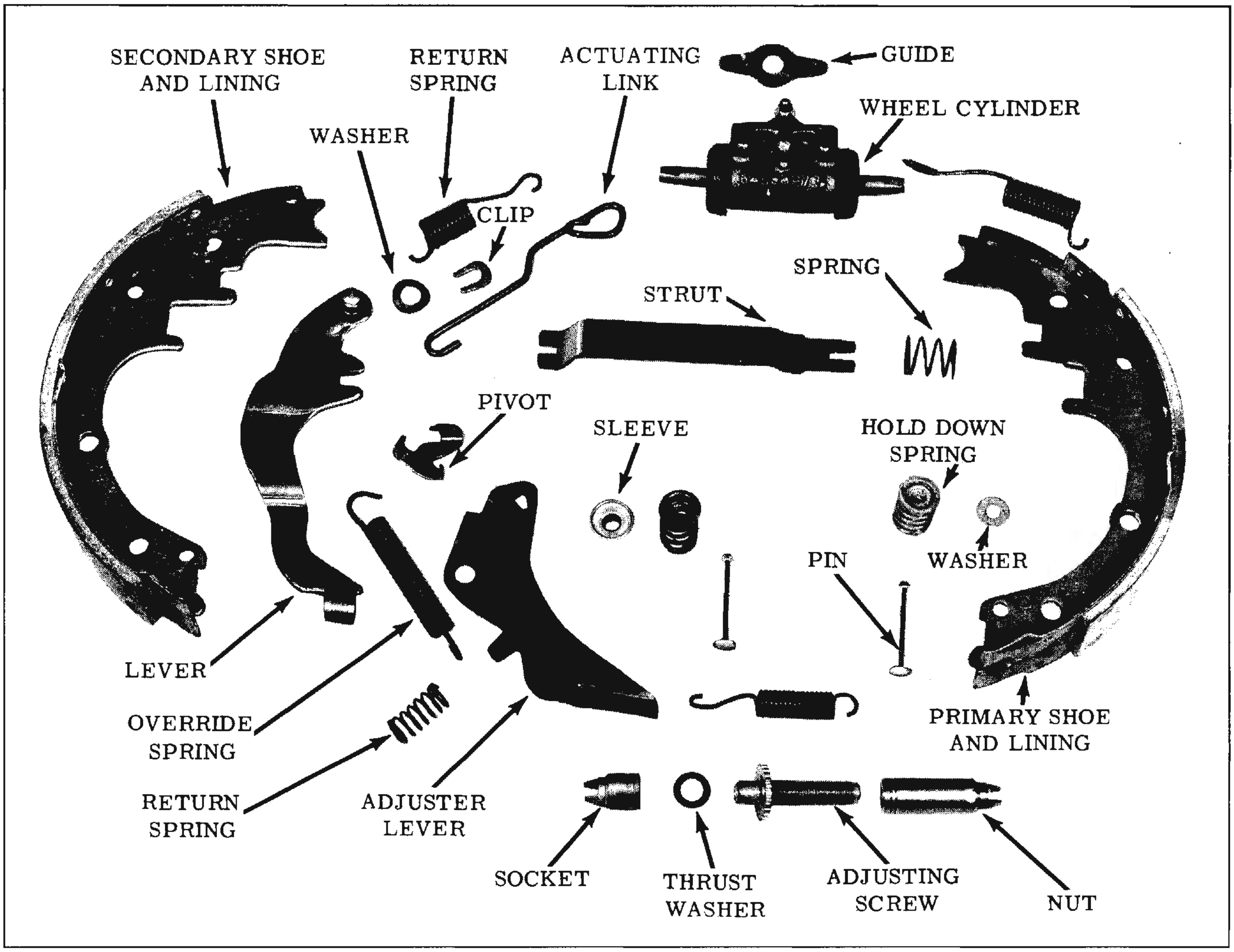


Fig. 7-116 Self-Adjusting Brake Components

2. Support hub and drum assembly and drive or press hub bolt out from the inside of the hub and drum assembly.

3. Press a new hub bolt into the hub. Splines of hub bolt must press tightly into hub.

4. While supporting hub bolt, peen hub bolt into the countersunk area of drum with the use of Peening Tool J-554-3-7/16" until the drum is secure to the hub. (Fig. 7-115)

BRAKE ASSEMBLIES (Fig. 7-116)

Removal

FRONT

1. Hoist car and remove the front hub and drum assemblies.

   NOTE: It may be necessary to back off the brake shoe adjustment before the brake drums can be removed. Back off shoe adjustment as shown in Fig. 7-117.

2. Remove the primary and secondary shoe return springs and the actuating link.

3. Remove the brake shoe hold down springs, pins, and washers. Remove the adjuster lever, override pivot and spring assembly and the lever return spring.

4. Spread shoes to clear wheel cylinder links, then remove the primary and secondary shoes as an assembly.

5. Remove the primary to secondary shoe spring and the adjusting screw.

REAR

1. Hoist car and remove parking brake equalizer adjuster nut. Remove cable connector from cable and remove equalizer from left hand cable.

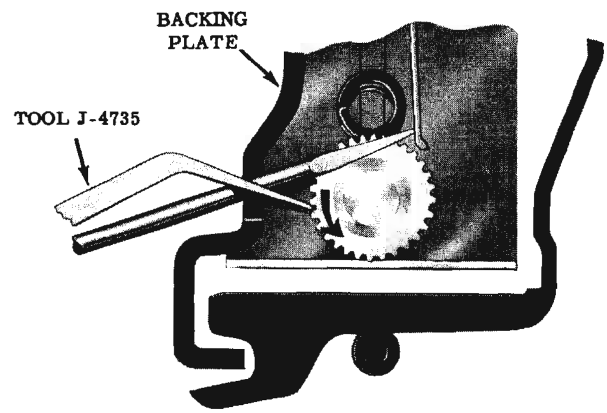
2. Remove the rear wheel assemblies and remove rear brake drums.

3. Remove the primary and secondary shoe return springs and the actuating link.

4. Spread shoes slightly and remove the parking brake lever strut and spring, then disconnect the parking brake cable from the operating lever.

5. Remove the brake shoe hold down springs, pins, and washers. Remove the adjuster lever, override pivot and spring assembly and the lever return spring.

6. Spread shoes to clear wheel cylinder links, then remove the primary and secondary shoes as an assembly.



INSERT SMALL SCREWDRIVER OR AWL THROUGH BACKING PLATE SLOT AND HOLD ADJUSTER LEVER AWAY FROM SPROCKET BEFORE BACKING OFF BRAKE SHOE ADJUSTMENT

Fig. 7-117 Backing Off Adjusting Screw

7. Remove the primary to secondary shoe spring and the adjusting screw.

8. Remove the parking brake lever from the secondary shoe.

Cleaning and Inspection

1. Inspect linings for wear. If linings are worn nearly flush with rivets, new linings should be installed.

2. Loosen wheel cylinder boot and inspect wheel cylinder for brake fluid leakage. If leak exists, remove wheel cylinder for service or replacement.

3. Clean inner surfaces of brake backing plates and all shoe contacting points.

4. Clean exposed portions of parking brake cables.

5. Disassemble the adjusting screw assembly. Clean and inspect as follows:

   a. Check thrust washer and mating surfaces for burrs or excessive wear.

   b. Inspect teeth on sprocket for wear.

   c. Remove all foreign material from adjusting screw and nut. Nut must rotate freely on threads.

6. Check the foot of the adjuster lever for wear. Replace if necessary.

7. Check the override pivot for wear or deformed parts.

8. Check brake drum for build-up of rust and dirt at outer circumference. Remove build-up so that drums can be installed over pre-adjusted linings.

Installation

Before installing brake shoe assemblies, lubricate the adjusting screw threads, thrust washer mating surfaces, backing plate ledges and all other contacting surfaces with lubricant, Part Number 987786.

FRONT

1. Assemble the adjusting screw.
2. Attach the primary to secondary shoe spring to the shoes with the long hooked end of the spring connected to the secondary shoe.
3. Position the adjusting screw between the primary and secondary shoes with the sprocket end of the screw toward the secondary shoe.

   IMPORTANT: THE RIGHT FRONT ADJUSTING SCREW HAS LEFT HAND THREADS AND CAN BE IDENTIFIED BY TWO (2) FLAT GROOVES IN THE ADJUSTING SCREW NUT. THE LEFT FRONT ADJUSTING SCREW HAS RIGHT HAND THREADS AND CAN BE IDENTIFIED BY TWO (2) "V" GROOVES IN THE ADJUSTING SCREW NUT.

4. Position the shoe assembly on the backing plate and position the wheel cylinder links in the shoe notches.
5. Position the upper end of the actuating link onto the brake shoe guide at the anchor pin.
6. Hook the actuating link onto the override pivot and then position the adjuster lever assembly and return spring on the secondary shoe. Fasten with the dark blue hold down spring assembly.

   NOTE: The front and rear brake shoe assemblies each use two (2) brake shoe hold down springs. A light blue hold down spring is used at the primary shoe and a dark blue hold down spring is used at the secondary shoe. The front brake shoe hold down spring retaining pins are identified with the numeral 5 stamped on the outer face. The rear brake shoe hold down spring retaining pins are identified with the numeral 3 stamped on the outer face.

7. Install the primary shoe hold down spring assembly (light blue spring).
8. Install the primary and secondary brake shoe return springs.
9. Adjust brake shoes as outlined under "ADJUSTMENTS-BRAKE SHOES".
10. Install the front hub and drum assembly and adjust front wheel bearings as outlined under ADJUSTMENTS-FRONT WHEEL BEARINGS.

REAR

1. Pull parking brake cables forward and rearward through conduits, lubricate freely with Lithium Soap Grease and return cable to normal position. Remove any excess lubricant.
2. Install parking brake lever to the secondary shoe.

   NOTE: The secondary shoe linings, when new, are .065" thicker than the primary linings.

3. Assemble the adjusting nut.
4. Attach the primary to secondary shoe spring to the shoes with the long hooked end of the spring connected to the secondary shoe.
5. Position the adjusting screw between the primary and secondary shoes with the sprocket end of the screw toward the secondary shoe. The sprocket should not contact the spring.

   IMPORTANT: THE RIGHT REAR ADJUSTING SCREW HAS LEFT HAND THREADS AND CAN BE IDENTIFIED BY TWO (2) FLAT GROOVES IN THE ADJUSTING SCREW NUT. THE LEFT REAR ADJUSTING SCREW HAS RIGHT HAND THREADS AND CAN BE IDENTIFIED BY TWO (2) "V" GROOVES IN THE ADJUSTING SCREW NUT.

6. Position the shoe assembly on the backing plate and position the wheel cylinder links in the shoe notches. Install the parking brake strut and spring.
7. Position the upper end of the actuating link over the anchor pin.
8. Hook the actuating link onto the override pivot and then position the adjuster lever assembly and return spring on the secondary shoe. Fasten with the dark blue hold down spring assembly.

   NOTE: The front and rear brake shoe assemblies each use two (2) brake shoe hold down springs. A light blue hold down spring is used at the primary shoe and a dark blue hold down spring is used at the secondary shoe. The front brake shoe hold down spring retaining pins are identified with the numeral 5 stamped on the outer face. The rear brake shoe hold down spring retaining pins are identified with the numeral 3 stamped on the outer face.

9. Connect the parking brake cable to the parking brake lever.
10. Install the primary shoe hold down spring assembly (light blue spring).

11. Install the primary and secondary brake shoe return springs.

12. Adjust brake shoes as outlined under "ADJUSTMENTS-BRAKE SHOES".

13. Install the drums and wheel and tire assemblies.

14. Assemble parking brake cables to equalizer and reinstall equalizer to car. Adjust parking brake as outlined under "ADJUSTMENTS".

After the brake shoe assemblies have been installed and adjusted, the master cylinder fluid level should be checked. The fluid level should be 1/4" below the reservoir opening. Also check the brake pedal travel to be sure it is within specifications, and then road test car for proper operation of the brake system.

FRONT WHEEL BEARINGS

Removal

1. Remove hub dust cap.

2. Remove cotter pin, knuckle nut, and washer.

3. Pull hub and drum assembly outward, then push back onto knuckle to clear outer bearing and remove outer bearing.

4. Pull hub and drum assembly off knuckle.

   NOTE: It may be necessary to back off the brake shoe adjustment before the hub and drum can be removed.

5. Remove grease seal by placing the tip of a long screwdriver under seal flange at hub and tapping other end of screwdriver with a hammer to jar seal and retainer flange loose from hub bore.

6. Remove inner bearing.

7. Support drum and hub with J-7027 (flywheel housing support) when removing outer bearing race.

8. Use Tool J-8092 with Adapters J-7030-1 and J-7030-2, to drive outer bearing race out of the hub bore.

9. Use a brass drift to drive inner bearing outer race out of hub bore.

Installation

1. Support hub and drum with J-7027 (flywheel housing support) when installing inner bearing outer race. Install inner bearing outer race using Tool J-6198 (front pinion bearing cup installer) with Handle J-8092. Use flat side of J-6198 to drive race into hub bore and take up slack between tool and handle with 3/4" washers to remove driving force from handle threads.

2. Install outer bearing outer race using Tools J-6278 and J-6278-2.

3. Use a fine fiber sodium soap wheel bearing grease and pack the wheel bearings. Spread a thin film of grease on bearing races and install inner bearing assembly in the hub.

4. Install a new grease seal by tapping seal into hub.

   NOTE: If brake adjuster was backed off, it will be necessary to adjust as outlined under ADJUSTMENTS.

5. Install wheel assembly on knuckle.

6. Install outer bearing, washer and knuckle nut on knuckle.

7. Tighten adjusting nut to 18-20 ft. lbs. while revolving wheel.

8. Back nut off 1/2 turn and retighten to 8-12 ft. lbs.

9. Back nut off 1/6 turn minimum to 1/4 maximum and install cotter pin and dust cap.

POWER BRAKES

The hydraulic system used in conjunction with the power unit is identical to the standard brakes with the following two exceptions:

1. The power brake pedal assembly has been designed to incorporate a shorter pedal travel than the standard brake system.

2. The master cylinder used with the power unit has a 1-1/8" diameter bore, 1/8" larger than the standard master cylinder.

Periodic Maintenance

Check level of brake fluid in reservoir; fluid level should be 1/4" below master cylinder filler cap. Replenish as necessary with Super 11 Brake Fluid. If addition of fluid is frequent, inspect the brake hoses, lines, master cylinder and wheel cylinders for leakage or damage.

If the pedal free travel, from the released to fully applied position exceeds 2" with the engine running, the brake shoes should be adjusted.

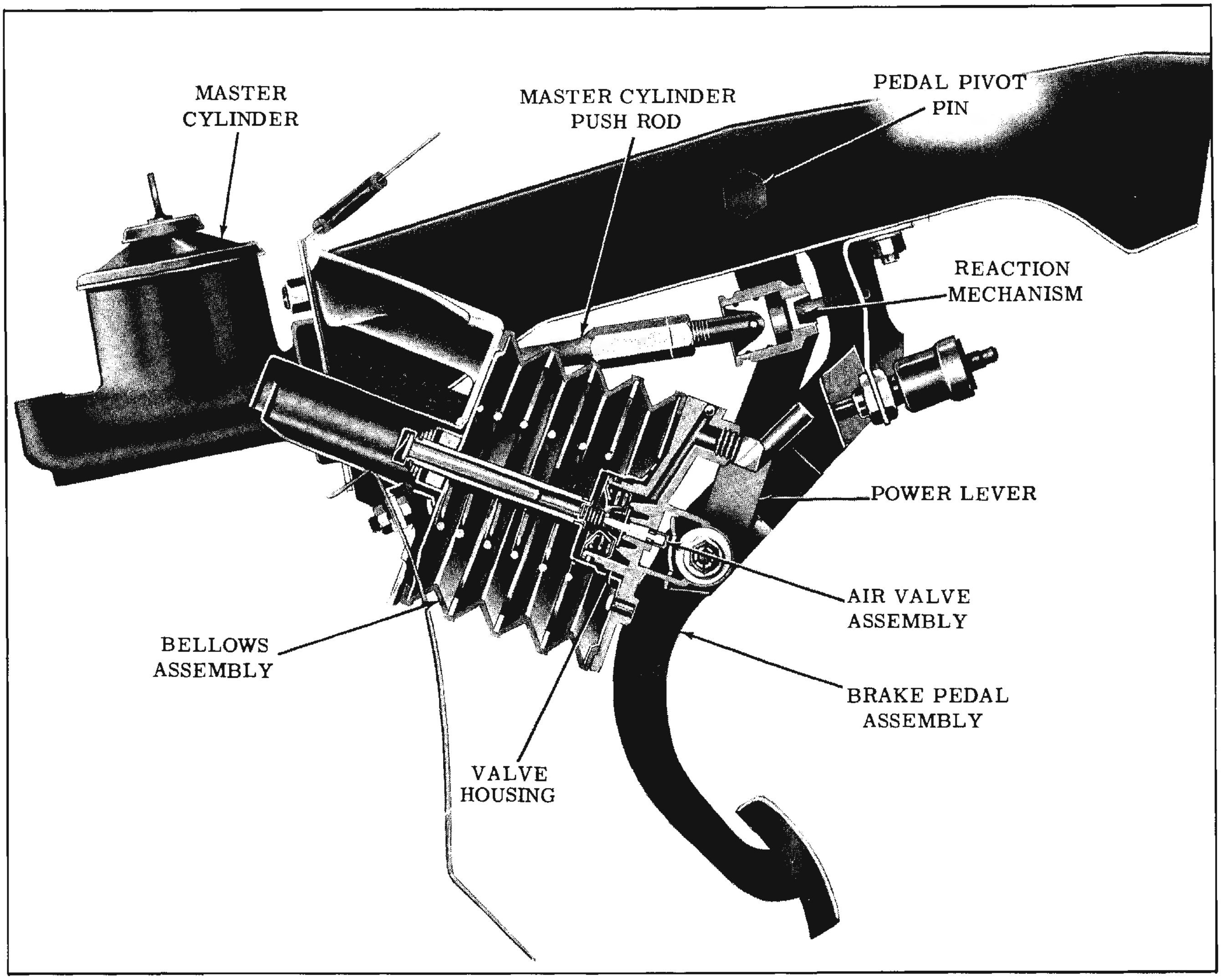


Fig. 7-118 Power Brake

DESCRIPTION

The F-85 Power Brake Unit is a pedal-assist type power unit which is mounted on the passenger side of the cowl and to the left of the brake pedal. (Fig. 7-118) The power unit consists of the bellows assembly, the pedal assembly and the master cylinder assembly. The power assist bellows acts as an assist in depressing the brake pedal assembly. Since the pedal assembly is designed to incorporate a shorter pedal travel than is used on the standard brake system, a larger diameter master cylinder is required to provide the same volume displacement in the hydraulic system.

PRINCIPLES OF OPERATION

The bellows assembly contracts and expands as the air pressure in it is varied by the introduction of vacuum or atmosphere. One end of the bellows assembly is attached to the mounting bracket, and the other end is connected to the pedal assembly. The valves which control the air pressure in the bellows are located in the valve housing, and are controlled by the movement of the trigger and brake pedal assembly. When the bellows contracts, it draws the power lever toward the master cylinder and gives a proportional assist to the operator as he depresses the brake pedal. This movement is transmitted to the master cylinder through the reaction mechanism and the push rod.

The power lever assembly is connected to the bellows assembly through the shank of the valve adjusting eccentric bolt. (Fig. 7-119) The power lever is also connected to the master cylinder push rod through the reaction mechanism. The brake pedal carries the valve actuating bracket or "trigger".

Refer again to Fig. 7-119 and note the relative positions of the valve assembly and the brake pedal, and particularly the air valve button and the trigger. The trigger is part of the brake pedal, and its movement, transmitted through the air valve button, controls the operation of the valves. The details of this operation are shown in the insets of Fig. 7-119.

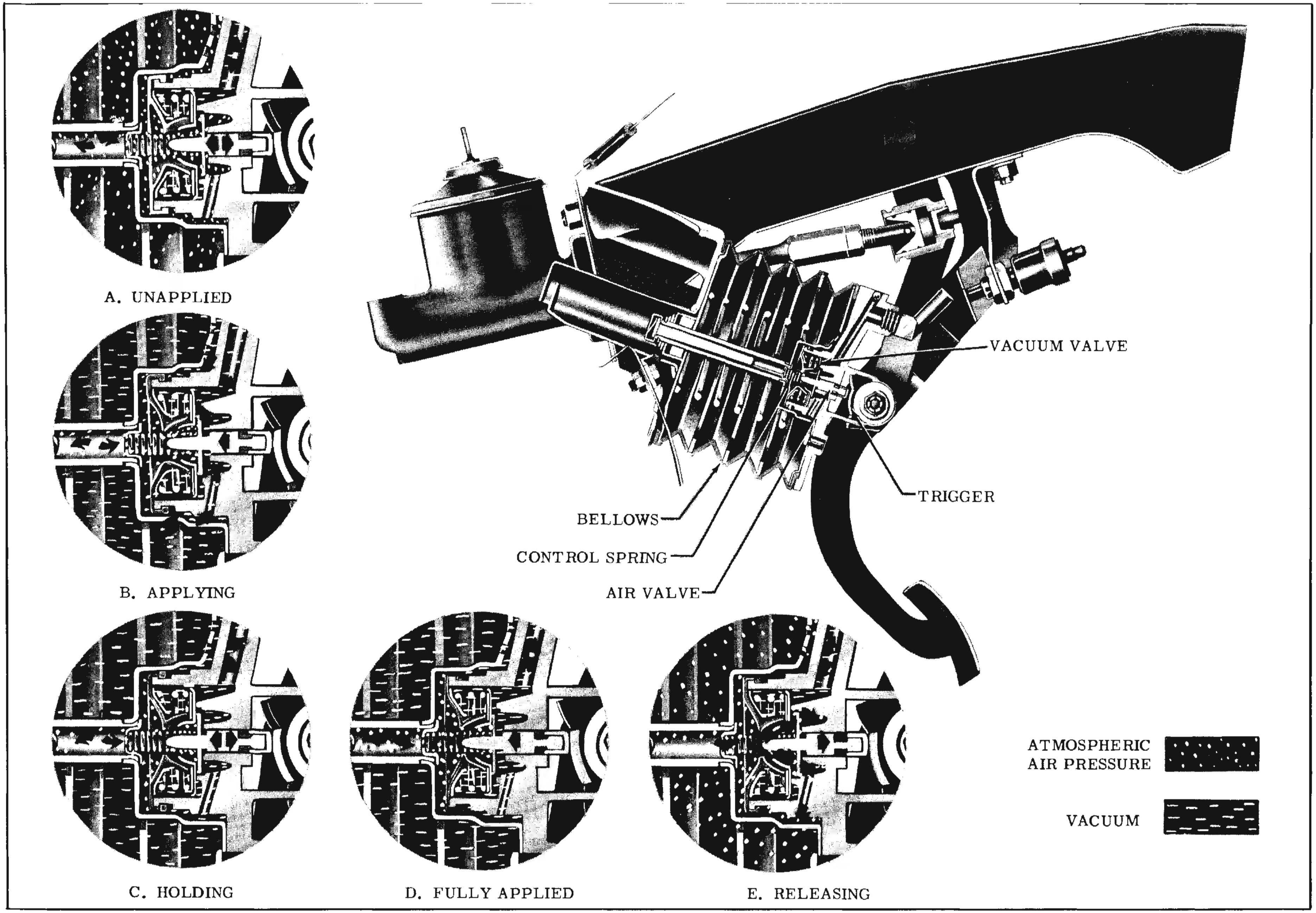


Fig. 7-119 Vacuum Valve Operation

Unapplied Position (Inset "A", Fig. 7-119)

In inset "A" of Fig. 7-119, the air and vacuum valves are shown in the unapplied position. The air valve is held open by the air valve control spring and the vacuum valve is held closed by the vacuum valve return spring. Atmospheric pressure enters the bellows through the air filter and the open air valve. The brake mechanism is held in the released position by the bellows return spring.

Applying Position (Inset "B", Fig. 7-119)

As the brake pedal is applied, the trigger pushes against the air valve, sealing off atmospheric air pressure to the bellows. Further movement of the brake pedal opens the vacuum valve and the vacuum begins to evacuate a controlled amount of air from the bellows. Atmospheric air pressure acting on the outside of the bellows causes the bellows to contract. Contraction of the bellows moves the power lever which in turn moves the push rod into the master cylinder giving an assist to brake application. The amount of air evacuated from the bellows is controlled by the amount of pedal effort. Any force applied to the pedal less than that required to cause the power unit to be fully applied will result in the unit seeking a hold position.

As fluid pressure increases in the master cylinder, a reaction force is transmitted back through the push rod, push rod piston, reaction disc, and reaction piston to apply a pressure to the brake pedal. This reaction force moves the trigger away from the air valve which in turn allows the vacuum valve to close. The reaction force is proportional to the fluid pressure in the hydraulic system and balances the force exerted on the brake pedal, providing the driver with brake "feel".

Holding Position (Inset "C", Fig. 7-119)

When pedal effort is maintained at any stage of brake application or release, the unit will assume a holding position.

With the valves in the applying position, the bellows contracts and in so doing, the distance between the air valve and the trigger is increased; allowing the vacuum valve to close. With both the vacuum and air valves closed the existing pressure in the bellows is maintained. The power unit then holds the brake system at the same degree of application as the operator's foot pressure on the brake pedal.

Fully Applied Position (Inset "D", Fig. 7-119)

In the fully applied position the air valve is held closed and the vacuum valve is held open. This results in a continuous application of vacuum at the bellows and the unit delivers its maximum assist to the brake pedal.

Releasing Position (Inset "E", Fig. 7-119)

When the brake pedal is released, the vacuum valve return spring closes the vacuum valve and the air valve control spring opens the air valve. This allows atmospheric air to enter the bellows and, as the inside and outside pressures acting on the bellows begin to balance, the bellows return spring causes the bellows to expand to its full length; thereby removing any assist force from the brake pedal. The pedal returns to the unapplied position.

BELLOWS ASSEMBLY

For removal and installation see Fig. 7-120.

If necessary to service the pedal assembly, it can be removed at this time.

1. Disconnect and remove stop lamp switch.
2. Remove pedal pivot bolt.
3. Remove pedal assembly.

Disassembly

1. Remove seal from air inlet housing.
2. Remove the three attaching nuts and lock washers and remove the mounting bracket assembly from the power unit. (Fig. 7-121)

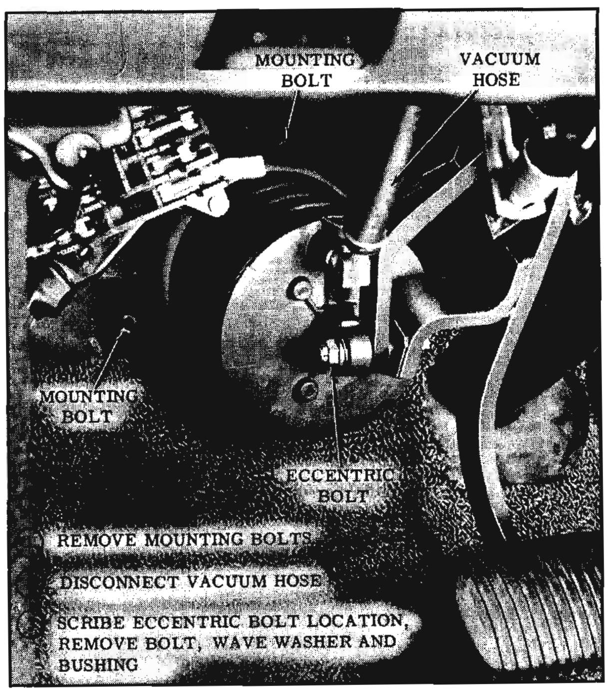


Fig. 7-120 Bellows Removal

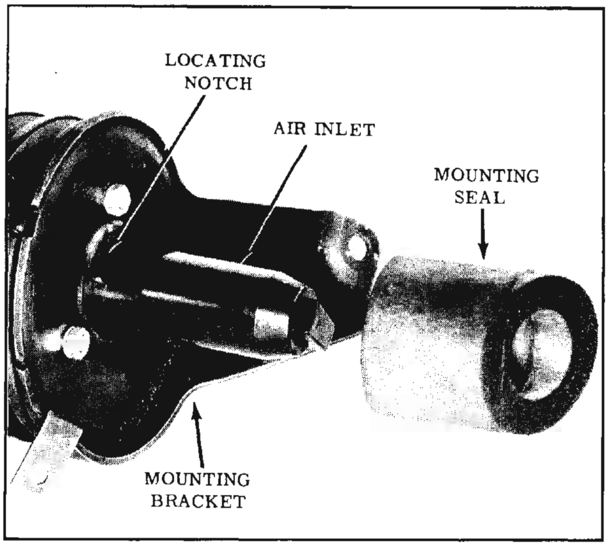


Fig. 7-121 Mounting Bracket Removal

3. Remove air inlet housing from the mounting bracket assembly.
4. Clamp power unit in a vise as shown in Fig. 7-122.
5. Remove air filter baffle from sleeve of retainer and sleeve assembly by pushing down and sideways to unhook, then lift out air filter with baffle. Remove baffle from air filter. (Fig. 7-122)
6. While holding mounting hub and bellows down against return spring, remove retaining ring, steel stop washer and rubber stop washer from guide sleeve. CAUTION: Use care to avoid damaging retaining ring by opening too wide. (Fig. 7-123)
7. Still holding mounting hub down, remove lip of bellows from hub (Fig. 7-124), then lift mounting hub assembly and return spring from power unit.

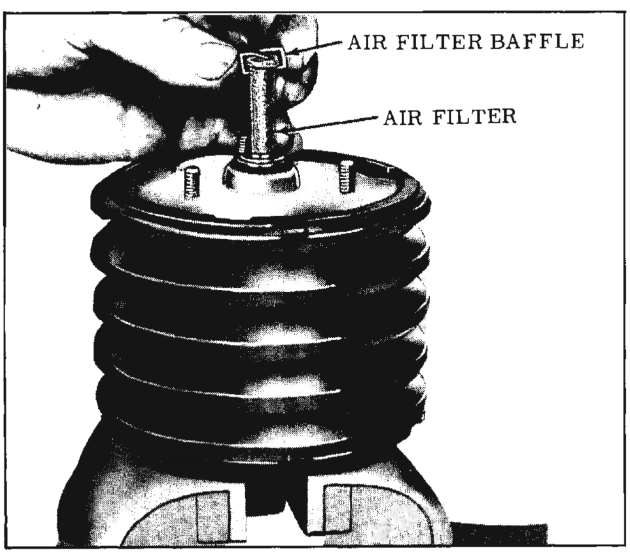


Fig. 7-122 Air Filter and Baffle Removal

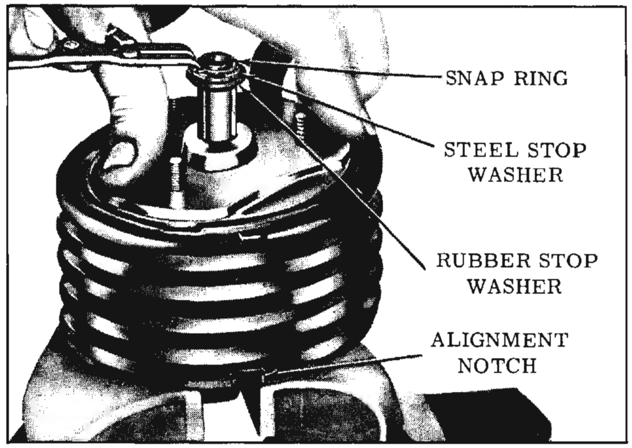


Fig. 7-123 Snap Ring Removal

NOTE: Do not place mounting hub in any type of cleaning solvent since hub contains a leather seal.

8. Remove three self-locking and sealing cap screws, then remove retainer and guide sleeve assembly with bellows from valve housing.
9. Remove retainer and sleeve assembly from bellows. (Fig. 7-125)
10. Remove air valve control spring, valve balancing diaphragm, vacuum valve spring, vacuum valve assembly and air valve assembly from valve housing. See Fig. 7-126 taking steps in order F to A.
11. From the valve balancing diaphragm, remove the valve balancing washer and the valve balancing retainer. (Fig. 7-126-C) Discard the valve balancing diaphragm, vacuum valve assembly and air valve assembly.
12. Clean all metal parts (except the mounting hub assembly), including the air filter, in alcohol or other oil-free solvent and dry thoroughly with dry compressed air.

NOTE: Mounting hub assembly contains a

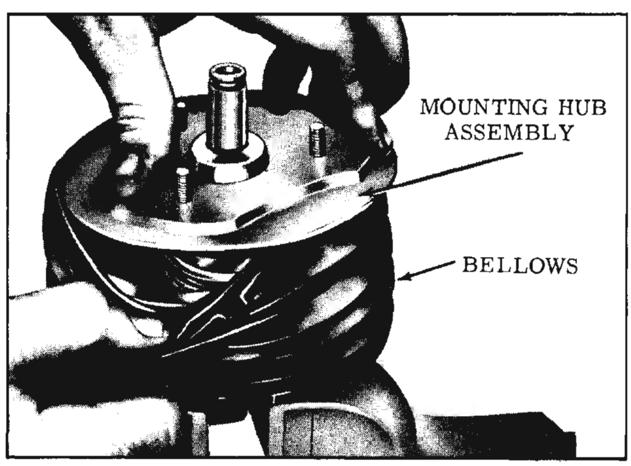


Fig. 7-124 Mounting Hub Removal

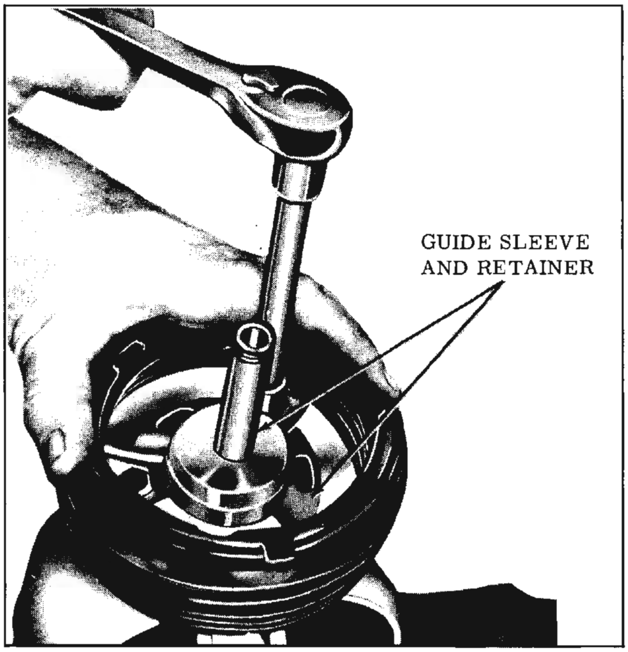


Fig. 7-125 Retainer and Sleeve Removal

leather seal from which the lubricant must not be removed.

If it is necessary to clean the mounting hub assembly, it should be wiped clean with a dry cloth only. Clean the rubber bellows, if necessary, by washing in a mild soap and water solution, after removing three support rings. Rinse in clean water and dry with compressed air. Inspect all parts for wear or damage. All worn or damaged parts must be replaced. If vacuum valve seat (in valve housing) is damaged, valve housing must be replaced.

Assembly

1. Clamp valve housing in padded jaw vise so that alignment notch is visible. (Fig. 7-123)

2. Refer to Fig. 7-126 and re-assemble air and vacuum valve. Follow steps in order A to F. Install air valve assembly, then vacuum valve assembly. Install vacuum valve spring. Assemble washer into valve balancing diaphragm. Then assemble diaphragm retainer to valve balancing diaphragm with small diameter of retainer toward diaphragm; then install this assembly as shown, retainer first, being sure that diaphragm retainer is centered in vacuum valve spring, and that center bead in retainer is pressed down snugly and evenly over neck or hub of vacuum valve assembly. Wipe some lubriplate around outside diameter of valve balancing diaphragm.

   WARNING: DO NOT APPLY BRAKE FLUID TO THE RUBBER PARTS OF THIS UNIT.

3. If a new bellows is to be installed, remove three support rings from old bellows and insert them into convolutions of new bellows,

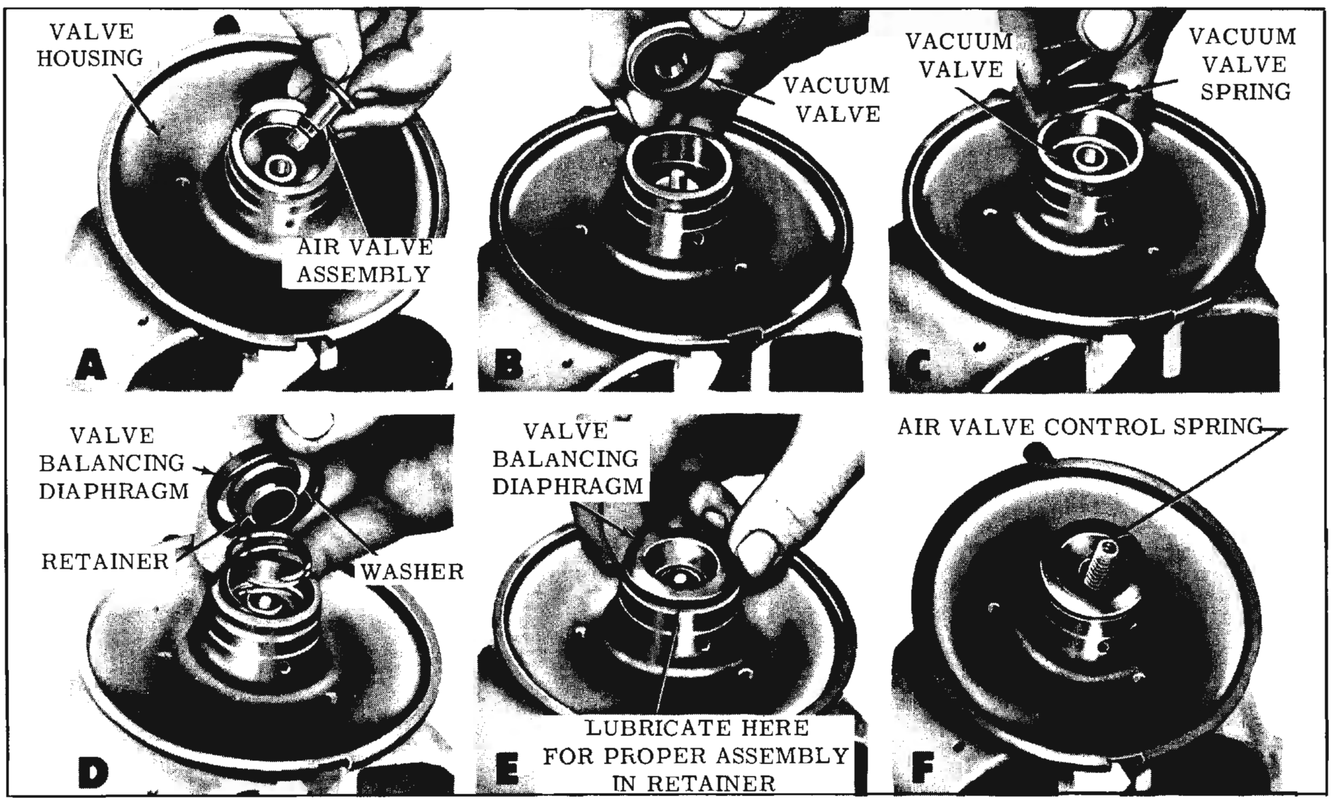


Fig. 7-126 Air Valve Disassembly and Assembly

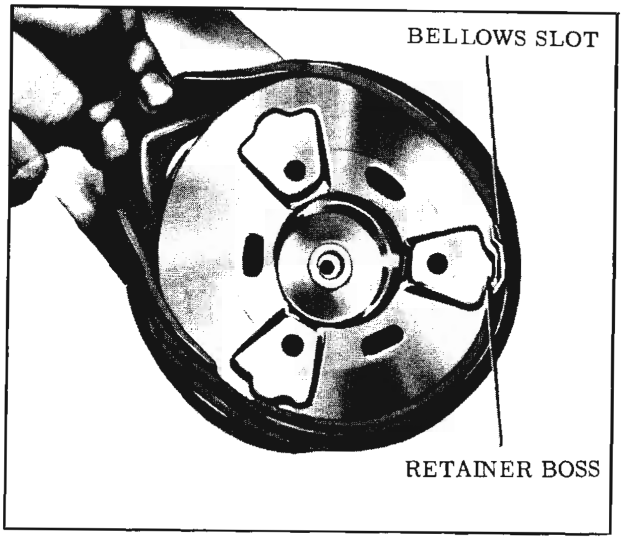


Fig. 7-127 Assembling Bellows to Retainer

then assemble either end of bellows over retainer and guide sleeve assembly as in Fig. 7-127. Be sure that the three bosses in the retainer are aligned with the three recesses in the bellows and that guide sleeve projects into (not out of) bellows.

4. Carefully place the assembled bellows and guide sleeve and retainer assembly over the valve balancing diaphragm, using a twisting motion, then position on the valve housing. Check alignment marks to be sure of correct positioning. Start the three self-locking and sealing cap screws. Do not use lock washers. Then tighten the three self-locking and sealing cap screws evenly to 7 to 9 ft. lbs. (Fig. 7-128)

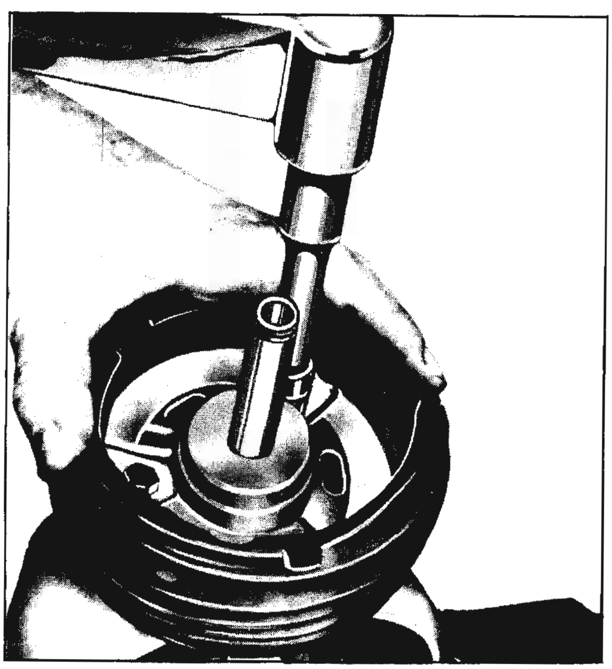


Fig. 7-128 Installing Guide Sleeve and Retainer

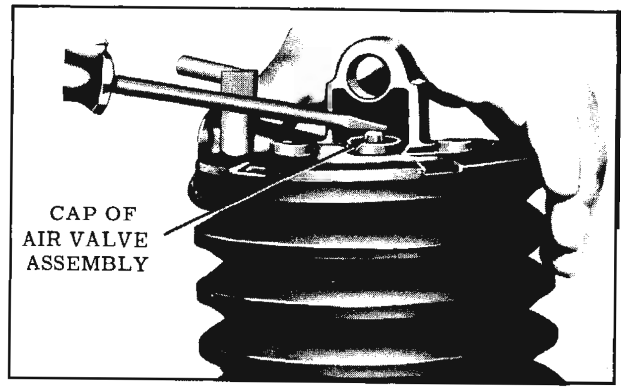


Fig. 7-129 Testing Air Valve Operation

5. Sight down guide sleeve to be sure air valve control spring is squarely in retainer.

6. Remove unit from vise, invert and test air valve operation as shown in Fig. 7-129. Using the flat of a screwdriver, press air valve button inward. Two definite stages of movement should be felt. In the first stage, only the air valve control spring is being compressed; in the second stage, the resistance of the vacuum valve spring is added. The step from stage one to stage two can be felt if the valves have been correctly assembled. When pressure is released, the valve should snap back readily.

7. Lubricate guide sleeve and inside diameter of leather seal in mounting hub with lubriplate. Replace unit in vise as before and position return spring around guide sleeve and retainer assembly, being sure that it is evenly placed around hub of retainer. Slide mounting hub assembly with threaded studs facing up, over guide sleeve. Hold mounting hub assembly down against return spring and assemble flange of bellows evenly over outside edge of mounting hub assembly.

8. Still holding mounting hub assembly down against return spring, place rubber stop washer, then steel stop washer, over guide sleeve. Install retaining ring, being sure it is seated properly in its groove. Refer to Fig. 7-123.

9. Assemble air filter baffle to air filter, then install this assembly into guide sleeve. See Fig. 7-122. Air filter baffle clips over end of guide sleeve and into the same groove with and above the retaining ring.

10. Assemble air inlet housing to mounting bracket assembly, being sure the air inlet stays in alignment with the clearance slot in the mounting bracket.

11. Position mounting bracket on mounting hub with threaded studs projecting through holes in mounting bracket and start three lock

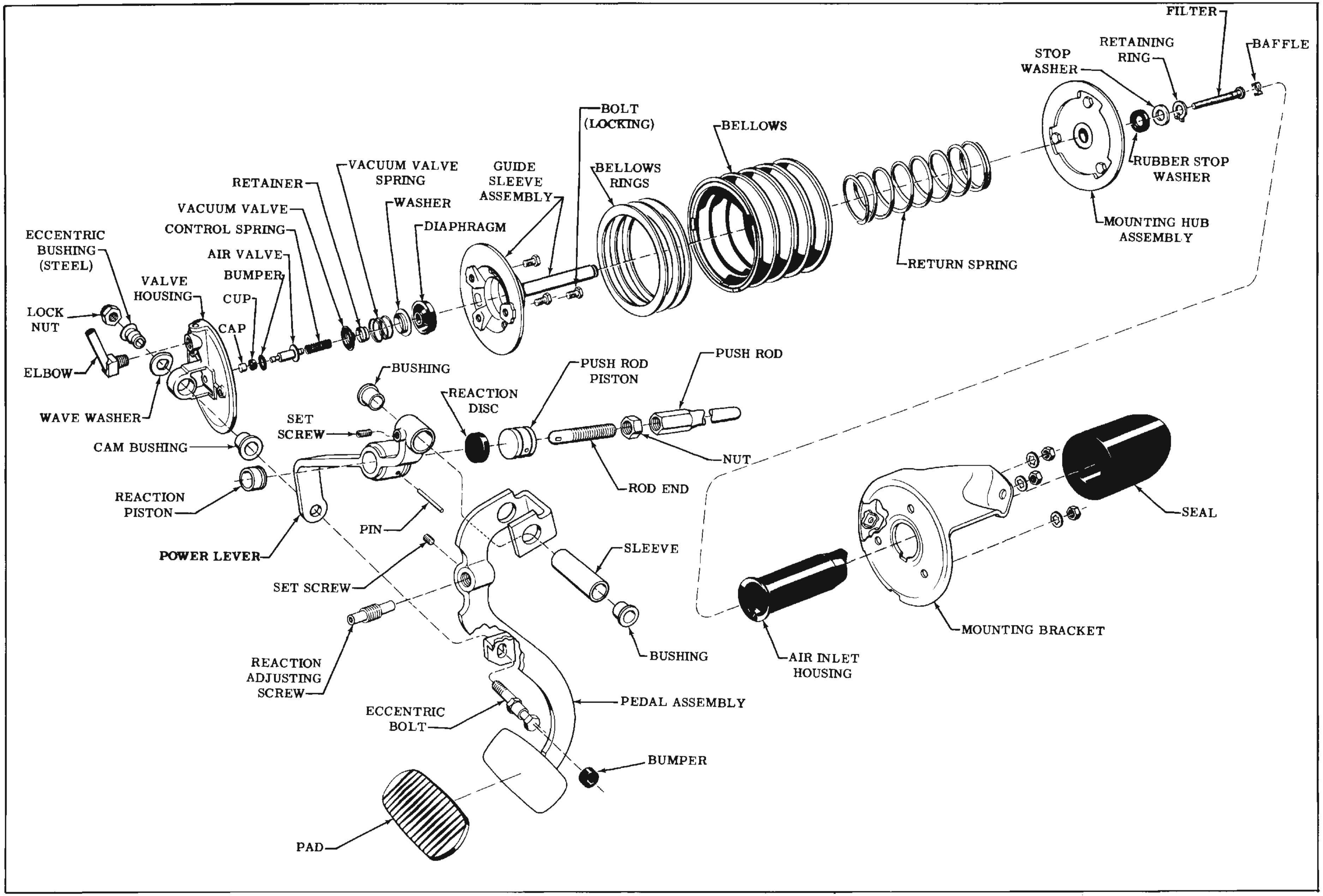


Fig. 7-130 Power Brake Assembly

washers and nuts. Align slot in mounting bracket with tab on bellows and torque the three nuts 7 to 9 ft. lbs. (Fig. 7-121)

12. Replace seal over air inlet housing.

Pedal Disassembly (Fig. 7-130)

1. Remove (2) pedal pivot nylon bushings.
2. Loosen sleeve set screw and remove pedal pivot sleeve.
3. Remove power lever from pedal assembly.

Reaction Mechanism Disassembly

1. Drive the roll pin out of the push rod piston and out the side of the power lever. Remove the push rod assembly and the push rod piston.
2. Use the push rod to push the reaction piston and reaction disc out of the power lever.

Reaction Mechanism Assembly

1. Clean the reaction bore of the power lever.
2. Install a new reaction disc in large bore of power lever. Seat disc in bore when installing the push rod piston. Align push rod piston roll pin holes with holes in power lever.
3. Install a new reaction piston in small bore of power lever.

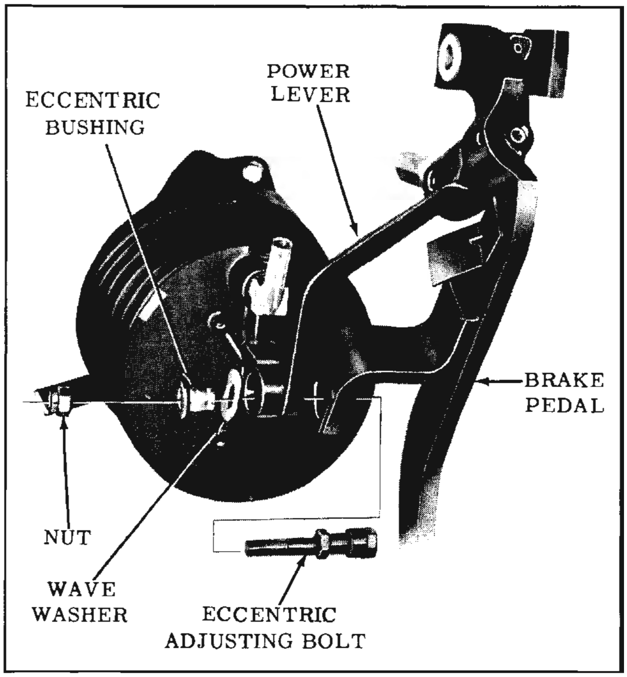


Fig. 7-131 Air Valve Eccentric Adjuster

4. Position the push rod end into socket of push rod piston and install roll pin.

Pedal Assembly

1. Position the power lever on the pedal assembly and insert the pedal pivot sleeve into the pedal and power lever bores.
2. Center the sleeve in the pedal and tighten sleeve set screw. Position the nylon bushings in the sleeve.

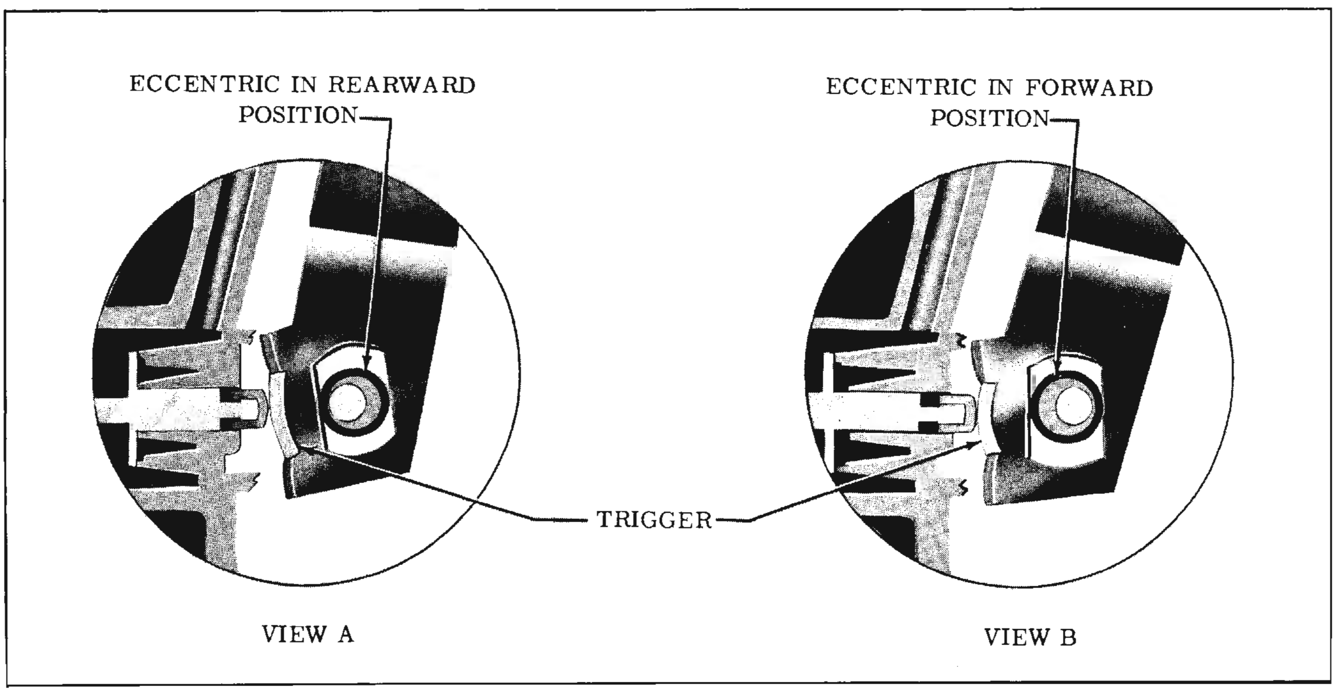


Fig. 7-132 Eccentric Extreme Positions

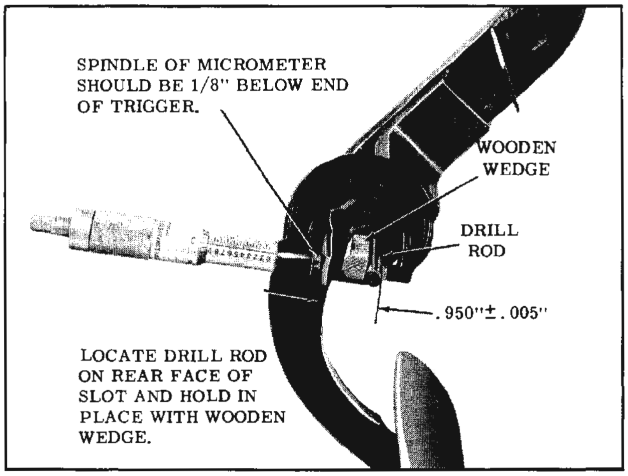


Fig. 7-133 Checking Trigger Alignment

ADJUSTMENTS

AIR VALVE ADJUSTMENT (Fig. 7-131)

1. The air valve adjustment must be performed in the car with the master cylinder removed and the push rod located so that the cut-in of the unit can be checked without interference.

2. Turn the eccentric to the forward position. (View "B", Fig. 7-132) and apply the pedal in a quick movement, if the unit does not chatter, no further adjustment is necessary. If the unit chatters, turn the eccentric towards the rear position (View "A", Fig. 7-132) until the chatter disappears. Tighten eccentric lock nut 15 to 18 ft. lbs.

NOTE: If turning the eccentric from one extreme position to the other does not stop the chatter, it will be necessary to check the trigger alignment as shown in Fig. 7-133.

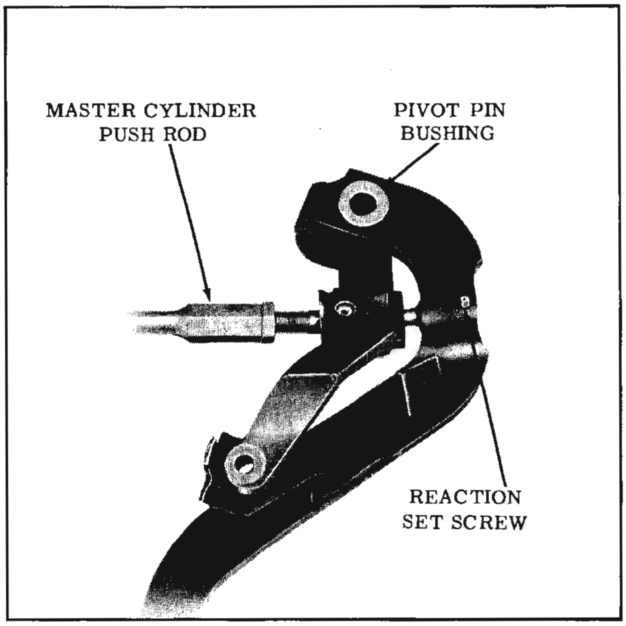


Fig. 7-134 Adjusting Push Rod

PUSH ROD ADJUSTMENT

This adjustment is necessary if any of the master cylinder parts, power lever parts or the push rod is changed.

Adjust the push rod length until the end of the rod just touches the master cylinder piston, then tighten the lock nut. (Fig. 7-134)

NOTE: If the push rod adjustment is too long, it may force the master cylinder piston forward, closing off the compensating port and causing

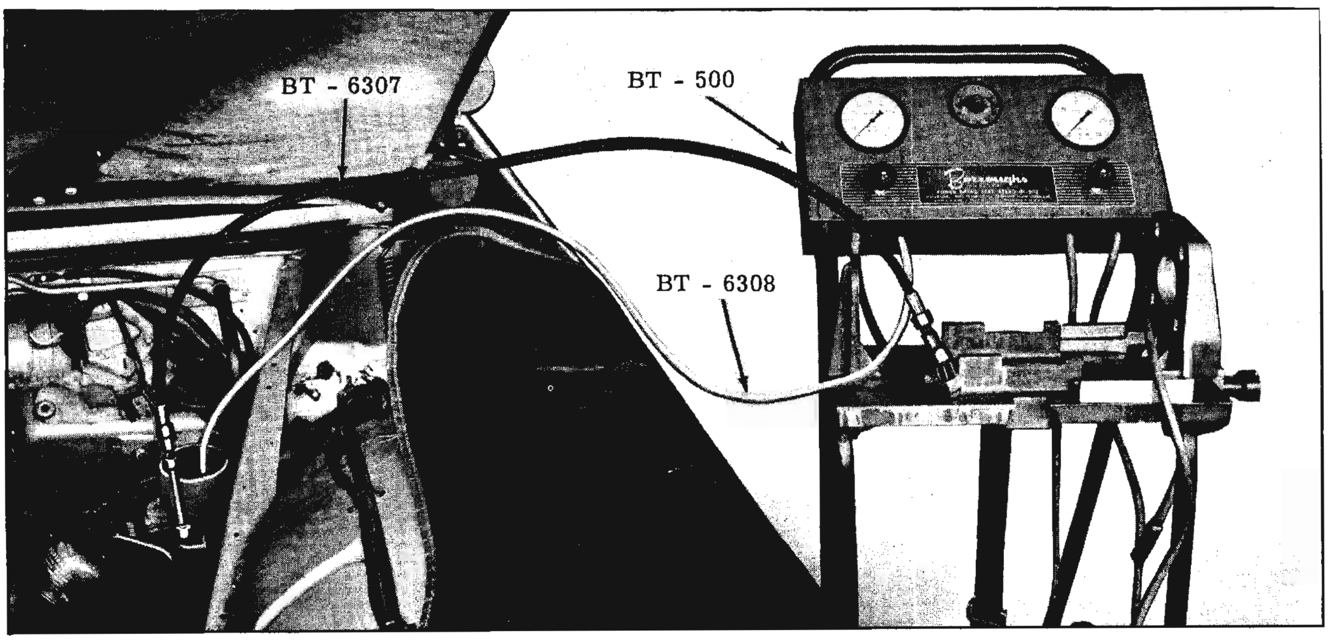


Fig. 7-135 Connecting BT-500 for Reaction Adjustment

locked brakes. If the adjustment is too short, a "clunk" may result.

Remove the master cylinder filler cap and look for bubbles or a spurt of fluid upon brake application, which indicates that the push rod is properly adjusted. Check fluid level, level should be 1/4" below lip of master cylinder. Install filler cap finger tight.

REACTION ADJUSTMENT

This adjustment is necessary only if the adjustment has been changed, pedal assembly has been changed, or if the reaction mechanism is serviced.

WITH BT-500

1. Connect BT-500 tester as shown in Fig. 7-135.
2. Open valve on gauge and apply brake pedal until bubbles are no longer visible in plastic tube, then close valve.
3. Start engine and apply 30 lbs. load as shown in Fig. 7-136.
4. Gauge should register 345 lbs. ± 15 lbs. If necessary to adjust, loosen the set screw on the side of the reaction valve and adjust as shown in Fig. 7-136.

WITHOUT BT-500

1. Turn reaction valve adjusting screw OUT if pedal feel is too hard. (Fig. 7-136)
2. Turn reaction valve adjusting screw IN if pedal feel is too soft.

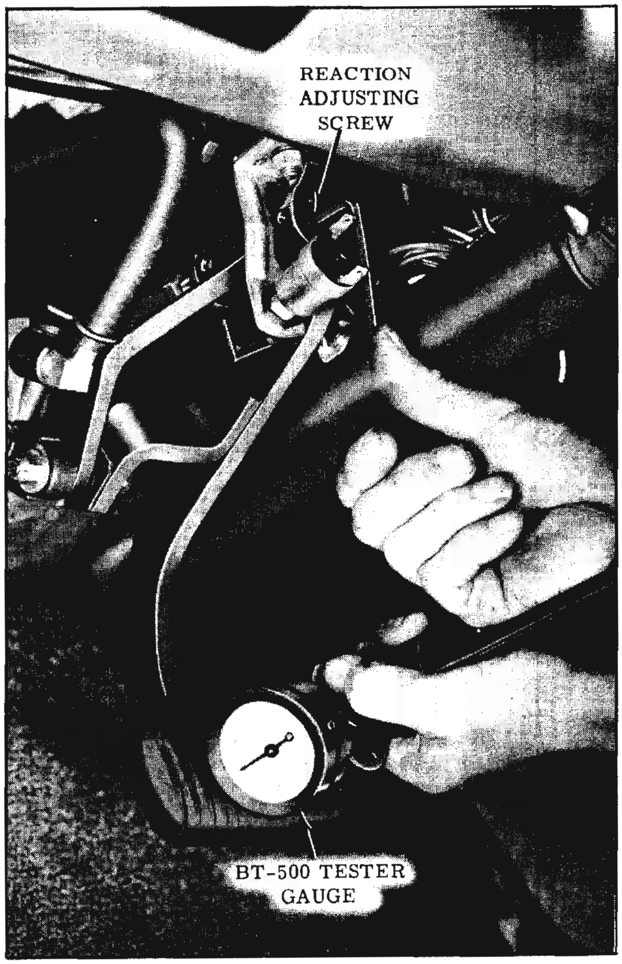


Fig. 7-136 Adjusting Reaction

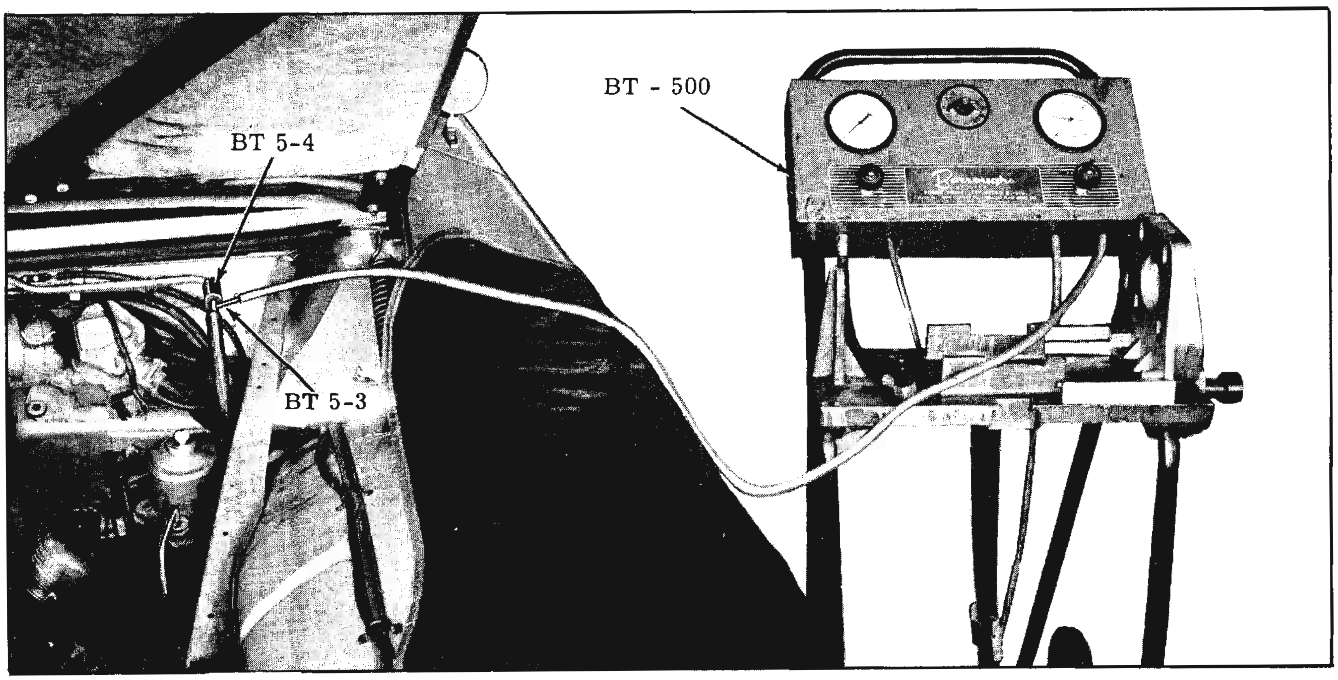


Fig. 7-137 Testing Vacuum System (Complete)

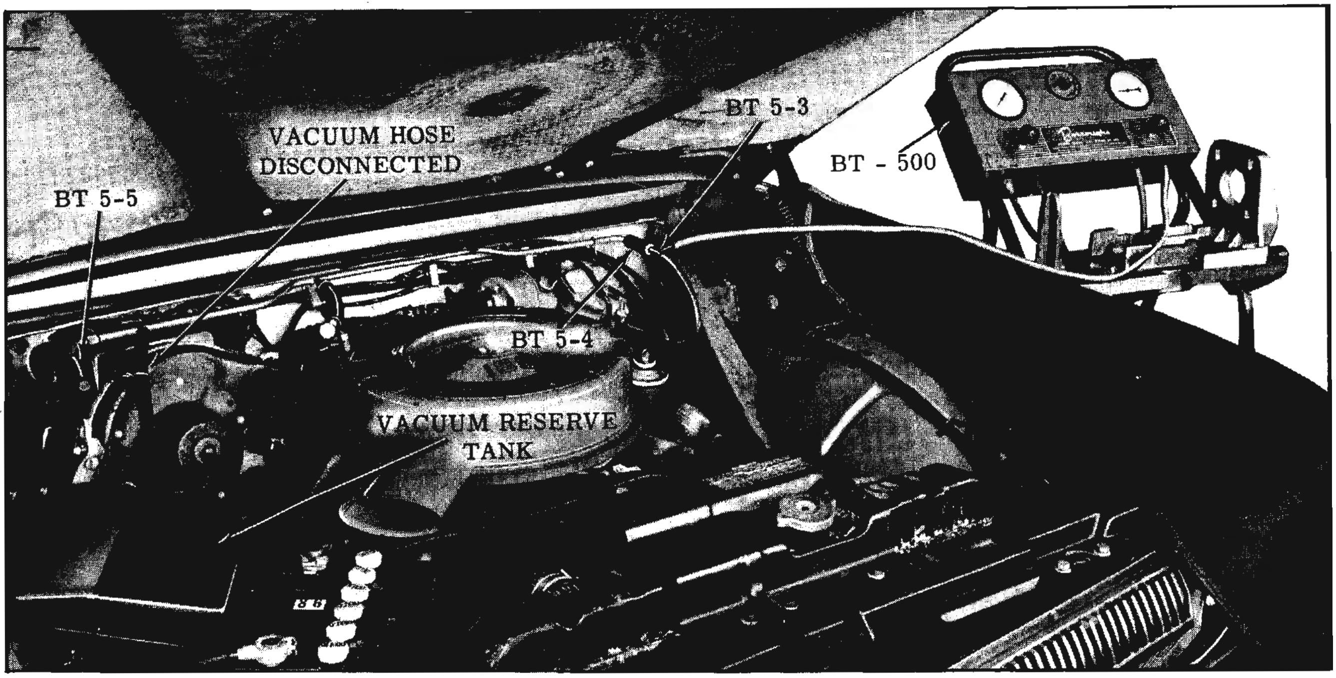


Fig. 7-138 Testing Vacuum System (Less Vacuum Reservoir)

TESTING WITH BT-500

VACUUM SYSTEM CHECK (ON CAR)

The power brake vacuum system, including the power brake unit, the vacuum check valve, the reserve tank and the connecting hoses, can be checked on the car for leaks, using Tester BT-500. By following the procedures, the leak can be isolated so that unnecessary removal of any of the power brake system units is eliminated.

Before proceeding with the tests, inspect all power brake system vacuum hoses and tighten all connections.

A. Testing Vacuum System (Complete)

1. Connect tester hoses as shown in Fig. 7-137.
2. Start the engine and set it on slow idle.
3. Open the vacuum gauge valve. Tap the gauge to stabilize the reading. The vacuum gauge should read 19" to 21".
4. Shut off the engine and set the timer at 15 seconds. There should be no drop in vacuum during this period. If there is a drop in vacuum, a leak exists. To isolate the leak, proceed with Test B.

B. Testing Vacuum System (Less Vacuum Reservoir)

1. Connect tester hose as shown in Fig. 7-138.
2. Start the engine and set it on slow idle.
3. With vacuum gauge valve open, tap the gauge to stabilize the reading. The vacuum gauge should read 19" to 21".
4. Shut off the engine and set the timer at 15 seconds. There should be no drop in vacuum during this period. If there is no drop in vacuum, the leak is at the reserve tank. If there is a drop in vacuum, the check valve or the power brake unit is leaking. To determine which of these two units is at fault, proceed with Test C.

C. Testing Vacuum System (Less Power Brake Unit)

1. Connect test hoses as shown in Fig. 7-139.
2. Start the engine and set it on slow idle.
3. With the vacuum gauge valve open, tap the gauge to stabilize the reading. The vacuum gauge should read 19" to 21".
4. Shut off the engine and set the timer at 15 seconds. There should be no drop in vacuum during this period.
   a. If there is a drop in vacuum, the leak is in the check valve.
   b. If there is no drop in vacuum during this period, the power brake unit is leaking since the rest of the system has proven to be satisfactory.
5. Disconnect the tester hoses from the car.

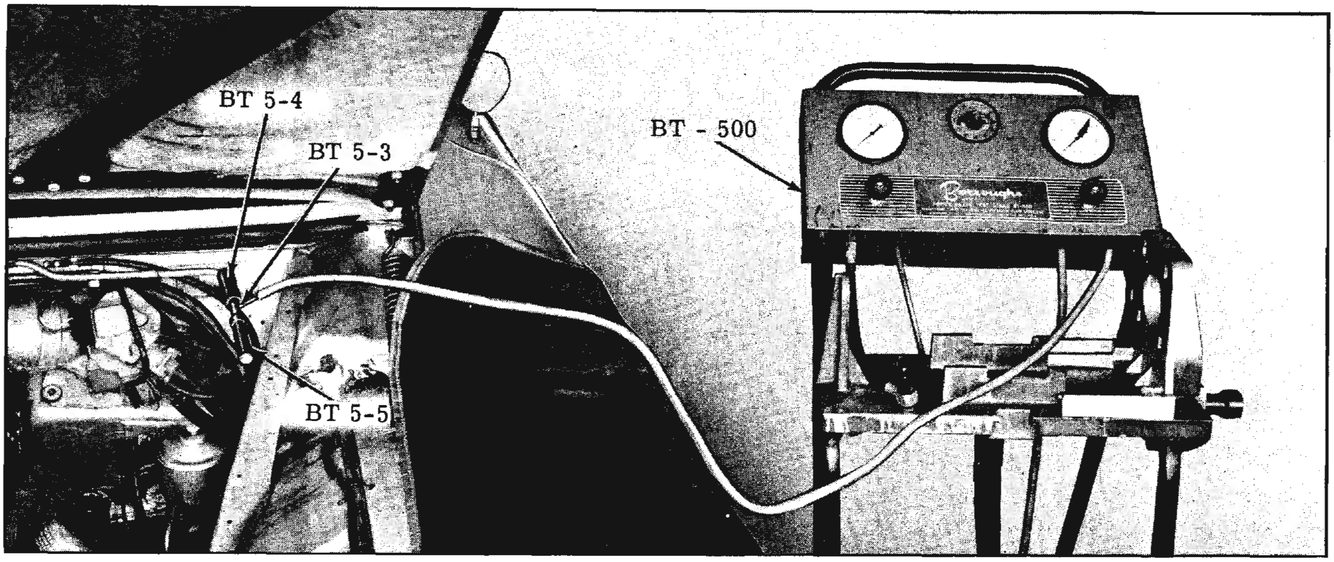


Fig. 7-139 Testing Vacuum System (Less Power Brake Unit)

BRAKE DIAGNOSIS

The following diagnosis applies to both power brakes and standard brakes unless otherwise specified.

1. Hard Pedal Feel May Be Caused By:

a. Power brake vacuum failure due to:

(1) Faulty vacuum check valve.

(2) Collapsed vacuum hose.

(3) Plugged or loose vacuum hose or fittings.

(4) High brake temperatures resulting from drag.

(5) Leaking vacuum reserve tank.

b. Bound up pedal mechanism.

c. Glazed linings.

d. Grease on brake drum or linings.

e. Power brake unit trouble due to:

(1) Vacuum leak in bellows assembly.

(2) Restricted air filter.

(3) Malfunctioning air valve.

2. "Grabby" or Severe Brakes Caused By:

a. Grease or brake fluid on linings.

b. Scored drums.

c. Burned linings.

d. Power brake unit trouble due to:

(1) Sticking air valve.

(2) Reaction valve incorrectly adjusted.

(3) Binding master cylinder piston.

3. Pedal Goes to Floor (or almost to floor) Caused By:

a. Self Adjuster not operating.

b. Air in hydraulic system.

c. Hydraulic leak in line or at wheel cylinders.

d. Low fluid level in master cylinder reservoir.

e. Leak at primary cup.

f. Sand hole or crack in master cylinder.

4. Brake Lock Up Caused By:

a. Restricted compensator port.

b. Incorrect push rod adjustment.

5. Excessive Lining Wear at Rear Brakes

a. Parking brake improperly adjusted.

BRAKE SPECIFICATIONS

BRAKE ASSEMBLIES AND DRUMS

1. BRAKING AREA . . . . 123.8 sq. in.

2. RATIO (Percentage of Braking Effect)

   Front Brakes 57%
   Rear Brakes 43%

3. DRUMS

   Inside Diameter
   Out of Round for Service (Total Indicator Reading)
   Front . . . . .005" (Max.)
   Rear . . . . .006" (Max.)

4. LININGS

   Length - Primary Shoes . . . . 7.52"
   Length - Secondary Shoes . . . . 9.79"
   Width - Front Brake . . . . 2"
   Width - Rear Brake . . . . 1-3/4"
   Thickness
   Primary (Front and Rear) . . . . 1/4"
   Secondary (Front and Rear) . . . . 5/16"
   Clearance between Drum . . . . .015"

HYDRAULIC SYSTEM

1. FLUID TYPE . . . . Super 11

2. FLUID LEVEL . . . . 1/2" Below Filler Cap

3. MASTER CYLINDER BORE

   Standard . . . . 1"
   Power . . . . 1-1/8"

4. WHEEL CYLINDER BORE

   Front . . . . 1"
   Rear . . . . 7/8"

ADJUSTMENTS

BRAKE SHOE (Standard and Power) . . . . Self-Adjusting

STANDARD PEDAL HEIGHT (from floor pan to top of pedal pad) . . . . 6-3/8" to 6-5/8"

FREE TRAVEL (Standard) . . . . 3/16"

STANDARD PEDAL TO FLOOR CLEARANCE (with brakes applied) . . . . Not less than 2"

PARKING BRAKE (adjust with parking brakes released)

Equalizer . . . . Tighten equalizer adjusting nut until heavy drag is felt at rear wheels, then loosen nut 9 turns.

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specification.

Application	Ft. Lbs.
GENERAL	
Brake Line Fittings	8 to 12
Steering Knuckle to Backing Plate Bolts & Nuts	80 to 100
Plain Arm to Steering Knuckle to Backing Plate Bolts & Nuts	55 to 80
Anchor Pin Bolt to Knuckle	85 to 110
Rear Brake Backing Plate to Axle Housing Nuts	22 to 30
Wheel Cylinder to Backing Plate Bolts	10 to 12
Wheel Nuts	55 to 70
PARKING BRAKE	
Brake Lever Assembly to Instrument Panel Bolts	8 Max.
Brake Rod End to Intermediate Lever Bolts	10 to 18
STANDARD BRAKES	
Pedal Mounting Bracket to Instrument Panel Bolts	20 to 28
Pedal Mounting Bracket and Master Cylinder Bolts to Dash	20 to 28
Pedal Pivot Pin Nut (Synchromesh)	8 to 16
Master Cylinder Filler Cap	Finger Tight
POWER BRAKES	
Mounting Bracket to Floor Pan	3 to 6
Master Cylinder and Brake Pedal Support to Dash	18 to 2
Guide Sleeve Assembly to Valve Housing	7 to
Mounting Bracket to Mounting Hub Assembly	7 to
Eccentric Lock Nut	15 to
Master Cylinder Filler Cap	Finger T

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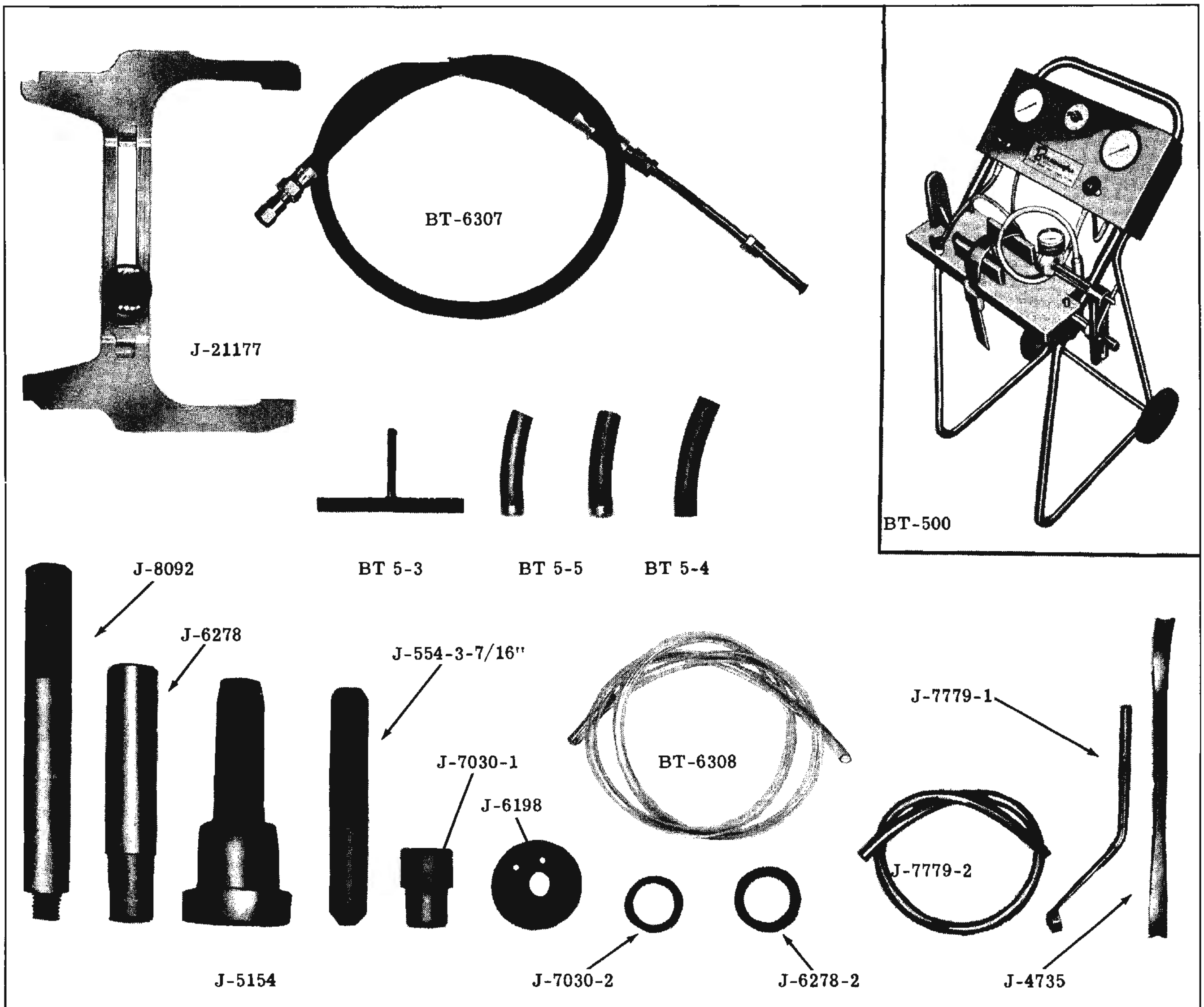


BT-5-3	Adapter Tee
BT-5-4	Hose Connector
BT-5-5	Hose End Plugs
BT-500	Power Brake Test Stand
BT-6307	High Pressure Hose For BT-500 Brake Tester
BT-6308	Return Hose For BT-500 Brake Tester
J-554-3	7/16" Hub Bolt Peening Tool
-4735	Brake Adjusting Tool
J-554	Rear Bearing Retainer Seal Installer
J-6198	Front Pinion Bearing Cup Remover
J-6278	Pinion Shaft Bearing Remover & Installer
J-6278-2	Pinion Shaft Bearing Remover & Installer
J-7030-1 J-7030-2	Needle Bearing Remover & Installer
J-7779-1 J-7779-2	Brake Bleeder Wrench (with hose)
J-8092	Drive Handle (use with Threader Driver Heads)
J-21177	Brake Shoe Gauge

ENGINE

(FULL SIZE CAR)

CONTENTS OF SECTION 8

PERIODIC MAINTENANCE

For periodic engine lubrication and maintenance refer to PERIODIC MAINTENANCE - SECTION 2.

Remove dirt and foreign materials from radiator cooling fins with compressed air when necessary. If equipped with air conditioning, also remove dirt and foreign material from condenser cooling fins.

For cooling system service recommendations, refer to PERIODIC MAINTENANCE - SECTION 2.

GENERAL DESCRIPTION

Regular fuel engines have a compression ratio of 8.75:1, premium fuel engines except Starfire, have a compression ratio of 10.25:1. Starfire engines have a compression ratio of 10.50:1.

All engines are equipped with positive crankcase ventilation, consisting of a check valve and two hoses. The hose from the check valve to the carburetor vents the crankcase at low speeds. At car speeds above 35 m.p.h. the main check valve opens and the crankcase is vented through the large hose to the air cleaner. Air flow through the crankcase is controlled by calibrated openings in the oil filler tube breather.

The check valve should be cleaned in kerosene every 12,000 miles. For detailed information on servicing of the check valve, refer to Periodic Maintenance, Section - 2.

MANIFOLDS

The intake manifold for both banks of cylinders is of one casting, while each bank has a separate exhaust manifold.

Preheating of the gasoline mixture is obtained by the exhaust gas passage through the intake manifold, which directly connects the two exhaust manifolds, forcing the hot exhaust gases to circulate around the choke heat tube when the heat

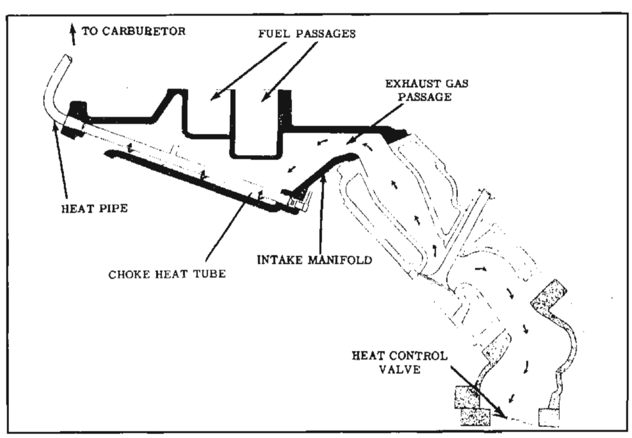


Fig. 8-1 Exhaust Flow (Heat Control Closed)

control valve is closed or partially closed. (Fig. 8-1)

Cast integral with the intake manifold at the front is a passage which returns the water from the cylinder heads to the water outlet and the radiator core.

An elbow is incorporated on the lower end of the choke heat tube to prevent water from being drawn up the heat tube and into the carburetor. (Fig. 8-1) The elbow must be installed with the tube end up.

INTAKE MANIFOLD AND/OR GASKET

Remove

1. Drain radiator, then disconnect radiator upper hose from water outlet.
2. Remove air cleaner.
3. Disconnect spark plug wires.
4. Disconnect throttle linkage.
5. Remove fuel and vacuum lines from carburetor.
6. Disconnect wiring from coil.
7. If equipped with power steering, disconnect power steering pump and bracket as an assembly.
8. If equipped with air conditioning, disconnect Delcotron, then remove attaching bolts and tip compressor and bracket rearward to obtain clearance for manifold removal.
9. Remove intake manifold with coil and carburetor attached.
10. Clean cylinder head and manifold machined surfaces.

Install

1. Reverse sequence of removal operations, using new graphite coated metal gaskets between the head and intake manifold. Apply No. 3 sealer (Part No. 557622) on both sides of gasket.
2. Dip threads of intake manifold bolts in C.P. No. 9 sealer (Nat. Machine Prod. Co.). Install manifold bolts and nuts and torque 22 to 34 ft. lbs. in sequence as shown in Fig. 8-2.
3. If equipped with power steering or air conditioning, adjust belt tension with BT 33-70.
4. After installation of manifold is completed, adjust throttle linkage. (For Hydra-Matic equipped cars, refer to Section 3; for Synchromesh equipped cars, refer to Section 11.)

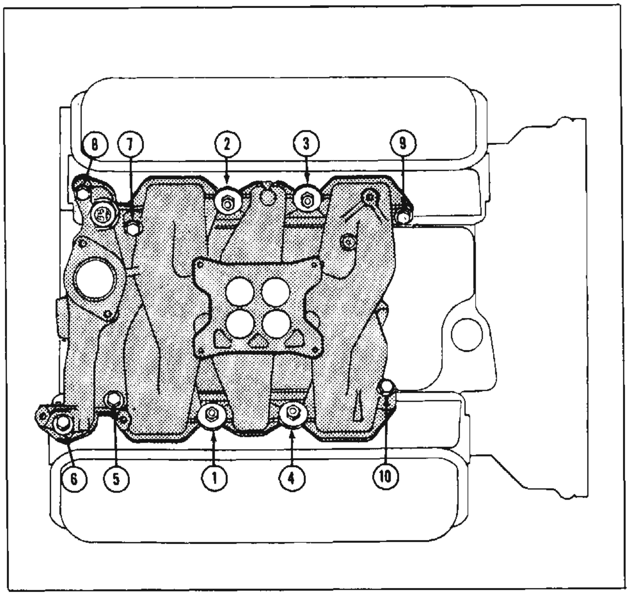


Fig. 8-2 Intake Manifold Torque Sequence

MANIFOLD HEAT CONTROL VALVE (Fig. 8-3)

The manifold heat control valve assembly is mounted on the left exhaust manifold. The valve regulates the amount of heat by-passed through the intake manifold so that a sufficient amount of heat is transferred to insure a uniform vaporization of the intake mixture under all operating conditions.

The offset valve, counterweight, and thermostat are calibrated to give proper intake manifold heat under all driving conditions.

The manifold heat control valve must be in proper operating condition to insure good performance and economy. A heat valve that does not close causes poor warm-up and rich carburetion. A heat valve that does not open will cause unsatisfactory operation during normal engine temperature operation, especially in hot weather. The thermostatic spring is designed to close the valve as the engine cools. As the spring warms and the engine speed increases, the counterweight and exhaust gas pressure opens the valve.

INSPECTION

With a cool exhaust manifold, start the engine and flash the throttle quickly. The heat control valve should open and return to the closed position. The valve opens when the weight rotates downward. If the valve does not operate and the counterweight shaft is free, it indicates that either the valve is loose on the shaft or the shaft is broken. If the shaft is tight, it may be freed-up by rotating the counterweight.

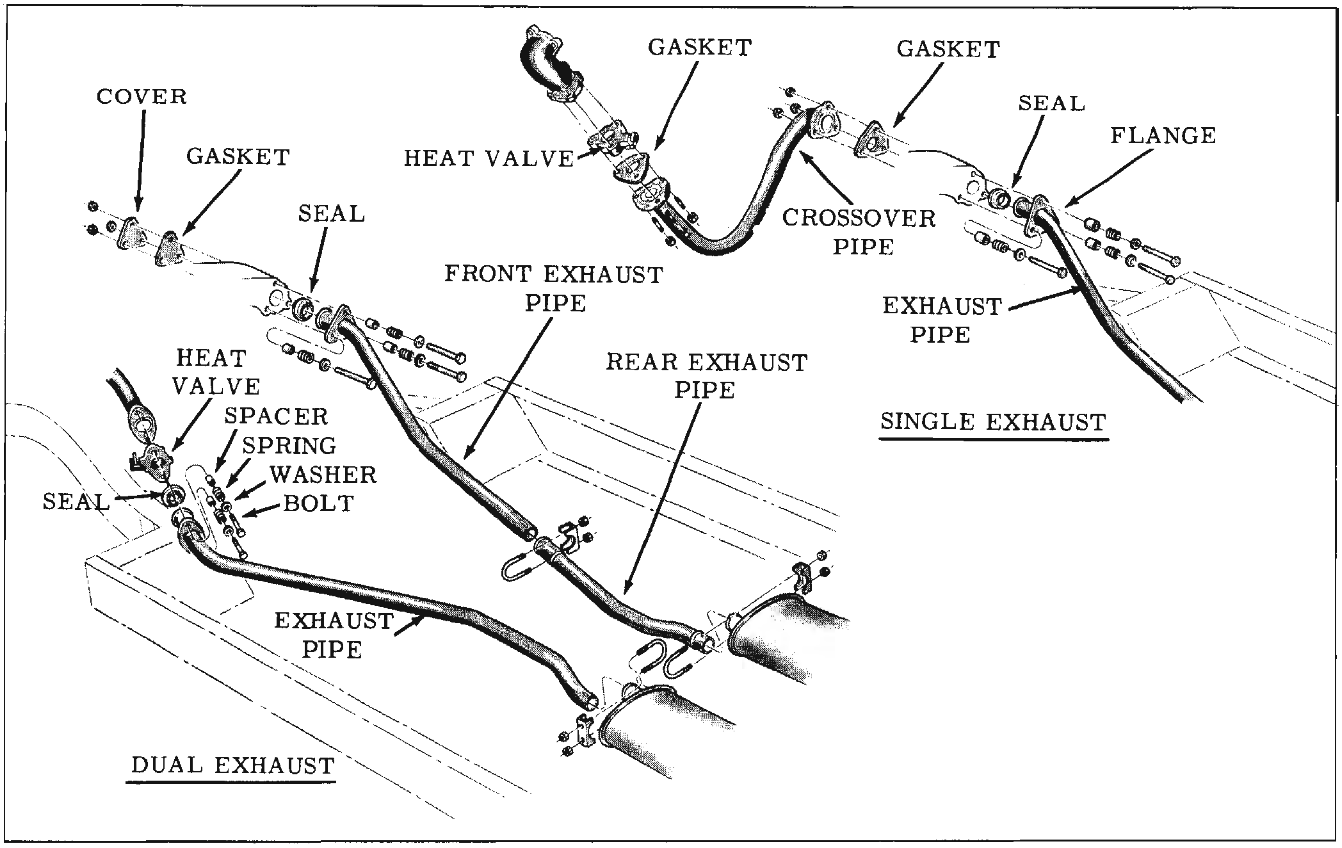


Fig. 8-3 Exhaust Systems

CAUTION: Never oil the heat control valve shaft bearing surfaces as carbon may form and "freeze" the shaft.

A rattling or "buzzing" noise indicates that the shaft bushings are worn. If the manifold heat control valve is noisy or inoperative, the assembly should be replaced.

The manifold heat control valve must be assembled as shown in Fig. 8-4.

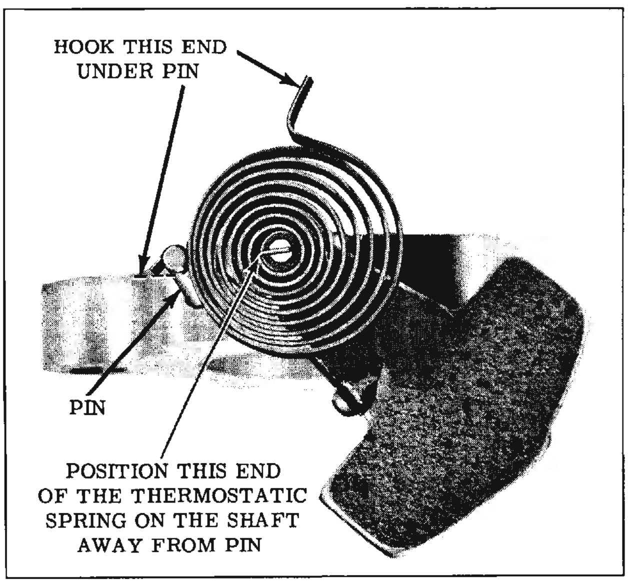


Fig. 8-4 Spring Installation

Remove and Install

The manifold heat control valve can be removed by disconnecting the crossover pipe to exhaust manifold attaching nuts (on cars with the single exhaust system) or by disconnecting the L.H. exhaust pipe to manifold (on cars with the dual exhaust system).

NOTE: Always use new gasket and "Seez-Pruf" nuts when replacing the heat control valve. Torque crossover pipe to manifold nuts 25 to 35 ft. lbs. Torque flex-joint nuts 7 to 10 ft. lbs.

EXHAUST MANIFOLD

Remove

1. Disconnect exhaust pipe or crossover pipe.
2. L.H. Manifold: Remove manifold heat control valve.
3. Raise front of engine as outlined under RAISING FRONT OF ENGINE.
4. L.H. Manifold: Remove the power steering hoses at the steering gear and position hoses above level of power steering pump to prevent oil loss.
5. Remove manifold to head attaching nuts and front bolt and remove manifold.

6. Clean manifold and cylinder head machined surfaces.

Install

1. Apply Graphite Grease Part No. 581823 to the sealing surfaces of the exhaust manifold center and end port flanges.

   NOTE: Gaskets are not used between the cylinder head and the exhaust manifold.

2. Position the exhaust manifold onto the head.
3. If manifold studs show signs of coolant leakage, remove the studs and apply C.P. No. 9 Sealer to the stud threads.
4. Apply C.P. No. 9 Sealer to the front attaching bolt and fasten the manifold to the head. Torque the bolt and nuts 19 to 25 ft. lbs.
5. Reverse Steps 1 thru 4 of the exhaust manifold removal procedure.
6. Check power steering gear pump oil level.

HEAD AND VALVE MECHANISM

ROCKER ARM SHAFT ASSEMBLY

Remove

1. R.H. rocker arm shaft: Remove the crankcase ventilation valve from rocker arm cover.
2. Remove rocker arm cover. If equipped with air conditioning, disconnect battery cable then remove compressor and Delcotron bracket attaching bolts and tip compressor and Delcotron rearward to remove R.H. rocker arm cover. If equipped with power steering, remove pump mounting bracket attaching bolts and move assembly to one side to gain access to L.H. rocker arm cover.
3. Remove rocker arm bracket bolts.
4. Remove rocker arm shaft assembly.
5. To disassemble rocker arm, remove brackets and rocker arms from shaft. (Fig. 8-5)

   NOTE: One bracket is attached to the shaft by an anchor pin. (Fig. 8-6) It is not necessary to remove this bracket unless either the bracket, shaft, or pin has to be replaced. If necessary to remove, insert a drift through the oil passage in the bracket and drive out pin.

   If necessary to remove rocker shaft plug, punch hole in plug, then pry plug from end of shaft.

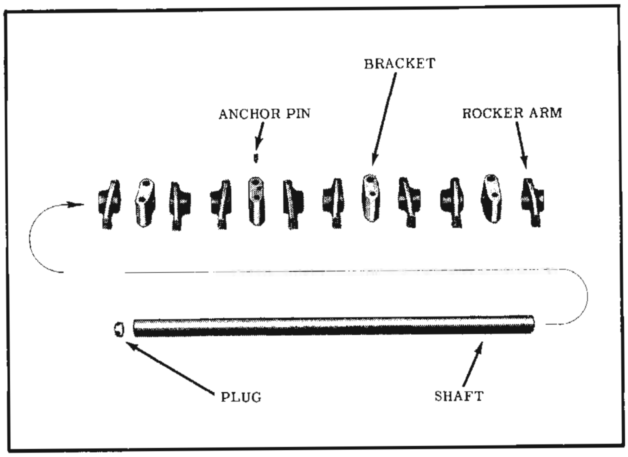


Fig. 8-5 Rocker Arm Assembly

Assemble

1. If shaft, pin, or pinned bracket was removed, install a new pin. Drive pin flush with bracket. (Rocker arm shaft oil ports must face down)
2. If rocker shaft plug was removed, position a new plug in end of shaft, and install plug until outer shoulder is 9/32" into end of shaft. stake end of shaft to retain plug.
3. Lubricate all frictional surfaces of the rocker arms, brackets and shaft, then assemble rocker arm shaft assembly as shown in Fig. 8-5.

Install

1. Position rocker arm shaft assembly on cylinder head and reverse removal procedure.
2. Align assembly and tighten bolts evenly.
3. Torque large bolts 60 to 80 ft. lbs., small bolts 14 to 22 ft. lbs.

VALVE SPRING

Remove and Install (On Car)

To replace a worn or broken valve spring without removing the cylinder head, proceed as follows:

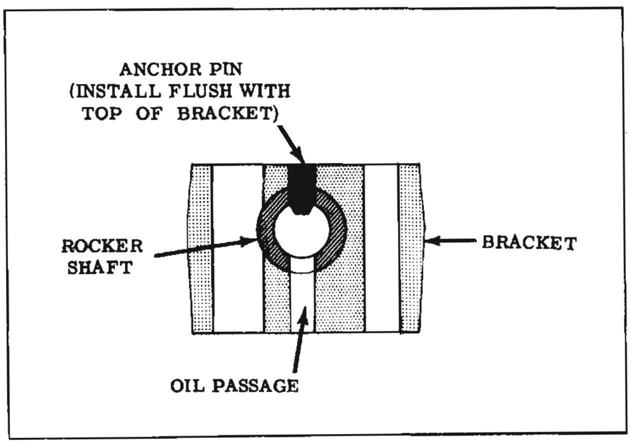


Fig. 8-6 Bracket and Anchor Pin

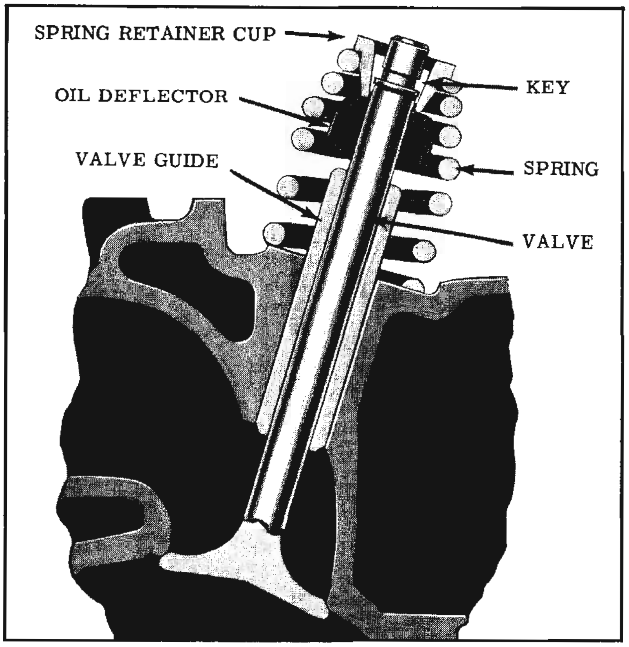


Fig. 8-7 Valve Assembly

1. Remove the rocker arm shaft assembly.

2. Remove spark plug and install Air Hose Adapter BT-72-1B. Connect an air hose to the adapter to hold the valve on its seat.

3. Install valve compressor on cylinder head as shown in Fig. 8-8. Compress valve spring until valve keys are accessible, then remove keys, spring retainer cup and spring. (Fig. 8-7)

To install valve springs, reverse the removal procedure.

CYLINDER HEAD AND/OR GASKET

Remove

1. Drain radiator and cylinder block.

2. Remove intake manifold.

3. Remove Delcotron.

4. Disconnect exhaust pipes.

5. R.H.head: Remove the crankcase ventilation valve from the R.H. rocker arm cover.

6. Remove rocker arm cover. If equipped with air conditioning, remove compressor and Delcotron bracket attaching bolts and tip compressor rearward to remove R.H. rocker arm cover. If equipped with power steering, remove pump mounting bracket attaching bolts and move assembly to one side to gain access to L.H. rocker arm cover.

7. Remove rocker arm shaft assembly. Disconnect ground strap from rear of cylinder head.

8. Remove push rods. Keep rods grouped so they can be installed in their original location.

9. Remove cylinder head bolts then remove cylinder head with exhaust manifold attached.

Disassembly

1. Remove spark plugs.

2. Remove exhaust manifold.

3. Remove valve keys by compressing valve spring with a tool such as BT-72-2 or OTC-CF-11.

4. Remove valve spring retainer cups and springs. (Fig. 8-7) Keep all parts grouped so they can be installed on their original valves.

5. Remove oil deflectors from valve stems.

6. Invert heads and remove valves. Keep valves separated so they can be installed in their original location.

7. If necessary to remove valve guides, support head on wood blocks then drive out with Valve Guide Remover Tool J-3062 (Fig. 8-9)

To install valve guides, proceed as follows:

Lay Gauge Washer J-5158-3 on the valve spring seat. Install guide into cylinder head (with grooved end of guide up) by driving on Tool J-5158-2 until the tool seats against the gauge washer. (Fig. 8-10) This will allow the valve guides to extend 25/32" above the face of the valve spring seat.

When reconditioning valves and valve seats, only precision equipment should be used and the recommendations of the equipment manufacturer should be followed. Clean carbon from heads and also from valve guides. Whenever valves are ground or new valves and guides are installed, the valve seats must be reconditioned. Cutters (45^{o}) are required for reseating, and a snug fitting solid pilot of the correct size should be used. New guides, if required, should be in place at the time seats are cut. Service guides are Parco-Lubrited and finished to size, and should NOT be reamed. Oversize guides (.010" O.D.) can be identified by a groove on the O.D. of the guide.

IMPORTANT: To insure satisfactory service, it is necessary that valve seat width be maintained within specifications. (Intake and exhaust seat width should be .037" to .075"). A 15^{o} cutter should be used to narrow the seat as necessary.

Assemble

1. Install valves in their respective guides.

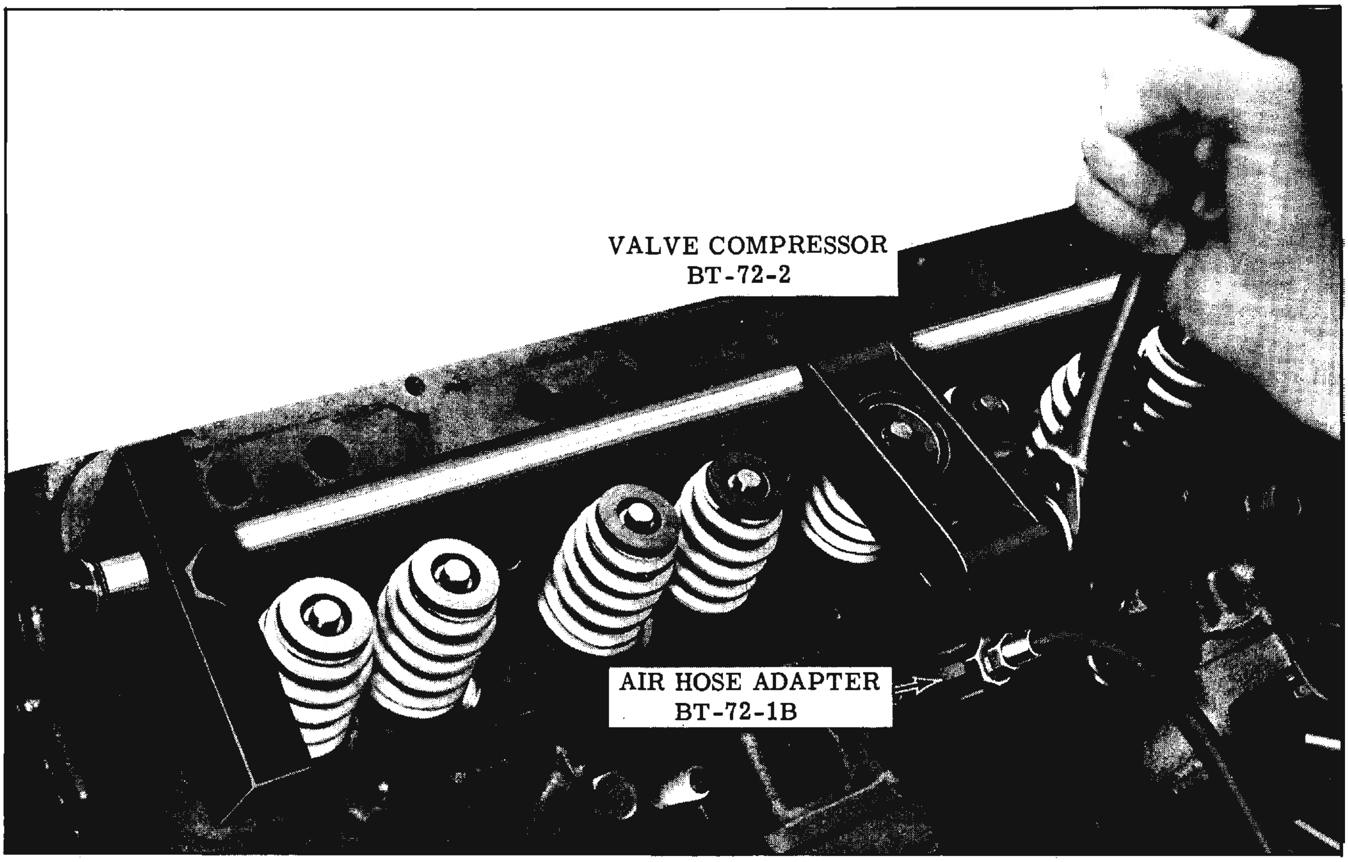


Fig. 8-8 Compressing Valve Springs

2. Install new oil deflectors over valve stem. Force deflectors down as far as possible on valve stem. The deflectors will correctly position themselves when the engine is started.

3. Position valve springs over valve stems.

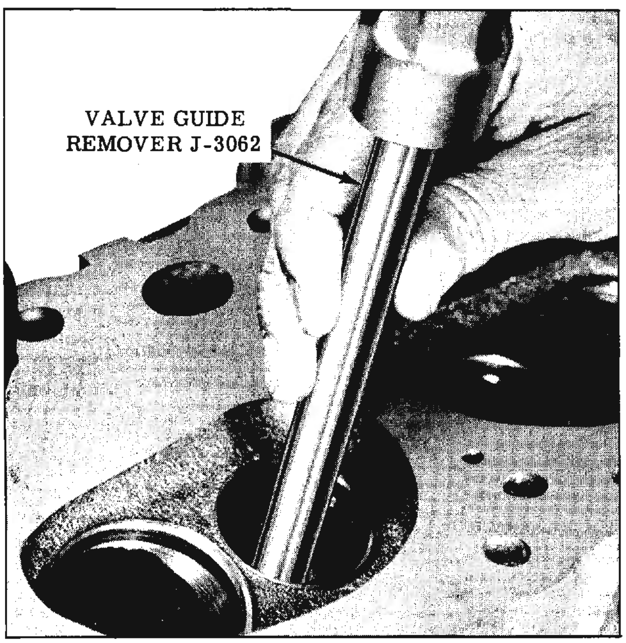


Fig. 8-9 Removing Valve Guide

4. Install valve lock retainer cups, then compress springs with a tool such as BT-72-2 or OTC-CF-11.

5. Install valve stem keys.

6. Check valve springs and keys to be sure they are properly seated.

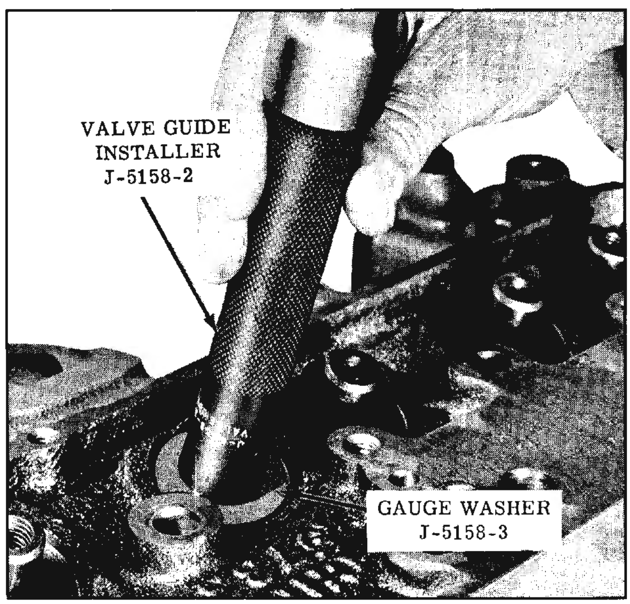


Fig. 8-10 Installing Valve Guide

7. Before assembling the exhaust manifold to the head, apply Graphite Grease Part No. 581823 to the sealing surfaces of the exhaust manifold center and end port flanges.

   NOTE: Gaskets are not used between the cylinder head and exhaust manifold.

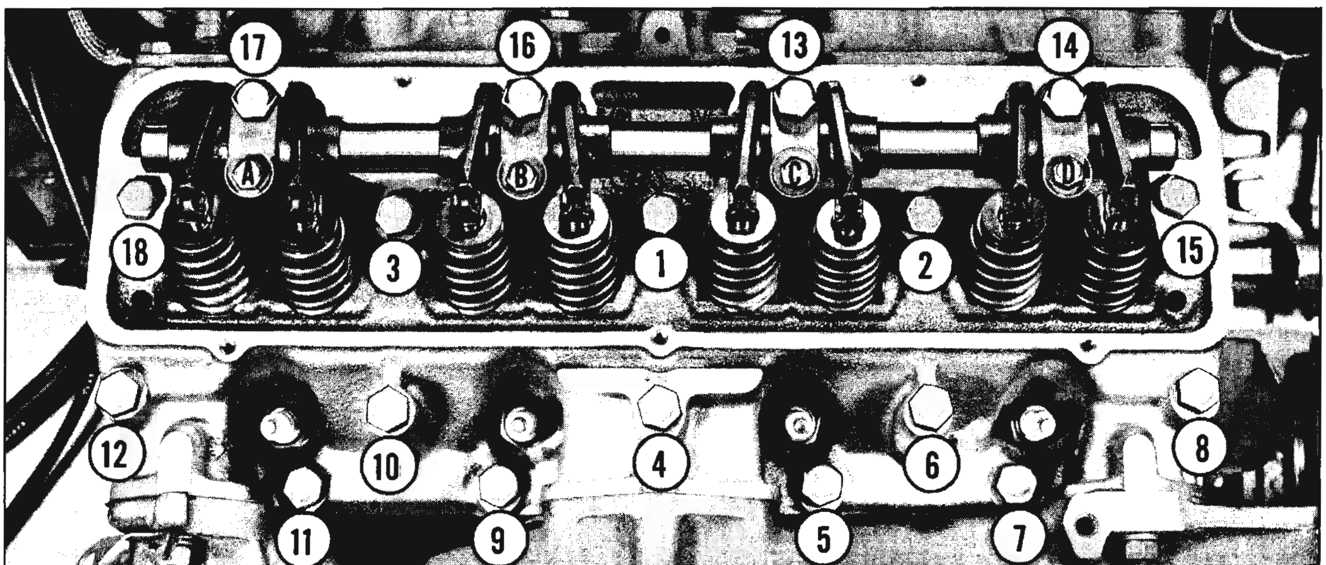
   If the manifold attaching studs show signs of coolant leakage, remove studs and apply a sealer such as C.P. No. 9 to the stud threads, then reinstall studs.

   Torque manifold to head nuts 19 to 25 ft. lbs.

8. Set spark plug gap to .030" and reinstall plugs. Torque 18 to 34 ft. lbs.

Install

1. Install cylinder head guide studs J-3455 in cylinder head bolt holes at each end of block.
2. Apply sealer, Part No. 557622, to both sides of a new head gasket and position gasket over guide studs.
3. Place cylinder head in position. Apply a sealer such as C.P. No. 9 to head bolts. Install the center and lower row of attaching bolts finger tight, after removing guide studs.
4. Install push rods and rocker arm shaft assembly making sure that the push rods are properly seated in the rocker arms and valve lifters.
5. Tighten rocker arm shaft bracket and cylinder head attaching bolts in sequence as shown in Fig. 8-11.
6. Connect ground strap to rear of cylinder head.
7. Cement new gasket to rocker arm cover, then install cover.
8. R.H. head: Install crankcase ventilation valve and hoses on R.H. rocker arm cover.
9. Connect exhaust pipes to exhaust manifold using new gaskets.
10. Install Delcotron and compressor, if so equipped.
11. Adjust belts with BT-33-70.
12. Apply sealer to the attaching bolts and install intake manifold. Torque nuts and bolts 22 to 34 ft. lbs.
13. Fill radiator.
14. After engine reaches operating temperature,



A. TIGHTEN ALL BOLTS SNUG.

B. TIGHTEN NUMBERED BOLTS IN SEQUENCE SHOWN 50 TO 60 FT. LBS.

C. TIGHTEN LETTERED BOLTS 14 TO 22 FT. LBS.

D. RETIGHTEN NUMBERED BOLTS IN SEQUENCE SHOWN 60 TO 80 FT. LBS.

E. RETIGHTEN LETTERED BOLTS 14 TO 22 FT. LBS.

Fig. 8-11 Head Bolt Torque Sequence

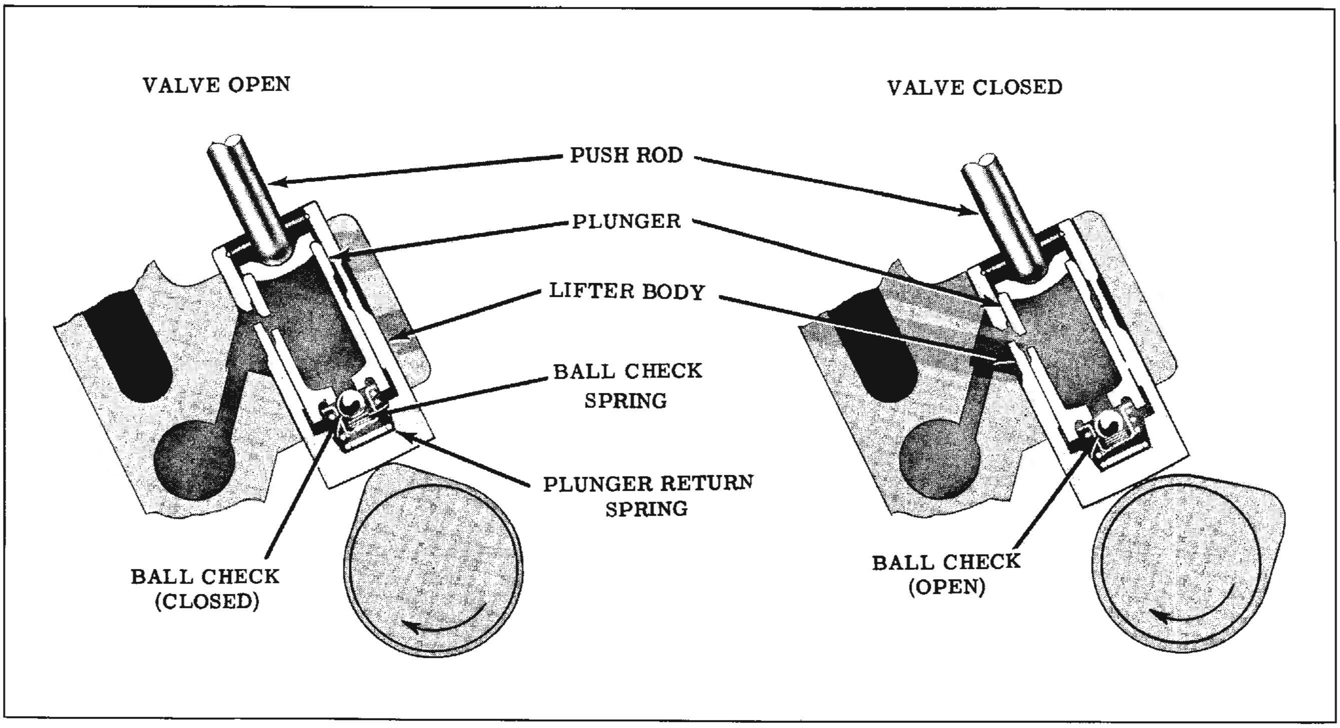


Fig. 8-12 Lifter Action on Camshaft

finish filling radiator until coolant level is 1/4" below filler neck.

VALVE LIFTERS

Operation (Fig. 8-12)

Oil is supplied to the lifter through a hole in the side of the lifter body which indexes with a groove and hole in the lifter plunger.

When the lifter begins to ride up the cam lobe, the ball check is held against its seat in the plunger by the ball check spring which traps the oil in the base of the lifter body below the plunger. The plunger and lifter body then raise as a unit, pushing up the push rod to open the valve. The force of the valve spring which is exerted on the plunger through the rocker arm and push rod causes a slight amount of leakage between the plunger and lifter body. This "leak down" allows a slow escape of trapped oil in the base of the lifter body. As the lifter rides down the other side of the cam lobe and reaches the base circle or "valve closed" position, the plunger spring quickly moves the plunger back (up) to its original position. This movement causes the ball check to open against the ball spring and oil from within the plunger is drawn into the base of the lifter. This restores the lifter to zero lash.

Valve Lifter Sizes

Valve lifters may be one of three sizes: Standard, .001", or .010" oversize. It is important when replacing valve lifter assemblies that the proper size lifter be ordered. An identification numeral is etched on all lifter bodies except standard. The cylinder block is marked 1 or 10, for lifter size, on the rail under the engine top cover. No mark indicates standard size lifter.

Remove and Install

IMPORTANT: Valve lifters and push rods should be kept in order so they can be reinstalled in their original position in the cylinder block.

1. Remove intake manifold, engine top cover, rocker arm covers and rocker arm shaft assemblies.

2. Remove push rods.

3. On varnished lifters, apply cleaning solvent to lifter body. Allow five minutes for solution to remove varnish.

4. Remove valve lifters. The use of Tool 23-15 will aid in removal of varnished lifters. (Fig. 8-13)

Reverse removal procedure for installation. Check lifters for free movement in the bore and to see that there is no perceptible side play.

Disassemble

1. Remove retainer spring with Tool BT-31 or a

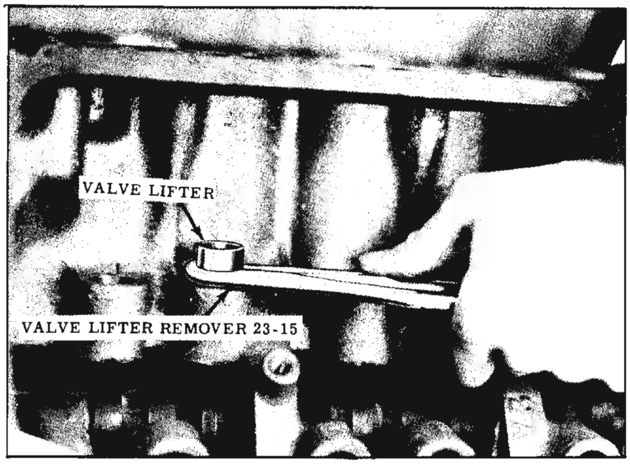


Fig. 8-13 Removing Lifter

small screw driver.

2. Remove push rod seat.

3. Remove plunger and plunger spring. If plunger is stuck tight, allow lifter to soak in cleaning solvent for approximately five minutes, then remove plunger. Tool 23-16 may be used if plunger does not fall out. (Fig. 8-14)

4. Remove ball check retainer from plunger, then remove ball and spring.

Clean and Inspect

After lifters are disassembled, all parts should be cleaned in clean solvent, using cleaning brush J-5099. A small particle of foreign material under the ball check valve will cause malfunctioning of the lifter. Close inspection should be made for

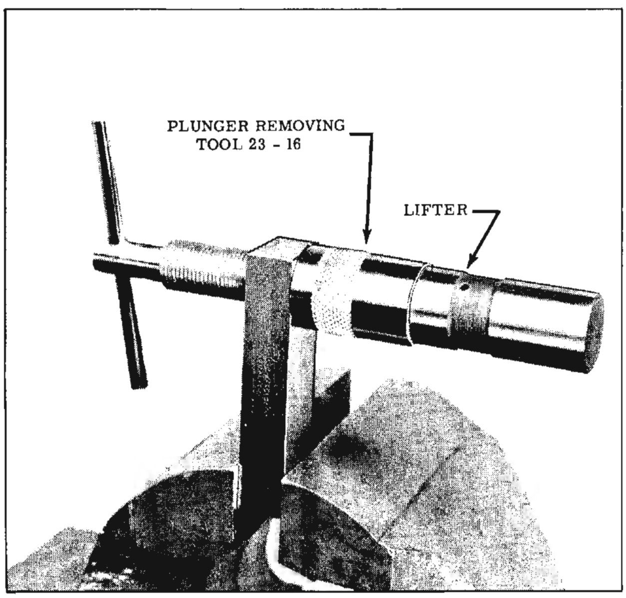


Fig. 8-14 Removing Plunger

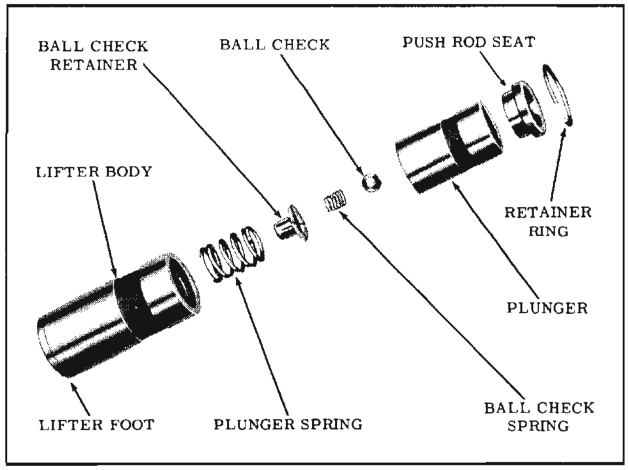


Fig. 8-15 Hydraulic Valve Lifter

nicks, burrs, or scoring of parts. If either the body, plunger or internal parts are defective, replace with a new lifter assembly.

IMPORTANT: DO NOT CONDEMN VALVE LIFTERS THAT HAVE A SLIGHT GAP OR SHOW EVIDENCE OF LEAKAGE WHERE THE LIFTER FOOT IS WELDED TO THE LIFTER BODY (FIG. 8-15) UNLESS THE LEAK-DOWN RATE IS NOT WITHIN SPECIFICATIONS. (SEE VALVE LIFTER LEAK-DOWN)

NOTE: Whenever lifters are removed, always check the lifter foot for wear as follows:

1. Place a straight edge across the lifter foot.

   NOTE: Lifter foot must be clean and dry.

2. While holding the lifter at eye level, check for light between the straight edge and lifter foot.

3. If light indicates a flat or concave surface of the lifter foot, the lifter should be replaced and the camshaft inspected for wear. Wear at

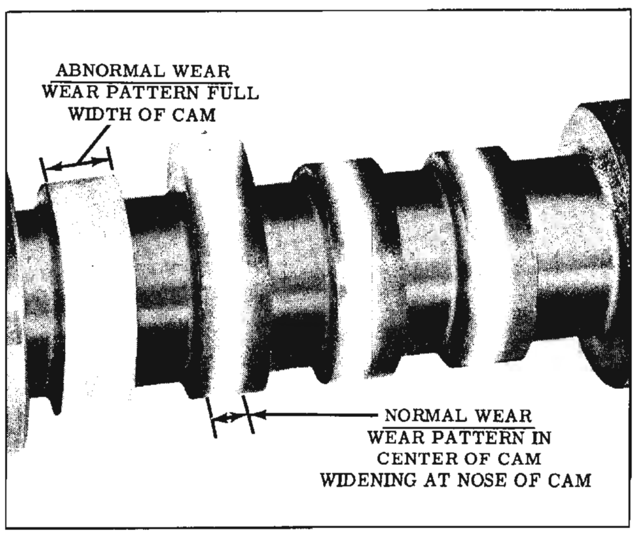


Fig. 8-16 Camshaft Wear Patterns

the CENTER of the cam base circle is NORMAL. (Fig. 8-16) The camshaft should be replaced ONLY when wear is present across FULL WIDTH of cam base circle.

Assemble and Leak-Down Test

IMPORTANT: Lifters must be assembled while submerged under Hydraulic Lifter Test Fluid BT-59 and leak-down tested before placing into service.

1. Install Adapter 105-2 in reservoir of Tester BT-60, then fill reservoir with Hydraulic Lifter Test Fluid BT-59, 1/2" below top of reservoir.

2. Assemble ball check, spring and retainer into plunger. (Fig. 8-17) Make sure retainer flange is pressed tight against bottom of recess in plunger.

3. Install plunger spring over ball check retainer.

4. Hold plunger with spring up and insert into lifter body. Hold plunger vertical to prevent cocking spring.

5. Place assembly into the tester cup then position push rod seat onto plunger.

6. Position the 1/4" steel test ball on the push rod seat. Lower tester ram until it contacts the steel ball.

7. Allow ram to move downward by its own weight until air bubbles disappear.

8. Raise ram, then allow to lower as in step 7. Repeat this procedure several times or until all air is expelled from lifter.

CAUTION: DO NOT ATTEMPT TO EXPEL AIR FROM LIFTER BY PUMPING RAM.

9. After all air is expelled, allow ram to bleed down lifter until retaining ring groove is exposed.

10. Install retaining ring.

11. Adjust ram screw so that it contacts the steel ball in the push rod seat when the pointer is at the start line.

12. Raise arm, then start test by resting ram on steel ball. Rotate reservoir one revolution every two seconds and time the indicator from the start to the stop line. (Fig. 8-18) Allowable tolerance for leak-down rate is 12 to 90 seconds (for used lifters) and 20 to 90 seconds (for new lifters).

13. If leak-down tolerance is within specifications, the lifter can be placed in service without removing test fluid. If leak-down tolerance is not within specifications, the lifter should be replaced.

VALVE LIFTER DIAGNOSIS

1. Momentarily Noisy When Car is Started:

This condition is normal. Oil drains from the lifters which are holding the valves open when the engine is not running. It will take a few seconds for the lifter to fill after the engine is started.

2. Intermittently Noisy on Idle Only, Disappearing When Engine Speed is Increased:

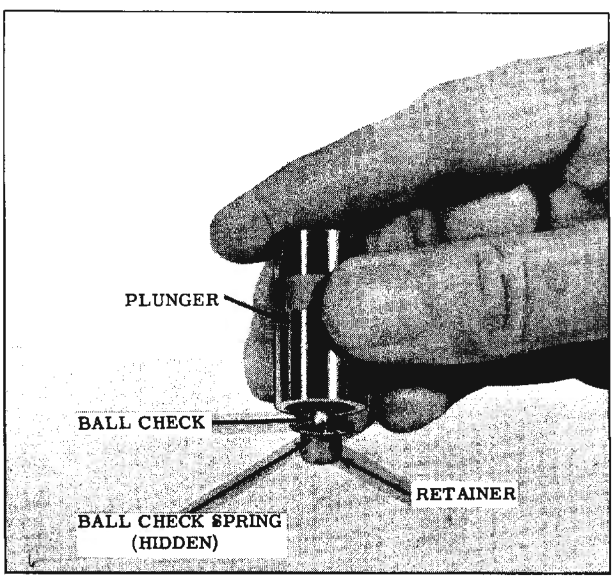


Fig. 8-17 Assembling Retainer in Plunger

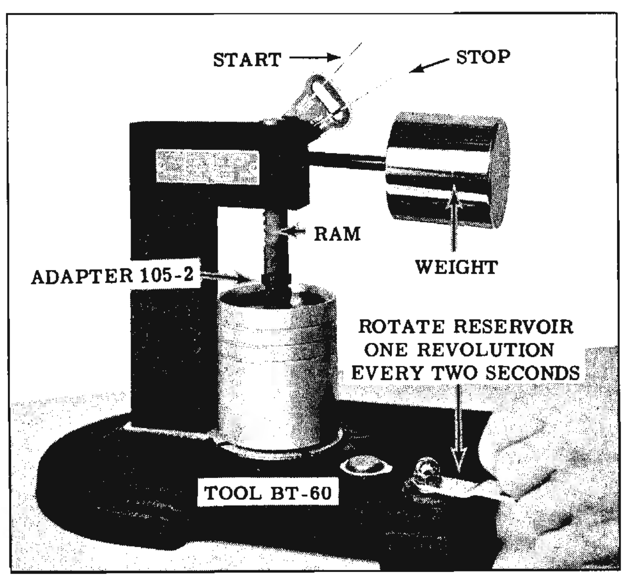


Fig. 8-18 Testing Lifter

Intermittent clicking is an indication of a flat or pitted ball. It may also be caused by dirt.

Correction: Clean lifter and inspect the ball. If ball is defective, replace lifter.

3. Noisy at Slow Idle or With Hot Oil, Quiet With Cold Oil or as Engine Speed is Increased:

Insert a .015" feeler gauge between the rocker arm and valve stem. If noise momentarily disappears and then reappears after a few seconds with the feeler still inserted, it is an indication that the lifter "leak-down" rate is too fast.

Correction: The lifter should be cleaned and tested.

4. Noisy at High Car Speeds and Quiet at Low Speeds:

a. High oil level - Oil level above the "Full" mark allows crankshaft counterweights to churn the oil into foam. When foam is pumped into the lifters, they will become noisy since a solid column of oil is required for proper operation.

   Correction: Drain oil until proper level is obtained. See PERIODIC MAINTENANCE Section.

b. Low oil level - Oil level below the "Add 2" mark allows the pump to pump air at high speeds which results in noisy lifters.

   Correction: Fill until proper oil level is obtained. See PERIODIC MAINTENANCE Section.

5. Noisy at Idle Becoming Louder as Engine Speed is Increased to 1500 R.P.M.:

a. This noise is not connected with lifter malfunction. It becomes most noticeable in the car at 10 to 15 M.P.H. "Lo" range, or 30 to 35 M.P.H. "S" range, and is best described as a "hashy" sound. At slow idle, it may disappear entirely or appear as a light ticking noise in one or more valves. It is caused by one or more of the following:

   (1) Badly worn or scuffed valve tip and rocker arm pad.

   (2) Excessive valve stem to guide clearance.

   (3) Excessive valve seat runout.

   (4) Off-square valve spring.

   (5) Off-square rocker arm pad.

   (6) Excessive valve face runout.

Diagnosis:

Remove rocker arm covers and while listening with a length of heater hose or Stethoscope BT-37, locate noisy valves by increasing engine speed slightly above idle, about 1000 R.P.M. With gloved hand, push sideways on valve spring. Noise will change, either becoming louder or disappearing completely. Some noise will be present in all valve locations. It is necessary to determine which are actually responsible for the customer complaint.

Correction:

a. Occasionally this noise can be eliminated by rotating the valve spring and valve. Crank engine until noisy valve is off its seat. Rotate spring 90°. This will also rotate valve. Repeat until valve becomes quiet. If correction is obtained, check for an off-square valve spring. If spring is off square more than 1/16" in free position, replace spring. (Fig. 8-19)

b. Observe rocker arm pad for excessive wear or excessive off square. Replace as required. (Fig. 8-20)

c. If correction is not obtained, remove cylinder head and check for excessive valve stem to guide clearance. Correct as required.

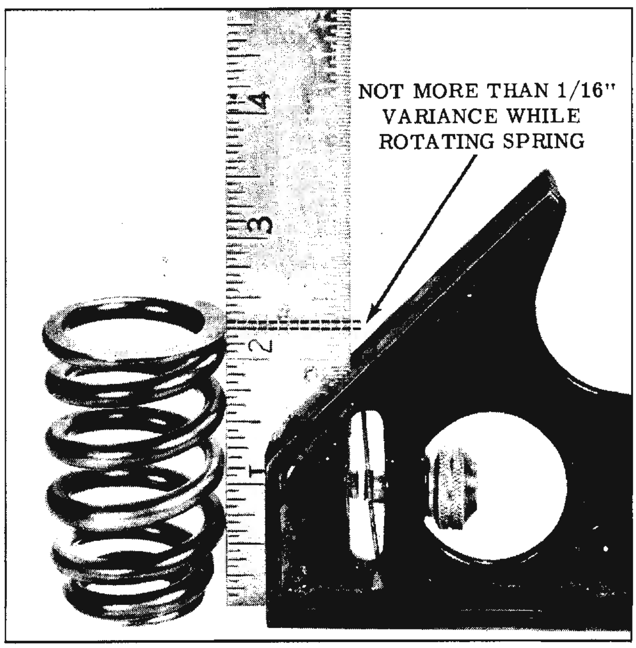


Fig. 8-19 Checking Valve Spring for Distortion

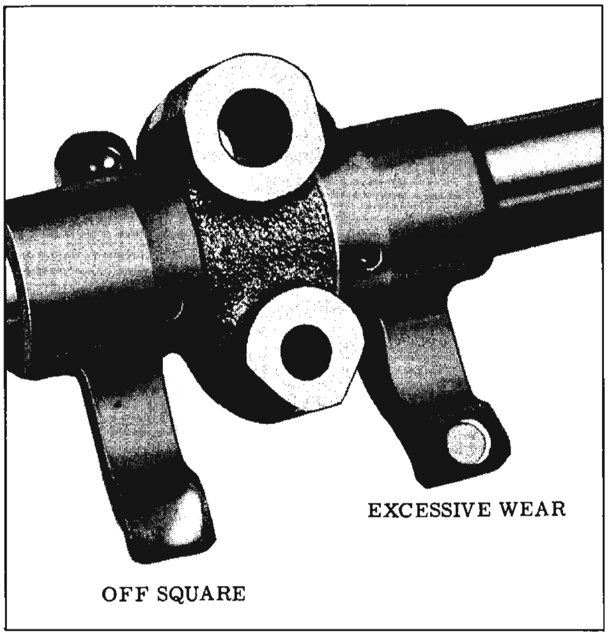


Fig. 8-20 Rocker Arm Wear Patterns

Check valve seat runout. Repair as required by cutting seat. Reface valve and lap valve to seat lightly.

CAUTION: Heavy lapping which results in a groove in the valve face can cause early burning.

6. Valves Noisy Regardless of Engine Speed:

Correction: This condition can be caused by any of the following factors:

a. With transmission in neutral and parking brake on, run the engine at a high R.P.M. If a foreign particle in the lifter is restricting proper operation, this method sometimes proves successful in dislodging the particle. If this method does not quiet the lifter, strike the rocker arm above the push rod with a mallet while the engine is idling. This method of correction has proven successful for dislodging a foreign particle which is preventing the ball from seating properly.

b. Check for valve lash by turning engine so the piston in that cylinder is on T.D.C. of firing stroke. If valve lash is present, the push rod can be freely moved up and down a certain amount with rocker arm held against valve.

Valve lash indicates one of the following:

(1) Worn push rod.

(2) Worn rocker arm.

(3) Lifter plunger stuck in down position due to dirt or varnish.

(4) Defective lifter.

CHECKING OF THE ABOVE FOUR ITEMS:

Remove the rocker arm shaft assembly, then proceed as follows:

1. Observe upper end of push rod. Excessive wear of the spherical surface indicates one of the following conditions:

   (a) Improper hardness of the push rod. The rod must be replaced.

   (b) Improper lubrication to the push rod. The push rod and rocker arm must be replaced. The oiling system to the push rod should be checked.

2. If push rod appears in good condition and has been properly lubricated, replace rocker arm and recheck valve lash.

3. & 4. If valve lash exists and push rod and rocker arm are satisfactory, trouble is in lifter. Lifter should be replaced.

RAISING FRONT OF ENGINE

When removing the exhaust manifold, oil pan, front cover or the engine front mount, the front of the engine must be raised to provide clearance. This is accomplished as follows:

1. Remove the engine front mount to front cross member attaching nuts.

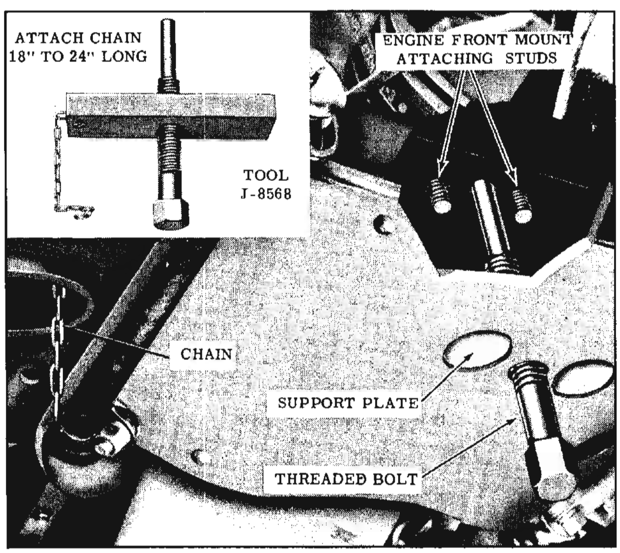


Fig. 8-21 Raising Front of Engine

2. Remove the threaded bolt of Tool J-8568 from the support plate. Feed the support plate through the large opening in the underside of the front cross member. Align the hole in the support plate with the center hole in the front cross member.

   NOTE: Attach a chain 18 to 24 inches long to Tool J-8568 to aid in positioning the Tool in and out of the front cross member. (Inset, Fig. 8-21)

3. Insert the threaded bolt into the support plate. Rotate the threaded bolt until it contacts the engine front mount. (Fig. 8-21). Raise engine until proper clearance is obtained.

   NOTE: When raising engine, do not allow rear of engine or engine components to contact the cowl.

4. When removing the engine front cover or the engine front mount, raise the engine to the desired height then insert wood blocks between the exhaust manifolds and the front cross member. Lower engine until the engine is supported by the wood blocks. The threaded bolt can now be lowered away from the engine front mount.

After the service operations have been performed, lower the engine. Remove the threaded bolt from the support plate then pull the plate out of the cross member. Install the engine mount nuts. Torque nuts 45 to 50 ft. lbs.

OIL PAN AND PUMP

OIL PAN

Remove

1. Position No. 1 piston on bottom of stroke. This moves the No. 1 and No. 2 crankshaft counterweights out of the way to aid in pan removal and installation.

2. Disconnect battery cable.

3. On cars equipped with single exhaust systems, remove the exhaust crossover pipe.

4. Disconnect idler arm support from frame.

5. Remove attaching bolts and position starter away from engine.

6. Remove the two engine front mount attaching nuts. Raise engine with Tool J-8568. (Refer to RAISING FRONT OF ENGINE.)

7. Drain oil from pan, then remove pan.

   NOTE: Holes are provided in the frame cross member for access to the front oil pan bolts.

8. Clean oil pan. Use lacquer thinner to clean old sealer from pan.

Install

1. Apply sealer, Part No. 557622 to the bottom side of new fiber gaskets and install gaskets on pan.

2. Install new front and rear synthetic rubber seals on oil pan. Apply a light coat sealer Part No. 557622 to exposed surfaces of seals, to insure that seals do not hang up on the front cover and rear main bearing cap sealing surfaces during oil pan installation.

3. Apply cement, Part No. 557621, to both sides of the rear main bearing cap and install two new cork seals.

4. To install oil pan reverse removal procedure making sure that all seals are in position before pan is tightened.

5. Torque oil pan bolts evenly 10 to 15 ft. lbs.

6. Lower engine. (Refer to RAISING FRONT OF ENGINE).

OIL PUMP

Remove and Install

1. Remove oil pan. (Refer to OIL PAN - Remove)

2. Remove the oil pump baffle.

3. Remove the oil pump to rear main bearing cap attaching screws, then remove pump and drive shaft extension.

To install, insert the drive shaft extension through the opening in the block until the shaft mates into the distributor drive gear. Position pump onto the rear main bearing cap, torque the attaching bolts 24 to 34 ft. lbs. Install the oil pump baffle then install oil pan. (Refer to OIL PAN - Install)

OIL PUMP—DISASSEMBLE (Fig. 8-22)

1. Remove the oil pump drive shaft extension.

   NOTE: Do not attempt to remove the washers from the drive shaft extension. The drive shaft extension and washers must be serviced as an assembly.

2. Remove the intake pipe and screen assembly and gasket.

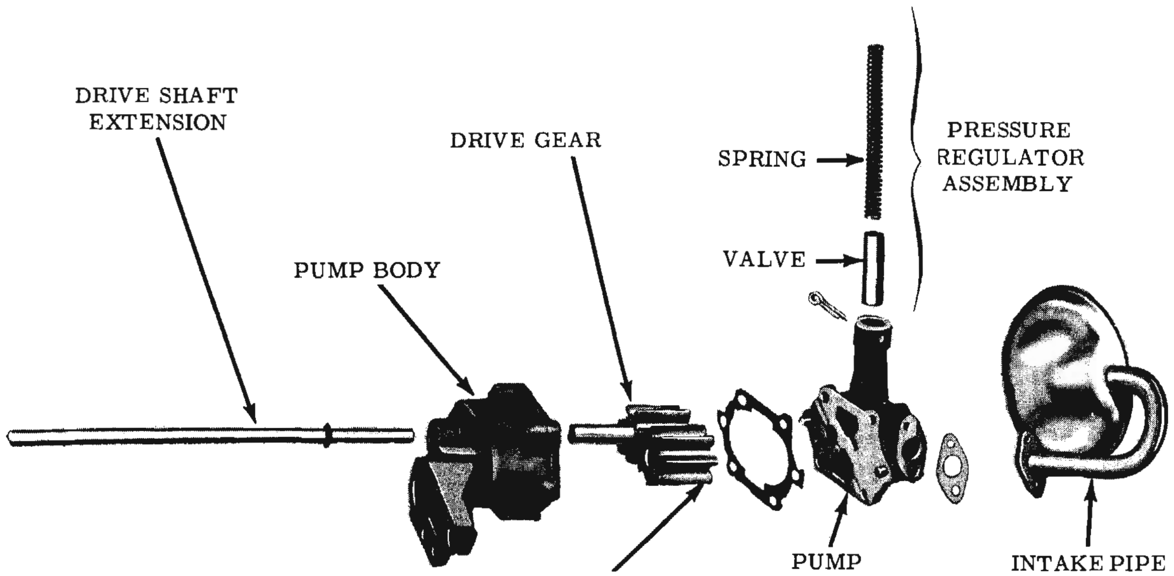


Fig. 8-22 Oil Pump Assembly

3. Remove the retaining pin and the pressure regulator, spring and valve.

   CAUTION: Position thumb over pressure regulator bore before removing retaining pin as the spring is under tension.

4. Remove the oil pump cover attaching screws and remove the oil pump cover and gasket.

5. Remove the drive gear and idler gear from the pump body.

CLEANING AND INSPECTION

1. Wash all parts in clean solvent and blow out passages with compressed air.

2. Inspect all moving parts for scoring. Small imperfections can be cleaned up with a fine hone.

3. Check pressure relief valve clearance in bore. Clearance should be .0025" to .005". Too much clearance can affect oil pressure at idle.

   (The oil pressure warning light on the instrument panel is calibrated to light when oil pressure is less than 3 lbs.)

4. Check end clearance of gears. End clearance of gears should be .0025" to .008".

Assembly

1. Install the drive gear into the pump body with the hex I.D. of the drive shaft toward the oil pump mounting pad, then install the idler gear.

2. Position a new gasket on the pump body and install the oil pump cover. Tighten the cover screws 5 to 8 ft. lbs.

3. Position the pressure regulator valve into the pump cover, closed end first, then install the spring and retaining pin.

4. Position a new gasket on the pump cover and install the intake pipe and screen with screen facing away from the pump mounting pad. Tighten screws 4 to 7 ft. lbs.

   IMPORTANT: When assembling the drive shaft extension to the drive shaft, the END OF THE EXTENSION NEAREST THE WASHERS MUST BE INSERTED INTO THE DRIVE SHAFT.

CONNECTING ROD AND PISTON ASSEMBLY

Three types of pistons are used and can be identified by referring to Fig. 8-23.

ROD AND PISTON ASSEMBLY—REMOVE

1. Remove cylinder head or heads.

2. Remove oil pan.

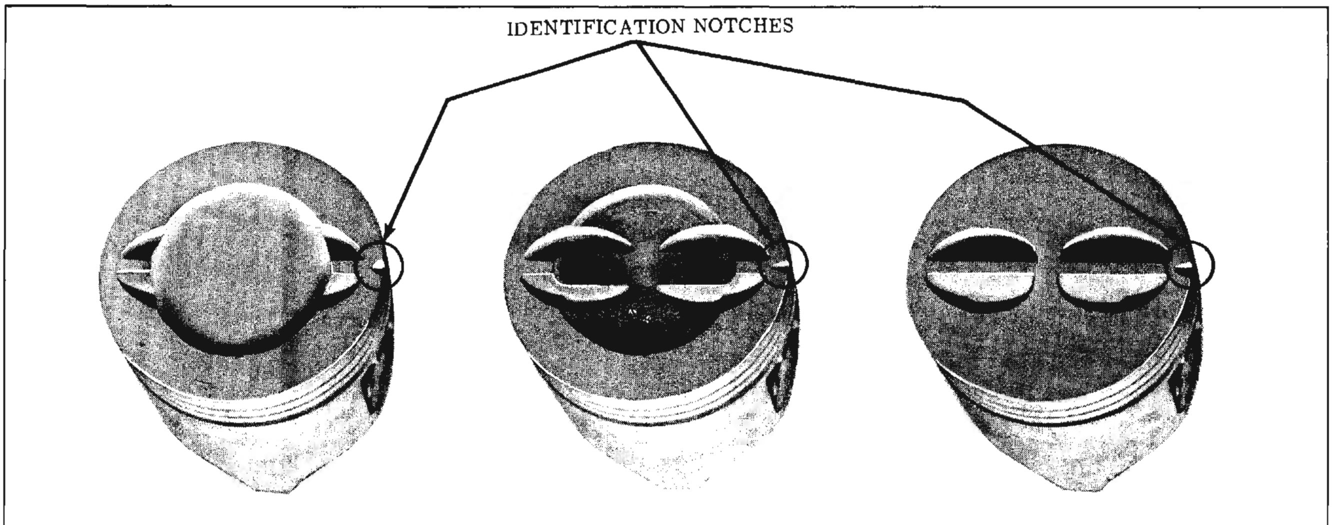


Fig. 8-23 Piston Identification

IMPORTANT: If more than one piston and rod assembly is to be removed, the corresponding cylinder number should be stamped on the machined surfaces of the connecting rod and cap (on side opposite spit hole) for identification when reinstalling. If the pistons are to be removed from the connecting rod, mark but DO NOT STAMP cylinder number on piston.

CAUTION: To prevent damage to the rods, the stamping operation must be performed while the connecting rods are still attached to the crankshaft.

3. Remove the ridge at the top of the cylinder bore before attempting to remove the piston and rod assembly.

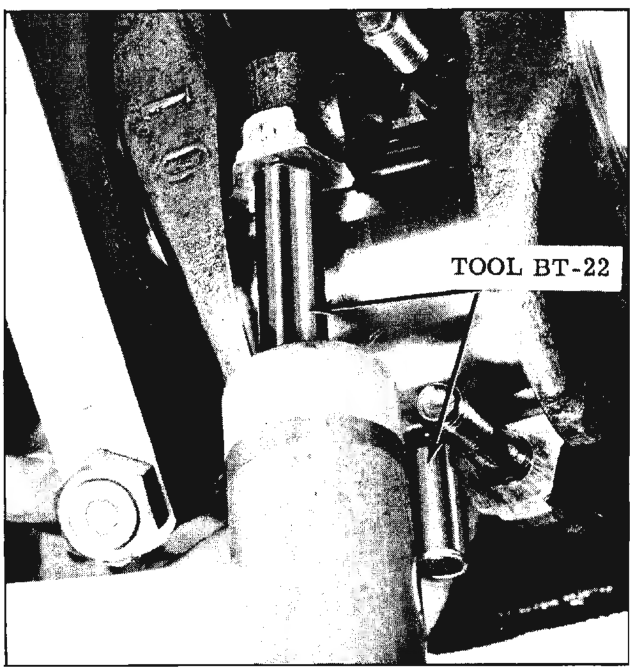


Fig. 8-24 Connecting Rod Removal

4. After removing bearing caps and bearings, place guide Tool BT-22 over the threads of connecting rod bolts to prevent damaging the bearing journals, then tap rod and piston assembly through the top of the cylinder bore. (Fig. 8-24) Pistons should only be removed from the top of the cylinder block.

CYLINDER BORE

Cylinder bore size can be measured with inside micrometers. Maximum allowable taper of the cylinder bore is .010".

Reconditioned cylinder bores should be held to not more than .001" out of round and .001" taper (larger at the bottom)

It is important that reconditioned cylinder bores be thoroughly washed with a large brush and a soap and water solution to remove all traces of abrasive material to eliminate rapid wear.

CLEANING PISTON

Clean the pistons by scraping carbon off the top of the piston and immerse the pistons in a solvent. Deposits in the ring grooves can be removed by using a broken piston ring or a suitable groove cleaning tool.

MEASUREING PISTON (Fig. 8-25)

When measuring piston for size or taper, measurement must be made on skirt 90° from piston pin hole (with the piston pin removed).

When measuring taper, the largest reading must be at the bottom of the skirt. Allowable taper is .000" to .001".

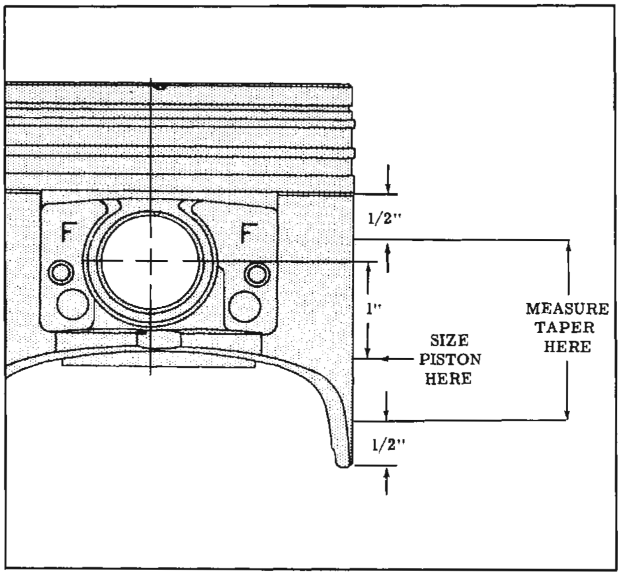


Fig. 8-25 Measuring Piston

NOTE: On some cars, oversize pistons may be found. These pistons will be either .005" or .010" oversize.

FITTING PISTON

NOTE: The piston and cylinder bore must be free of oil and at the same temperature.

1. Place a 1/2" x 12" x .0015" ribbon attached to scale J-5515 against the upper side of the bore, at 90° to the normal piston pin location. (Fig. 8-26)

2. Insert piston (with pin and rings removed) into bore with head downward.

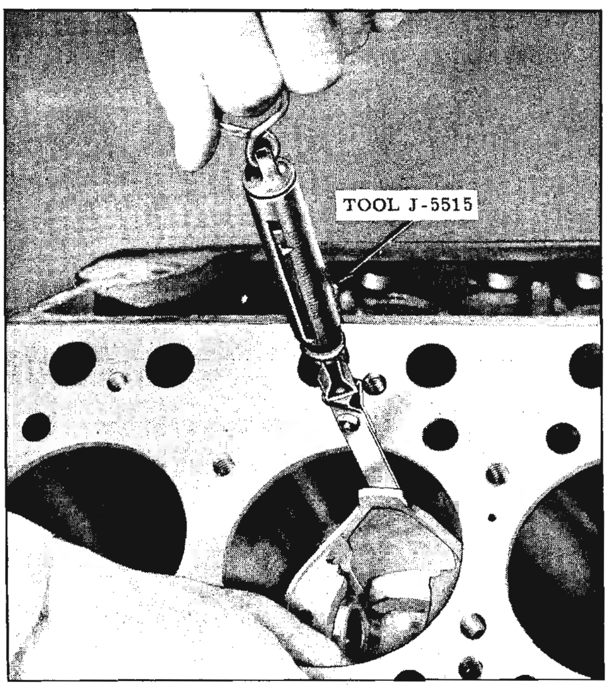


Fig. 8-26 Fitting Piston to Cylinder

3. While holding the piston in the center of its normal travel, slowly pull the scale in a straight line and note the reading on the scale. The reading should be 3 to 12 pounds.

Each piston should be fitted to its individual cylinder and marked for that cylinder.

PISTON PIN

Piston pins are available in three sizes: Standard, .001", and .003" oversize. Honing of the piston pin hole for installation of oversize pins is the most satisfactory method of sizing.

The correct piston pin fit in the piston and in the connecting rod is .0003" to .0005" loose. If the pin to piston clearance is to the high limit (.0005"), the pin can be inserted in the piston with very little hand pressure. The pin will fall through the piston by its own weight. If the pin to piston clearance is to the low limit, .0003", very little hand pressure will be required to insert the pin into the piston. The pin will not slide through the piston by its own weight. It is important that both the pin and piston pin hole be clean and free of oil when checking pin fit, and that the piston pin hole is not more than .0005" out of round.

Whenever the replacement of a piston pin is necessary, the size pin required should be determined by trying standard, .001" or .003" oversize pins.

CONNECTING ROD BUSHINGS

In rod bushing replacement, the bronze bushing, after having been pressed into the rod, should be burnished and then finished to size with a hone.

The fit of the piston pin in the connecting rod bushing should be .0003" to .0005" loose.

CHECKING CONNECTING ROD

After the connecting rods and pistons are separated, the rods should be checked for alignment. If a rod is twisted or bent, a new rod must be installed. NO ATTEMPT SHOULD BE MADE TO STRAIGHTEN CONNECTING RODS.

ROD AND PISTON—ASSEMBLY

Lubricate piston pin hole and piston pin to facilitate installation of pin, then position connecting rod with its respective piston as shown in Fig. 8-27. Install piston pin and pin retainers.

RINGS

The pistons have three rings (two compression

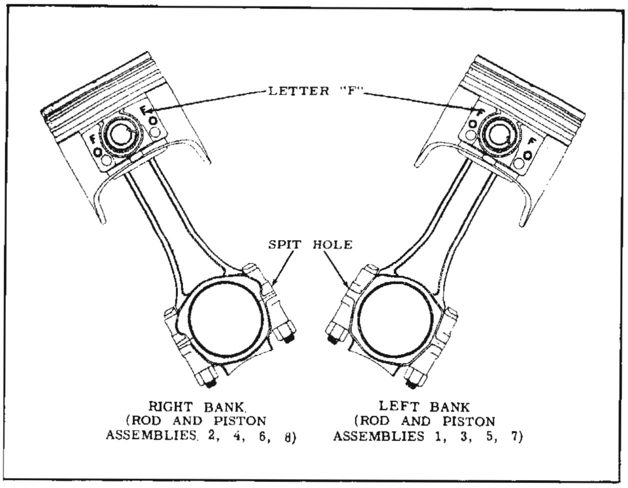


Fig. 8-27 Assembly of Rod to Piston

rings and one oil ring). Production rings are supplied from two sources and are of similar design. On both types of rings, the outside diameter of the top compression ring is chrome plated; the second compression ring is of the step type and has a black finish. Both types of oil rings consist of 2 rails and an expander.

To determine which make of production rings were installed in the engine, the following identification may be observed: Muskegon compression rings have an "O" marked on the top of the rings. Perfect Circle compression rings have the word "TOP" marked on the top of the rings.

RING TOLERANCES

When installing new rings, ring gap and side clearance should be checked as follows:

Piston Ring and Rail Gap

Each ring and rail gap must be measured with the ring or rail positioned squarely and at the bottom of the ring-travel area of the bore. (Fig. 8-28)

If the gap measurement is not within the specifications shown in Fig. 8-28, file the ends of rings and rails until the minimum gap is obtained. Ends of rings and rails must be filed square.

Side Clearance

Each ring must be checked for side clearance (see chart) in its respective piston groove by inserting a feeler gauge between the ring and its upper land. (Fig. 8-29) The piston grooves must be cleaned before checking ring for side clearance.

NOTE: To check oil ring side clearance, the oil rings must be installed on the piston.

ALLOWABLE SIDE CLEARANCE

Oil Rings	.0005" to .007"
Compression Rings	.001" to .004"

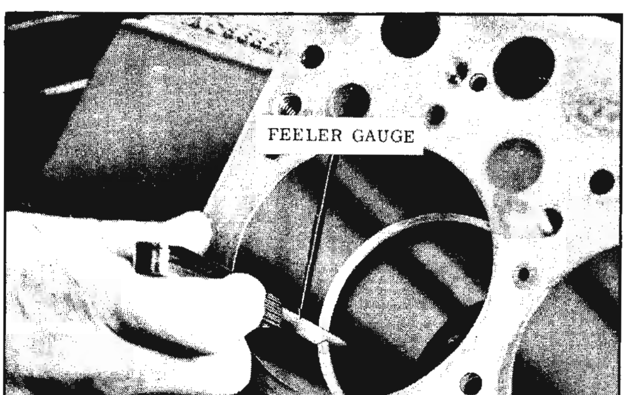
RING INSTALLATION

IMPORTANT: For service ring specifications and detailed installation instructions, refer to the instructions furnished with the parts package.

ROD AND PISTON ASSEMBLY—INSTALL

When installing piston and connecting rod assemblies, Connecting Rod Bolt Guide Tool BT-22 should be placed over the connecting rod bolt threads to protect the crankshaft bearing surfaces.

Apply SAE No. 20 oil to rings and piston, then install the rod and piston assemblies in their respective bores so the notch, cast in the top of each piston will be toward the front of the



RING GAP	
COMPRESSION RING	OIL RAIL
ALL SERIES . . . .013" to .023"	.015" to .055"

Fig. 8-28 Checking Ring Gap

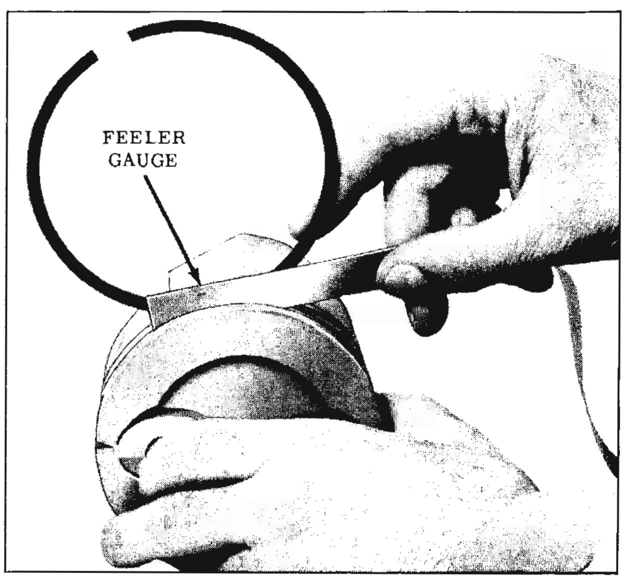


Fig. 8-29 Checking Ring Side Clearance

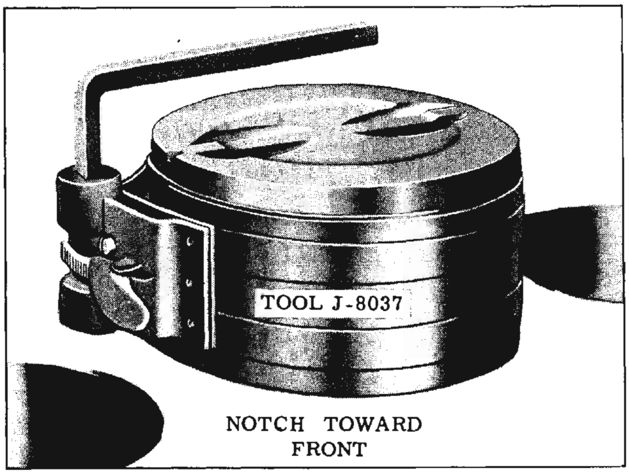


Fig. 8-30 Installing Piston Assembly

engine after installation.

NOTE: The piston can be installed in the piston bore without danger of breaking the piston rings if Tool J-8037 or a similar ring compressing tool is used. (Fig. 8-30)

Install connecting rod caps with bearing index notches in rod and cap on same side.

The connecting rod cap attaching nuts should only be tightened enough to keep each rod in position until all piston and rod assemblies have been installed. This will facilitate installation of the remaining piston assemblies.

The clearance between the adjacent rods on each crankpin should be from .002" to .011" when checked with a feeler gauge.

Torque rod bearing cap nuts 32 to 42 ft. lbs.

CONNECTING ROD BEARINGS—REPLACE

The removable steel backed aluminum insert type connecting rod bearing shells are assembled with a slight projection above the rod and cap faces to insure a positive contact. Adjustment for wear, such as installing shims behind the shells, should NEVER be practiced. WORN BEARINGS MUST BE REPLACED.

Connecting rod bearings can be replaced without removing the rod and piston assembly from the engine.

1. Remove oil pan.
2. With connecting rod journal at approximately bottom center, remove both bearing caps.

   NOTE: Before removing bearing caps, STAMP cylinder number on machined surfaces of connecting rod and cap for identification when reinstalling. Do not file notches on rod or cap.
3. Inspect journals for roughness and wear. Slight roughness may be removed with a fine grit polishing cloth saturated with engine oil. Burrs may be removed with a fine oil stone. If the journals are scored or ridged, the crankshaft must be replaced or reground.
4. The connecting rod journals can be checked for out-of-round with the use of a 2, to 3, micrometer. Maximum out-of-round must not exceed .0015".
5. Clean oil from journal, bearing cap connecting rod and outer and inner surface of bearing inserts.
6. Place a piece of "Plastigauge" in the center of lower bearing shell.
7. Reinstall bearing cap and torque 32 to 42 ft. lbs.
8. Remove bearing cap and determine bearing clearances by comparing the width of the flattened "Plastigauge" at its widest point with the graduation on the "Plastigauge" container. The number within the graduation on the envelope indicates the clearance in thousandths of an inch. (Fig. 8-31) If this clearance is greater than .0035", replace the bearing and recheck clearance with "Plastigauge".

   NOTE: Lubricate bearing with SAE 20 oil before installation. Repeat Steps 2 thru 8 on remaining connecting rod bearings.

   All rods must be connected to their journals when rotating the crankshaft.

MAIN BEARINGS

Main bearing clearance must not exceed .0035" on No. 1, 2, 3, and 4 bearings and .0045" for No.

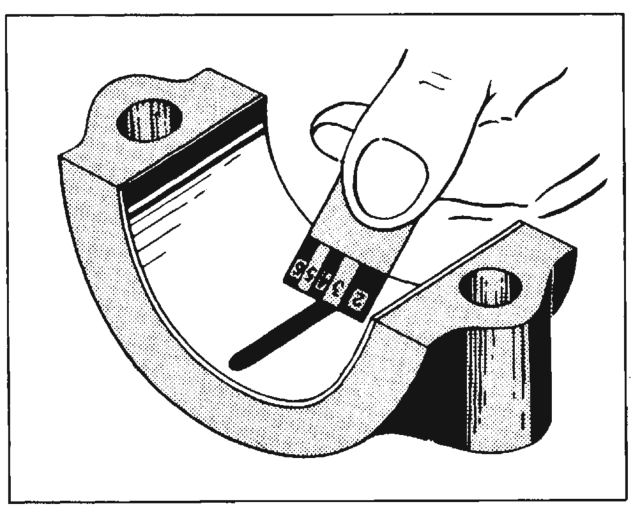


Fig. 8-31 Checking Bearing Clearance

5 bearing. The .0035" and .0045" clearances are permissable only if the engine is disassembled for other than a bearing noise condition. If bearings are noisy or if a visual inspection indicates defective bearings, new bearings must be installed within the specifications outlined under MAIN BEARINGS - REPLACE.

Bearings which fall within the .0035" and .0045" specifications should not be rejected if the bearings show a normal wear pattern or slight radial grooves.

CHECKING BEARING CLEARANCES

1. Remove bearing cap and wipe oil from crankshaft journal and outer and inner surfaces of bearing shell.

   NOTE: To prevent the possibility of raising the metal around the dowel hole in the rear main bearing cap, insert Slide Hammer J-6125 in oil pump mounting screw hole to remove the cap.

2. Place a piece of "Plastigauge" in the center of bearing.

3. Use a floor jack or other means to hold crankshaft against upper bearing shell. This is necessary to obtain accurate clearance readings when using "Plastigauge".

4. Reinstall bearing cap and bearing. Torque 90 to 120 ft. lbs. (Rear bearing cap to be torqued 130 to 160 ft. lbs.)

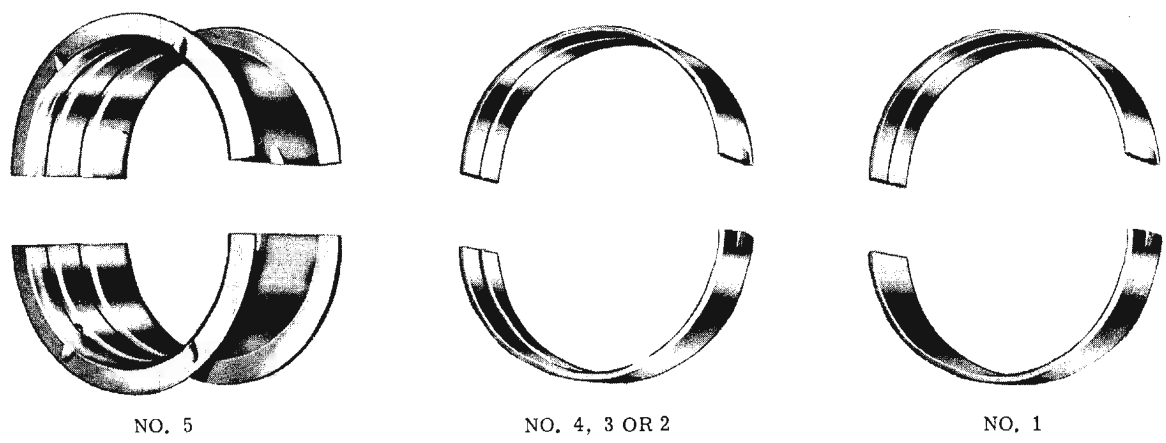
5. Remove bearing cap and determine bearing clearance by comparing the width of the flattened "Plastigauge" at its widest point with the graduation on the "Plastigauge" container. The number within the graduation on the envelope indicates the clearance in thousandths of an inch. (Fig. 8-31) If this clearance is greater than .0035" for No. 1, 2, 3 or 4 bearings and .0045" for No. 5 bearing, REPLACE BOTH BEARING SHELLS AS A SET. Recheck clearance after replacing shells. (Refer to MAIN BEARINGS - REPLACE).

MAIN BEARINGS—REPLACE

Main bearing clearances not within specifications (.0005" to .0021" for No. 1 and 2 bearings, .008" to .0024" for No. 3 and 4 bearings and .0020" to .0034" for No. 5 bearing), must be corrected by the use of selective upper and lower shells. (Refer to Fig. 8-32 for selective sizes.) UNDER NO CIRCUMSTANCES should the use of shims behind the shells, to compensate for wear, be attempted.

IMPORTANT: THE UPPER AND LOWER SHELLS MUST BE INSTALLED IN PAIRS.

To install main bearing shells, proceed as follows:



IDENTIFICATION (ON SHELL TANG)		THICKNESS
NO. 1 THRU 4	NO. 5	
NONE	NONE	STANDARD
B	A	.0005" UNDERSIZE
C	B	.0010" UNDERSIZE
E	C	.0015" UNDERSIZE

Fig. 8-32 Main Bearing Sizes

1. Remove bearing cap and remove lower shell.

2. Insert a flattened cotter pin in the oil passage hole in the crankshaft, then rotate the crankshaft in the direction opposite to cranking rotation. The cotter pin will contact the upper shell and force it out.

3. The main bearing journals should be checked for roughness and wear. Slight roughness may be removed with a fine grit polishing cloth saturated with engine oil. Burrs may be removed with a fine oil stone. If the journals are scored or ridged, the crankshaft must be replaced or reground.

   NOTE: The journals can be measured for out-of-round with the crankshaft installed by using a crankshaft caliper and inside micrometer. The upper bearing shell must be removed when measuring the crankshaft journals. Maximum out-of-round of the crankshaft journals must not exceed .0015".

4. Clean crankshaft journals and bearing caps thoroughly before installing new main bearings.

5. No. 5 bearing - apply Special Lubricant, Part No. 567196 to the thrust flanges of bearing shells. (Fig. 8-33)

6. Place new upper shell on crankshaft journal with locating tang in correct position and rotate shaft to turn it into place using cotter pin as during removal.

7. Place new lower shell in bearing cap.

8. No. 5 bearing - install new asbestos oil seal in the rear main bearing cap. (See REAR MAIN BEARING OIL SEAL - REPLACE)

9. Install bearing caps. Torque No. 1 thru 4 bearing caps 90 to 120 ft. lbs. and No. 5 bearing cap 130 to 160 ft. lbs.

REAR MAIN OIL SEALS—REPLACE

Rear Main Oil Seal

The rear main bearing is sealed against oil leaks by a special asbestos covered wiper seal. Special care must be exercised when installing this seal.

Whenever the crankshaft is removed, a new seal coated with graphite grease should be installed in the engine block. Whenever the No. 5 bearing cap is removed, a new seal should be installed in the bearing cap. The seal, to be properly installed, should be crowded into the groove in the bearing cap and block by hand, then driven tightly into the groove by tapping Tool 23-18 with a hammer. (Fig. 8-34)

NOTE: To check if seal is fully seated in the bearing cap, slide Tool 23-18 away from the seal. With Tool 23-18 fully seated in the bearing cap, slide tool against the seal. If under cut area of tool slides over the seal, the seal is fully seated. If tool butts against the seal, the seal must be driven further into the seal groove.

After the seal has been seated in the bearing cap and while the tool is still resting in the bearing cap, the seal should be cut flush with the parting line between upper and lower bearing. The ends of the seal must be cut clean so no frayed

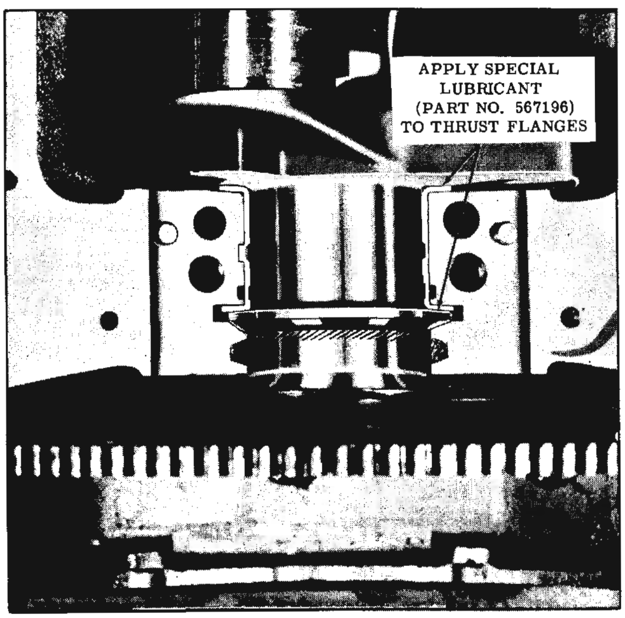


Fig. 8-33 Rear Main Bearing

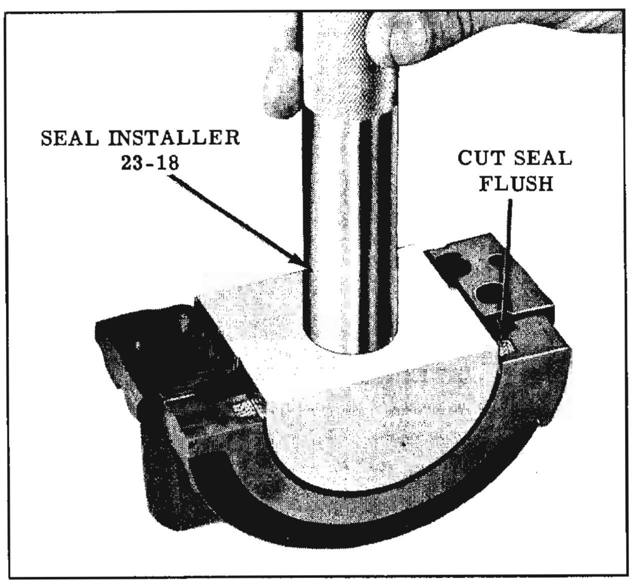


Fig. 8-34 Installing Oil Seal

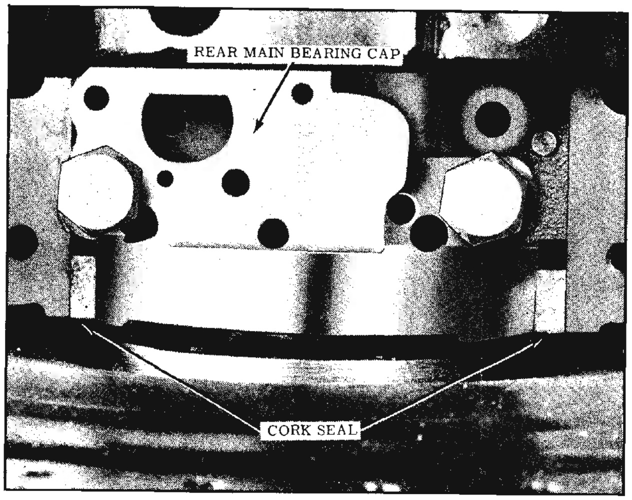


Fig. 8-35 Rear Main Bearing Cork Seals

ends will be clamped between the block and cap, and the seal must entirely fill the groove.

Cork Seals

After the rear main bearing cap has been installed, cement, Part No. 557621, should be wiped in grooves in block on both sides of bearing cap and the two cork seals pressed into place in the grooves. (Fig. 8-35)

CRANKSHAFT PULLEY—REMOVE

1. Remove belt(s) from crankshaft pulley.
2. Remove crankshaft pulley bolt and washer.
3. Pull pulley from crankshaft.

When installing crankshaft pulley, apply sealer Part No. 557622 to inside diameter of pulley and to crankshaft key to prevent possible oil leakage. Coat outside area of crankshaft pulley, which enters seal, with lubricant, Part No. 567196. Torque crankshaft pulley bolt 100 ft. lbs. (minimum).

CRANKSHAFT FRONT OIL SEAL

Remove (Fig. 8-36)

The crankshaft front oil seal can be removed without removing the radiator or crankshaft pulley key as follows:

1. Remove crankshaft pulley and thread Pilot Bolt J-7583-3 into end of crankshaft.
2. Thread Tool J-7583-1 into oil seal, then tighten forcing screw J-7583-2 until seal is removed from front cover.
3. Remove oil seal from Tool J-7581-1 and Pilot

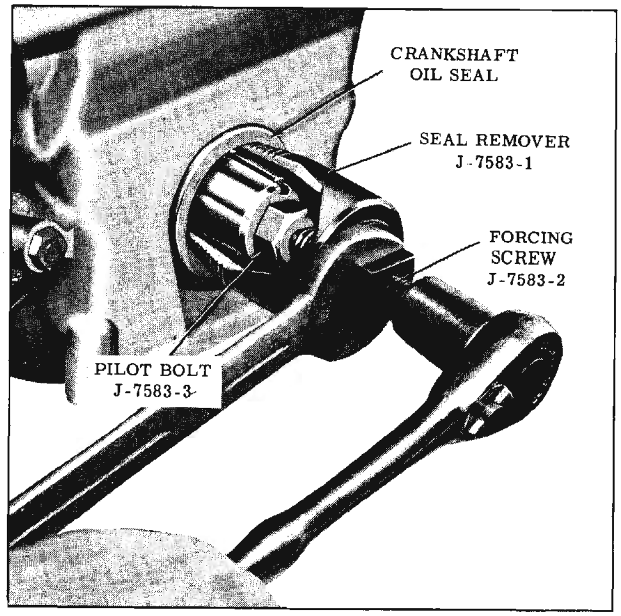


Fig. 8-36 Removing Crankshaft Front Oil Seal

Bolt J-7583-3 from crankshaft.

Install (Fig. 8-37)

1. Coat outer diameter of a new seal with sealer, Part No. 557622. Lubricate lips of seal with lubricant, Part No. 567196
2. Position seal into engine front cover.
3. Position Seal Installer J-7584-1 over seal and thread Forcing Screw J-7584-3 into crankshaft until Seal Installer contacts engine cover.
4. Remove Seal Installer.
5. Install crankshaft pulley and belts. Torque pulley bolt 100 ft. lbs. minimum. Tighten belts using Tool 33-70.

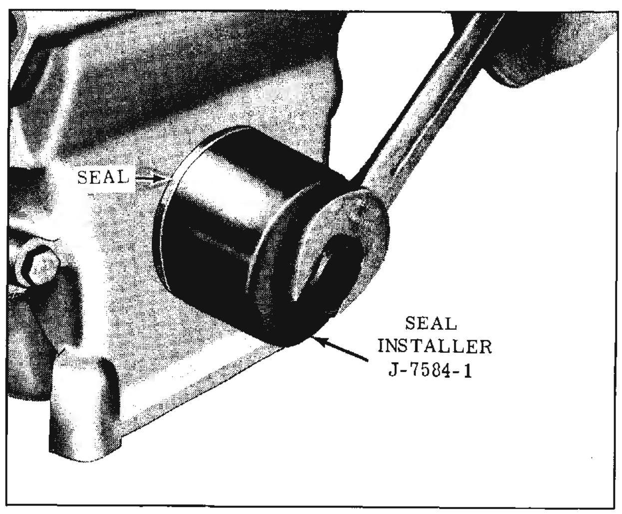


Fig. 8-37 Installing Crankshaft Front Oil Seal

FRONT COVER—REMOVE AND INSTALL

1. Drain cooling system.
2. Disconnect radiator lower hose and heater hose from front cover.
3. Disconnect Delcotron link at Delcotron.
4. Raise front of engine as outlined under RAISING FRONT OF ENGINE.
5. Remove oil pan.
6. Remove fan blades and pulley.
7. Remove crankshaft pulley.
8. Remove distributor cap. Install a jumper wire and crank engine until distributor rotor points toward the front of the engine, then remove fuel pump assembly.
9. Remove front cover attaching bolts and front cover assembly.

To install, reverse sequence of operations. Tighten belts using Tool 33-70.

NOTE: Always install a new front oil seal. Fuel pump rocker arm pad should be coated with lubricant, Part No. 567196. Install fuel pump with rocker arm of fuel pump resting on top of the fuel pump eccentric.

The front cover attaching bolts should be dipped in sealer, Part No. 557622. Torque 24 to 40 ft. lbs. One side of the fuel and vacuum pump gasket should be coated with sealer, Part No. 557622.

TIMING CHAIN AND GEARS (WITH FRONT COVER REMOVED)

Whenever the timing gears or chain are to be removed, remove the fuel pump eccentric, then pull the camshaft gear from the shaft. The timing chain can now be removed. To remove the crankshaft gear, tap gear off shaft or if the gear is a tight fit, use a universal puller.

On reassembly, apply sealer, Part No. 557622 to crankshaft key, then install the gears and timing chain so the correct valve timing is obtained. Alignment marks on timing chain gears must index with pointers on Gauge BT-11. (Fig. 8-38) Install fuel pump eccentric with the cupped side out and torque attaching cap screws 14 to 22 ft. lbs.

CAMSHAFT AND CAMSHAFT BEARINGS

Three types of camshafts are used and can be identified by referring to Fig. 8-39.

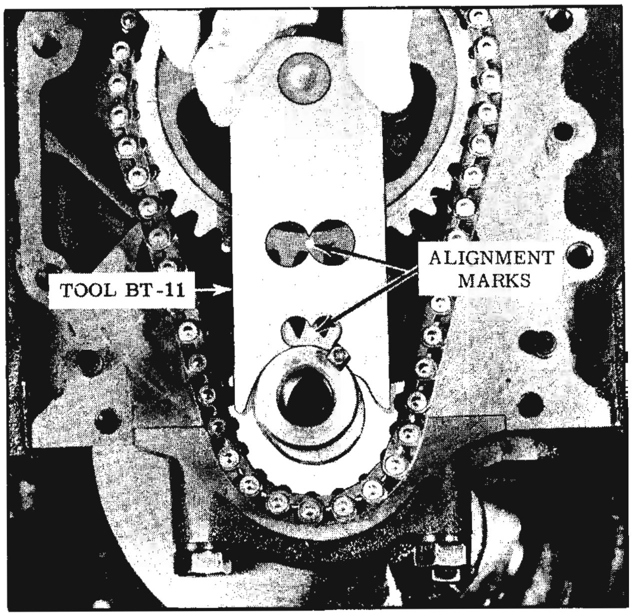


Fig. 8-38 Timing Camshaft

CAMSHAFT

Remove and Install

1. Drain cooling system.
2. Remove oil cooler lines and radiator hoses.

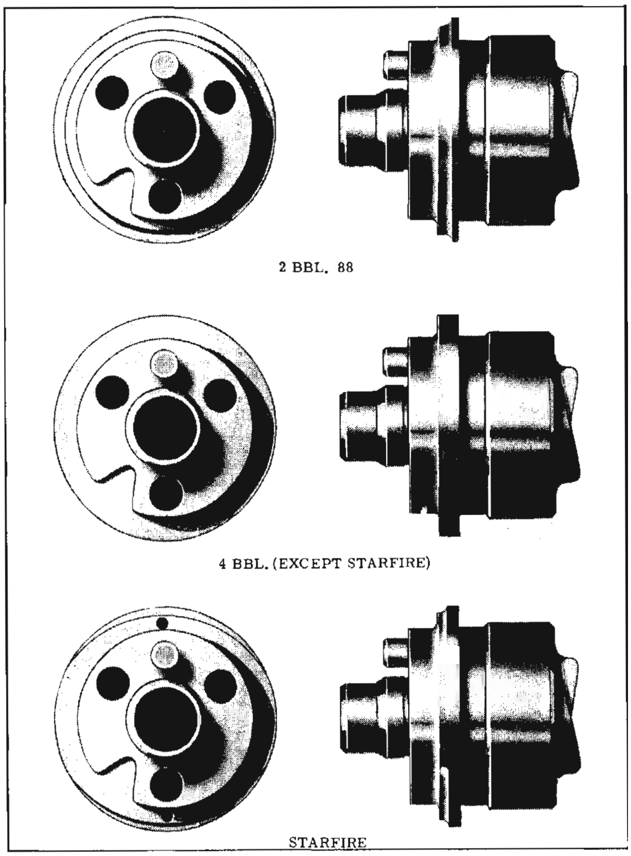


Fig. 8-39 Camshaft Identification

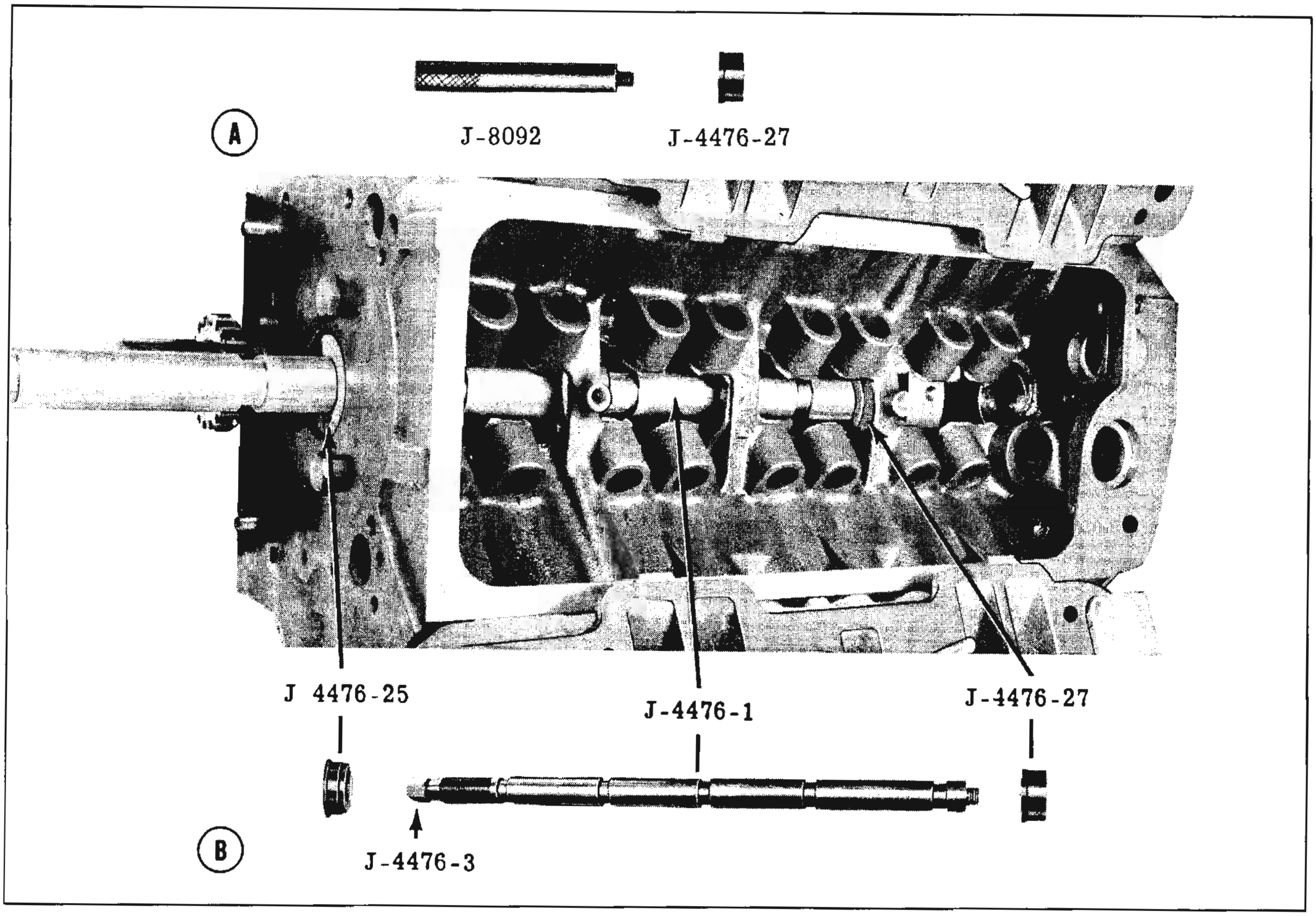


Fig. 8-40 Removing No. 4 Camshaft Bearing (Typical of 1, 2 & 3)

3. If equipped with air conditioning, remove condenser.
4. Remove radiator upper support and radiator.
5. Remove air cleaner.
6. Remove rocker arm covers, then remove the rocker arm shaft assemblies and push rods.
7. Disconnect fuel and vacuum lines, then remove intake manifold.
8. Remove distributor.
9. Remove engine top cover and valve lifters.
10. Raise engine, then remove oil pan.
11. Remove crankshaft pulley, fuel pump and engine front cover.
12. Remove fuel pump eccentric, camshaft sprocket and timing chain.
13. Remove camshaft by CAREFULLY sliding it out from the front of the engine.

    Before installing the camshaft, it is important that the camshaft be lubricated liberally with engine oil mixed with Concentrate, Part No. 582099. To install the camshaft, reverse the removal procedure.

CAMSHAFT BEARINGS

Whenever it is necessary to replace a camshaft bearing, ALL THE BEARINGS must be replaced. Service replacement bearings do not require line reaming.

Remove—(Camshaft Removed)

1. Assemble tools as shown in Fig. 8-40 (Inset "A") and remove No. 1 camshaft bearing by driving it rearward. Remove old bearing from J-4476-27 and repeat procedure on No. 2 bearing.
2. Assemble tools as shown in Fig. 8-40 (Inset "B") and remove No. 3 bearing. Remove old bearing from J-4476-27 and repeat procedure on No. 4 bearing.
3. To remove No. 5 bearing proceed as follows:
   a. Assemble tools as shown in Fig. 8-41.
   b. Insert tool into block with the fingers of remover J-4476-9 behind No. 5 camshaft bearing. Spread fingers of remover by

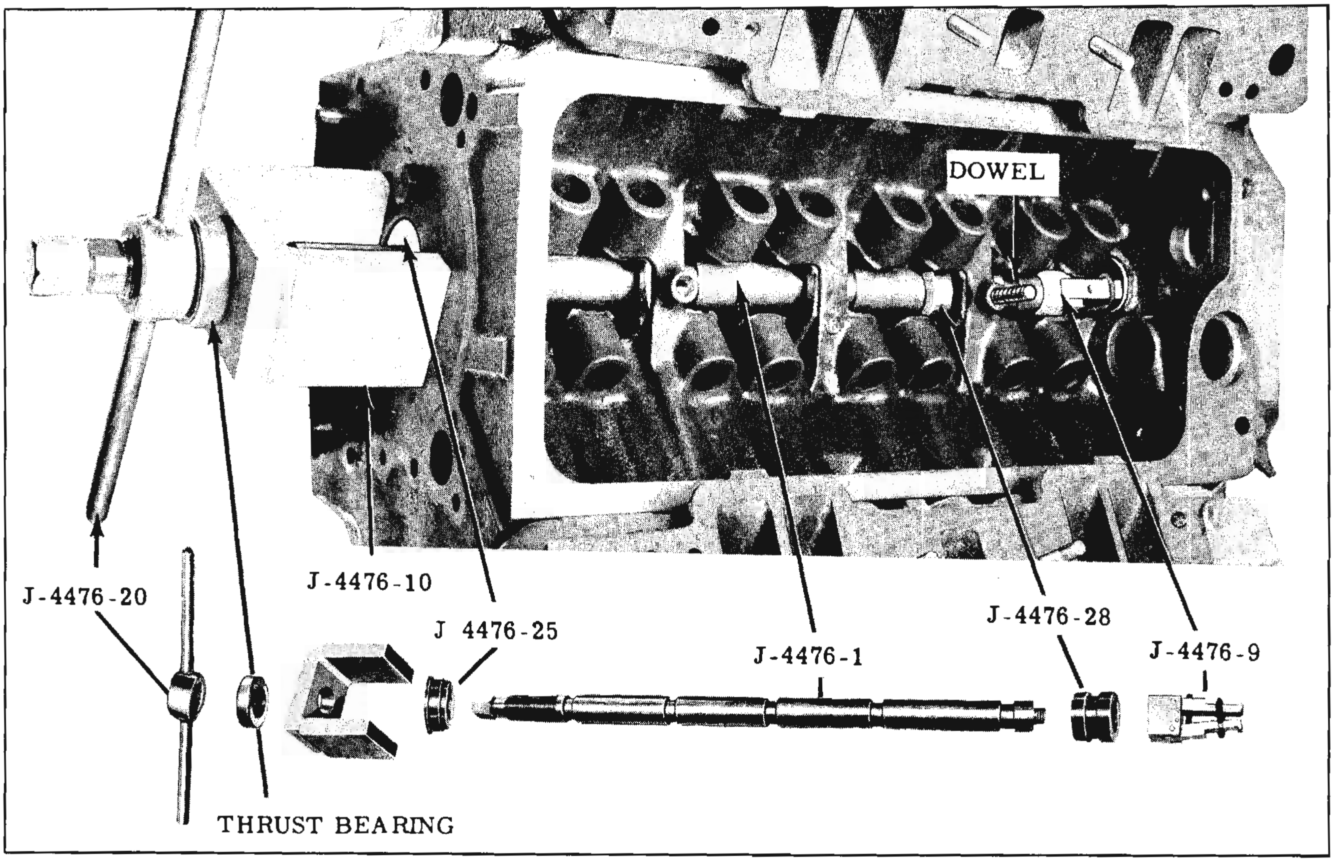


Fig. 8-41 Removing No. 5 Camshaft Bearing

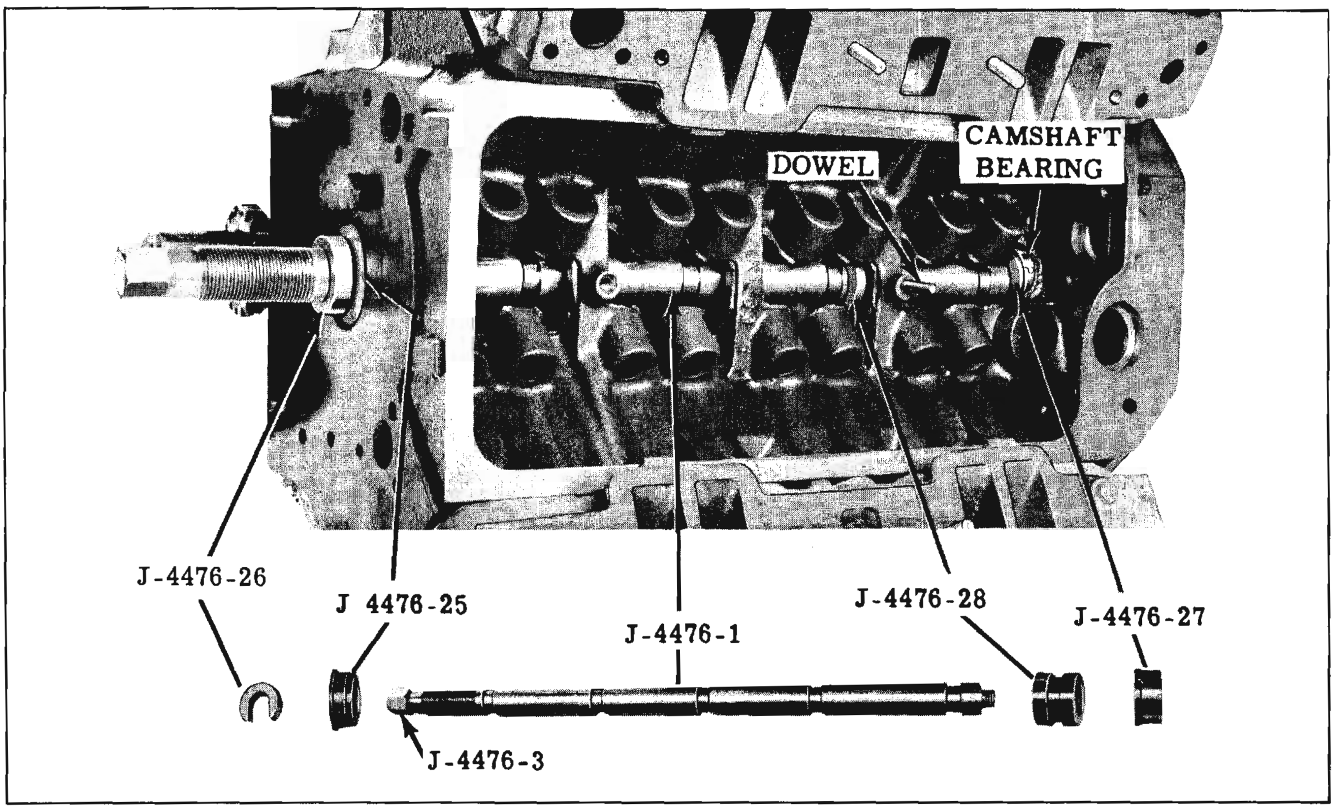


Fig. 8-42 Installing No. 5 Camshaft Bearing

tightening the set screw.

CAUTION: Use care to prevent dislodging the plug in the rear of the block.

c. Turn handle J-4476-20 clockwise until No. 5 bearing is removed.

d. Remove bearing from Remover J-4476-9 and remove Tool set-up from engine.

Install

Camshaft bearings must be installed with the outside chamfer toward the rear of the engine. Position bearing with parting line at top center to insure alignment of the bearing oil holes with the oil passages in the block.

CAUTION: Be sure the camshaft bearings are installed exactly as outlined in the installation procedure, as the bearings must be positioned in proper relationship to the camshaft bearing surfaces. If a bearing is installed too far forward or rearward in the web of the block, it is possible for the camshaft to wear a groove into the bearing and restrict the oil passage through the cam bearings.

After a bearing is installed, check alignment of the oil hole in the bearing and the oil hole in the block with a 1/8" rod.

1. To install No. 5 camshaft bearing proceed as follows:

   a. Assemble tools as shown in Fig. 8-42 and insert into engine block so that Installer J-4476-27 is past the No. 4 bearing opening.

   b. Position a new bearing on Installer J-4476-27, and insert tool and bearing in No. 5 bearing opening.

   c. Drive bearing into the bearing opening until Horseshoe Spacer J-4476-26 contacts Tool J-4476-25. This will correctly position the No. 5 bearing laterally.

   CAUTION: Be sure spacer J-4476-26 remains in place during bearing installation. If spacer should become mispositioned, it is possible to drive out the plug in the rear of the cylinder block. If the plug is loosened, the flywheel must be removed in order to install a new plug.

   d. Remove Installer from No. 5 bearing and check oil hole alignment.

2. After the No. 5 bearing is in place, install the No. 4 bearing as follows:

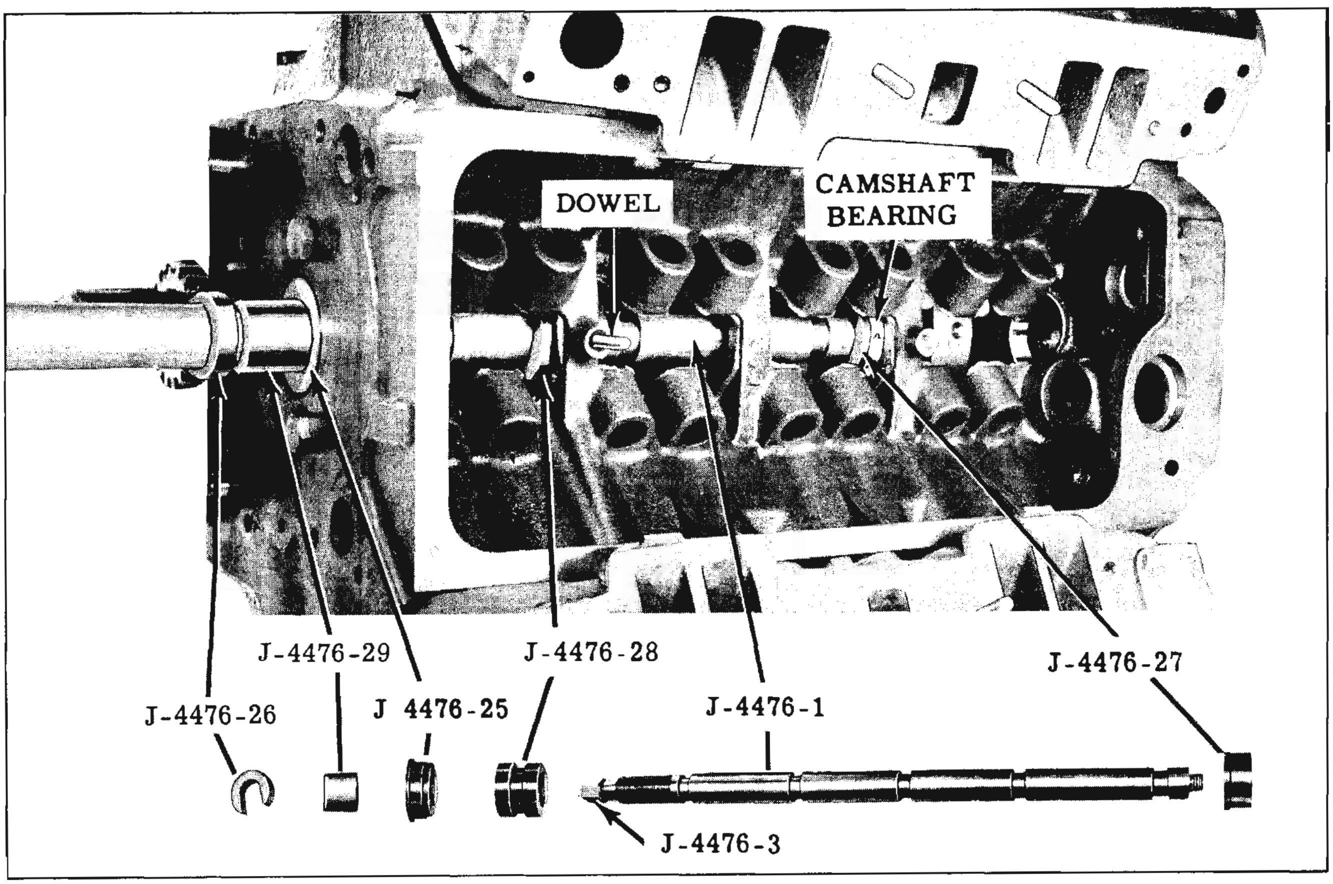


Fig. 8-43 Installing No. 4 Camshaft Bearing (Typical of 3 and 2)

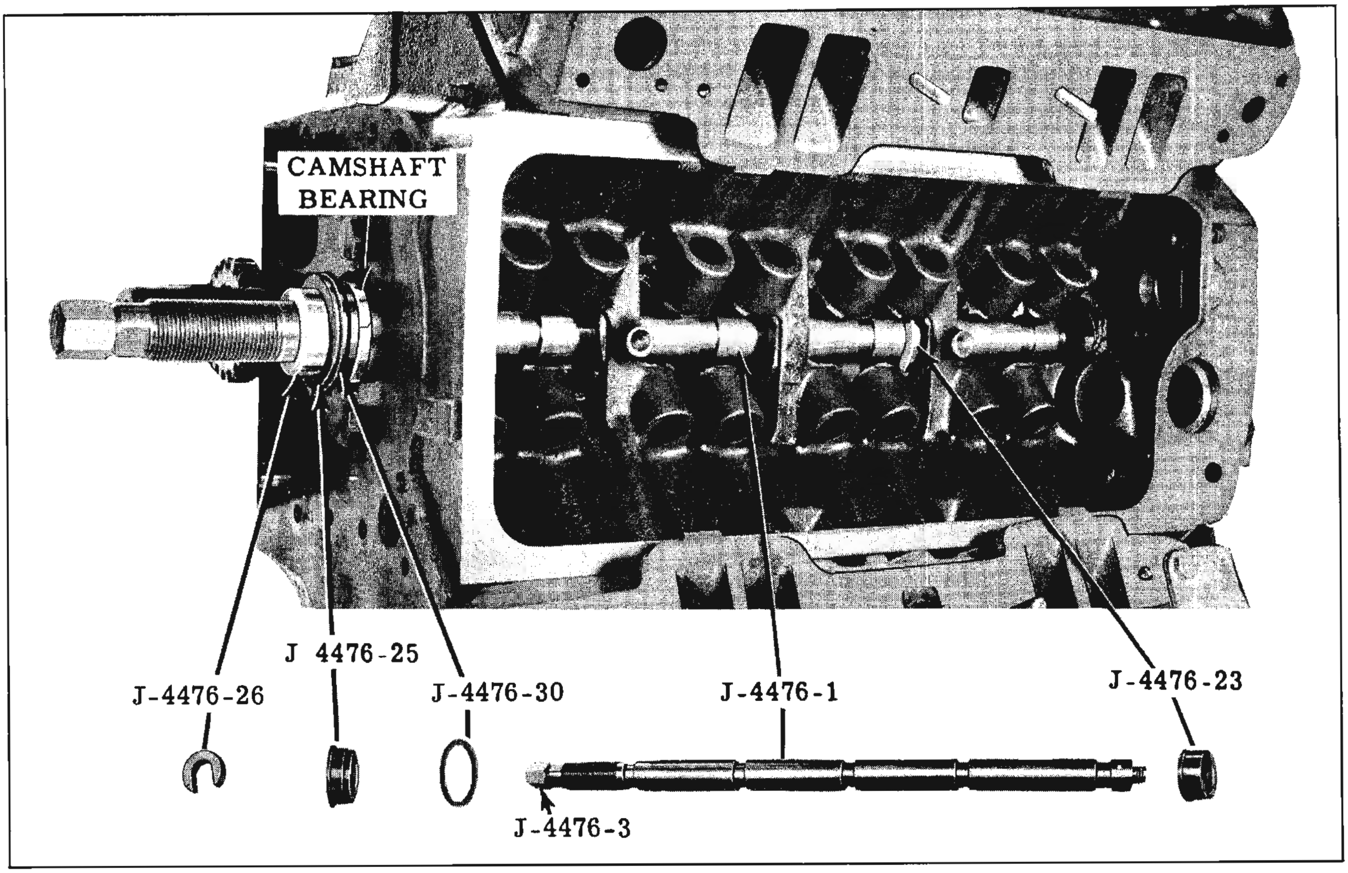


Fig. 8-44 Installing No. 1 Camshaft Bearing

a. Assemble tools as shown in Fig. 8-43.

b. Position a new bearing on Installer J-4476-27 and drive bearing until Tools J-4476-29 and J-4476-26 are driven tight against J-4476-25. This will correctly position the bearing laterally.

c. Remove Installer from bearing and check upper and lower oil hole alignment.

d. Repeat Steps b. and c. on No. 3, then No. 2 bearing.

NOTE: When installing No. 2 bearing, Pilot J-4476-28 is not used. After bearing is installed, check upper and lower oil hole alignment.

3. To install No. 1 bearing, proceed as follows:

a. Assemble tools as shown in Fig. 8-44.

b. Install Pilot J-4476-23 in No. 4 camshaft bearing.

c. Install a new bearing on Installer J-4476-25 and drive bearing until tool J-4476-30 and J-4476-26 are driven tight against Tool J-4476-25. This will correctly position No. 1 bearing laterally. Check oil hole alignment.

LOWER FLYWHEEL HOUSING ALIGNMENT

(CLUTCH HOUSING REMOVED)

Lower flywheel housing alignment is rarely required; however, if a new lower housing is used, alignment should be checked.

Misalignment is evident as a "step" between the engine block and the lower housing resulting from the location of the housing too far forward or rearward on the block. (Fig. 8-45) This condition can be corrected by elongating the dowel holes

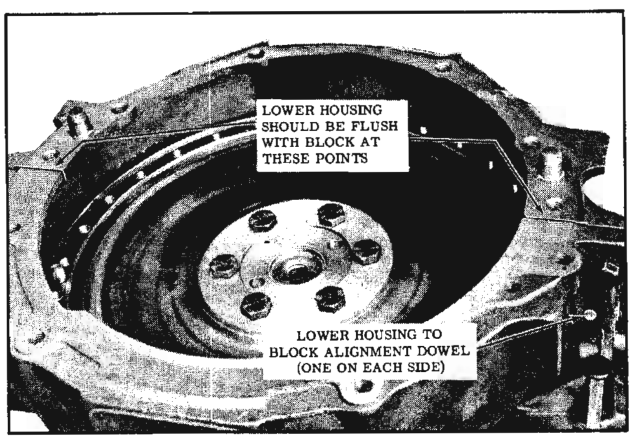


Fig. 8-45 Checking Lower Housing Alignment

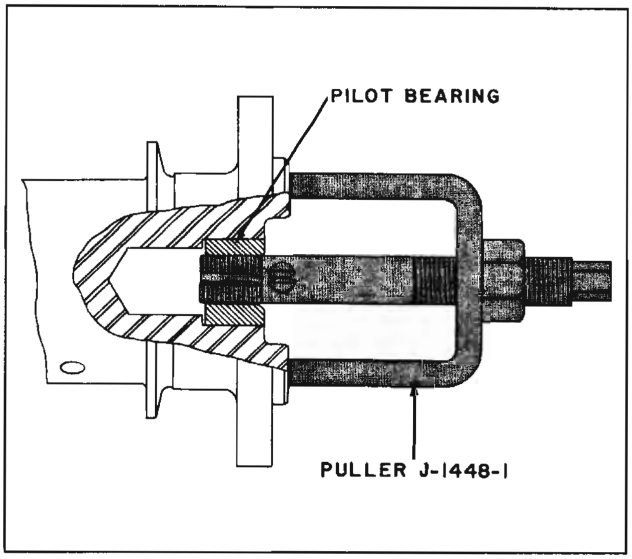


Fig. 8-46 Pilot Bearing Removal

so as to allow the lower housing to move to the rear or to the front as required.

NOTE: Do not remove dowel pins or enlarge dowel pin holes with an oversize drill, as correct sidewise location of lower housing must be maintained for proper engagement of starter pinion and ring gear.

CRANKSHAFT PILOT BEARING SYNCHROMESH

On Synchromesh transmission equipped cars, a pilot bearing is located in a bore in the rear end of the crankshaft and is held in place by a sheet metal retainer pressed in the crankshaft.

When removing the pilot bearing, pry out the bearing retainer with a screwdriver; then remove the bearing with Pilot Bearing Puller J-1448-1. (Fig. 8-46) All old lubricant in the reservoir behind the bearing should be removed.

Install the new bearing using Tool J-4530-1

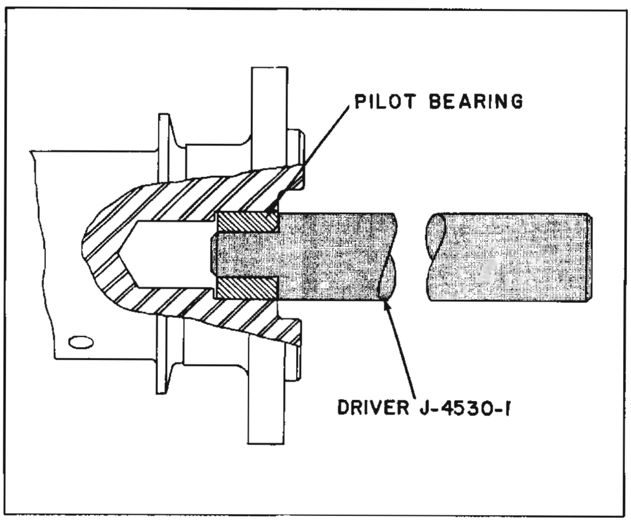


Fig. 8-47 Pilot Bearing Installation

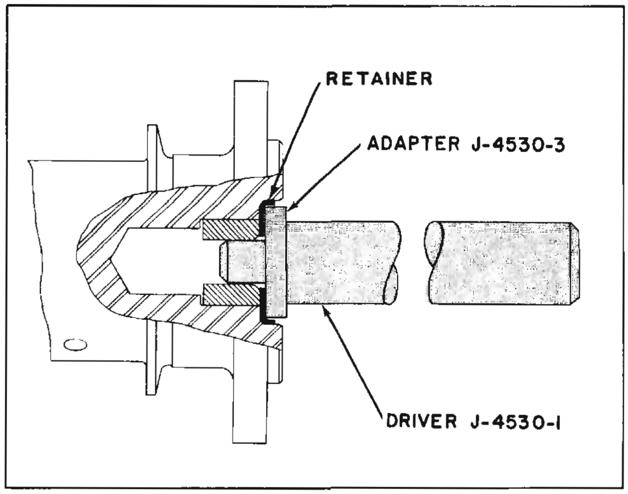


Fig. 8-48 Pilot Bearing Retainer Installation

(Fig. 8-47) Apply a light coat of sealer, Part No. 557622 to rim of retainer then install retainer as shown in Fig. 8-48. Add 1/4 ounce (level tablespoonful) of wheel bearing grease to the reservoir.

DAMPER PLATE

Remove and Install

1. Remove Hydra-Matic transmission.

2. Remove the six damper plate to flywheel attaching cap screws and remove damper. (Fig. 8-49)

To install, position damper with hub of damper toward the crankshaft and reverse the removal procedure. Torque the damper to crankshaft attaching cap screws 17 to 22 ft. lbs.

FLYWHEEL

Remove

1. Remove transmission, starting motor and

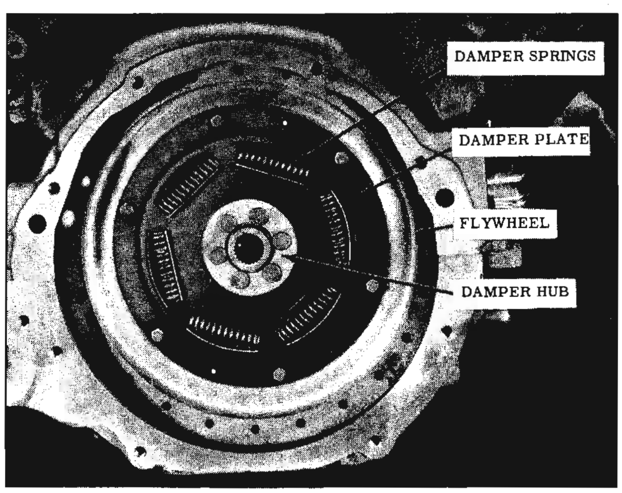


Fig. 8-49 Damper Assembly

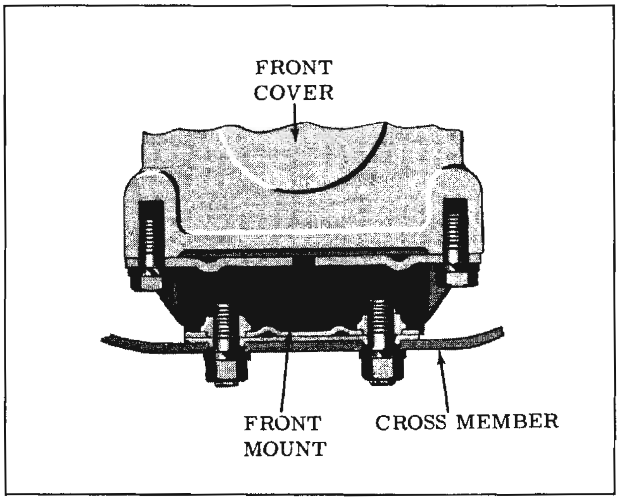


Fig. 8-50 Front Engine Mount

lower flywheel housing.

2. On Synchromesh transmission equipped cars, remove the clutch assembly.

3. On Hydra-Matic equipped cars, remove the damper plate assembly.

4. Remove the six flywheel to crankshaft attaching cap screws and remove the flywheel.

Balancing

All flywheels, original and service replacement, are balanced individually. This is accomplished by inserting and staking a balancing pin or pins, if necessary, into the holes provided along the outer circumference of the flywheel. THESE STAKED BALANCE PINS ARE NOT TO BE REMOVED. After the flywheel is attached to the crankshaft, the engine and flywheel are again balanced as an assembly and, if necessary, additional balancing pins are installed in the flywheel. These pins are not staked.

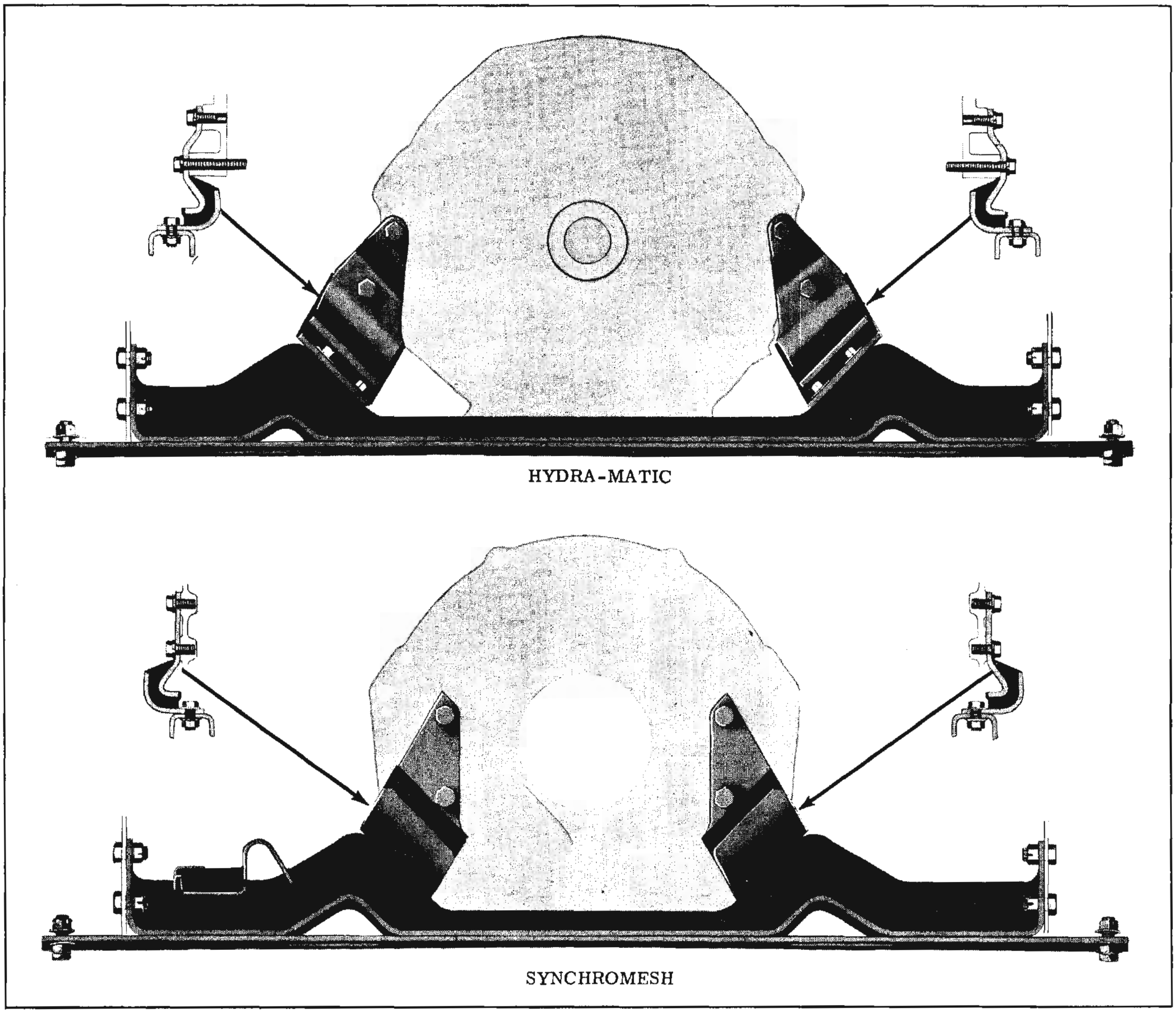


Fig. 8-51 Rear Engine Mounts

When installing a service replacement flywheel, it is essential that the flywheel be balanced with the engine. If there are no unstaked balance pins in the original flywheel, the new flywheel may be installed on the crankshaft as is. If UNSTAKED balance pins are found on the original flywheel, proceed as follows:

1. Position the original flywheel over the new flywheel and align the flywheel to crankshaft attaching bolt holes.
2. Mark the position of the unstaked balancing pins on new flywheel.
3. Transfer the balancing pins from the original flywheel to the new flywheel in the holes marked in Step 2.

   NOTE: If an unstaked pin cannot be installed in the exact position as the original due to the presence of a staked pin, insert the pin into an adjacent hole on either side of the staked pin.

Install

To install the flywheel, position the flywheel onto the crankshaft. Align the attaching bolt holes of the flywheel and crankshaft and install the attaching bolts. Torque the bolts 85 to 95 ft. lbs.

ENGINE MOUNTS

FRONT (Fig. 8-50)

To remove the front engine mount, proceed as follows:

1. Raise front of engine. (Refer to RAISING FRONT OF ENGINE.)
2. Loosen the mount to front cover bolts and remove mount.
3. To install engine front mount, reverse removal procedure.

   NOTE: The front mount must be properly positioned and tightened; otherwise, the mounting will bind and the engine will feel rough, particularly at idle. Tighten mount nuts 35 to 50 ft. lbs.

REAR (Fig. 8-51)

Remove

To remove a rear mount, proceed as follows:

1. Position the Engine Support BT-30-16 as shown in Fig. 8-52.
2. Remove the rear mount to cross member attaching bolts.

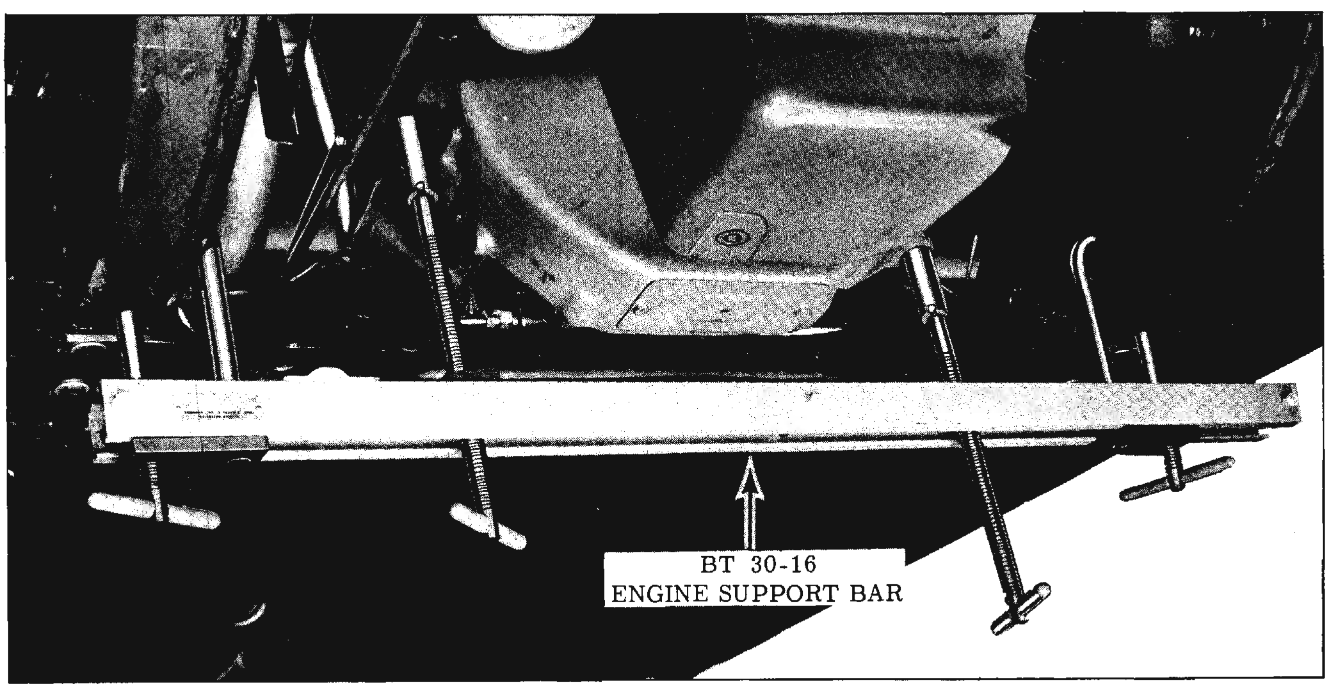


Fig. 8-52 Engine Support Bar

3. Raise engine slightly, until mount can be removed.

4. Remove the mount to flywheel housing attaching bolts and remove mount.

Install

1. Position the mount on the flywheel housing and install the attaching bolts. Torque mount to flywheel housing attaching bolts 50 to 60 ft. lbs.

2. Lower engine until full weight of engine is on the mounts and install the mount to cross member attaching bolts. Torque bolts 40 to 56 ft. lbs. Remove Tool BT-30-16.

COOLING SYSTEM (Fig. 8-53)

GENERAL DESCRIPTION

The engine cooling system is of the pressure type employing a 15 lb. pressure radiator cap. The water pump is a centrifugal type, and circulation is controlled by a thermostat located under the water outlet in the intake manifold. Full length water jackets allow the engine coolant to completely surround all cylinders.

OPERATION

The water pump discharges coolant through the front engine cover into both banks of the block. The water then flows through the full length water jackets in the block, up into the two cylinder heads, through the heads and then flows from the front of each cylinder head through the intake manifold water passage to the water outlet and finally to the radiator.

When the thermostat is closed, all the coolant flows through the two internal by-passes to the inlet side of the water pump and back to the engine block.

The 15 pound pressure radiator cap raises the boiling point of the coolant to approximately 247°F.

CAUTION: When removing the radiator cap, turn the cap counterclockwise to the point where pressure is released. After all the pressure has been released, the cap can then be SAFELY removed.

DRAIN AND REFILL

Before draining the cooling system, inspect the system and perform any necessary service to insure that it is clean, leak-tight and in proper working order.

1. Completely drain the system by opening drain valves at radiator lower tank and on each side of engine block.

   NOTE: If coolant drains out rusty, or if rust deposits are seen in the radiator, the cooling system should be flushed.

2. Determine the amount of anti-freeze to be used and mix with approximately 2 gallons of water.

3. Start engine and immediately pour the mixture of anti-freeze and water into the radiator with the engine idling and finish filling with water until level covers radiator core.

4. Run the engine until it reaches driving temperature, covering the radiator if necessary in order to open the thermostat and establish complete circulation through the system before driving the car or exposing it to freezing temperature. Finish filling with water to 1/4" below top of radiator filler neck after the engine has reached operating temperature.

FAN CLUTCH

A torque limited thermostatically controlled fan assembly is used on all air-conditioned cars. Through pulley ratio changes, the fan rotates faster than a conventional fan at low engine speeds. This improves low-speed cooling at idle.

The fan clutch engages when the radiator discharge air reaches 160°F. Engagement of the clutch allows the fan to rotate up to a maximum of 2000 R.P.M. When the radiator discharge air drops to 135°F. or below, the clutch disengages, which allows the fan to run a maximum of approximately 1500 R.P.M.

The thermostatically controlled fan clutch is serviced only as an assembly.

Remove and Install

1. Remove the four fan and clutch to pulley attaching bolts. (Fig. 8-54)

2. Remove fan and clutch assembly from car.

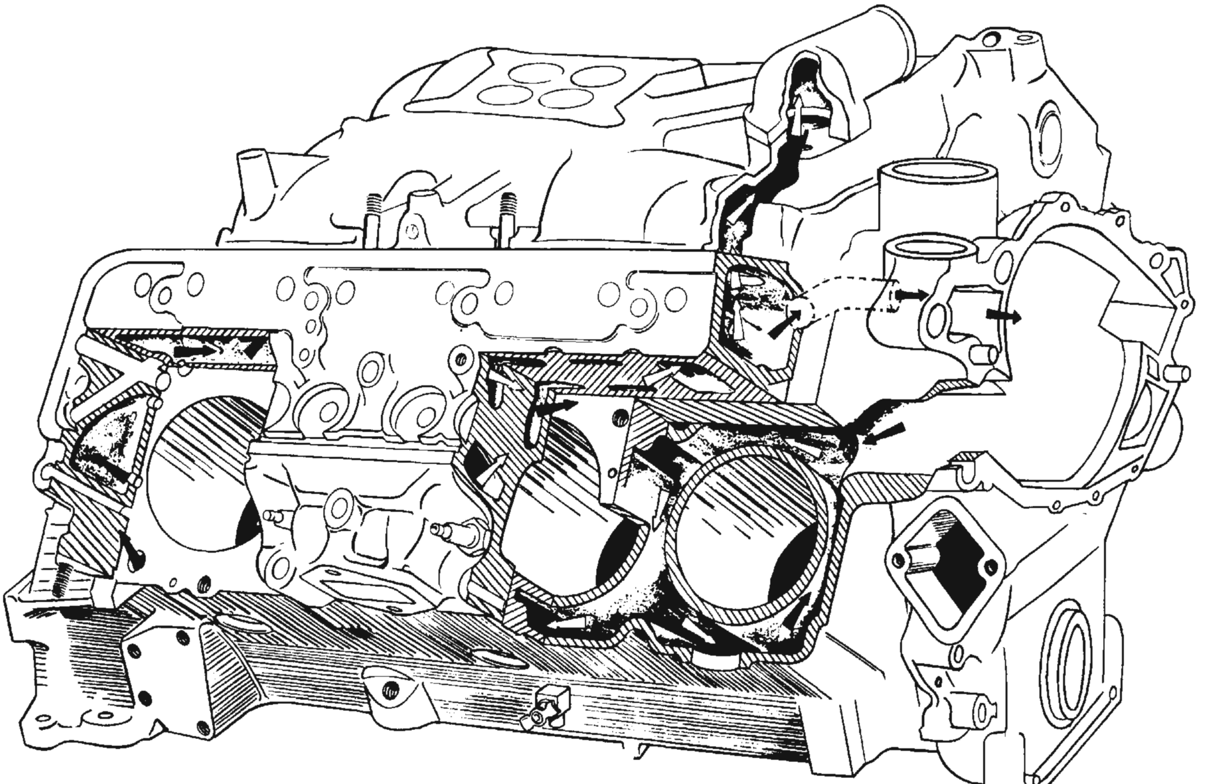
3. Remove the four fan to clutch attaching nuts, then separate fan and clutch.

4. To install, reverse the removal procedure. Torque attaching bolts and nuts 10 to 15 ft. lbs.

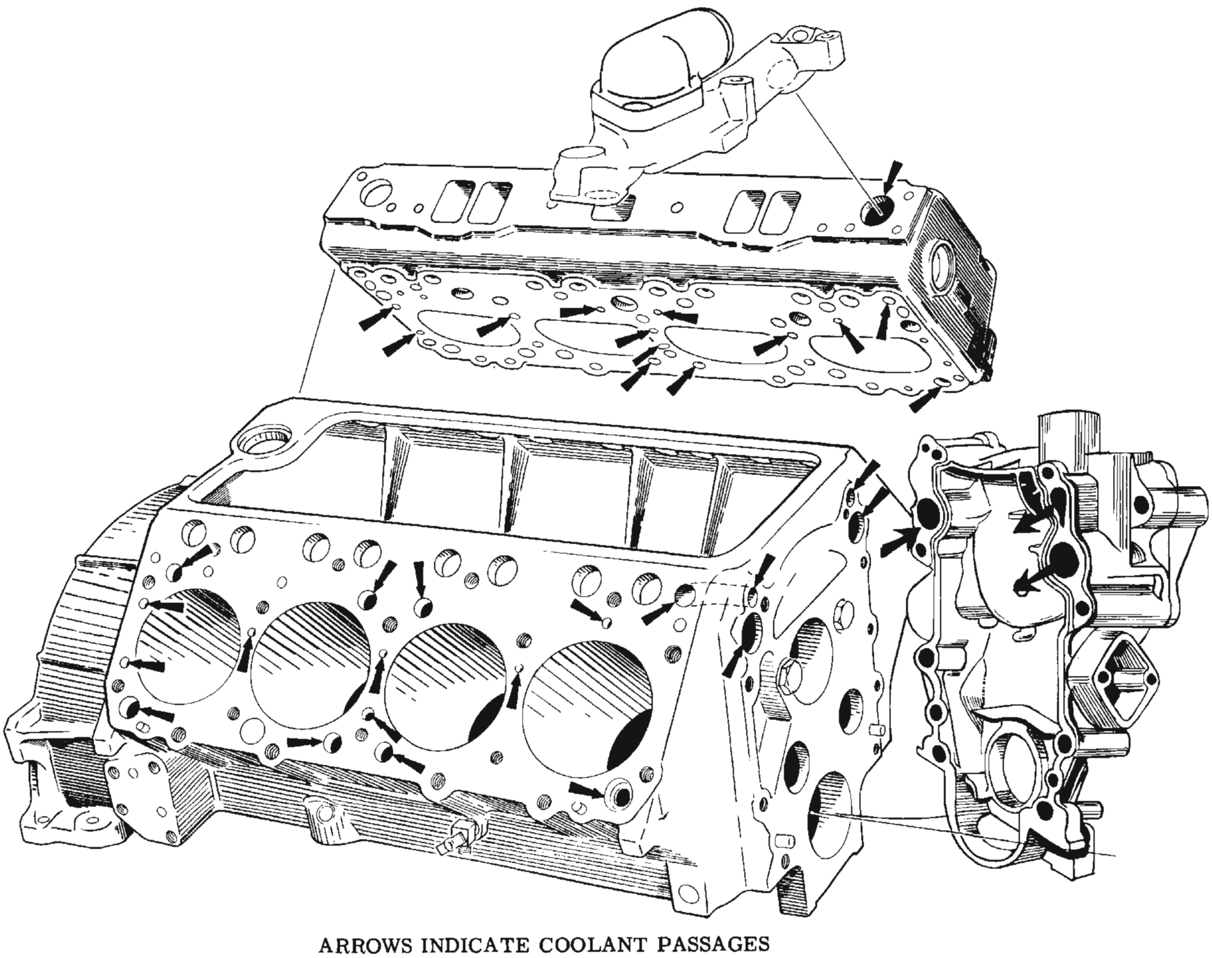
FAN AND PULLEY— REMOVE AND INSTALL

The fan blades and pulley can be removed without disturbing the water pump or radiator.

NOTE: If belt tension on pulley is not released, the fan can be removed without disturbing the



ARROWS INDICATE DIRECTION OF COOLANT FLOW



ARROWS INDICATE COOLANT PASSAGES

Fig. 8-53 Engine Cooling Flow and Passages

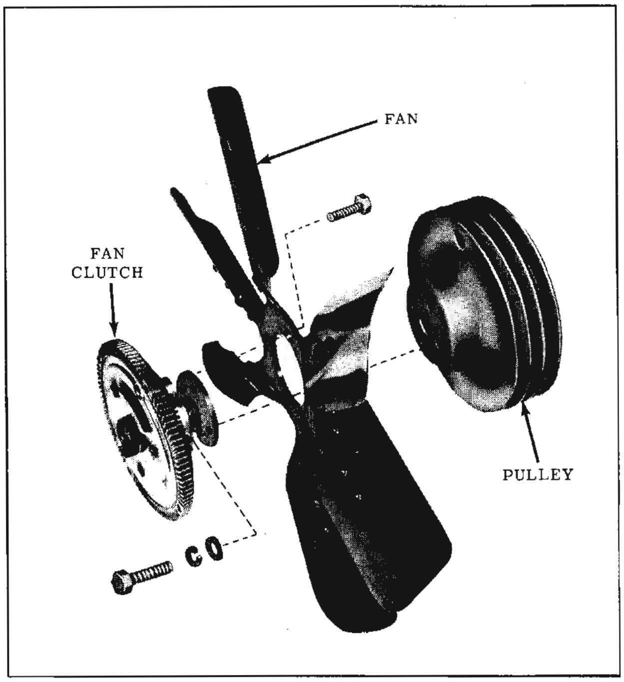


Fig. 8-54 Fan and Clutch Assembly

pulley by removing four attaching bolts. When the first two bolts are removed, replace with aligning studs. The tension of the belt will keep the pulley in position.

To remove the fan and pulley as an assembly, proceed as follows:

1. Loosen Delcotron and link adjusting bolt.
2. Remove four fan and pulley attaching bolts.
3. Remove fan and pulley.

Reverse the removal procedure for installing fan and pulley and adjust belt(s) to proper tension with BT 33-70.

RADIATOR—REMOVE AND INSTALL (Fig. 8-55)

1. Drain complete cooling system.
2. Disconnect radiator upper and lower hoses.

   NOTE: If car is equipped with Hydra-Matic transmission, disconnect and cap oil cooler lines.

3. Remove the radiator upper support.
4. Position fan blades to clear radiator lower outlet and remove radiator.

To install radiator, reverse sequence of operations and refill to 1/4" below top of radiator filler neck (At normal operating temperature). Check Hydra-Matic fluid level.

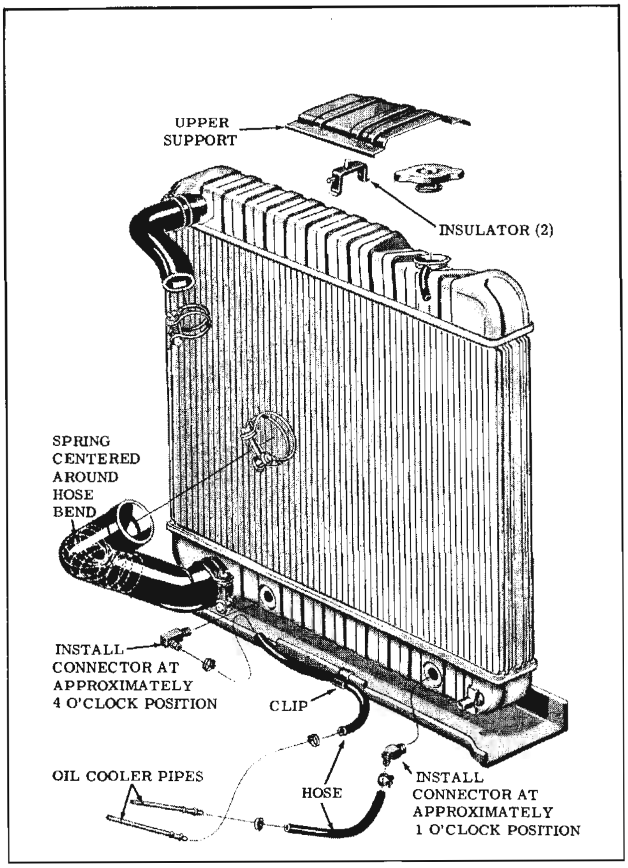


Fig. 8-55 Radiator and Attaching Parts

WATER PUMP (Fig. 8-56)

Remove

1. Drain cooling system below water pump level.
2. Loosen pulley belts, then remove fan, spacer and pulley from pump hub.

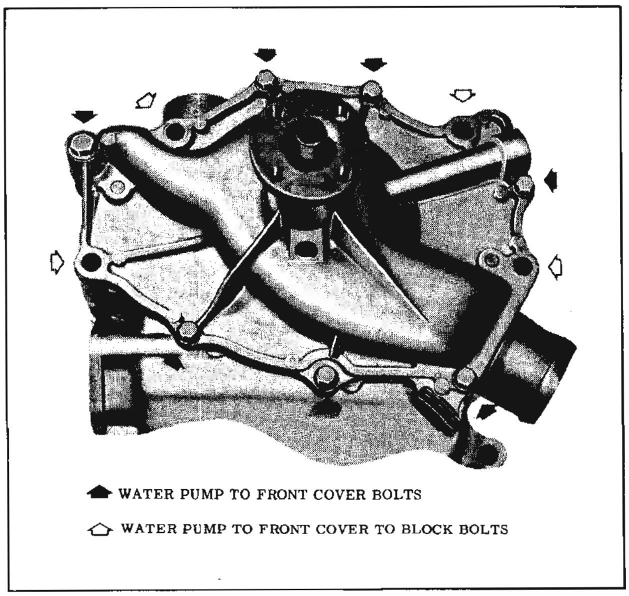


Fig. 8-56 Water Pump Attachment

3. Remove the water pump attaching bolts (seven pump housing to front engine cover attaching bolts and four pump housing to block attaching bolts).

   NOTE: To remove the water pump lower center attaching bolt, rotate the crankshaft pulley until one of the notches machined in the pulley weight is aligned with the lower center bolt.

4. Remove water pump.

Install

1. Position a new water pump gasket on the engine front cover.

2. Install the water pump assembly on the front cover. Dip the 1/4" bolts in lubricant, Part No. 980131 before installing in front cover.

   Torque the 1/4" bolts 5 to 8 ft. lbs. and the 3/8" bolts 25 to 35 ft. lbs. The 3/8" cover to block bolts (4 long ones) require sealer.

3. Install fan pulley, spacer and fan. Torque fan to hub bolts 10 to 15 ft. lbs.

4. Install pulley belt(s) and adjust belt tension with Tool 33-70.

5. Fill cooling system until coolant covers radiator core. After engine reaches operating temperature, fill radiator to 1/4" below filler neck.

FUEL SYSTEM

GAS TANK AND GAUGE (Fig. 8-57)

The gas tank has a capacity of 21 gallons. The gas tank filler is located in the left rear quarter panel. Venting of the fuel tank is provided for at the top of the tank and in the filler tube cap.

The tank gauge unit has a Saran fuel filter on the end of the suction pipe which prevents entry of dirt or water into the fuel line. The filter is a push fit on the end of the pipe and should be pressed on approximately 1-11/16" so that the pipe bottoms on the shoulder inside the filter. For repair and diagnosis of fuel gauge, refer to ELECTRICAL SECTION.

DRAINING GAS TANK

1. With the car on a hoist, gas tank cap removed, disconnect the neoprene hose from the fuel line at the frame side rail. This connection is located just ahead of the right rear torque box.

2. Insert approximately a three foot piece of tubing into the neoprene hose. Insert open end of tubing into a container.

3. The tank can now be drained through gravity flow.

Remove and Install

1. Drain tank.

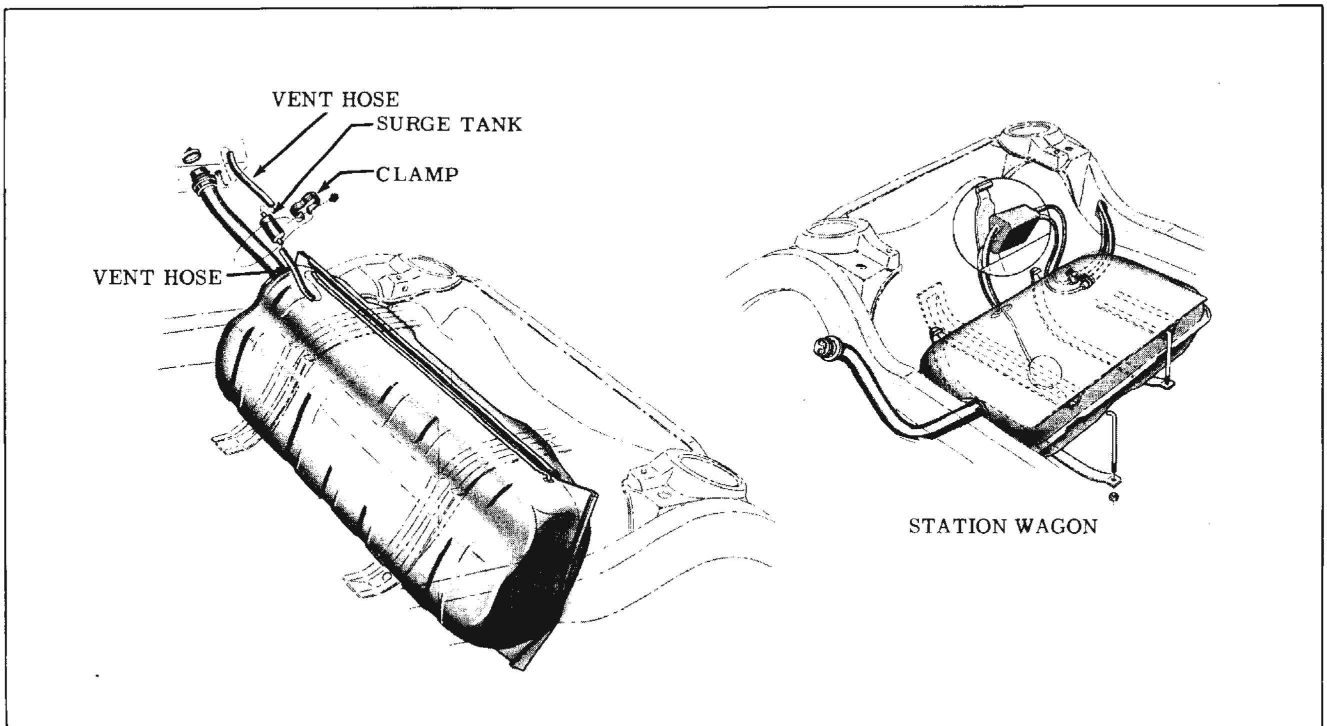


Fig. 8-57 Fuel Tank Installation

2. Disconnect gas hose from fuel line at right side of tank. On cars equipped with a fuel return line, remove the fuel return hose from return line at right side of gas tank.

3. Disconnect the fuel gauge wire. Remove the two tank strap attaching bolts and lower tank.

   To install, reverse the removal procedure. Torque the strap attaching nuts 10 ft. lbs. maximum.

   NOTE: A fuel return from the fuel filter to the gas tank is incorporated on air conditioned and two barrel carubretor equipped cars to prevent excessive fuel pressure build-up in the line between the fuel pump and the carburetor.

   CAUTION: If a car is to be stored for any appreciable length of time, the gasoline should be drained from the complete fuel system - including carburetor, fuel pump, all fuel lines and fuel tank, in order to prevent gum formations and resultant improper engine performance.

FUEL FILTER

No attempt should be made to clean a dirty filter element. Whenever a dirty filter is encountered, the element should be replaced.

FUEL PUMP

GENERAL DESCRIPTION

Cars equipped with a two barrel carburetor or cars equipped with air conditioning use a fuel pump with integral fuel filter which incorporates a fuel return line. The fuel return line, from the filter to the gas tank, aids in maintaining a constant fuel pressure at the carburetor under varying conditions.

OPERATION

The fuel pump draws gasoline from the tank and supplies it to the carburetor in sufficient quantity to meet engine requirements at any speed or load.

The fuel pump rocker arm is held in constant engagement with the eccentric on the camshaft by the rocker arm spring. As the outer end of the rocker arm moves up, the fuel link pulls the fuel diaphragm down. The enlargement of the fuel chamber draws fuel from the tank through the inlet valve and into the fuel chamber.

The pump delivers fuel to the carburetor only when the pressure in the outlet line is less than the pressure maintained by the diaphragm spring. When the carburetor float needle valve opens, the spring expands and moves the diaphragm up to force fuel past the outlet valve to the carburetor. When the carburetor float needle valve closes (on cars without a fuel return line), the pump builds up pressure in the fuel chamber until the diaphragm spring is again compressed. The diaphragm then remains stationary until more fuel is required by the carburetor.

A pulsator is used to insure a solid charge of fuel to the carburetor.

FUEL PUMP INSPECTION AND TEST (ON CAR)

Before testing the fuel pump for volume flow, a new fuel filter should be installed.

As filtered foreign material builds up within the filter, fuel flow restriction increases, resulting in a decrease of volume flow at the filter outlet. When the restriction becomes excessively high, volume flow to the carburetor can drop below engine requirements although the fuel pump is still capable of meeting volume specifications.

1. Be sure there is gasoline in the tank.

2. Check for loose line connections. A leak at the pressure side of the system (line from pump to carburetor) will be indicated by dripping fuel. A leak in the suction side of the system (line from gas tank to pump) will not be apparent except in its effect of reducing volume of fuel on the pressure side of the system. Tighten loose line connections. Tighten fuel pump diaphragm flange screws.

3. Look for bends or kinks in lines which will reduce fuel flow.

4. Test fuel flow as follows:

   a. Disconnect fuel line at the carburetor.

   b. Ground primary terminal of distributor with jumper lead so that engine can be cranked without firing.

   c. Place suitable container at end of fuel line and crank engine a few revolutions.

      NOTE: If little or no gasoline flows from open end of line, then the fuel line or tank filter is clogged or the pump is inoperative. Before removing pump, disconnect fuel lines at fuel pump and at gas tank and blow through them with an air hose to make sure they are clear. Reconnect fuel lines to pump and gas tank, then retest fuel flow while cranking engine.

5. Even if fuel flows in good volume from line at carburetor, it is advisable to make certain that pump is operating within limits.

a. Attach a low reading pressure gauge to upper end of pump to carburetor line.

b. Run engine at approximately 1800 R.P.M. (using gasoline in carburetor bowl) and note reading on pressure gauge.

c. If pump is operating properly, the pressure will be 5 to 6 pounds and will remain constant. If pressure is too low or too high or varies materially at different speeds, the pump should be removed for repair or replacement.

PUMP ASSEMBLY

Remove and Install

1. Install a jumper wire and crank engine until the distributor rotor points forward.

2. Disconnect fuel lines from pump.

3. Remove the pump to front engine cover attaching bolts and remove pump.

When installing pump, the pump arm operating pad should be coated with lubricant, Part No. 567196. The gasket should be cemented in place to aid installation. Torque pump to cover bolts 34 to 40 ft. lbs.

Disassembly (Fig. 8-58)

NOTE: Before proceeding with the following operation, clean the outside of the unit. DO NOT SUBMERGE PUMP IN COMMERCIAL TYPE DEGREASER OR USE STEAM.

1. Clamp pump body in vise.

2. Remove screws attaching pulsator cover and diaphragm to pump body, then remove pulsator cover and diaphragm.

3. Mark edges of fuel cover and pump body flange so the parts can be reassembled in the same relative position.

4. Remove fuel cover screws and lock washers. Tap cover lightly to separate it from body if cover sticks.

5. Remove pump from vise. Remove diaphragm and spring as shown in Fig. 8-59.

6. If valves are to be replaced, remove the staking then remove the inlet and outlet valves and gaskets from the fuel cover. (Fig. 8-60)

7. Remove pull rod seal as shown in Fig. 8-61.

NOTE: The pull rod seal should be replaced whenever the fuel pump is disassembled.

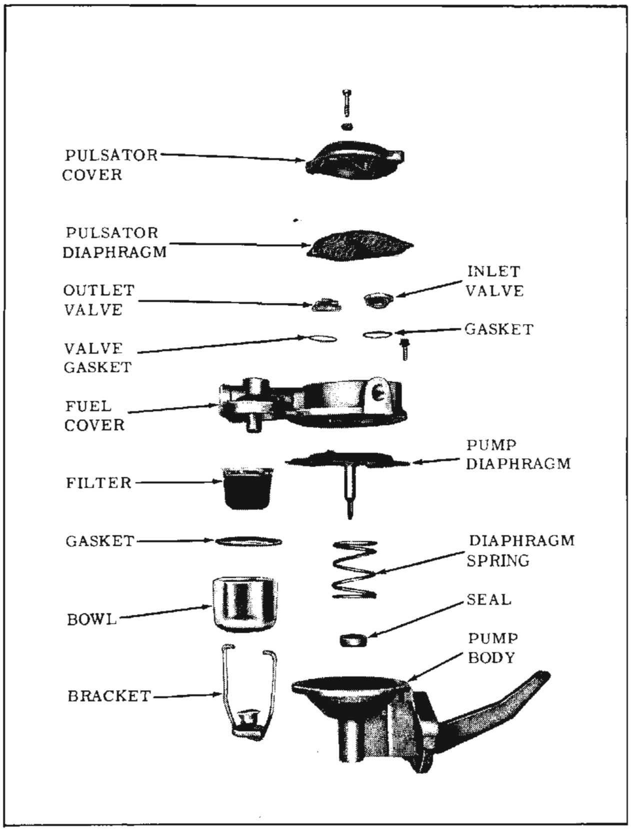


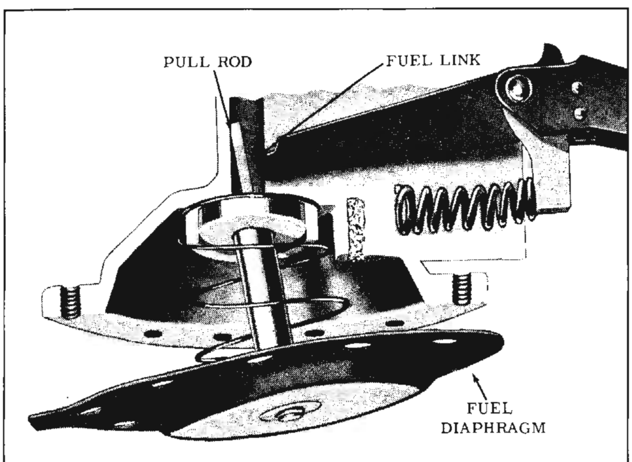
Fig. 8-58 Fuel Pump

Cleaning and Inspection

1. Clean and rinse all metal parts in solvent. Blow out all passages with air hose.

2. Inspect pump body and fuel cover for cracks, breakage, and distorted flanges. Examine all screw holes for stripped or crossed threads. Replacement of pump assembly is advisable if any of the following conditions are found:

a. Body or cover castings warped or damaged.



DEPRESS DIAPHRAGM. THEN TIP PULL ROD AWAY FROM FUEL LINK TO RELEASE AND TOWARD LINK TO ENGAGE

Fig. 8-59 Removing Fuel Diaphragm

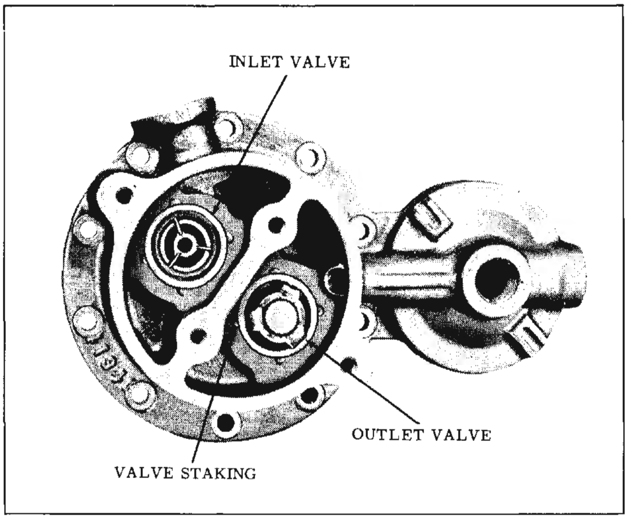


Fig. 8-60 Fuel Inlet and Outlet Valves

b. Rocker arm worn at cam pad.

c. Rocker arm bushing worn.

d. Link worn excessively.

NOTE: If flange facings are warped .010" or less, they can be trued up on a piece of plate glass with No. 400 grit sandpaper.

Assembly

1. Install a new pull rod seal and retainer using a tube or socket which rests on the outer shoulder of the retainer.

2. Position spring into the pump body, insert the diaphragm through the pull rod seal.

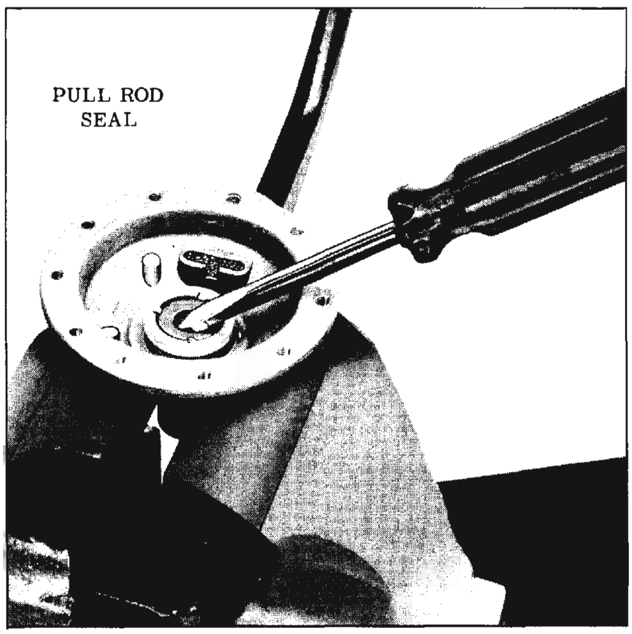


Fig. 8-61 Removing Fuel Pull Rod Seal

3. Install diaphragm as shown in Fig. 8-59.

4. Place valve gaskets in recesses provided in fuel cover. Install valves as shown in Fig. 8-60 and stake in place.

5. Lift rocker arm until the diaphragm is flat across the body flange and install fuel cover on body, making sure that alignment marks on cover and body are aligned. While holding diaphragm flat, install cover screws and lock washers loosely until screws just engage lock washers.

   NOTE: Diaphragm must be flexed by several full strokes of rocker arm before tightening cover screws, or pump pressure will be incorrect and diaphragm may be damaged.

6. Tighten the cover screws alternately and securely.

7. Position pulsator diaphragm on fuel cover, then install pulsator cover and secure with attaching screws.

EXHAUST SYSTEM

The single exhaust system consists of a cross-over pipe, exhaust pipes, muffler and resonator.

The dual exhaust system standard on Starfire Series and optional on all other Hydra-Matic equipped cars, (except station wagons) consists of exhaust pipes, resonators and mufflers. (Fig. 8-62)

MUFFLER AND RESONATOR

The muffler is a reverse flow type having an asbestos and steel outer shell.

Resonators are used to aid the mufflers in silencing exhaust pulsations.

Mufflers and resonators have drain holes to expel condensation. These drain holes should be periodically checked and opened if necessary.

When installing components of the exhaust system, observe the following:

1. To insure gas tight connections:

   a. Always use new gaskets.

   b. Apply Vibradamp No. 253 or equivalent to the outside diameter of the pipes where they join the muffler or resonator, and at exhaust pipe joints.

   c. When tightening exhaust pipe flange, tap the flanges with a hammer to insure the proper seating of the flanges and gaskets.

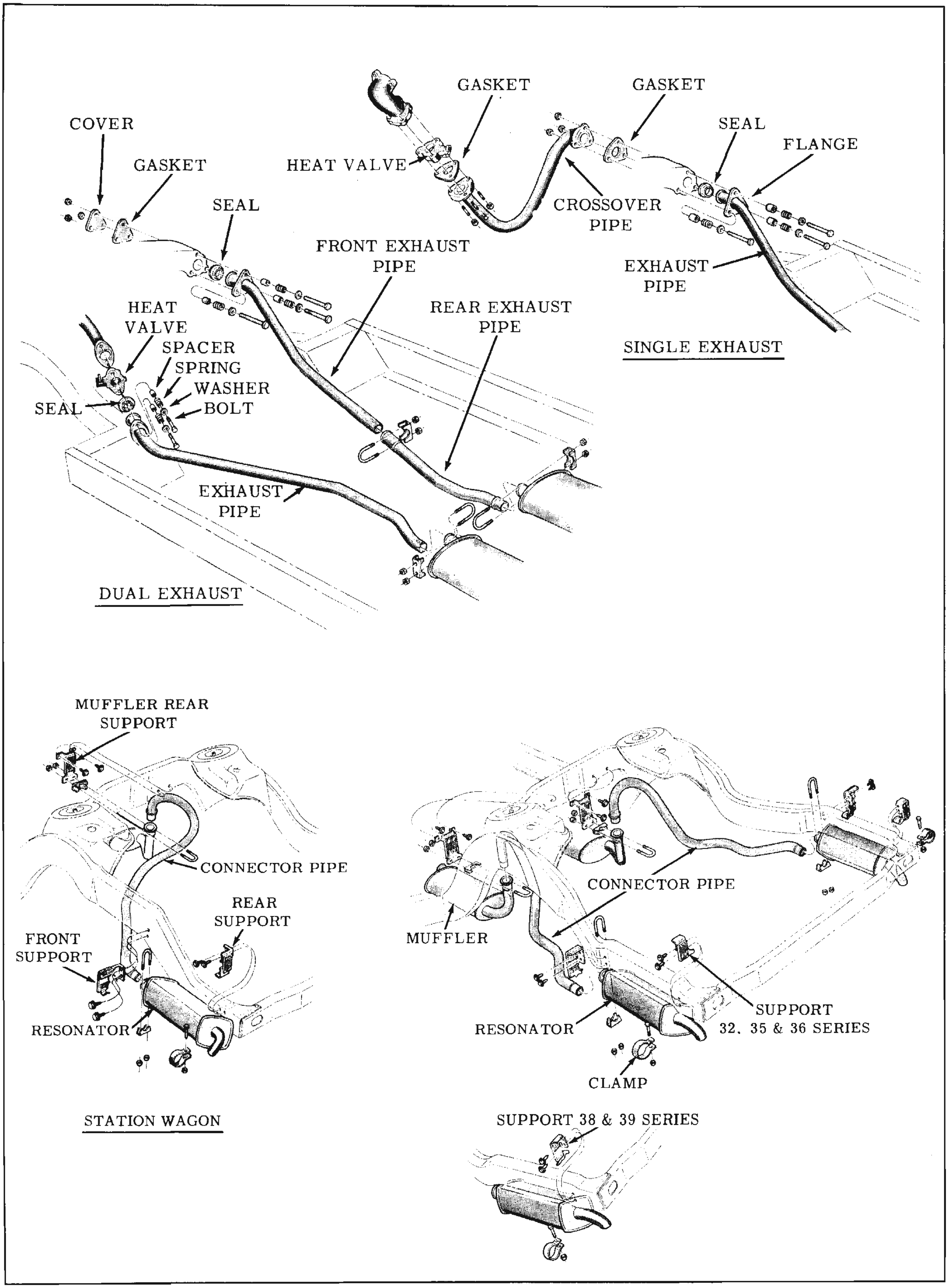
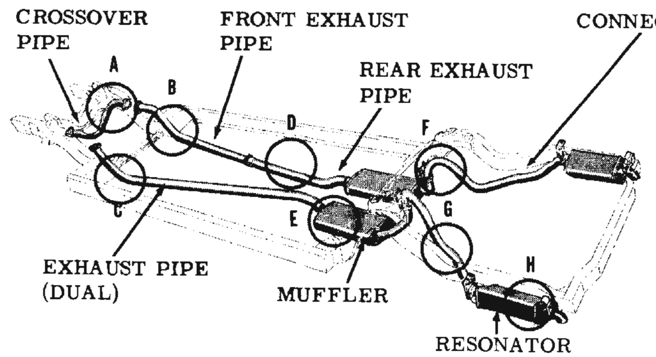
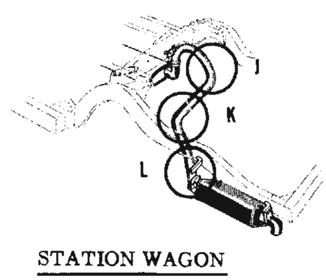


Fig. 8-62 Exhaust Systems





LOCATION	MINIMUM CLEARANCE
A. CROSSOVER PIPE TO FRAME	7/8"
B. FRONT EXHAUST PIPE TO FRAME	1"
C. EXHAUST PIPE TO FRAME	1"
D. REAR EXHAUST PIPE TO UNDERBODY	13/16"
E. MUFFLER TO UNDERBODY	1-3/8"
F. CONNECTOR PIPE TO UNDERBODY	13/16" Ex. S.W. - 1" S.W.
G. CONNECTOR PIPE TO SHOCK	2-1/4"
G. CONNECTOR PIPE TO GAS TANK	1-1/16"
H. RESONATOR TO FRAME	1"
H. RESONATOR TO UNDERBODY	15/16"
J. CONNECTOR PIPE TO UNDERBODY	1-1/2"
K. CONNECTOR PIPE TO GAS TANK	1-13/16"
L. CONNECTOR PIPE TO SHOCK	1-5/8"

Fig. 8-63 Clearance Specifications for Exhaust System Parts

2. Before tightening any part of the exhaust system, align the exhaust system pipes to provide adequate clearance between the body and frame. (Fig. 8-63)

   NOTE: ALLOW ENGINE TO REACH OPERATING TEMPERATURE BEFORE TORQUING ATTACHING NUTS.

   Torque exhaust system flex-joint nuts 7 to 10 ft. lbs.

LOCATING ENGINE OIL LEAKS

In cases where the engine oil leaks cannot be located visually, the use of Oil Red or "Blacklight" should be used.

To use Oil Red, drain one quart (minimum) of oil from the engine, then mix 1 tablespoon of the Oil Red and the oil that was drained. Pour this mixture into the crankcase. Start engine and inspect for trace of colored oil. Oil Red is harmless to the engine.

Blacklight should be used when it cannot be determined whether the oil leak originated from the engine or the transmission. To use the Blacklight method, remove engine and transmission dipsticks to compare with a sample of oil from the location of the leak. By viewing the oil on the dipsticks with a sample under Blacklight, it can be determined which unit is leaking.

NOTE: When an oil leak is suspected in the immediate flywheel area, remove the lower flywheel housing and install starter bracket BT-6122

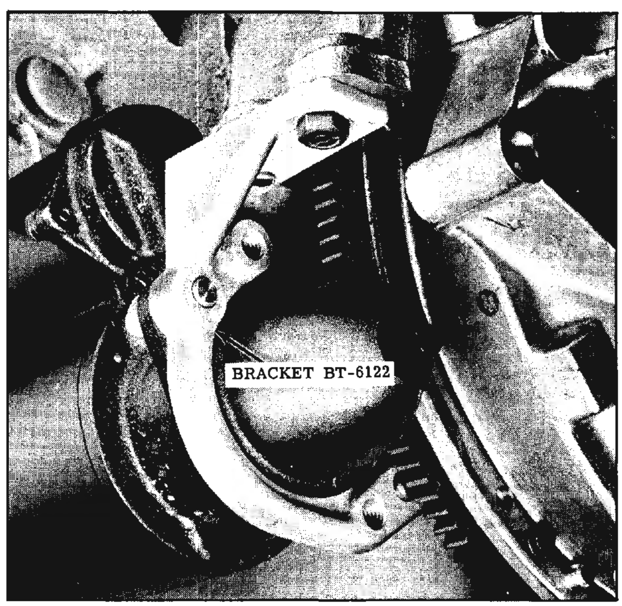


Fig. 8-64 Starter Bracket Installation

as shown in Fig. 8-64. This will allow the engine to be started with lower housing removed.

The Blacklight method can also be used to pin point leaks after the suspected area has been wiped clean of oil and the engine runs long enough to show up a leak. The oil will glow when viewed with Blacklight.

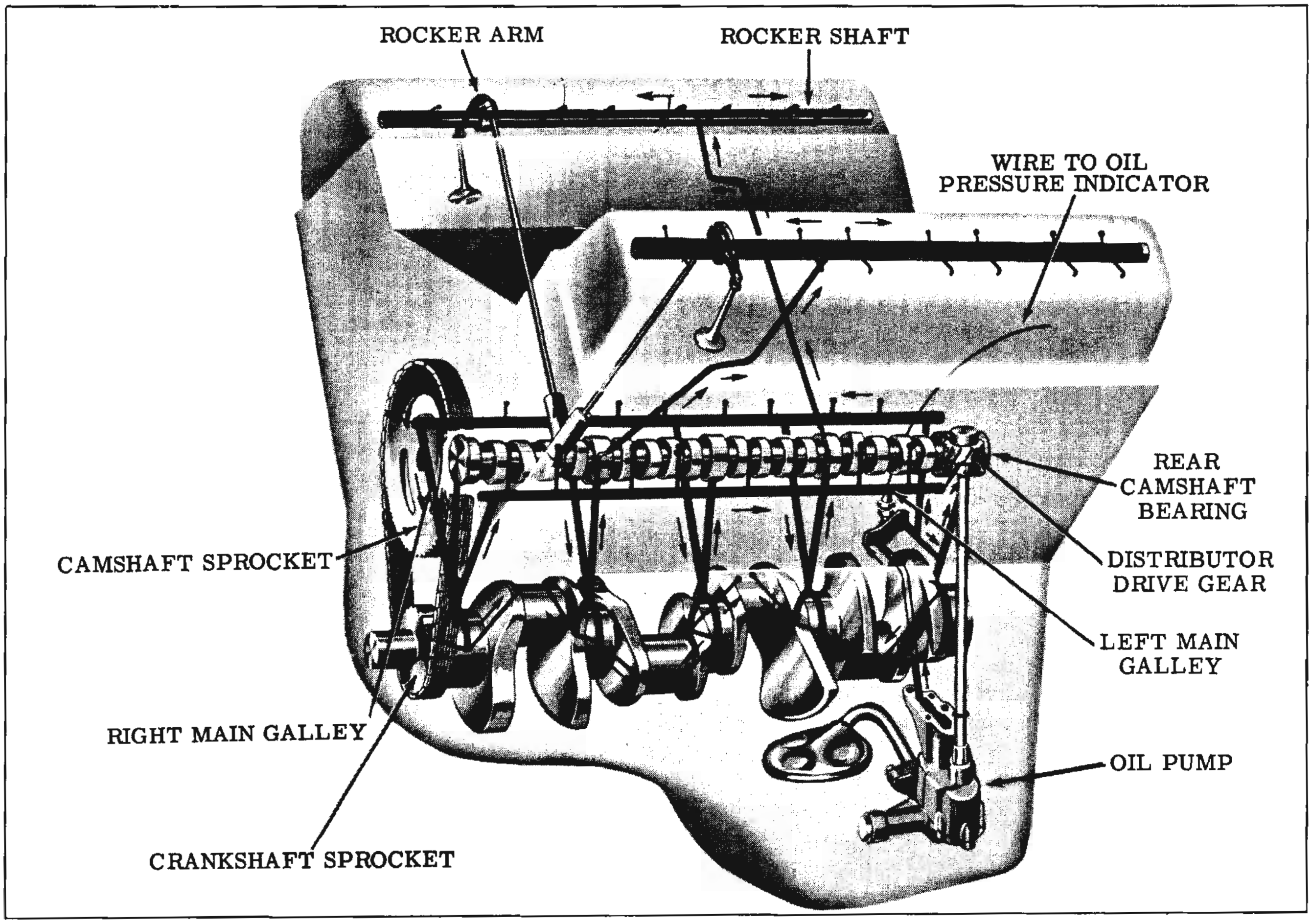


Fig. 8-65 Engine Lubrication Circuit

GENERAL SPECIFICATIONS

Subject and Remarks

1. CYLINDER BLOCK
   - a. Engine Type . . . . . 90^{o}V-Type
   - b. Number of Cylinders 8
   - c. Bore and Stroke . . . . . 4.125" x 3.6875"
   - d. Piston Displacement . . . . . 394.1 cu. in.
   - e. Compression Ratio
     - Regular Fuel 8.75:1
     - Premium Fuel 10.25:1
     - Premium Fuel, Starfire 10.50:1
   - f. Firing Order 1-8-7-3-6-5-4-2
   - g. Cylinder Identification
     - Left Bank (Front to Rear) 1-3-5-7
     - Right Bank (Front to Rear) 2-4-6-8

2. CRANKSHAFT
   - a. Diameter - Main Bearing Journal
     - All . . . . . 2.9990" to 3.000"
   - b. Width - Main Bearing Journal, Including Fillets
     - No. 1 . . . . . 1.090"
     - Nos. 2, 3 and 4 . . . . . 1.000"
     - No. 5 . . . . . 1.880"
   - c. Diameter - Connecting Rod Bearing Journal . . . . . 2.4988" to 2.4998"
   - d. Diameter - Connecting Rod Bearing Journal (Engines with "X" on Left Front Face of Block) . . . . . 2.4893" to 2.4988"
   - e. Width - Connecting Rod Bearing, Including Fillets . . . . . 1.877" to 1.880"
   - f. Length - Overall Crankshaft . . . . . 26.066"
   - g. Diameter - Of Oil Holes in Crankshaft . . . . . .201" to .209"
   - h. Number of counterweights 6
   - j. Clearance - Crankshaft End Thrust . . . . . .004" to .008"

3. CRANKSHAFT SPROCKETS
   - a. Width . . . . . .520" to .530"
   - b. Pitch . . . . . .500"
   - c. Number of Teeth 18

4. FLYWHEEL
   - a. No. of Teeth on Starter Gear 176
   - b. No. of Teeth on Starter Pinion 9

5. MAIN BEARINGS
   - a. Clearance - Crankshaft Vertical
     - Nos. 1 and 2 . . . . . .0005"
     - Nos. 3 and 4 . . . . . .0008" to .0024"
   - b. No. 5 . . . . . .0020" to .0034"
   - c. Width - Bearing Shaft
     - Nos. 1, 2, 3 and 4 . . . . . .818"
     - No. 5 . . . . . 1.875"

6. PISTONS
   - a. Length Overall . . . . . 4.050"
   - b. Length from Top of Piston to Pin Center . . . . . 1.770" to 1.773"
   - c. Clearance (At Thrust Surface) Selective . . . . . .0075" to .00125"
   - d. Diameter - Nominal Outside . . . . . 4.125"
   - e. Weight - Less Pins and Rings . . . . . 27.761 oz.

GENERAL SPECIFICATIONS—Continued

Subject and Remarks	
7. PISTON PINS	
a. Diameter (Selective)	.9807" to .9803"
b. Length Overall	3.126"
c. Diametrical Clearance (Selective) Plain Boss	.0003" to .0005" Loose
8. PISTON RINGS	
a. Number Compression Rings	2
b. Width, Compression Ring Upper	.0775" to .0780"
c. Width, Compression Ring, Lower	.0925" to .0935"
d. Gap Clearance Compression Rings	.013" to .023"
e. Clearance in Groove, Compression Rings	.001" to .004"
f. Number, Oil Rings	1
g. Width, Oil Ring Assembly	
Perfect Circle	.1874" to .1894"
Muskegon	.1844" to .1874"
h. Gap Clearance, Oil Ring	.015" to .055"
i. Clearance - Oil Ring to Piston Groove	.0005" to .007"
9. CONNECTING RODS	
a. Length - Center to Center	6.996" to 7.000"
b. Diameter - Connecting Rod Bore	2.6245" to 2.6250"
c. Diameter - Pin Bore	.9807" to .9811"
d. Clearance - Crankshaft (Vertical)	.0005" to .0026"
e. Clearance - Pin to Rod	.0003" to .0005" Loose
f. Clearance - End to Crankshaft	.002" to .011"
10. CAMSHAFT	
a. Bearing Journal Diameters	
All	1.9977" to 1.9985"
b. Width (Including Chamfers)	
Nos. 1 and 5	.781"
Nos. 2, 3 and 4	.699"
c. Journal Clearance in Bushing	.0010" to .0033"
d. Diameter - Reamed Bushing	
All	1.9995" to 2.001"
e. Length - Bushing	
All	.688"
11. CAMSHAFT SPROCKET	
a. Width	.520" to .530"
b. Pitch	.500"
c. Number of Teeth	36
12. TIMING CHAIN	
a. Width	27/32"
b. Length	24"
c. Number of Links	48
d. Pitch	.500"
13. VALVES - INTAKE	
a. Diameter - Head	1.870" to 1.880"
b. Diameter - Stem	.3427" to .3432"

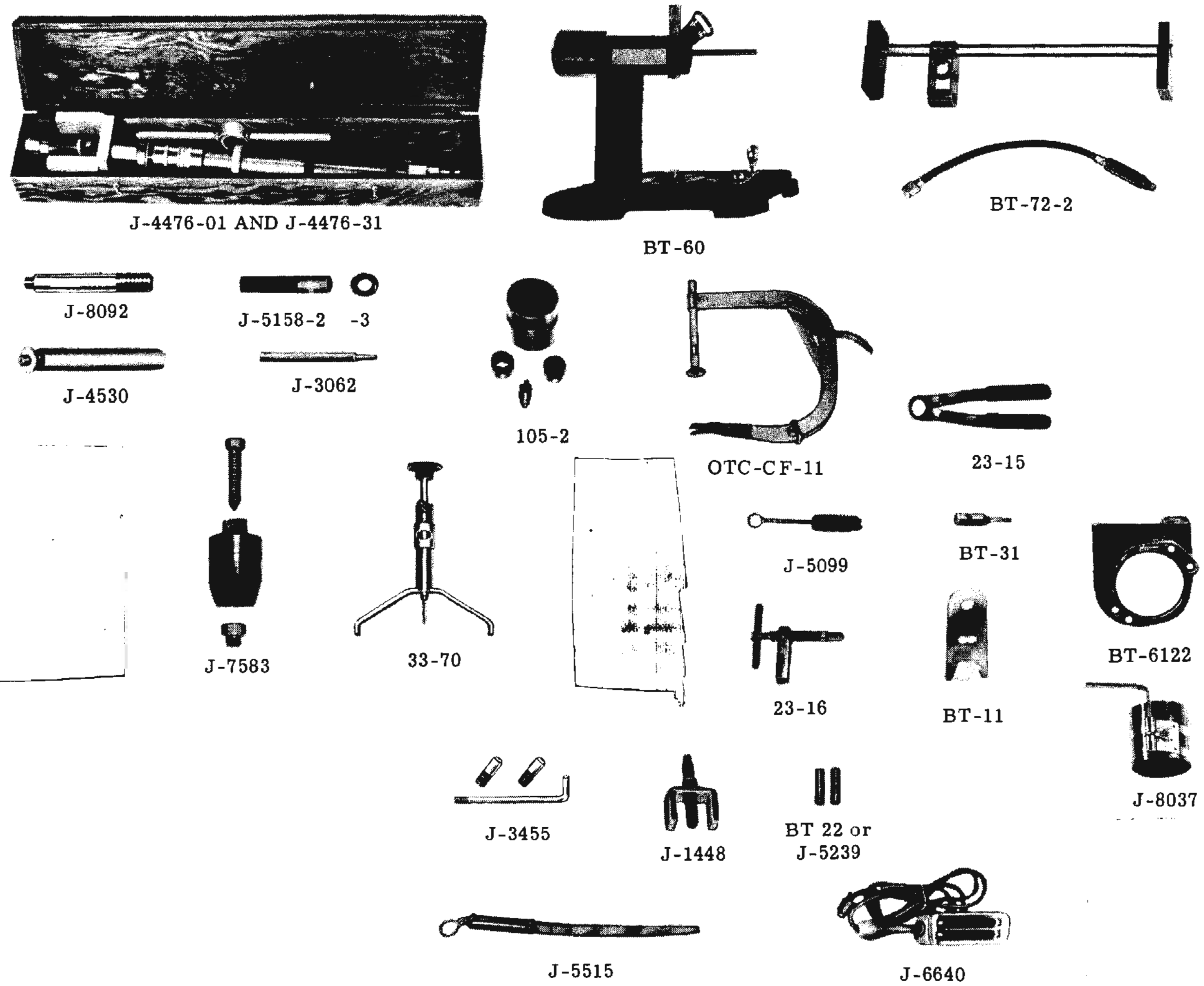
GENERAL SPECIFICATIONS—Continued

Subject and Remarks	
13. VALVES - INTAKE - (Continued)	
c. Angle - Valve Seat	45°
d. Width - Valve Seat	.037" to .075"
e. Lift - Premium Fuel	.427"
Regular Fuel	.427"
f. Clearance in Guide	.0011" to .0025"
g. Lash	Hydraulic
14. VALVES - EXHAUST	
a. Diameter - Head	1.557" to 1.567"
b. Diameter - Stem	.3940" to .3945"
c. Angle - Valve Seat	45°
d. Width - Valve Seat	.037" to .075"
e. Lift	.435"
f. Clearance in Guide	.0015" to .0030"
g. Lash	Hydraulic
15. VALVE SPRINGS	
a. Number of coils	6.40 to 6.60
b. Length - Free	2.25"
c. Diameter - Wire	.190" to .194"
d. Diameter - Inside Top	.760"
e. Diameter - Outside Bottom	1.472" to 1.496"
f. Pressure and Length	
Valve Open	175 to 189 lbs. @ 1.437"
g. Valve Closed	85 to 95 lbs. @ 1.837"
16. VALVE LIFTERS	
a. Diameter - Body	
Standard	.9210" to .9215"
.001" Oversize	.9220" to .9225"
.010" Oversize	.9310" to .9315"
b. Length - Overall	2.125"
c. Clearance in Boss Selective	.0005" to .0020"
17. VALVE GUIDES	
a. Height from top of Head	.787"
b. Diameter - Inside Intake	.3442, to .3452"
c. Diameter - Inside Exhaust	.3960" to .3970"
d. Length - Overall	2.390"
18. LUBRICATION SYSTEM	
a. Capacity - Engine	
Crankcase Only, Drain and Refill	4 Qts.
Drain and Refill with Filter Change	5 Qts.
b. Oil Pump	
Clearance - Pressure Relief Valve in Bore	.0025" to .005"
Clearance - End Gears	.0025" to .008"
Width - Pump Gears	1-1/2"
19. COOLING SYSTEM	
a. Radiator - Make	Harrison
b. Capacity	19-1/4 Qts.
For Heater, Add	1 Qt.
For Air Conditioning, Add	1-3/4 Qts.
c. Pressure Cap	15 Lb.
d. Thermostat	170°

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified minimum.

Application	Ft. Lbs.
CRANKSHAFT AND CONNECTING RODS	
Connecting Rod Bearing Cap Bolts	32 to 42
Crankshaft Bearing Cap Bolts (Nos. 1, 2, 3 & 4)	90 to 120
Crankshaft Bearing Cap Bolts (Rear)	130 to 160
Crankshaft Pulley Bolt	100 Min.
ENGINE MOUNTS	
Front Mount to Front Cover Bolts	40 to 50
Front Mount to Frame Nuts	35 to 50
Rear Mount to Flywheel Housing Bolts	45 to 60
Rear Mount to Cross Member	40 to 56
HEAD AND VALVE MECHANISM	
Rocker Arm Cover Bolts	4 to 7
Cylinder Head to Block Bolts	60 to 80
Rocker Shaft Bracket to Head	14 to 22
Spark Plugs	18 to 34
FLYWHEEL AND DAMPER PLATE	
Flywheel to Crankshaft Bolts	85 to 95
Clutch Pressure Plate to Flywheel Bolts	14 to 17
Damper Plate to Flywheel Bolts	17 to 22
FLYWHEEL AND CLUTCH HOUSING	
Flywheel Lower Housing Cover Bolts	4 to 7
Flywheel Lower Housing to Block Bolts	50 to 55
Flywheel Cover Housing to Block and Flywheel Housing	50 to 55
Clutch Housing to Block and Flywheel Housing Bolts	50 to 55
FRONT COVER AND WATER PUMP	
Cover to Block Bolts (3/8")	24 to 40
Water Pump to Front Cover (3/8")	25 to 35
Water Pump to Front Cover (1/4")	5 to 8
Water Outlet to Manifold	22 to 26
FUEL PUMP	
Pump to Front Cover Bolts	34 to 44
Fuel Pump Eccentric	14 to 22
MANIFOLD	
Intake Manifold to Head Bolts	22 to 34
Exhaust Manifold to Head Bolts and Nuts	19 to 25
OIL PAN, PUMP AND FILTER	
Oil Pan Bolts	10 to 15
Oil Pan Drain Plug	30 to 50
Pump to Bearing Cap	24 to 34
Pump Cover Bolts	5 to 8
Pump Screen Bolts	4 to 7
Filter Assembly to Cylinder Block Bolts	28 to 38
Filter Housing	10 to 20
Oil Pressure Switch	10 to 15
OIL COOLER LINES	
Oil Cooler Pipe Connector to Radiator	Brass - 22 to 28 Steel - 30 to 40
Adapter, Oil Cooler to Transmission	15 to 20
Fitting, Oil Cooler Pipe to Transmission Adapter	20 to 25



BT-11	Timing Gauge
BT-22	Connecting Rod Bolt Guide
BT-31	Valve Lifter Lock Spring Tool
BT-60	Hydraulic Valve Lifter Tester
BT-72-2	Valve Spring Compressor Set
23-15	Valve Lifter Remover
23-16	Valve Lifter Plunger Remover
23-17	Water Pump Seal Installer
J-4476-01 & J-4476-31	Camshaft Bearing Remover and Installer
J-4530	Crankshaft Pilot Bearing Installer
J-5099	Valve Lifter Cleaning Brush
J-5158-2 & 3	Valve Guide Remover and Installer
J-5239	Connecting Rod Bolt Guide
J-5515	Spring Scale (Used for Fitting Piston)
J-6640	Black Light (Used for Checking Oil Leaks)
J-7583	Front Cover Crankshaft Oil Seal Remover

ENGINE

(F-85)

CONTENTS OF SECTION 8

TURBO-ROCKET ENGINE

COOLING, FUEL, AND EXHAUST SYSTEMS

MAINTENANCE RECOMMENDATIONS

Refer to Section 2, Periodic Maintenance

The same V-8 engine is used in all series except the 3147 model. Different flywheels and housings are used to accommodate either the Synchromesh or Hydra-Matic transmission. The engine has a bore of 3.5" and a stroke of 2.8" providing a displacement of 215 cubic inches.

The cylinder block is cast aluminum with non-replaceable cast iron cylinder liners cast integral with the block. A one-piece intake manifold gasket is used which also serves as an engine top cover.

The left bank of cylinders (as viewed from the drivers seat) are numbered (from front to rear) 1-3-5-7. Cylinders in the right bank are numbered (from front to rear) 2-4-6-8. (Fig. 8-101)

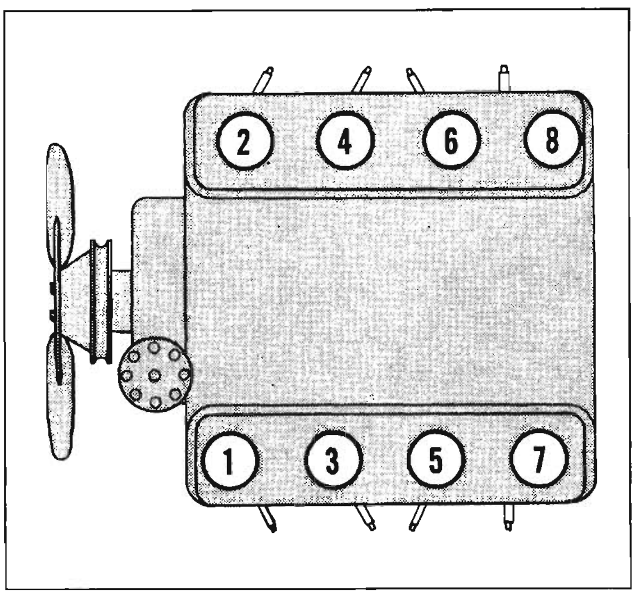


Fig. 8-101 Cylinder Numbers

The cylinder heads are made of cast aluminum with cast iron valve seat inserts and valve guides. Right and left cylinder heads are identical and interchangeable. The valve guides may be replaced.

The oil pump and distributor are located in the front engine cover. The distributor is driven by a driving gear that is bolted to the end of the cam shaft. The oil pump is driven by the distributor shaft. Oil flow in the engine is shown in Fig. 8-102.

The Turbo-Rocket engine design differs from the regular F-85 engine in the following respects:

Main and Connecting Rod Bearings - (Fig. 8-125)

Pistons - (Fig. 8-127)

Main Bearing Caps and Bolts - (Fig. 8-149)

Other changes are: Aluminized valve heads and seats, exhaust and intake manifolds, designed to accommodate the turbo-charger, choke heat stove in the left exhaust manifold, and a fuel return line system. A separate by-pass type fuel filter is mounted between the fuel pump and the carburetor and 3/8" fuel lines are used. To provide adequate cooling, a cross flow radiator is used. The fan clutch, used on the 3147 model, air conditioned equipped car, is identified by the number 2200 stamped on the forward face of the clutch, this fan clutch is not interchangeable even though it is the same size as that used on other F-85 models.

ENGINE ASSEMBLY

Removal

When necessary to remove the engine assembly from the body, the necessary items should be disconnected and the body raised off the engine and suspension assembly.

The following procedure is recommended.

1. Remove hood and place protective covers on fenders.

   Disconnect the following:

2. Battery cable from starter, ground cable and engine ground strap.

3. Accelerator linkage.

4. Oil pressure switch, ignition switch wire, temperature gauge and fuel line. On 3147 models, disconnect turbo-rocket fluid tank hoses and performance vacuum line.

5. Drain radiator and disconnect radiator hoses and heater hoses. If equipped with air con-

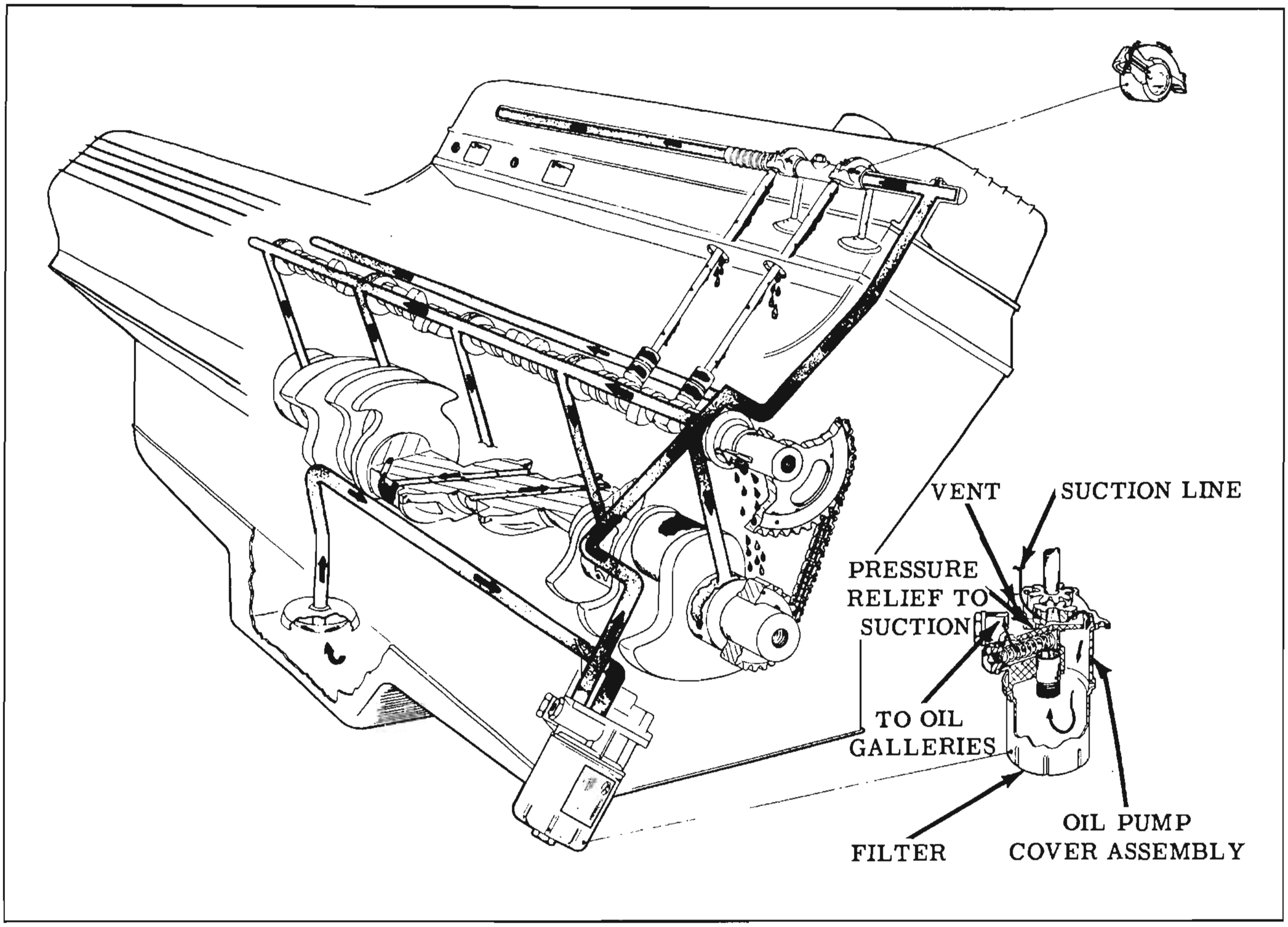


Fig. 8-102 Engine Oil Flow

ditioning, remove the pressure hoses from the compressor and fan shroud.

6. Remove the air cleaner assembly.

7. The front exhaust pipe from the rear exhaust pipe. On 3147 models, it will be necessary to remove the turbo-charger outlet pipe.

8. Speedometer cable, front of propeller shaft, and shift linkage from transmission.

9. Clutch and clutch equalizer on synchromesh equipped cars.

10. Stabilizer brackets from frame rail.

11. Front brake hoses.

12. Steering shaft from gear and raise up into steering column.

13. Place a block of wood between the front cross bar and the front of the engine oil pan. Remove the rear transmission mount cross support and support the rear of transmission with a stand.

14. With the front wheels on the floor, remove the three (3) isolation mount bolts and carefully raise the body off the engine and suspension. Care must be taken not to let suspension tip.

Installation

When installing the assembly into the body, the torque specifications and adjustments may be found for the specific unit in the corresponding section of this manual.

The brake system must be bled and the cooling and lubricating system properly serviced.

INTAKE MANIFOLD

Removal

1. Drain radiator, then disconnect upper radiator hose from water outlet. Also, disconnect heater hose at rear of manifold, (if car is so equipped).

2. On 3147 models, it will be necessary to remove the turbo-charger.

3. Disconnect spark plug wires and remove the air cleaner assembly.

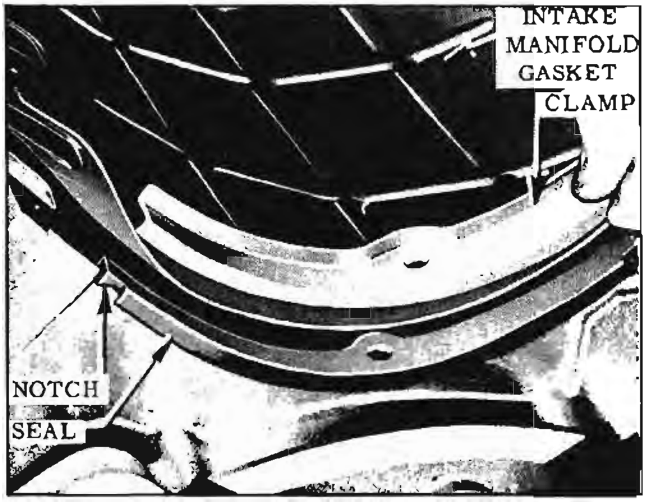


Fig. 8-103 Intake Gasket End Seals

4. Disconnect throttle linkage from accelerator bellcrank.

5. Disconnect choke heat tubes and lower throttle rod.

6. Remove fuel and vacuum lines from carburetor.

7. Disconnect primary wiring from coil and secondary lead.

8. Disconnect temperature gauge wire.

9. Slide thermostat by-pass hose clamp back on hose at water pump.

10. Remove 12 intake manifold bolts. Then remove manifold with coil and carburetor attached. (On 3147 models it is necessary to remove the carburetor before removing the manifold)

CAUTION: Aluminum can be dented or nicked if carelessly handled. Use particular care to protect gasket surfaces against damage.

11. Remove 2 intake manifold gasket clamp bolts, clamps, seals, and gasket.

12. Clean machined surfaces of cylinder head and intake manifold with a putty knife. Use extreme care not to gouge or scratch machined surface.

Installation

1. Coat both sides of gasket sealing surface that seal the intake manifold to the head with POB #3 and install new intake manifold gasket.

2. Install end seals and clamps. (Fig. 8-103) Lubricate bolts with engine oil and torque bolts 10-15 ft. lbs.

NOTE: When tightening clamp bolts, intake gasket must be positioned so manifold to head bolt holes will be open. (Fig. 8-104)

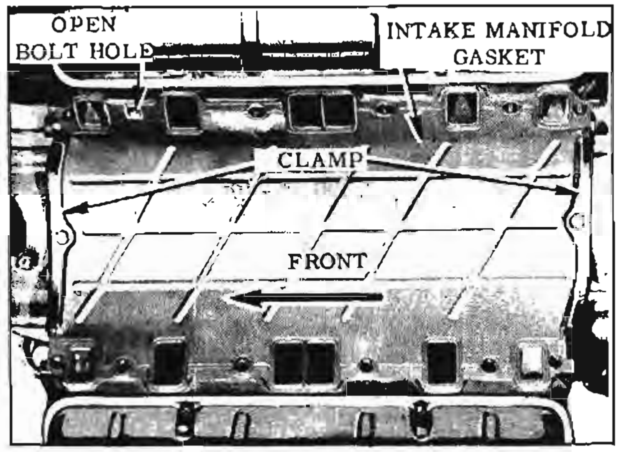


Fig. 8-104 Position of Intake Manifold Gasket

3. Position intake manifold on engine and connect thermostat by-pass hose to water pump.

4. Coat 12 intake manifold bolts with engine oil and install bolts. Torque alternately 25-30 ft. lbs. (Fig. 8-105)

5. Connect temperature gauge wire, primary wire and secondary lead to coil.

6. Install fuel and vacuum lines.

7. Connect upper radiator hose, spark plug wires, heater hose, carburetor linkage and install carburetor cover.

8. On 3147 models, install turbo-charger.

9. Fill cooling system.

NOTE: Refer to Section 2, Periodic Maintenance for cooling system recommendations.

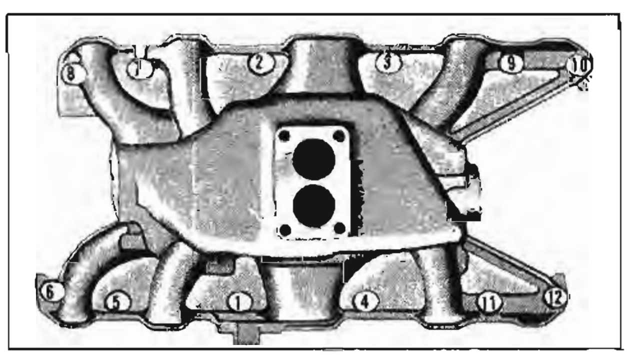


Fig. 8-105 Intake Manifold Bolt Torque Sequence

EXHAUST MANIFOLD (ALL EXCEPT 3147)

Removal

1. Disconnect the exhaust pipe.

2. For the right manifold, remove the rear Delcotron mounting bolt, and disconnect the heat tube.

3. For the left manifold disconnect the dipstick tube, remove the power steering hoses, and raise the steering column.

4. Remove the manifold to head attaching nuts and washers and remove the manifold.

5. Clean manifold and cylinder head machined surfaces with a putty knife. Use extreme care not to gouge or scratch machined surfaces.

Installation

Apply a coat of graphite grease or equivalent on the head and manifold contact surfaces.

1. Install manifold to head and torque nuts 18-24 ft. lbs.

2. Reconnect disconnected parts.

EXHAUST MANIFOLD (3147)

Removal

1. For the right manifold, remove the exhaust inlet pipe, disconnect exhaust outlet pipe at turbo-charger and remove the rear Delcotron mounting bolt.

2. For the left manifold, remove the air cleaner, the power steering hoses and raise the steering column.

3. Disconnect crossover pipe by removing the two bolts.

4. Remove the manifold by removing the 8 attaching nuts and washers.

   CAUTION: Do not loosen or dislodge the transmission dipstick tube or transmission breather tube from their transmission locations.

Installation

Apply a coat of graphite grease or equivalent on the head and manifold contact surfaces.

1. Install manifold to head and torque nuts 18-24 ft. lbs.

2. Reconnect disconnected parts.

POSITIVE CRANKCASE VENTILATION

Description

The positive crankcase ventilating system draws, by intake manifold vacuum, unburned fuel gases out of the crankcase and returns them to the combustion chamber to be burned.

It is very important that crankcase oil level be correctly maintained and not overfilled. Because of the nature of materials carried, it is recommended that the check valve be cleaned every 12,000 miles or more often if necessary. (Fig. 8-106)

Testing

A rough idle or crankcase fumes escaping through the crankcase breather is an indication the system may need service.

At idle, and low engine r.p.m., crankcase vapors are drawn into the intake manifold through the small hose. Flow is controlled by an orifice in the carburetor throttle body fitting. The diaphragm valve is closed.

At higher engine r.p.m., air flow through the air cleaner snorkel opens the diaphragm valve. This allows the major portion of the crankcase vapors to be drawn through the large hose into the air cleaner. This flow is controlled by two orifices in the breather cap assembly.

Fig. 8-106 Positive Crankcase Ventilation

Service

At every 12,000 miles (or at the oil change period nearest to this interval), remove the ventilation valve and hoses from engine and clean as follows:

1. Blow compressed air through both hoses.

2. Submerge valve in kerosene, slosh around in fluid. Blow compressed air through small tubing of valve assembly.

3. Clean bleed hole in connector at carburetor with 1/16" diameter wire, or drill. Not necessary to remove connector; however, if car-

buretor service is performed, clean out hole with kerosene and compressed air.

ROCKER ARMS AND SHAFTS

Removal

1. Remove air cleaner.
2. Disconnect heat tube from carburetor and manifold.
3. Disconnect spark plug wires and move away from valve cover.
4. On 3147 models, it will be necessary to remove the exhaust inlet pipe before removing the right hand valve cover.
5. Disconnect positive crankcase ventilation from valve cover.
6. Remove five (5) valve cover to cylinder head screws.

   NOTE: On two and four barrel equipped cars move choke fresh air filter out of the way.
7. Remove 4 rocker arm shaft bracket to head bolts. (Fig. 8-107)
8. Remove heater blower assembly to remove right rocker arm assembly.

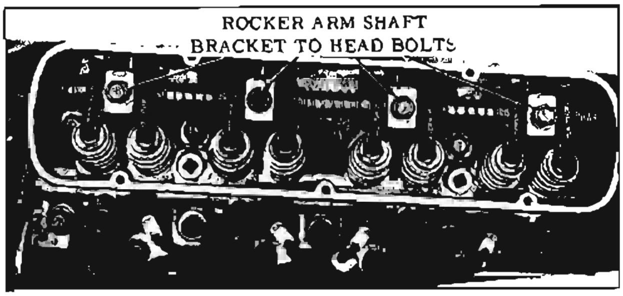


Fig. 8-107 Rocker Arm Assembly Attachment

Disassembly

1. Remove cotter pins from ends of shaft.

   NOTE: Disassemble one shaft assembly at a time and place on bench so parts may be reassembled in their original place.
2. Remove springs, arms and brackets from shaft.

If necessary to remove shaft end plug, punch hole in plug, then pry plug from end of shaft.

Assembly

1. If shaft end plug was removed, drive new plug in shaft to clear cotter pin hole.
2. Lubricate frictional surfaces of rocker arms and shaft with SAE 10W30 oil and assemble. (Fig. 8-108)

Installation

1. Position rocker arm shaft assembly on cylinder head and align brackets with mounting bolts. Shaft goes on a dowel on head. (Fig. 8-109)

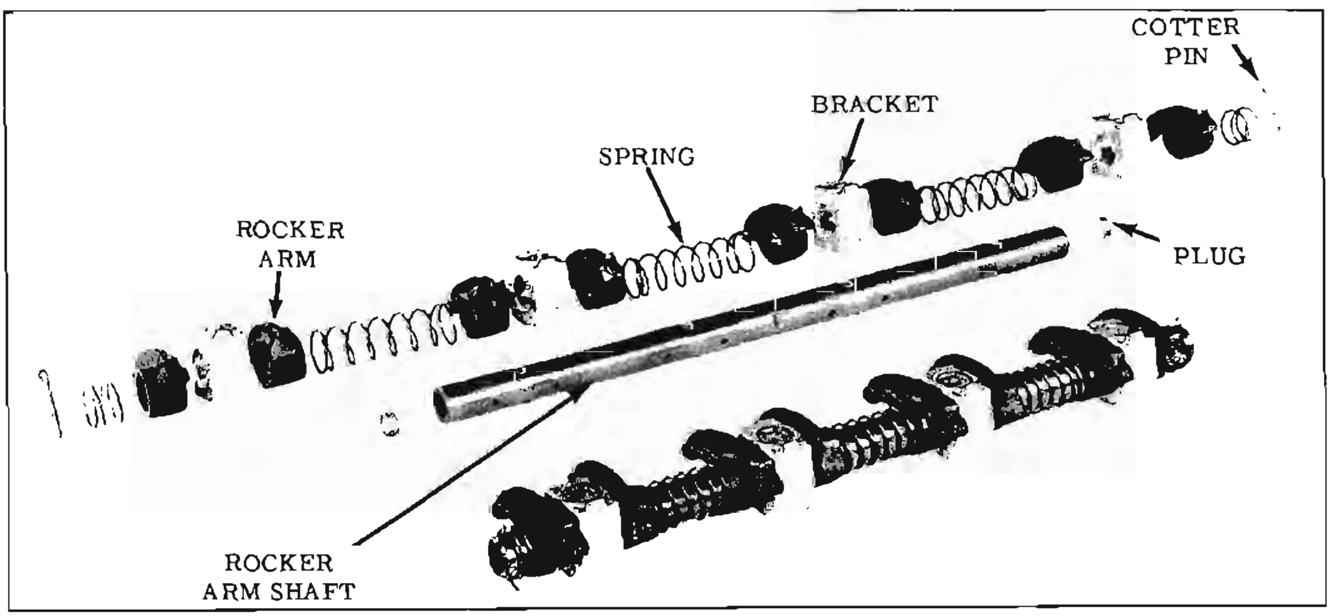


Fig. 8-108 Rocker Arm Shaft Assembly

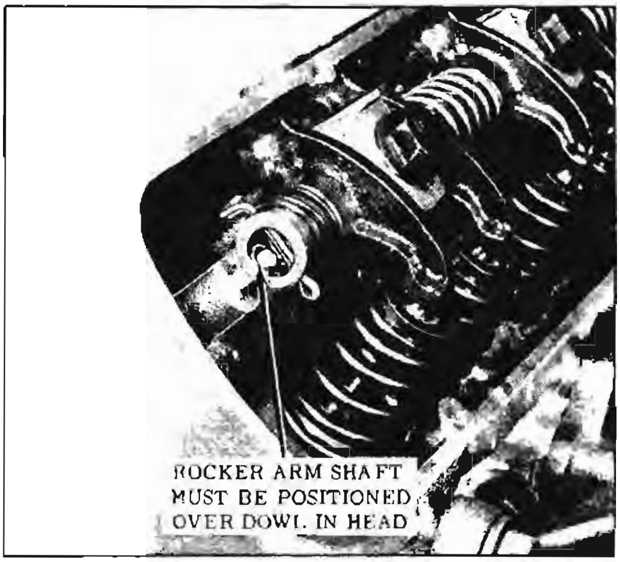


Fig. 8-109 Rocker Arm Shaft Position

2. Coat bolt threads with POB No. 4 Sealer or equivalent, and torque 45-55 ft. lbs. Check rocker arm to valve stem contact for proper alignment.

3. Install valve cover with a new gasket, connect spark plug wires, heat tube, heat tube retainer and air cleaner.

4. On 3147 models install the exhaust inlet pipe.

VALVE LIFTERS

Operation

Oil is supplied to the lifter through a hole in the side of the lifter body which indexes with a groove and hole in the lifter plunger. (Fig. 8-110)

When the lifter begins to ride up the cam lobe, the ball check is held against its seat in the plunger by the ball check spring which traps the oil in the base of the lifter body below the plunger. The plunger and lifter body then raise as a unit, pushing up the push rod to open the valve. The force of the valve spring which is exerted on the plunger through the rocker arm and push rod causes a slight amount of leakage between the plunger and lifter body. This "leak down" allows a slow escape of trapped oil in the base of the lifter body. As the lifter rides down the other side of the cam lobe and reaches the base circle or "valve closed" position, the plunger spring quickly moves the plunger back (up) to its original position. This movement causes the ball check to open against the ball spring and oil from within the plunger is drawn into the base of the lifter. This restores the lifter to zero lash.

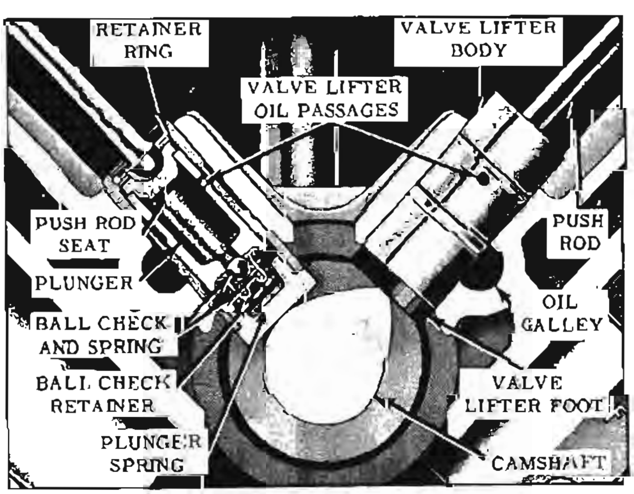


Fig. 8-110 Valve Lifter Operation

Removal

IMPORTANT: Valve lifters and push rods should be kept in order so they can be reinstalled in their original position in the cylinder block.

1. Remove intake manifold and gasket.

2. Remove valve covers and rocker arm assemblies and push rods.

3. On varnished lifters, apply carburetor cleaning solution to lifter body. Allow 5 minutes for solution to remove varnish.

4. Remove lifters. Use of Tool BT-39 will aid in removal of varnished lifters. (Fig. 8-111)

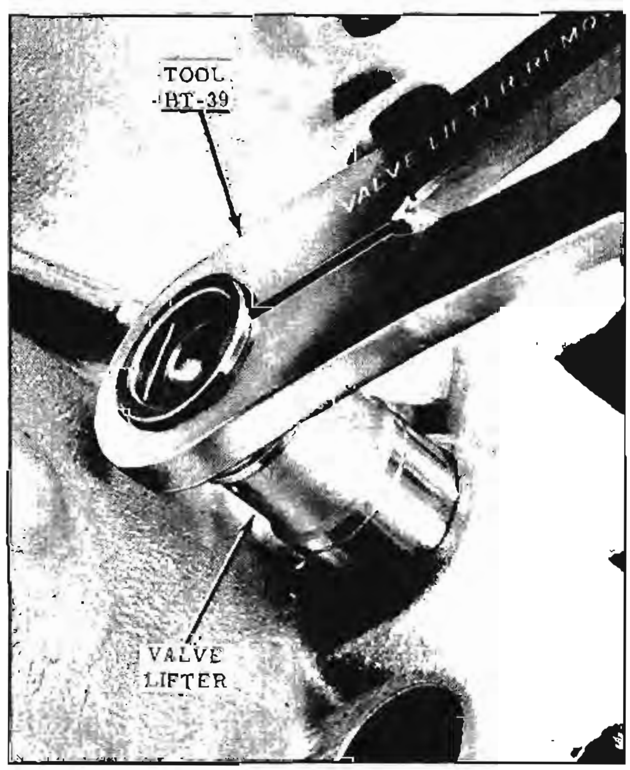


Fig. 8-111 Removing Valve Lifter

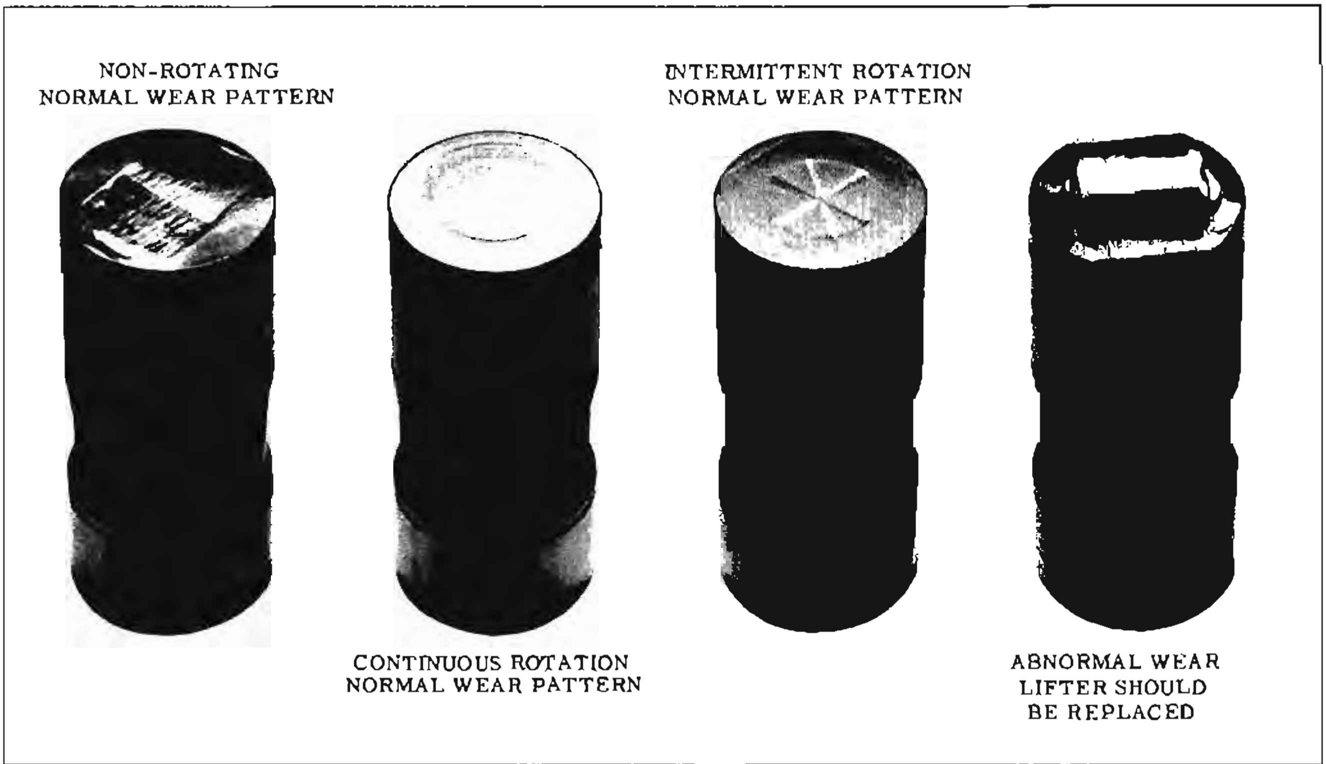


Fig. 8-112 Valve Lifter Wear Patterns

Disassembly

1. Remove retainer spring with Tool BT-31 or a small screwdriver.

2. Remove push rod seat.

3. Remove plunger and plunger spring. If plunger is stuck tight, allow lifter to soak in carburetor cleaning solvent for approximately five minutes, then remove.

   NOTE: Available Tool BT-6313 can be used to remove plunger.

   CAUTION: Carburetor cleaning solvent should be used in a well ventilated room. Avoid contact with skin and prolonged breathing of fumes.

4. Remove ball check retainer from plunger, then remove ball and spring.

Cleaning and Inspection

After lifters are disassembled, all parts should be cleaned in clean solvent. A small particle of foreign material under the ball check valve will cause malfunctioning of the lifter. Close inspection should be made for nicks, burrs, or scoring of parts. If either the body or plunger is defective, replace with a new lifter assembly.

IMPORTANT: Do not condemn valve lifters that have a slight gap or show evidence of leakage where the lifter foot is welded to the lifter body, (Fig. 8-112), unless the leak-down rate is not within specifications. (See VALVE LIFTER LEAK-DOWN)

NOTE: Whenever lifters are removed, check the lifter foot for abnormal wear.

A slight concave condition is not an indication of lifter wear with this engine. A worn lifter foot can be readily seen as it will have a trench worn in it from the camshaft lobe. (Fig. 8-112)

NOTE: Install lifters and push rods into original position in cylinder block.

1. Install lifters and push rods.

2. Position rocker arm assembly on cylinder head and align brackets with mounting bolts.

3. Coat bolt threads with POB No. 4 Sealer or equivalent and install bolts. Torque 45-55 ft. lbs. Check rocker arm to valve stem contact.

4. Install valve cover, connect spark plug wires, heat tube and air cleaner.

Assembly and Valve Lifter Leak-Down Test

IMPORTANT: Lifters must be assembled while

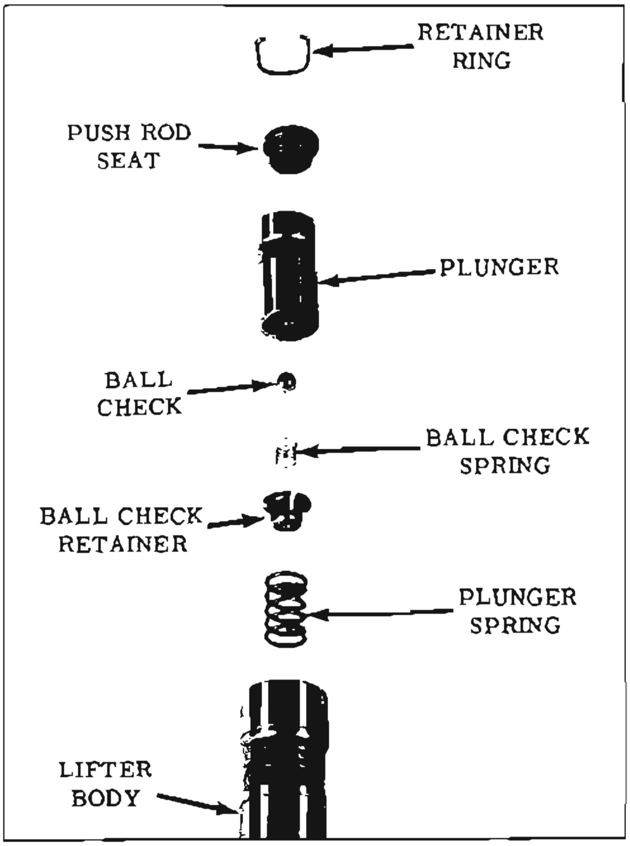


Fig. 8-113 Valve Lifter Exploded View

submerged in Hydraulic Lifter Test Fluid BT-59 and leak-down tested before placing into service.

1. Install Adapter 105-2 in reservoir of Tester BT-60, then fill reservoir with Hydraulic Lifter Test Fluid BT-59, 1/2" below top of reservoir.

2. Assemble ball check and retainer into plunger. (Fig. 8-113) Make sure retainer flange is pressed tight against bottom of recess in plunger.

3. Install plunger spring over ball check retainer.

4. Hold plunger with spring up and insert into lifter body. Hold plunger vertical to prevent cocking spring.

5. Place assembly into the tester cup then position push rod seat onto plunger.

6. Position the 1/4" steel test ball on the push rod seat. Lower tester ram until it contacts the steel ball.

7. Allow ram to move downward by its own weight until air bubbles disappear.

8. Raise ram, then allow to lower as in Step 7. Repeat this procedure several times or until all air is expelled from lifter.

CAUTION: Do not attempt to expell air from lifter by pumping on ram.

9. After all air is expelled, allow ram to bleed down lifter until retaining groove is exposed.

10. Install retaining ring.

11. Adjust ram screw so that it contacts the steel ball in the push rod seat when the pointer is at the start line.

12. Raise arm, then start test by resting ram on steel ball. Rotate reservoir one revolution every 2 seconds and time the indicator from the start to the stop line. (Fig. 8-114) Allowable tolerance for leak-down rate is 8 to 40 seconds for used lifters and 12 to 40 seconds for new lifters.

13. If leak-down tolerance is within specifications, the lifter can be placed in service without removing test fluid.

Valve Lifter Diagnosis

1. Momentarily Noisy When Car is Started:

   This condition is normal. Oil drains from the lifters which are holding the valves open when the engine is not running. It will take a few seconds for the lifter to fill after the engine is started.

2. Intermittently Noisy on Idle Only, Disappearing When Engine Speed is Increased:

   Intermittent clicking may be an indication of a flat or pitted ball, or it may be caused by dirt.

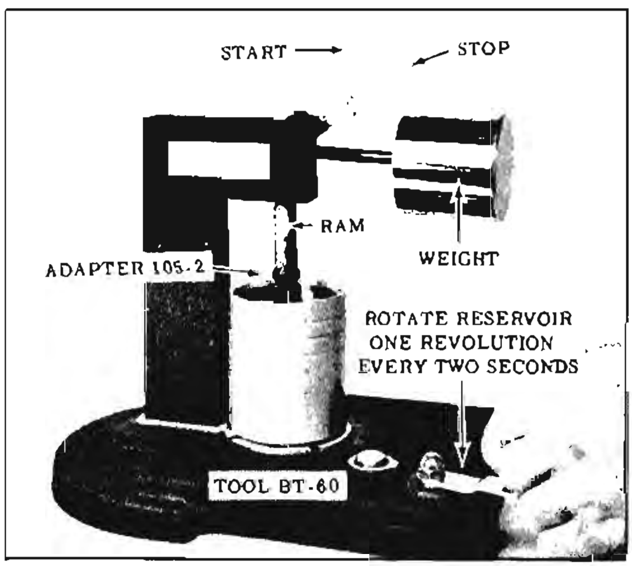


Fig. 8-114 Valve Lifter Bleed Down Test

Correction: Clean the lifter and inspect. If ball is defective, replace lifter.

3. Noisy At Slow Idle or With Hot Oil, Quiet With Cold or As Engine Speed is Increased:

   Insert a .015" feeler gauge between the rocker arm and valve stem. If noise momentarily disappears and then re-appears after a few seconds with the feeler still inserted, it is an indication that the lifter "leak-down" rate is too fast.

   Correction: The lifter must be replaced.

4. Noisy at High Car Speeds and Quiet at Low Speeds.

   a. High oil level - Oil level above the "Full" mark allows crankshaft counter weights to churn the oil into foam. When foam is pumped into the lifters, they will become noisy since a solid column of oil is required for proper operation.

   Correction: Drain oil until proper level is obtained. See PERIODIC MAINTENANCE SECTION.

   b. Low oil level - Oil level below the "Add 2" mark allows the pump to pump air at high speeds which results in noisy lifters.

   Correction: Fill until proper oil level is obtained. See PERIODIC MAINTENANCE SECTION.

5. Noisy at Idle Becoming Louder as Engine Speed is Increased to 1500 r.p.m.

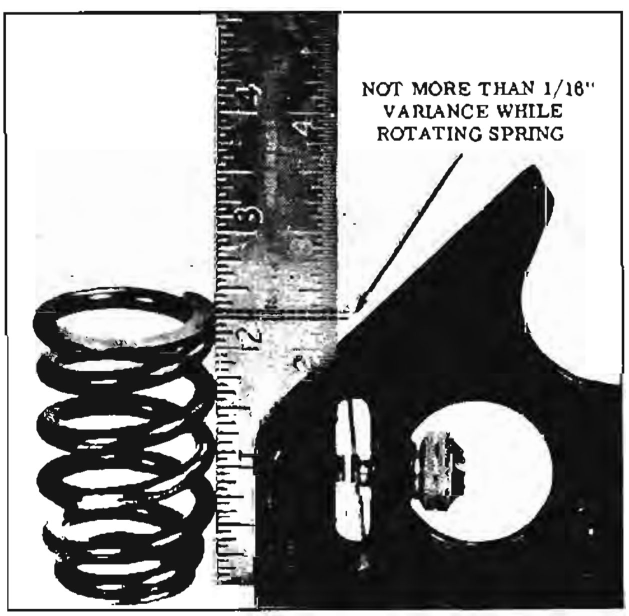


Fig. 8-115 Valve Spring Height

   a. This noise is not connected with lifter malfunction. It becomes most noticeable in the car at 10-15 m.p.h. "Lo" range, or 30-35 m.p.h. "S" range, and is best described as a hashy sound. At slow idle, it may be entirely gone or appear as a light ticking noise in one or more valves. It is caused by one or more of the following:

      (1) Badly worn or scuffed valve tip and rocker arm pad.

      (2) Excessive valve stem to guide clearance.

      (3) Excessive valve seat runout.

      (4) Off square valve spring.

      (5) Off square rocker arm pad.

      (6) Excessive valve face runout.

Diagnosis:

Remove valve covers and while listening with a stethoscope, locate noisy valves by increasing engine speed slightly above idle, about 1500 r.p.m. With gloved hand, push sideways on valve spring. Noise will change, either becoming louder or disappearing completely. Some noise will be present in all valve locations. It is necessary to determine which are actually responsible for the noise.

Correction:

   a. Occasionally this noise can be eliminated by rotating the valve spring and valve. Crank engine until noisy valve is off its seat. Rotate spring 90°. This will also rotate valve. Repeat until valve becomes quiet. If correction is obtained, check for an off square valve spring. If spring is off square more than 1/16" in free position, replace spring. (Fig. 8-115)

   b. Observe rocker arm pad for excessive wear or excessive off square. Replace as required. (Fig. 8-116)

   c. If correction is not obtained, check for excessive valve stem to guide clearance. If necessary, correct as required.

6. Valves Noisy Regardless of Engine Speed.

   This condition can be caused by foreign particles or excessive valve lash.

Correction:

   a. If a foreign particle in the lifter is

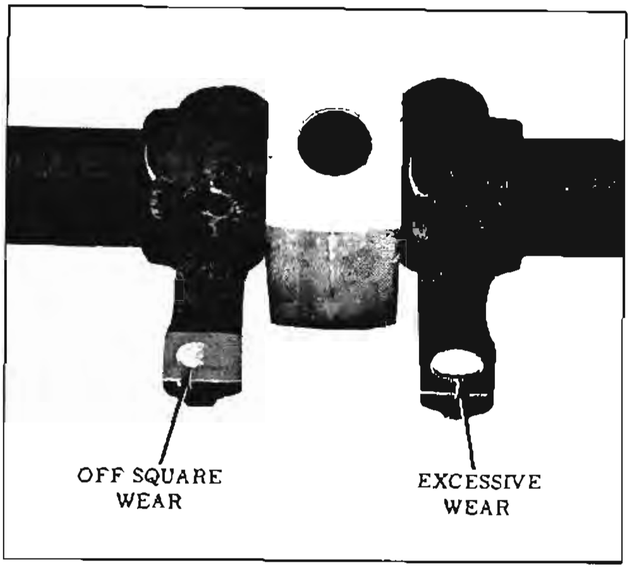


Fig. 8-116 Rocker Arm Weor

restricting proper operation, this method sometimes proves successful in dislodging the particle.

With transmission in neutral and parking brake on, run the engine at a high speed.

If this method does not quiet the lifter, strike the rocker arm above the push rod with a mallet while the engine is idling. This method of correction has proven successful for dislodging a foreign particle which is preventing the ball from seating properly.

b. Check for valve lash by turning engine so the piston in that cylinder is on top dead center of firing stroke. If valve lash is present, the push rod can be freely moved up and down a certain amount with rocker arm held against valve.

Valve lash indicates one of the following:

(1) Worn push rod.

(2) Worn rocker arm.

(3) Lifter plunger stuck in down position due to dirt or varnish.

(4) Defective lifter.

Checking of the above four items

Remove the rocker arm shaft assembly then proceed as follows:

1. Observe upper end of push rod. Excessive wear of the spherical surface indicates one of the following conditions.

   a. Improper hardness of the push rod. The rod and arm must be replaced.

   b. Improper lubrication to the push rod. The push rod and rocker arm must be replaced. The oiling system to the push rod should be checked.

2. If push rod appears in good condition and has been properly lubricated, replace rocker arm and recheck valve lash.

3. If valve lash exists and push rod and rocker arm are O.K., trouble is in lifter. Lifter should be replaced.

CYLINDER HEAD AND GASKET

Removal

1. Drain radiator and cylinder block.

2. Remove intake manifold.

3. Disconnect exhaust pipe.

4. Disconnect spark plug wires and remove valve cover.

5. Right cylinder head removal:

   a. Remove Delcotron rear mounting bracket bolt.

   b. Remove ground straps at the front and rear of the cylinder head.

If equipped with heater the following procedure should be followed to remove right cylinder head.

   a. Remove all head bolts except rear rocker arm shaft bracket bolt. (Blower motor case prevents this.)

   b. Loosen rear rocker arm shaft bracket bolt and raise shaft assembly from head and remove push rods except No. 16.

   c. Lift No. 16 Push Rod to within 1" of blower case and tape to rocker shaft.

   d. Lift head, rocker shaft assembly and exhaust manifold off dowel pins and move forward to clear blower case.

6. Left cylinder head removal:

   a. Remove power steering belt if so equipped.

   b. Remove 2 power steering pump bracket to cylinder head bolts.

   CAUTION: Aluminum can be dented or nicked if carelessly handled. Use

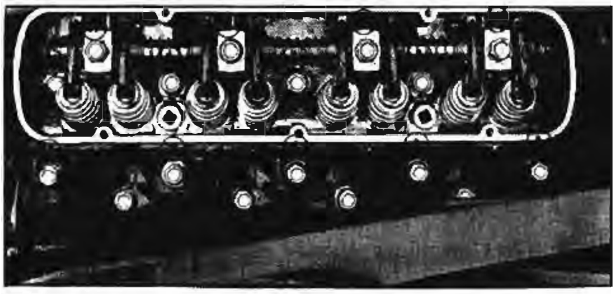


Fig. 8-117 Cylinder Head Torque Sequence

particular care to protect gasket surfaces against damage.

7. Remove rocker arm shaft assembly and remove push rods.

8. Remove cylinder head bolts and remove cylinder head with exhaust manifold attached.

Installation

Coat eight (8) rocker arm shaft bracket bolts with P.O.B. No. 4 sealer. Remaining cylinder head bolts are to be coated with 980131 lubricant. Torque head bolts 45-55 ft. lbs. and torque exhaust manifold to head bolts 18-24 ft. lbs. Follow sequence shown in Fig. 8-117.

Head gaskets should be coated on both sides with P.O.B. No. 4 Sealer or equivalent before installation.

VALVES AND SPRINGS (HEAD REMOVED)

NOTE: Valves used in the 2 bbl., 4 bbl., and turbo-charged engines are shown in Fig. 8-118.

Removal

1. Remove spark plugs and exhaust manifold.

2. Remove valve keys by compressing valve spring with a tool such as J-7541 or OTC-CF-11.

3. Remove valve spring retainers and springs. (Fig. 8-119)

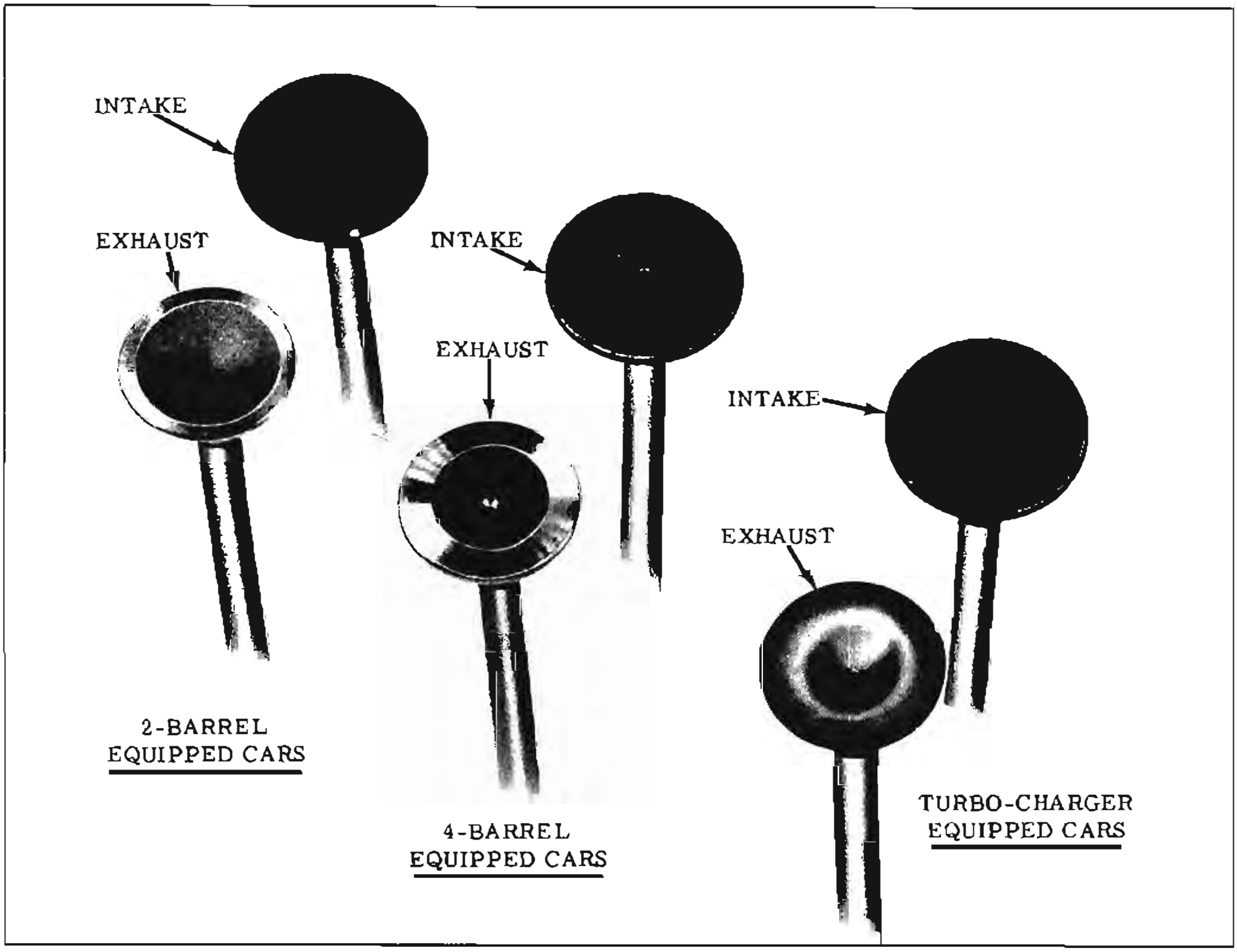


Fig. 8-118 Valves

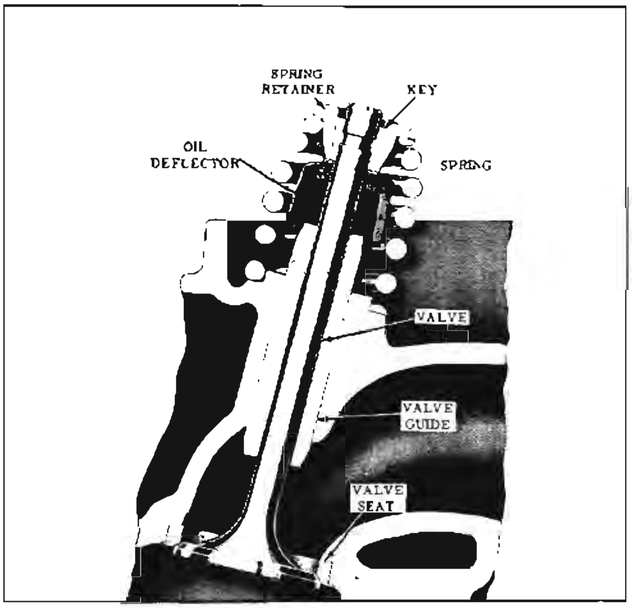


Fig. 8-119 Valve Assembly

4. Remove oil deflectors from valve stems.

5. Remove valves. Keep valves separated so they can be installed in their original locations.

Installation

1. Install valves in their respective guides.

2. Install new oil deflectors over valve stem. Force deflectors down as far as possible on valve stem. The deflectors will correctly position themselves when the engine is started.

3. Position valve springs over valve stems, large diameter against head.

4. Install valve spring retainers then compress springs with a tool such as J-7541 or OTC-CF-11 and install valve stem keys.

5. Check valve springs and keys to be sure they are properly seated.

6. Install exhaust manifold. Torque bolts and nuts 18-24 ft. lbs.

7. Set spark plug gap. Lubricate plug threads with 1 drop of SAE 10W30 oil and reinstall plugs. Torque 12-17 ft. lbs.

Reconditioning Valves

When reconditioning valves and valve seats, clean carbon from cylinder heads and valves using extreme care not to gouge or scratch machined surface. A soft wire brush is suitable for the purpose. Whenever valves are replaced or new valves and guides are installed, the valve seats must be reconditioned. New guides, if required should be in place at the time seats are reconditioned. Service guides are finished to size.

IMPORTANT: To assure satisfactory service, it is necessary that valve seat width be maintained. (Intake and exhaust seat width should be 1/16", and angle, 45°.)

VALVE GUIDES

Valve guides are identified as follows:

Std. Guides	No Grooves
.001" oversize	2 Grooves
.010" oversize	1 Groove
.011" oversize	3 Grooves

Standard guides should be replaced with .001" oversize guides and .010" guides should be replaced with .011" oversize.

Removal

1. Support cylinder head and drive out valve guide, using Tool BT-68-5A. (Fig. 8-120)

Installation

1. Lubricate guide and bore of head with SAE 10W30 oil.

2. Place valve guide into cylinder head with outside beveled end of guide up.

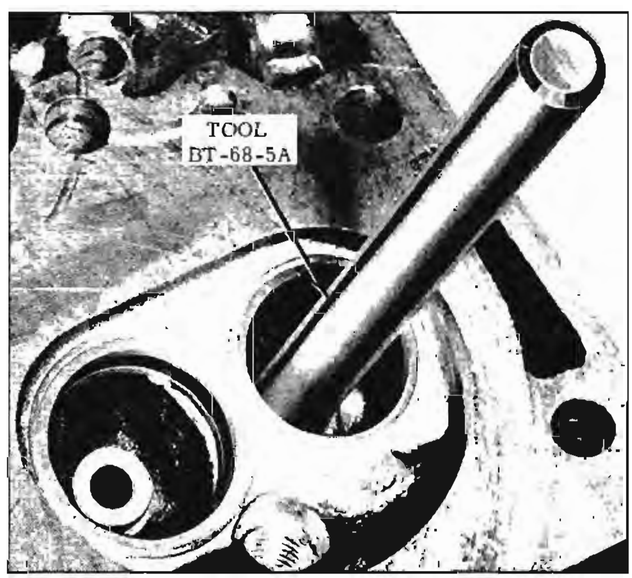


Fig. 8-120 Removing Valve Guide

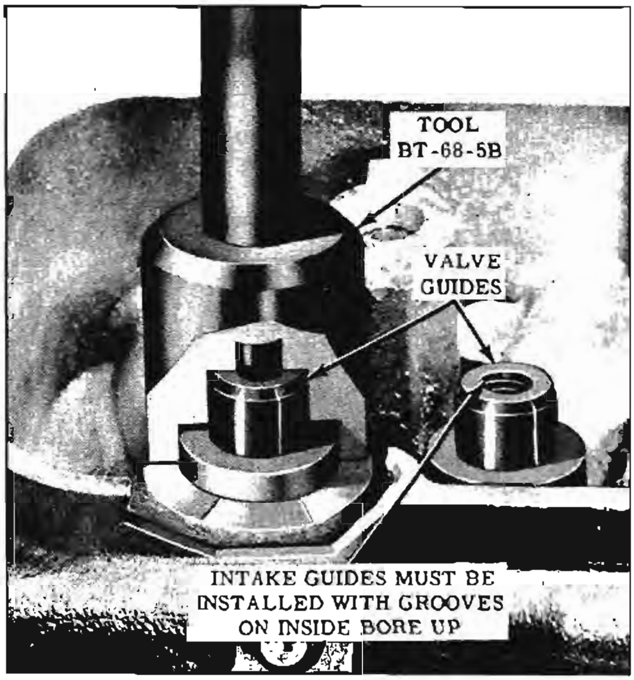


Fig. 8-121 Installing Valve Guides

The inside bore of the guides are grooved.

The EXHAUST guide has grooves the full length of the bore. The INTAKE guide has grooves to within 1/2" of the bottom.

NOTE: INTAKE GUIDES MUST BE INSTALLED WITH THE GROOVES UP.

3. Place guide Installer Tool BT-68-5B over new guide and drive until tool makes contact with cylinder head. This will automatically position guide. (Fig. 8-121)

REPLACING VALVE SPRING (HEAD ON ENGINE)

To replace a worn or broken valve spring without removing the cylinder head:

Removal

1. Remove rocker arm assembly.
2. Remove spark plug and install Tool BT-72-1-B into spark plug hole and attach to an air hose to hold the valve against its seat.
3. Install Tool BT-72-2, (Fig. 8-122), compress the valve spring until valve keys are accessible, then remove keys, spring retainer cups, and springs.

NOTE: If valve spring does not compress, tap retainer with a plastic hammer to break bind at retainer and keys.

Installation

1. Install valve spring and spring retainer. With Tool BT-72-2 compress the valve spring until valve keys can be installed.
2. Install spark plugs. Torque 15-20 ft. lbs.
3. Install rocker arm assembly.

OIL PAN

Removal

1. Remove the dipstick.
2. Hoist car and drain oil.
3. Disconnect idler arm from relay rod.
4. Remove the cover on the front of lower flywheel housing and remove pan bolts.

NOTE: On some types of lifts, it may be necessary to drop the oil intake into the pan before removing pan. The crankshaft should be positioned so the counterweights do not interfere with the pan removal.

Installation

1. Lubricate pan bolts with SAE 10W-30 oil and install pan. Torque bolts 6-15 ft. lbs.
2. Connect the right hand end of relay rod to the idler arm.
3. Install hex nut and torque 40-50 ft. lbs.
4. Install cotter pin. If necessary to rotate nut to allow for cotter pin installation, tighten nut but do not exceed 65 ft. lbs. torque. Never back off nut to install cotter pin.
5. Install flywheel cover.

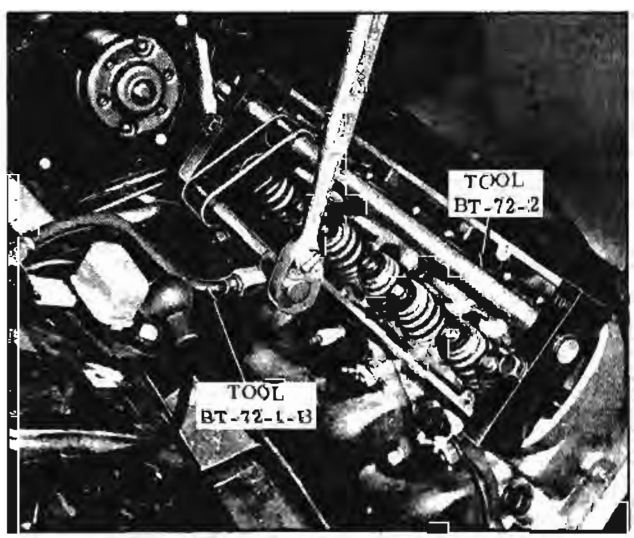


Fig. 8-122 Removing Valve Spring

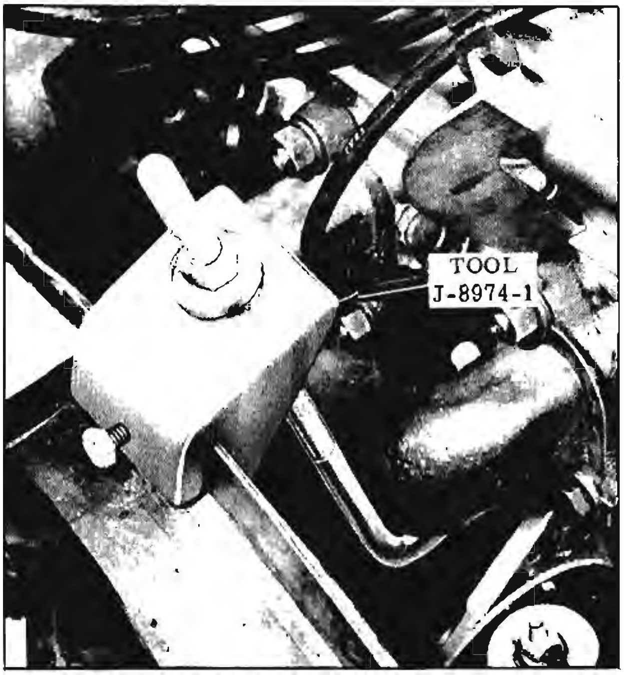


Fig. 8-123 Engine Support Tool

CONNECTING ROD AND PISTON ASSEMBLY

Removal

1. Remove intake manifold, head or heads.

2. Remove oil pan.

IMPORTANT: Stamp cylinder number on the machined surfaces of the bolt bosses of the connecting rod and cap for identification when reinstalling. If the pistons are to be removed from the connecting rod, mark cylinder number on piston with a silver pencil or quick drying paint. The right bank is numbered 2-4-6-8, left bank 1-3-5-7.

3. Examine cylinder bore above ring travel. If ridge exists, remove ridge with ridge reamer before attempting to remove the piston and rod assembly.

4. Remove rod bearing cap and bearing.

5. Install guide Tool BT-8822 over threads of rod bolts. This is to prevent damage to bearing journal and rod bolt threads. (Fig. 8-124)

6. Remove rod and piston assembly through the top of the cylinder bore.

7. Remove other rod and piston assemblies in the same manner.

ROD BEARINGS (Fig. 8-125)

The connecting rod bearings are assembled with a slight projection above the rod and cap faces to insure a positive contact. Adjustment for wear is compensated by replacing the bearing.

Connecting rod bearings can be replaced without removing the rod and piston assembly from the engine.

1. Remove oil pan.

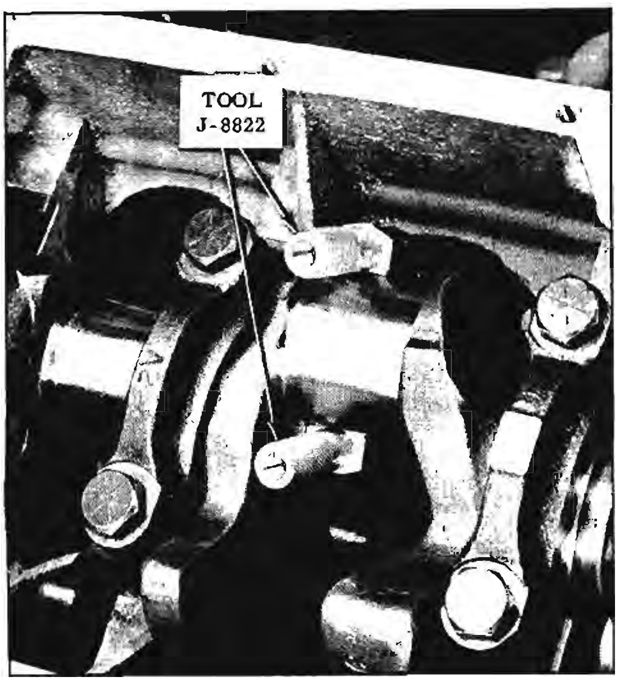


Fig. 8-124 Connecting Rod Bolt Guides

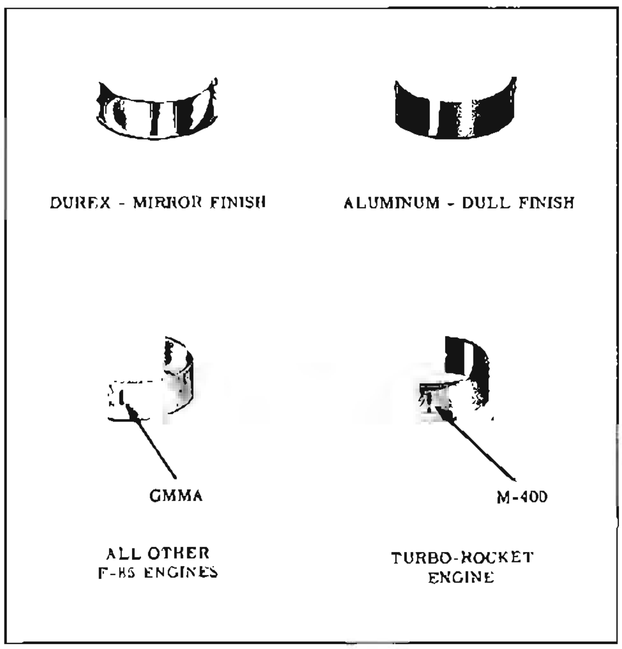


Fig. 8-125 Connecting Rod Bearings

2. If all bearings are being removed, it will be advantageous to disconnect engine mounts and raise the engine one or two inches with Tool J-8974. (Fig. 8-123)

3. With connecting rod journal at the bottom, stamp cylinder number on machined surfaces of connecting rod and cap for identification when reinstalling, then remove caps.

4. Inspect journals for roughness and wear. Slight roughness may be removed with a fine grit polishing cloth saturated with engine oil. Burrs may be removed with a fine oil stone. If the journals are scored or ridged, the crankshaft must be replaced or reground.

5. The connecting rod journals can be checked for out-of-round with the use of a micrometer. Maximum out-of-round must not exceed .0015".

If plastigauge is to be used:

6. Clean oil from journal, bearing cap, connecting rod, and outer and inner surface of bearing inserts.

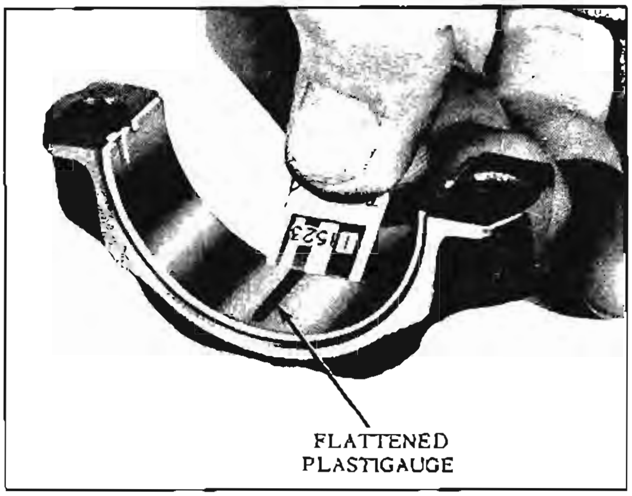


Fig. 8-126 Checking Oil Clearance

7. Place a piece of plastigauge in the center of lower bearing shell.

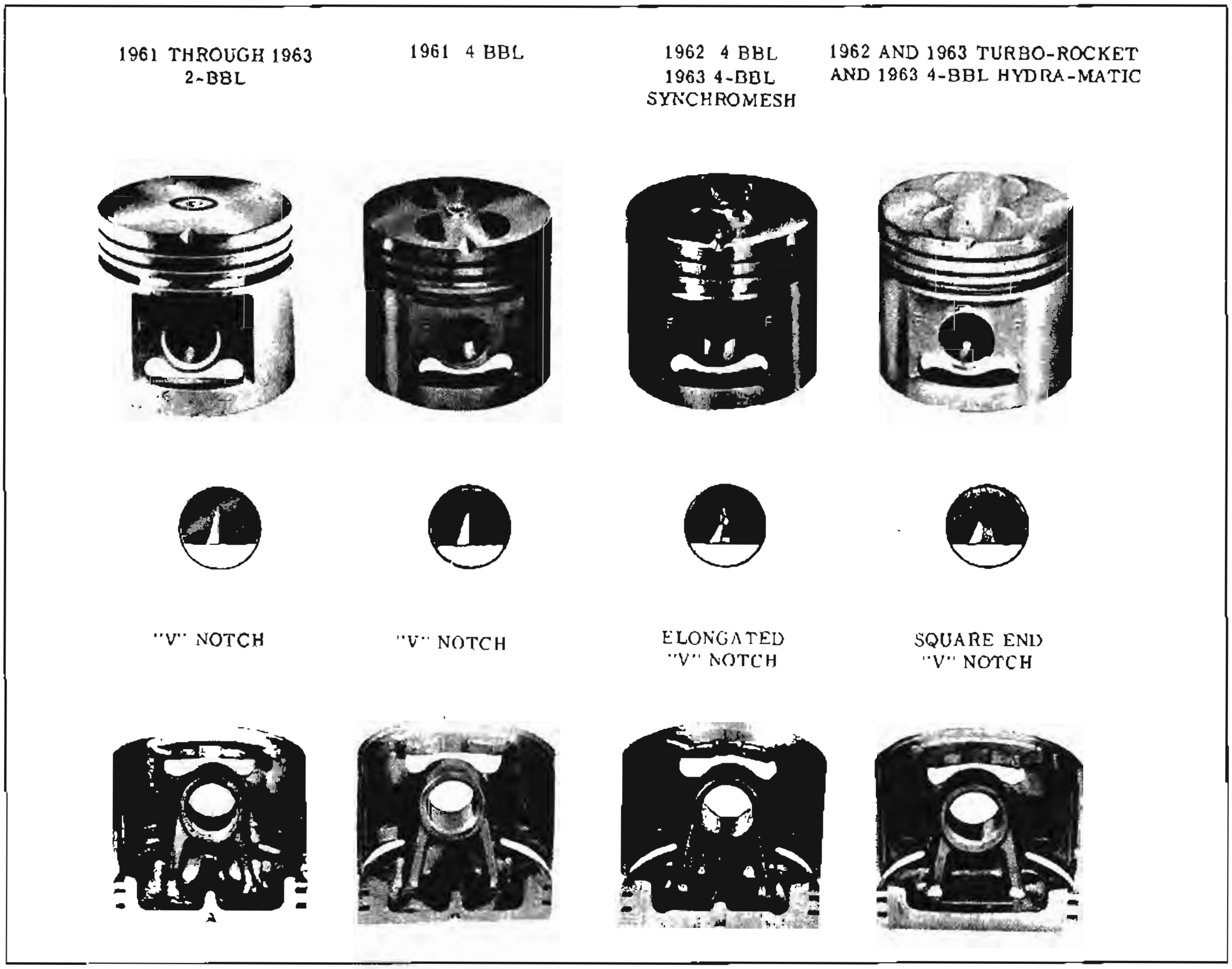


Fig. 8-127 Pistons

8. Reinstall bearing cap and torque 30-35 ft. lbs.

9. Remove bearing cap and determine bearing clearances by comparing the width of the flattened plastigauge at its widest point with the graduation on the plastigauge container. The number within the graduation on the envelope indicates the clearance in thousandths of an inch. (Fig. 8-126) If this clearance is greater than .0035", replace the bearing and recheck clearance with plastigauge.

   NOTE: Lubricate bearing with SAE 10W30 oil before installation. Repeat Steps 2 thru 8 on remaining connecting rod bearings.

All rods must be connected to their journals when rotating the crankshaft.

ROD ASSEMBLY

If a rod is twisted or bent, a new rod must be installed. NO ATTEMPT SHOULD BE MADE TO STRAIGHTEN CONNECTING RODS.

PISTON (Fig. 8-127)

MEASURING PISTON

When replacing pistons, the original cylinder size is stamped with a code number near each cylinder on the oil pan rail.

If the cylinder size is 2-4-6 or 8, use that size piston. If the cylinder size is 1-3-5 or 7, use the next even number size larger. Example: If the rail is stamped 5, use the 6 size piston.

NOTE: The piston and cylinder bore must be free of oil and at the same temperature.

1. Place a strip of .0015" feeler gauge against the upper side of the bore, at 90° to the normal piston pin location. Attach scale J-5515 to feeler gauge. (Fig. 8-128)

2. Insert piston with pin and rings removed, into bore with head downward.

3. While holding the piston in the center of its normal travel, slowly pull the scale in a straight line and note the reading on the scale. The reading should be between 3 to 8 pounds while pulling the feeler gauge out of the bore.

Each piston should be fitted to its individual cylinder and marked for that cylinder.

CHECKING CYLINDER BORE

Cylinder bore size can be measured with inside micrometers or a cylinder gauge. Maximum allowable taper of the cylinder bore is .010". The most wear will occur at the top of the ring travel.

Reconditioned cylinder bores should be held to not more than .001" out-of-round and .001" taper. They should not be bored over .010".

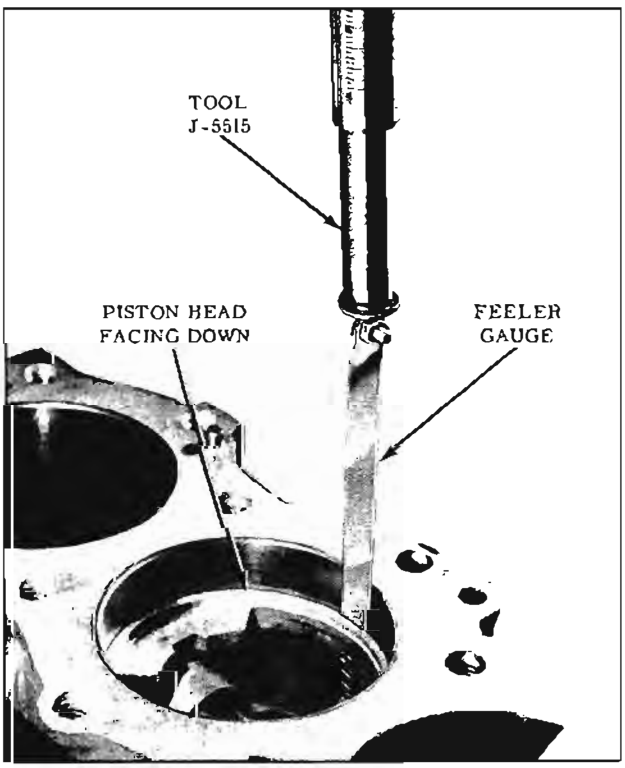


Fig. 8-128 Checking Piston Clearance

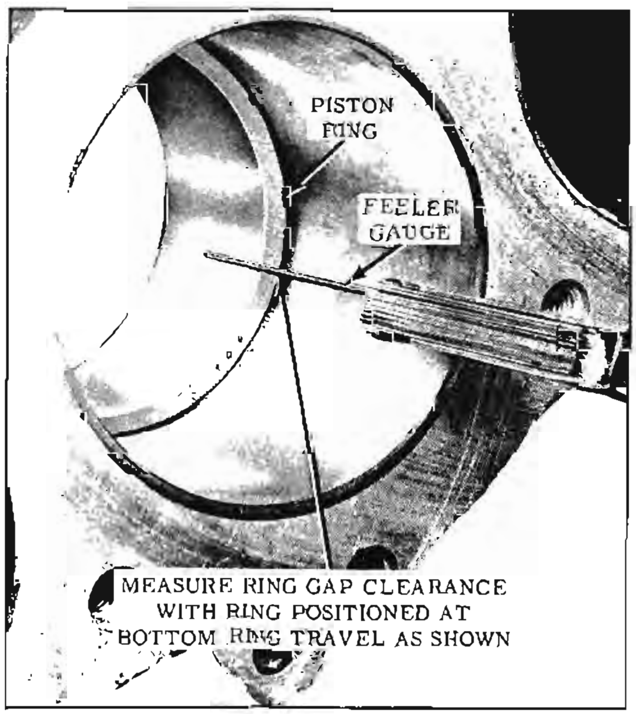


Fig. 8-129 Measuring Piston Ring Gap

It is important that reconditioned cylinder bores be thoroughly washed with a soap and water solution to remove all traces of abrasive material to eliminate premature wear.

Cleaning Piston

Clean the pistons by scraping carbon off the top of the piston. Deposits in the ring grooves should be removed with a suitable ring groove cleaning tool. It is important that the ring grooves be completely free of deposits.

RINGS

The pistons have three rings (two compression rings and one oil ring.)

The top compression ring is chrome plated, the second compression ring is of the step type and has a black finish. Both types of oil rings consist of 2 rails and an expander.

Ring Tolerances

When installing new rings, ring gap and side clearance should be checked as follows:

Piston Ring and Rail Gap

Each ring and rail gap must be measured with the ring or rail positioned squarely and at the bottom of the ring-travel area of the bore. (Fig. 8-129)

If the gap measurement is less than .010" to .020" for compression rings and .015" to .055" for oil rings, minimum, file the ends of rings and rails until the minimum gap is obtained. Ends of rings and rails must be filed square.

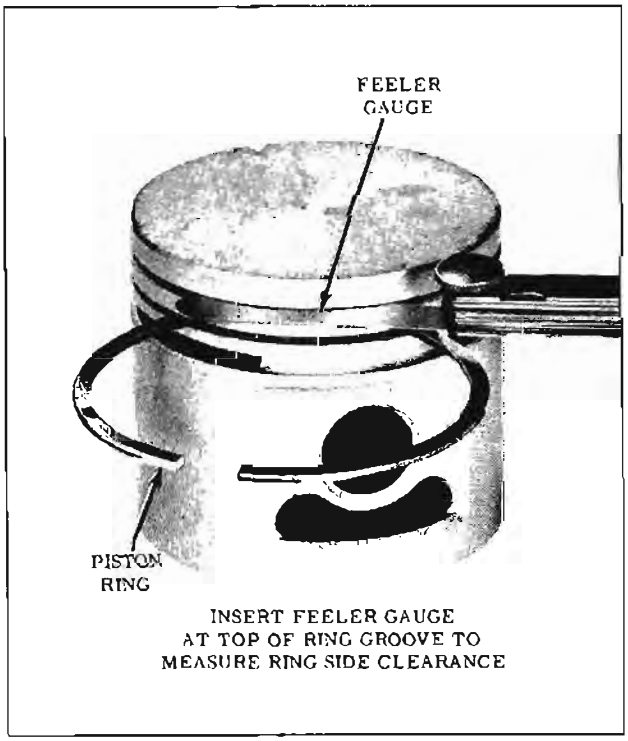


Fig. 8-130 Piston Ring Side Clearance

Side Clearance

Each ring must be checked for side clearance (see chart) in its respective piston groove by inserting a feeler gauge between the ring and its upper land. (Fig. 8-130) The piston grooves must be cleaned before checking ring for side clearance.

NOTE: To check oil ring side clearance, the oil rings must be installed on the piston.

ALLOWABLE SIDE CLEARANCE

Oil Rings	.0005" to .0055"
Compression Ring	.003" to .005"

Ring Installation

IMPORTANT: For service ring specification and detailed installation instructions, refer to the instructions furnished with the parts package.

ROD AND PISTON ASSEMBLY

Installation

1. Install connecting rod bolt guide Tool BT-8822 over rod bolt threads. (Fig. 8-124)
2. Apply SAE 10W30 oil to rings and piston,

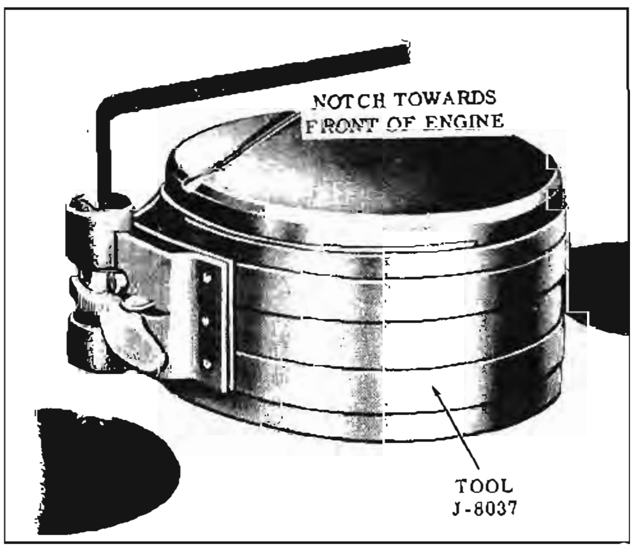


Fig. 8-131 Piston Ring Compressor

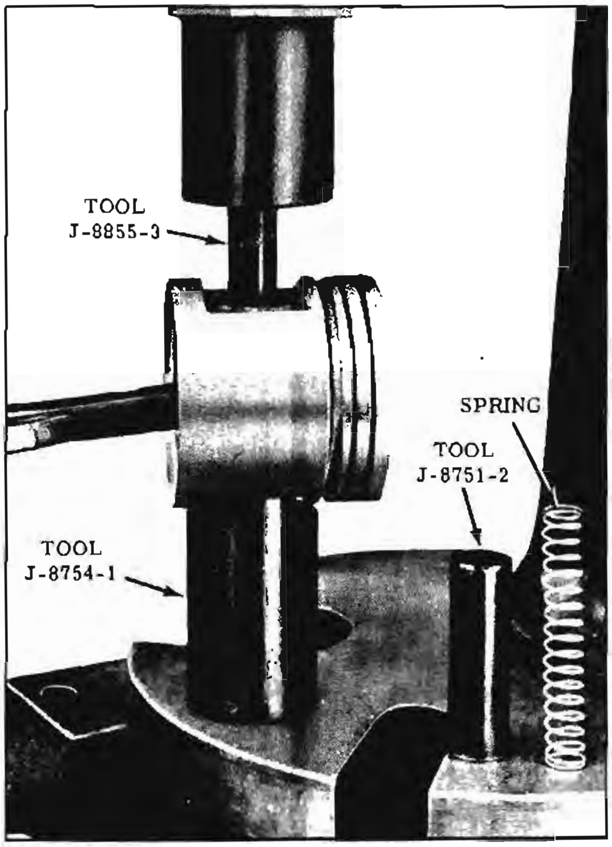


Fig. 8-132 Removing Piston Pin

then install piston ring compressing tool on piston. (Fig. 8-131)

3. Install assembly in its respective cylinder bore so notch cast in top of piston is towards the front of engine.

4. Lubricate the crankshaft journal with new SAE 10W30 oil and install connecting rod bearing and cap, with bearing index tang in rod and cap on same side.

   NOTE: When more than one rod and piston assembly is being installed, the connecting rod cap attaching nuts should only be tightened enough to keep each rod in position until all have been installed. This will facilitate installation of remaining piston assemblies.

   The clearance between the adjacent rods when checked with a feeler gauge on each crankpin should be from .002" to .011".

5. Torque rod bolt nuts 30-35 ft. lbs.

PISTON PINS

The correct piston pin fit in the piston is .0003" to .0005" loose. If the pin to piston clearance is to the high limit (.0005"), the pin can be inserted in the piston with very little hand pressure. The pin will fall through the piston by its own weight.

It is important that the piston pin hole be clean and free of oil when checking pin fit. The pin is a press fit in the connecting rod.

Whenever the replacement of a piston pin is necessary, use the following procedure.

Removal

1. Place piston on piston pin remover Tool J-8754-1, with the letter "F" on piston facing up.

2. Place Remover Tool J-8855-3 in piston pin as shown in Fig. 8-132, and press pin out.

Installation

1. Place spring and guide stop Tool J-8751-2 in main body Tool J-8754-1. (Fig. 8-133)

2. Place piston on Tool J-8754-1 with letter "F" facing up. Refer to Fig. 8-134 for correct rod and piston assembly.

3. Coat piston pin with SAE 10W30 oil. Place pin in piston as shown in Fig. 8-135. Press in piston pin with Tool J-8855-3 until it makes contact with guide stop Tool J-8751-2 in main body Tool J-8754-1. This will automatically center the pin in the piston. Pin to connecting rod fit is .0007" to .0013" tight.

CRANKSHAFT PULLEY

Removal

1. Remove belt(s). Remove fan.

2. Hoist car.

3. Remove six (6) pulley bolts, reinforcement plate and pulley. Air conditioning equipped cars do not have a reinforcement plate.

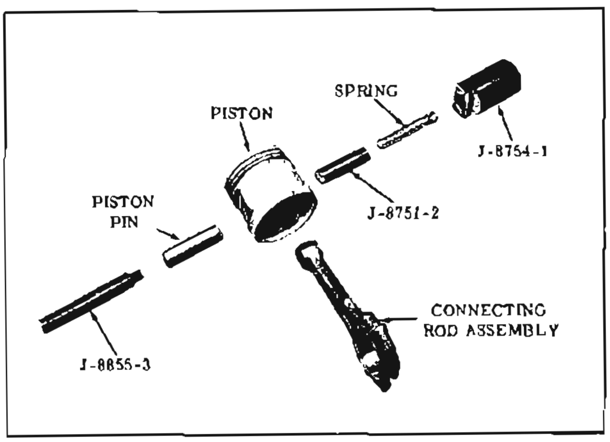


Fig. 8-133 Tool J-8754

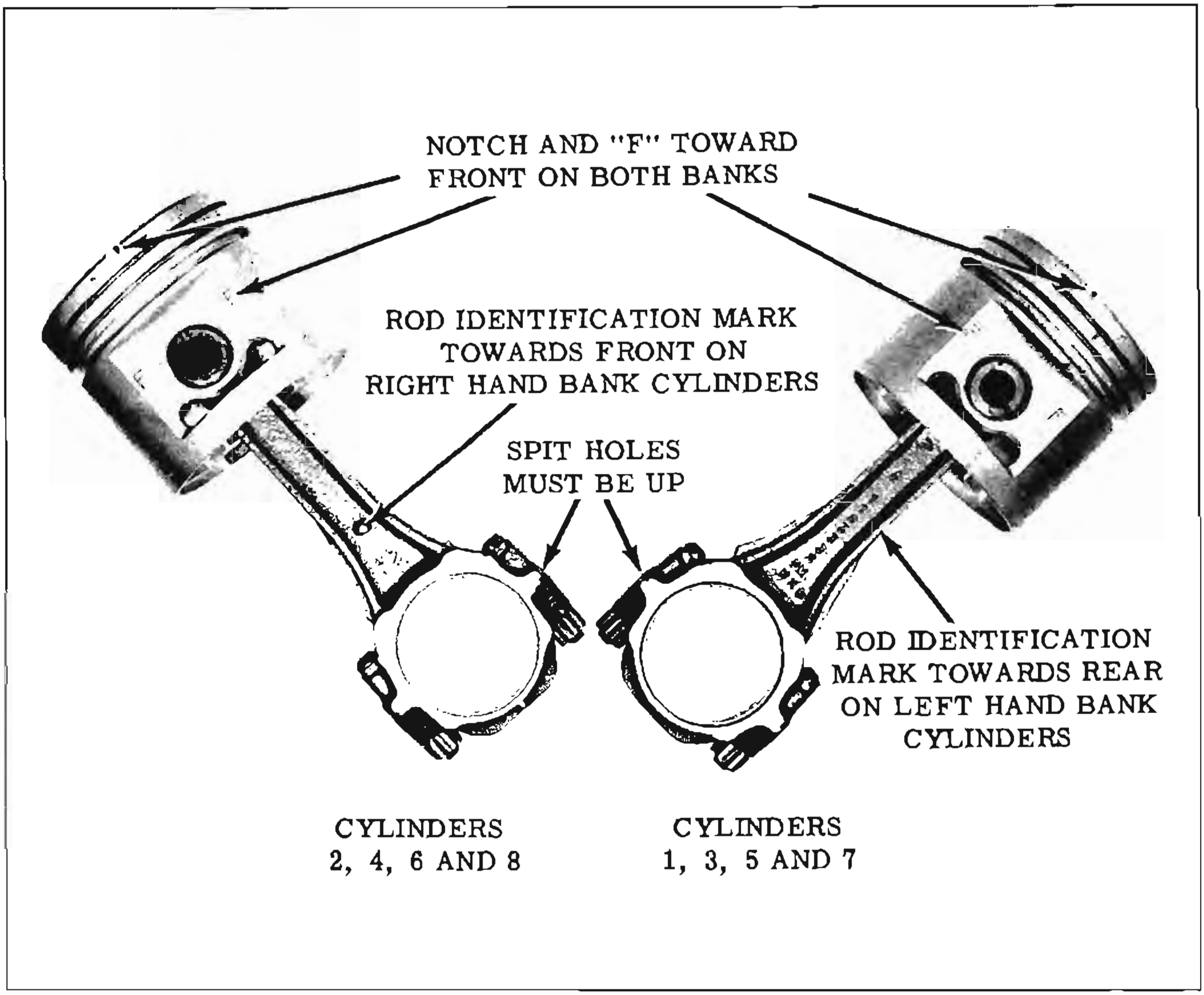


Fig. 8-134 Piston and Connecting Rod Assembly

Installation

1. Install pulley, reinforcement plate and six (6) bolts. Torque 15-20 ft. lbs.
2. Install fan pulley and fan.
3. Install belt(s). Adjust belts using Tool BT-33-70.

CRANKSHAFT BALANCER

Removal

1. Remove belts. Remove fan and fan pulley.
2. Remove crankshaft balancer bolt and washer.
3. Remove balancer.

NOTE: All crankshaft balancers, original and service replacements are balanced individually before being installed. After the balancer is attached to the crankshaft, the engine and the balancer are balanced as an assembly. This is accomplished by inserting a balancing pin or pins, if necessary, into the holes provided along the outer circumference of the balancer. These pins are not staked.

When installing a service replacement balancer it is essential that the balancer be in balance with the engine. If there are no balancer pins in the original balancer, the new balancer may be installed as is. If balance pin or pins are found on the original balancer, proceed as follows:

a. Lay new and old balancer with keyway in relative position. (Fig. 8-136)

b. Remove balancing pin(s), if any, from old balancer and install in corresponding hole(s) in new balancer.

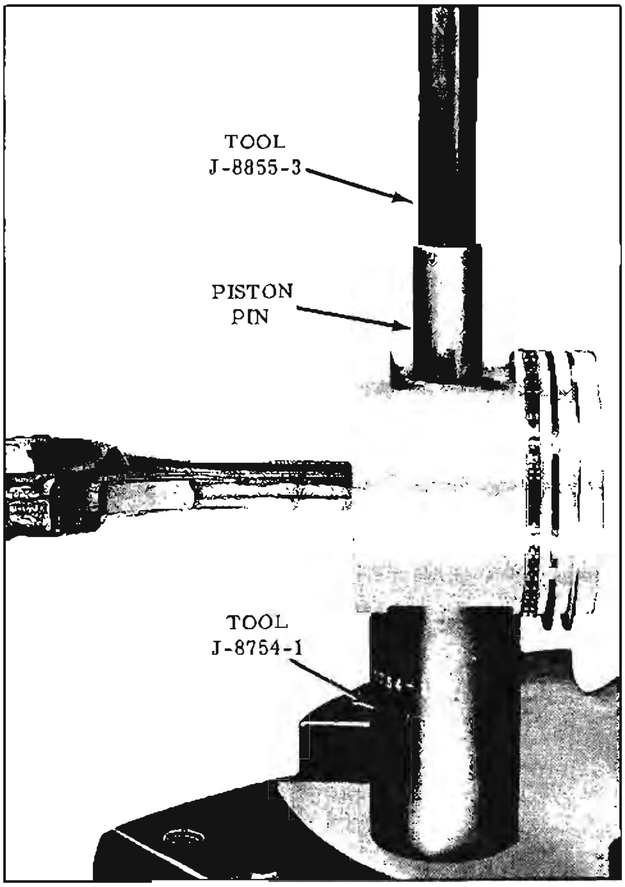


Fig. 8-135 Installing Piston Pin

4. Install pulley and reinforcement plate on hub of balancer, then align small holes in plate and pulley with the bolt holes in balancer.

5. Install six (6) pulley bolts and torque 15-20 ft. lbs.

Installation

1. Apply P.O.B. No. 3 Sealer to inside diameter of pulley and to crankshaft key to prevent possible oil leakage. Coat outside area of crankshaft pulley which enters seal with special seal lubricant.

2. Install pulley balancer assembly on crankshaft.

3. Install pulley balancer assembly washer and bolt. Torque 140-160 ft. lbs.

4. Install belt(s). Use Tool BT-33-70 and adjust.

FRONT COVER

Removal

1. Drain cooling system.

2. Disconnect heater hose, by-pass hose, and both radiator hoses. Disconnect oil pressure switch wire.

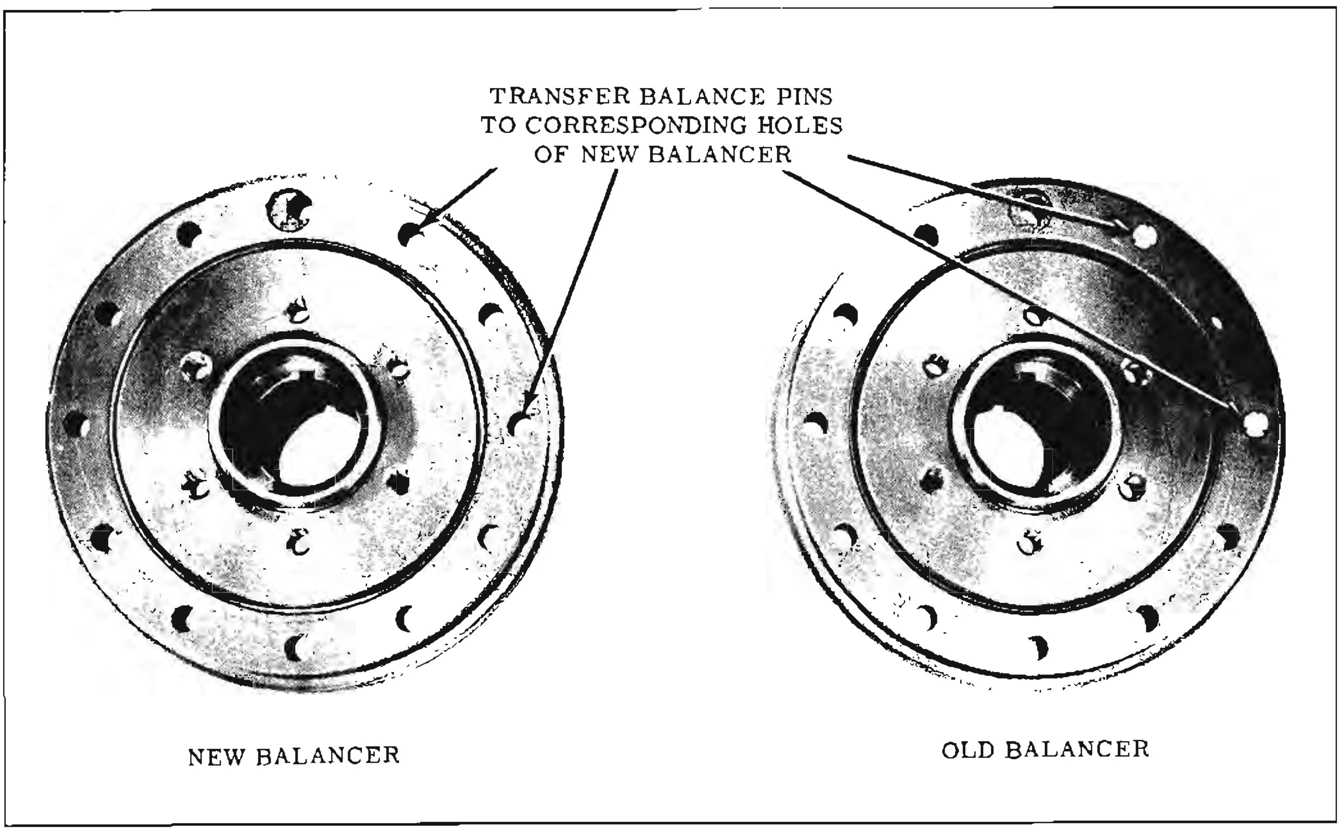


Fig. 8-136 Crankshaft Balancer Pins

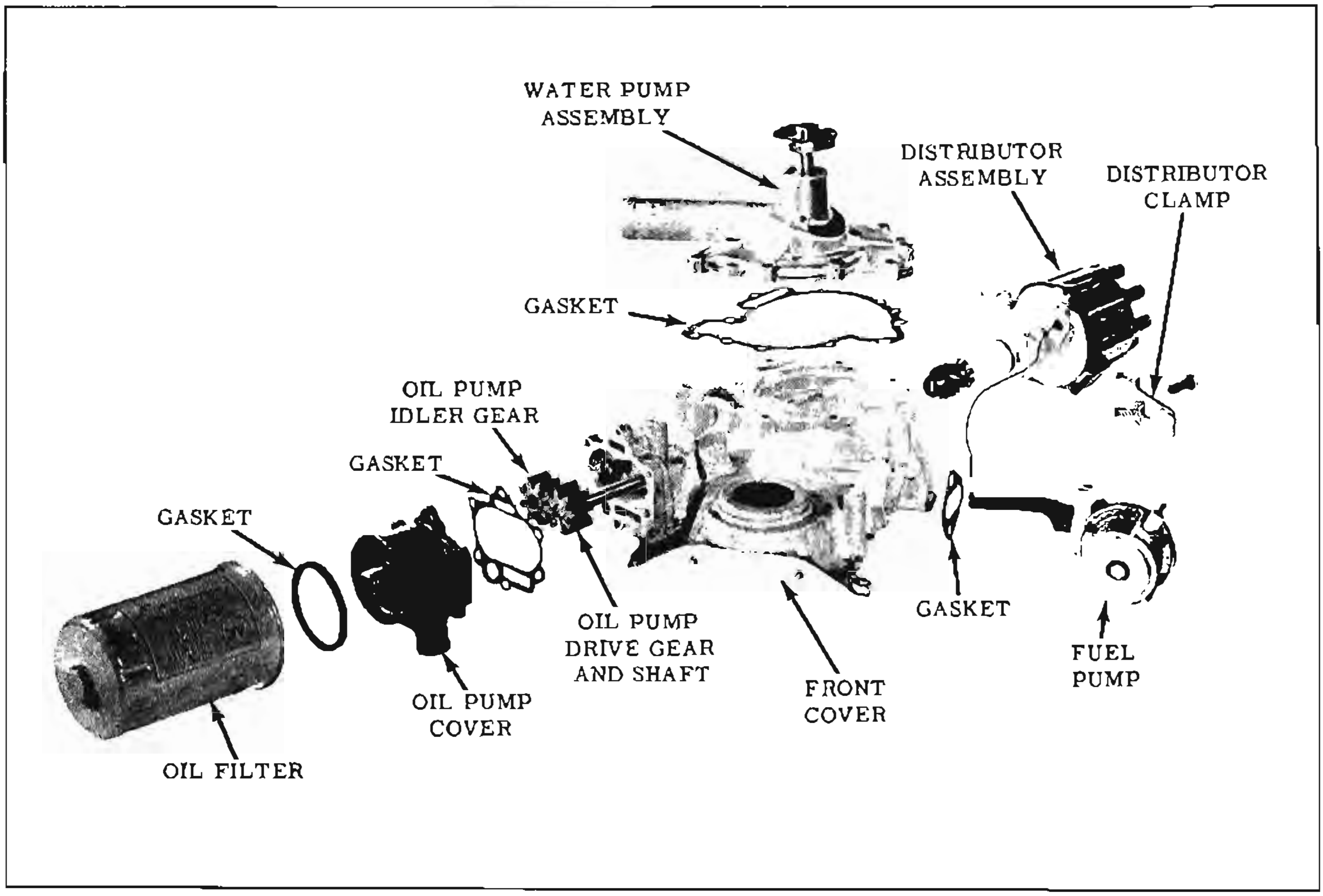


Fig. 8-137 Engine Front Cover

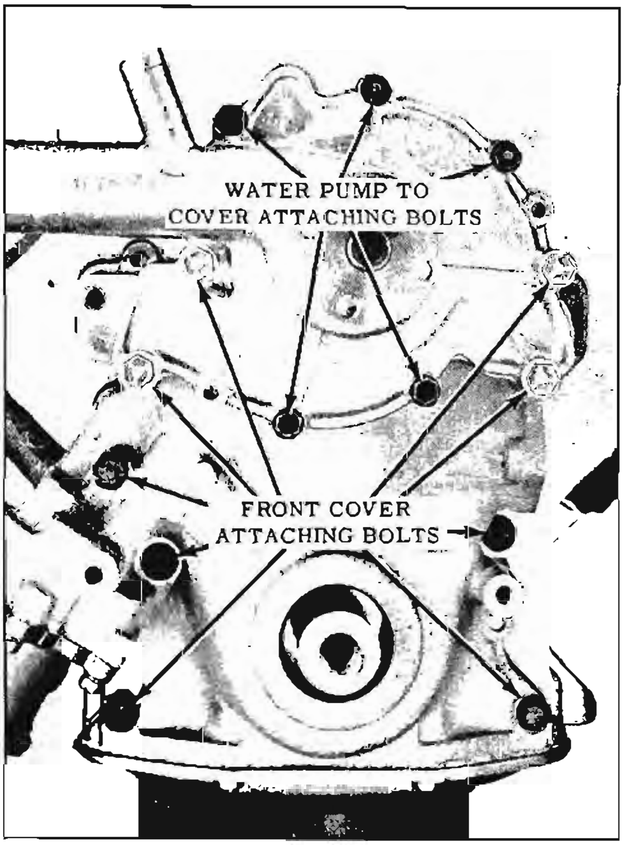


Fig. 8-138 Engine Front Cover Bolts

3. Remove crankshaft pulley, fan and fan pulley, and all belts.

4. Remove distributor cap, vacuum hose, Delcotron and mounting bracket.

5. Remove distributor.

6. Remove fuel pump hoses and fuel pump.

7. Remove oil pan.

8. Remove nine (9) cover to block attaching bolts and remove cover. (Fig. 8-138)

Installation

IMPORTANT: Whenever the front timing chain cover is removed it will be necessary to remove the oil pump cover and pack the space around the oil pump gears COMPLETELY FULL of petrolatum. This step is very important as the oil pump may lose its prime when the cover is removed. If the pump is not packed, it may not begin to pump oil as soon as the engine is started.

1. Install new cover gasket. Apply P.O.B. No. 2 to gasket and place on block.

2. Install front cover.

3. Apply SAE 10W30 oil to bolts and install. Torque bolts evenly 20-25 ft. lbs.

4. Apply seal lubricant on pulley seal surface.

5. Install pulley and pulley bolt. Torque 140-160 ft. lbs.

6. Connect oil pressure switch.

7. Install Delcotron, mounting bracket and adjusting link.

8. Install new fuel pump gasket using P.O.B. No. 2. Apply special seal lubricant on fuel pump arm.

9. Apply SAE 10W30 oil to 2 fuel pump attaching bolts and install. Torque 20-25 ft. lbs.

10. Connect fuel lines.

11. Install distributor. (See ENGINE TUNE-UP SECTION for engine timing)

12. Connect distributor vacuum advance hose and primary lead.

13. Install distributor cap and wires.

14. Connect heater hose, by-pass hose and heater hoses.

15. Install fan pulley, fan and four (4) attaching bolts.

16. Torque bolts 15-20 ft. lbs.

17. Install belts and adjust using Tool BT-33-70.

18. Install oil pan.

19. Fill radiator and crankcase.

OIL PUMP

Removal

1. Disconnect pressure switch wire.

2. Clean all dirt away from pump to front cover joint. Also, around oil filter joint.

3. Remove oil filter.

4. Remove six (6) pump cover to front cover attaching screws.

5. Remove cover carefully as idler gear may fall out. Slide out idler and oil pump drive gears.

Disassembly

1. Remove oil filter by-pass valve cap. (Cap with pressure switch.) (Fig. 8-139)

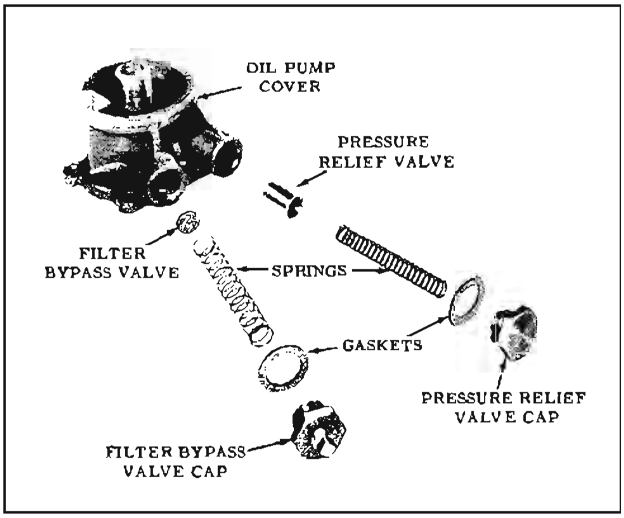


Fig. 8-139 Pump Assembly

2. Remove oil filter by-pass spring and valve.

3. Remove oil pressure valve cap and spring.

4. Remove pressure regulator valve by tapping housing in palm of hand.

Cleaning and Inspection

1. Wash all parts in clean solvent and blow out passages with compressed air.

2. Inspect all parts for scoring. Small imperfections may be cleaned up with crocus cloth. DO NOT BREAK EDGES OF VALVE.

3. Check cover bore for cracks, nicks or warping.

4. Check pressure relief valve clearance in bore. Clearance should be .0015" to .0035". Too much clearance can affect oil pressure at idle. (The oil pressure warning light on the instrument panel is calibrated to light when oil pressure is less than 3 lbs.)

5. Check clearance of gears. End clearance of gears should be .0015" to .0075".

Assembly

1. Install filter by-pass valve into output passage bore (this is the passage with inside diameter ribs) seating squarely in bottom of passage.

2. Install spring (light weight), gasket and cap, replace gasket if damaged.

3. Install pressure regulator valve (flat end first), pressure regulator spring, gasket and oil pressure regulator cap.

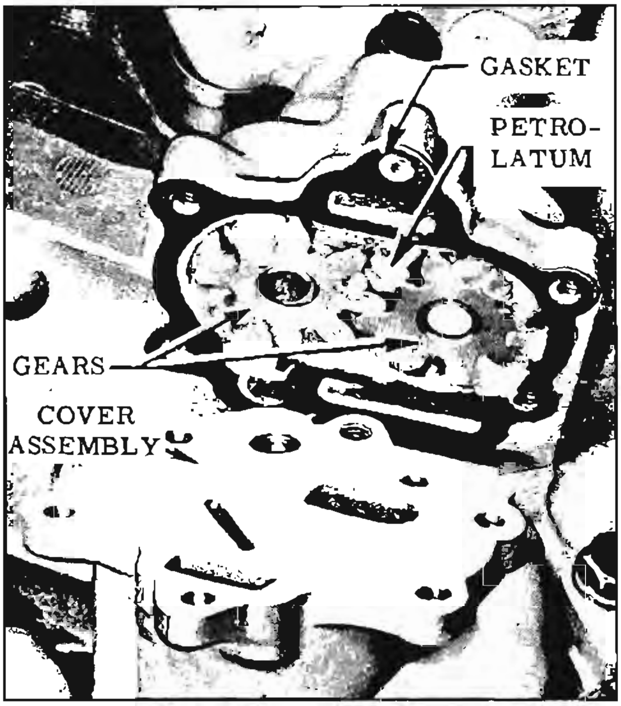


Fig. 8-140 Packing Oil Pump

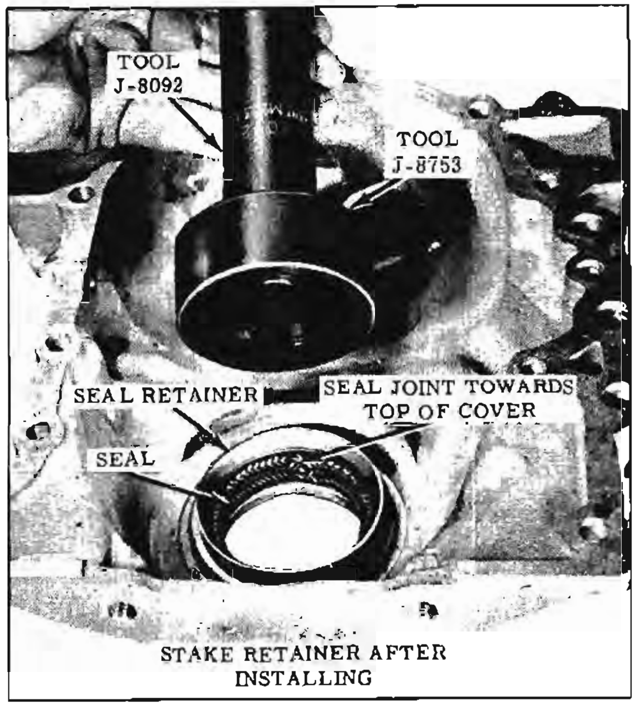


Fig. 8-142 Installing Front Seal

4. Torque caps 30-35 ft. lbs.

5. Install pump drive gear and idler gear.

6. Install new pump cover gasket.

7. Fill gear pocket with petrolatum and force into every cavity of the gear pocket. Also between teeth of gears. (Fig. 8-140)

   NOTE: This step is very important. To assist in instant priming when engine is started, unless pump is packed with petrolatum, it may not prime itself when engine is started.

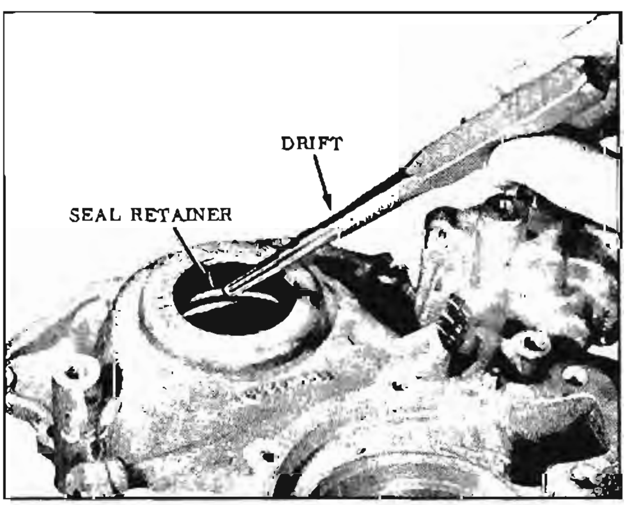


Fig. 8-141 Removing Front Oil Seal

OIL SEAL

Removal

1. Remove front cover.

2. Lay front cover flat on bench.

3. Remove seal retainer with drift. (Fig. 8-141)

Installation

1. Assemble seal in retainer.

2. Support front cover on block of wood. Apply P.O.B. No. 4 sealer to outside of seal retainer.

3. Place seal and retainer in cover with seal joint towards top of cover, and install with Tool J-8753 until seated. Stake retainer securely. (Fig. 8-142)

4. Place Tool J-8753-2 in seal and push tool a little at a time from both sides of the seal until tool goes through seal. (Fig. 8-143)

TIMING CHAIN AND GEARS

(With Front Cover Removed)

Removal

1. Remove distributor drive gear bolt, washer and gear from end of camshaft.

2. Remove fuel pump eccentric.

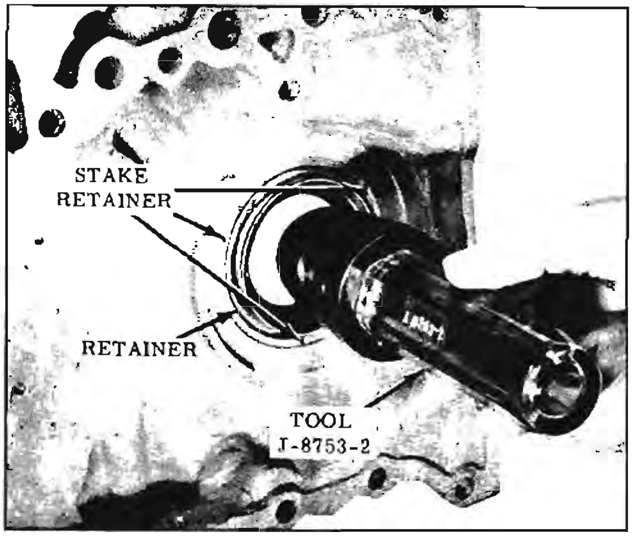


Fig. 8-143 Sizing Front Seal

3. Remove crankshaft gear, chain, and cam gear together by prying off crankshaft gear.

Installation

1. Install camshaft gear, crankshaft gear, and timing chain together to align timing marks. (Fig. 8-144)

2. Install fuel pump eccentric with flat side rearward, distributor drive gear, washer and bolt. Torque bolt 40-45 ft. lbs. (Fig. 8-145)

3. Install oil slinger.

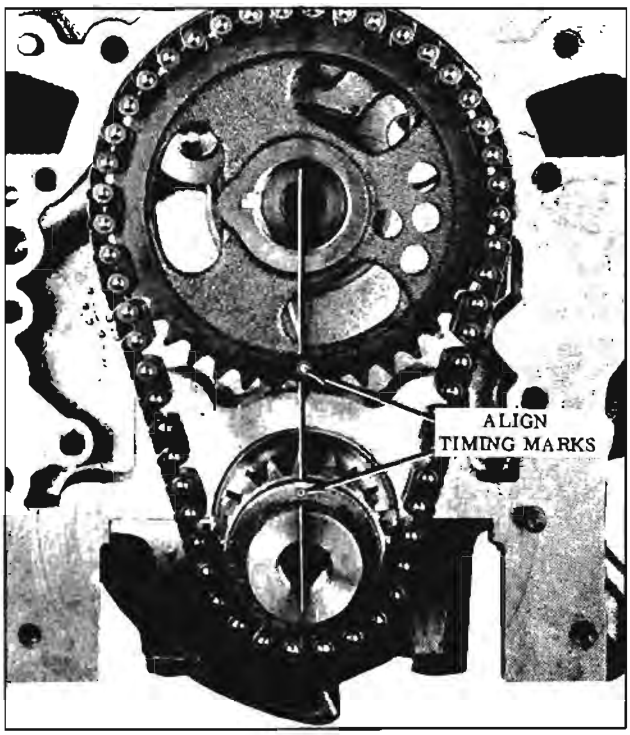


Fig. 8-144 Timing Gear Positions

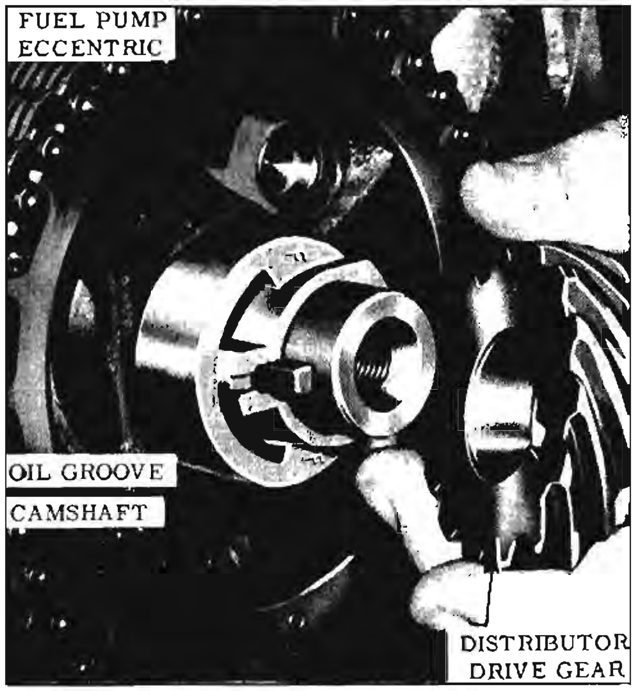


Fig. 8-145 Fuel Pump Eccentric

CAMSHAFT

Removal

1. Remove grille.

2. Remove radiator. If equipped with air conditioning, it will be necessary to remove the condenser.

3. Remove front cover.

4. Remove timing chain and gears.

5. Remove intake manifold.

6. Remove rocker arm assembly, push rods and valve lifters.

7. Remove camshaft by carefully sliding it out the front of the engine.

Installation

NOTE: To insure proper camshaft installation and to provide initial lubrication, it is extremely important that whenever a camshaft is installed it must first be coated liberally with SAE 10W-30 mixed with G.M. Concentrate, Part No. 582099.

1. Install camshaft CAREFULLY.

2. Install valve lifters, push rods, and rocker arm assemblies.

3. Install intake manifold.

4. Install timing chain and gear, and front cover.

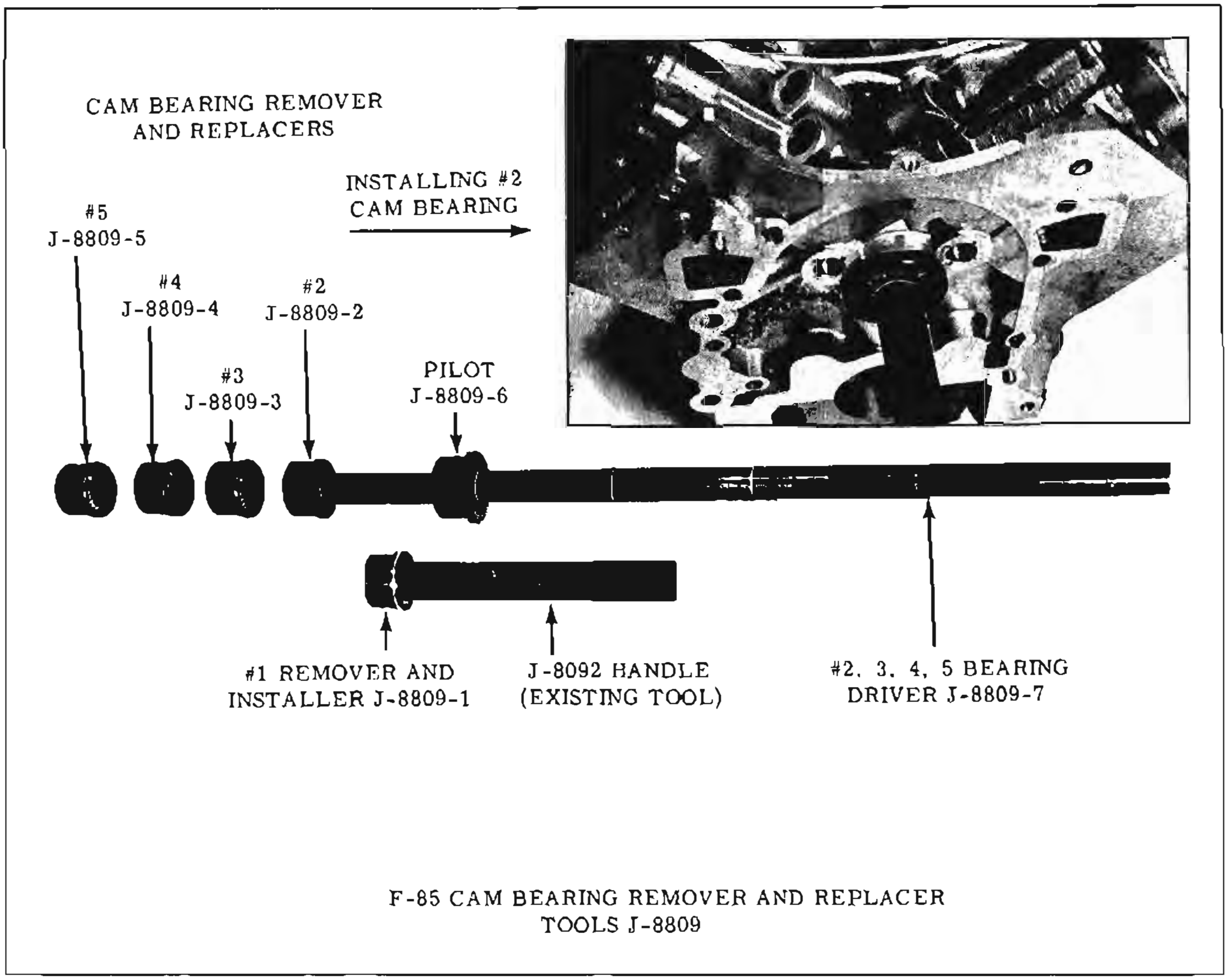


Fig. 8-146 Camshaft Bearing Tool

5. Install radiator (condenser, if so equipped) and grille.

CAMSHAFT BEARINGS

The camshaft bearings must be replaced in complete sets. All bearings must be removed before any can be installed. Number 1 bearing must be removed first, then number 2, then 3, 4 and 5. When installing the bearings, number 5 must be installed first, then number 4, 3, 2 and 1.

Included with the 1961 available tools is an F-85 Camshaft Bearing Remover and Installer Set J-8809 shown in Fig. 8-146.

This set can be used to remove cam bearings with the engine either in or out of the car. To replace bearings with engine in car, proceed as follows:

Removal

(Camshaft Removed)

1. Install #1 Cam Bearing Remover and Installer J-8809-1 on Handle J-8092 (existing tool) and drive out front cam bearing.

2. Place Pilot J-8809-6 on Driver J-8809-7 and install #2 Cam Bearing Tool J-8809-2 on driver and drive out #2 bearing.

3. Remove #3 and #4 bearings in the same manner, using #3 and #4 removers.

NOTE: Each cam bearing is a different diameter and the correct sequence must be used both for removal and installation.

4. To remove #5 bearing with engine in chassis, drill a 3/16" hole in web of block. Do not

Fig. 8-147 Removing Rear Cam Bearing

drill through bearing. As shown in Fig. 8-147, use a 1/8" pin punch to collapse the bearing for removal with needle nose pliers.

NOTE: If smaller punch is used, it will pierce the bearing and bearing will not collapse.

When removing bearing with engine out of car, install #5 Bearing Tool J-8809-5 and drive out bearing and plug in rear of engine. Then use J-8809-5 to install new plug before replacing bearings.

Installation

NOTE: To aid in aligning bearings with oil passages, place each bearing in the front bore with tapered edge toward block and align the oil hole in the bearing with the center of the oil slot in the bore. Mark top of bearing with a pencil. When installing the bearings the pencil mark will act as a guide.

1. Place new #5 bearing on J-8809-5 and drive bearing in until the last white line on the driver is flush with the front face of the pilot.

2. Remove J-8809-5 Installer and install J-8809-4. Place #4 bearing on installer and drive in until second to last white line on driver is flush with pilot.

3. Follow same procedure to install #3 and #2.

   NOTE: Set-up shown in Fig. 8-146, inset is used to install #2 bearing.

4. Install Tool J-8809-1 on Handle J-8092 and place #1 bearing on installer. (The pilot is not used to install #1 bearing). Drive bearing in until white line on Installer J-8809-1 is flush with front face of block.

5. Reinstall previously removed parts.

   If the Tool J-8809 is not used the correct position of the bearings in the block is as follows. The front of No. 5 bearing is 18-7/32 inches from the front face of the block. No. 4 is 13-13/32 inches from the front, No. 3 is 9-11/64 inches from the front, No. 2 is 4-15/16 inches from the front, and No. 1 is 1/8 inch from the front.

CRANKSHAFT

Removal

It is recommended that the crankshaft be installed with the engine out of the chassis. In order to remove the crankshaft, the oil pan, front cover, connecting rods, transmission and flywheel must be removed from the engine.

The crankshaft may then be removed by marking the position of the five (5) main bearing caps and removing them.

Installation

1. Position upper half of main bearings in block and lubricate with SAE 10W30 oil.

2. Install a new rear main bearing seal and a new front seal.

3. After oil passages in crankshaft have been checked for being open and shaft is clean,

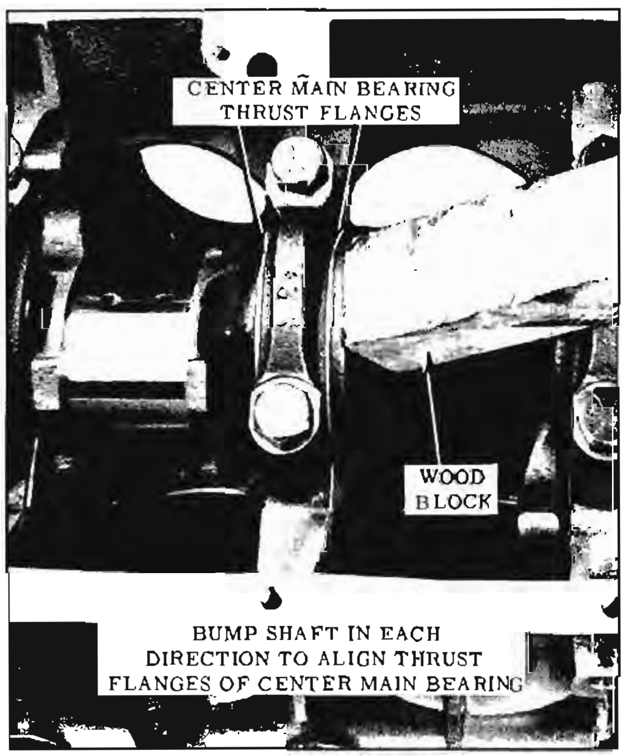


Fig. 8-148 Aligning Center Main Bearing Flanges

place shaft in block. Lubricate thrust flanges of the center bearing with 767196 lubricant. Install caps with lower half of bearing lubricated with SAE 10W30 oil. Lubricate cap bolts with Part No. 980131 and install, but do not tighten.

4. With a block of wood (Fig. 8-148) bump shaft in each direction to align thrust flanges of center main bearing.

5. Torque main bearing cap bolts 65-70 ft. lbs.

6. Reassemble engine and install in chassis.

MAIN BEARINGS

Main bearing clearance must not exceed .0035" on all bearings. The .0035" clearance is permissible only if the engine is disassembled for other than a bearing noise condition. If bearings are noisy or if a visual inspection indicates defective bearings, new bearings must be installed within the specifications outlined under MAIN BEARINGS - REPLACE.

Bearings which fall within the .0035" specification should not be rejected if the bearings show a normal wear pattern or slight radial grooves, unless it has been established to be defective.

Checking Bearing Clearances

1. Remove bearing cap and wipe oil from crankshaft journal and outer and inner surfaces of bearing shell.

2. Place a piece of plastigauge in the center of bearing.

3. Use a floor jack or other means to hold crankshaft against upper bearing shell. This is necessary to obtain accurate clearance readings when using plastigauge.

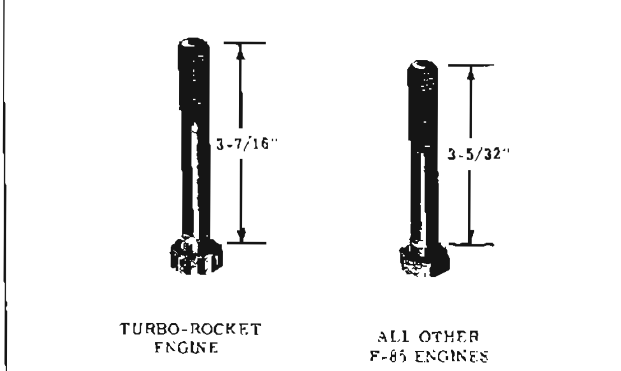


Fig. 8-149 Main Bearing Cap Bolts

4. Reinstall bearing cap and bearing. Place Part No. 980131 lubricant on cap bolts and install. Torque 65-70 ft. lbs.

5. Remove bearing cap and determine bearing clearance by comparing the width of the flattened plastigauge at its widest point with the graduation on the plastigauge container. The number within the graduation on the envelope indicates the clearance in thousandths of an inch. (Fig. 8-126) If this clearance is greater than .0035", REPLACE BOTH BEARING SHELLS AS A SET. Recheck clearance after replacing shells. (Refer to MAIN BEARINGS-REPLACE)

Main Bearings—Replace

Main bearing clearances not within specifications (.0008" to .0024") must be corrected by the use of selective upper and lower shells. UNDER NO CIRCUMSTANCES should the use of shims behind the shells, to compensate for wear, be attempted.

IMPORTANT: The upper and lower shells must be installed in pairs. Sizes of the bearings are located on the tang. (Fig. 8-150)

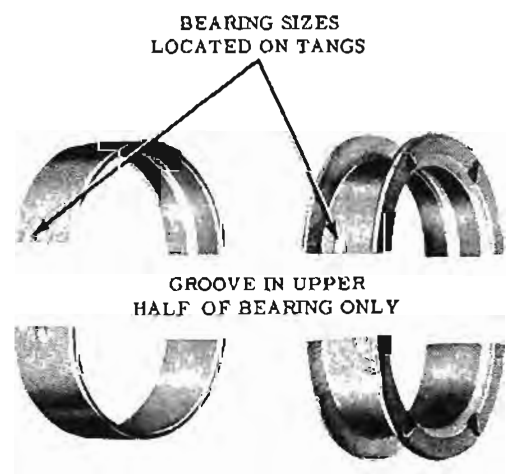


Fig. 8-150 Main Bearing Size Location

To install main bearing shells, proceed as follows:

1. Remove bearing cap and remove lower shell.

2. Insert a flattened cotter pin or roll out pin in the oil passage hole in the crankshaft, then

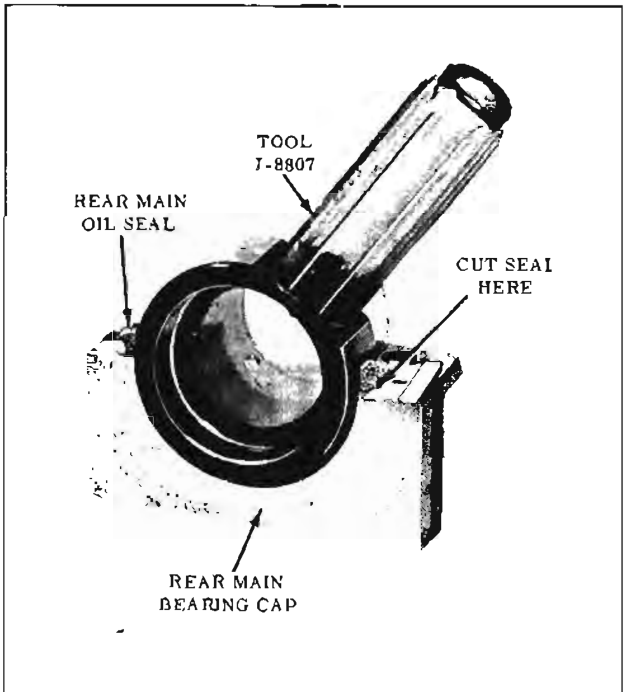


Fig. 8-151 Installing Rear Oil Seal

rotate the crankshaft in the direction opposite to cranking rotation. The pin will contact the upper shell and roll it out.

3. The main bearing journals should be checked for roughness and wear. Slight roughness may be removed with a fine grit polishing cloth saturated with SAE 10W30 oil. Burrs may be removed with a fine oil stone. If the journals are scored or ridged, the crankshaft must be replaced or reground.

   NOTE: The journals can be measured for out-of-round with the crankshaft installed by using a crankshaft caliper and inside micrometer or a main bearing micrometer. The upper bearing shell must be removed when measuring the crankshaft journals. Maximum out-of-round of the crankshaft journals must not exceed .0015".

4. Clean crankshaft journals and bearing caps thoroughly before installing new main bearings.

5. Apply Special Lubricant (Part No. 567196) to the thrust flanges of bearing shells on No. 3 bearing.

6. Place new upper shell on crankshaft journal with locating tang in correct position and rotate shaft to turn it into place using cotter pin or roll out pin as during removal.

7. Place new bearing shell in bearing cap.

8. No. 5 bearing - install new asbestos oil seal in the rear main bearing cap. (REAR MAIN BEARING OIL SEAL) (Fig. 8-151)

9. Install bearing caps, lubricate bolt threads with Part No. 980131 lubricant and install. Torque 65-70 ft. lbs.

REAR MAIN OIL SEALS

Removal

1. Remove oil pan.
2. Remove the rear main bearing cap.
3. Remove bearing insert and old seals.
4. Clean bearing cap and seal grooves and inspect for cracks.

Installation

1. Install seal into bearing cap, packing by hand.

2. Using Seal Installer J-8807, hammer seal into groove. (Fig. 8-151)

   NOTE: To check if seal is fully seated in the bearing cap, slide Tool J-8807 away from seal. With Tool J-8807 fully seated in the bearing cap, slide tool against the seal. If under cut area of tool slides over the seal, the seal is fully seated. If tool butts against the seal, the seal must be driven further into the seal groove. Rotate tool before cutting off excess seal packing. (Fig. 8-151.)

3. Hold Tool J-8807 as in Fig. 8-151. Cut seal 1/16" from bearing surface. Taper end of seal into a point. With screwdriver, pack seal fibers towards center, away from edges. Rotate seal installer to cut seal between notch and handle.

4. Install two side bearing cap seals, leaving seal extended on each side of cap.

5. Coat back of insert with light film of oil and install in bearing cap.

6. Clean crankshaft bearing journal and seal contact.

7. Install bearing cap guide pins.

8. Install bearing cap into place by tapping with block of wood.

9. Remove guide pins.

10. Apply Part No. 980131 lubricant to cap bolts. Torque bolts 65-70 ft. lbs.

11. Do not trim ends of side seals.

12. Install pan with new gasket.

13. Install lower flywheel cover.

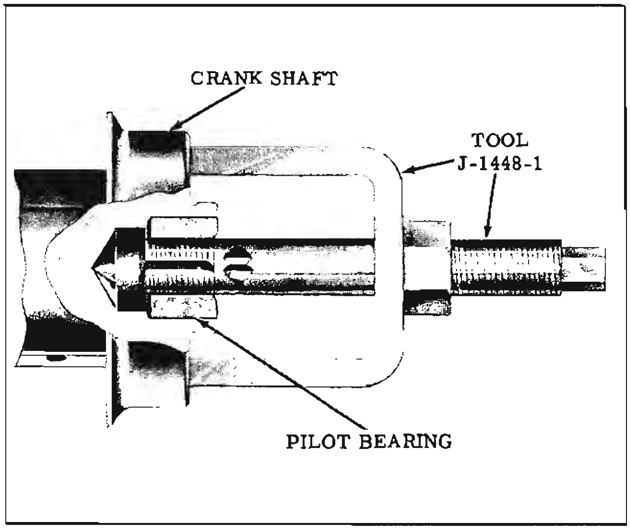


Fig. 8-152 Removing Pilot Bearing

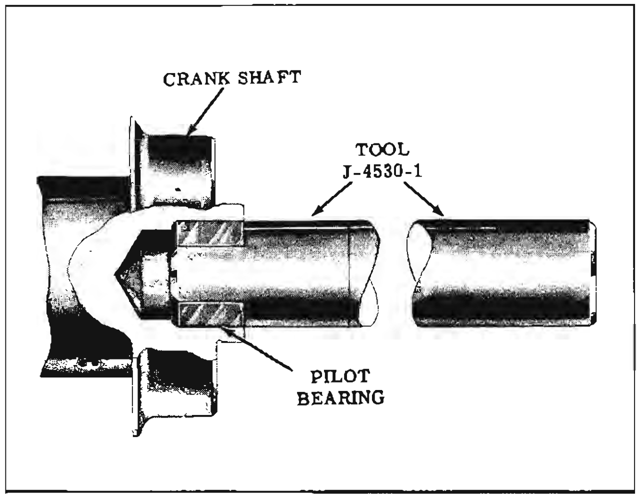


Fig. 8-153 Installing Pilot Bearing

PILOT BEARING (SYNCRO-MESH)

On Synchromesh equipped cars a pilot bearing is located in a bore in the rear end of the crankshaft.

When removing the pilot bearing, remove with Pilot Bearing Puller J-1448-1. (Fig. 8-152). All old lubricant in the reservoir behind the bearing should be removed.

Install the new bearing using Tool J-4530-1, (Fig. 8-153). Add 1/4 ounce (level tablespoonful) of front wheel bearing grease to the reservoir.

FLYWHEEL

One bolt hole in the flywheel is offset and it will attach to the crankshaft in only one position.

All flywheels, original and service replacement, are balanced individually. This is accomplished by inserting and staking a balancing pin or pins, if necessary, into the holes provided along the outer circumference of the flywheel. These staked balance pins are not to be removed. After the flywheel is attached to the crankshaft, the engine and flywheel are again balanced as an assembly and, if necessary, additional balancing pins are installed in the flywheel. These pins are not staked.

When installing a service replacement flywheel, it is essential that the flywheel be balanced with the engine. If there are no unstaked balance pins in the original flywheel, the new flywheel may be installed on the crankshaft as is. If unstaked balance pins are found on the original flywheel, proceed as follows:

1. Position the original flywheel over the new flywheel and align the flywheel to crankshaft attaching bolt holes.

2. Mark the position of the unstaked balancing pins on new flywheel.

3. Transfer the balancing pins from the original flywheel to the new flywheel in the holes marked. (Fig. 8-154)

   NOTE: If an unstaked pin cannot be installed in the exact position as the original due to the presence of a staked pin, insert the pin into an adjoining hole on either side of the staked pin.

Flywheel Ring Gear

The flywheel ring gear may be replaced if damaged. Drill two 3/16" holes in the gear, and then split with a sharp chisel.

Heat the new gear with a torch and place in position on the flywheel. As the gear cools, it will become tight on the flywheel.

Flywheel Damper

A flywheel damper is used on Hydra-Matic equipped cars to drive the transmission. This damper is attached to the engine flywheel. (Fig. 8-155) It also assists in absorbing torsional vibrations.

When attaching the damper plate to the flywheel, the hub side must be out as shown in the figure.

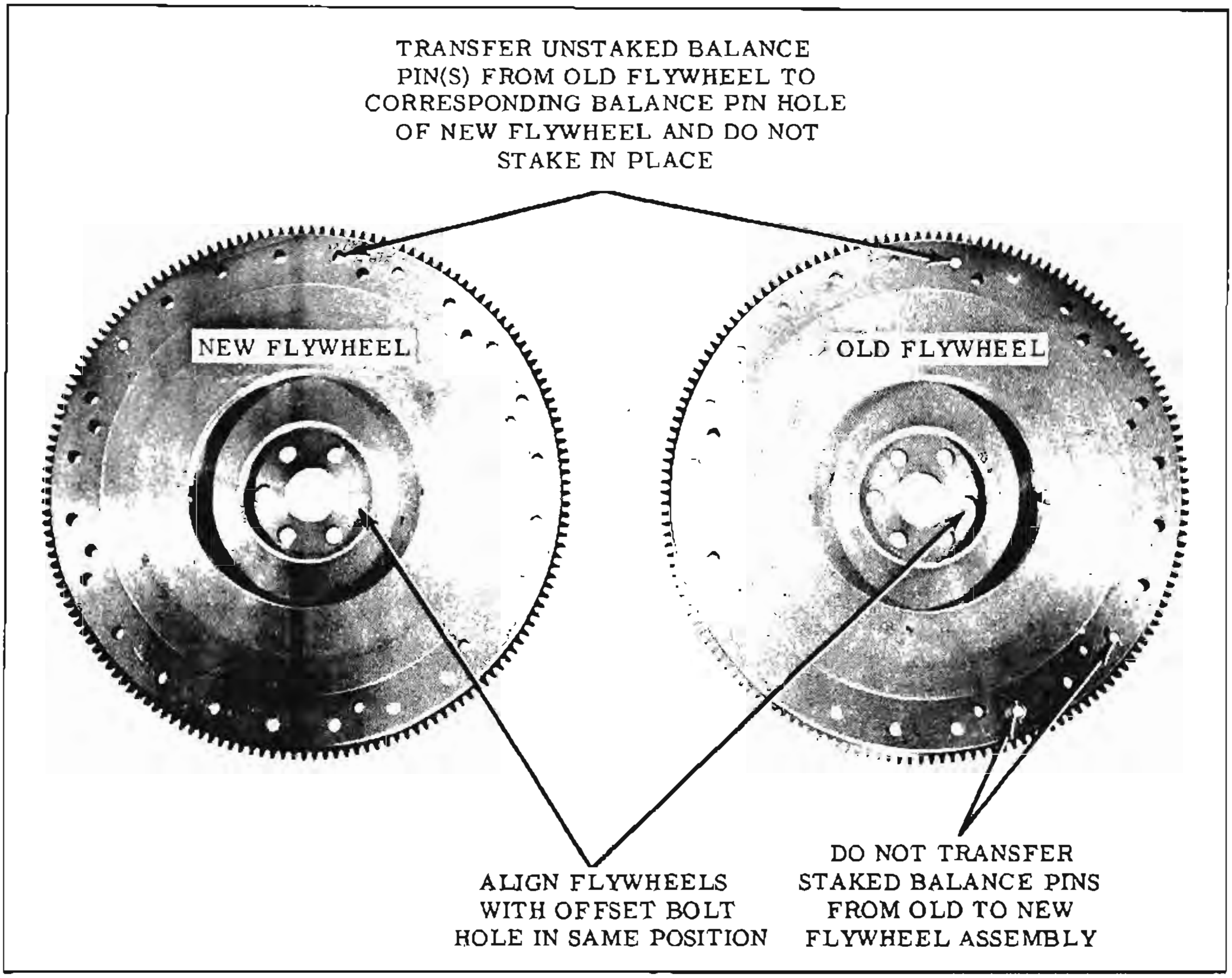


Fig. 8-154 Fly Wheel Balance Pins

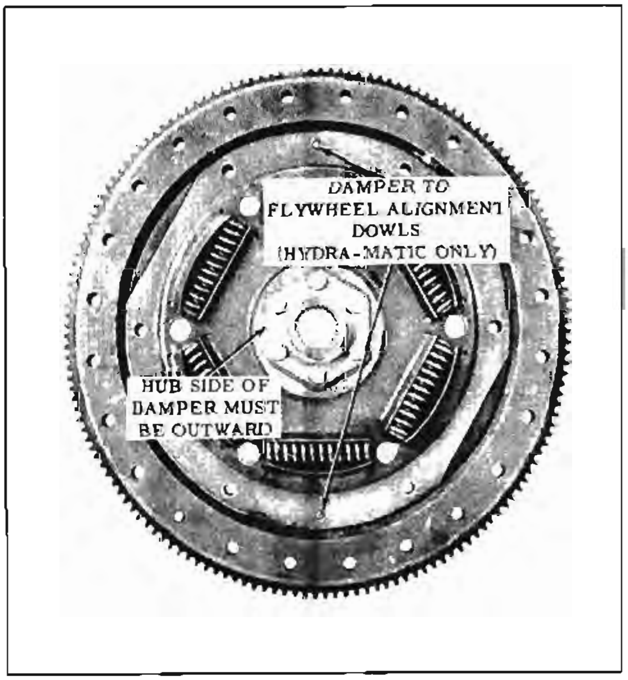


Fig. 8-155 Fly Wheel Damper

ENGINE MOUNTS

FRONT

Removal

1. Support engine with Tool J-8974. (Fig. 8-123)
2. Remove mount to cross bar bolt and engine mount bolts.

Installation

To install new mount, USING SAE 10W30 OIL ON BOLTS, bolt securely to engine block first, torque bolts 50-55 ft. lbs., then bolt to cross bar and torque bolt 55-65 ft. lbs.

REAR (TRANSMISSION MOUNT)

Removal

The rear mount is commonly referred to as the rear transmission mount or the rear engine mount.

It can be removed by:

1. Removing mount to support bar bolts.
2. Removing mount to transmission rear bearing retainer bolts.
3. Raise rear of transmission slightly and remove mount.

When installing, torque mount to transmission rear bearing retainer bolts 30-40 ft. lbs. and mount to support bar bolts 20-34 ft. lbs.

ENGINE OIL LEAKS

In cases where the engine oil leaks cannot be located visually, the use of Oil Red or Blacklight should be used.

To use Oil Red, drain one quart (minimum) of oil from the engine, then mix 1 tablespoon of the Oil Red and the oil that was drained. Pour this mixture into the crankcase. Start engine and inspect for trace of colored oil. Oil Red is harmless to the engine.

Blacklight should be used when it cannot be determined whether the oil leak originates from the engine or the transmission. To use the Blacklight method, remove engine and transmission dipsticks to compare with a sample of oil from the location of the leak. By viewing the oil on the dipsticks with a sample under Blacklight, it can be determined which unit is leaking.

The Blacklight method can also be used to pin point leaks after the suspected area has been wiped clean of oil and the engine runs long enough to show up a leak. The oil will glow when viewed with Blacklight.

HELI-COIL REPAIRS

Damaged Thread Repair Using Heli-Coils

Threaded holes which have been damaged or stripped may be repaired using Heli-Coil inserts as described in the following procedures.

1. Drill out the old threads, bolt or stud, (if any), using the proper size drill as indicated on the instruction sheet in the Heli-Coil Kit. (Fig. 8-156)
2. Cut new threads using the proper Heli-Coil tap for the size thread being repaired. Use only the special taps furnished in the kit. (Fig. 8-157)
3. Installing inserts:

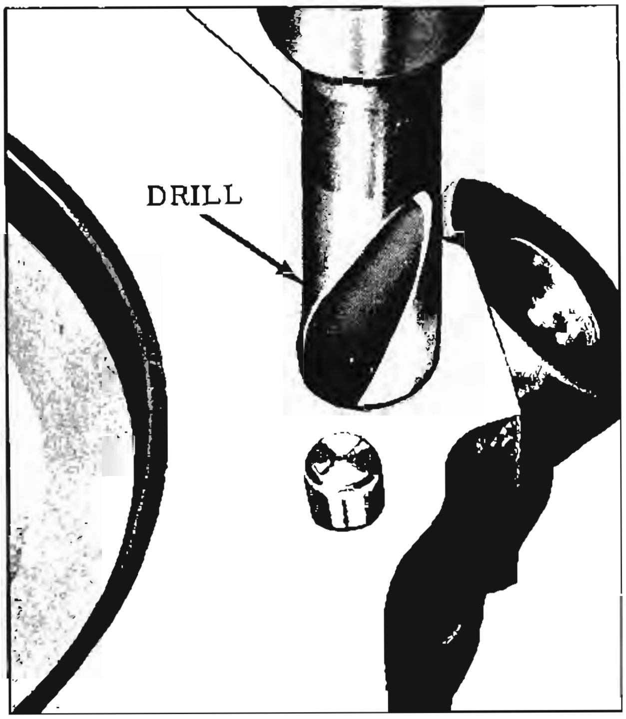


Fig. 8-156 Removing Damaged Threads

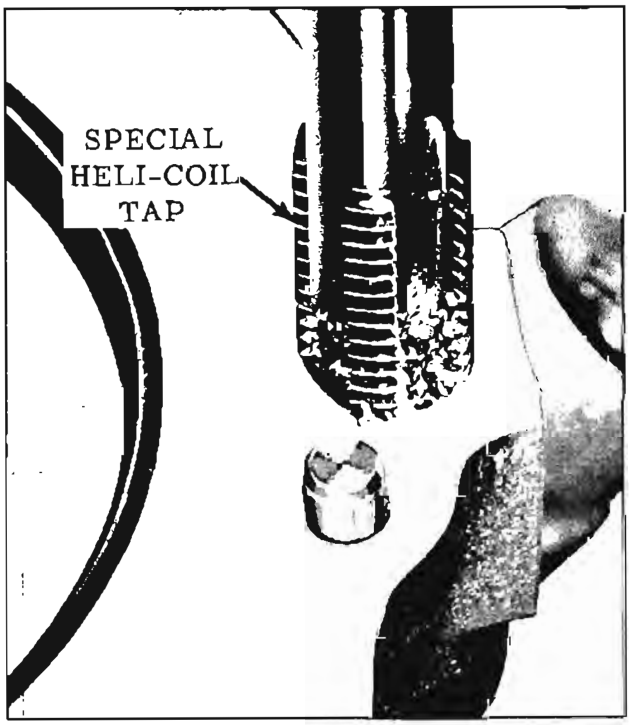


Fig. 8-157 Tapping New Threads

a. Using the proper size inserting tool on the "T" handle furnished, place an insert of the proper size over the top of the tool and engage the insert tang in the slot.

b. Place the tool and insert squarely over the hole. Using the pressure plate from kit, press the insert firmly into the mouth of the hole.

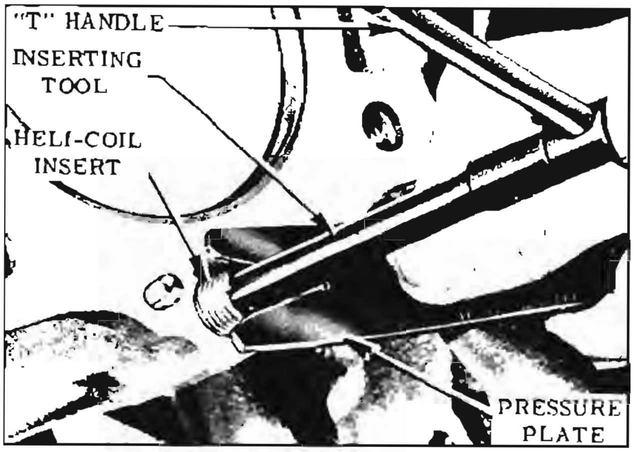


Fig. 8-158 Installing Insert

c. While maintaining pressure on the insert, turn it clockwise into the hole to engage the first 2 or 3 threads. DO NOT APPLY PRESSURE WITH THE INSERTING TOOL. Remove the pressure plate and continue the installation until the insert is 1/4 to 1/2 turns below the surface. (Fig. 8-158)

CAUTION: If insert starts to cross thread, remove the tool and back the inserts out with fingers or pliers. Retap the hole to be sure the threads are clear, then install a new insert as previously described. Cross threaded inserts should not be reused.

4. Removing tang:

   a. In deep blind holes or through holes, where the tang will not cause damage, withdraw the inserting tool enough to disengage the tang and turn 1/4 turn. With the tool bearing against the tang, strike the tool sharply with a hammer to remove the tang.

   b. Where tang is to be retrieved, use needle nose pliers and flex the tang in and out until it breaks off. Do not attempt to twist the tang off as this may rotate the insert.

5. Removing inserts.

   a. Notch the top coil, about 1/4 turn from the end, using a small triangular file.

   b. Place one edge of a 3-edge scraper in the notch. Turn counterclockwise maintaining a steady downward pressure until the insert is completely removed.

   c. Discard the insert. Retap the hole. Install a new insert.

ENGINE SPECIFICATIONS

CYLINDER BLOCK	
Engine Type	90° V-Type
Number of Cylinders	8
Bore and Stroke	
All Series	3.500" x 2.8"
Piston Displacement	
All Series	215 cu. in.
Compression Ratio	2 Bbl 8.75:1, 4 Bbl HMT 10.75:1, 4 Bbl SMT 10.25:1, 3147 10.25:1
Firing Order	1-8-4-3-6-5-7-2
Main Bearing Bore (Inside Diameter)	3.188" - 3.189"
CRANKSHAFT	
Diameter - Main Bearing Journal	
All	2.299" - 2.298"
Width - Main Bearing Journal, Including Fillets	
No. 1	1.052"
No. 3	1.062" - 1.064"
Nos. 2 and 4	1.055" - 1.065"
No. 5	1.085" - 1.095"
Diameter - Connecting Rod Bearing Journal	1.999" - 2.000"
Width - Connecting Rod Bearing, Including Fillets	1.698" - 1.702"
Length - Overall Crankshaft	23.510"
Diameter - Of Oil Holes in Crankshaft	.2188"
Clearance - Crankshaft End Thrust	.004" to .008"

ENGINE SPECIFICATIONS (Cont'd.)

MAIN BEARINGS

Oil Clearance - Crankshaft Vertical	
All	.0008" to .0024"
Width - Bearing Shaft	
Nos. 1, 2, 4 and 5	.797" - .807"
No. 3	1.056" - 1.058"

CONNECTING RODS

Length - Center to Center	5.658" - 5.662"
Diameter - Connecting Rod Bore	2.1247" - 2.1252"
Diameter - Pin Bore	.8742" - .8737"
Bearing Clearance - Crankshaft (Vertical)	.0002" - .0022"
Clearance - End to Crankshaft	.006" - .014"

PISTONS

	2 BBL.	4 BBL.	Jetfire
Diameter - Nominal Outside	3.500	3.500	3.500
Length Overall	3.060	3.060	3.060
Length from Top of Piston to Pin Center	1.880	1.880	1.880
Clearance (At Thrust Surface) Selective	.0005-.0011		
Weight - Less Pins and Rings	14.7795 oz.	14.920 oz.	15.661 oz.
Taper from Top of Skirt to Bottom	.0000-.0005 Larger at btm.	.0000-.0005 Larger at btm.	.0000-.0005 Larger at btm.
Ring Width (2 Compression)	.081	.081	.081
(1 Oil)	.188	.188	.188

PISTON PINS

Diameter	.8747" - .8750"
Length Overall	2.860" - 2.880"
Pin to Piston Clearance	.0003" - .0005" Loose
Pin to Rod Clearance	.0007" - .0013" Tight

PISTON RINGS

Number of Compression Rings (Per Piston)	2
Width, Compression Ring Top and Bottom	.0780" - .0785"
Gap Clearance Compression Rings	.010" - .020"
Clearance in Groove, Compression Rings	.003" - .005"
Number of Oil Rings (Per Piston)	1
Gap Clearance, Oil Ring	.015" - .055"
Clearance - Oil Ring to Piston Groove	.0005" - .0055"

CAMSHAFT

Bearing Journal Diameters	
No. 1	1.785" - 1.786"
No. 2	1.755" - 1.756"
No. 3	1.725" - 1.726"
No. 4	1.695" - 1.696"
No. 5	1.665" - 1.666"
Width (Including Chamfers)	.750"
Journal Clearance in Bushing	
No. 1	.0005" - .0025"
Nos. 2, 3, 4 and 5	.0005" - .0035"
End Thrust	.011" - .059"

ENGINE SPECIFICATIONS (Cont'd.)

VALVES - INTAKE

Diameter - Head	1.517" - 1.527"
Diameter - Stem	.3427" - .3432"
Angle - Valve Seat	45°
Width - Valve Seat	.037" - .075"
Overall Length	(4 Bbl and 3147-4.943") (2 Bbl-4.863")
Clearance in Guide	.0010" - .0025"
Lash	Hydraulic

VALVES - EXHAUST

Diameter - Head	1.348" - 1.358"
Diameter - Stem	.3422" - .3427"
Overall Length	(4 Bbl and 3147-4.941") (2 Bbl-4.861")
Angle - Valve Seat	45°
Width - Valve Seat	.037" - .075"
Clearance in Guide	.0015" - .0030"
Lash	Hydraulic

VALVE GUIDES

Diameter - Inside Intake	.344" - .345"
(Outside Intake)	.657" - .658"
Diameter - Inside Exhaust	.344" - .345"
(Outside Exhaust)	.657" - .658"
Length - Overall	2.390"

VALVE SPRINGS

Length - Free	2.150"
Diameter - Wire	.180" - .184"
Diameter - Inside Top	.760"
Diameter - Outside Bottom	1.465" - 1.479"
Load @ 1.750"	70-80 Lbs.
Load @ 1.350"	160-175 Lbs.

VALVE LIFTERS

Diameter - Body	.8422" - .8427"
Length - Overall	1.997" - 2.007"
Clearance in Boss Selective	.0008" - .0023"

CAMSHAFT SPROCKET

Width	.521" - .529"
Pitch	.375"
Number of Teeth	40

CRANKSHAFT SPROCKETS

Width of Sprockets	.521" - .529"
Overall Width of Gear	1.774"
Pitch	.375"
Number of Teeth	20

TIMING CHAIN

Width	.875"
Number of Links	54
Pitch	.375"

ENGINE SPECIFICATIONS (Cont'd.)

FLYWHEEL

No. of Teeth on Starter Gear	156
No. of Teeth on Starter Pinion	9

LUBRICATION SYSTEM

Crankcase Capacity, Drain and Refill	4 Qts.
Drain and Refill with Filter Change	5 Qts.
Oil Pump	
Clearance - Pressure Relief Valve in Bore	.0025" - .005"
Clearance - End Gears	.0015" - .0075"

TORQUE SPECIFICATIONS

NOTE: Before threading bolts into aluminum, some must be coated with Part No. 980131 lubricant, some with SAE 10W30 oil and others with sealer. Consult the component part of the text for correct installation.

Application	Ft. Lbs.
CRANKSHAFT AND CONNECTING RODS	
Connecting Rod Bearing Cap Bolts	30 to 35
Crankshaft Bearing Cap Bolts (No. 1-2-3-4)	65 to 70
Crankshaft Bearing Cap Bolt (No. 5)	65 to 70
Crankshaft Balancer	140 to 160
Fan Driving Pulley to Balancer	15 to 20
Fan and Driven Pulley to Hub	15 to 20
ENGINE MOUNTS	
Front Mount to Block Bolts	50 to 55
Front Mount to Crossbar Nuts	55 to 65
Rear Mount to Transmission	30 to 40
Rear Mount to Cross Support	20 to 34
HEAD AND VALVE MECHANISM	
Valve Cover Bolts	3 to 5
Cylinder Head to Block Bolts	45 to 55
Rocker Shaft Bracket to Head	45 to 55
Spark Plugs (1 Drop of SAE 10W30 Oil on Threads)	12 to 17
FLYWHEEL AND DAMPER	
Flywheel to Crankshaft Bolts	85 to 95
Clutch to Flywheel	14 to 17
Damper to Flywheel	17 to 22
CLUTCH HOUSING	
Clutch Lower Housing to Upper Housing Bolts	4 to 7
Clutch Housing to Block Bolts	30 to 35
Flywheel Cover to Housing Bolts	20 to 25
FRONT COVER AND WATER PUMP	
Cover to Block Bolts	20 to 25

TORQUE SPECIFICATIONS (Cont'd.)

Water Pump to Front Cover	6 to 8
Oil Pressure Switch to Filter Valve Cap	10 to 15
MANIFOLD	
Intake Manifold Gasket Clamp Bolts (2-5/16")	10 to 15
Intake Manifold to Head Bolts	25 to 30
Exhaust Manifold to Head Bolts and Nuts	18 to 24
Water Outlet to Intake Manifold	10 to 15
Carburetor to Intake Manifold	14 to 17
OIL PAN PUMP AND FILTER	
Oil Pan Bolts	6 to 15
Oil Pan Drain Plug	30 to 35
Pump Cover to Engine Front Cover	10 to 15
Pump Screen to Engine Block	10 to 15
Filter Assembly to Front Cover	30 to 35
Filter Assembly	10 to 15
Oil Pressure Valve Cap	30 to 35

JETFIRE

CONTENTS OF SECTION

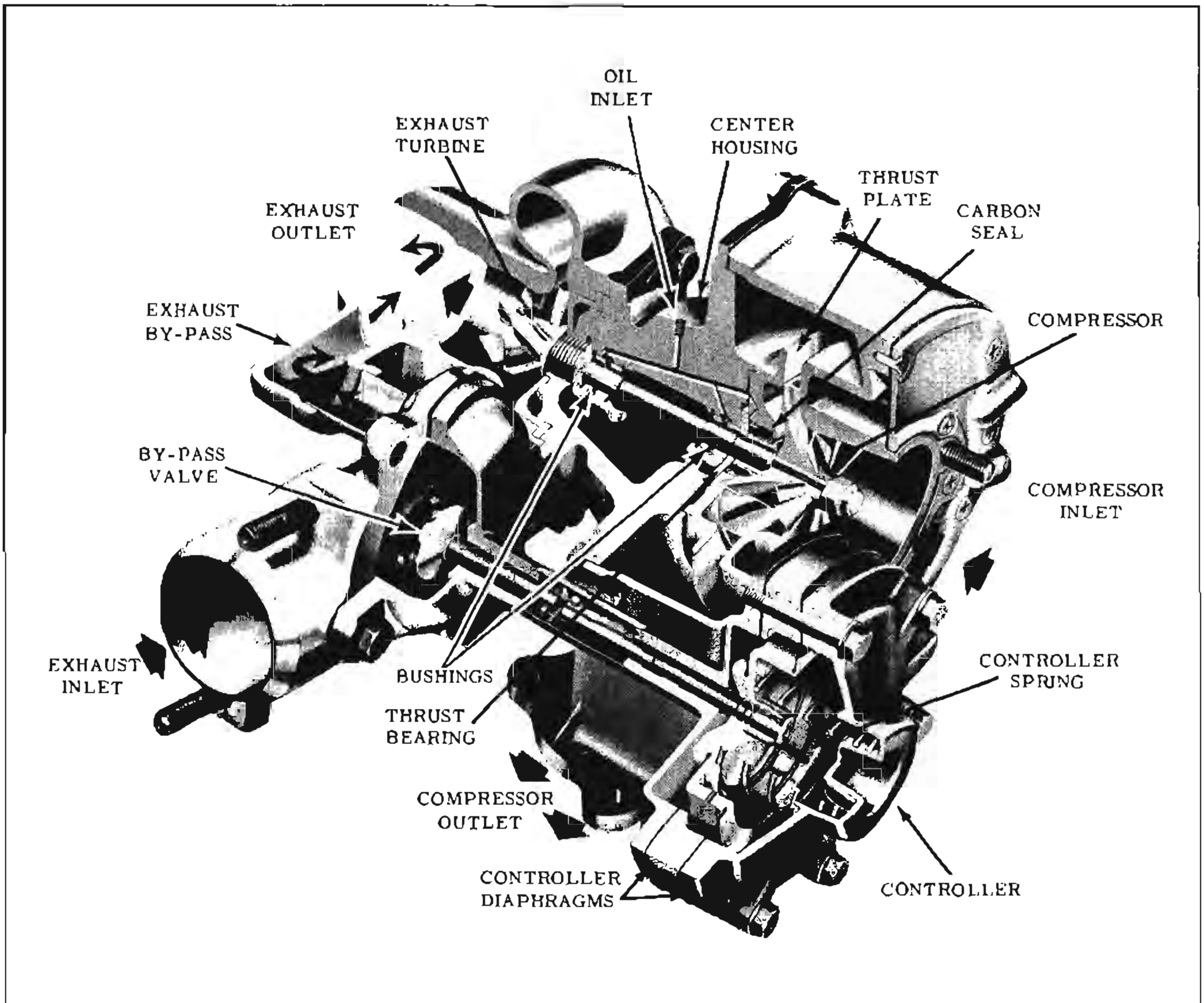


Fig. 8-159 Turbo-Charger Assembly

TURBO-CHARGER

DESCRIPTION (Fig. 8-159)

The turbo-charger supercharges the engine by boosting or increasing the density of the air-fuel mixture in the engine's intake manifold. With the density of the air-fuel mixture increased, the engine takes in more pounds of air-fuel mixture on each intake stroke. This supercharging of the air-fuel mixture makes possible a greater power output for the engine's displacement.

The turbo-charger assembly consists of the following units or assemblies: an exhaust driven turbine and housing, a compressor with a water jacket housing, a by-pass valve and a controller assembly.

The turbine wheel and compressor wheel are mounted on a common shaft, the turbine is welded to the shaft and the compressor is pressed onto the shaft and retained with a nut. The turbine wheel and compressor impeller are enclosed in separate housings. The balanced shaft is supported in the center housing by two floating bushings lubricated by engine oil pumped through passages in the center housing, and drained back into the right rocker arm cover. The turbine housing provides the acceleration and proper angle to the exhaust gases to drive the turbine, which in turn through the shaft drives the compressor.

The compressor housing is provided with a water jacket to provide pre-heating of the compressor discharge air.

The by-pass valve located in the turbine housing is operated by the controller. When the engine is first started the by-pass valve is closed, as engine r.p.m. increases, the exhaust also increases which turns the turbine faster. The by-pass valve controls the amount of exhaust pressure used to turn the turbine and compressor, thereby controlling the engine power output and the speed of the turbo-charger.

The controller bolted to the compressor housing with two passages to the compressor housing senses compressor inlet and outlet pressures. When pressure differential is enough to overcome the controller spring within the controller, the controller will open the by-pass valve to divert exhaust gases from the turbine wheel. The controller limits the pressure the turbo-charger will deliver to the engine to 5 to 6 psi.

OPERATION

When the engine is started, the by-pass valve is closed and the exhaust is directed into the turbine housing turning the turbine shaft. Air is drawn through the air cleaner into the carburetor where it is mixed with fuel, then into the turbo-charger where it is compressed and forced into the intake manifold at pressures of 5 to 6 psi. As exhaust increases, the compressor speed increases the pressure until pressure reaches a pre-determined value which is the spring force in the controller. When compressor pressure reaches the pre-set limits, the controller opens the by-pass valve allowing exhaust gases to by-pass, however, the major portion of the exhaust gas will pass through the turbine.

Turbo-charging the engine packs air-fuel mixture into the combustion chamber and when ignition occurs, the resultant explosion can cause detonation unless properly cooled or controlled. Cooling or controlling is accomplished by an anti-detonant fluid. "Turbo-Rocket Fluid" is injected into the combustion chamber by a fluid metering valve on the side of the carburetor, any time manifold pressure exceeds 1 psi. DO NOT USE A SUBSTITUTE. A safety device in the Fluid Metering Valve limits the amount of boost pressure if the fluid supply is depleted.

A filter is used between the fluid supply tank and the metering valve to prevent foreign material from entering the valve. The filter does not require periodic maintenance. If the fluid is restricted at the filter, the filter should be replaced.

SERVICE PRECAUTIONS

The design and use of the turbo-charger places the exhaust pipes at the top of the engine. Do not touch the exhaust pipes or turbo-charger until they have cooled. Keep manifolds and exhaust pipes clean, anything left in them such as torn gaskets, bolts or nuts will destroy the turbo-charger. Use BT-6219 protective caps whenever the turbo-charger is being serviced. When the air cleaner is removed, do not lay any shop towels or rags near the carburetor air inlet. Protective screen BT-6218 is to be used when the turbo-charger is being operated without the air cleaner.

REMOVAL (Fig. 8-160)

CAUTION: Before removing the turbo-charger, clean as much dirt as possible off the turbo-charger and carburetor connections. Cleanliness is essential when servicing this unit, due to close tolerances and high operating r.p.m. Cover the oil inlet and outlet ports with tape or plastic plugs to prevent entrance of dirt.

1. Remove carburetor (see CARBURETOR REMOVAL).
2. Remove turbo-charger exhaust inlet pipe by removing the four flange attaching nuts. (Fig. 8-161)

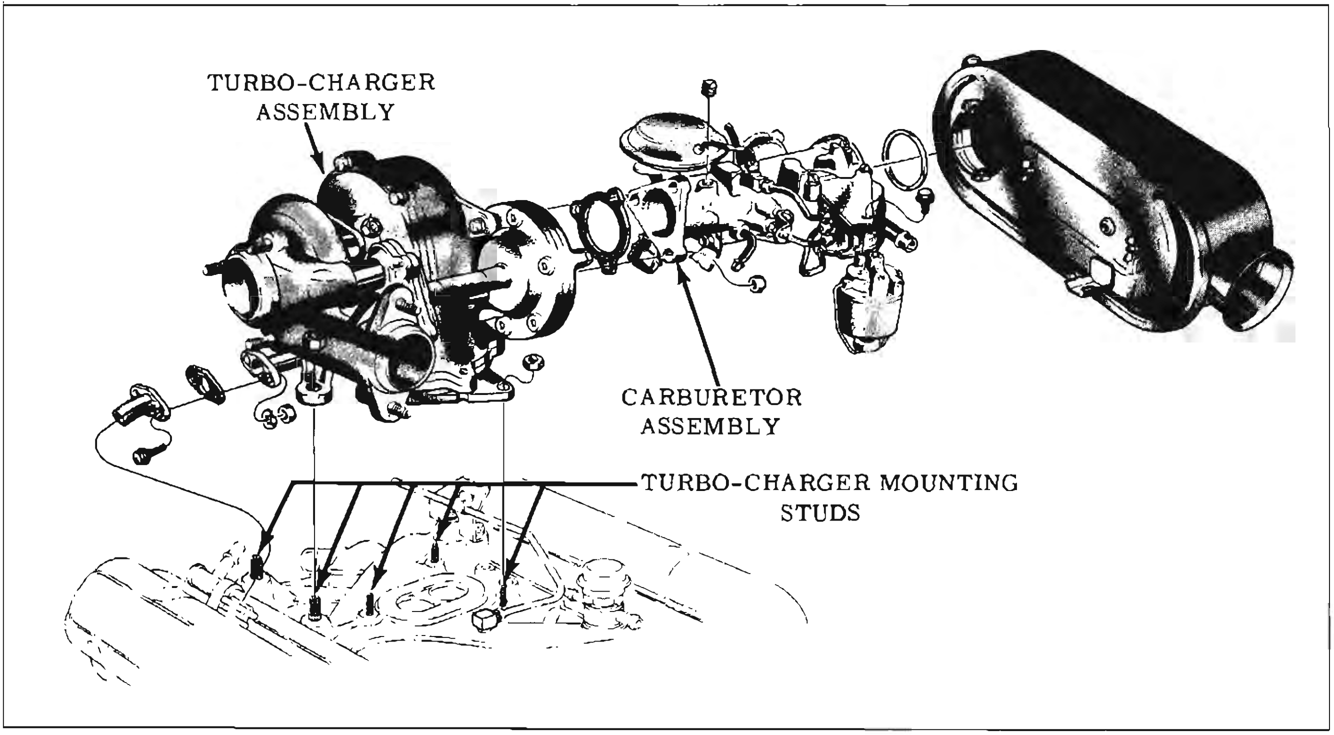


Fig. 8-160 Turbo-Charger and Carburetor Attachment

3. Install Tool BT-6219 on the turbo-charger exhaust inlet and right exhaust manifold outlet.

4. Disconnect turbo-charger exhaust outlet pipe at upper flange.

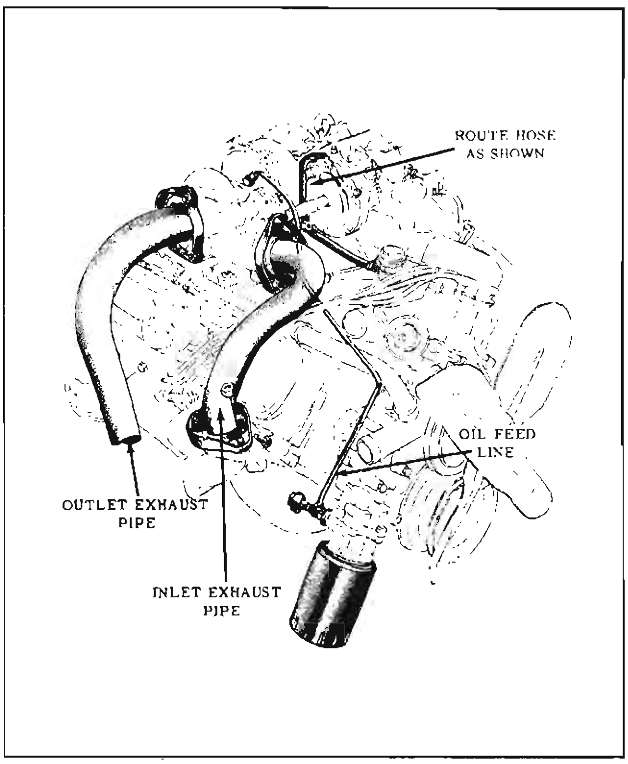


Fig. 8-161 Exhaust Pipe Connections

5. Drain radiator coolant below level of turbo-charger.

6. Disconnect oil feed line at top of center housing.

7. Disconnect oil return line.

8. Disconnect compressor water inlet hose at compressor housing.

9. Remove turbo-charger to intake manifold attaching nuts.

10. Carefully lift turbo-charger off the intake manifold studs.

INSTALLATION

Before installing turbo-charger see CLEANING AND INSPECTION and inspect turbo-charger to intake manifold flange seal. If damaged, it can be replaced by removing the socket head screws retaining turbo-charger to intake manifold flange. Torque the screws 14 to 17 ft. lbs. Torque turbo-charger to intake manifold nuts 25 to 30 ft. lbs. Install new oil return line flange gaskets and torque bolts 10 to 15 ft. lbs. Torque nuts at turbo-charger exhaust pipe connections 10 to 18 ft. lbs.

DISASSEMBY (Fig. 8-162)

1. Remove controller assembly (see CONTROLLER REMOVAL).

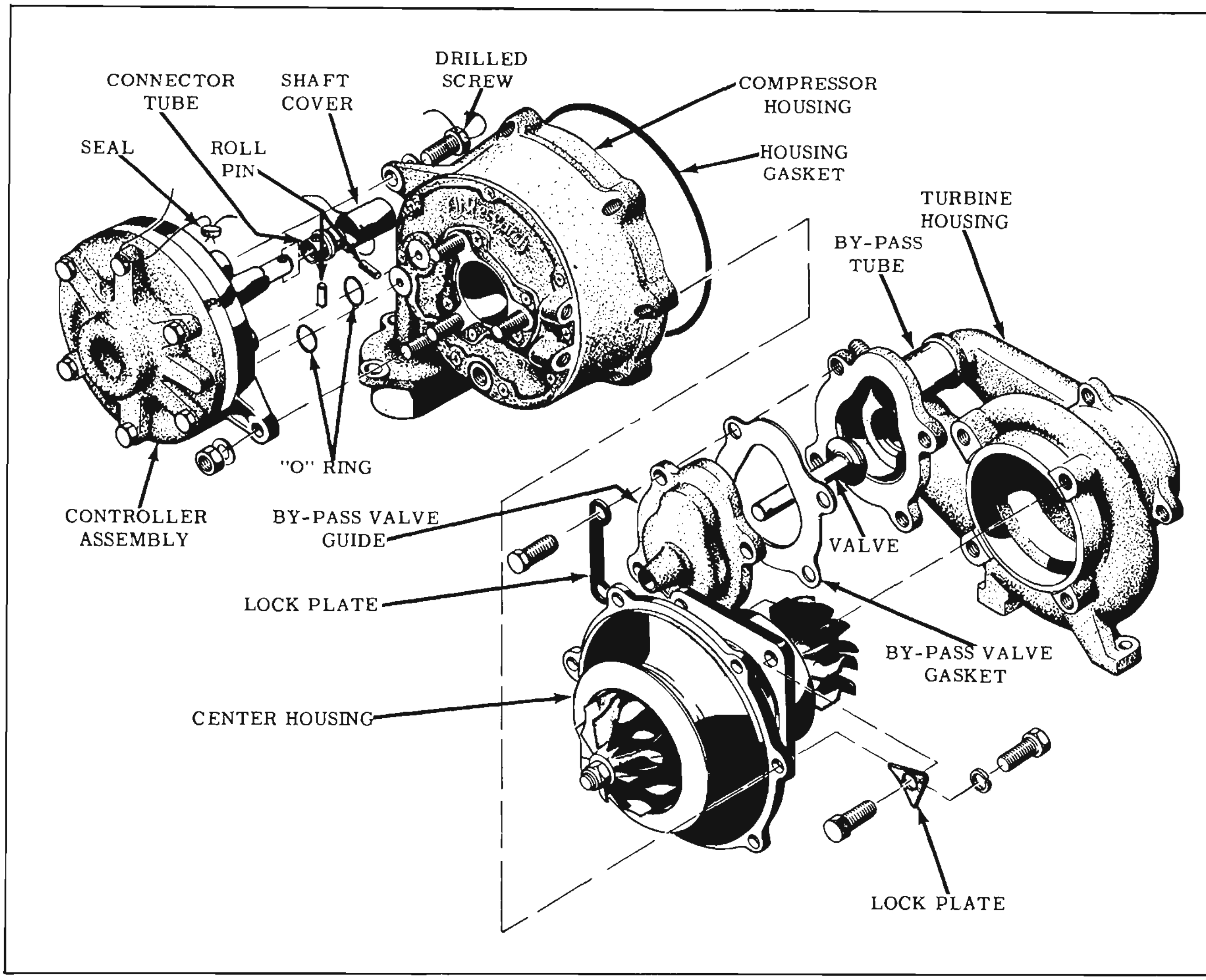


Fig. 8-162 Exploded View of Turbo-Charger

2. Remove by-pass valve assembly (see BY-PASS VALVE).

3. Remove compressor housing.

   a. Scribe a line across the center housing and compressor housing.

   b. Remove the six (6) compressor housing to center housing bolts.

   c. Tap the compressor housing lightly to separate the housings.

   d. Remove the gasket.

   e. Remove the housing cover and gasket by removing the eleven (11) attaching screws.

   f. Inspect the housing and cover for cracks or indications of leakage.

4. Remove turbine housing.

   a. Scribe a line across the center housing and turbine housing.

   b. Straighten the lock tabs on the four (4) center housing to turbine housing bolts and remove bolts and lock plates.

   c. Carefully separate the two housings.

   NOTE: The center housing and rotating assembly is serviced only as an assembly due to the critical tolerances necessary to maintain the balance.

CLEANING AND INSPECTION

Before cleaning, inspect the parts for signs of burning, rubbing or other damage that might not be evident after cleaning. Soak all parts EXCEPT THE CENTER HOUSING ASSEMBLY in clean carburetor solvent. After soaking, use a stiff bristle brush to remove all dirt particles. Dry parts thoroughly with filtered, moisture-free compressed air.

ITEMS	REQUIREMENTS
All Parts	Must not show signs of damage, corrosion, deterioration. Threads must not be nicked, stripped, or crossed.
Turbine Wheel	The turbine wheel must not show signs of rubbing, and the vanes must not be eroded to a feather edge. A slight build-up of carbon will not affect the operation.
Compressor Impeller	The compressor impeller must not show signs of rubbing and must be completely free of dirt and other foreign material.
Center, Compressor and Turbine Housings	The housings must not show signs of having been in contact with the rotating parts. Oil, air and water passages must be clean and free of any obstructions.
Bearings	The rotating assembly must rotate without signs of roughness. A slight drag due to the spring loaded carbon seal is normal. Heat shield must not rub the turbine wheel.

PARTS REPLACEMENT

Replace any part which fails to meet the inspection requirements. Also, replace the following parts any time the turbo-charger is disassembled; the gasket between the compressor housing and the center housing; two small "O" rings between the controller and the compressor housing; the lockplates used on the turbine housing and the by-pass valve guide; the by-pass valve guide gasket and the oil return line gaskets.

If it becomes necessary to replace the production controller spring, a service spring identified by a blue stripe should be installed.

ASSEMBLY

1. Assemble turbine housing to center housing.

   a. Install turbine housing on the center housing with scribe marks aligned.

   b. Install the lockplates and bolts. Torque bolts 8 to 9 ft. lbs.

   c. Check for turbine clearance by pushing the shaft towards the turbine housing while rotating the shaft. There should not be any contact between the wheel and the housing.

2. Install compressor housing.

   a. Install compressor housing to center housing gasket.

   b. Position center housing to compressor housing with scribe marks aligned.

   c. Install the six (6) center housing to compressor housing bolts and torque 8 to 10 ft. lbs.

   d. Install the compressor housing to cover gasket.

   e. Install housing cover and secure with eleven (11) attaching screws, 25 to 30 in. lbs.

   f. Check the compressor impeller to housing clearance by pushing on the turbine end of the shaft while rotating the shaft. There should not be any contact between the compressor impeller and the housing.

3. Install the by-pass valve (see BY-PASS VALVE, ASSEMBLY).

4. Install the controller (see CONTROLLER, INSTALLATION).

CONTROLLER ASSEMBLY

OPERATION (Fig. 8-163)

As pressure builds up in the intake manifold, it acts on the primary diaphragm against spring force. At the same time compressor inlet pressure (less than atmosphere) is also acting on the other side of the primary diaphragm pulling against spring force. As manifold pressure reaches approximately 5 to 6 psi it acts, along with inlet pressure, on the primary diaphragm moving the retainer and stem assembly against spring force to open the by-pass valve. This controls the amount of exhaust gases acting on the turbine to limit the turbine speed.

The secondary diaphragm has inlet pressure on both sides; therefore, it is in balance and serves to dampen rapid movement of the retainer and stem assembly.

REMOVAL (Fig. 8-164)

The controller assembly can be removed for service without removing the turbo-charger.

1. Cut and remove safety wire.

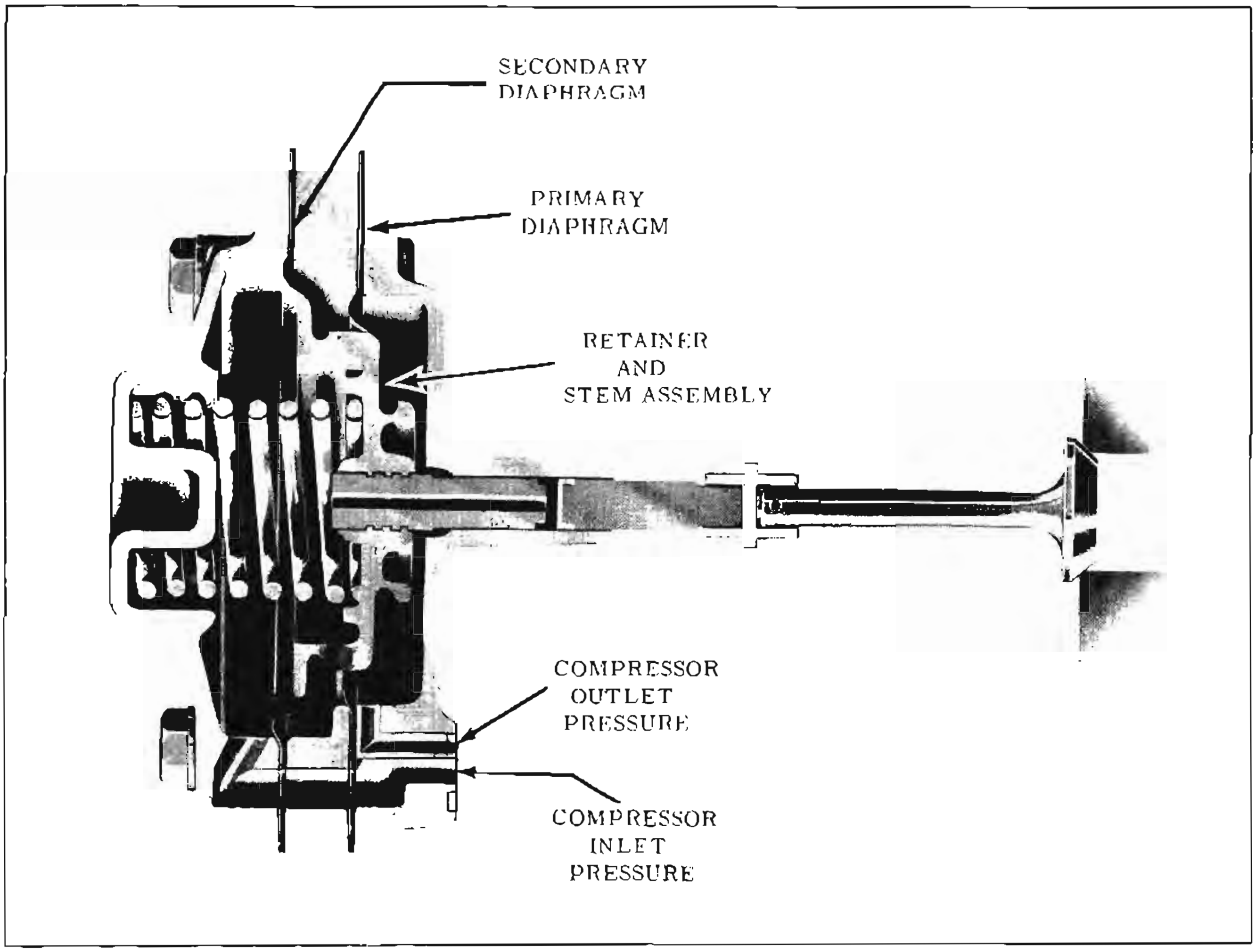


Fig. 8-163 Controller Assembly

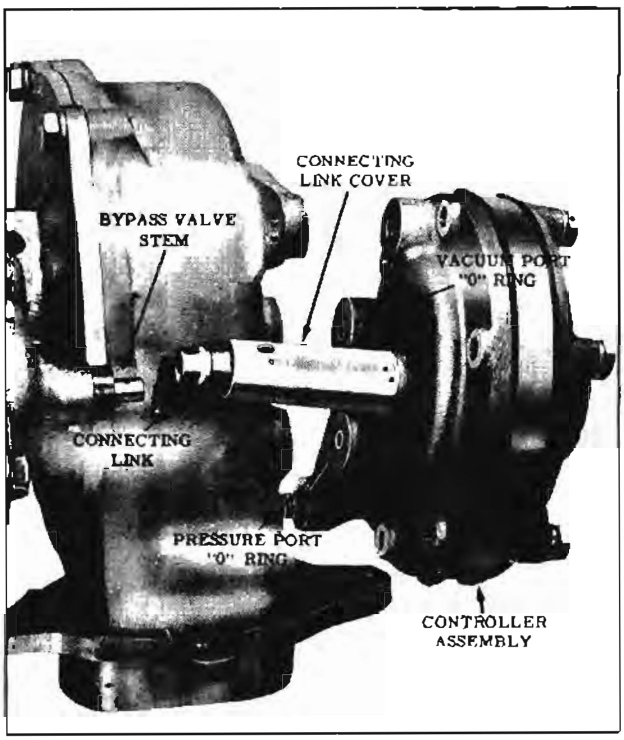


Fig. 8-164 Controller Assembly Removal

2. Loosen the bolt at the top of the controller and the nut at the bottom mounting ear. Remove the carburetor rod to gain access to bottom nut.

3. Slide cover towards the controller and remove roll pin at the by-pass end of the connecting link.

4. Remove the bolt and nut, hold the throttle valve wide open and remove controller.

5. Remove sensing port "O" rings.

6. Remove the cover and remaining roll pin, then remove connecting link.

INSTALLATION

1. Install the two new sensing port "O" rings and the connector link onto the stem of the controller.

2. Install the roll pin through the link and controller stem.

3. Slide cover, safety wire end first, over the link.

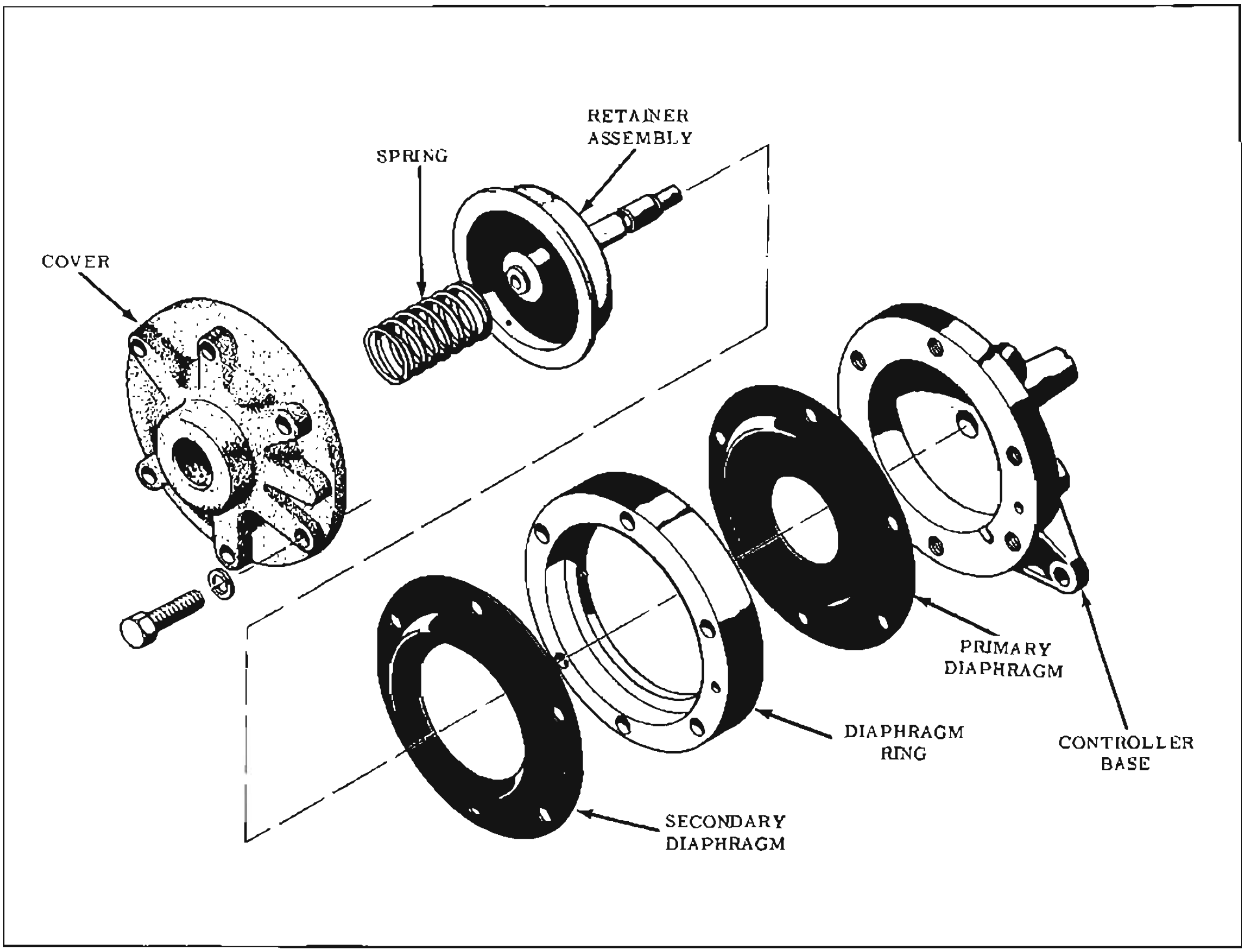


Fig 8-165 Exploded View of Controller Assembly

4. Pull out the by-pass valve and position the link over the valve stem.

5. Temporarily install a cotter pin through the link and by-pass valve.

6. Position the controller to the housing and install lock washers, bolt and nut. Torque 8 to 9 ft. lbs.

7. Remove cotter pin and install roll pin.

8. Replace the original safety wire with another piece.

9. Connect carburetor rod.

DISASSEMBLY (Fig. 8-165)

1. Scribe a line on the edge of the controller.

2. Remove four (4) of the six (6) cover bolts.

3. Loosen the two (2) remaining bolts about 1/8".

NOTE: Cover is under spring tension.

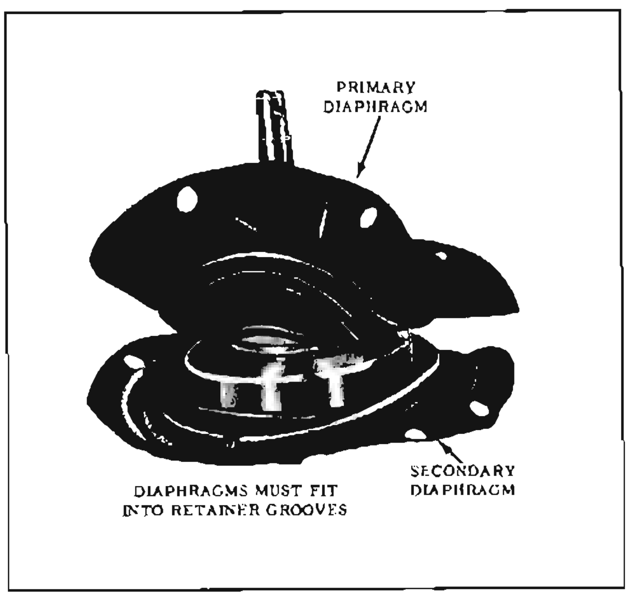


Fig. 8-166 Controller Diaphragms

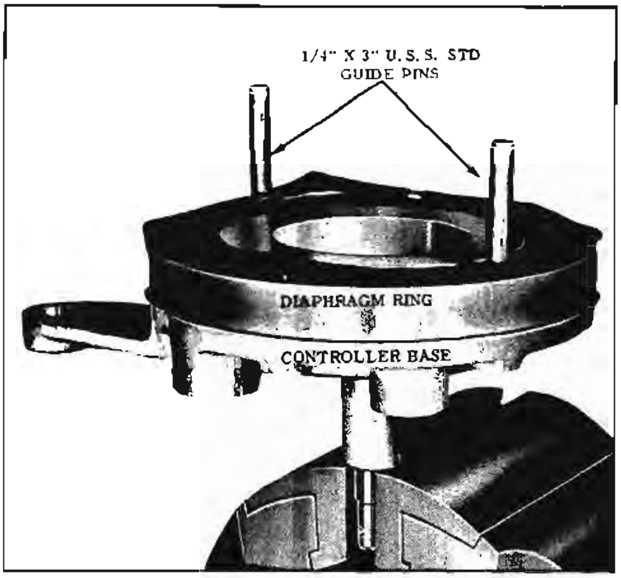


Fig. 8-167 Diaphragm Alignment

4. Apply air, 15 to 20 psi to the pressure port first and then the vacuum port to free diaphragms. (Fig. 8-163)

5. Remove the two (2) bolts while holding cover and spring compressed, then remove cover and spring.

6. Separate the controller base, diaphragm and diaphragm ring.

7. Remove the diaphragm retainer, diaphragms and ring.

8. Remove the ring from the retainer by slipping over the stem end of the retainer.

9. Remove the diaphragms off from the stem side of the retainer.

ASSEMBLY (Fig. 8-166)

1. Install diaphragms with raised ring toward retainer. (Fig. 8-163)

2. Install diaphragm ring over the retainer, relieved side towards the secondary.

3. Install primary diaphragm raised ring towards the retainer.

4. Align the pressure passage holes and bolt holes.

5. Install two guide pins 1/4" x 3", U.S.S. standard bolts, in the controller base. (Fig. 8-167)

6. Install retainer with diaphragms over the guide pins with holes aligned.

7. Clamp in brass jawed vise as shown in Fig. 8-167.

8. Compress the controller stack up and install two (2) opposite bolts finger tight.

9. Remove guide pins and install remaining bolts.

10. Diaphragms should be centered and 1/8" edge exposed all the way around. Tighten the bolts alternately 40 to 50 In. lbs.

BY-PASS VALVE

DISASSEMBLY (Fig. 8-162)

The by-pass valve can be removed for service without removing turbo-charger assembly.

1. Remove controller assembly.

2. Straighten the lock tabs at the four (4) by-pass valve guide bolts.

3. Remove the bolts, guide, gasket and valve.

CLEANING AND INSPECTION

Check valve for freeness in the valve guide. Clean carbon deposits from valve. Inspect valve head and seat for deterioration. Valve guide is serviced only as an assembly.

ASSEMBLY

1. Install the valve in the valve guide, and position a new gasket and guide assembly on the turbine housing.

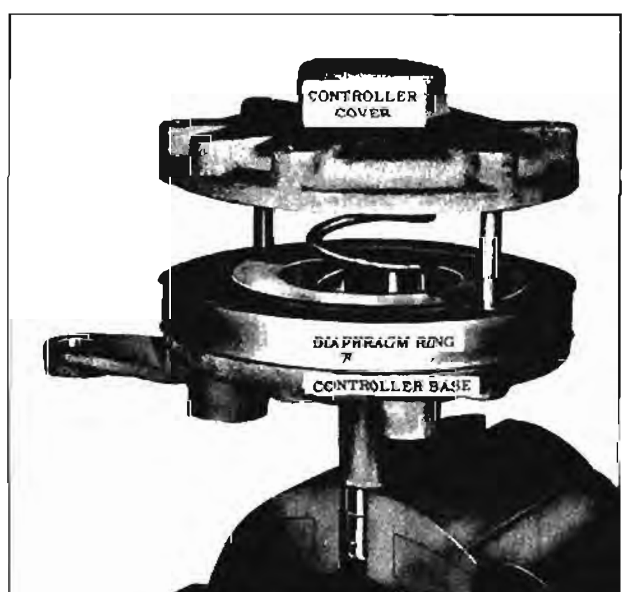


Fig. 8-168 Installing Cover

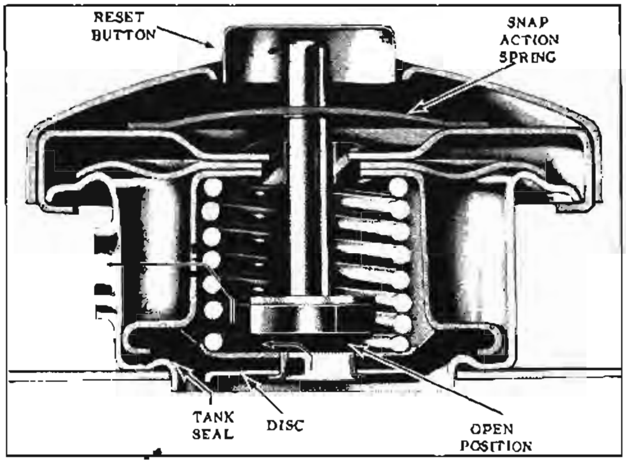


Fig. 8-169 Fluid Tank Cap

2. Install two (2) new lock plates and four (4) valve guide bolts. Torque evenly 8 to 9 ft. lbs.

3. Install the controller assembly using new "O" rings at sensing ports.

TURBO-ROCKET FLUID TANK

The tank located on the left front inner fender panel has a capacity of five quarts. The tank is equipped with a fluid level gauge which will light the console fluid warning lamp when the fluid level reaches 1-1/2 pints. When the fluid tank is empty, the performance gauge pointer will not register in the red or boost area. The fluid tank has a reset type cap designed to open at 6.5 to 7.5 psi to prevent excessive boost pressure. If the cap is in open position, the fluid delivery will stop, thereby limiting the boost pressure. (Fig. 8-169)

REMOVAL (Fig. 8-170)

1. Loosen fluid filter clamp and lift filter up from mounting bracket.

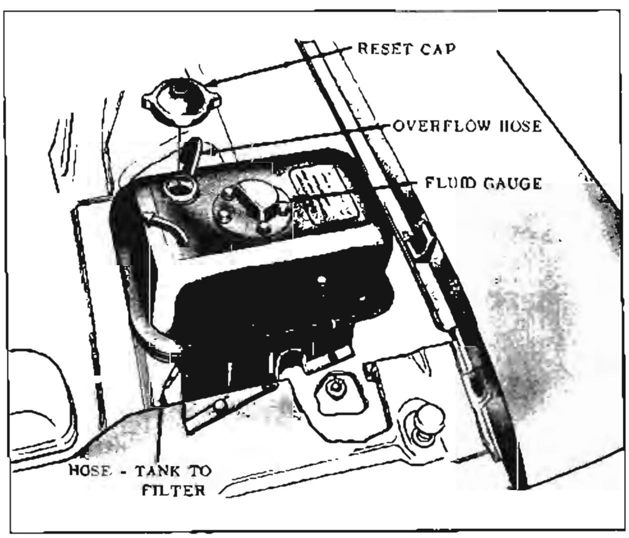


Fig. 8-170 "Turbo-Rocket Fluid" Tank

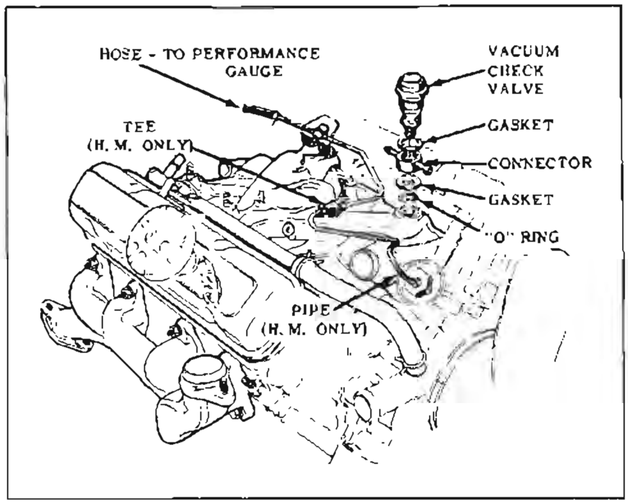


Fig. 8-171 Exploded View of Relief Valve

Fig. 8-172 Testing Fluid Tank Cap

2. Disconnect and clamp fluid supply hose at the fluid metering valve.

3. Lower the hose and filter to underside of car, release clamp and drain fluid into a clean container.

4. Disconnect gauge wire and disconnect the remaining hoses at the tank.

5. Remove the attaching bolts and nuts, three (3) on each side of the tank, and remove the tank.

INSTALLATION

To install, position the tank and install the tank attaching bolts and nuts. Connect all hoses and check for leaks.

CHECK AND RELIEF VALVE ASSEMBLY

OPERATION

The check and relief valve assembly allows the Turbo-Rocket Fluid tank to be pressurized during boost operation and remain pressurized during normal engine operation when there is a vacuum in the intake manifold. It also permits a slight relief of pressure, caused by normal thermal expansion, in the fluid supply tank thus preventing the reset cap from relieving the pressure.

REMOVAL (Fig. 8-171)

Disconnect hoses, remove coil, remove valve assembly and nylon gasket. Lift connector, large washer and "O" ring from intake manifold.

INSTALLATION

Install a new "O" ring, install large washer and connector into intake manifold. Install valve assembly with nylon gasket. Torque valve 12 to 18 ft. lbs.

THROTTLE RETARDER

Operation

In addition to the throttle return check used on the carburetor, a throttle retarder has been connected to the throttle lever. This unit controls the closing of the throttle valve throughout the entire range of throttle opening, in contrast to the throttle return check which provides only partial range control. The purpose of using the retarder is to provide a smooth transmission downshift by preventing a sudden release of power from rapid throttle closing. The retarder is a slow bleed air device consisting of a spring loaded diaphragm, a rubber "flapper" valve, and a bleed restriction. As the throttle valve is opened, the diaphragm is pulled up against the force of the spring. This action forces air above the diaphragm out of the top vent and sucks air into the chamber below the diaphragm through the bottom vent and the rubber check valve. When pressure on the accelerator pedal is released and the throttle valve starts to close, the spring in the retarder forces the diaphragm down. This force of the spring tends to push the air below the diaphragm out of the chamber, thus closing the rubber flapper valve and causing all the escaping air to pass through the calibrated restriction before escaping through the bottom vent. The air, therefore, bleeds out at a slow rate, thereby, allowing the throttle valves to close slower during deceleration.

Adjustment

To check the adjustment of the throttle retarder, merely open the throttle valve to the wide open position. If the linkage connecting the unit to the throttle valve is so adjusted as to prevent wide open throttle, bend the rod until the total throttle opening is possible.

PERFORMANCE GAUGE

All 3147 models are equipped with a Performance Gauge which indicates the operation of the turbo-charger. Under normal (no boost) operation, there is a partial vacuum in the intake manifold. During this stage of operation, the Performance Gauge indicates in the "Economy" (green) or vacuum area. When the needle is centered between the "Economy" and "Power" sections, it indicates atmospheric pressure. The needle will be about centered when the engine is not operating. When the throttle is opened, additional pressure (boost pressure) is built up in the intake manifold causing the needle to indicate "Power" (red) or pressure.

The Performance Gauge is mounted in the console directly ahead of the shift lever. To remove the gauge, it is necessary to remove the top console panel or shift indicator panel to gain access to the back of the gauge. DO NOT ATTEMPT TO PRY GAUGE OUT AS THIS WILL BREAK OFF THE RIM.

FLUID GAUGE

The fluid gauge is attached to the tank with five (5) screws. A gasket is used between the tank and gauge. The gauge is calibrated to light the console warning lamp when the level reaches 1-1/2 pints.

TURBO-ROCKET ENGINE DIAGNOSIS

TESTING WITH THE BT-6225 GAUGE

TESTS: Check and Relief Valve Assembly, Depressure Valve, supply tank and hoses.

1. Install gauge BT-6225 on the fluid supply tank and start engine.
2. Pump up the gauge to 8 lbs. with the engine idling, relief valve should reduce pressure to 5-1/4 - 6-1/4 lbs. If pressure drops below 5-1/4 lbs., the depressure valve may not be closing, or leaks may be present in or around the relief valve or hose.
3. Turn off ignition, depressure valve should open, dropping pressure to zero within two minutes.

If the pressure drops below 5-1/4 lbs. when performing Step 2, a leak is indicated. The following Steps will pinpoint the location:

1. Clamp the upper hose leading from the fluid tank with Vise Grip pliers.

2. Install BT-6225 and pump up to 8 lbs. The tank should hold 8 lbs. for 30 seconds.

3. If the gauge pressure drops, clamp upper and lower hoses with Vise Grip pliers.

4. Pump up to 8 lbs. If the gauge holds the 8 lbs. for 30 seconds, the leak is in the Fluid Metering and Boost Limit Valve assembly. If the gauge pressure continues to drop, check for air pressure leaks at the tank.

5. If leaks are not detected, remove pliers from the upper tank hose, clamp hose between the relief valve assembly and the depressure valve.

6. Pump up to 8 lbs., if pressure drops below 5-1/4 lbs., check for external leaks at the relief valve assembly. If neither of these show a leak, the relief valve assembly may be leaking internally.

7. Remove both pairs of Vise Grip pliers, and the gauge.

TESTING THE TURBO-ROCKET FLUID TANK CAP (Fig. 8-172)

1. Install the cap on BT-6225 tester with the reset button depressed.

2. Pump up tester to 5 lbs., the cap should hold this pressure for 30 seconds.

3. Pump up the tester to 7.5 lbs., the cap must release the pressure between 6.5 to 7.5 lbs.

CONDITION	POSSIBLE CAUSE	CORRECTION
Dull whine on acceleration or deceleration.	Center housing shaft bushings worn or compressor impeller or turbine wheel rubbing the housing.	Inspect and replace necessary parts.
Pressure cap releases.	Exhaust by-pass valve or the controller stem stuck.	Inspect the by-pass valve and controller, repair or replace.
Some performance, but not maximum.	Broken primary diaphragm in controller.	Replace with diaphragm kit.
No boost operation	Turbo-rocket fluid tank empty, or plugged fluid filter.	Check fluid level and/or fluid filter.
	Fluid tank cap released, (popped).	Reset cap.
	Depressure valve not closing, or check and relief valve defective. Leaks in fluid tank or hoses. A leak in the upper diaphragm of the Fluid Metering and Boost Limit control valve assembly.	These can be checked with the BT-6225 diagnosis test procedures. If the checks indicate that the malfunction is in the Fluid Metering and Boost Limit Control Valve assembly, disassemble and inspect the upper diaphragm.
	Leak in the lower diaphragm of the Fluid Metering and Boost Limit Control Valve assembly.	If the BT-6225 diagnostic tests do not show leakage in any of the components, and still "no boost", disassemble and inspect the lower diaphragm of the Fluid Metering and Boost Limit Control Valve assembly.
	Broken auxiliary throttle valve return spring.	Replace the spring.

TORQUE SPECIFICATIONS

TURBO-CHARGER	FT. LB.
Carburetor to Turbo-Charger Nuts	14 to 17
Exhaust Pipe Nuts - Exhaust Manifold to Turbo-Charger	10 to 18
Exhaust Pipe Nuts - Exhaust Outlet to Turbo-Charger	10 to 18
Turbo-Charger to Intake Manifold Nuts	25 to 30
Intake Manifold Flange to Turbo-Charger Screw	14 to 17
Oil Return Line Bolts	10 to 15
Controller Cover Bolts	40 to 50 In. Lbs.
Controller to Compressor Bolt and Nut	8 to 9
Center Housing to Compressor Housing Bolts	8 to 10
Compressor Housing Cover Screws	25 to 30 In. Lbs.
Turbine Housing to Center Housing Bolts	8 to 9
Check and Relief Valve to Intake Manifold	12 to 18

COOLING, FUEL, AND EXHAUST SYSTEMS

CONTENTS OF THIS SECTION

COOLING SYSTEM

MAINTENANCE RECOMMENDATIONS

Refer to Section 2, PERIODIC MAINTENANCE

DESCRIPTION

The engine cooling system is of the pressure type employing a 15 lb. pressure radiator cap. The water pump is a centrifugal type. Circulation is controlled by a thermostat located in the water outlet on the intake manifold. Full length water jackets allow the engine coolant to completely surround all cylinders.

OPERATION (Fig. 8 173)

The water pump discharges water through the front engine cover into both banks of the block. The water then flows through the full length water jackets in the block up into the two cylinder heads through the heads and then flows from the front of each cylinder head into the intake manifold water jacket. The water flows to the rear in the lower portion. From here a portion of the water flows to the heater while the remainder flows forward through the upper portion of the intake manifold water jacket to the thermostat housing and thermostat by-pass. The flow of heated water through the intake manifold water jacket warms the manifold evenly to provide good vaporization of the incoming fuel charge.

A pellet type thermostat housed in the forward (outlet) end of the intake manifold controls the circulation of water through the engine radiator.

During cold engine operation when the thermostat is closed, a thermostat by-pass, open at all times, allows recirculation of water through the engine to provide even warm up of all cylinders. When the thermostat opens, water is directed to the upper tank of the radiator and thence through the radiator core, lower tank to water pump inlet where the cycle is repeated.

CAUTION: When removing the radiator cap, turn the cap counterclockwise to the point where pressure is released. After all the pressure has been released, the cap can then be SAFELY removed.

DRAIN AND REFILL

Before draining the cooling system, inspect the system and perform any necessary service to insure that it is clean, does not leak, and is in proper working order.

1. Completely drain the system by opening drain valves at the radiator lower tank (r.h. tank on cross-flow radiators) and removing plugs on each side of the engine block.

   NOTE: If coolant drains out dirty, or if deposits are seen in the radiator, the cooling system should be flushed.

2. Refill cooling system with recommended coolant. (Refer to PERIODIC MAINTENANCE Section 2 for recommended coolant)

FAN

The fan blades and pulley can be removed without disturbing the water pump or radiator.

NOTE: If belt tension on pulley is not released, the fan can be removed without disturbing the pulley by removing four (4) attaching bolts. When the first two (2) bolts are removed, replace with aligning studs. The tension of the belt will keep the pulley in position.

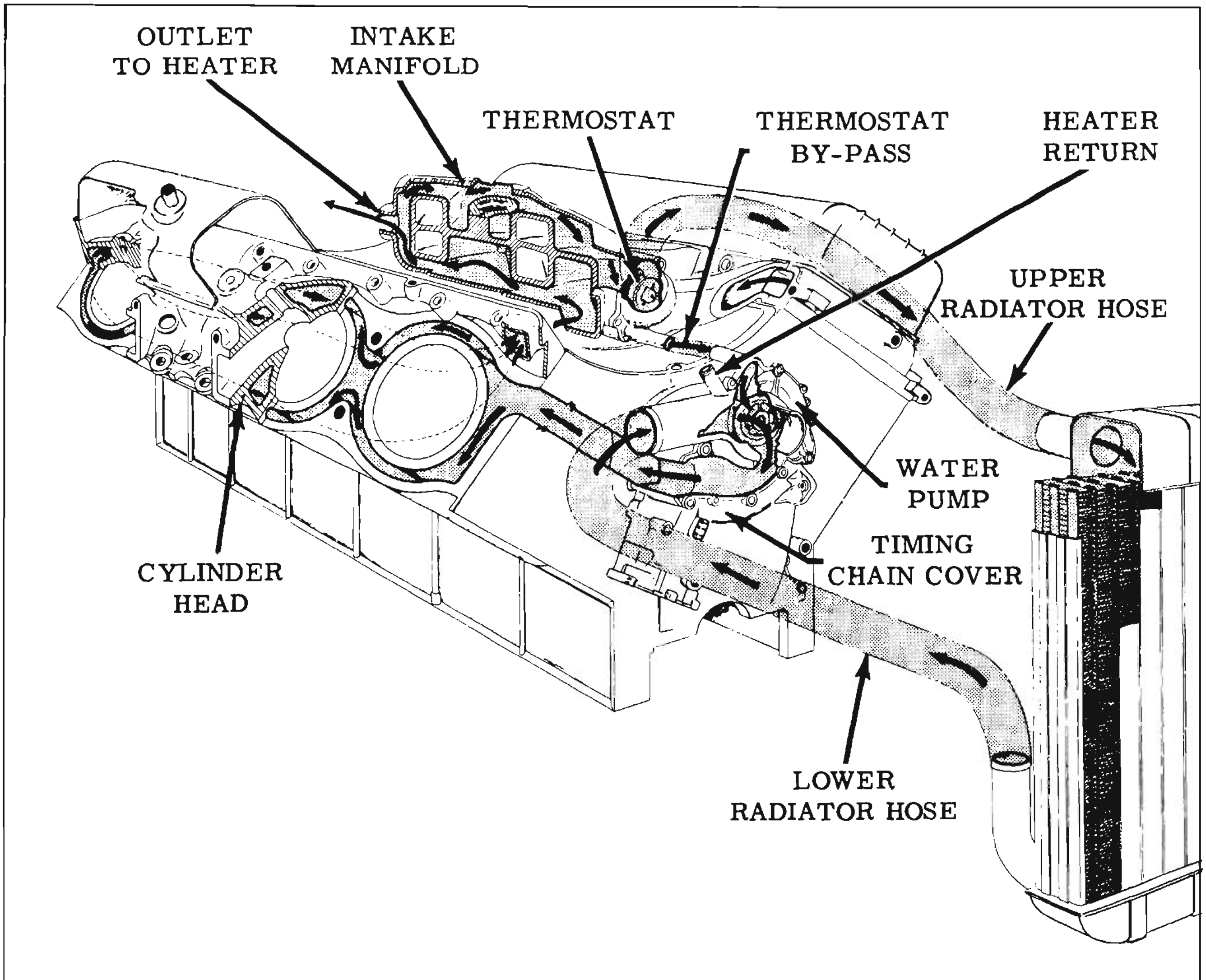


Fig. 8-173 Cooling System

PULLEY

Removal

1. Loosen Delcotron and link adjusting bolt and remove belts from pulley.
2. Remove four (4) fan and pulley attaching bolts.
3. Remove fan pulley.

Installation

1. Install fan and pulley.
2. Install four (4) fan and pulley bolts.
3. Install belt(s) on pulley and adjust to proper tension using Tool BT-33-70.

RADIATOR

Removal

1. Drain cooling system.
2. Remove upper radiator bracket.
3. Remove upper and lower radiator hose.

NOTE: If car is equipped with Hydra-Matic transmission:

4. Disconnect and cap cooler lines.

5a. All except 3147 and/or Air Conditioning-- Loosen lower radiator support bolts and move supports rearward to allow radiator to be removed.

5b. 3147 and/or Air Conditioning-- Remove side attaching screws and remove radiator.

Installation

1a. All except 3147 and/or Air Conditioning-- Place radiator in lower supports.

1b. 3147 and/or Air Conditioning-- Position radiator and install side attaching screws.

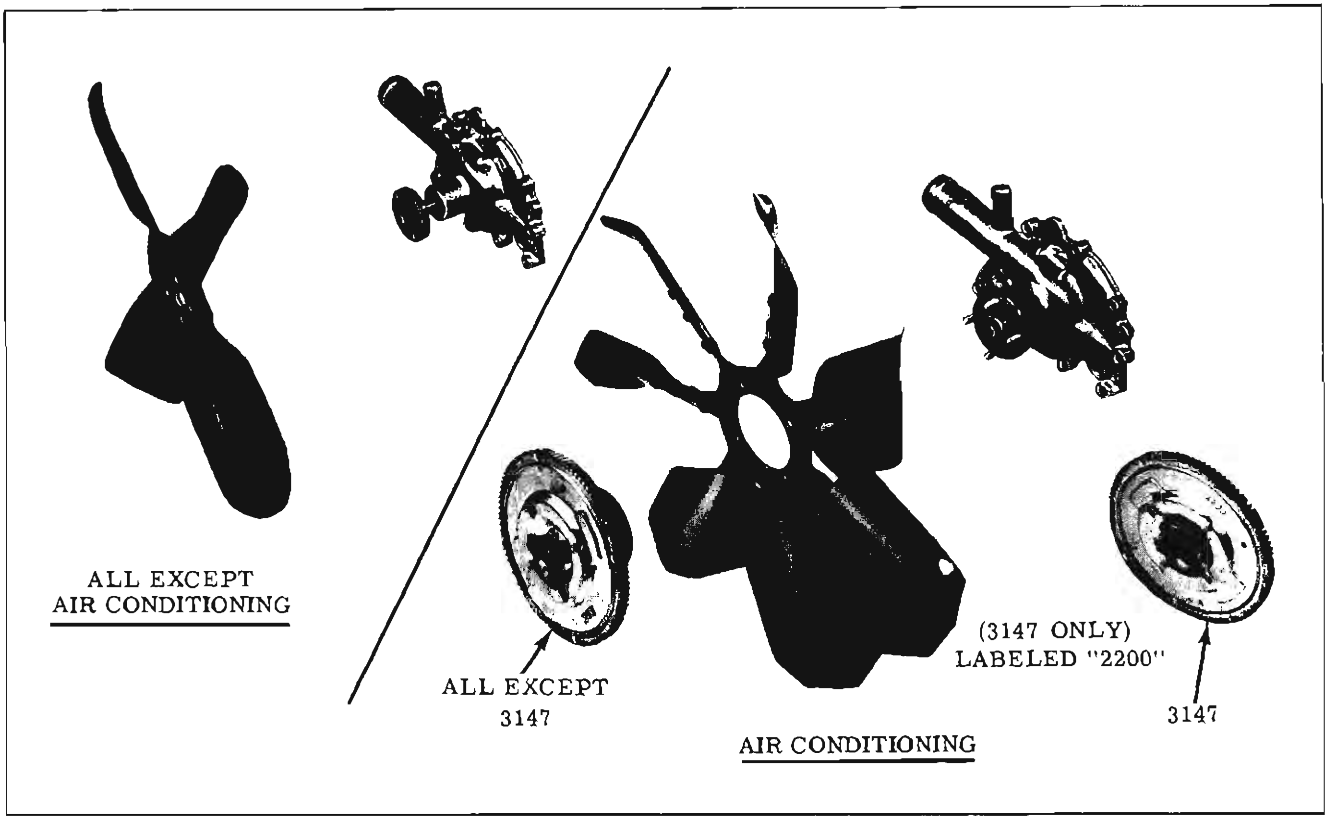


Fig. 8-174 Water Pumps

2. In Hydra-Matic transmission cars, connect cooler lines.

3. Install upper and lower radiator hose.

4. Install upper radiator bracket.

5. Fill cooling system with recommended coolant. (Refer to PERIODIC MAINTENANCE Section 2 for recommended coolant)

WATER PUMP (Fig. 8-174)

Removal

1. Drain cooling system.

2. Disconnect heater and lower radiator hose from pump.

3. Loosen pulley . belts and remove fan, and pulley. On air conditioned equipped cars remove the clutch and fan assembly, and pulley.

4. Remove nine (9) pump to front cover attaching bolts. (Fig. 8-138)

Installation

1. Apply a thin coat of gasket cement to the pump housing to retain the gasket, then position the gasket on the housing.

2. Install the pump assembly in the front cover. Torque 1/4" bolts 6 to 8 ft. lbs. and 5/16" bolts 20 to 25 ft. lbs. Use SAE 10W30 oil on the 1/4" bolts and sealer on the 5/16" bolts.

3. Install pulley, and fan. Torque fan to pump bolts 15 to 20 ft. lbs. On air conditioned equipped cars install pulley, and fan and clutch assembly. Torque nuts 15 to 20 ft. lbs.

4. Install pulley belt(s) and adjust belt tension using Tool BT-33-70.

5. Refill cooling system, See Section 2, PERIODIC MAINTENANCE for recommended coolant.

FUEL SYSTEM
(Figs. 8-175, 8-176, and 8-177)

DESCRIPTION

The fuel tank has a capacity of 16 gallons, except for station wagons which have a 15.2 gallons capacity. The filler tube is located in the left quarter panel. Venting of the fuel tank is provided by a hose at the top of the tank.

The tank gauge unit has a Saran fuel filter, as shown in Fig. 8-178, on the end of the suction pipe which prevents entry of dirt or water into the fuel lines. The filter is a push fit on the end of the pipe and should be pressed on approximately 1-11/16" so that the pipe bottoms on the shoulder inside the filter.

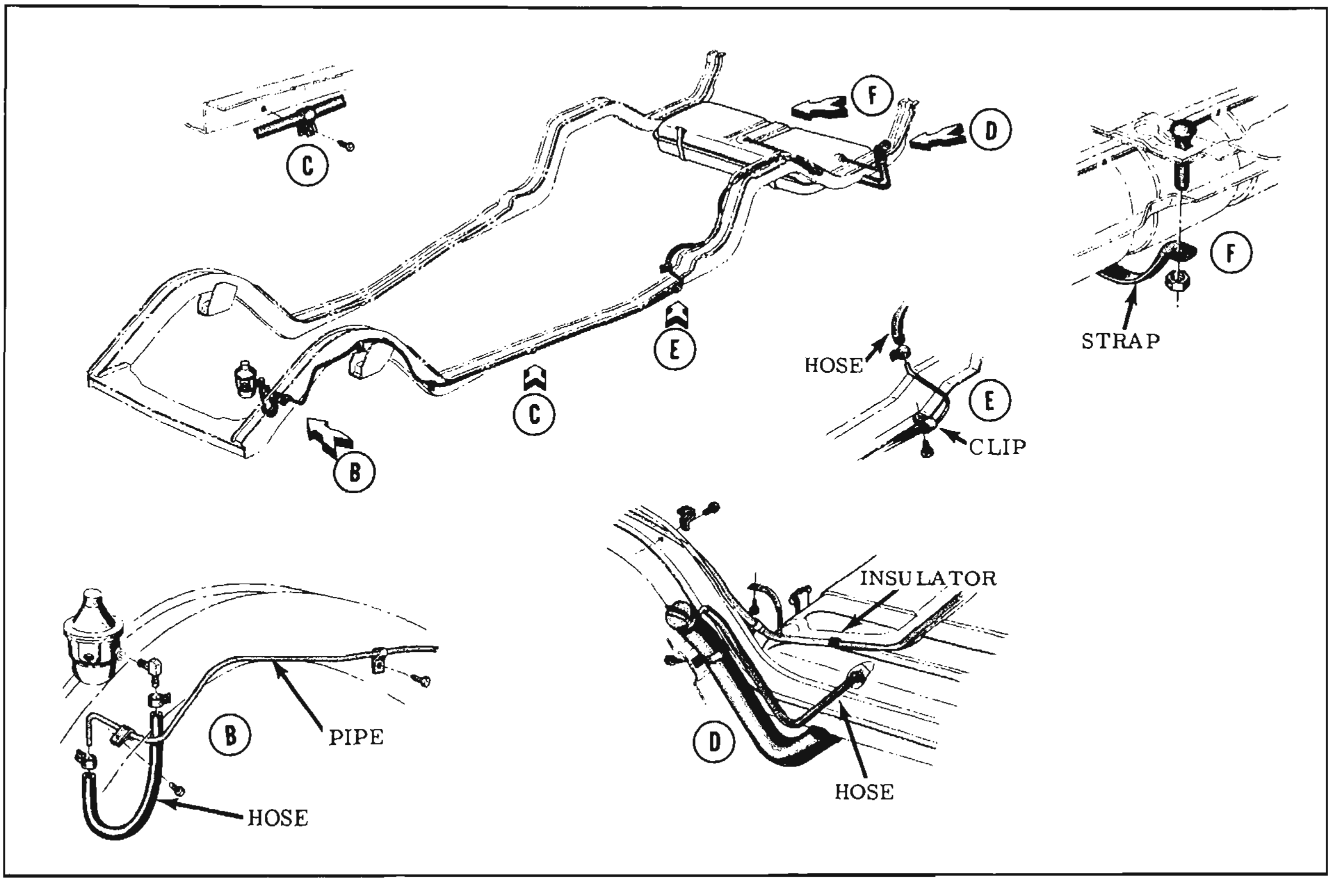


Fig. 8-175 Fuel System (All except 3147 and 3167)

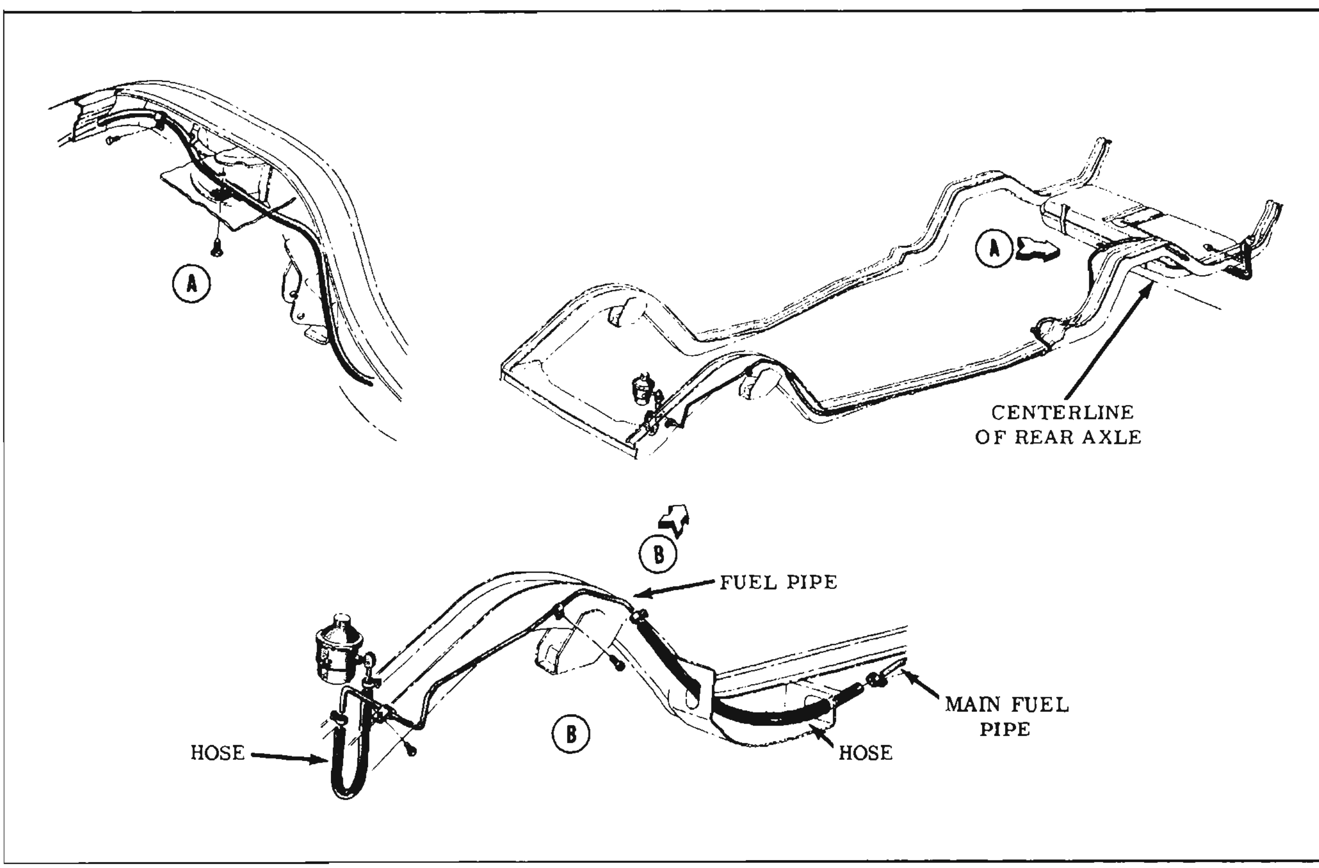


Fig. 8-176 Fuel System (3167)

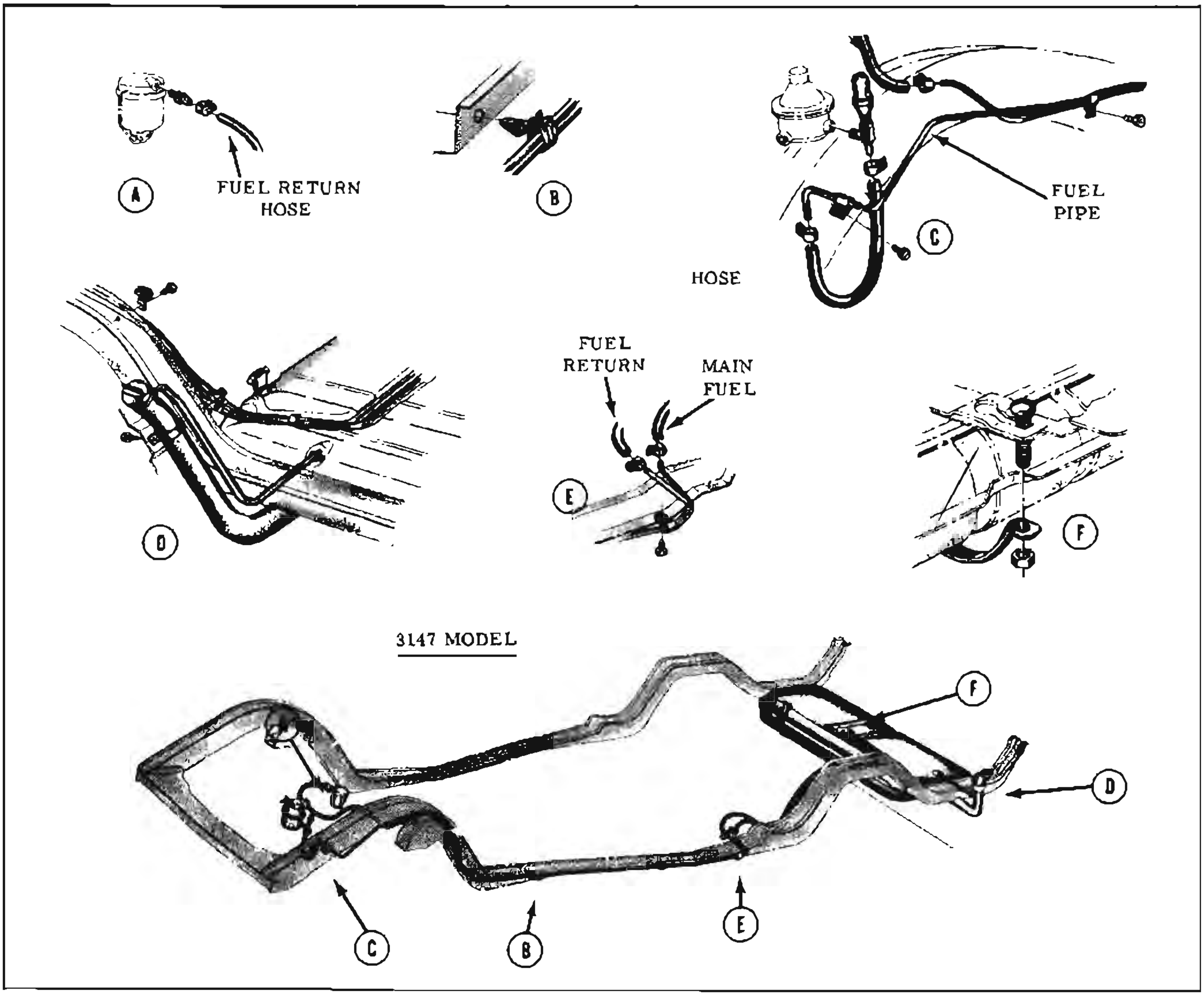


Fig. 8-177 Fuel System (3147)

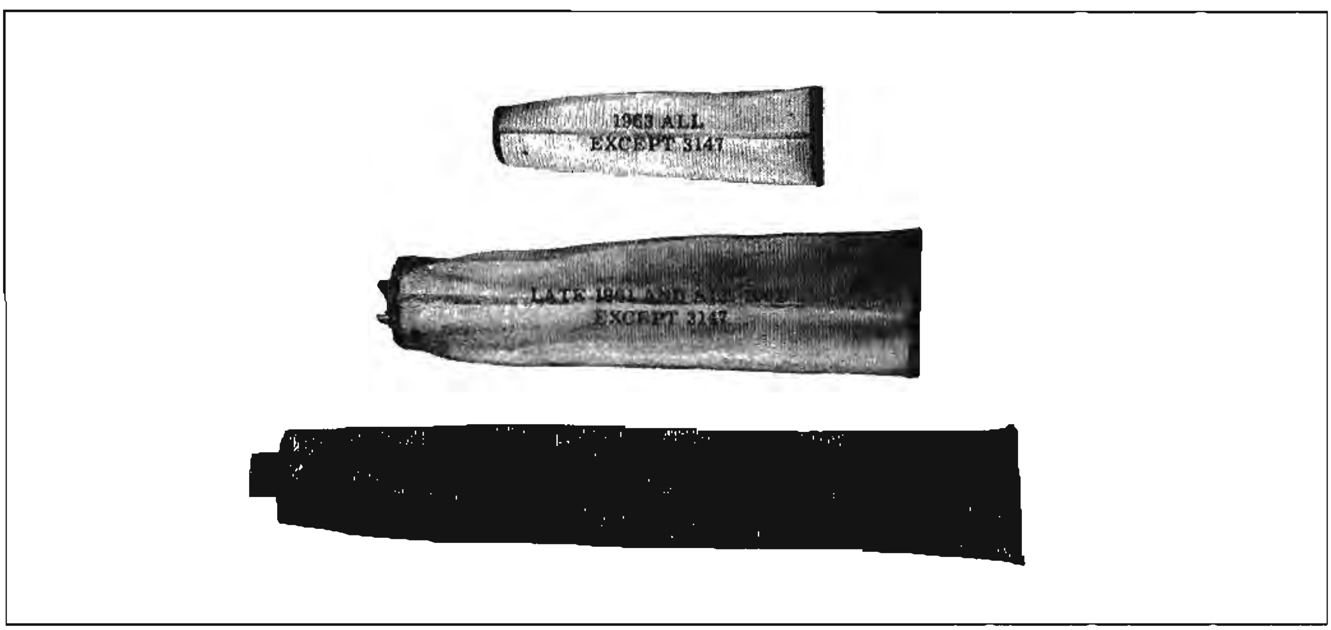


Fig. 8-178 Fuel Filters

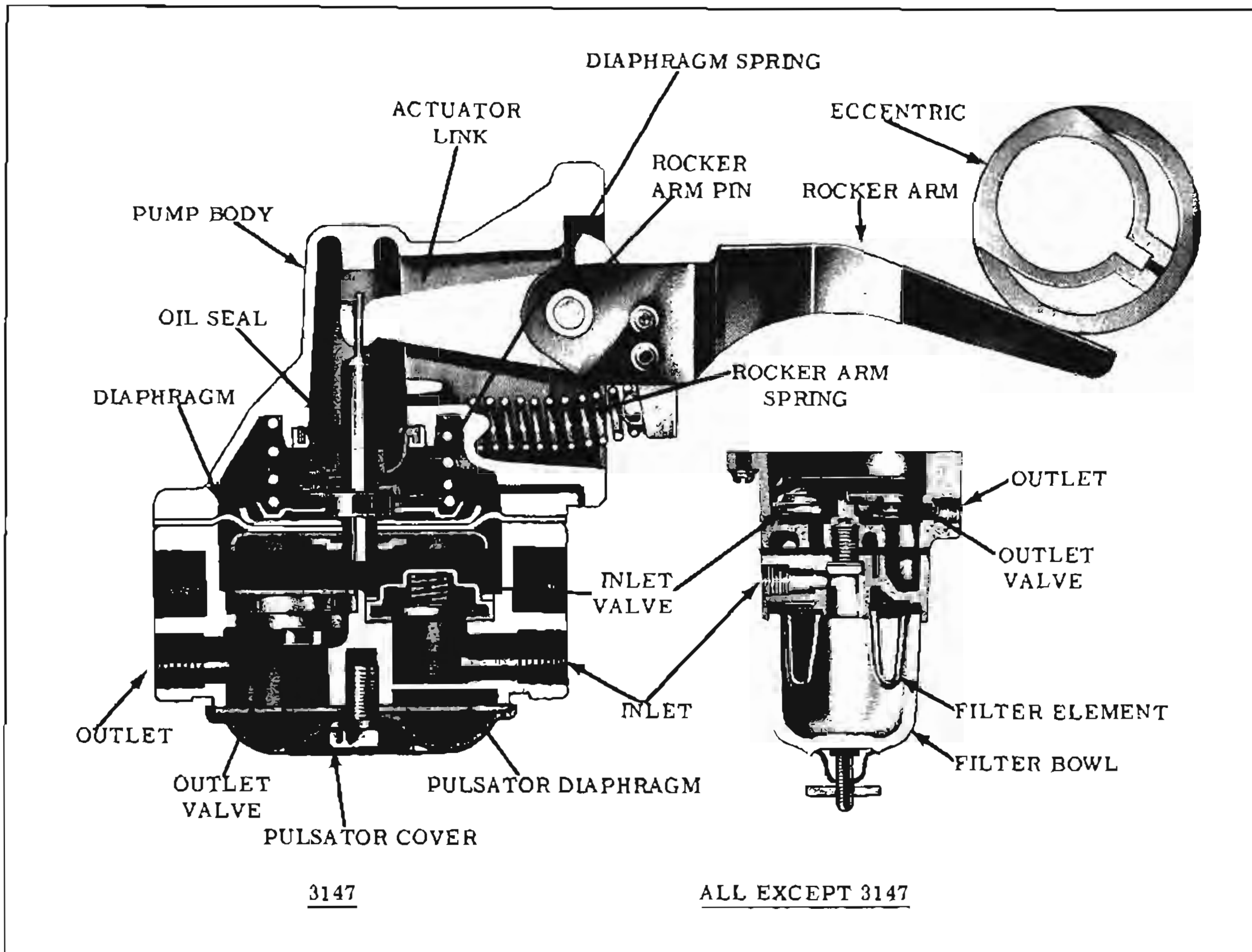


Fig. 8-179 Fuel Pump

NOTE: Due to the engine operating temperatures, a fuel return from the fuel filter to the gas tank has been incorporated, on the 3147 model only, to prevent excessive fuel pressure build-up in the line between the fuel pump and the carburetor.

CAUTION: If a car is to be stored for any appreciable length of time, the gasoline should be drained from the complete fuel system - including carburetor, fuel pump, all fuel lines, and fuel tank in order to prevent gum formations and resultant improper engine performance.

The fuel pump on all models with or without heater or air conditioning, is a single action pump.

The fuel pump rocker arm is held in constant engagement with the eccentric on the camshaft by the rocker arm spring. As the outer end of the rocker arm moves downward, the fuel link pulls the fuel diaphragm upward. The enlargement of the fuel chamber draws fuel from the tank through the inlet valve and into the fuel chamber. (Fig. 8-179)

The pump delivers fuel to the carburetor only when the pressure in the outlet line is less than the pressure maintained by the diaphragm spring. Therefore, when the carburetor float needle valve opens, the spring will expand to move the diaphragm downward to force fuel past the outlet valve to the carburetor. When the carburetor float needle valve closes, the pump builds up pressure in the fuel chamber until the diaphragm spring is again compressed. The diaphragm will then remain stationary until more fuel is required by the carburetor.

FUEL TANK

Draining Fuel Tank

1. Insert a length of hose into the gas tank, pipe nipple end first, until weighted end of hose rests on bottom of tank.

2. Cut a small slit in hose near the outer end and insert chuck of air hose into hose slit, a short blast of air will cause the gas to flow.

   NOTE: The tank can be drained rapidly by raising the front of car several feet off the floor when performing the above operation.

Removal

1. Drain tank.

2. Disconnect gas hose from fuel line. On 3147 model cars, remove the fuel return hose from return line.

3. Disconnect the gauge wire at connector in rear compartment, then feed wire thru floor. Remove the two (2) tank straps and lower tank.

Installation

1. Position tank gauge wire to the rear of tank.

2. Install tank and position the two (2) tank straps and tighten bolts.

3. Feed gas gauge wire thru floor and connect at the connector in the rear compartment.

4. Connect gas hoses at tank.

5. Fill tank.

FUEL PUMP

Inspection and Test (On Car)

1. Be sure there is gasoline in the tank.

2. Check for loose line connections. A leak at the pressure side of the system (line from pump to filter to carburetor) will be indicated by dripping fuel. A leak in the suction side of the system (line from gas tank to pump) will not be apparent except in its effect of reducing volume of fuel on the pressure side of the system.

   Tighten fuel pump diaphragm flange screws.

3. Look for bends or kinks in lines which will reduce fuel flow.

4. Test fuel flow as follows:

   a. Disconnect fuel line at the carburetor.

   b. Ground primary terminal of distributor with jumper lead so that engine can be cranked without firing.

   c. Place suitable container at end of fuel line and crank engine a few revolutions.

   NOTE: If little or no gasoline flows from open end of line, then the fuel line is clogged, filter clogged or the pump is inoperative. Before removing pump, disconnect fuel lines at fuel pump and at gas tank and blow through them with an air hose to make sure they are clear. Reconnect fuel lines to pump and gas tank.

   Also, when testing fuel system for volume flow, the disposable type filter must be checked. Volume must be first checked at the outlet side of the fuel filter and then at the inlet side of the filter.

As foreign material builds up within the filter, fuel flow restriction increases, resulting in a decrease of volume flow at the filter outlet. When the restriction becomes excessively high, volume flow to the carburetor can drop below engine requirements although the fuel pump is still capable of meeting volume specifications. THIS MAKES IT NECESSARY TO CHECK VOLUME FLOW AT BOTH THE INLET AND OUTLET SIDE OF THE FUEL FILTER TO DETERMINE IF THE FUEL PUMP OR FILTER IS OUT OF SPECIFICATION.

5. Even if fuel flows in good volume from line at carburetor, it is advisable to make certain that pump is operating within limits.

   a. Attach a low reading pressure gauge to upper end of pump to carburetor line.

   b. Run engine at approximately 1800 r.p.m. (using gasoline in carburetor bowl) and note reading on pressure gauge.

   c. If pump is operating properly, the pressure will be 6 to 8 psi constant. If pressure is too low or too high or varies materially at different speeds, the pump should be removed for repair or replacement.

Removal and Installation

1. Disconnect fuel lines at fuel pump.

2. Remove 2 fuel pump to front cover mounting bolts, and then remove fuel pump.

Disassembly

1. Clamp pump upside-down in vise by one ear of mounting flange. Clean dirt from outside of pump.

2a. (All except 3147)

Remove filter bowl, filter element, and filter housing from pump body.

2b. (3147)

Remove fuel pulsator plate and diaphragm from fuel cover.

3. To facilitate correct reassembly, mark edges of fuel cover and body flange with a file.

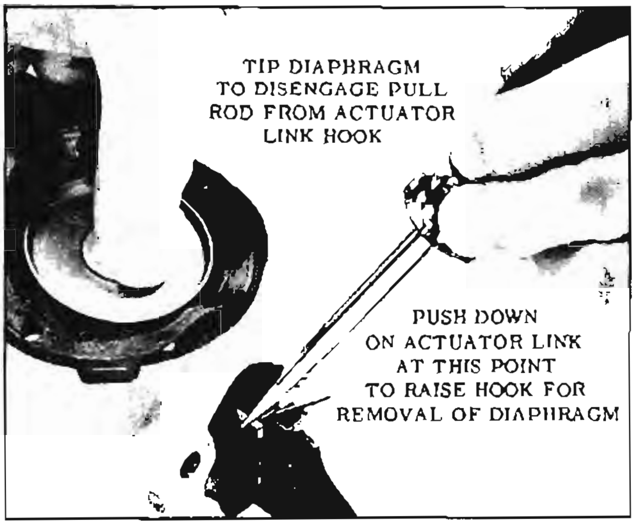


Fig. 8-180 Disengaging Diaphragm

4. Loosen six (6) cover screws about two turns.

5. Separate fuel cover from body by jarring cover lightly with a plastic hammer. Remove all but two (2) attaching screws.

6. Holding the cover down against the diaphragm spring pressure, remove the two (2) remaining cover screws and cover. Carefully separate the diaphragm from cover.

7. Remove rocker arm spring.

8. Push down on the end of the actuator link. (Fig. 8-180) This will hold the link up so that the diaphragm assembly may be tipped off of the link hook. (Fig. 8-181) To disconnect the diaphragm from the link, push down and away from the rocker arm side of pump.

9. To remove valves, remove burrs produced by staking and pry inlet valve assembly from pump and push outlet valve assembly through cover from pulsator side of cover.

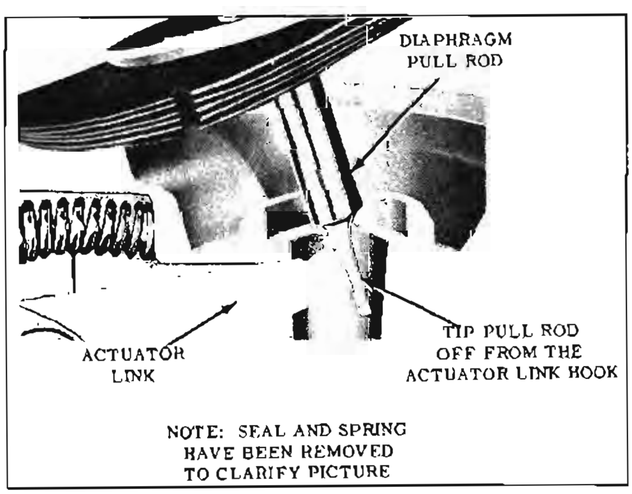


Fig. 8-181 Diaphragm Removal

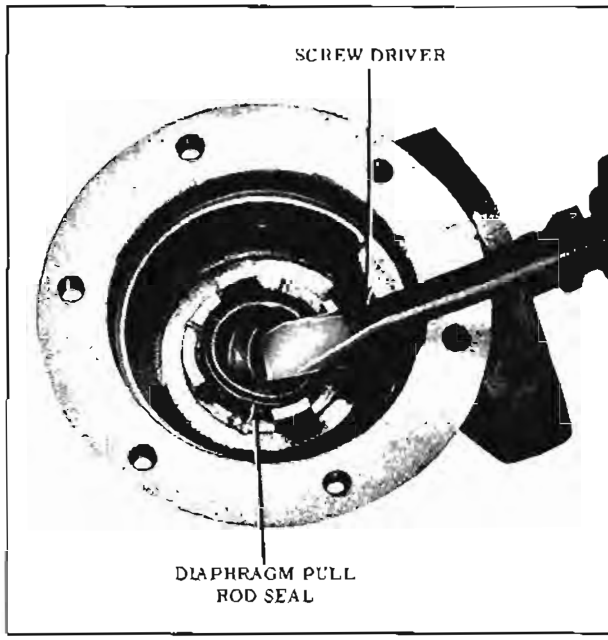


Fig. 8-182 Removing Seal

10. Remove staking burrs from diaphragm pull rod seal and remove seal by prying out with screwdriver. (Fig. 8-182)

11. To remove rocker arm, drive out rocker arm pivot pin with a suitable drift, being sure the pump body is supported to prevent damage to casting. The rocker arm and link assembly will then slide from the pump body.

Cleaning and Inspection

1. Clean and rinse all metal parts in solvent. Blow out all passages with air hose.

2. Inspect pump body and cover for cracks, breakage, and distorted flanges. Examine all screw holes for stripped or crossed threads. Replacement of pump assembly is advisable if one or more of the following conditions are found:

   a. Body or cover castings warped or damaged.

   b. Rocker arm worn at cam pad.

   c. Rocker arm bushing worn.

   d. Links worn excessively.

   NOTE: If flange facings are warped .010" or less, they can be trued up on a piece of plate glass with No. 400 grit sandpaper.

Assembly

1. Install a new pull rod seal using a socket or a tube which will rest on the outer shoulder of the retainer and stake securely.

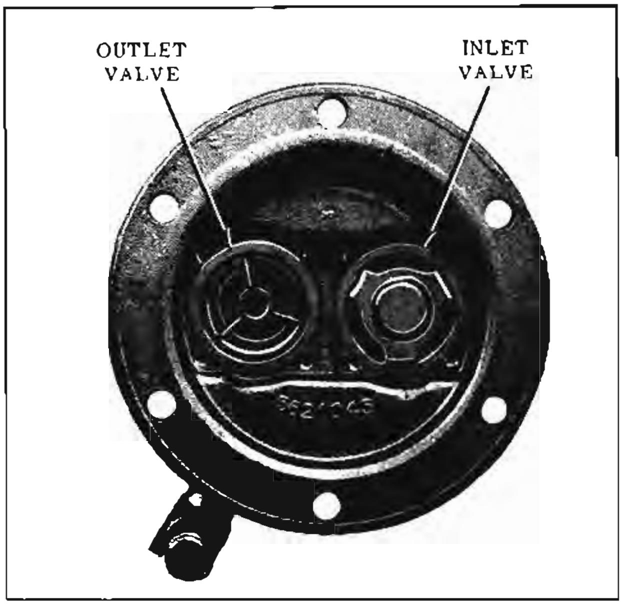


Fig. 8-183 Fuel Pump Valves

2. Soak diaphragm in clean kerosene or fuel oil, and oil diaphragm pull rod.

3. Place spring over pull rod seal. Hold the fuel link up against the seal, as shown in Fig. 8-181, then install the diaphragm by inserting the pull rod through the spring and pull rod seal. With the flat of pull rod at a right angle to the fuel link, hook rod to link.

4. Place valve gaskets in recesses provided in fuel cover. Place valve assemblies on top of gaskets. Inlet valve must have spring cage facing out of cover, and the outlet valve must have the spring cage facing into cover. Stake valves in place. (Fig. 8-183)

5. Using aligning pins, lift rocker arm until the diaphragm is flat across the body flange and install fuel cover on body, making sure that file marks on cover and body line up. While holding diaphragm flat, install cover screws and lock washers loosely until screws just engage lock washers. Remove aligning pins and install remaining screws with lock washers.

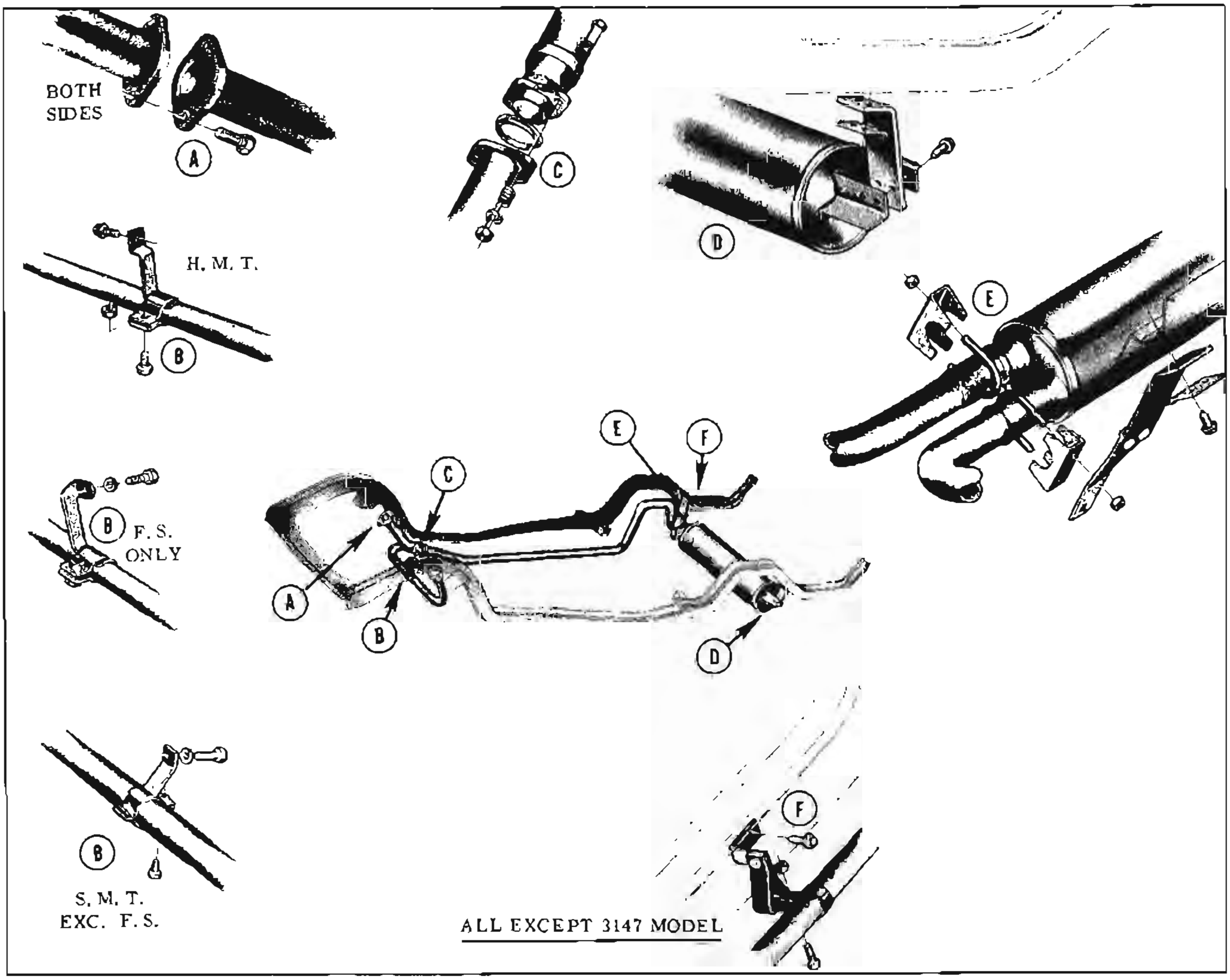


Fig. 8-184 Exhaust System (All except 3147)

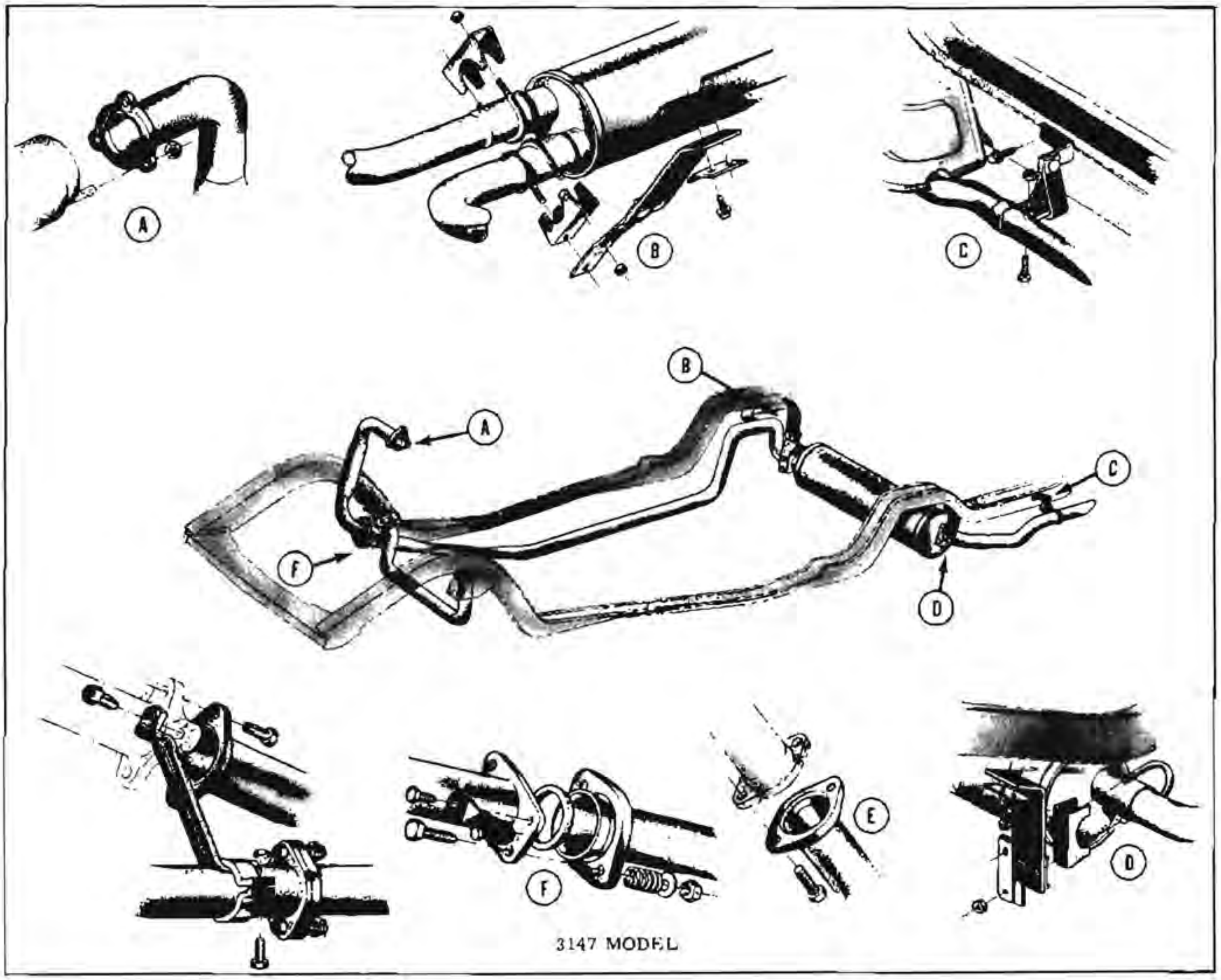


Fig. 8-185 Exhaust System (3147)

NOTE: Diaphragm must be flexed by several full strokes of rocker arm before tightening cover screws, or pump pressure will be incorrect and diaphragm may be damaged.

6. Tighten the cover screws alternately and securely.

7a. (All Except 3147) - Install filter housing, filter element and filter bowl.

7b. (3147) - Position pulsator diaphragm on fuel cover, then install pulsator cover and secure with attaching bolts.

FUEL STRAINER

No attempt should be made to clean a dirty filter element. Whenever a dirty filter is encountered, the element should be replaced.

EXHAUST SYSTEM (Figs. 8-184 and 8-185)

DESCRIPTION

The single exhaust system consists of a front exhaust pipe, rear exhaust pipe, muffler and tail pipe. The muffler is mounted in front of the gas tank, parallel to the rear bumper. The inlet and outlet is on the same end of muffler which is a reverse flow type, having an asbestos and steel outer shell. (Fig. 8-184)

The dual outlet exhaust system is basically the same as the single exhaust system except for the muffler which has an outlet on each end.

The exhaust system used on the (3147) model consists of a turbo-charger inlet exhaust pipe (not shown), turbo-charger outlet exhaust pipe, crossover pipe, intermediate exhaust pipe incorporating a resonator, rear exhaust pipe, dual outlet muffler and two (2) tail pipes. (Fig. 8-185)

To replace the resonator, cut off the

intermediate exhaust pipe immediately in front of the resonator, remove the resonator and replace with service package Part Number 380278 which consists of a resonator, two clamps and bolts.

The intermediate exhaust pipe, without the incorporated resonator, is also available. However, to replace the original intermediate pipe, it will also be necessary to install a new resonator.

SPECIFICATIONS

COOLING SYSTEM		
CAPACITY	Jetfire and/or A/C.	9.8 Qts.
	All except Jetfire and/or A/C	10.5 Qts.
For Heater, Add		1.5 Qts.
Pressure Cap		
With or Without Air Conditioning		15 Lbs.
Thermostat		170°
FUEL PUMP		
Pressure		6 to 8 Lbs.

TORQUE SPECIFICATIONS

FUEL AND VACUUM PUMP	
Fuel Pump to Front Cover Bolts	20 to 35
Fuel Pump Eccentric to Camshaft	40 to 45
EXHAUST SYSTEM	
Intermediate Pipe to Muffler	15-18
Muffler to Tail Pipe.	15-18
Tail Pipe to Support Assembly	8-16
Insulator to Muffler Assembly	5-8
Exhaust Pipes to Exhaust Manifold	10-18
Junction to Intermediate Pipe	10-15
R.H. Exhaust Manifold to Turbocharger Pipe Assembly	10-18
Intermediate Pipe and Muffler to Support	15-18
Intermediate Pipe to Exhaust Pipe	7-10
Hanger and Exhaust Pipe to Manifold	25-28
Clamp to Exhaust Pipe and Hanger	7-10

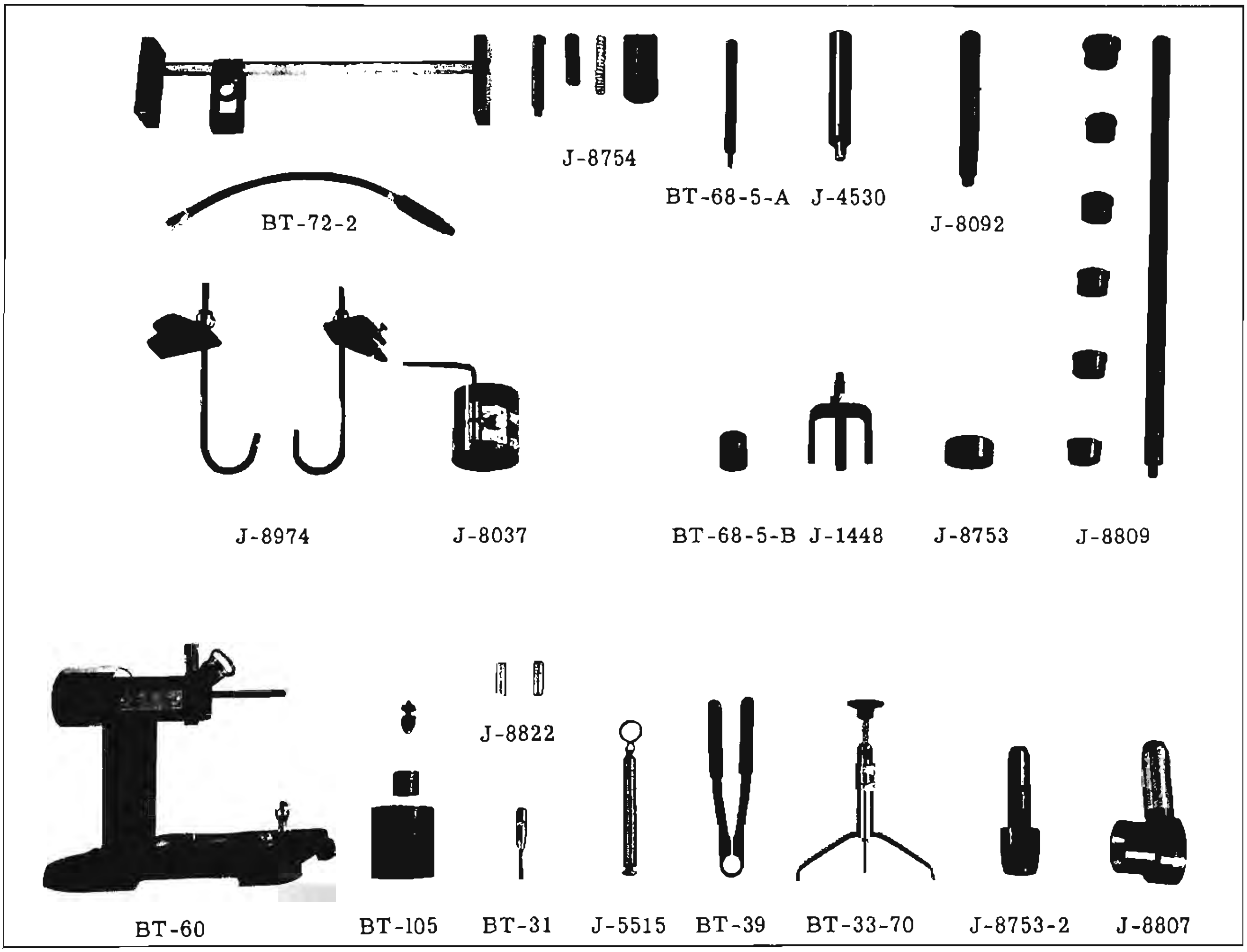


Fig. 8-186 Tools

BT-31	Valve Lifter Remover
BT-33-70	Belt Tension Gauge
BT-39	Valve Lifter Remover
BT-60	Hydraulic Valve Lifter Tester
BT-68-5-A	Valve Guide Remover
BT-68-5-B	Valve Guide Installer
BT-72-1-B	Valve Holding Tool
BT-72-2	Valve Spring Compressor
BT-105	Adapter Kit (Used With Hydraulic Valve Lifter Tester)
J-1448	Crankshaft Pilot Bushing Remover
J-4530	Crankshaft Pilot Bushing Installer
J-55-5	Spring Scale (Used For Fitting Piston)
J-8037	Piston Ring Compressor
J-8092	Drive Handle
J-8753	Front Cover Seal Installer
J-8753-2	Front Seal Sizer
J-8754	Piston Pin Remover and Replacer Set
J-8807	Crankshaft Rear Seal Installer
J-8809	Cam Bearing Remover and Installer
J-8822	Connecting Rod Bolt Guide Set
J-8974	Engine Support Hooks

CARBURETION

(FULL SIZE CAR)

CONTENTS OF SECTION 9

ROCHESTER CARBURETOR
MODEL 4GC

THEORY OF OPERATION

FLOAT SYSTEM (Fig. 9-1)

The 4GC carburetor employs two sets of twin floats. As fuel is consumed, the floats drop and open the needle seats. Fuel enters on the primary side and some of this fuel passes through the air horn to the secondary side, maintaining correct fuel level in the float bowl under all operating conditions.

IDLE SYSTEM (Fig. 9-2)

The idle system located on the primary side of

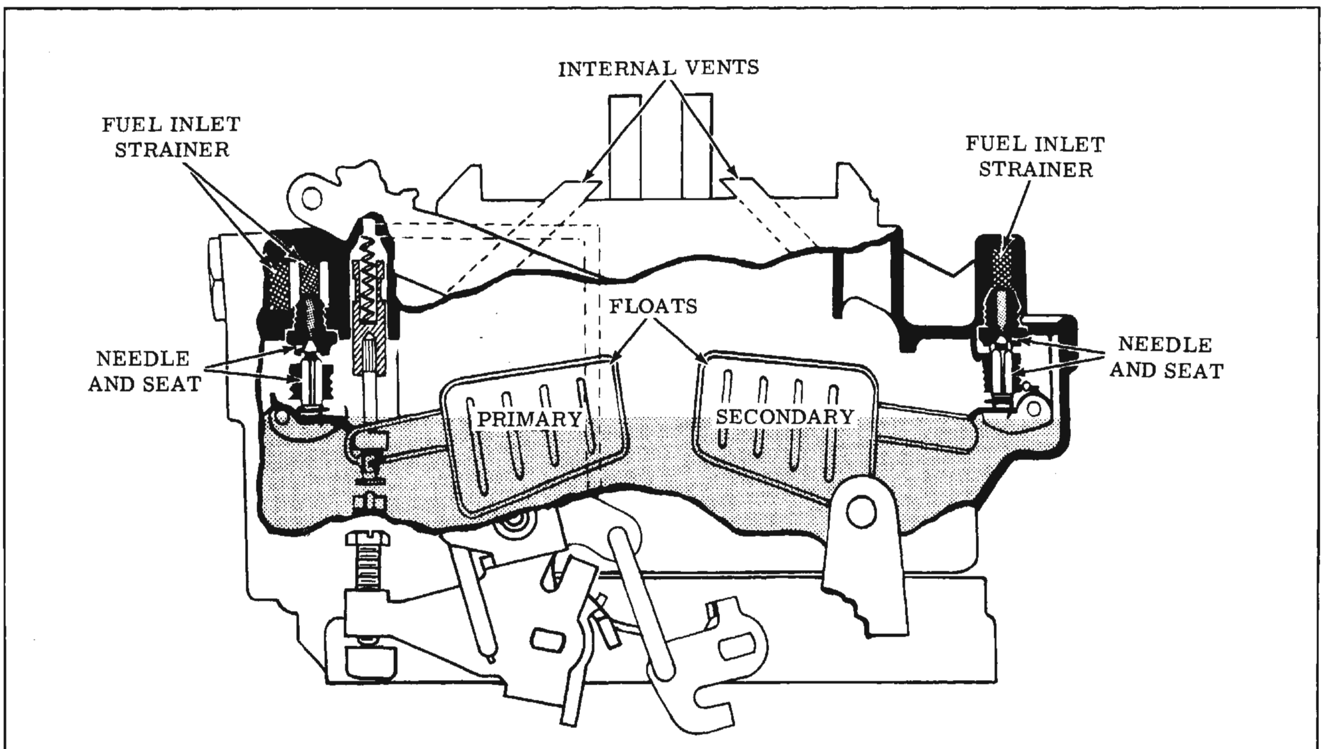


Fig. 9-1 Float System

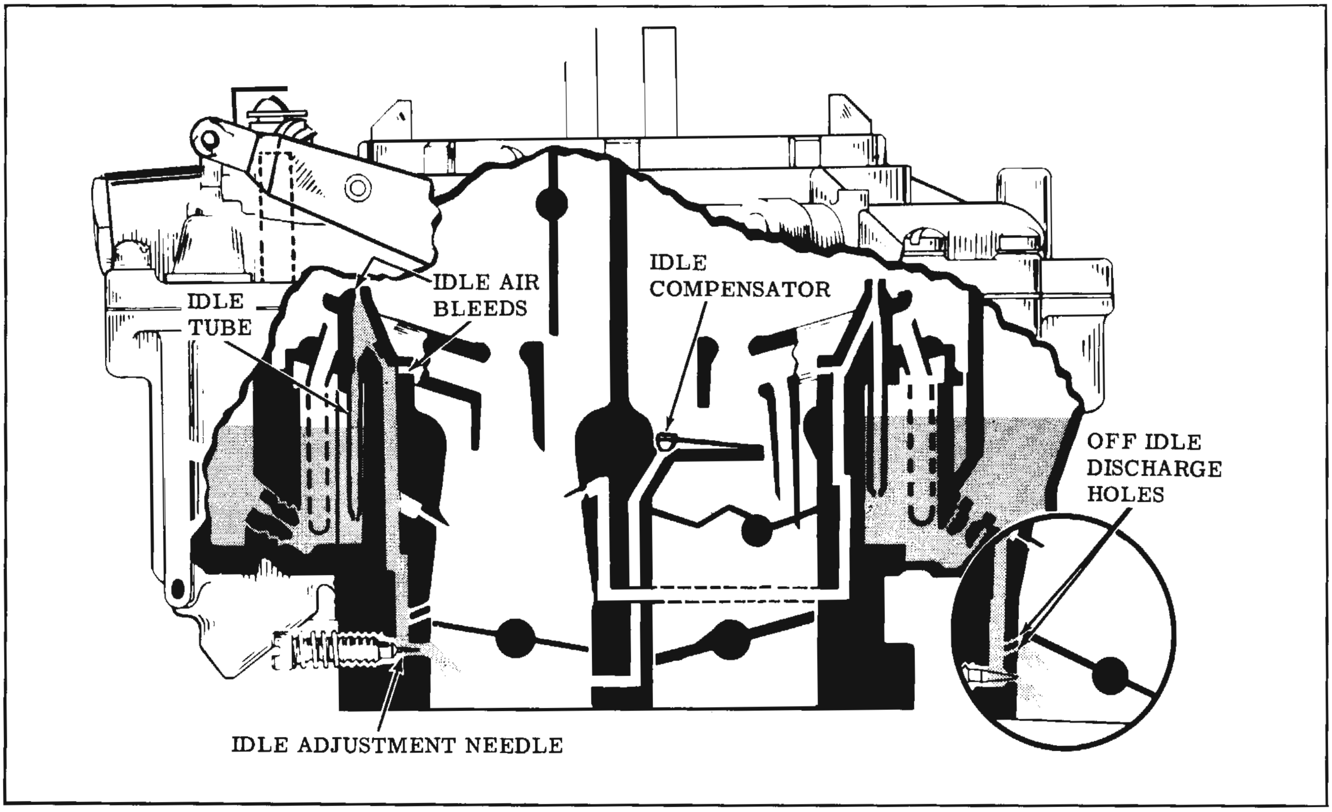


Fig. 9-2 Idle System

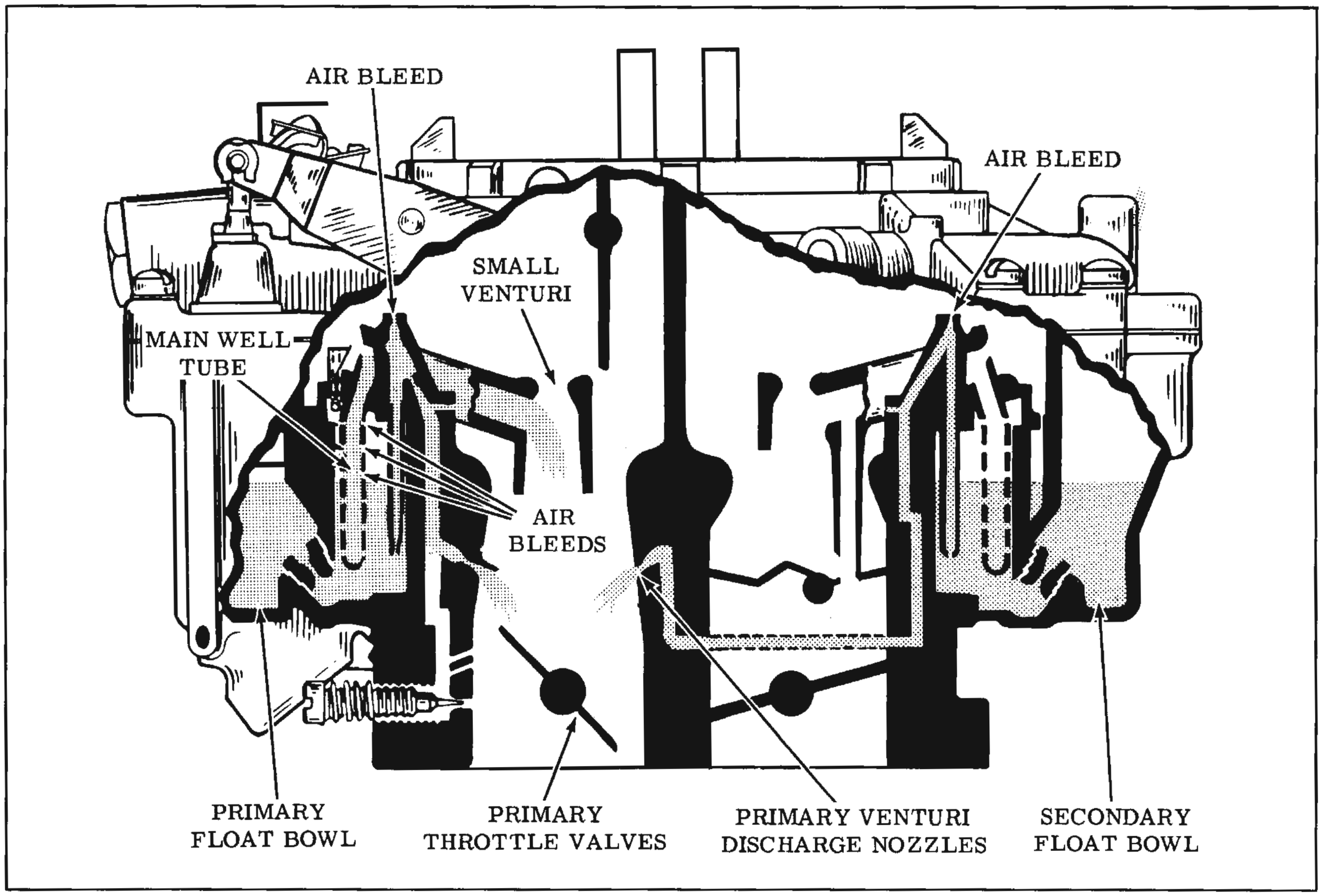


Fig. 9-3 Part Throttle System

the carburetor supplies the fuel required for normal curb idle, off idle and low speed operation.

To minimize fuel vapor formation in the carburetor bowl, an external vent opens when the throttle valves are in the idle position.

Cars equipped with factory installed A/C are equipped with an idle compensator to prevent stalling under prolonged "hot idle" conditions. When underhood temperatures rise, a bimetal strip lifts the valve off its seat allowing additional air to enter below the throttle valves, offsetting the enrichening effects of the higher temperatures.

PART THROTTLE (Fig. 9-3)

As the primary throttle valves open, the speed of air entering the carburetor bore increases and raises the vacuum in the small venturi area. Fuel is then drawn from the float bowl into the main well up the main well tubes, where air bleeds are provided, and into the venturi. However, at wide primary throttle valve openings, prior to the opening of the secondary throttle valves, and continuing through wide open secondary throttle operation, an additional source of fuel is provided from the secondary side through a discharge nozzle that opens into the primary venturi.

POWER SYSTEM (Fig. 9-4)

When more power is needed or high speed driving is maintained, a vacuum operated power piston and power valve provide additional fuel.

When manifold vacuum drops below approximately 9" hg. the power piston spring forces the piston down to unseat the spring loaded power valve, permitting additional fuel to flow through the main well tubes.

PUMP SYSTEM (Fig. 9-5)

The accelerator pump provides the fuel necessary for smooth operation during acceleration by forcing additional fuel into the air stream.

CHOKE SYSTEM (Fig. 9-6)

The choke system is designed to work independently of the fast idle which provides a relatively short choking period with adequate fast idle for a cold engine. A thermostatic coil closes the choke valve for cold operation and gradually releases the choke during the warm-up period. To maintain a more exacting air fuel ratio during warm-up, the force of the thermostatic coil is opposed by air velocity against the offset choke valve and a vacuum piston and link assembly. To prevent a closed choke condition with a wide open throttle,

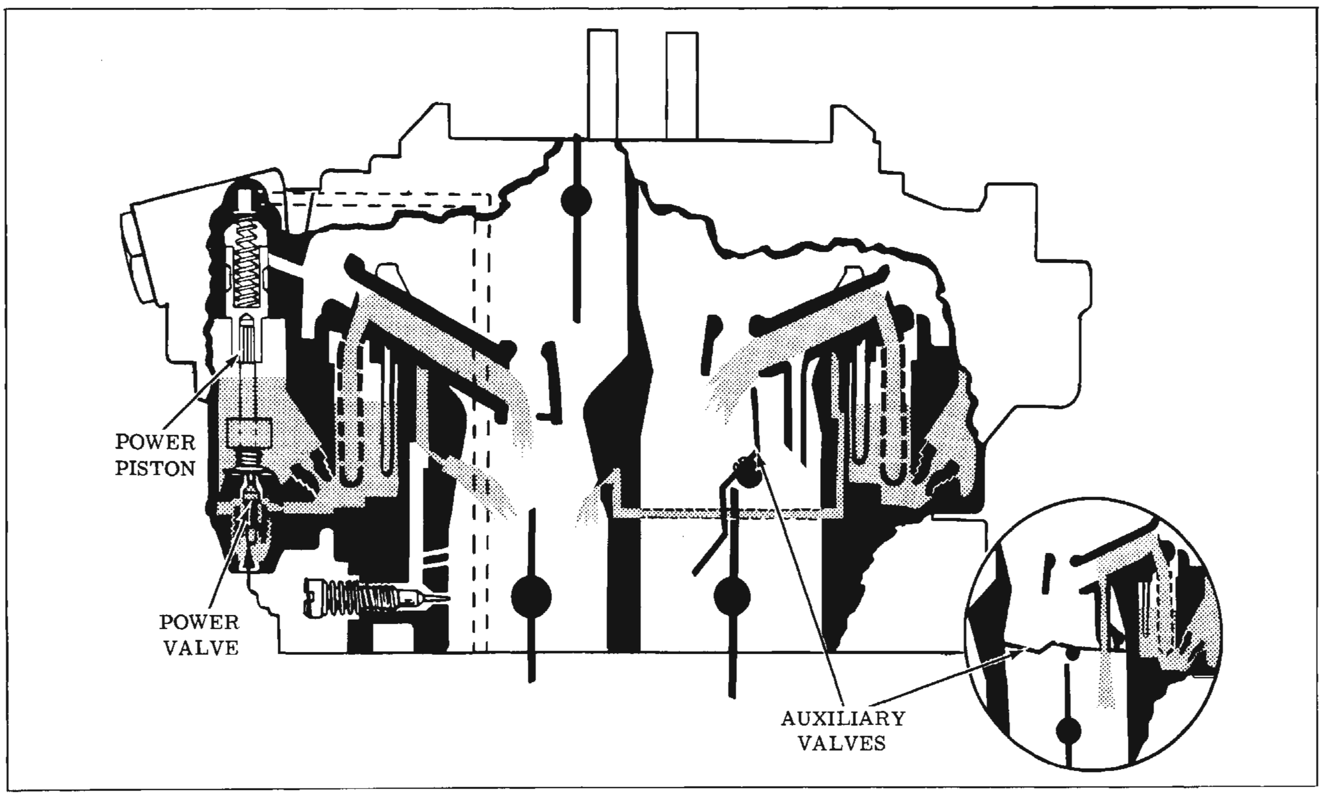


Fig. 9-4 Power System

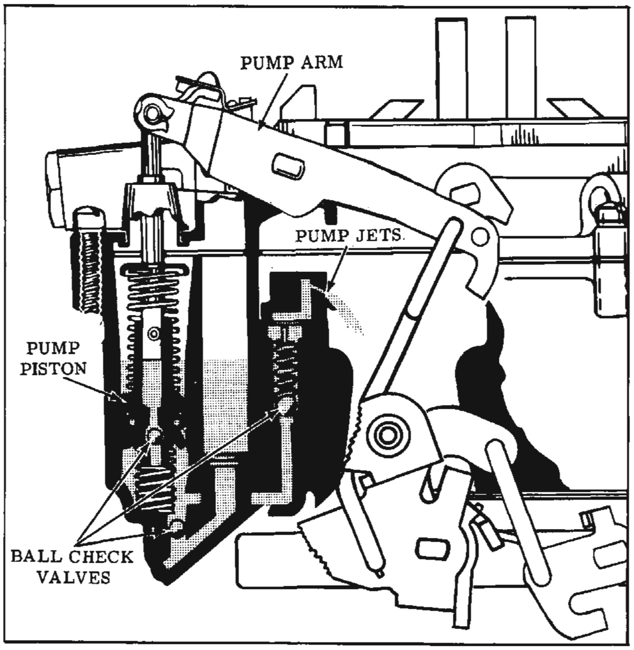


Fig. 9-5 Pump System

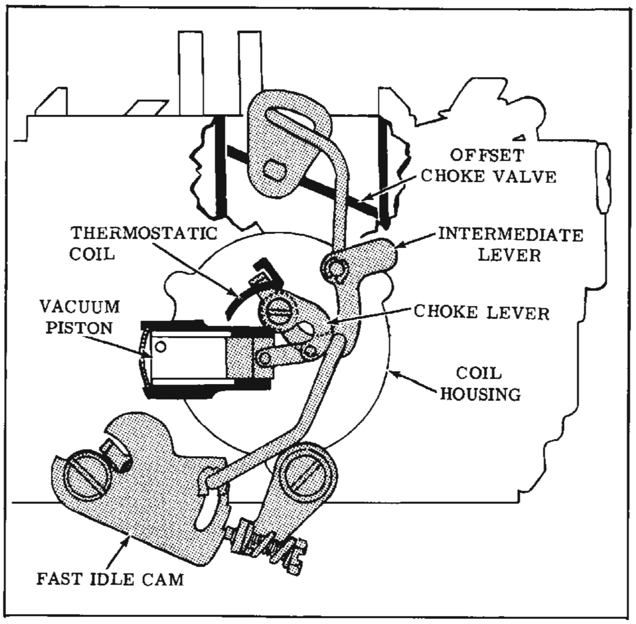


Fig. 9-6 Choke System

a tang on the pump arm mechanically opens the choke a sufficient amount to prevent a loading condition. This also provides an unloader to open the choke valve when starting a flooded engine.

REMOVE AND INSTALL

1. Remove air cleaner.
2. Remove cotter key, which retains bellcrank, and retainer from bellcrank rod and remove bellcrank and rod as an assembly.
3. Disconnect fuel line from front of carburetor.
4. Disconnect choke pipe from choke cover.
5. Disconnect vacuum lines.
6. Remove four throttle body to intake manifold nuts and remove carburetor.

To install reverse removal procedure and make adjustments outlined under Adjustments (On Car). Torque carburetor to intake manifold nuts 11 to 14 ft. lbs.

CARBURETOR DISASSEMBLY

DISASSEMBLY OF AIR HORN (Fig. 9-7)

1. Mount the carburetor on Holding Fixture J-5923-B, or 30-14.
2. Remove the fuel inlet fitting and gasket, then remove the filter screen from the air horn.
3. Remove idle vent valve screw, shield and valve.
4. Remove the retainer from the upper end of the pump rod and disengage rod.
5. Remove the retainer from pump plunger shaft and unhook the shaft from pump arm.
6. Remove the retainer from the intermediate choke rod and unhook rod from choke lever.
7. If the choke shaft is to be removed:

   a. Remove the small screw holding the choke unloader lever to the choke shaft, then remove the lever.

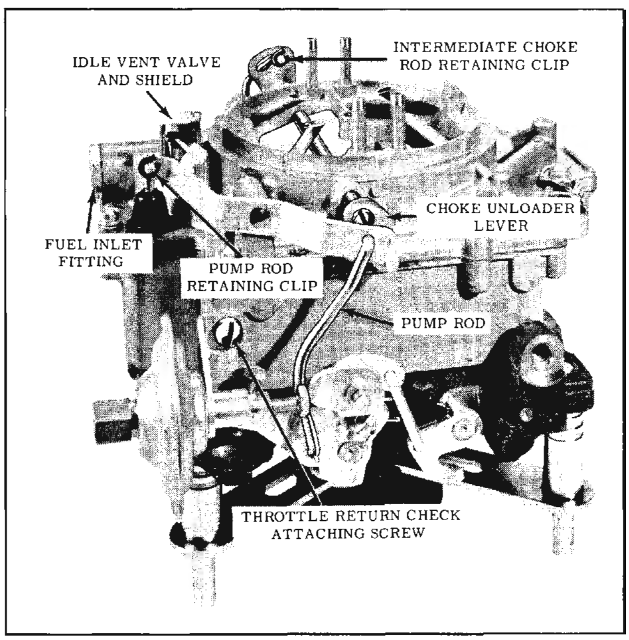


Fig. 9-7 4GC Carburetor

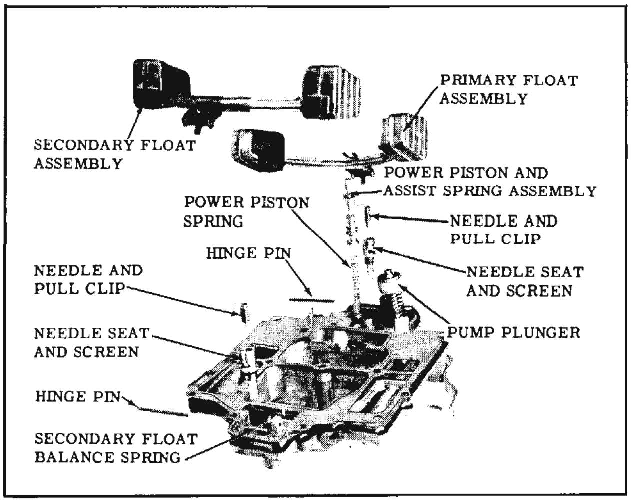


Fig. 9-8 Air Horn Assembly

b. Remove the two small brass choke valve retaining screws and discard. Remove the choke valve and the choke shaft.

8. Remove the 13 air horn attaching screws, one screw is recessed in the top of the air horn.

9. Carefully lift the air horn until the float assemblies are clear of the carburetor body.

10. Remove the hinge pin from the primary float assembly, then slide the float and needle away from the power piston stem. (Fig. 9-8)

11. Remove primary float needle seat and gasket, using Tool BT-52. Remove the small filter screen from the needle seat bore.

    NOTE: The float needle and seat are matched and must be installed as an assembly.

12. Remove the hinge pin, float assembly, needle seat gasket and filter screen from the secondary side of the air horn. Do not remove the float balance spring unless it is distorted and needs replacement.

13. Remove the air horn gasket.

14. Remove burrs around power piston bore due to staking and remove the power piston assembly by depressing the stem and allowing it to snap back into position. Remove the spring under the piston.

15. Remove the pump plunger assembly by sliding the shaft through the rubber seal. Remove the rubber seal from the top side of the air horn casting.

DISASSEMBLY OF FLOAT BOWL

1. Remove the fast idle cam attaching screw. (Fig. 9-9)

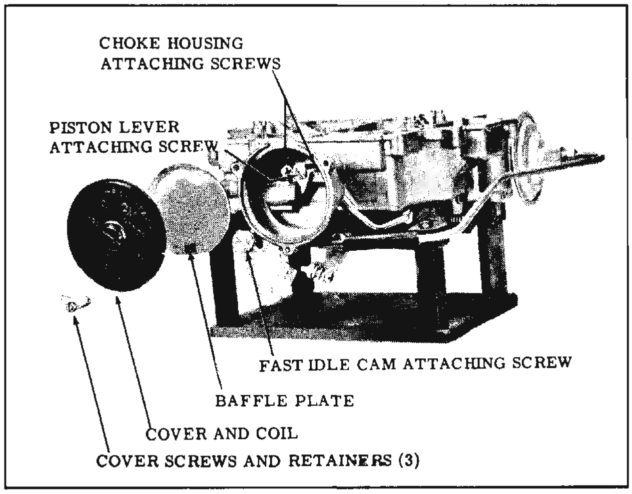


Fig. 9-9 Choke Assembly and Fast Idle Cam

2. Remove the three choke cover attaching screws and retainers, then remove the choke cover, gasket and baffle from the choke housing.

3. Remove the choke piston lever attaching screw, then remove the lever link and piston assembly from the choke housing.

4. Remove the two choke housing attaching screws, then remove the choke housing and linkage from the carburetor body.

5. Remove the intermediate choke lever and shaft with linkage from the choke housing, then remove choke housing gasket.

6. Remove the throttle return check by removing the attaching screw, and the rubber tee from the vacuum fitting on the throttle body.

7. Remove the three attaching screws and lock

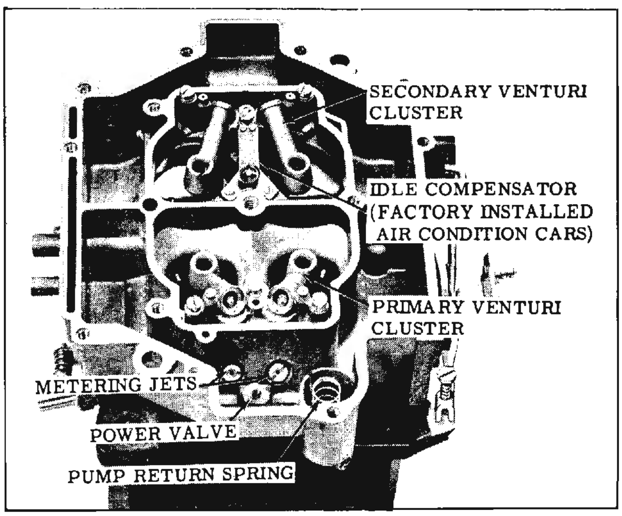


Fig. 9-10 Float Bowl Assembly

washers from the venturi cluster on the primary side, then remove the cluster and gasket. (Fig. 9-10)

8. Remove the main well inserts. (Fig. 9-11)

9. Remove the three attaching screws and lockwashers from the venturi cluster on the secondary side, then remove the cluster and gasket.

10. If equipped with idle compensator, remove attaching screws then remove the idle compensator and gasket.

11. Remove both metering jets from the primary (pump) side of the carburetor body.

12. Remove the power valve and gasket.

13. Remove both metering jets from the secondary side of the carburetor. Keep them in a separate group.

14. Remove the pump return spring from the pump well, then invert the carburetor body to remove the aluminum pump inlet ball from the well.

15. Remove the small "T" shaped pump discharge spring guide with needle nose pliers, then remove the small spring and steel ball. (Fig. 9-11)

16. If it is necessary to clean or replace the small screen next to the pump plunger bore, remove the retainer ring and screen.

17. Invert the carburetor body and remove the four throttle flange attaching screws. Remove the throttle flange and gasket. (Fig. 9-12)

18. Remove the secondary auxiliary throttle valve assembly from the carburetor body.

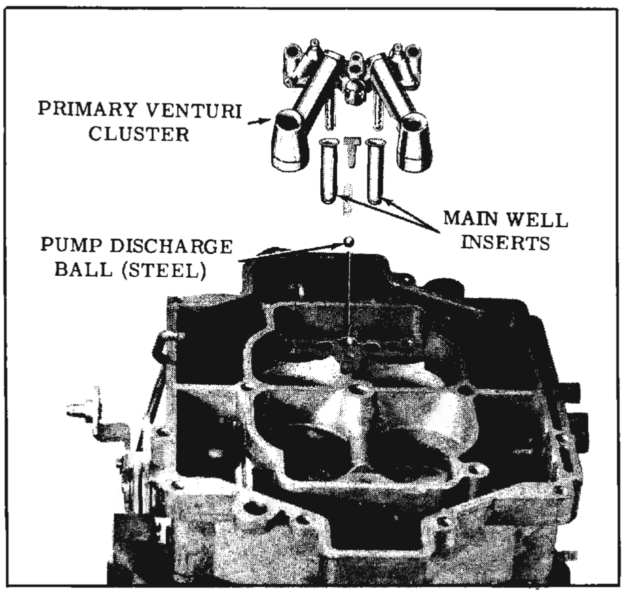


Fig. 9-11 Pump Discharge Spring, Guide and Main Well Inserts

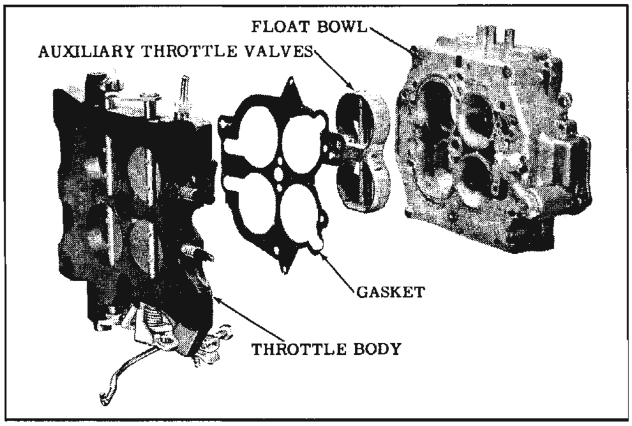


Fig. 9-12 Auxiliary Throttle Valves

DISASSEMBLY OF THE THROTTLE BODY

NOTE: No attempt should be made to remove the throttle valve or shaft from the throttle flange as it may be impossible to reassemble the throttle valves correctly in relation to the vacuum advance and idle discharge orifices.

The idle mixture needle screws may be removed for cleaning or replacement. Also the slow and fast idle speed screws can be removed if necessary.

CLEANING OF PARTS

The carburetor should not be cleaned in any solution other than a cold immersion type cleaner.

1. Thoroughly clean carburetor castings and metal parts in carburetor cleaning solvent.

   CAUTION: The choke coil, housing, and pump plunger should not be immersed in solvent. Clean pump in clean gasoline only.

2. Blow all passages in casting dry with compressed air. DO NOT PASS DRILLS THROUGH JETS OR PASSAGES.

3. Clean filter screens of dirt or lint. If the filter screens are distorted or plugged they should be replaced.

INSPECTION OF PARTS

1. Check floats for dents or excessive wear at hinge pin holes.

2. Shake floats to check for leaks.

3. Examine float needle and seat. If grooved, replace with a factory matched float needle, seat, and gasket assembly.

4. Inspect the idle mixture adjusting needles for burrs or ridges.

5. Inspect the upper and lower surfaces of the carburetor body to see that the small sealing beads are not damaged. Damaged beading may result in air or fuel leaks at that point.

6. Inspect holes in pump rocker arm, fast idle cam, and throttle shaft lever. If holes are worn excessively or out-of-round to the extent of improper operation of the carburetor, worn parts should be replaced.

7. Inspect the steps on the fast idle cam for excessive wear. If excessive wear is noted, cam should be replaced to assure proper engine operation during the warm-up and choking periods.

8. Inspect the pump plunger for cracks or creases. If the pump plunger is damaged, replace the pump plunger as a complete assembly.

9. Inspect the throttle flange assembly. Make sure the idle passages and vacuum channels are clean.

10. Inspect filter screens. If screens are distorted or plugged, they should be replaced.

As mentioned during the disassembly of the carburetor, there is a very close tolerance fit of the throttle valves in the throttle body. Also the idle discharge orifices are drilled in relation to a properly fitting valve. Therefore, if the throttle valves, levers or shafts are worn excessively or damaged, a complete throttle body assembly is required.

CARBURETOR ASSEMBLY

ASSEMBLY OF THE THROTTLE BODY

1. Install the idle mixture needles and springs finger tight. Back out the needles 1-1/2 turns as a preliminary idle adjustment.

2. If removed, install the slow and fast idle screws in the throttle levers.

ASSEMBLY OF THE FLOAT BOWL

1. With the carburetor body in the inverted position, install the auxiliary throttle valve assembly so that the calibrated spring operating pin is down. (Fig. 9-12)

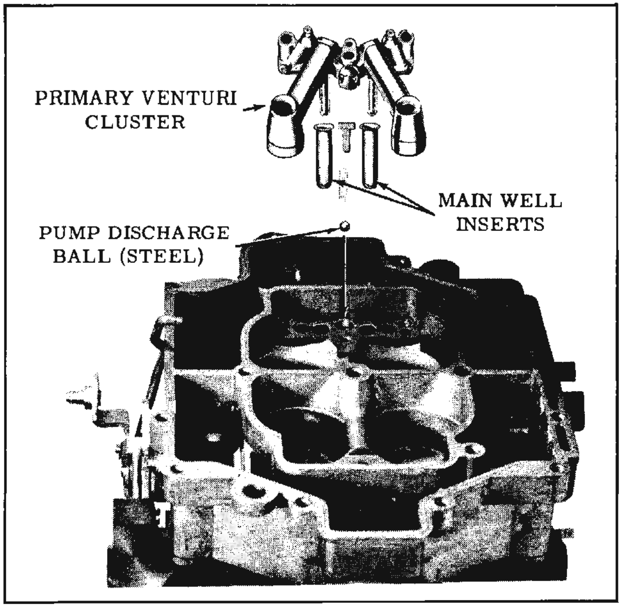


Fig. 9-13 Pump Discharge Spring, Guide and Main Well Inserts

2. Position the throttle body gasket on the float bowl so that all holes are properly aligned.

3. Place the throttle body on the float bowl and install the four attaching screws. Tighten the center screw 9 to 10 ft. lbs. and the outer screws 3 to 4 ft. lbs.

4. Place the float bowl upright on the holding stand.

5. Install the pump outlet steel ball, spring, and "T" shaped guide in the center hole of primary venturi cluster. (Fig. 9-13)

6. Install the main well inserts. (Fig. 9-13)

7. Install the power valve and gasket, and the two primary main metering jets. (Fig. 9-14)

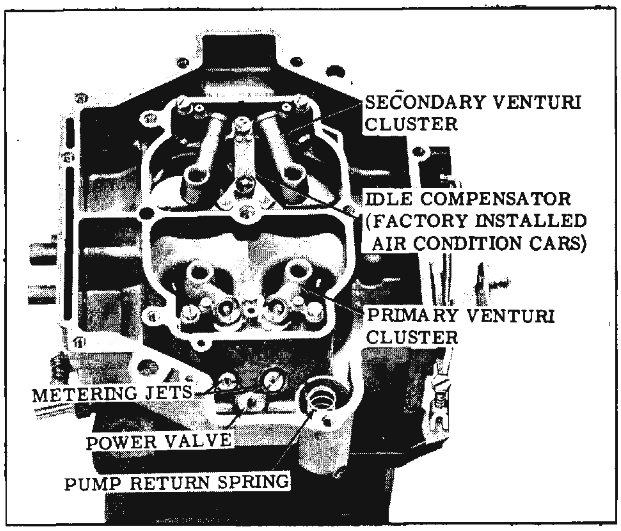


Fig. 9-14 Float Bowl Assembly

8. Install the two secondary main metering jets.

9. If equipped with idle compensator, install compensator and gasket and retain with two screws. Make sure the compensator is seated firmly in the passage and tighten screws securely.

10. Install the secondary venturi cluster and gasket and retain with three attaching screws and washers.

    NOTE: The secondary cluster does not have pump discharge nozzles.

11. Install primary venturi cluster and gasket and retain with three attaching screws and lock washers.

12. Install the pump inlet aluminum ball and the pump return spring in the pump plunger well. Be sure the spring is seated over the ball.

13. Install the pump inlet screen and retainer if removed.

14. Install the choke housing gasket, intermediate choke lever and shaft with linkage, in the choke housing. (Fig. 9-15)

15. Install the choke housing on the float bowl and retain with two attaching screws. Be sure the intermediate choke shaft lever is extending downward between the two attaching screw bosses.

16. Install the choke lever, link, and piston assembly and attach lever to the intermediate choke shaft.

    NOTE: The choke piston pin hole in the piston should be pointing inward.

17. Install fast idle cam with attaching screw.

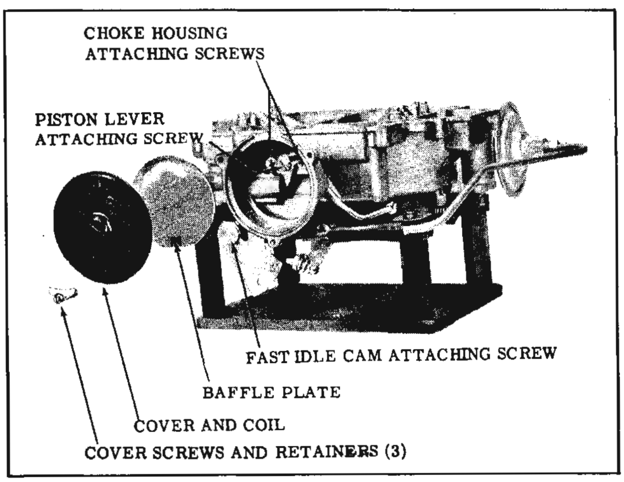


Fig. 9-15 Choke Assembly and Fast Idle Cam

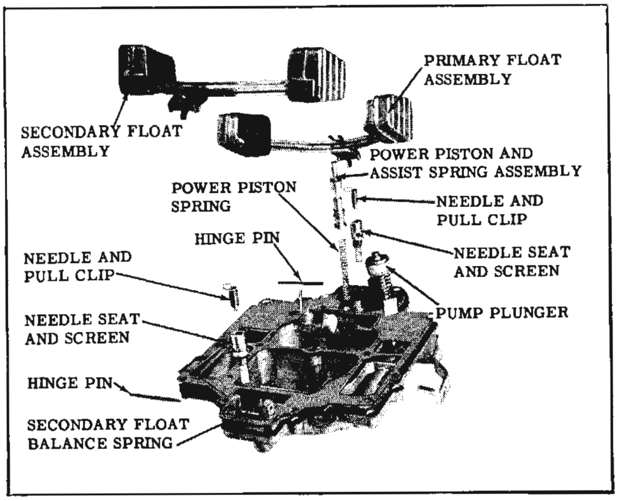


Fig. 9-16 Air Horn Assembly

ASSEMBLY OF THE AIR HORN (Fig. 9-16)

1. Install the power piston spring in the bore, then install the power piston in the air horn and stake the casting very lightly to hold the piston in place.

2. Install the pump plunger rubber seal in the air horn by inserting the small end through from the bottom. The lips of the seal must be seated on both sides of the cover.

3. Insert the pump plunger shaft through the rubber seal.

4. Position the gasket on the air horn.

5. Install both float needle seats and gaskets, with filter screens attached using Tool BT-52.

6. Install secondary float assembly on the air horn, retaining in place with hinge pin. Make sure tang on rear of the float arms is over the balance spring.

7. Install primary float assembly with the center of the float arms on the power piston shaft under the vacuum assist spring retainer.

8. Make float adjustments as outlined under FLOAT ADJUSTMENTS.

FLOAT ADJUSTMENTS

FLOAT LEVEL AND ALIGNMENT— PRIMARY SIDE

When checking the primary float level, be sure that the float arms do not rest on baffles. A minimum of .030" must be maintained between the float arms and the baffles. If the minimum clearance does not exist after the float adjustments are made, it will be necessary to file the float arms.

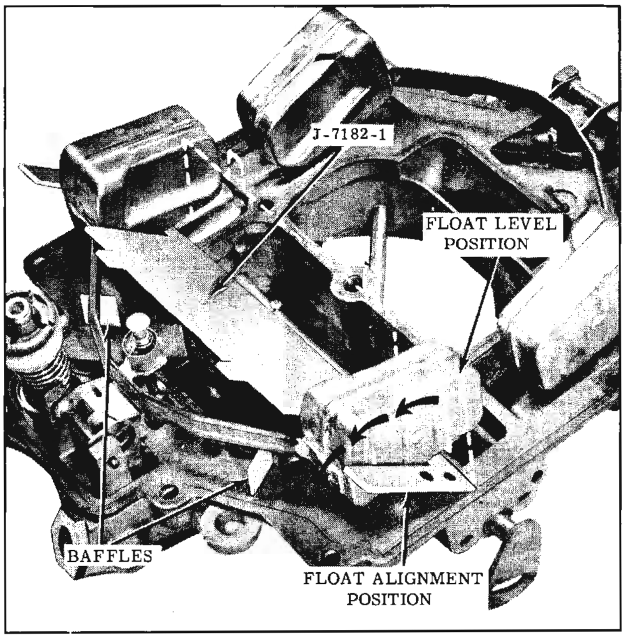


Fig. 9-17 Checking Primary Float Level and Alignment

NOTE: Do not file the baffles.

1. With gasket in place and the air horn inverted, position gauge J-7182-1 under the primary float as shown in Fig. 9-17.

2. With the gauge held vertical, the lower surfaces of each float pontoon should just touch the gauge. The lower surface of each pontoon should be parallel with the air horn.

3. If necessary to adjust, bend the float arm as indicated in Fig. 9-18.

4. To check float alignment, rotate gauge as indicated in Fig. 9-17. Float pontoon should be centered in the gauge cut-out.

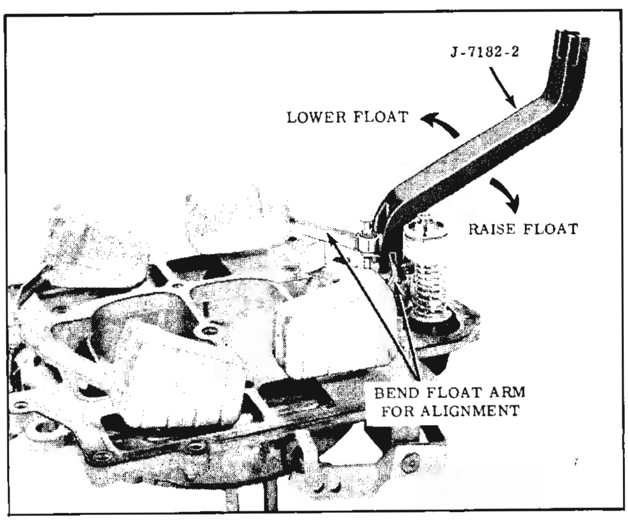


Fig. 9-18 Adjusting Float Level (Primary Shown)

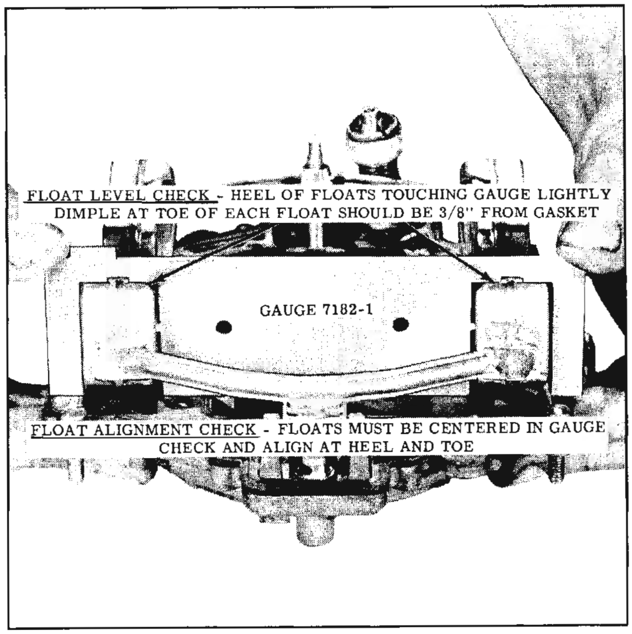


Fig. 9-19 Checking Secondary Float Level and Alignment

5. If adjustment is necessary, bend the float arms horizontally as required. After bending float arms, recheck the float level.

FLOAT LEVEL AND ALIGNMENT SECONDARY SIDE

1. With the gasket in place and the air horn inverted, position gauge as shown in Fig. 9-19.

2. The highest point of the float pontoons at the heel should just touch the gauge.

3. If necessary to adjust, bend the float arms at the center with Tool J-7182-2.

4. Measure distance from the dimple on the side of each pontoon to the air horn gasket. Distance should be 3/8".

5. If an adjustment is necessary, bend each float arm as required, then recheck float level.

6. To check for float alignment, position gauge J-7182-1 over the floats. With the gauge centered on the air horn, the float pontoons should be centered in the gauge.

7. If an adjustment is necessary, bend the float arm to center the pontoon in the gauge. Recheck the float level.

VACUUM ASSIST SPRING ADJUSTMENT

1. Position the air horn as shown in Fig. 9-20, with the power piston retained in the up position.

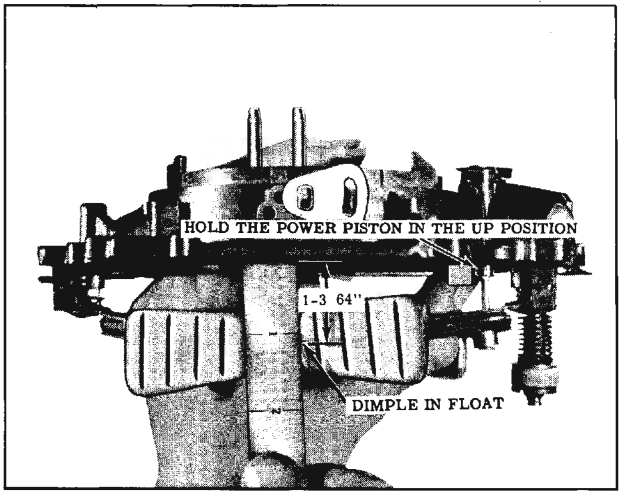


Fig. 9-20 Checking Vacuum Assist Spring

2. Bounce the floats lightly and measure the distance from the gasket to the dimple on the side of the primary float.

3. If an adjustment is necessary, bend the tang under the vacuum assist spring and retainer as indicated in Fig. 9-21.

FLOAT DROP ADJUSTMENT—PRIMARY AND SECONDARY

1. Position the air horn as shown in Fig. 9-22. Do not hold the power piston for this adjustment.
2. Bounce the floats lightly and measure the distance from the air horn gasket to the center of the dimple on the secondary and primary float pontoons. Distance on the secondary should be 1-5/16". Distance on the primary should be 1-1/2".

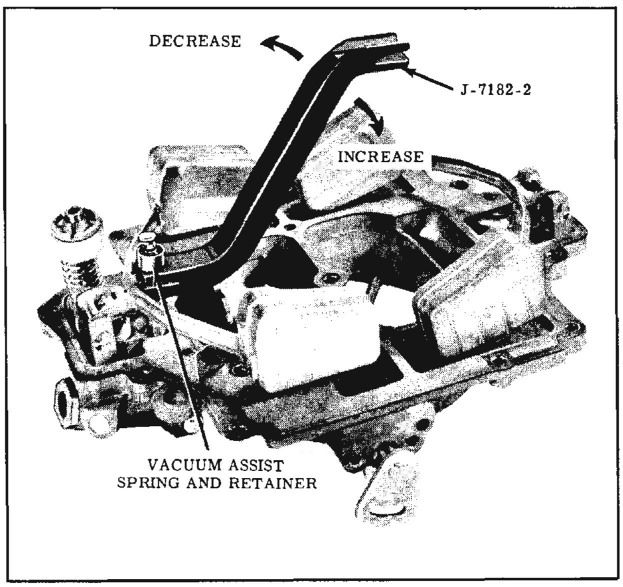


Fig. 9-21 Adjusting Vacuum Assist Spring

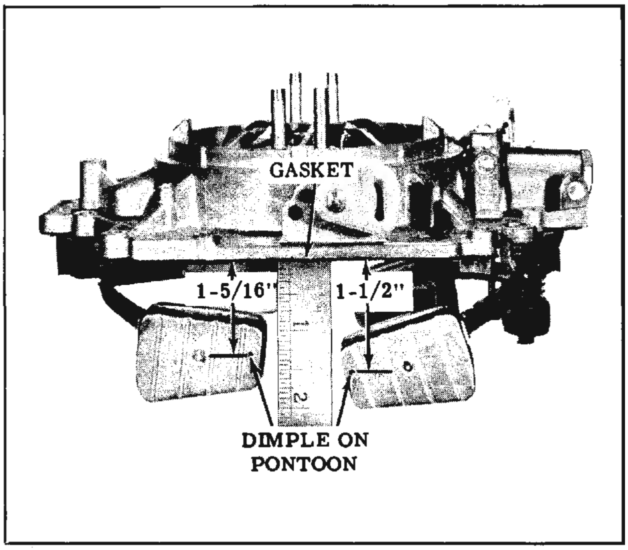


Fig. 9-22 Checking Primary and Secondary Float Drop

3. If an adjustment is necessary, bend the tang at the rear of the float arms toward the needle and seat to decrease the setting, away from the needle and seat to increase the setting.

COMPLETION OF CARBURETOR ASSEMBLY

1. Carefully guide the air horn assembly on the carburetor body so that the pump plunger, power valve stem, and floats will not be damaged.

2. Align the holes in the air horn, gasket and body and just start the 13 air horn attaching screws.

3. Tighten evenly and securely the inner attaching screws (including the screw through the inner wall), then tighten the remaining outside attaching screws in the same manner.

4. If choke shaft was removed, install the choke shaft in the air horn by inserting it in the hole from the same side as the choke.

   a. Slide the choke valve through the shaft so that the letters "RP" on the valve are facing up when the valve is closed.

   b. Install two new small choke valve-to-shaft attaching screws. Close the choke valve to align choke in air horn, then tighten screws.

5. Install the rubber idle vent valve and shield on top of the air horn. Make sure valve seats properly on air horn.

6. Insert upper end of the pump rod through the inner hole in the pump lever by lifting up on the lever, then install the retainer. Insert pump plunger shaft in pump lever and install retainer.

7. Install the fuel inlet screen, gasket and fitting in the air horn.

8. Install the choke unloader lever on the choke shaft.

9. Install the intermediate choke rod into the choke lever.

10. Adjust intermediate choke rod and choke coil as outlined under ADJUSTMENTS (ON OR OFF THE CAR).

11. Install the rubber tee on the vacuum fitting in the throttle body.

12. Adjust fast idle cam rod, secondary lockout, secondary throttle lockout, pump rod, and unloader as outlined under ADJUSTMENT (ON OR OFF CAR).

ADJUSTMENTS (On or Off the Car)

INTERMEDIATE CHOKE ROD AND CHOKE COIL ADJUSTMENT

The choke vacuum piston must be properly positioned with respect to the vacuum slots in the choke housing bore to provide proper choke pull-off action.

1. With the choke cover and baffle removed, position the fast idle screw on the high step of the fast idle cam. Raise the intermediate choke lever to its full up position then push lightly on the end of choke piston to remove all lash in the linkage, check to see if the choke position is flush to 1/32" out of the choke piston bore. (Fig. 9-23)

2. Bend the intermediate choke rod if necessary to correctly position choke piston.

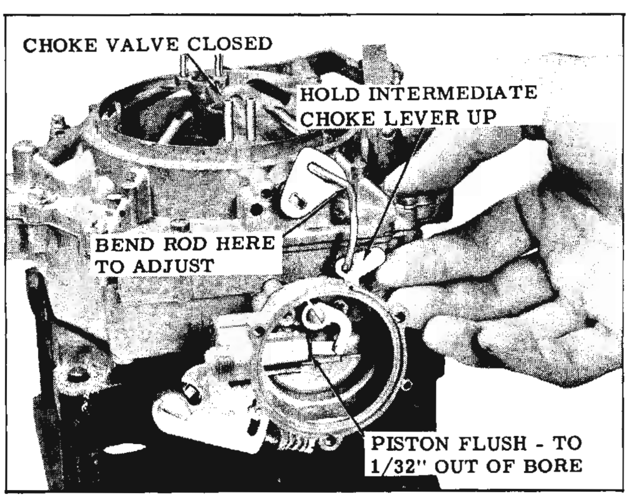


Fig. 9-23 Intermediate Choke Rod Adjustment

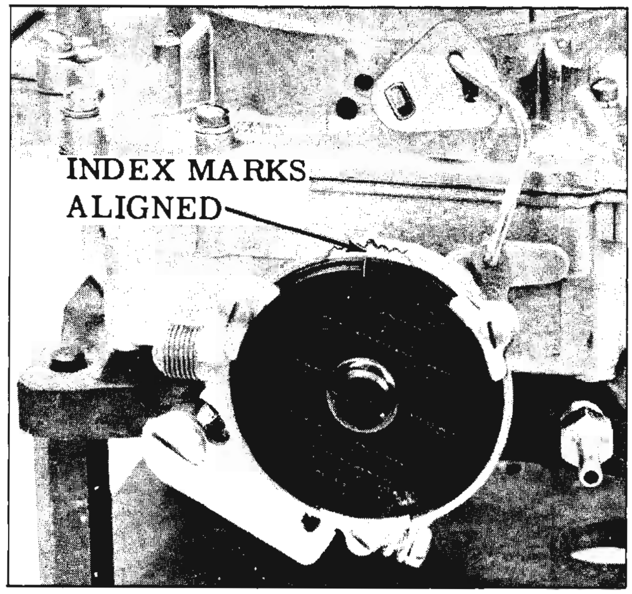


Fig. 9-24 Choke Coil Setting

3. Position baffle in choke housing, then install cover gasket, cover and coil assembly, and three screws and retainers.

4. Rotate cover counterclockwise until coil picks up tang on piston linkage. Continue rotating cover until scribe line on cover is on index. (Fig. 9-24)

5. Tighten the three cover attaching screws.

FAST IDLE CAM ROD ADJUSTMENT

In addition to the intermediate choke rod and choke coil adjustment, it is necessary to adjust the fast idle cam rod to the cam. This insures proper positioning of the fast idle cam when the choke coil is in operation.

1. Turn in the fast idle screw until it just contacts the middle step of the fast idle cam.

2. With the shoulder of the highest step of the fast idle cam held against the fast idle screw, hold the intermediate choke lever in the extreme up position. The intermediate choke rod and the fast idle cam rod must be at the upper limit of travel in the slot to remove all travel. Check the clearance between the top edge of the choke valve and the dividing wall of the air horn. Check clearance with small end of gauge BT-68. Clearance should be .053". (Fig. 9-25)

3. If necessary to adjust, bend the fast idle cam rod (lower rod).

SECONDARY THROTTLE LOCK-OUT ADJUSTMENT

The secondary throttle lock-out prevents open-

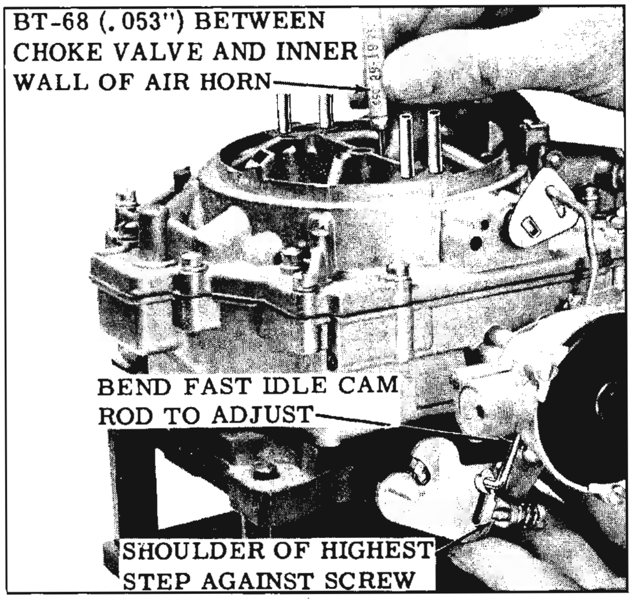


Fig. 9-25 Fast Idle Cam Rod Adjustment

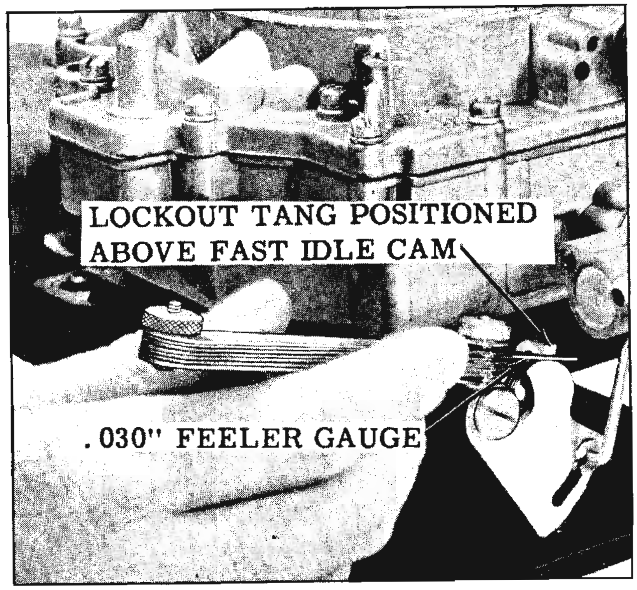


Fig. 9-27 Secondary Throttle Contour Clearance Adjustment

ing of the secondary throttle valves until the engine has reached normal operating temperature. Insufficient clearance at the lock point will allow the fast idle cam to strike the tang and prevent the choke from closing.

1. Measure the clearance between the lock-out tang and the top edge of the slot in the fast idle cam. The clearance should be .015"± .005". (Fig. 9-26)
2. If adjustment is necessary, bend the tang sideways using Tool BT-18 until the proper clearance is obtained.

SECONDARY THROTTLE CONTOUR CLEARANCE ADJUSTMENT

The secondary throttle contour clearance adjustment, which is performed after the lock-out adjustment, actually times the unlocking of the secondary throttle valve in relation to engine temperature.

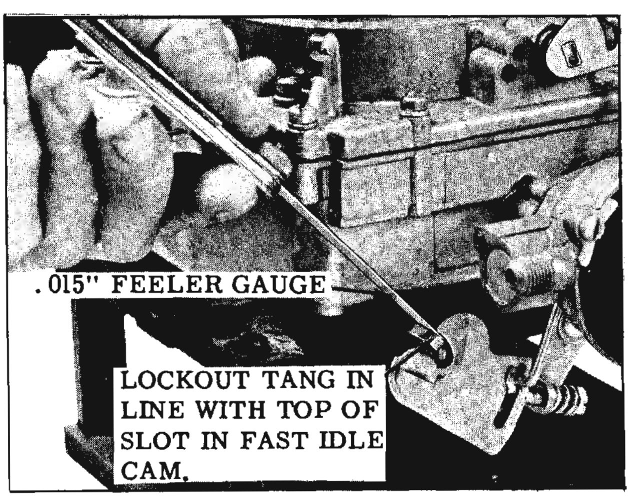


Fig. 9-26 Secondary Throttle Lock-Out Adjustment

1. Hold the choke valve in the wide open position so that the secondary lock-out tang is positioned over the fast idle cam, then measure the clearance between the tang and the fast idle cam. The clearance should be .030"± .010". (Fig. 9-27)
2. If adjustment is necessary, allow the choke to close so that the tang is again in the slot of the fast idle cam, then use Tool BT-91 to bend the tang straight up or down as required for proper clearance.

PUMP ROD ADJUSTMENT

1. While holding the throttle valves closed, idle speed screw backed out, measure the distance from the top of the air horn casting to the bottom edge of the pump plunger shaft. It should be 1-1/64". (Fig. 9-28)
2. If adjustment is necessary, bend the pump rod using Tool BT-18.
3. Operate the pump rod several times to be sure the movement is free.

UNLOADER ADJUSTMENT

If the engine "loads up" or becomes flooded when cold starting, it is necessary to mechanically open the choke valve a small amount to admit more air and facilitate starting. This is accomplished when the tang on the pump lever contacts a tang on the choke shaft at wide-open throttle.

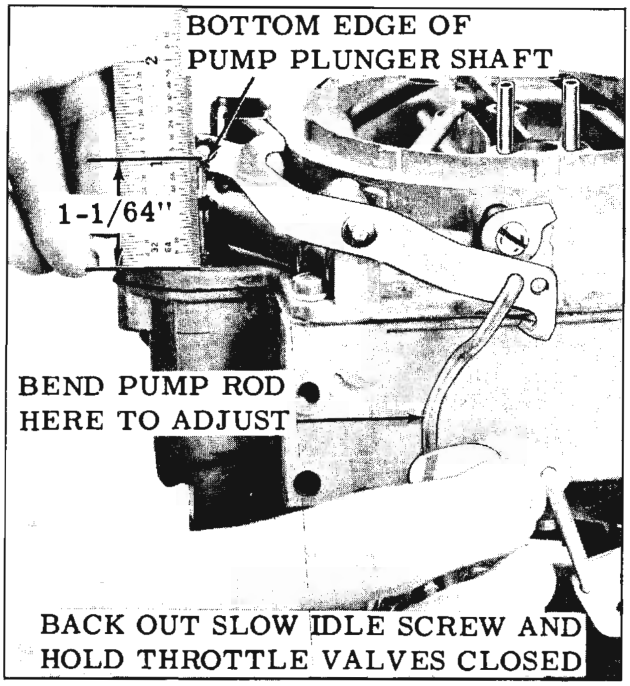


Fig. 9-28 Pump Rod Adjustment

1. Be sure the pump rod adjustment is correct.

2. While holding the throttle lever in the wide open position (with carburetor off car), or with accelerator pedal completely depressed (with carburetor on car), check the clearance between the top edge of the choke valve and the dividing wall. The correct clearance is .115" and can be checked with gauge BT-90. (Fig. 9-29)

3. If necessary, bend the small tang on the pump lever with Tool BT-91 to obtain the correct dimension.

IMPORTANT: If the unloader adjustment was made off the car, it will be necessary to recheck the adjustment with the accelerator pedal completely depressed after the carburetor is installed.

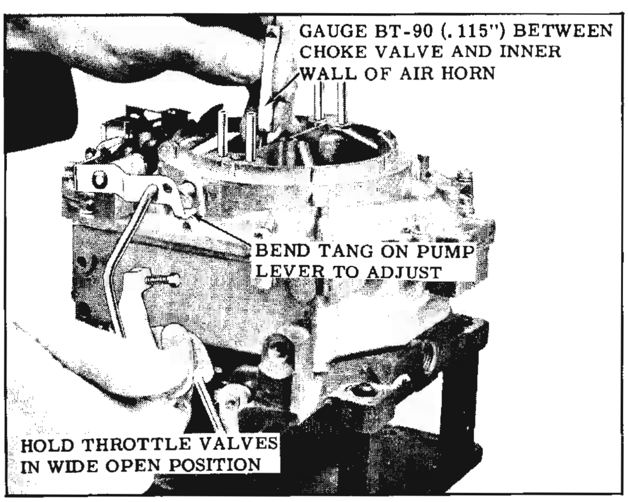


Fig. 9-29 Unloader Adjustment

SECONDARY ACTUATING LEVER ADJUSTMENT

1. Install the throttle return check on the carburetor with holding fixture J-6342-01 in place.

2. Back out the fast idle adjusting screw until the throttle valves are fully closed. Be sure the fast idle screw is not resting against the fast idle cam.

3. Remove slack from linkage and insert a feeler gauge between the actuating lever and the primary lever. (Fig. 9-30)

4. Clearance should be between .005" and .025".

5. To adjust, open the throttle valves and bend the actuating tang with Bending Tool BT-18.

ADJUSTMENTS (ON CAR)

There are four adjustments that must be made with the carburetor mounted on the engine. They are: Slow Idle, Fast Idle, Throttle Return Check and Atmospheric Idle Vent.

SLOW IDLE ADJUSTMENT

(Air Cleaner Removed)

Engine must be at operating temperature and throttle return check Holding Fixture J-6342-01 in place when making the slow idle speed adjustment.

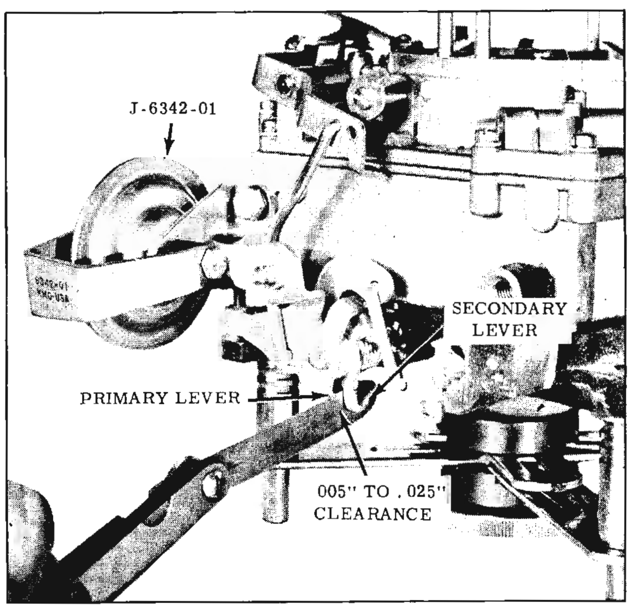


Fig. 9-30 Secondary Actuating Lever Adjustment

SLOW IDLE SPEED

TRANSMISSION	GEAR	R.P.M.
Hydra-Matic	Drive	* 500
Synchromesh	Neutral	550
Factory Installed Air Conditioning - Air Conditioning turned "OFF", Idle Compensator held closed. Dealer Installed Air Conditioning (Without Idle Compensator) - Air Conditioning turned "ON". * If Equipped with Air Conditioning - 550		

After the idle r.p.m. is stabilized, turn in or out each idle adjusting needle screw until the smoothest possible idle is obtained. This normally is accompanied by a higher manifold vacuum reading and/or an increase of idle r.p.m. Then, turn out (rich) each needle 1/4 turn, at which time both the idle vacuum and r.p.m. will drop off slightly. This adjustment will prove to be correct for all normal requirements.

NOTE: Idle speed and mixture should be rechecked with air cleaner installed.

When setting the idle speed and mixture on cars with an idle compensator (factory installed air conditioning only) make sure the idle compensator stays closed by holding it down. If the idle speed increases when the air cleaner is installed, do not reduce the idle speed setting since the idle compensator is open. If the speed decreases, readjust idle to correct r.p.m.

FAST IDLE ADJUSTMENT

When the engine is cold and the choke valve is partially closed, it is necessary that the engine r.p.m. at idle be higher than normal to prevent stalling. This adjustment, if correct, will assure proper engine r.p.m. during the warm-up period.

1. Open throttle valves and rotate the fast idle cam so that the fast idle screw is resting on the high step of the cam.

2. With the engine running at operating temperature, transmission selector lever in neutral and the parking brake applied, adjust the fast idle screw to obtain an engine speed of 1600 r.p.m.

   NOTE: Any time the fast idle is changed, it will be necessary to adjust the throttle return check.

THROTTLE RETURN CHECK ADJUSTMENT

The throttle return check is designed to open the throttle valves to increase engine speed when engine vacuum drops if the engine loads up and starts to stall. It also acts to retard throttle closing when the driver suddenly takes his foot off the accelerator pedal.

The vacuum to the throttle return check has an air bleed above the throttle valves to give faster response to the return check on deceleration.

1. Be sure the fast idle adjustment has been made, then shut off the engine.

2. Rotate the fast idle cam so that the fast idle screw rests on top of the highest step of the fast idle cam.

3. Measure the clearance between the contact screw and the contact on the throttle lever. The clearance should be .020".

4. If adjustment is necessary, adjust the contact screw using two wrenches.

   NOTE: Any time the fast idle is changed, it will be necessary to readjust the throttle return check. For throttle linkage adjustments refer to the Hydra-Matic Section (3) or Synchromesh Section (11).

ATMOSPHERIC IDLE VENT ADJUSTMENT

The atmospheric idle vent is designed to vent any vapor formed in the float bowl during slow idle operation. It is opened by a tang on the pump lever whenever the throttle valves are in the slow idle position.

1. Rotate fast idle cam until the fast idle screw is resting on the highest step of the fast idle cam. (1600 r.p.m.) The idle vent valve should just be closed.

2. If necessary to adjust, bend the idle vent tang on the pump lever, using Tool BT-69.

3. Run the engine on slow idle. The idle vent must be open.

ROCHESTER CARBURETOR MODEL 2GC

THEORY OF OPERATION

FLOAT SYSTEM (Fig. 9-31)

The 2GC carburetor employs a single float. As fuel is consumed, the float drops and opens the needle seat. Fuel then enters the float bowl, raises the float and closes the needle seat, maintaining correct fuel level in the float bowl under all operating conditions.

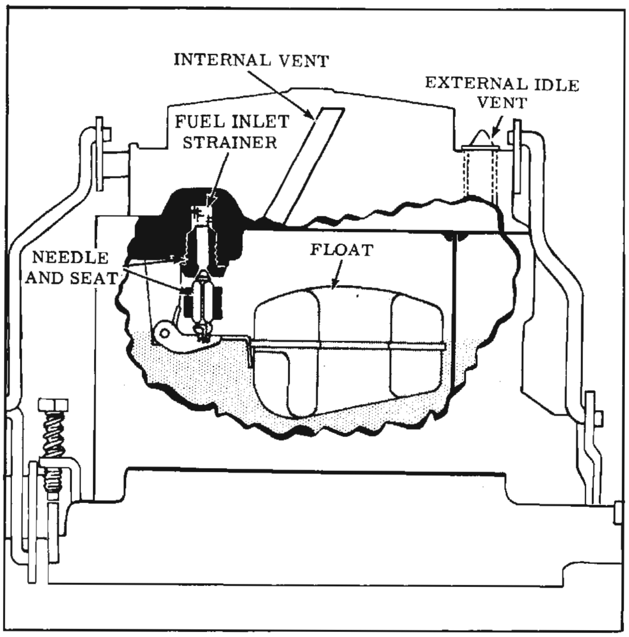


Fig. 9-31 Float System

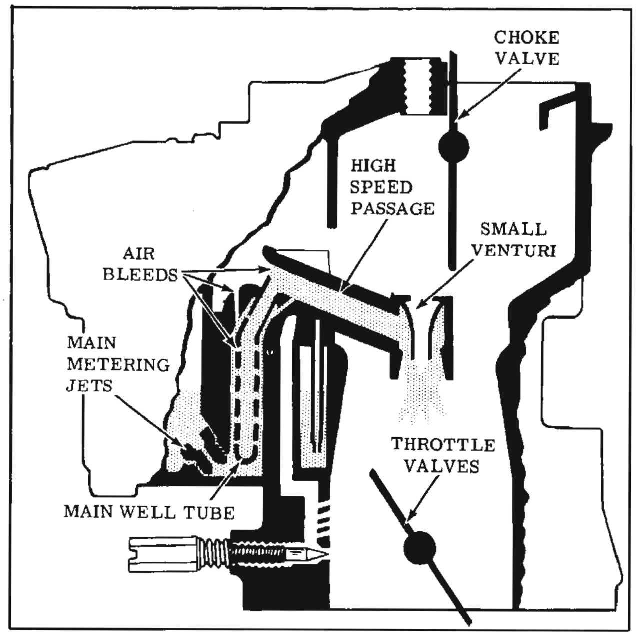


Fig. 9-33 Part Throttle System

IDLE SYSTEM (Fig. 9-32)

The idle system supplies the fuel required for normal curb idle, off idle and low speed operation.

To minimize fuel vapor formation in the carburetor bowl, an external vent opens when the throttle valves are in the idle position.

Cars equipped with factory installed A/C are equipped with an idle compensator to prevent stalling under prolonged "hot idle" conditions. When underhood temperatures rise, a bi-metal strip lifts the valve off its seat allowing additional air to enter below the throttle valves, offsetting the enrichening effects of the higher temperatures.

PART THROTTLE (Fig. 9-33)

As the throttle valves open, the speed of air entering the carburetor bore increases and raises the vacuum in the small venturi area. Fuel is then drawn from the float bowl into the main well, where air bleeds are provided, and into the venturi.

POWER SYSTEM (Fig. 9-34)

When more power is needed or high speed

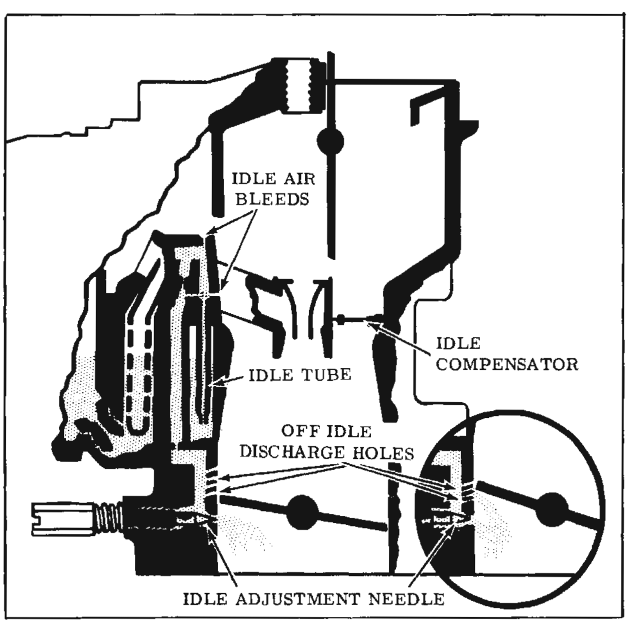


Fig. 9-32 Idle System

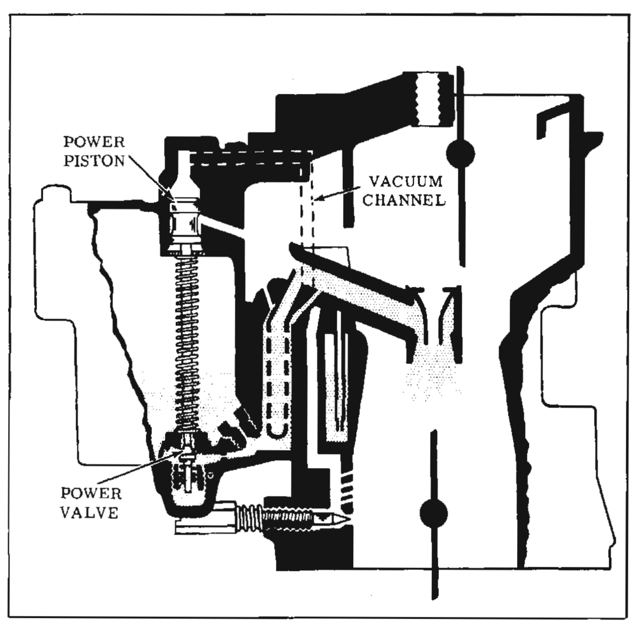


Fig. 9-34 Power System

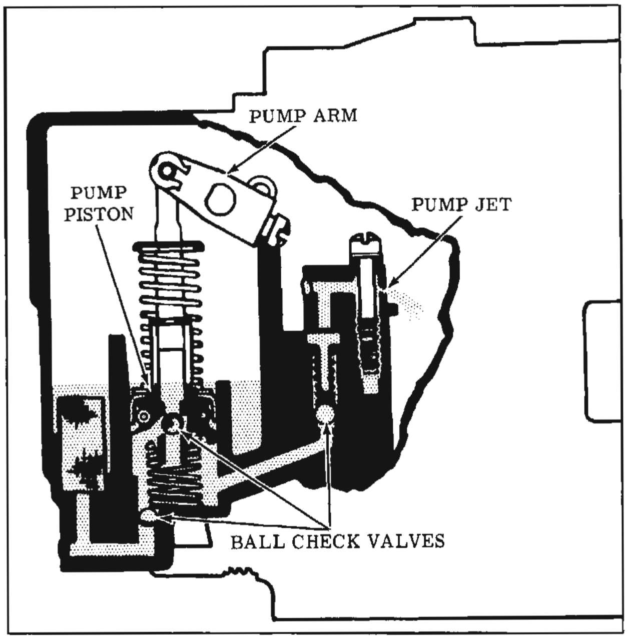


Fig. 9-35 Pump System

driving is maintained, a vacuum operated power piston and power valve provide additional fuel.

When manifold vacuum drops below approximately 9" hg. the power piston spring forces the piston down to unseat the spring loaded power valve, permitting additional fuel to flow through the main well tubes.

PUMP SYSTEM (Fig. 9-35)

The accelerator pump provides the fuel necessary for smooth operation during acceleration by forcing additional fuel into the air stream.

CHOKE SYSTEM (Fig. 9-36)

The choke system is designed to work independently of the fast idle which provides a relatively short choking period with adequate fast idle for a cold engine. A thermostatic coil closes the choke valve for cold operation and gradually releases the choke during the warm-up period. To maintain a more exacting air fuel ratio during warm-up, the force of the thermostatic coil is opposed by air velocity against the offset choke valve and a vacuum piston and link assembly. To prevent a closed choke condition with a wide open throttle, a tang on the unloader lever contacts the choke lever and holds the choke valve partially open to prevent a loading condition. This also provides an unloader to open the choke valve when starting a flooded engine.

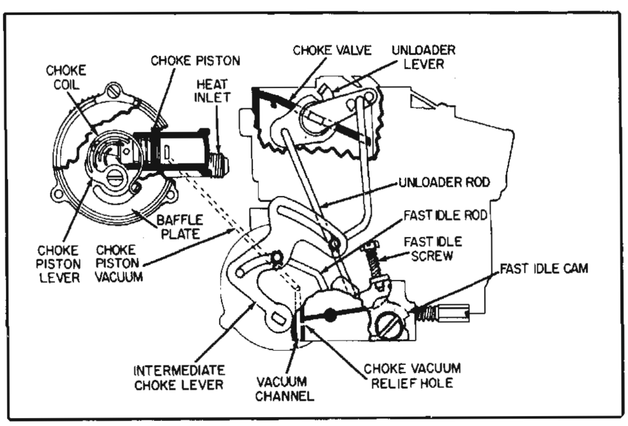


Fig. 9-36 Choke System

CARBURETOR REMOVE AND INSTALL

1. Remove air cleaner.
2. Remove retaining clip from bellcrank rod and remove rod from carburetor.
3. Disconnect fuel line from front of carburetor.
4. Disconnect choke pipe from choke housing.
5. Disconnect vacuum lines.
6. Remove four throttle body to intake manifold nuts.
7. Remove carburetor.

To install, reverse removal procedure and make adjustments outlined under ADJUSTMENTS (ON THE CAR).

Torque carburetor to intake manifold nuts 11 to 14 ft. lbs.

CARBURETOR DISASSEMBLY

AIR HORN

1. Mount carburetor on Holding Fixture BT-30-14 or J-5923-B. (Fig. 9-37)
2. Remove fuel inlet fitting and gasket, then remove the filter screen.
3. Remove the idle vent valve retaining screw, shield and vent.
4. Remove retainer clip from the intermediate choke rod and unloader rod and remove the intermediate choke and unloader rods.
5. Remove retainer spring clip from the upper end of the pump rod at the pump lever and disconnect the upper end of the pump rod.
6. Remove the eight air horn attaching screws, then lift the air horn straight up to remove.

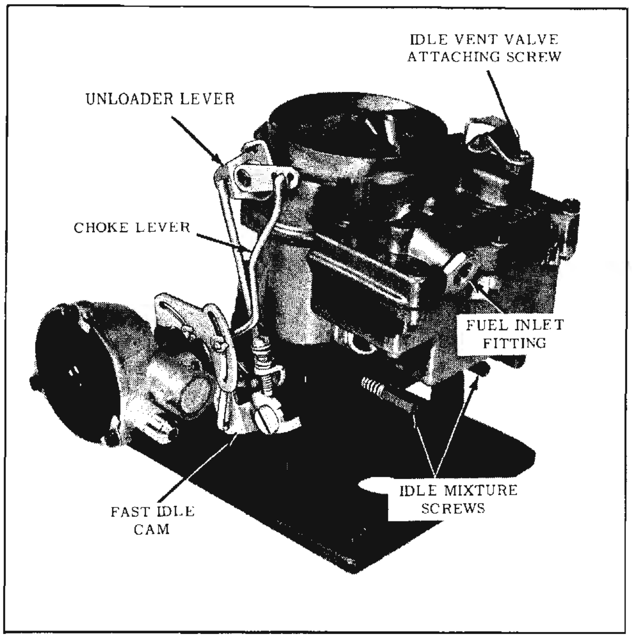


Fig. 9-37 2GC Carburetor

7. Invert the air horn and place on a flat surface, then remove the float hinge pin, float and needle assembly. (Fig. 9-38)

8. Remove the float needle and seat and gasket using Tool BT-52, then remove fuel filter from the needle seat bore.

9. Remove the power piston by depressing piston stem and allowing it to snap free.

10. Remove the retainer from the pump plunger shaft and remove pump plunger.

11. If the pump lever and shaft or inner arm is to be replaced, loosen the set screw on the inner arm.

12. Remove the air horn gasket.

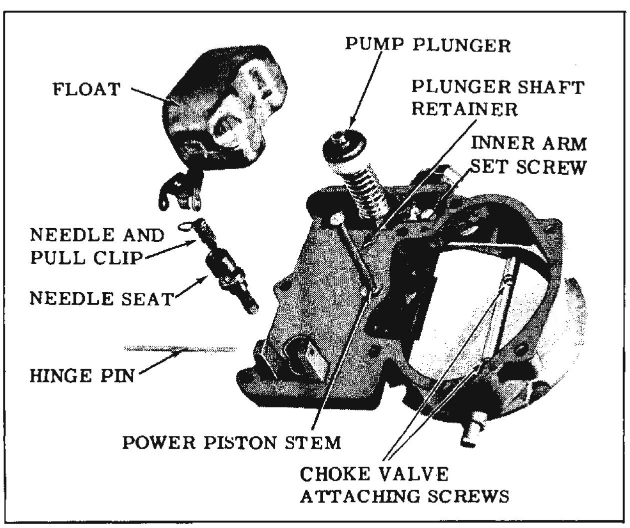


Fig. 9-38 Air Horn

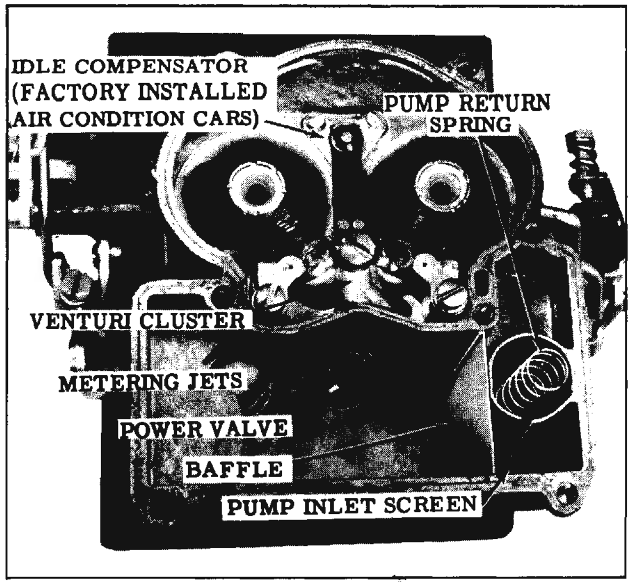


Fig. 9-39 Float Bowl Assembly

13. If the choke valve or shaft is to be replaced, remove the two choke valve attaching screws, then remove the choke valve, choke valve shaft and unloader from the air horn.

FLOAT BOWL (Fig. 9-39)

1. Remove baffle, pump inlet filter screen and pump plunger return spring, then remove aluminum ball check from bottom of pump well.

2. Remove main metering jets and power valve.

3. If equipped with an idle compensator, factory installed air conditioned cars only, remove attaching screws and remove idle compensator and gasket.

4. Remove venturi cluster attaching screws and remove cluster and gasket.

   NOTE: The cluster center screw is larger and has a gasket since it is located in the pump discharge passage.

5. Using a pair of needle nosed pliers, remove the pump discharge spring guide, then remove the spring and steel ball. (Fig. 9-40)

6. Invert float bowl and remove the three throttle body attaching screws, then remove the throttle body and gasket.

THROTTLE BODY AND CHOKE LINKAGE (Fig. 9-41).

1. Remove the fast idle cam attaching screw.

2. Remove the three choke cover attaching

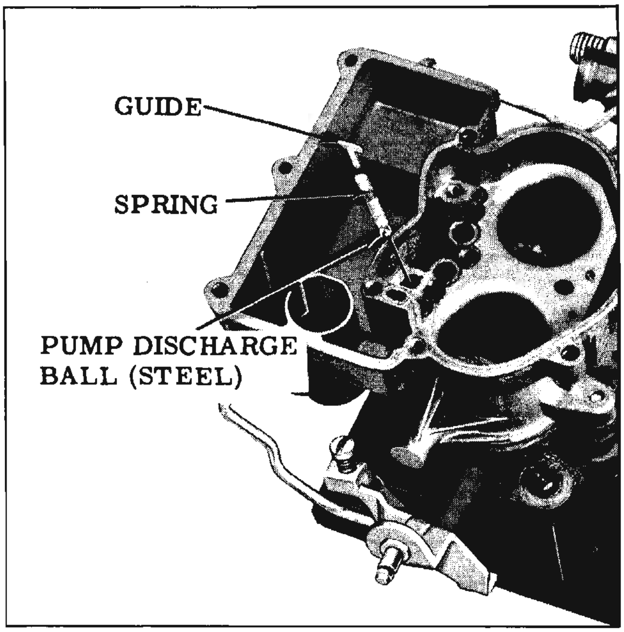


Fig. 9-40 Pump Discharge Guide

screws and retainers, then remove the cover and gaskets.

3. Remove baffle plate from choke housing.

4. Remove the choke piston attaching screw, then remove piston link and lever assembly. The piston can be removed from the link by removing the piston pin.

5. Remove the two choke housing attaching screws, then remove the choke housing with linkage and gasket.

6. Remove the choke housing gasket, then remove the choke lever and shaft with linkage from the choke housing.

7. The idle mixture needle screws may be removed for cleaning or replacement.

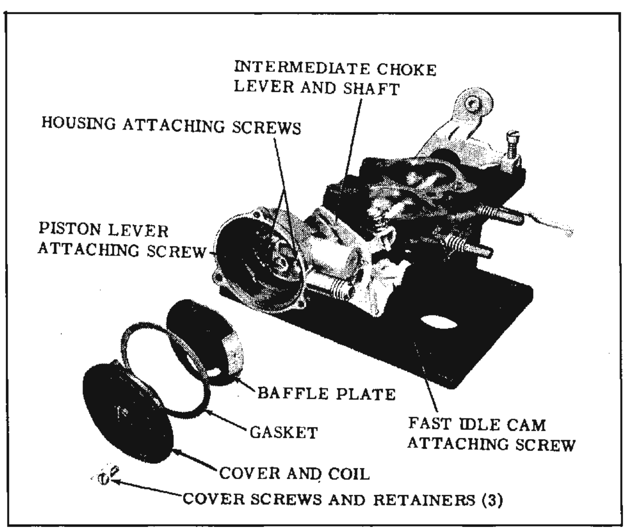


Fig. 9-41 Throttle Body and Choke

NOTE: No attempt should be made to remove the throttle valves or shaft as it may be impossible to assemble the throttle valve correctly in relation to the idle discharge orifices.

CLEANING OF PARTS

The carburetor should not be cleaned in any solution other than a cold immersion type cleaner.

1. Thoroughly clean carburetor castings and metal parts in carburetor solvent.

   CAUTION: The choke coil, housing and pump plunger should not be immersed in solvent. Clean pump in clean gasoline only.

2. Clean and dry all passages in castings with compressed air. Do not pass drills through jets or passages.

3. Clean filter screens of dirt or lint. If filter screens are distorted or plugged, they should be replaced.

INSPECTION OF PARTS

1. Check float for dents or excessive wear at hinge pin holes.

2. Shake float to check for leaks.

3. Examine float needle and seat. If grooved, replace with a new matched float needle, seat and gasket assembly.

4. Inspect the idle mixture adjusting needles for burrs or ridges. Replace if necessary.

5. Inspect the upper and lower surfaces of the float bowl to see that the small sealing beads are not damaged. Damaged beading may result in air or fuel leaks at that point.

6. Inspect holes in pump rocker arm, fast idle cam and throttle shaft lever. If holes are worn excessively or out-of-round to the extent of improper operation of the carburetor, the worn parts should be replaced.

7. Inspect the steps on the fast idle cam for excessive wear. If worn, replace cam to assure proper engine operation during the warm-up and choking periods.

8. Inspect the pump plunger for cracks or creases. If damaged, replace the pump plunger as an assembly.

9. Inspect the throttle body to make sure idle passages and vacuum channels are open.

CARBURETOR ASSEMBLY

THROTTLE BODY ASSEMBLY (Fig. 9-41)

1. If removed, install the slow idle speed screw.

2. If removed, install the fast idle lever on the end of the throttle shaft with attaching screw. Install the fast idle speed screw and spring in the lever.

3. If removed, install the idle mixture needles and springs in the throttle body. Tighten finger tight, then back out 1-1/2 turns as a preliminary idle adjustment.

4. Install the intermediate choke lever and shaft, with linkage attached, in the choke housing. The lever should extend upward between the attaching screw bosses.

5. Install the choke housing gasket, then position the choke housing on the throttle body and install the two attaching screws.

6. If removed, install the choke piston on the link so that the piston hole is facing outward.

7. Install the choke piston lever and link assembly in the choke housing, then install the attaching screw.

8. Position the fast idle cam on the throttle body and install attaching screw.

9. Place a new gasket on the bottom of the float bowl with holes aligned, then position the throttle body on the gasket and install the three attaching screws. Tighten screws evenly and securely.

FLOAT BOWL ASSEMBLY

1. Install the pump discharge (steel) ball, spring and guide in the passage in the venturi cluster mounting surface. (Fig. 9-40)

2. Install the venturi cluster, gasket, and attaching screws. Screw with gasket must be inserted in center hole.

3. If equipped with idle compensator, install compensator and gasket between the two large venturi, using two self-tapping screws. Do not over-tighten.

4. Install the main metering jets and power valve.

5. Install the pump inlet (aluminum) ball and the pump return spring in the pump well. Install the pump inlet screen and the baffle in the float bowl.

AIR HORN ASSEMBLY

1. If removed, install choke unloader lever on choke shaft. Tang on unloader lever faces outward. Install the choke shaft in air horn by inserting it from the choke side, then install choke valve in the choke shaft with the letters RP facing upward.
   a. Install the choke valve screws. Center the choke valve before tightening choke valve screws. .020" clearance should be maintained between choke unloader lever and the air horn casting. Tighten choke valve screws and stake lightly in place.

2. If removed, position the pump inner lever in the air horn, install the pump lever and shaft and tighten retaining screw.

   NOTE: Lubricate shaft with "Lubriplate" or light grease.

3. Install the pump plunger shaft in the pump lever so that the end is pointing inward, then install the retainer.

4. Position the float needle seat gasket and small filter screen on the seat. Install seat in air horn with BT-52.

5. Install the power piston and lightly stake the casting. Make sure piston travels freely.

6. Install the air horn gasket, float and needle assembly and float hinge pin.

FLOAT LEVEL ADJUSTMENT

Make sure the float is properly aligned on the air horn. If it is necessary to bend the float arm for alignment purposes, recheck the float level setting. (Fig. 9-42)

FLOAT DROP ADJUSTMENT (Fig. 9-43)

If necessary to adjust, bend the float tang which

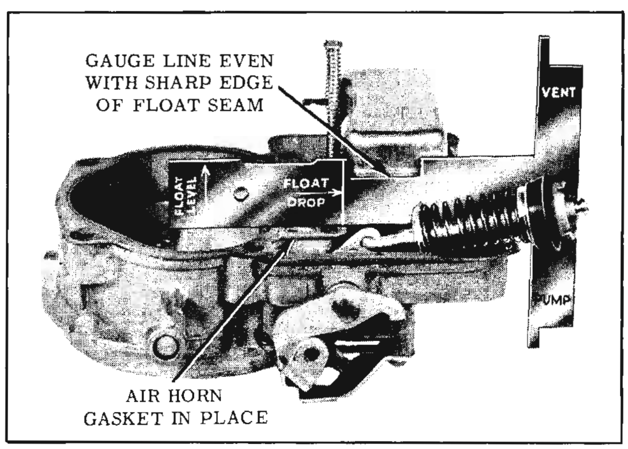


Fig. 9-42 Float Level Adjustment

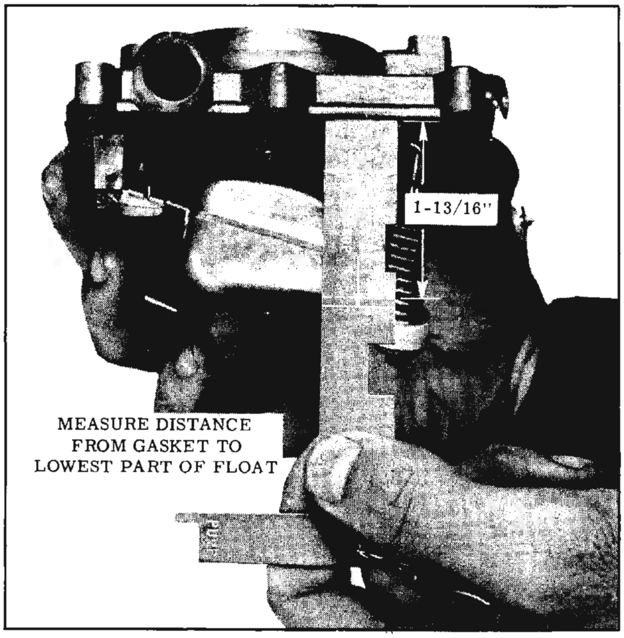


Fig. 9-43 Float Drop Adjustment

contacts the needle seat. Bend the tang toward the seat to decrease the float drop and away from the seat to increase the drop.

COMPLETION OF CARBURETOR ASSEMBLY (Fig. 9-44)

1. Install the air horn on the float bowl while guiding accelerator pump in place. Install and tighten the eight air horn screws evenly and securely.

2. Position the upper end of the pump rod on the pump lever and retain with spring clip.

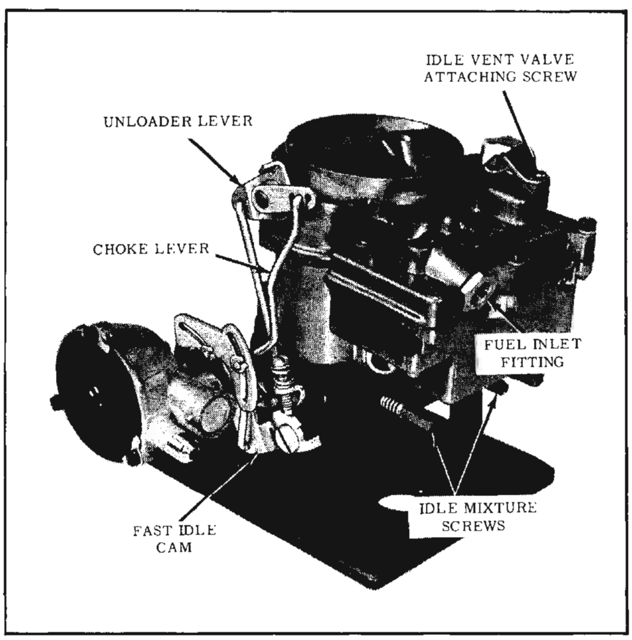


Fig. 9-44 Carburetor Assembly

3. Position idle vent valve and shield on air horn and retain with attaching screw.

4. Install the fuel inlet filter screen with the closed end inward, then install the inlet fitting and gasket.

5. Install choke unloader rod into unloader lever (end of rod facing inward). Then connect lower end of rod to fast idle lever, retaining with clip.

6. Install intermediate choke rod into upper choke lever (end of rod facing inward). Then connect lower end of rod to intermediate lever retaining with horseshoe clip.

7. Install rubber tee on the vacuum fitting in the throttle body.

8. Adjust fast idle cam rod, pump rod, and unloader as outlined under ADJUSTMENTS (ON OR OFF CAR).

ADJUSTMENTS (On or Off the Car)

INTERMEDIATE CHOKE ROD AND CHOKE COIL ADJUSTMENT

A three hole upper choke lever is used which will allow a finer choke piston adjustment in all temperatures and climatic conditions.

With the lever in the outer hole, the choke valve will open less for a given throttle opening resulting in richer mixtures under loads while accelerating. By moving the lever into the center, or inboard hole, the choke valve will open progressively more resulting in leaner mixtures. Normal position of the intermediate choke rod is in the center hole.

1. Adjust the intermediate choke rod as outlined in Fig. 9-45.

2. After choke rod adjustment is made, position the baffle plate, coil cover and gasket and the three screws with retainers in the choke housing. Do not tighten screws.

3. Rotate the choke cover counterclockwise until the coil picks up the choke shaft tang, and the mark on the choke cover is one notch lean. (Fig. 9-46)

4. Tighten the three cover screws evenly and securely.

FAST IDLE CAM ROD ADJUSTMENT

1. Turn in fast idle speed screw until it just contacts the second step of the fast idle cam.

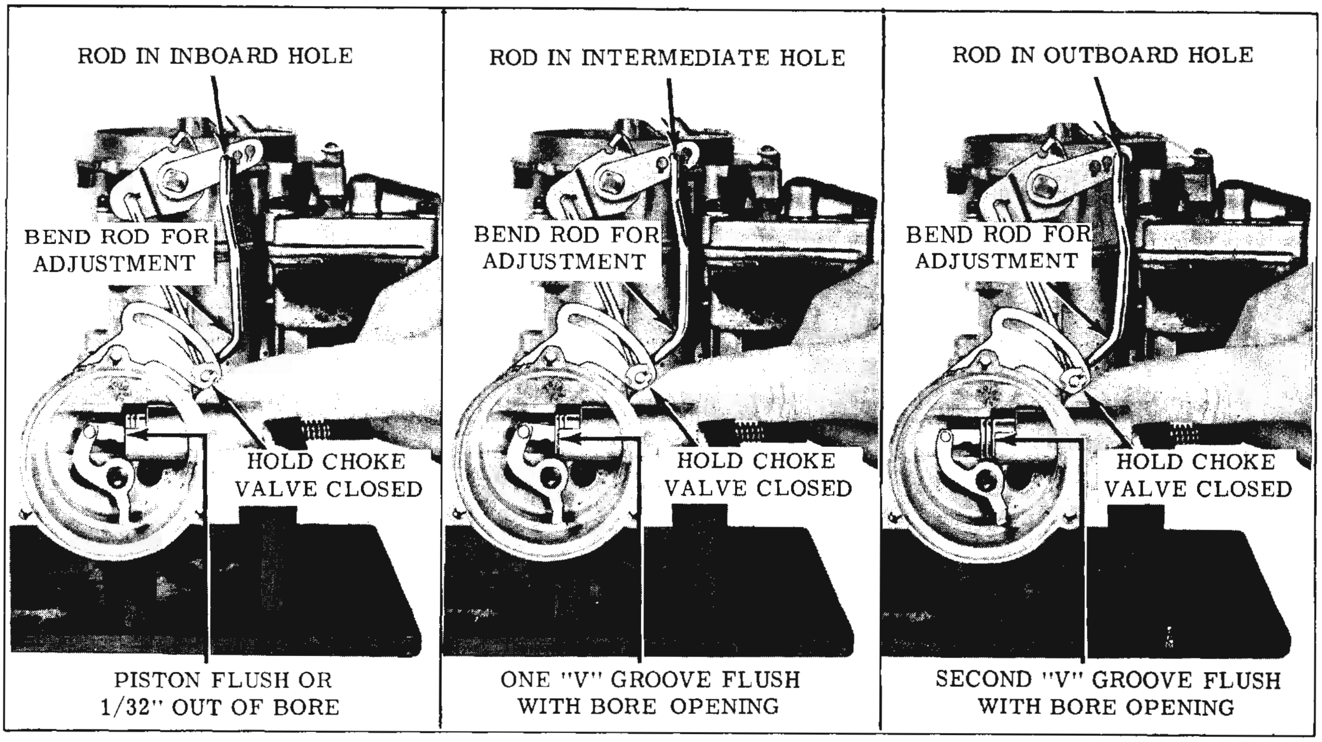


Fig. 9-45 Intermediate Choke Adjustment

2. Hold up on the intermediate choke lever so that the shoulder of the highest step of the fast idle cam is against the fast idle speed screw. Check the clearance between top edge of the choke valve and the air horn at the rear edge, using Gauge Set 100-31 (.150#). Make sure the intermediate choke rod is at the bottom of its slot in the intermediate lever. (Fig. 9-47)

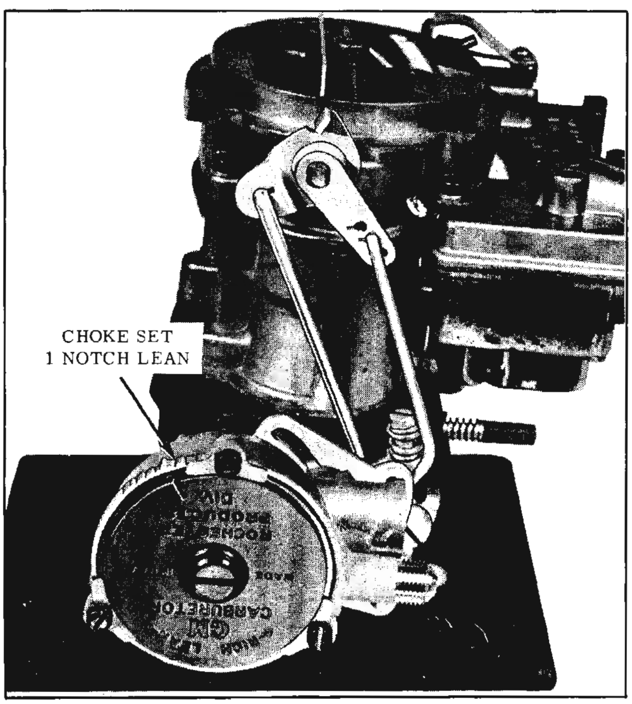


Fig. 9-46 Choke Coil Setting

3. If necessary to adjust, bend the fast idle cam rod.

PUMP ROD ADJUSTMENT

1. Using Gauge Set 100-31 check the distance from the top of the air cleaner mounting ring to the top of the pump rod. The leg of the gauge marked "Pump" should just touch the top of the pump rod. (Fig. 9-48)

2. If necessary to adjust, bend the pump rod in

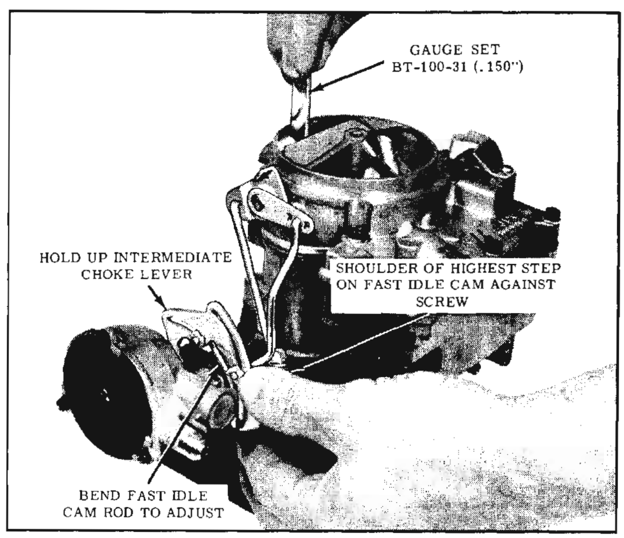


Fig. 9-47 Fast Idle Cam Rod Adjustment

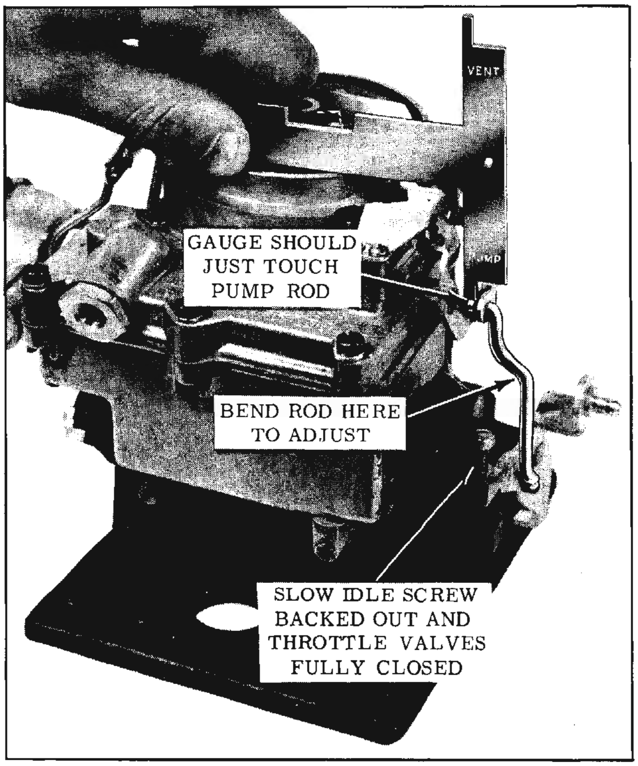


Fig. 9-48 Pump Rod Adjustment

the location shown.

UNLOADER ADJUSTMENT

1. With throttle valves held wide open, check clearance between the top edge of the choke valve and the air horn. (Fig. 9-49)
2. If necessary to adjust, bend the tang on the unloader lever which contacts the choke lever.

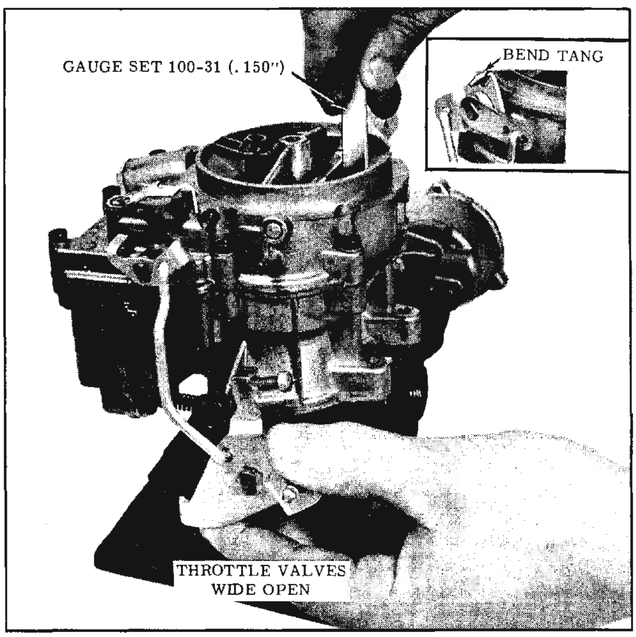


Fig. 9-49 Unloader Adjustment

NOTE: If the unloader adjustment is made with the carburetor off the car, recheck the adjustment after the carburetor is installed while the accelerator pedal is completely depressed.

ADJUSTMENTS (ON CAR)

There are three adjustments that must be made with the carburetor mounted on the engine. They are: Slow Idle, Fast Idle and Throttle Return Check.

SLOW IDLE SPEED

TRANSMISSION	GEAR	R.P.M.
Hydra-Matic	Drive	*500
Synchromesh	Neutral	550

Factory Installed Air Conditioning - Air Conditioning turned "OFF", Idle Compensator held closed.

Dealer Installed Air Conditioning (Without Idle Compensator) - Air Conditioning turned "ON"

*If equipped with Air Conditioning - 550

SLOW IDLE ADJUSTMENT

With the engine at normal operating temperature, throttle return check Holding Fixture J-6342-01 in place, and air cleaner removed, adjust slow idle as outlined in chart. Tool BT-1501 can be used to turn adjusting screws.

After the idle r.p.m. is stabilized, turn in or out each idle adjusting screw until the smoothest possible idle is obtained. This is normally accompanied by a higher manifold vacuum reading and/or an increase in the idle r.p.m. Then turn out each needle 1/4 turn, at which time both vacuum and idle r.p.m. will drop off slightly.

NOTE: It may be necessary to readjust idle speed and mixture after air cleaner is installed on car.

When setting idle speed and mixture on carburetors with an idle compensator (factory installed air conditioning only) make sure the idle compensator is closed by holding it down. If the idle speed increases when the air cleaner is installed, do not reduce idle speed setting since the idle compensator is open. If idle speed decreases, readjust to correct r.p.m.

FAST IDLE ADJUSTMENT

The fast idle adjustment can be made as follows:

1. Rotate fast idle cam, so that the fast idle screw is resting on the high step of the cam.

2. With engine running at operating temperature and transmission in neutral, adjust the fast idle screw to obtain an engine speed of 1900 r.p.m.

   NOTE: Set fast idle at 2200 r.p.m. in sub-zero temperatures.

   Any time the fast idle is changed, it will be necessary to adjust the throttle return check.

THROTTLE RETURN CHECK ADJUSTMENT

The throttle return check adjustment can be made as follows:

1. Be sure fast idle adjustment has been made, then shut off engine.

2. Rotate fast idle cam so that the fast idle screw rests on top of the highest step of the fast idle cam.

3. Measure clearance between the contact screw and the throttle lever contact. Clearance should be .050".

4. If adjustment is necessary, adjust the contact screw using two wrenches.

   NOTE: Any time the fast idle is changed, it will be necessary to readjust the throttle return check. For throttle linkage adjustment, refer to the Hydra-Matic Section (3) or Synchromesh Section (11).

ATMOSPHERIC IDLE VENT ADJUSTMENT

The atmospheric idle vent is designed to vent any vapor formed in the float bowl during slow idle operation. It is opened by a tang on the pump lever whenever the throttle valves are in the slow idle position.

1. Rotate fast idle cam until the fast idle screw is resting on the highest step of the fast idle cam. (1900 r.p.m.) The idle vent valve should just be closed.

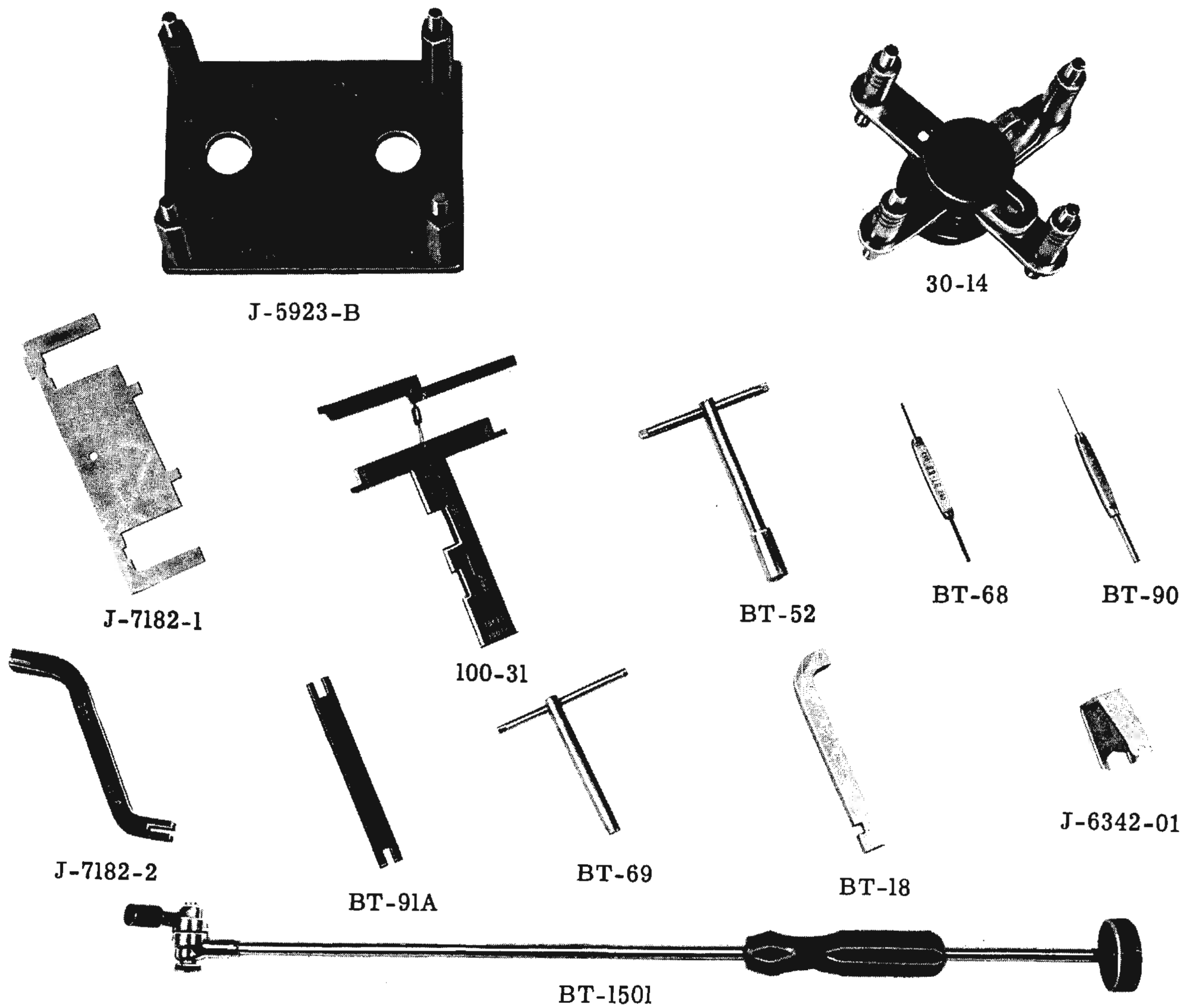
2. If necessary to adjust, bend the idle vent tang on the pump lever, using Tool BT-69.

3. Run the engine on slow idle. The idle vent must be open.

SPECIFICATIONS

Carb.	Float Level			Float Drop		Assist Spring	Choke Rod	Choke Coil	Fast Idle Cam Rod	Lock-Out	Sec. Throt. Clearance	Pump Rod	Un-loader	Sec. Act. Lever	Slow Idle	Fast Idle	Return Check	Idle Vent
	Prim.	Sec. Toe	Sec. Heel	Prim.	Sec.													
2-GC	1/2"	-	-	1-13/16"	-	-	1st "V" Groove	One Notch Lean	.150"	-	-	1-7/16"	.150"	-	500 & 550	1900 & 2200	.050"	Just Closed at 1900
4-GC	9/32"	3/8"	1-3/8"	1-1/2"	1-5/16"	1-3/64"	Flush	Index	.053"	.015"	.030"	1"	.115"	.005" to .025"	500 & 550	1600	.020"	Just Closed at 1600

* For detailed information as to adjustment procedures for the above specifications refer to their respective sections.



BT-18	- Bending Tool - Pump Rod
BT-52	- Needle Seat Remover and Installer
BT-68	- Fast Idle Cam Rod Checking Gauge (.053")
BT-69	- Bending Tool - Idle Vent
BT-90	- Unloader Checking Gauge (.115")
BT-91A	- Bending Tool - Tang of the Fast Idle Cam
BT-1501	- Idle Adjusting Tool
30-14	- Universal Carburetor Holding Fixture
100-31	- Tool Set for 2GC Adjustments
J-5923-B	- Carburetor Holding Stand
J-6342-01	- Throttle Return Check Holding Tool
J-7182-1	- Float Level and Alignment Gauge 4GC
J-7182-2	- Bending Tool - Float and Vacuum Assist Tang 4GC

Fig. 9-50 Carburetor Tools

CARBURETION

F-85

MODEL RC

CONTENTS OF SECTION 9

MODEL 2GC

MODEL 4GC

FLOAT SYSTEM (Fig. 9-101)

The RC carburetor has one float which actuates the float needle, as the float rises or lowers it controls the float needle, allowing the fuel to enter or shut-off which maintains correct fuel level. The float bowl is vented both externally and internally which gives a balanced metering.

IDLE SYSTEM (Fig. 9-102)

The idle system supplies the necessary fuel for curb idle and off-idle speed operation.

At idle, the throttle valve is opened slightly which does not allow enough air flow for venturi action so the fuel needed to mix with the small amount of air is supplied by the idle mixture needle hole and is controlled by the idle mixture needle.

At off-idle speeds the throttle valve is opened slightly from the idle position and additional fuel is needed to increase engine speed. The slotted off-idle port supplies the fuel for off-idle operation by gradually uncovering the slot to high engine vacuum as the throttle is opened. The idle needle hole and off-idle discharge port continues to feed fuel until air flow is great enough to obtain good metering from the main discharge nozzle in the venturi.

MAIN METERING SYSTEM (Fig. 9-103)

Further opening of the throttle valve increases the speed of the air stream through the venturi. It is at this point that the means to provide engine fuel requirements is done through the main metering system.

Fuel is forced by atmospheric pressure through the main metering jet into the screened main well. Air entering through the main well bleed is mixed with the fuel through calibrated holes in the main well tube. The mixture then moves up and out through the main discharge nozzle into the small venturi where it is delivered into the air stream and then on into the intake manifold.

A metering control rod is used in place of the conventional power valve. The rod is down in the main metering jet during part throttle operation when manifold vacuum is high.

The main well bleed acts as a fuel siphon breaker when the main metering system is not in operation. This prevents the possibility of fuel siphoning out through the main discharge nozzle from the main well.

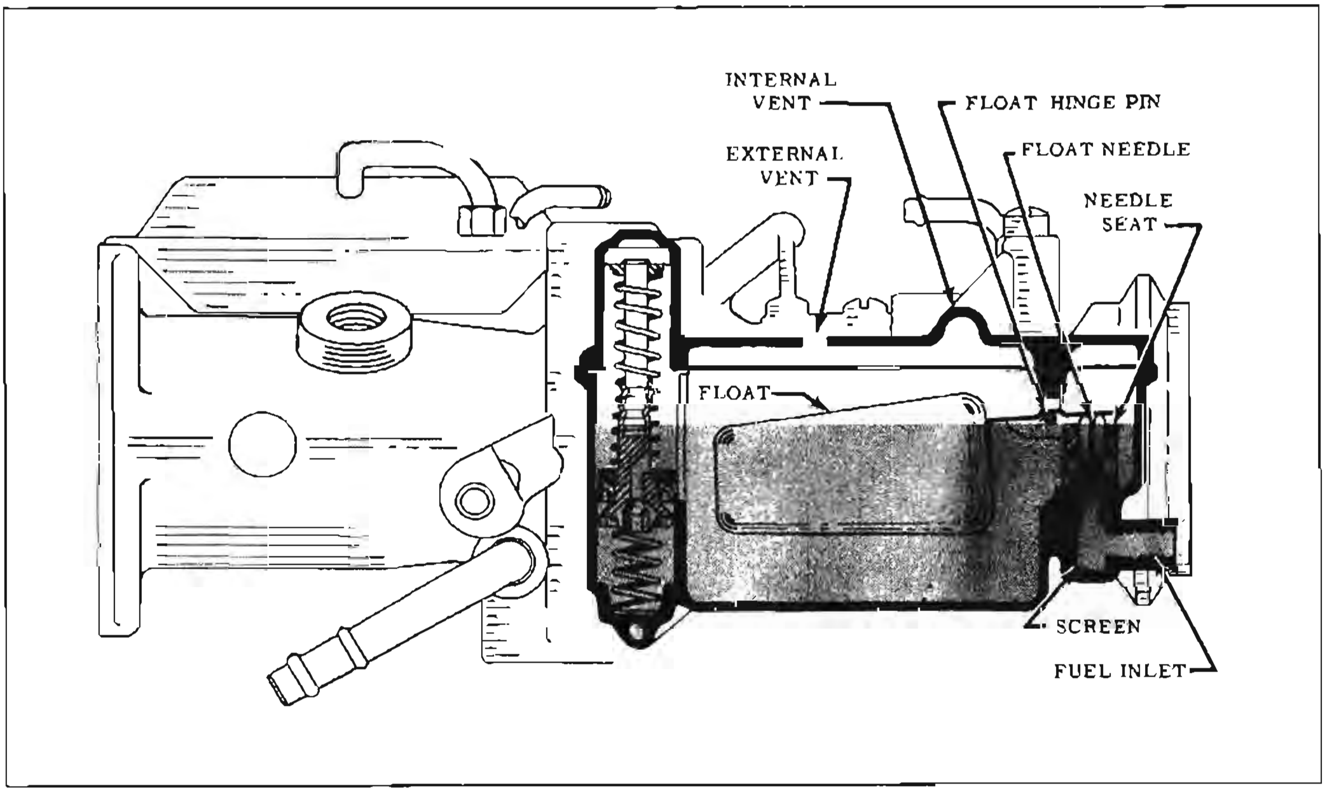


Fig. 9-101 Float System

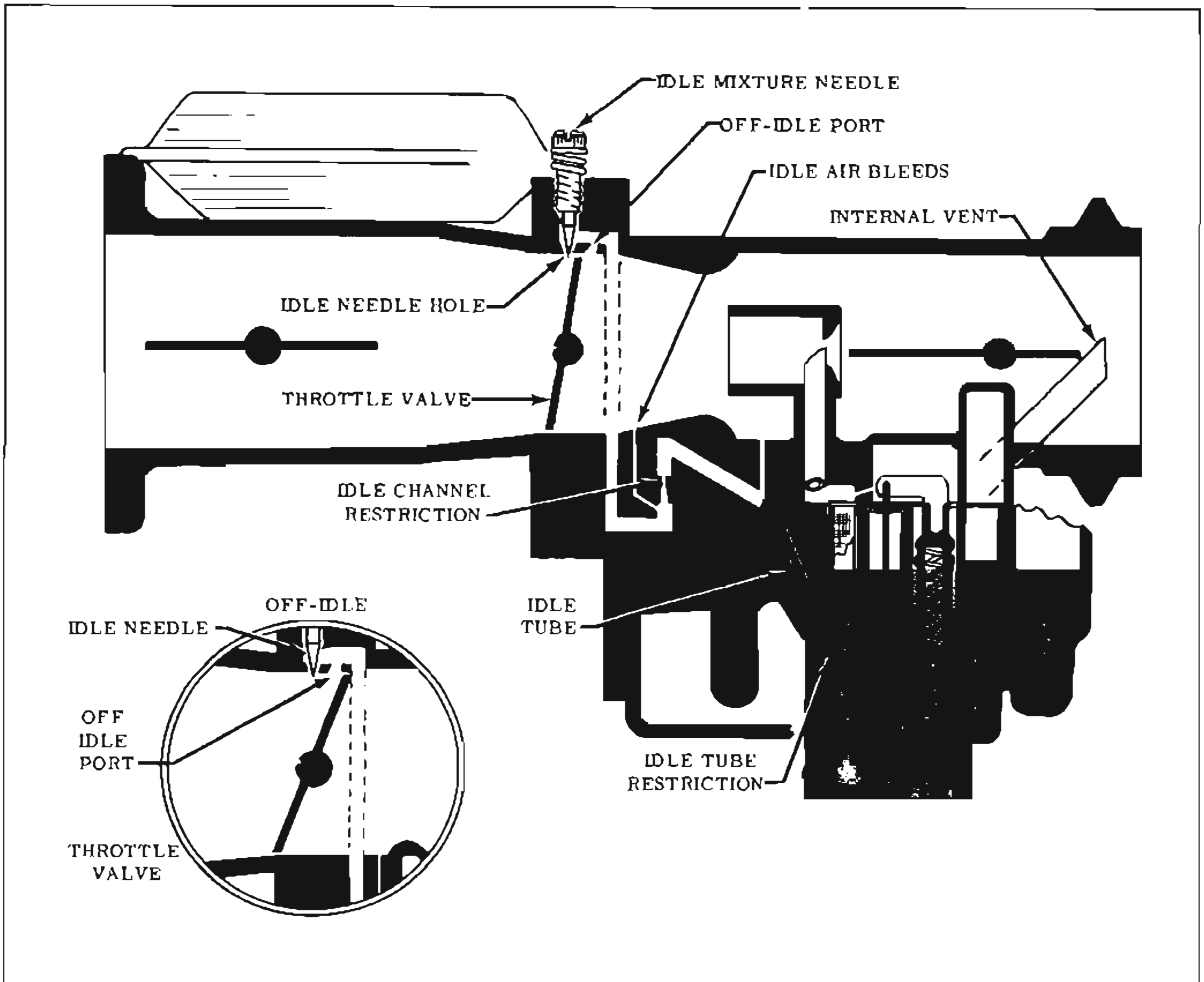


Fig. 9-102 Idle System

POWER SYSTEM (Fig. 9-104)

A vacuum operated power piston connected to a metering control rod controls fuel flow through the main jet.

When manifold vacuum drops to a point where enrichening of the fuel mixture is needed for added power, the piston spring overcomes the pull created by engine manifold vacuum and pushes the piston up, pulling the control rod out of the jet orifice allowing more fuel to flow through it.

PUMP SYSTEM (Fig. 9-105)

During quick acceleration, the air flow through the carburetor increases while the fuel being heavier tends to lag momentarily causing a leanness. An accelerator pump is used to prevent this momentary leanness by forcing additional fuel into the air stream.

When the throttle valve is closed, the pump plunger moves upward, fuel from the float bowl enters the pump well through a slot in the side of the pump well. It flows past the ball check in the plunger head and fills the pump well below the pump plunger head.

On acceleration the pump plunger is forced downward by the linkage connected directly to the throttle lever. Downward motion of the pump plunger seats the ball check in the pump plunger head. Fuel beneath the pump plunger is then forced through the pump discharge passage where it unseats a pump discharge ball check and passes on through the passage to the pump discharge hole where it sprays into the carburetor bore just above the throttle valve.

The spring-loaded check ball in the pump discharge passage is normally in the seated position and prevents fuel in the discharge passage from draining back into the fuel bowl, thereby, keeping this passage full of solid fuel when the pump is not in operation. The spring-loaded discharge ball check in the pump fuel passage also prevents any "pullover" or discharge of fuel from the pump nozzles when the pump is inoperative.

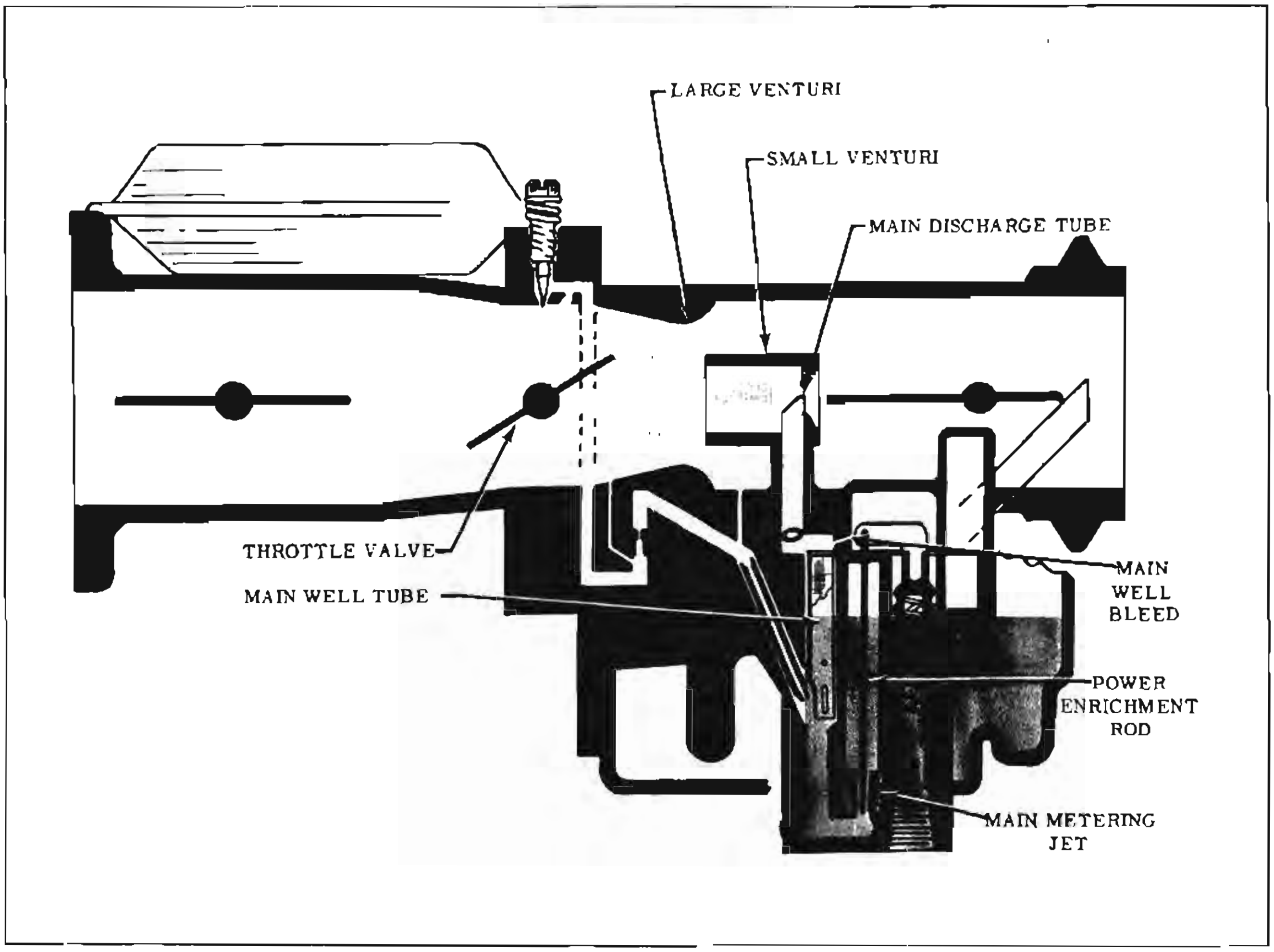


Fig. 9-103 Main Metering System

The check ball in the pump plunger head also serves as a vapor vent from the pump well during "hot" engine operation. Without this vent, vapor pressure build-up in the pump well might force fuel from the pump system into the carburetor bore and consequently on into the engine, causing hard starting. It also insures the pump system will be completely vented from fuel vapor so that a solid discharge of fuel will be maintained at all times.

CHOKE SYSTEM (Fig. 9-106)

Hydra-Matic Transmission

The choke system used on the RC carburetor is basically the same as on all previous models. However, a spring-loaded diaphragm mounted in a plastic case has been added. Manifold vacuum applied to the diaphragm provides a pulling action on the choke shaft against the tension of the choke coil. This pull provides a definite amount of vacuum break for starting regardless of ambient temperature around the choke coil, insuring correct fuel mixture for starting.

The second vacuum break system is that provided by the choke piston. Located in the choke piston bore in the choke housing is a vacuum break channel. After initial starting, the vacuum pull against the choke piston pulls the choke valve to an opening desirable for the ambient temperature. As the engine heats up, the choke coil gradually relaxes and takes over control of the choke blade.

During initial starting and as the engine warms up, manifold vacuum exists in the choke housing. Hot air from the choke stove is pulled into the choke housing to heat the thermostatic coil. The air is supplied to the choke stove in the manifold from the choke air filter, mounted on the right hand valve cover.

The baffle plate inside the choke housing distributes the heat evenly around the choke coil to prevent "hot spots" on the choke coil and give gradual relaxing of the choke coil until the choke valve is fully open and the engine is warm.

During warm up, it is necessary to provide a faster than normal idle speed to prevent engine stalling. This is accomplished by a fast idle cam

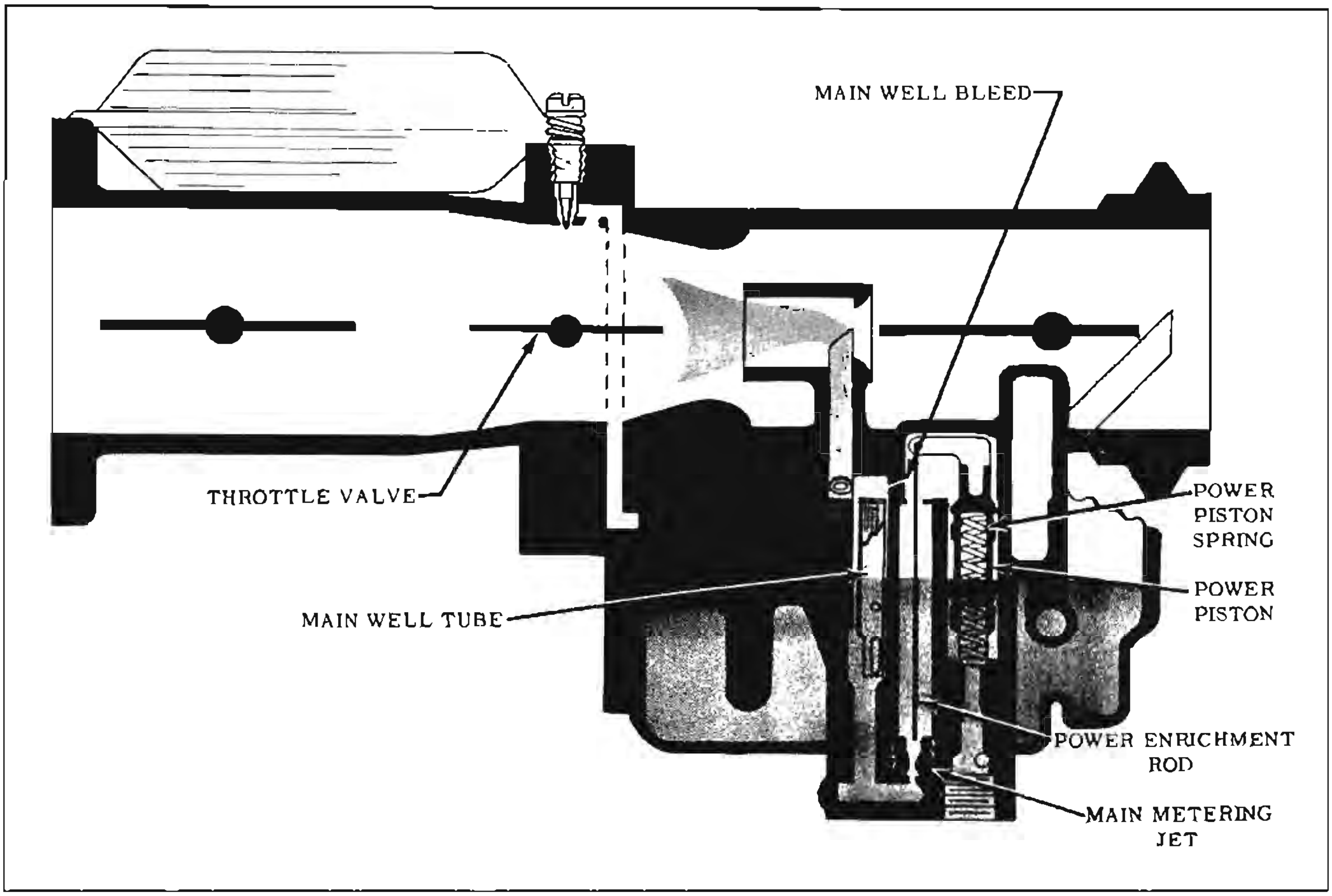


Fig. 9-104 Power System

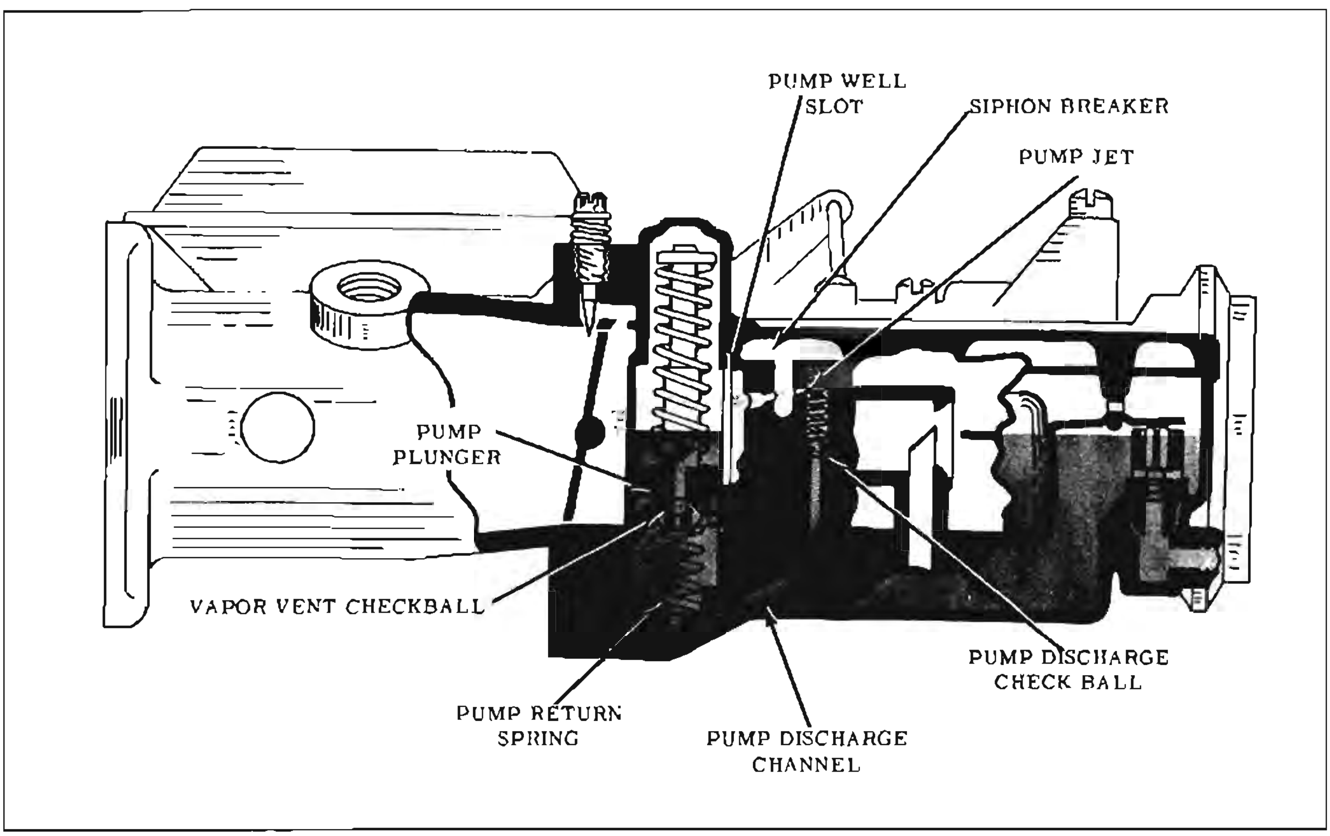


Fig. 9-105 Pump System

connected by linkage directly to the choke shaft. A fast idle screw on the throttle lever rests on steps located on the fast idle cam. The calibrated steps give the correct fast idle speed in relation to the amount of choke valve opening. When the engine is fully warm the fast idle cam no longer is needed and the engine returns to normal curb idle at which point the idle stop screw controls idle speed.

Synchromesh Transmission

The hand choke system used on the synchromesh transmission equipped cars has a simple wrap-up type spring rather than the bi-metal spring. The wrap-up type spring is connected to an adjustable pointer on the outside of the cover. The choke housing hot air inlet is capped, and a cable bracket with a detent mechanism is attached to the choke housing. The detent position is designed to provide higher than normal idle during the warm-up period by positioning the fast idle screw on the lowest step of the cam with the choke off. A two step fast idle cam is used on all synchromesh equipped cars.

THROTTLE RETARD UNIT (Fig. 9-107)

In addition to the throttle return check, the model RC carburetor also has a throttle retard unit connected to the throttle lever. This unit controls the closing of the throttle valve throughout the entire range of throttle opening, in contrast to the throttle return check which provides only partial range control. The retard unit provides a smooth transmission downshift by preventing a sudden release of power from rapid throttle closing.

The retard unit is a slow bleed air device consisting of a spring-loaded diaphragm, a rubber "flapper" valve, and a bleed restriction. As the throttle valve is opened, the diaphragm is pulled up, against the force of the spring. This action forces air above the diaphragm out of the top vent and sucks air into the chamber below the diaphragm through the bottom vent and the rubber check valve. When pressure on the accelerator pedal is released and the throttle valve starts to close, the spring in the retard unit forces the diaphragm down. The force of the spring tends to push the air below the diaphragm out of the chamber, thus closing the rubber flapper valve causing all the air to escape through the bottom vent. The air, therefore, bleeds out at a slow rate, thereby, allowing the throttle valves to close slower during deceleration.

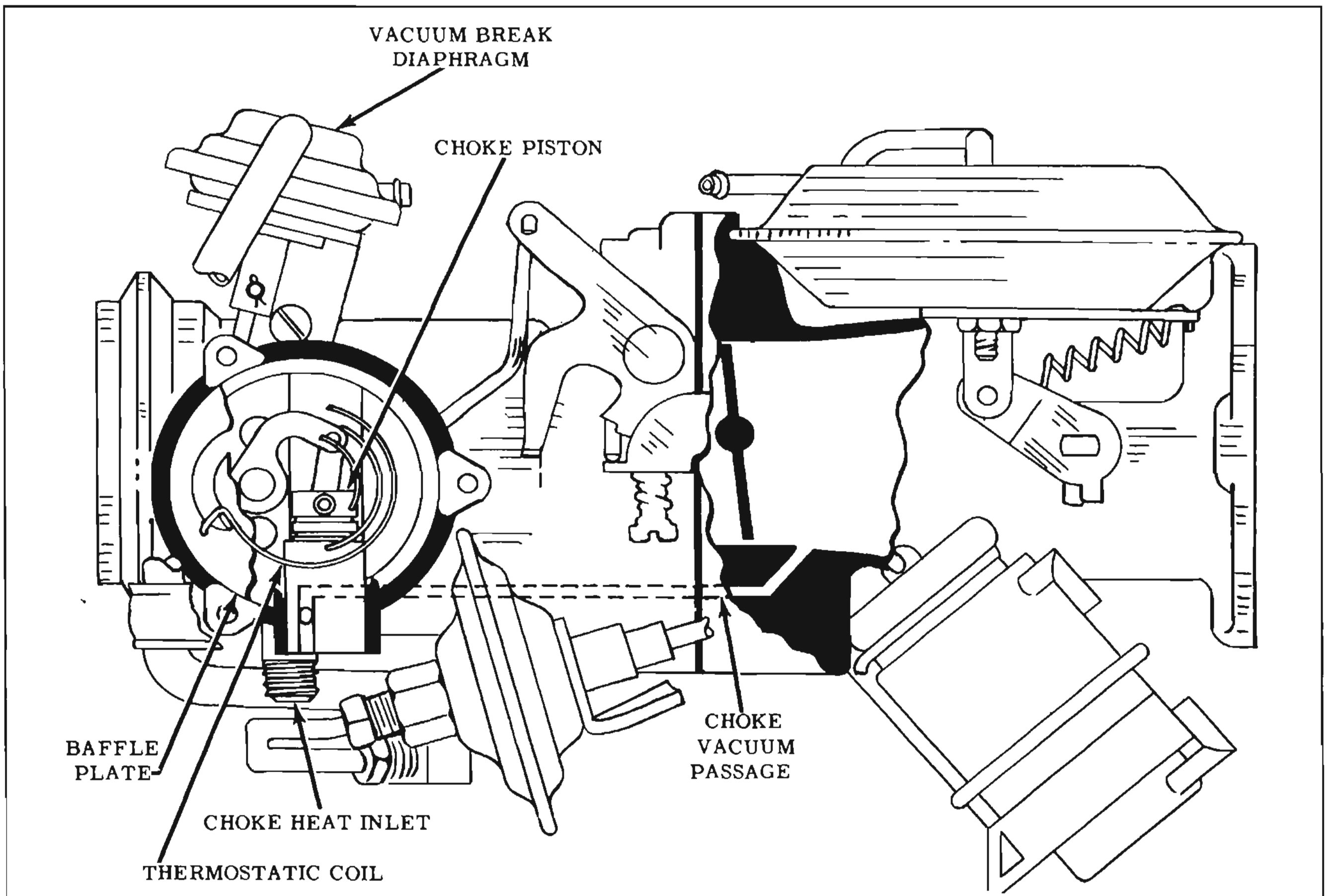


Fig. 9-106 Choke System

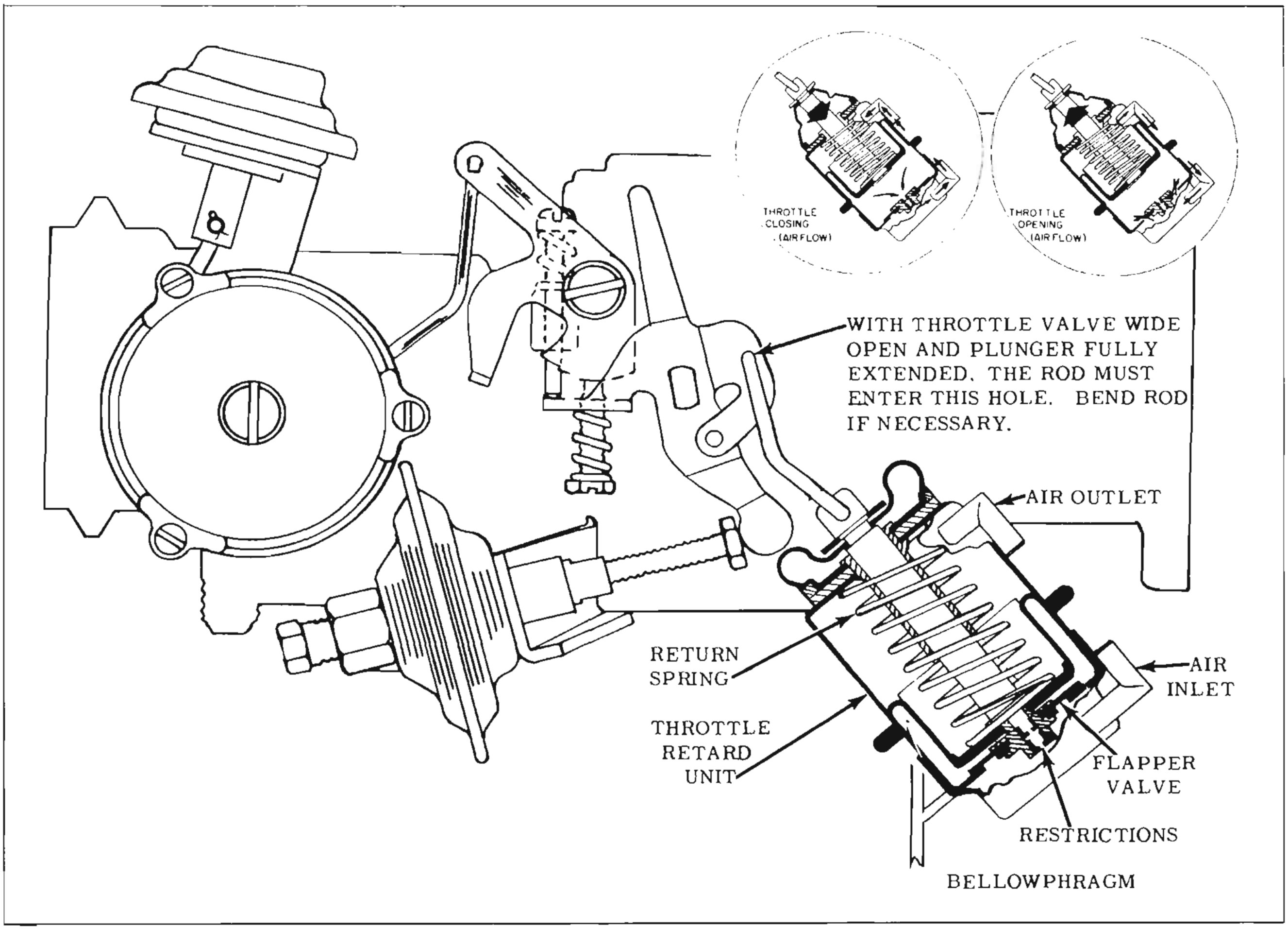


Fig. 9-107 Throttle Retarder

TURBO-ROCKET FLUID METERING AND BOOST LIMIT VALVE OPERATION

The valve is designed to deliver Turbo-Rocket Fluid any time intake manifold pressure exceeds 1 p.s.i. Periodic maintenance of the valve is not required.

ENGINE RUNNING (NORMAL—NO BOOST) (Fig. 9-108)

With the engine operating in the economy range (no boost) the depressure valve, located in the throttle flange of the carburetor, is closed by vacuum from the throttle body acting on the diaphragm to pull it up and seal the tank pressure bleed.

The intake manifold and compressor housing has lower than atmospheric pressure (vacuum).

In the Fluid Metering Valve assembly, the float is down and the vent above the float is open, both check balls are seated and the boost limit control valve is closed due to intake manifold vacuum below the diaphragm and atmospheric pressure above the diaphragm.

With the Boost Limit Control Valve closed, low pressure created in the throttle body is in the tee fitting on the upper portion of the throttle body and the passage to the upper line on the boost limit control valve. This low pressure holds the diaphragm down during slight or momentary pressure changes in the boost limit control side of the valve assembly.

Both the check valve and the relief valve in the Check and Relief Valve assembly are seated.

The Turbo-Rocket Fluid supply tank has not yet been pressurized. Once the engine has been operated in the boost range, the supply tank will be pressurized and will remain pressurized until the engine is turned off.

BOOST PRESSURE

When the engine is operating in the economy range, the performance is comparable to the standard F-85 2-barrel carburetor engine. However, if additional performance is desired, the Turbo-Charger provides boost pressure in the engine. At this time Turbo-Rocket Fluid is metered into the carburetor throttle body where it is combined with the air-fuel mixture to control cylinder temperatures.

The following takes place when the Turbo-Charger produces a pressure of 1.0 p.s.i. or above, in the intake manifold.

As boost pressure builds up in the intake manifold, it will unseat the check valve in the Check and Relief Valve assembly and enter the supply tank pressure line where it is directed to the top of the fluid supply tank, pressurizing the tank. The boost pressure from the check valve is also directed to the depressure valve located in the carburetor throttle body.

With the fluid tank pressurized, fluid is forced from the tank into the float chamber of the fluid metering valve raising the float. The check ball below the float chamber prevents the fluid from flowing out of the float chamber at this time.

During the time pressure is being transmitted to the check valve, fluid tank and depressure valve, fluid is being forced from the tank into the fluid metering and boost limit control valve assembly.

Also, manifold pressure from the compressor housing is directed to a tee fitting at the bottom of the carburetor and then into the boost pressure chamber in the Fluid Metering Valve assembly. This pressure is then directed to the lower side of the diaphragm below the float chamber. This pressure is also against the lower side of the diaphragm at the top of the boost pressure chamber; however, the diaphragm will remain seated on the boost limit control valve.

PREPARATION FOR FLUID DELIVERY

When the engine is first placed into boost operation, the preparation for fluid delivery takes place almost instantly.

As the float chamber in the meter side of the valve assembly fills, the float rises, seating the diaphragm against the vent. The air that is trapped in the float chamber will be compressed by the fluid which is under pressure from the supply tank. This pressurized air is directed through openings in the float side of the diaphragm and above the diaphragm over the boost limit control valve.

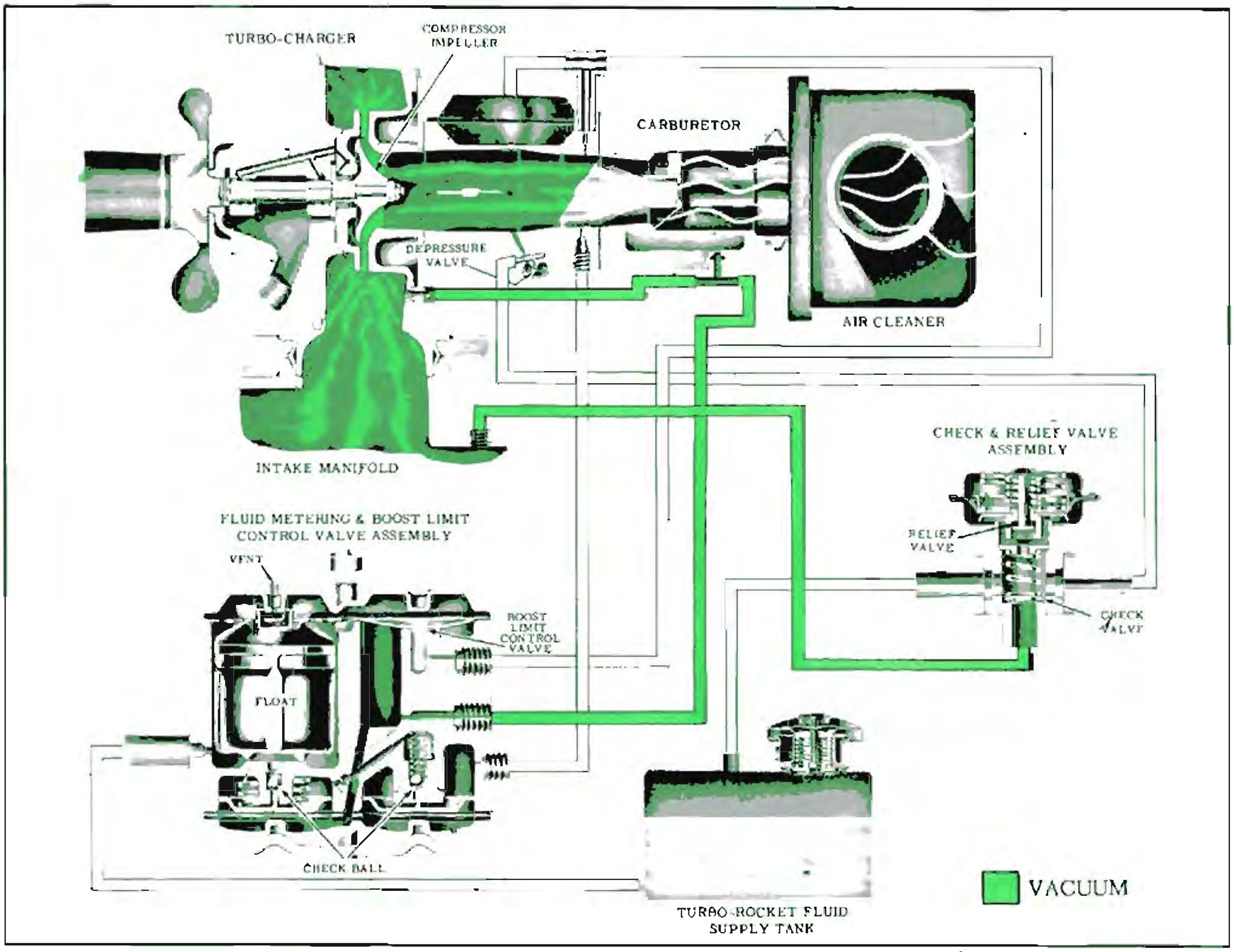


Fig. 9-108 Normal Operation (No Boost)

Boost pressure from the compressor housing is also directed through the tee fitting at the carburetor, into the boost pressure chamber of the valve assembly, through the passage and below the lower diaphragm under the float. This pressure, acting under the diaphragm, forces the diaphragm up against spring force. This causes the tang on the diaphragm plunger to unseat the check ball, allowing fluid to flow past the check ball, through a restricted passage in the body of the Fluid Metering Valve and to the other diaphragm operated check ball.

FLUID DELIVERY (Fig. 9-109)

High air velocity past the fluid outlet in the carburetor bore creates a lower than atmospheric pressure in the line to the Fluid Metering Valve assembly and in the chamber above the diaphragm.

The low pressure on one side of the diaphragm and atmospheric pressure (cover is vented) on other side moves the diaphragm up pushing the ball check off its seat. Fluid is then drawn past the second ball check through the passage to the carburetor throttle body where it is metered by a calibrated restriction into the throttle bore.

BOOST LIMIT OPERATION (Fig. 9-110)

In the event the fluid supply to the Fluid Metering Valve assembly is exhausted or blocked, the float will drop and open the vent at the top of the float chamber. This will exhaust the trapped pressurized air in the float chamber and above the Boost Limit Control diaphragm.

If the engine is now operated in a boost condition, the boost pressure from the compressor housing, through the tee fitting at the carburetor, and to the Fluid Metering Valve assembly moves the diaphragm up, allowing the boost pressure to enter the open boost limit control valve.

This boost pressure is then directed through the valve and to the boost limit diaphragm at the carburetor throttle body, closing the auxiliary

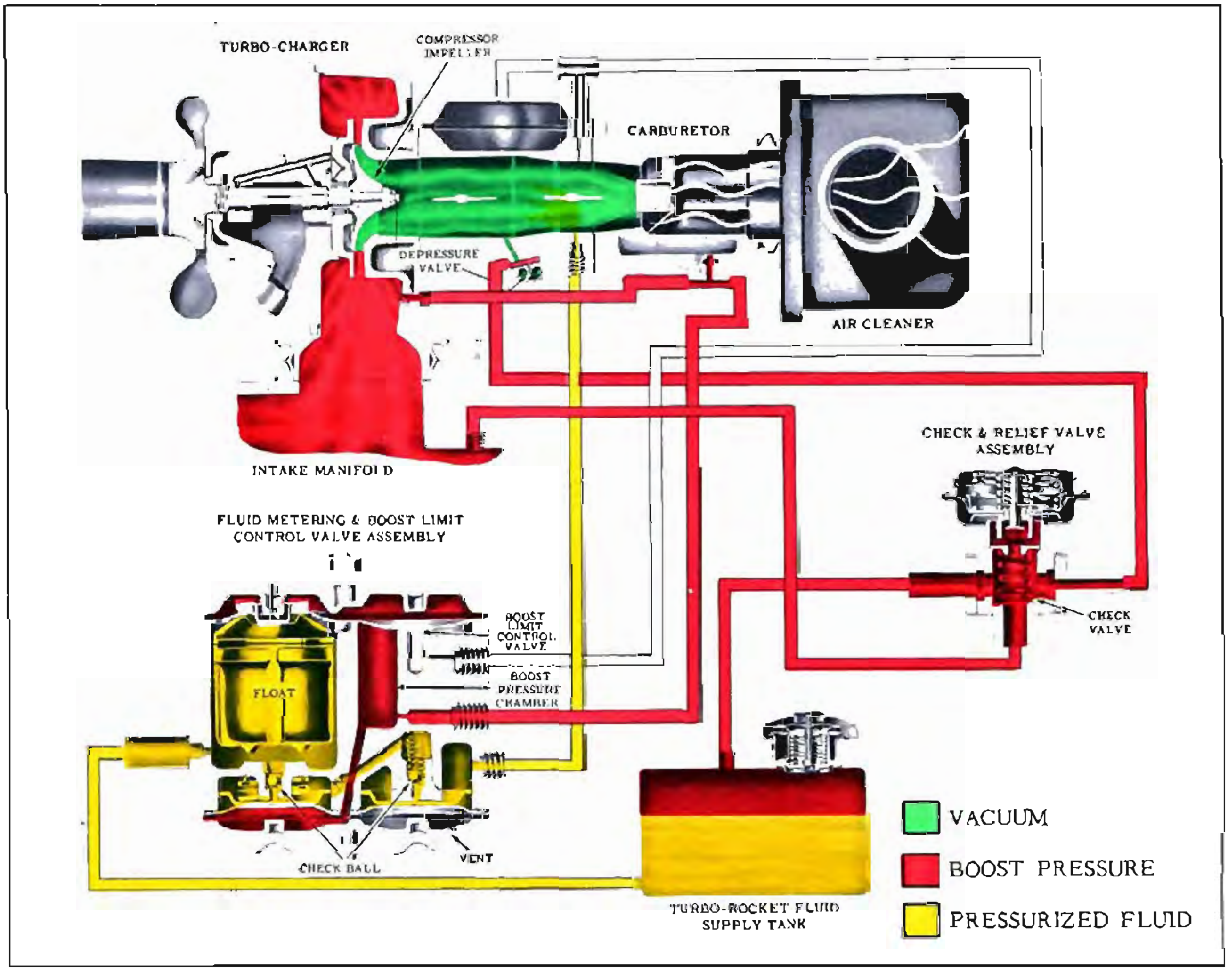


Fig. 9-109 Fluid Delivery

throttle valve against spring force. By closing the auxiliary throttle valve, the air-fuel mixture will be restricted to limit the maximum boost to approximately 1.0 p.s.i. Even though the engine can be operated with this boost, the cylinder temperatures will be maintained at a safe level.

During normal boost operation, the auxiliary throttle valve could be closed if the boost limit control valve, in the Fluid Metering Valve assembly, leaked. However, a calibrated bleed is incorporated in the boost limit line to allow a slight leakage without the possibility of actuating the boost limit diaphragm. This bleed is connected to the throttle bore through a tee fitting in the boost limit line.

TURBO-ROCKET FLUID METERING VALVE

Remove and Install (Fig. 9-111)

1. Remove fluid metering valve bracket to bowl screws.

2. Remove the 3 lines, being careful not to damage rubber gaskets, on flared lines and remove valve.

3. To install, connect the three lines, middle line first, be sure all lines are in line with holes before tightening. Install valve to float bowl by the two attaching screws.

Disassembly (Fig. 9-112)

1. Remove two screws which connect upper and lower valve cover retaining brackets together. Hold valve covers in place when removing brackets.

2. Remove top cover, while holding bottom cover, then remove top gasket.

3. Carefully remove diaphragm spacer.

4. Remove diaphragm, float weight and float assembly. Diaphragm can be removed from float by carefully bending tangs in float weight slot together, then remove weight and diaphragm from float. (Fig. 9-113)

5. Remove bottom cover and diaphragm. Cover is spring-loaded, use care to avoid damaging lower diaphragm.

6. Remove diaphragm from cover, then remove spacer and gasket.

7. Remove diaphragm plunger and spring from float side.

8. Remove diaphragm plunger from boost side of valve. Plungers are interchangeable.

9. Remove fluid outlet check ball retainer, then remove check ball and spring. (Fig. 9-114)

Cleaning and Inspection

1. Check diaphragm for holes, cracks or tears.

2. Check fluid outlet check ball and spring for distortion.

3. Ball check at bottom of float chamber should be free and clean.

4. Inspect float for dents, leak or distortion.

5. Clean all metal parts in standard carburetor cleaner.

6. Blow out all channels.

Assembly

1. Install check valve spring, ball and retainer. (Fig. 9-114)

2. Assemble float to top diaphragm, flat valve on diaphragm facing downward.

   NOTE: Prongs on top of float should be installed through diaphragm at right angles to center line. Place float weight over top of diaphragm and bend retaining clips on float into slots in weight.

3. Assemble float and diaphragm assembly to housing. Make sure wrinkles are removed from diaphragm and it lays flat on face of housing. Install diaphragm spacer over diaphragm making center holes line up with holes in diaphragm and casting. Install gasket; then diaphragm cover, making sure center holes are aligned properly and that prongs on cover are aligned correctly with holes in diaphragm.

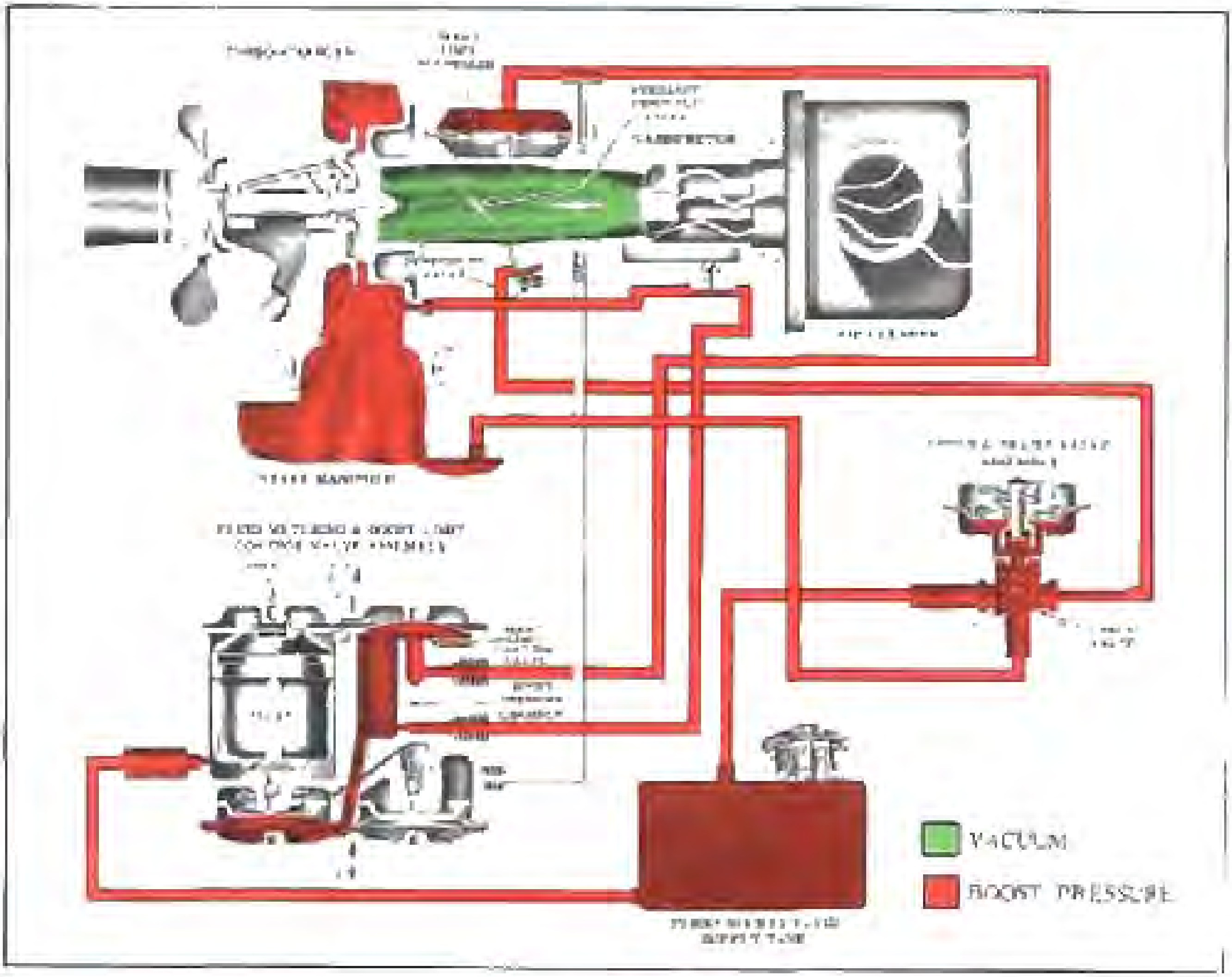


Fig. 9-110 Boost Limit Operation

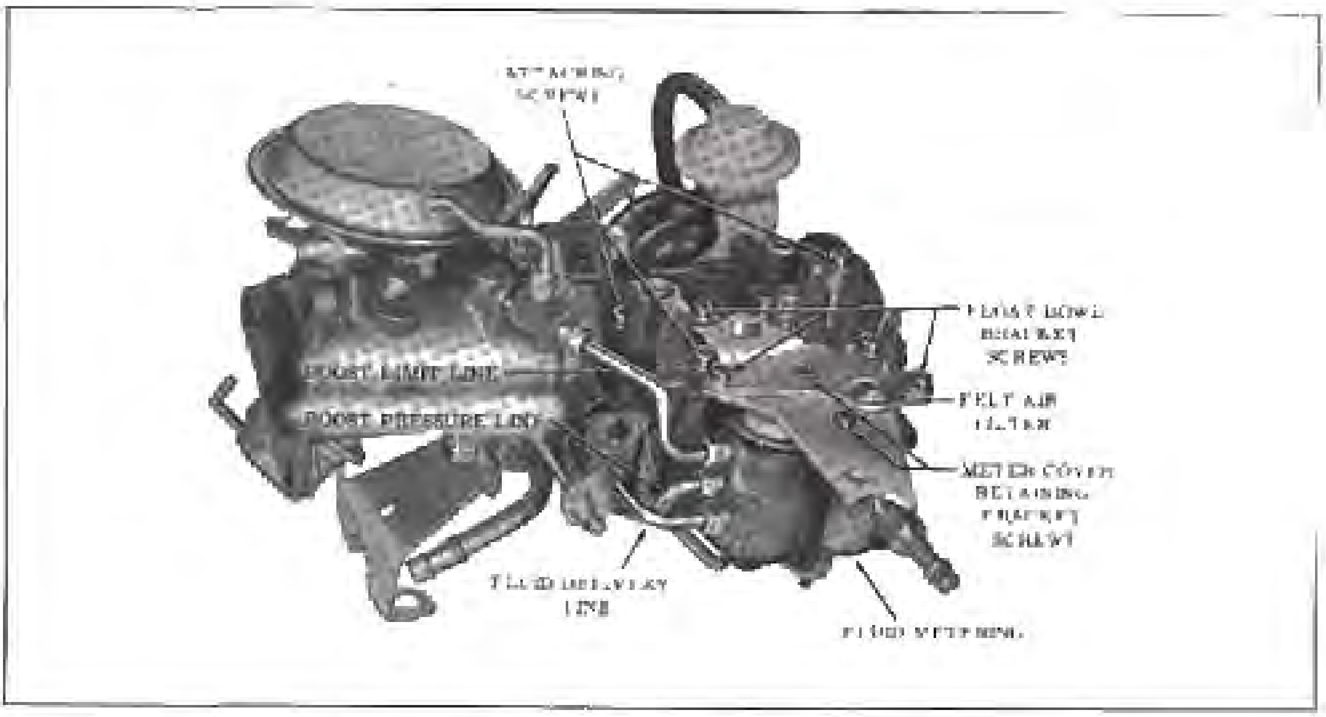


Fig. 9-111 Carburetor Assembly

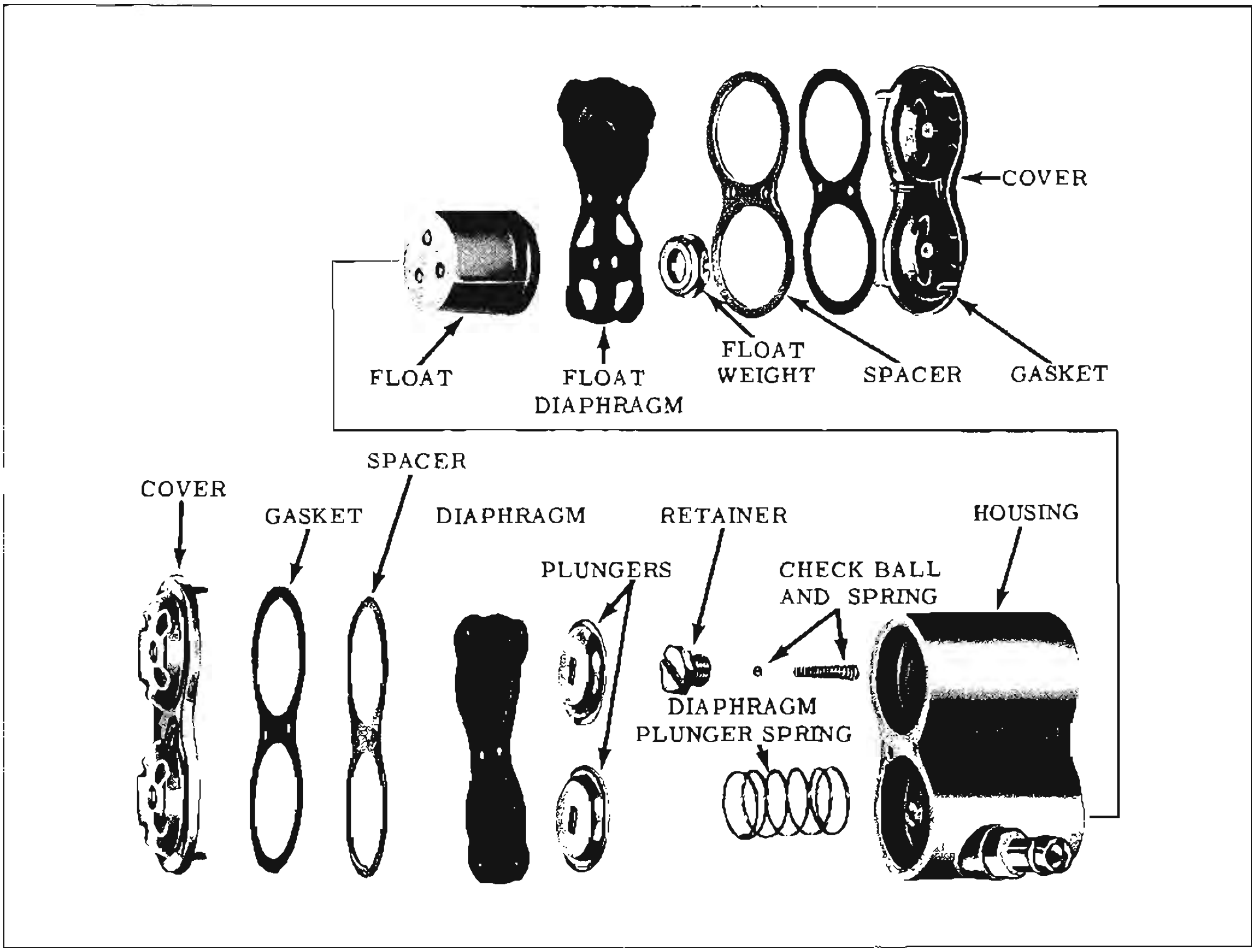


Fig. 9-112 Exploded View of Fluid Metering Valve

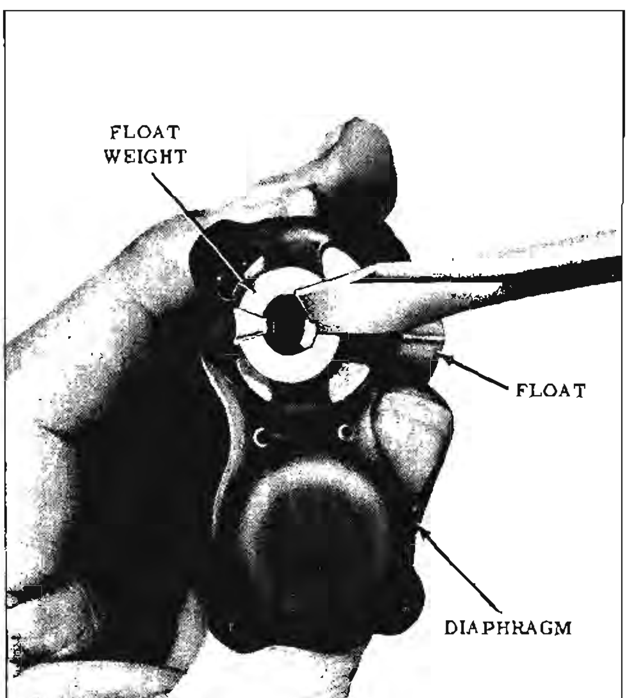


Fig. 9-113 Removing Diaphragm

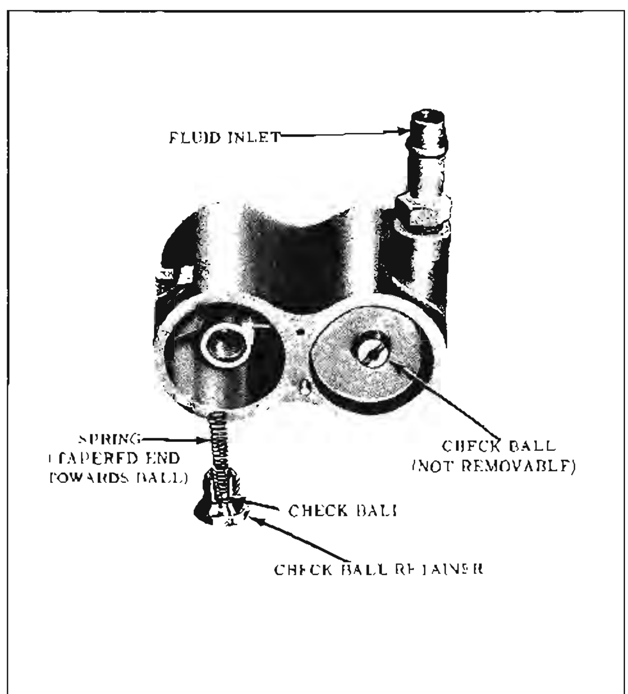


Fig. 9-114 Fluid Metering Valve

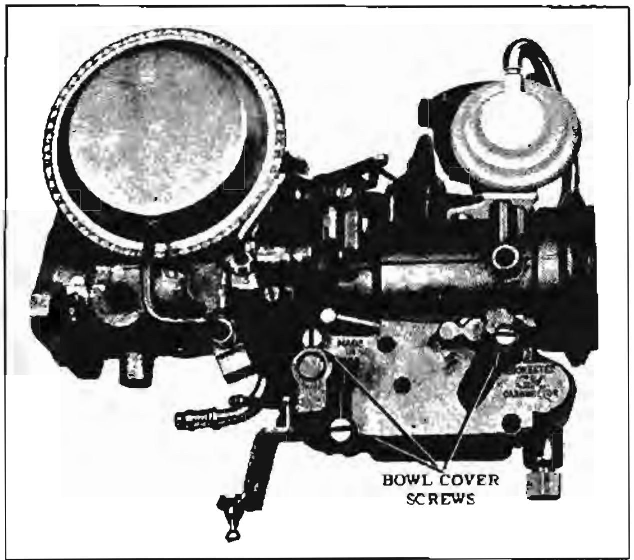


Fig. 9-115 Float Bowl Cover Screws

4. Install gasket into lower cover. Then install copper spacer next to gasket. Line up holes in gasket and spacer with holes in cover. Then install diaphragm in cover lining up holes and prong punctures.

5. Set diaphragm plungers in their centered positions on diaphragm, plunger stems pointing upward.

6. Then set diaphragm plunger spring on top of plunger on float side of fluid meter. Then with casting held in upright position, lower casting on to cover making sure diaphragm plunger stems fit into their respective holes. Also, be careful diaphragm does not wrinkle. Then assemble cover to casting.

7. Install upper and lower cover retaining bracket. Then tighten two screws evenly and securely.

   NOTE: Brackets are installed correctly when liquid inlet is pointing away from float bowl.

8. Connect lines in their respective positions before attaching fluid meter to carburetor (Fig. 9-111). Connect middle line first, making sure all tubes are in line with holes before tightening fittings.

9. Install fluid meter to float bowl by installing two screws through float bowl cover.

CARBURETOR ASSEMBLY

Removal

When removing the carburetor from a warm engine, release the pressure in the cooling system by loosening the radiator cap.

1. Remove hood.

2. Remove air cleaner.

3. Disconnect steel line from the filter to carburetor inlet at the carburetor inlet.

4. Disconnect short water hose, compressor housing to throttle body, at the throttle body.

5. Disconnect line from the turbo-charger to the bottom of the float bowl at the tee on the bottom of the float bowl.

6. Disconnect the carburetor rod.

7. Disconnect choke cable if so equipped. (Fig. 9-138)

8. Disconnect turbo-rocket fluid supply hose from the metering valve.

9. Disconnect the hose vacuum check-valve to throttle body).

10. Disconnect small hose, positive crankcase ventilation valve to throttle body.

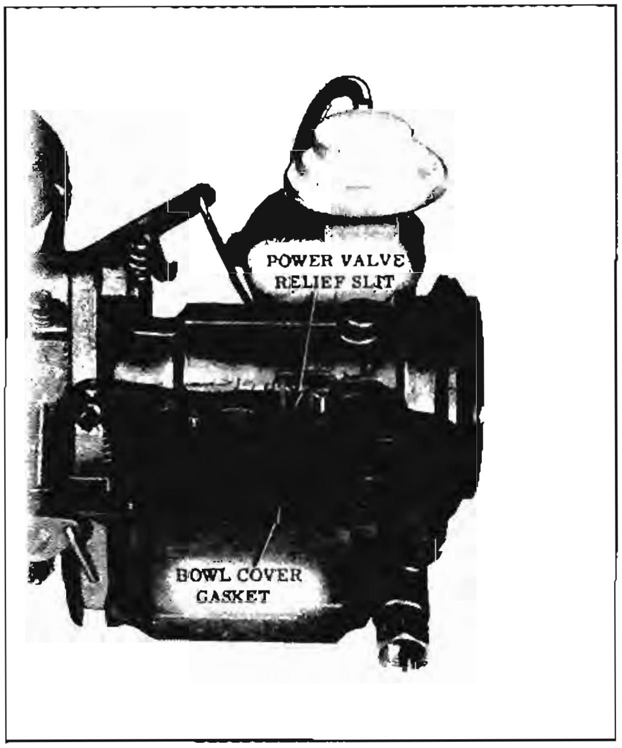


Fig. 9-116 Float Cover Bowl Gasket

11. Remove two carburetor lower mounting bracket bolts.

12. Remove the three nuts attaching carburetor to turbo-charger.

13. Remove remaining water hose and remove carburetor.

Installation

To install, reverse above procedure. Install new gasket between the carburetor and turbo-charger. Torque the carburetor to turbo-charger attaching nuts 9 to 12 ft. lbs. Oil the mounting bracket to intake manifold bolts with engine oil and torque 20 to 25 ft. lbs.

DISASSEMBLY

Float Bowl

1. Remove fluid metering valve and float bowl bracket by removing the attaching screws. Be careful to retain felt air filter covering fluid meter vent, held by the bowl cover bracket.

2. Remove float bowl cover attaching screws and remove cover. (Fig. 9-115)

3. Remove bowl slotted cover gasket. (Fig. 9-116)

4. Remove float hinge pin spring retainer; then remove float assembly and hinge pin together. Remove hinge pin from float arm. (Fig. 9-117)

5. Remove screen from main well. (Fig. 9-117)

6. Remove float needle valve by removing the float needle and the float needle seat using

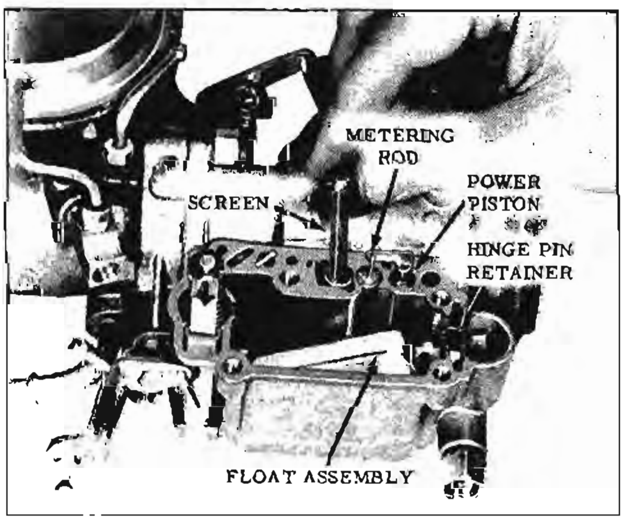


Fig. 9-117 Float Bowl Assembly

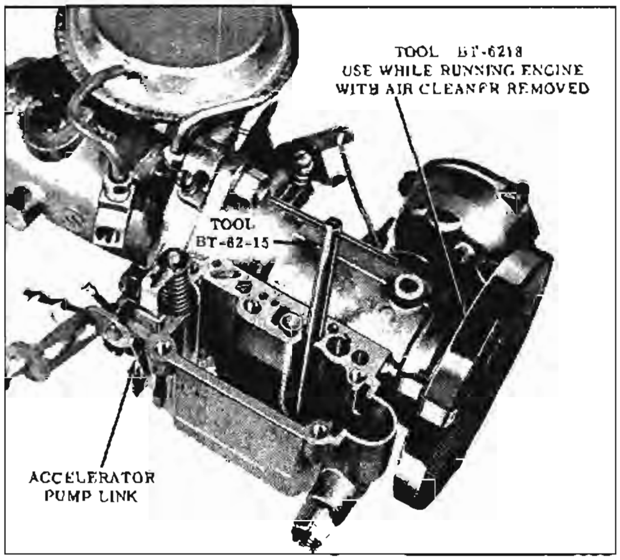


Fig. 9-118 Metering Jet Removal

Tool BT-52. Then remove gasket and strainer.

7. Remove the power piston and metering control rod assembly by turning small retaining pin to side, at the top of the power piston. (Caution - Piston is spring-loaded.) Then remove power piston, spring and metering rod. (Fig. 9-117)

8. The main metering jet may be removed by prying upward on the small guide disc at the top of the main metering jet well. Use Tool BT-62-15 to remove the main metering jet. (Fig. 9-118)

9. Remove T-shaped retainer, spring and discharge ball check from discharge well using a pair of long-nosed pliers.

10. To remove pump plunger assembly, remove the link connecting the pump plunger to the throttle lever by removing the hairpin clip, then remove end of link from throttle lever. Remove the other end of the link by rotating until the pump link passes through the slotted hole in the pump plunger arm. Rotate throttle lever to wide open position, then remove the pump plunger from the pump well. Now the pump return spring in the bottom of the pump well may also be removed. Pump arm and duration spring may be removed from pump plunger by removing spring clip at top of pump plunger stem. This will complete disassembly of the float bowl. The idle tube and main well tube are pressed in place and should not be removed. Thorough cleaning is all that is necessary.

Throttle Body

1. Remove depressure valve, diaphragm cover and diaphragm. (Fig. 9-119)

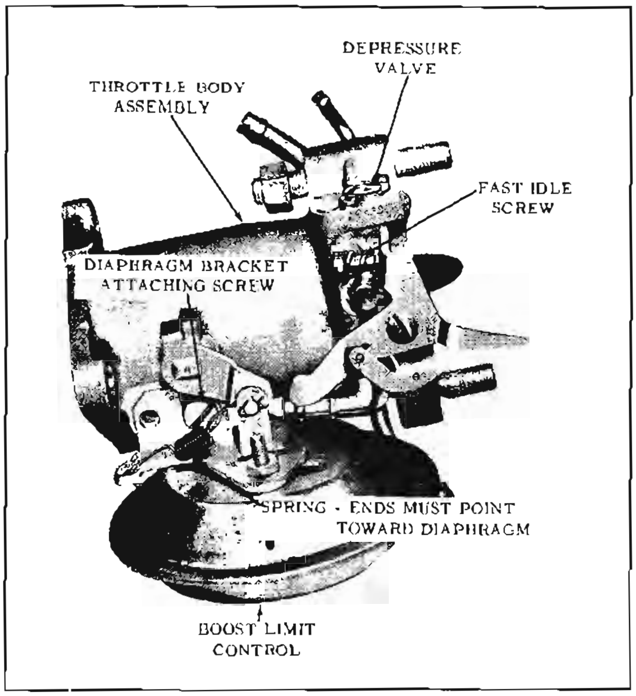


Fig. 9-119 Throttle Body Assembly

2. Remove boost limit diaphragm opening spring and disconnect diaphragm linkage from auxiliary throttle valve lever by removing hairpin clip. Loosen boost limit line from boost limit diaphragm and tee fitting at base of float bowl, but do not try to pull the line from the tee fitting. Remove diaphragm from throttle body by removing the attaching screw.

3. Remove idle mixture needle adjusting screw and spring.

4. Auxiliary throttle shaft assembly may be disassembled by removing the two retaining screws through the throttle valve; remove valve and then throttle shaft can be removed from the throttle body assembly bore.

5. Fast idle screw in the throttle lever may be removed if replacement is necessary (Fig. 9-119).

   NOTE: The throttle valve and shaft should not be removed as there is a close tolerance fit between the valve and bore and the off-idle slot. If the throttle shaft and/or valve is worn excessively, the complete throttle body assembly should be replaced.

6. To remove throttle retarder, disconnect linkage by removing hairpin clips and remove nut holding bracket to throttle body.

Air Horn to Throttle Body

1. Disconnect air horn from throttle body.

2. Remove throttle return check.

Choke and Linkage

1. Remove fast idle cam attaching screw. Fast idle cam can now be removed from the air horn assembly and the link connecting to the choke shaft lever. (Fig. 9-120)

2. Remove the three choke cover attaching screws and retainers, then remove the choke cover and gasket.

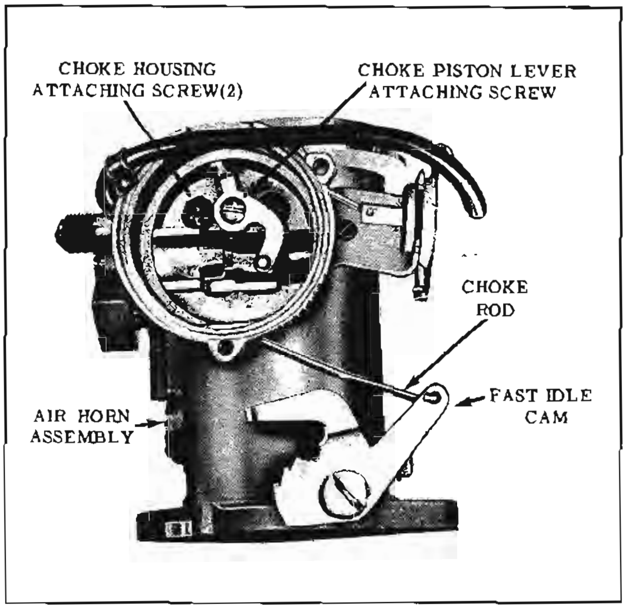


Fig. 9-120 Air Horn Assembly

3. Carefully lift the baffle plate from the choke housing.

4. Remove the choke piston lever attaching screw, then remove the lever link and piston assembly from the choke housing. (Fig. 9-120)

5. Remove the two choke housing attaching screws, then remove the choke housing and spring-loaded plastic washer from the air horn assembly. Remove washer spring. Now the hairpin clip on vacuum break diaphragm link can be removed. (Fig. 9-121)

6. Remove vacuum break diaphragm unit from air horn by sliding rubber vacuum hose from plastic casing and removing holding screw on bracket.

7. Remove two attaching screws which secure the choke valve to the choke shaft inside the air horn. Then the choke valve can be removed. Next, remove the choke shaft from air horn bore. The slow idle screw may be removed from air horn if replacement is necessary.

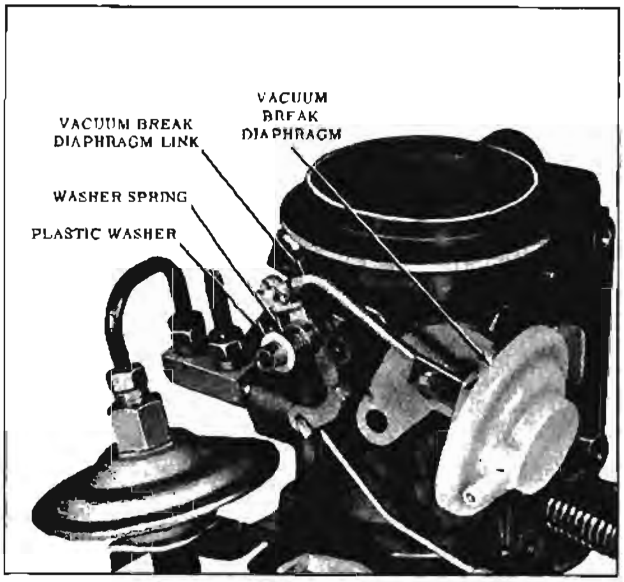


Fig. 9-121 Vacuum Break Diaphragm

8. Remove idle compensator cover and passage cover by removing two attaching screws. (Fig. 9-122)

CLEANING OF PARTS

The carburetor should be cleaned in a cold immersion type cleaner.

1. Thoroughly clean carburetor castings and all metal parts in carburetor cleaning solvent.

   CAUTION: The pump plunger, felt air filter, gaskets and diaphragms should not be immersed in solvent. Clean the pump plunger and felt air filter in clean solvent only.

2. Blow all passages in the casting dry with compressed air. Do not pass drills through jets or metering passages.
3. Clean all filter screens of dirt or lint.

INSPECTION OF PARTS

1. Check float for dents or excessive wear at hinge pin holes.
2. Shake float to check for leaks. Replace if necessary.
3. Examine float needle and seat. If grooved or scored, replace with a factory matched float needle and seat and gasket assembly.
4. Inspect the idle mixture adjusting needles for ridges, burrs or bends.
5. Inspect the surfaces between the carburetor body and air horn and between the float bowl cover and float bowl to see that the sealing areas are not damaged. Damaged sealing surfaces may result in air or fuel leaks at that point.
6. Inspect holes in the pump arm, pump link throttle lever, fast idle cam and choke piston link assembly. Replace excessively worn parts.
7. Inspect the steps in the fast idle cam for excessive wear. If excessive wear is noted, the cam should be replaced to insure proper engine operation during the warm-up and choking periods.
8. Inspect the pump plunger synthetic cup for cracks or creases. If the pump plunger is damaged, replace the pump plunger assembly.
9. Inspect the throttle body assembly. Make sure the idle passages and vacuum channels are clean.
10. Inspect filter screens. If screens are distorted or plugged, they should be replaced.
11. Check the depressure valve diaphragm for cracks or holes and if any are found it should be replaced.

As mentioned during the disassembly of the carburetor, there is a very close tolerance fit between the throttle valves and the off-idle port slot. Therefore, if the throttle valves, levers or shafts are worn excessively or damaged, a complete throttle flange assembly is required.

ASSEMBLY

Choke and Linkage

1. Install choke shaft in air horn; then install choke valve on choke shaft with two attaching screws. Seat choke in air horn bore and tighten choke valve screws securely. Choke valve is installed correctly when the stamped letters "RP" face upward on the choke valve.
2. Fasten vacuum break diaphragm bracket to air horn and connect vacuum tube to diaphragm and to fitting in air horn. Connect vacuum break diaphragm link to choke lever fastening with hairpin clip on choke lever end of link. (Fig. 9-121)
3. Assemble plastic washer and spring to choke housing. Install the choke housing on the air horn assembly with two attaching screws. Tighten attaching screws securely. (Fig. 9-121)
4. Install choke piston on choke piston link (if removed) by inserting choke piston pin through

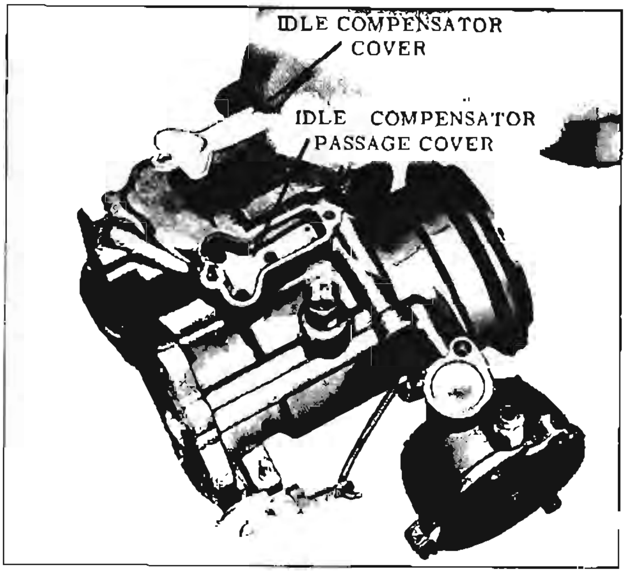


Fig. 9-122 Passage Covers

the hole in the choke piston and the choke link. Install the choke piston into the choke housing, then place choke piston lever over choke shaft and install retaining screw in the end of the choke shaft tightening securely.

5. Install choke baffle plate inside choke housing, then install thermostatic coil and cover assembly, retaining with three (3) screws.

6. Automatic Choke Adjustment - Rotate thermostatic coil and cover counterclockwise until the tang on the choke coil picks up the tang on the choke piston lever and the choke valve begins to close. Continue rotation to the point where the choke valve just closes and the index is aligned with the proper mark on the choke cover. Tighten choke cover retainer screws securely.

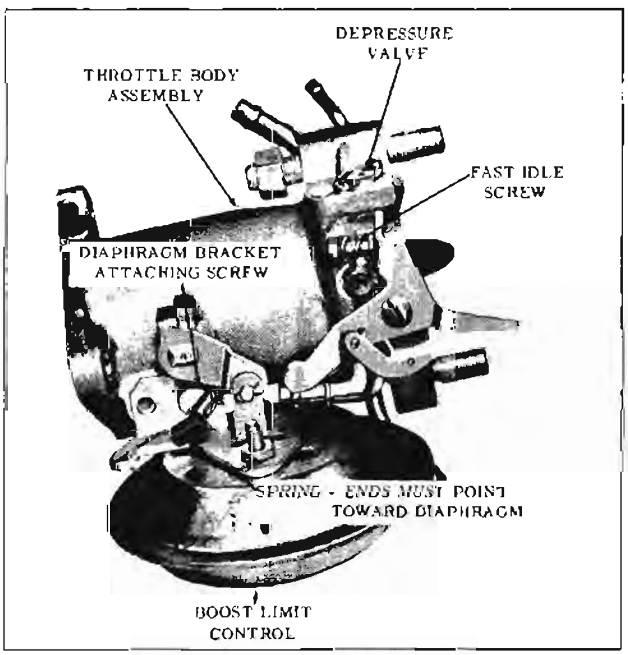


Fig. 9-123 Throttle Body

7. Install choke link and fast idle cam (looped ends of choke rod should face outward away from air horn casting). Install fast idle cam attaching screw and tighten securely. (Fig. 9-120)

8. Install slow idle screw if removed.

9. Install new idle compensator passage gasket and cover, retaining with two attaching screws. Then install idle compensator cover with the two attaching screws. (Fig. 9-122)

Throttle Body

1. Attach throttle retarder bracket to throttle body and assemble linkage to throttle lever using hairpin clips. Link goes in hole in throttle lever closer to heated water inlet tube in throttle body. Bend in link should point toward engine.

2. Install auxiliary throttle shaft and lever into throttle body bore, then install auxiliary throttle valve, attaching with two screws. Tighten screws securely.

   NOTE: Identification on auxiliary throttle valve should face towards manifold mounting surface. Valve should fit diagonally in bore with identification markings nearer to manifold mounting.

3. Install boost limit diaphragm to mounting bracket, then position boost pressure tube in fitting. Install the diaphragm and mounting bracket to throttle body casting, connecting pressure tube at the same time to tee fitting at base of float bowl. Tighten attaching screws securely, then tighten tube fittings. Install auxiliary throttle valve link to auxiliary throttle valve lever.

   NOTE: Auxiliary throttle body diaphragm should be centered on the mounting bracket so that the diaphragm plunger is parallel with the throttle lever, then tighten diaphragm to bracket attaching bolts.

4. Connect boost limit control diaphragm opening spring to auxiliary throttle shaft lever and to hole on diaphragm bracket. (Fig. 9-123)

5. Install diaphragm in fluid tank depressure valve chamber. Install diaphragm cover. Make sure that diaphragm is not wrinkled. Install diaphragm cover, holding bracket, and retaining screws evenly and securely. (Fig. 9-124)

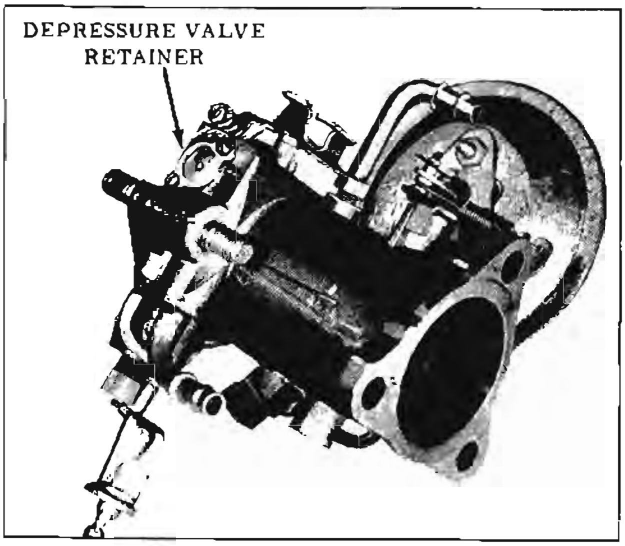


Fig. 9-124 Depressure Valve

6. Install idle mixture screw and spring. Turn in until lightly seated and back off approximately 1-1/2 turns for initial adjustment.

Air Horn to Throttle Body

1. Install new gasket over studs on throttle body assembly. Line up holes in gasket with holes on face of throttle body flange. (Fig. 9-125)

2. Assemble air horn to throttle body. Unloader tang on fast idle lever should be above tang on fast idle cam.

3. Install throttle return check on lower mounting stud. Then install throttle body to air horn attaching nuts and tighten evenly and securely. Make sure plunger on throttle return check lines up with pad on fast idle lever. Connect throttle return check vacuum tube to air horn fitting.

Float Bowl—Primary

1. Install pump return spring in pump well, pushing in place with finger to make sure that it is seated properly.

2. Install pump plunger into pump well being careful not to distort pump cup.

3. Install the pump link into pump plunger rod, then hook other end of link to throttle lever, retaining in place with spring clip.

4. Install pump discharge ball, spring and T-shaped retainer into pump discharge well.

5. Install main metering jet, if removed, using special main metering jet Tool BT-62-15 (Fig. 9-126). Then install metering rod guide into top of main metering jet well.

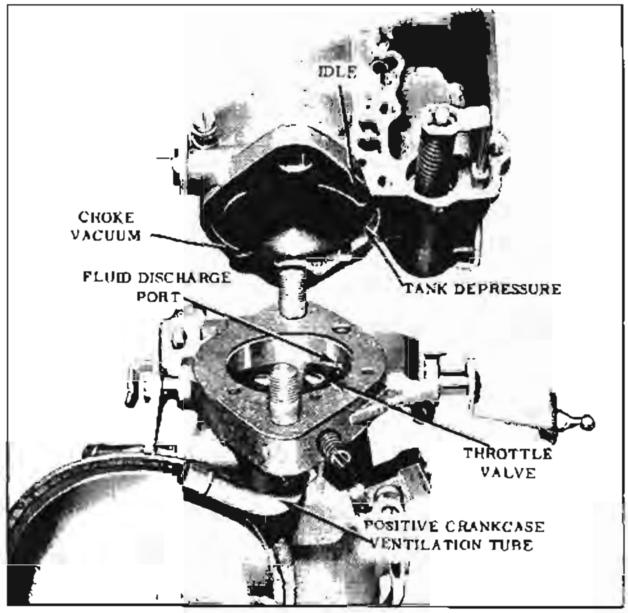


Fig. 9-125 Throttle Body Gasket

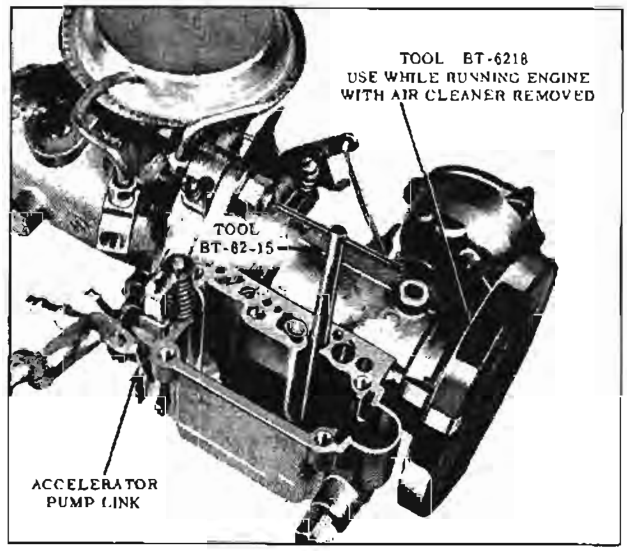


Fig. 9-126 Bowl Assembly

6. Install power piston spring into the chamber, then install power piston over the spring, while guiding metering rod through guide in the top of main metering jet well. Be sure metering rod enters orifice in the main metering jet. Retain power piston assembly in place by turning retainer wire towards power piston. Install screen into main well. (Fig. 9-127)

7. Install float needle seat and gasket into float bowl. Tighten needle seat securely using Tool BT-52 so that the needle seat will not be distorted.

8. Install hinge pin into float arm, then install

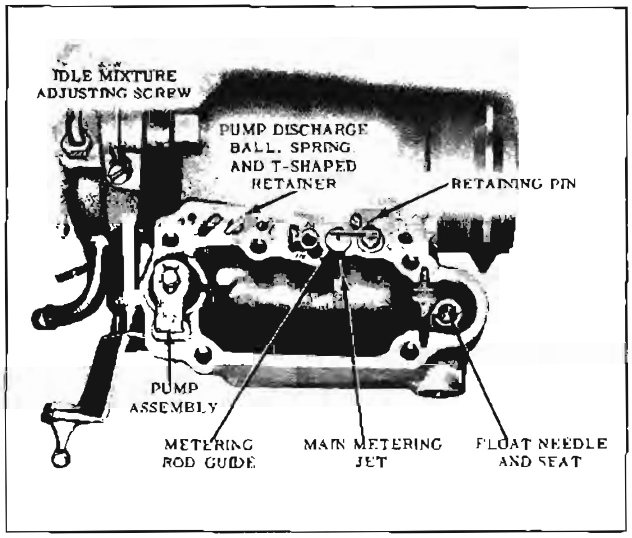


Fig. 9-127 Main Metering Jet

float assembly in float bowl with hinge pin located in guide channels in float bowl. (Fig. 9-128)

9. Install spring retainer against float hinge pin with loop of spring upwards toward bowl cover.

10. Float Level Adjustment - Setting 12/32" (Fig. 9-129). To obtain this adjustment, place the notch in gauge BT-62-16 over the edge of the float bowl with the gasket removed as shown. The leg of the gauge should then extend down into the bowl. Measurement should be taken at the end of the bowl opposite the fuel inlet end. Press downward at the rear of the float arm, seating the float needle. With gauge in place, the top corner of the float should just touch the gauge. If adjustment is needed, bend the float pontoon up or down at the float arm.

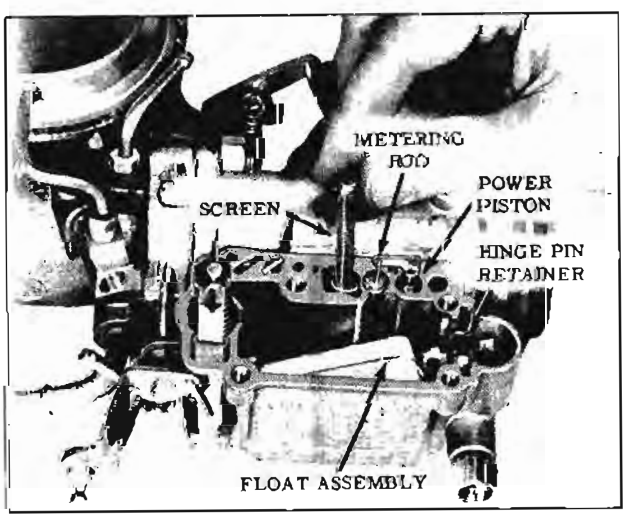


Fig. 9-128 Float Assembly

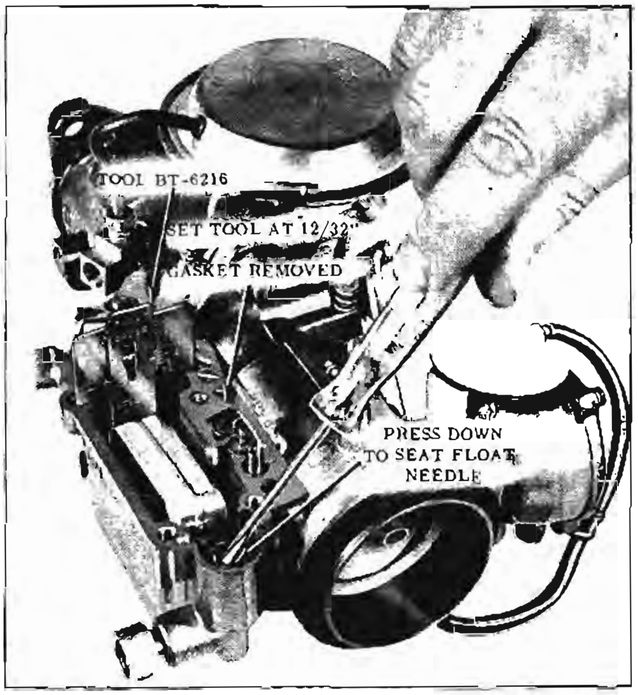


Fig. 9-129 Float Adjustment

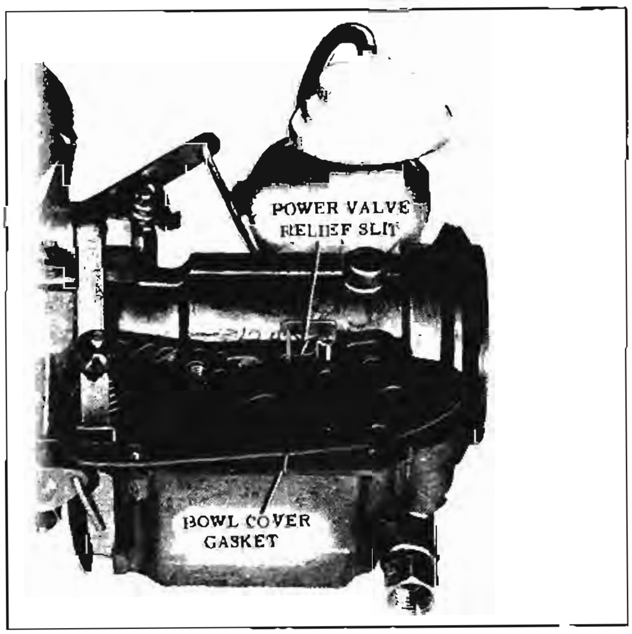


Fig. 9-130 Bowl Cover Gasket

Check to make sure float is centered in bowl and will not rub on walls. If alignment is needed, bend float in horizontal direction at the arm. Float drop adjustment is not required.

Float Bowl Assembly—Final

1. Install float bowl cover gasket, pushing slotted section over power piston and metering rod assembly, locating gasket on lugs on side of

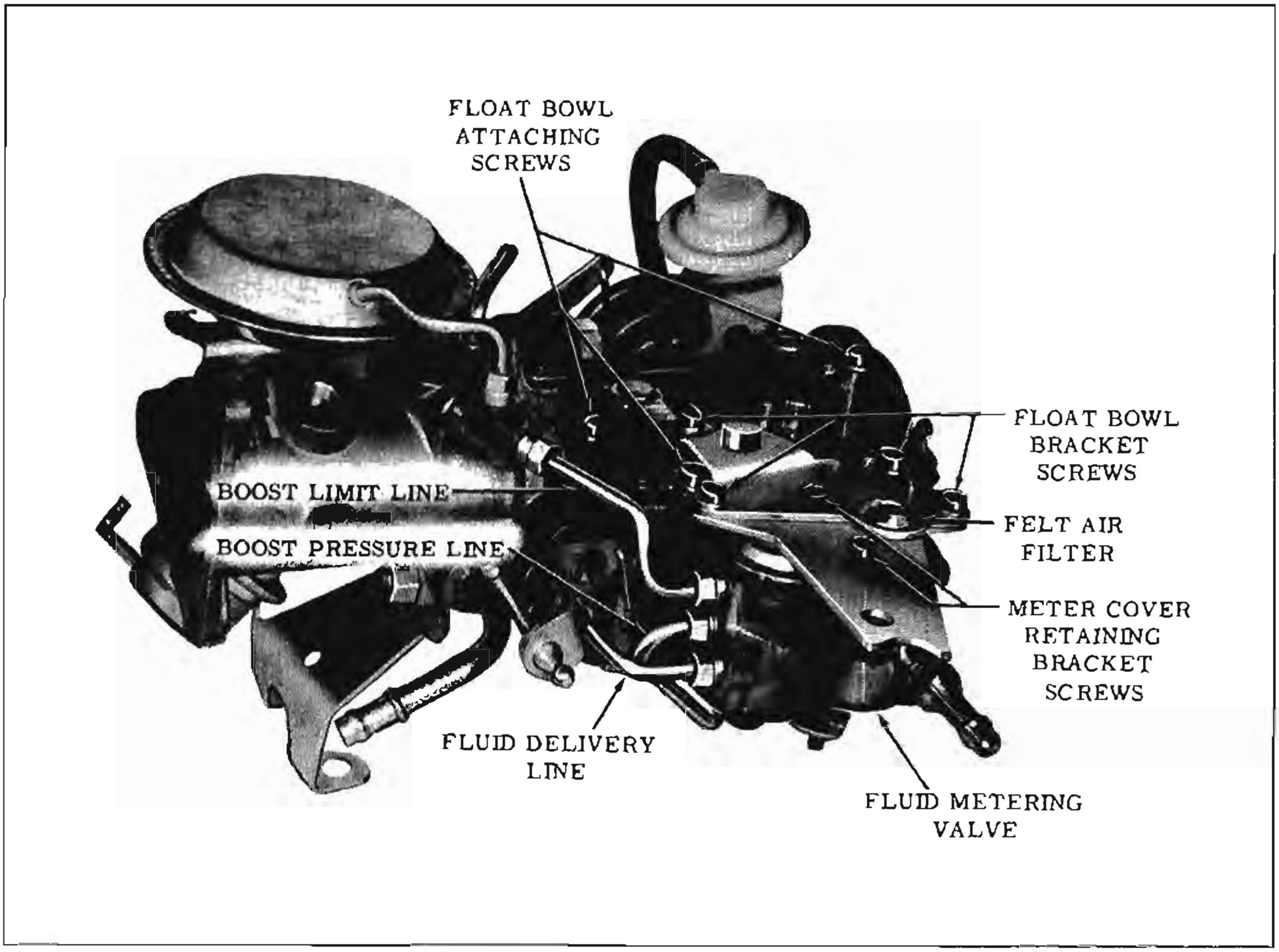


Fig. 9-131 Carburetor Assembly

float bowl. (Fig. 9-130)

2. Install float bowl cover retaining in place with three (3) attaching screws.

3. Attach fluid metering valve bracket to bowl cover bracket with the two attaching screws, making sure fluid metering valve fittings are aligned with their respective fittings in throttle body and boost limit diaphragm line. (Fig. 9-131)

4. Install fluid metering valve on air horn, retaining with 2 attaching screws, then tighten all screws and lines evenly and securely.

OFF THE CAR ADJUSTMENTS

VACUUM BREAK ADJUSTMENT— SETTING .140"-.160" (Fig. 9-132)

The linkage connected to the diaphragm controls the amount of choke opening after initial engine starting. Adjustment of the vacuum break setting is made by bending the tang which engages the pin in the shaft to the choke blade.

To check the setting, seat the diaphragm in its case by pushing in on the linkage to the diaphragm. With the diaphragm seated, the gauge or drill (5/32") should just fit between the edge of the

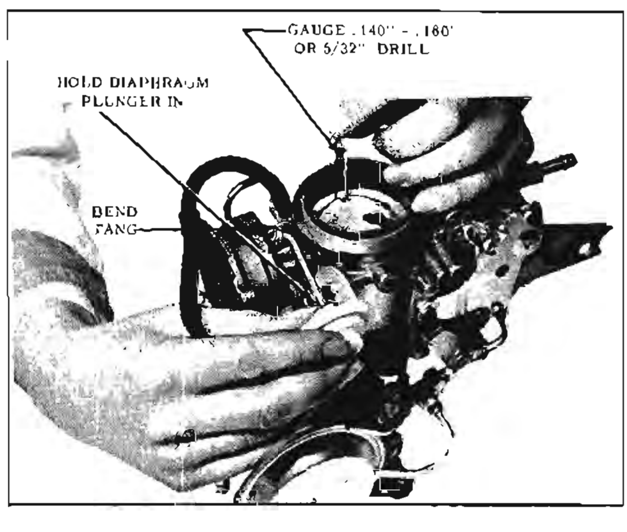


Fig. 9-132 Vacuum Break Adjustment

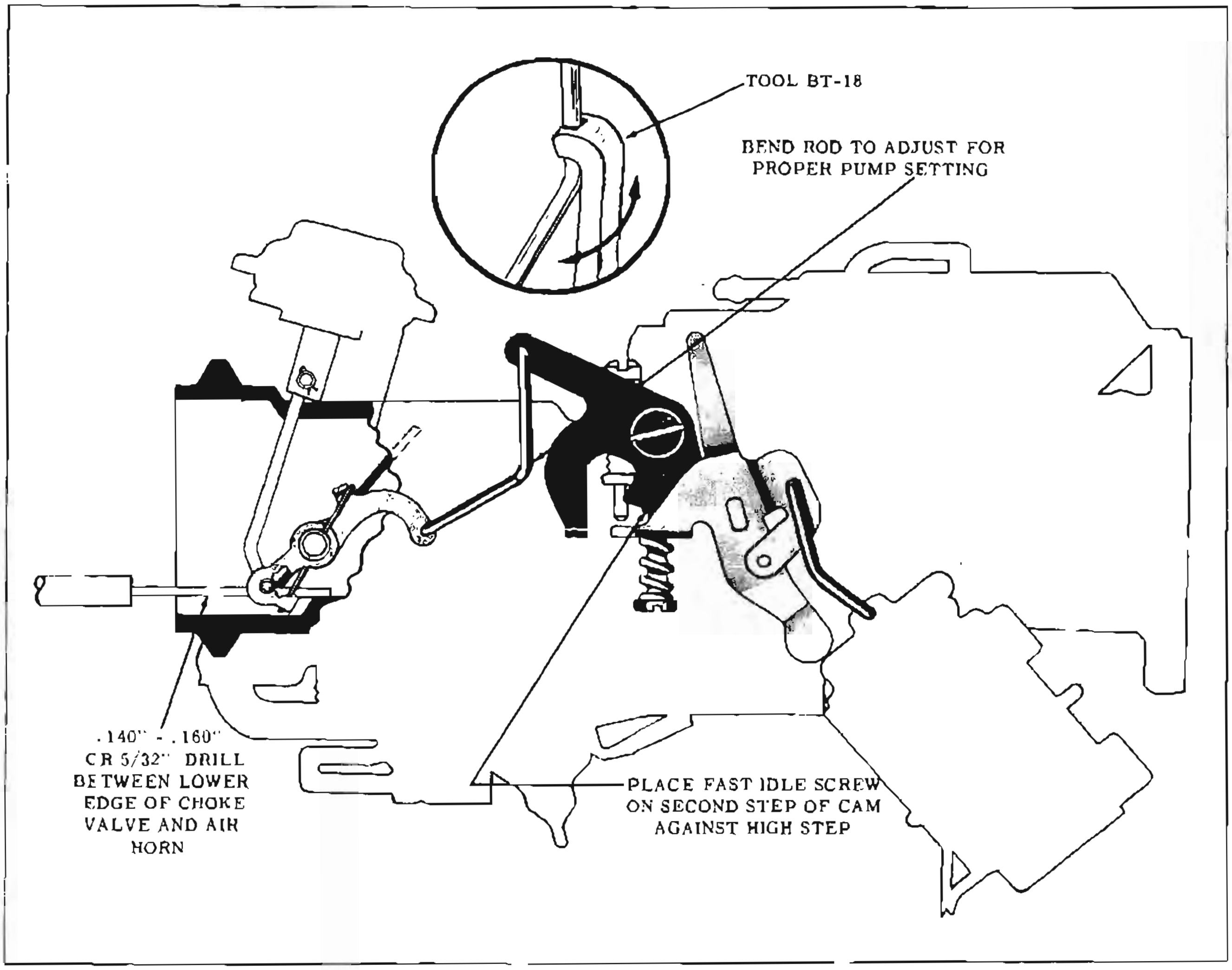


Fig. 9-133 Choke Rod Adjustment

choke blade and the inner air horn wall. If adjustment is necessary, bend the tang on the linkage. Make sure that when the diaphragm is released, the choke still closes completely. If a second method of adjustment is needed, the linkage arm may be bent slightly.

CHOKE ROD ADJUSTMENT— SETTING .140"-.160" (Fig. 9-133)

The choke rod adjustment positions the fast idle cam in relation to the choke valve opening. This insures the correct fast idle speed during engine starting and initial warm up.

To adjust, place the fast idle screw on the second step of the fast idle cam and against the highest step.

Bend the choke rod as shown to obtain the specified clearance.

UNLOADER ADJUSTMENT— SETTING .308"-.348" (Fig. 9-134)

If the engine "loads up" or becomes flooded when starting, it is necessary to mechanically open the choke valve a small amount to admit more air to facilitate starting. This is accomplished when a tang on the throttle lever contacts the fast idle cam and forces the choke valve open.

To adjust, hold the throttle valves wide open using throttle lever (with carburetor off car) or with accelerator completely depressed to floor (carburetor on car). Check the clearance between the edge of the choke valve and air horn wall. The correct clearance is .308"-.348".

To obtain correct setting, bend small tang on fast idle cam, as shown.

THROTTLE RETARD UNIT ADJUSTMENT— ALLOWANCE SETTING (Fig. 9-107)

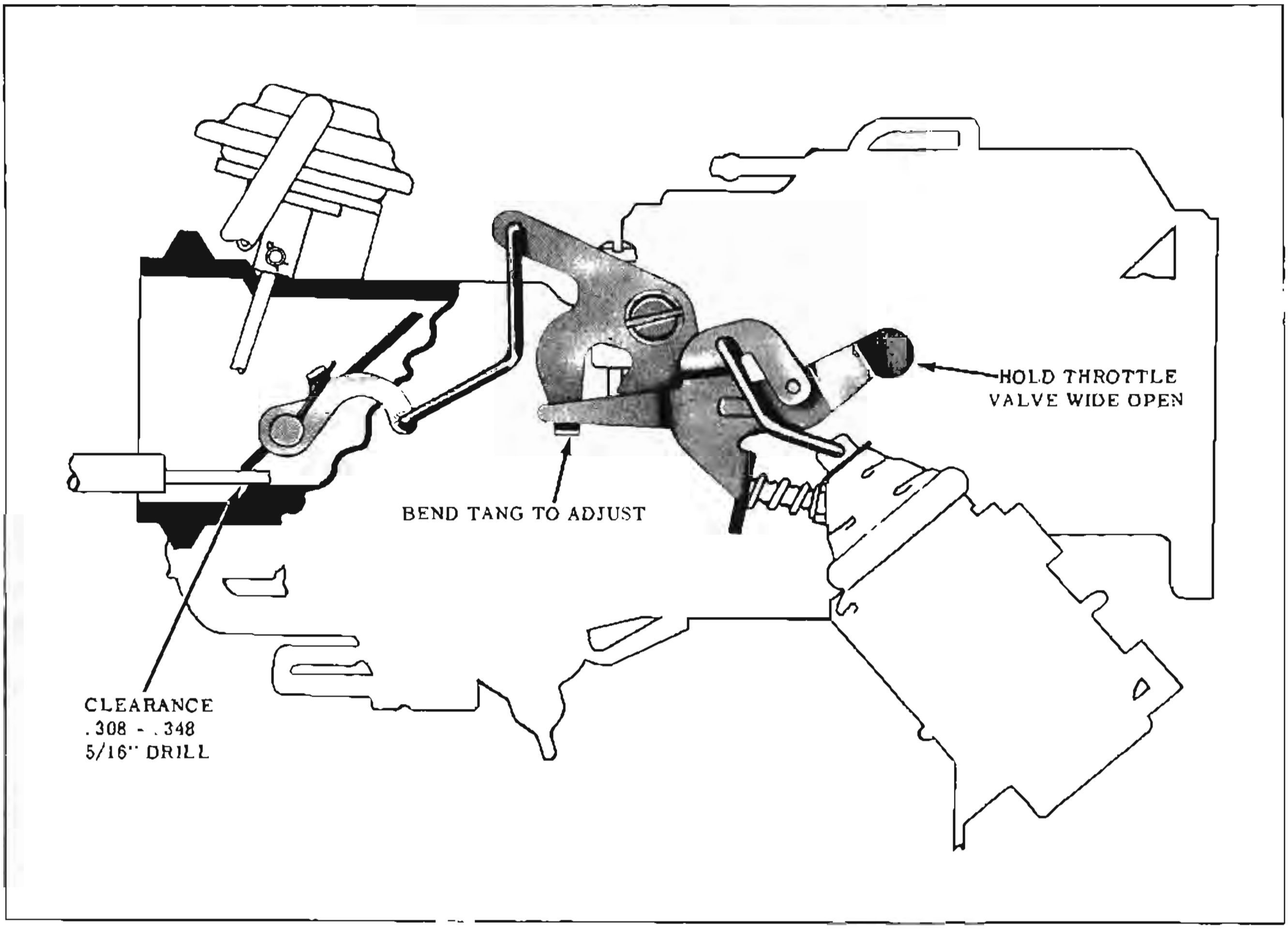


Fig. 9-134 Unloader Adjustment

ON THE CAR ADJUSTMENTS

NOTE: FOR THROTTLE LINKAGE ADJUSTMENTS, REFER TO HYDRA-MATIC SECTION.

SLOW IDLE ADJUSTMENT

Set to 600 r.p.m. (if equipped with air conditioning, set to 600 r.p.m. with air conditioning "OFF") with Hydra-Matic in "Dr", Synchromesh in "Neutral".

FAST IDLE ADJUSTMENT

For Hydra-Matic equipped cars set to 1500 r.p.m. on the second step of the fast idle cam, transmission in "Neutral" and engine warm - air conditioning "OFF".

For synchromesh equipped cars set to 2400 r.p.m. on the high step of the fast idle cam, transmission in "Neutral" and engine warm - air conditioning "OFF".

THROTTLE RETURN CHECK HYDRA-MATIC EQUIPPED CARS ONLY

Removal

1. Remove air cleaner.
2. Remove line from carburetor to turbocharger.
3. Disconnect vacuum line to throttle return check, at carburetor.
4. Remove return check attaching nut, using a 9/16" end wrench bent at right angles or a wrench such as OTC 520, and remove return check.

Installation

Reverse above procedure. Adjust as necessary.

Adjustment

With fast idle screw on the high step of the cam, adjust plunger screw to obtain .050" clearance.

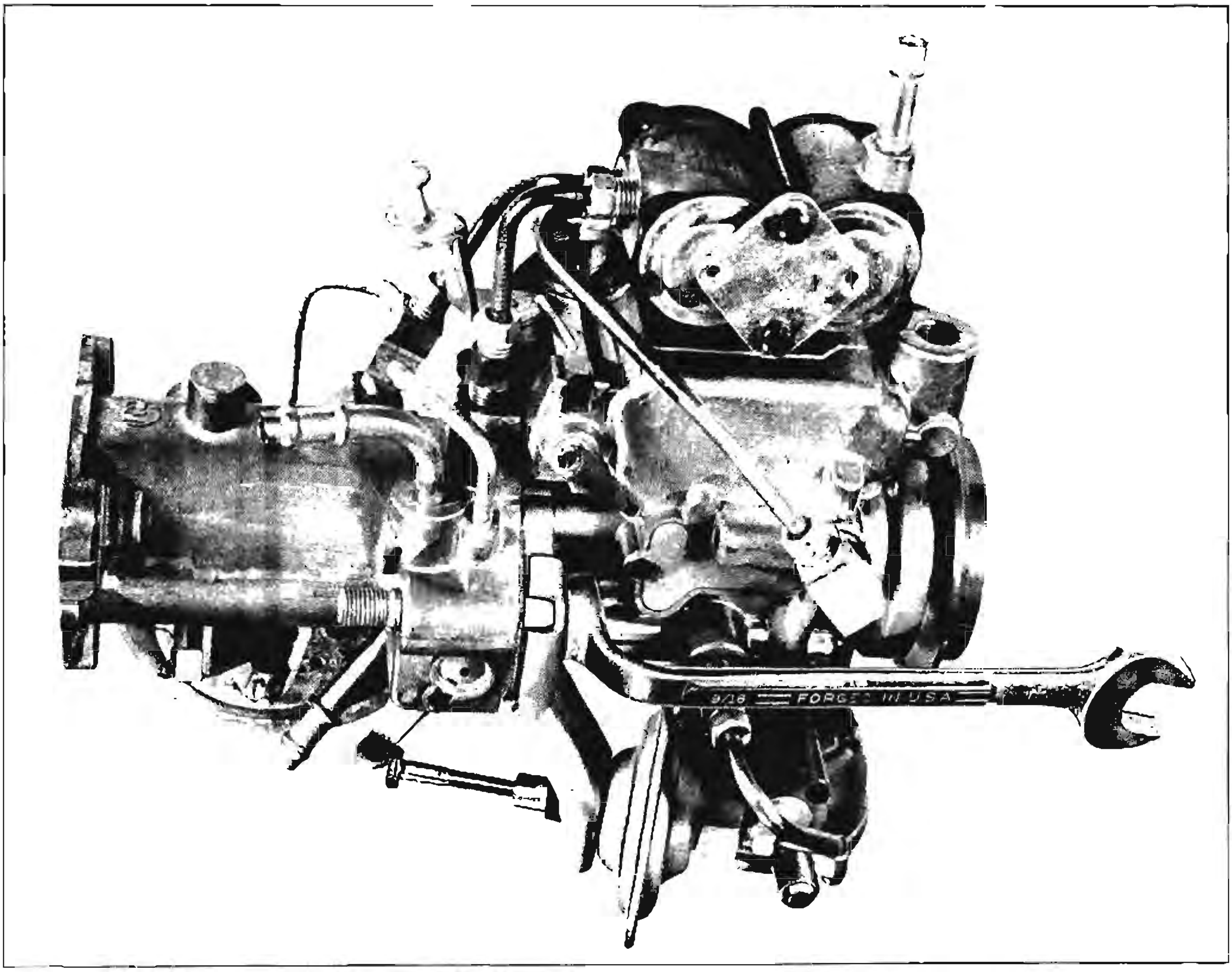


Fig. 9-135 Throttle Return Check Removal

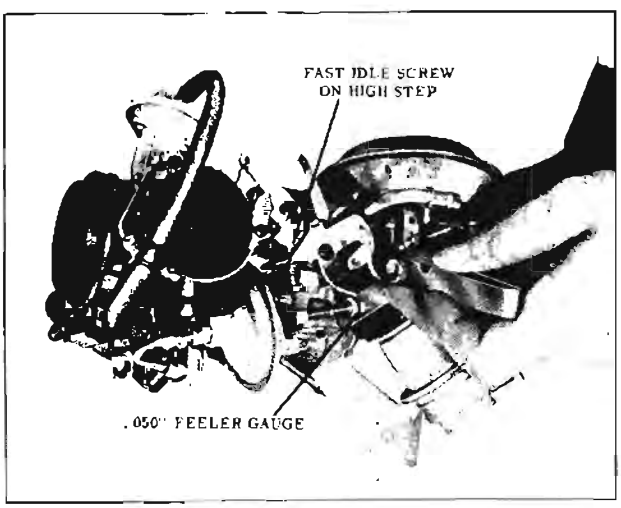


Fig. 9-136 Throttle Return Check Adjustment

Fig. 9-137 Pointer Adjustment

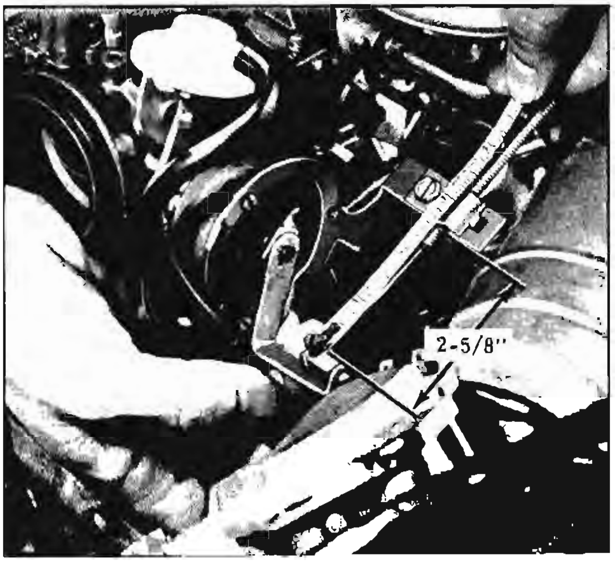


Fig. 9-138 Cable Adjustment

MANUAL CHOKE ADJUSTMENT

1. Set fast idle screw on high step of cam.
2. With choke control knob against dash bracket, loosen bowden wire set screw. Rotate choke lever to obtain the 2-5/8" dimension as shown in Fig. 9-138. Tighten set screw.
3. Pull choke control knob out until choke lever contacts stop on bracket. (Fig. 9-139)
4. Loosen lock screw. Rotate pointer clockwise to open choke valve. Rotate pointer counter-clockwise until choke valve just closes.
5. Note pointer index. Rotate pointer counter-clockwise four additional notches and tighten lock screw.
6. Push choke control knob in until detent is felt. (Note: Fast idle screw to be on end of 2nd step of fast idle cam.) Choke detent may be bent in or out to provide proper detent "feel".
7. Bend end of bowden wire up at choke lever.

FAST IDLE ADJUSTMENT

1. Place transmission in neutral.
2. Throttle retarder spring load must effectively hold throttle lever fast idle screw on cam.
3. Engine must be warm. Set fast idle screw on high step of fast idle cam to attain 2400 r.p.m.
4. Flash throttle, turn engine off and then open throttle to allow fast idle screw to rest on fast idle cam.
5. Adjust gap between carburetor lever and throttle return check plunger to .050" ± .010".

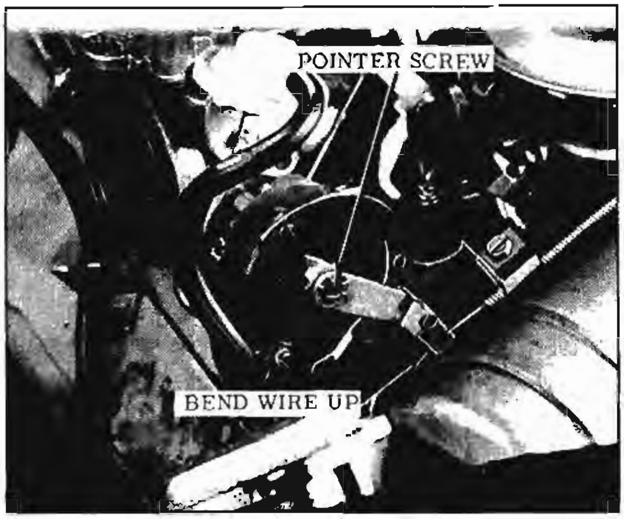


Fig. 9-139 Checking Adjustment

SLOW IDLE ADJUSTMENT

1. Disconnect carburetor rod at upper end.
2. Choke must be fully off and fast idle cam positioned so that fast idle screw does not contact fast idle cam.
3. Throttle return check must be retracted.
4. Back out slow idle screw until carburetor throttle valve is at "closed bore" position. (Fast idle cam must not touch fast idle screw)
5. Back auxiliary bellcrank stop screw out to allow bellcrank to contact stop on bracket.
6. Adjust carburetor rod short from free pin and snap on carburetor lever. While using rear carburetor lever to hold carburetor at closed bore (and with auxiliary bellcrank against its stop), lengthen carburetor rod until the folding links have closed and a slight load is felt on the threads. From this position, shorten rod one full turn and tighten locknut.
7. With transmission in neutral, adjust the slow idle speed to 600 r.p.m. (A/C "off")
8. Adjust stop screw on auxiliary bellcrank in until it just affects slow idle, then back it out one turn. This screw must be adjusted whenever the slow idle is adjusted.

ACCELERATOR LINKAGE ADJUSTMENT

1. Choke must be fully off and fast idle cam positioned so that fast idle screw does not contact cam.
2. Throttle return check must be retracted.
3. Throttle return spring must be effectively holding the auxiliary bellcrank against the auxiliary bellcrank stop screw.
4. Adjust accelerator lever rod to obtain a pedal height of 4-1/16".

MODEL 2GC CARBURETOR

F-85

CONTENTS

THEORY OF OPERATION

There are six basic systems used in the model 2GC. The six basic systems used are float, idle, part throttle, power, pump and choke.

FLOAT SYSTEM (Fig. 9-141)

The float system controls the level of the fuel in the carburetor bowl.

Fuel enters the carburetor through the fuel inlet fitting and channel, passes on through the needle and seat strainer, then through the needle and seat, and into the carburetor float bowl. The fuel continues until the rising liquid level raises the float, to a position where the float needle valve is closed. As fuel is used from the carburetor bowl the float pontoon drops downward, allowing the float needle to come off its seat which, in turn, lets more fuel into the carburetor bowl until the correct level is reached. The fuel level can be regulated by setting the float to close the valve when the proper fuel level is reached in the carburetor bowl.

The float tang, located at the rear of the float arm, prevents the float from traveling too far downward. A float needle pull clip, connecting the float arm to the needle valve, keeps the needle from sticking closed in the seat.

The float bowl is externally and internally vented to balance the air pressure inside the air horn bore with air pressure acting upon the fuel in the carburetor bowl.

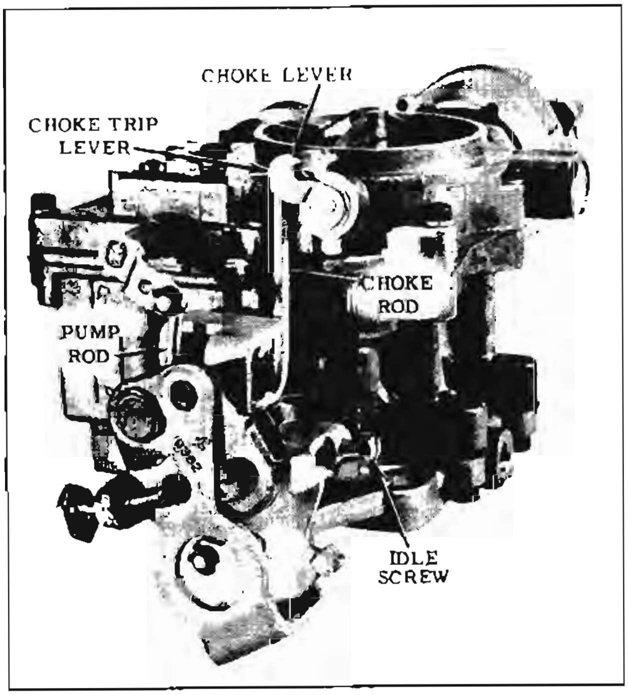


Fig. 9-140 Model 2GC Carburetor

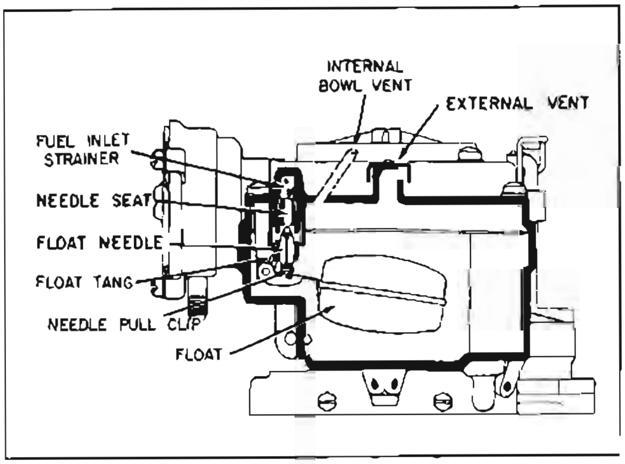


Fig. 9-141 Float System

A fixed external capped vent, located on top of the air horn, vents the bowl itself to atmosphere. Fuel vapors which may form in the float bowl will thus be vented to the outside so that metering will not be disrupted.

IDLE SYSTEM (Fig. 9-142)

The idle system consists of idle tubes, idle passages, idle air bleeds, idle channel restrictions, off idle discharge port, idle needle discharge holes and idle adjustment needles.

In the curb idle speed position, the throttle valve is slightly open, allowing a small amount of air to pass between the wall of the carburetor bore and the edges of the throttle valve.

The idle needle hole is in the high vacuum (low pressure) area below the throttle valves, while the fuel bowl is vented to atmospheric pressure.

The higher atmospheric pressure forces the fuel from the float bowl through the main metering jets into the main well. The fuel is metered by the calibrated orifice at the lower tip of the idle tube and travels up the idle tube. When the fuel reaches the top of the idle tube, it is mixed with air through three idle air bleed holes, one is located directly over the idle tube in the idle channel, one at the side through the cross channel, and one below the channel restriction. The air/fuel mixture then moves down the idle passage, through a channel restriction, located in the cluster just above the fuel bowl. It then moves down the vertical passage through a second idle channel restriction, located in the throttle body just above the off-idle port. More air is added to the mixture through the off-idle port slot just above the throttle valve. The mixture then moves down to the idle needle hole and on into the bore of the carburetor to mix with the incoming air, past the slightly open throttle valve. For smooth operation, the air from the carburetor bore and the air/fuel mixture from the idle needle hole must combine to form the correct final mixture for curb engine idle speed.

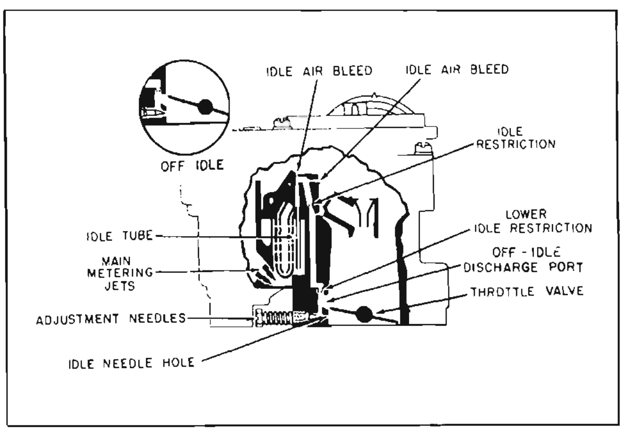


Fig. 9-142 Idle System

The position of the idle mixture adjusting needle regulates the amount of air/fuel mixture admitted into the carburetor bore. Turning inward on the idle mixture screw makes a leaner idle mixture, while turning the screw outward, or counterclockwise, enrichens the idle mixture. Except for this variable at the idle mixture needle, and curb idle adjusting screw, the idle system is specifically calibrated for low engine speed.

As the throttle valves are opened, a pressure differential occurs. Opening of the throttle valve progressively exposes the off-idle port slot to manifold vacuum and the air flow, with the result that it delivers additional air/fuel mixture for off-idle engine requirements.

PART THROTTLE SYSTEM (Fig. 9-143)

As the throttle valves are opened to a greater degree and more air is drawn through the carburetor, it is necessary to provide means, other than the idle system, for supplying additional fuel to meet engine requirements.

Further opening of the throttle valve increases the speed of the air stream passing through the venturi, thus lowering the pressure, (raising the vacuum) in the small venturi area of the carburetor bore. At the same time, the edge of the throttle valve is moved away from the wall of the carburetor bore, gradually reducing the vacuum until the discharge of the fuel mixture at the idle needle bore and off-idle port gradually diminishes.

Since the low pressure point is now in the small venturi area, fuel will be forced from the fuel bowl through the main metering system to the venturi, as follows:

The fuel passes through the main metering jets into the main well, there it passes through the holes in the main well tube insert and rises in the main well tube. Air entering through the main well air bleeds, in the top of the venturi cluster, is mixed with the fuel in the main well tube through the holes located in each side of the tube. The mixture continues up the main well tube, through the nozzle, where more air is added at the tip of

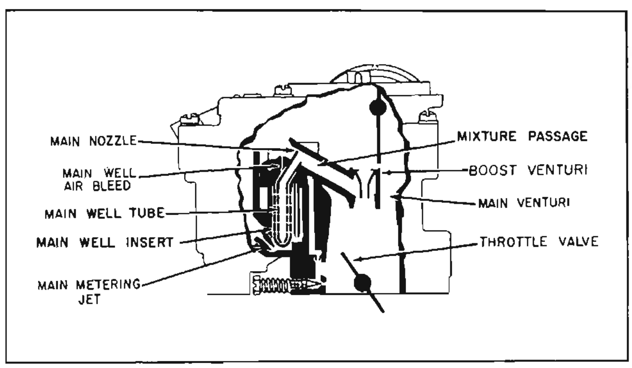


Fig. 9-143 Part Throttle System

the nozzle through the mixture passage. The air/fuel mixture then passes down through the mixture passage to the small venturi, where it mixes with the intake air for complete and final mixture for part throttle operation. The calibrated main well air bleeds control the level of the fuel in the main well and also maintains the proper air/fuel mixture to the engine throughout the part throttle range.

Jets and air bleeds calibrate the main metering system for efficient part throttle operation.

It should be noted that main well inserts are used in conjunction with the main well tubes in this model carburetor. The purpose of the main well inserts is to help break up any vapor bubbles which may form in the main well so that efficient carburetor metering can be maintained during hot engine operation. The addition of the main well inserts helps to maintain a more stable engine idle and also more efficient operation of the main metering system.

POWER SYSTEM (Fig. 9-144)

The power system provides additional fuel as required for heavy load and high speed engine requirements.

A spring loaded power piston controlled by engine manifold vacuum regulates the power valve to supply additional fuel required by the engine in respect to speed and load.

The power piston vacuum chamber is open to manifold vacuum beneath the throttle valves. This allows the vacuum in the channel to rise and fall with engine manifold vacuum.

During idle and part throttle operation, the vacuum in the chamber is normally high enough to hold the power piston in the fully raised position against the tension of the power valve spring. As the manifold vacuum drops with engine load, the calibrated spring forces the piston down against the power valve. The power valve is opened and allows additional fuel to flow through calibrated power restriction in the power system fuel passage and then on into the main wells.

The power valve allows the gradual increase in fuel flow as the power valve is fully opened to permit an efficient calibrated fuel flow from the power system.

As the engine load decreases, manifold vacuum increases. The increasing vacuum pull on the power piston gradually overcomes the spring tension of the power piston spring and the power piston returns to its original raised position; then the power valve is fully closed.

It will be noted that the power piston cavity in the carburetor air horn is connected to the main

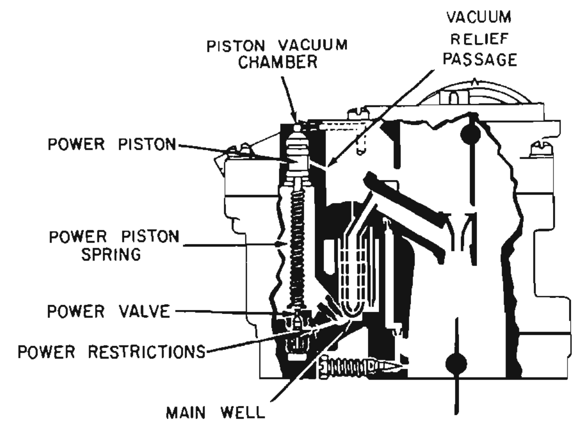


Fig. 9-144 Power System

air flow passage by a vacuum break hole. The purpose of this hole is to prevent the transfer of vacuum acting on the power piston to the top of the fuel in the float bowl. Any leakage of air past the upper grooves of the piston will be compensated for by this vacuum break hole and therefore will not affect carburetor calibration.

PUMP SYSTEM (Fig. 9-145)

When the throttle is opened rapidly, the air flow and manifold vacuum change almost instantaneously, while the heavier fuel tends to lag behind causing a momentary leanness. The accelerator pump provides the fuel necessary for smooth operation on rapid acceleration.

Fuel for acceleration is supplied by a double spring loaded pump plunger. The top and bottom springs combine to move the plunger so that a smooth, sustained charge of fuel is delivered for acceleration.

When the pump plunger moves upward, fuel enters the slotted pump well, flows by the ball check in the pump plunger head and also between the pump leather and the wall of the pump well.

Downward motion of the plunger seats the check ball in the pump plunger head. Fuel is forced through the pump discharge passage where it unseats the discharge ball check and then passes on through the passage at the pump discharge holes in the cluster, where it sprays into the venturi.

The ball check in the pump plunger head also serves as a vapor vent from the pump well. Without this vent, vapor pressure in the pump well might force fuel from the pump system into the engine manifold, causing hard starting and pump sludging under conditions of extreme heat. The pump discharge ball check in the accelerator pump passage prevents pull-over or discharge of

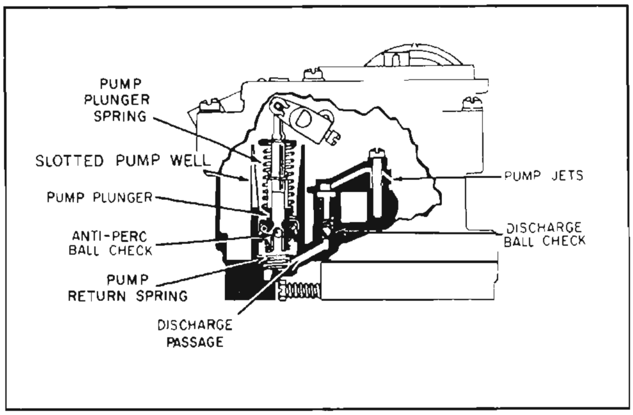


Fig. 9-145 Pump System

fuel from the pump nozzles when the accelerator pump is not in operation.

CHOKE SYSTEM (Fig. 9-146)

For cold engine operation, a richer mixture at the carburetor is required so that a combustible mixture enters the manifold system to be drawn into the engine cylinders after considerable condensation of the fuel vapor on the cold engine parts. The function of the choke system is to subject all fuel outlets in the bore of the carburetor to high vacuum while restricting the intake of the air. The choke system is composed of a thermostatic coil, vacuum piston, off-set choke valve, fast idle cam and choke linkage. Its operation is controlled by the combination of intake manifold vacuum, the off-set choke valve, atmospheric temperature, and exhaust manifold heat.

The thermostatic coil is calibrated to hold the choke valve closed when the engine is cold. As the engine is started, air velocity against the off-set choke valve causes the valve to open slightly against the torque of the thermostatic coil. In addition, intake manifold vacuum applied to the choke piston through the vacuum channel also tends to pull the choke valve open. Vacuum

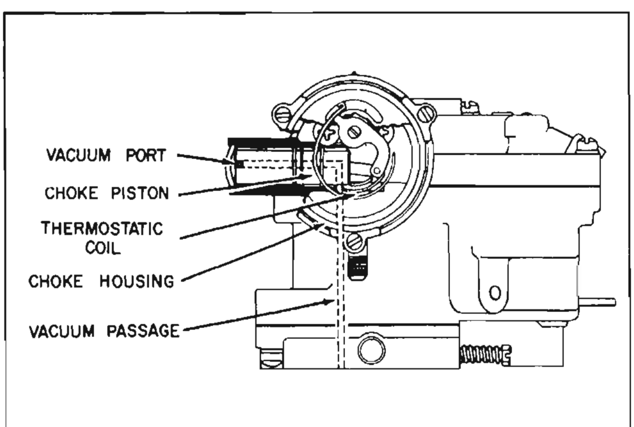


Fig. 9-146 Choke System

pull on the choke piston is off-set by tension on the thermostatic coil. As the engine warms up, heated air is drawn into the choke housing through the choke heat tube by vacuum, through a passage hole in the choke housing. As the engine temperature increases, it causes the thermostatic coil to relax its tension, which together with vacuum pull on the choke piston causes the choke valve to open to wide open position.

A mechanical choke unloader is incorporated to open the choke valve slightly when the engine is cold. The choke unloader provides a means for opening the choke valve to allow additional air to enter and mix with any over-rich mixtures encountered during cold starting.

To prevent stalling during the warm up period, it is necessary to run the engine at a slightly higher idle rpm than for a warm engine. This is accomplished by the idle screw which rests on the steps of the fast idle cam. The fast idle cam is, in turn, linked to the choke valve shaft by the choke rod, choke trip lever and choke lever and collar assembly. This holds the throttle valves open sufficiently during the warm-up period to give the increased idle rpm, until the choke valve moves to the full open position.

CARBURETOR

Removal

1. Remove air cleaner assembly.

2. Disconnect choke tubes, vacuum line and fuel inlet line.

3. Disconnect accelerator linkage, remove 4 carburetor to intake manifold bolts and remove carburetor.

Installation

1. Place carburetor on intake manifold and install bolts. Torque 14-17 ft. lbs.

2. Connect linkage, fuel line, vacuum line and heat tube.

3. Perform adjustments as outlined under "ON CAR ADJUSTMENTS."

4. Install air cleaner assembly.

DISASSEMBLY

Air Horn

1. Mount carburetor on proper holding fixture.

2. Remove fuel inlet fitting.

3. Remove 3 thermostat cover retaining screws and then remove the thermostat cover coil

assembly, gasket and inside baffle plate. (Fig. 9-147)

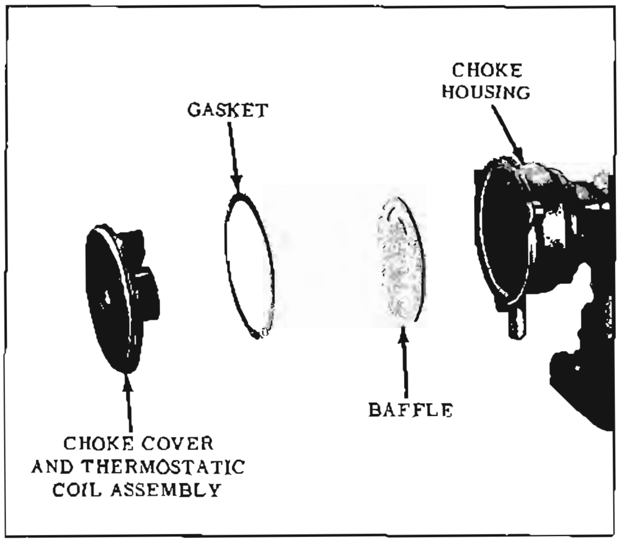


Fig. 9-147 Choke Thermostat Assembly

4. Remove pump rod by removing the upper horseshoe retaining clip at the upper pump lever and retaining clip at the throttle lever end.

5. Remove fast idle cam attaching screw; then remove cam and choke rod.

6. Remove retaining screw at the end of choke shaft in choke housing and remove choke piston assembly. (Fig. 9-148)

7. Remove 2 choke housing attaching screws and remove choke housing. (Fig. 9-149)

8. Remove 8 air horn attaching screws and carefully remove air horn from float bowl by lifting upward. (Fig. 9-150)

9. Invert the air horn and place on a flat surface, then remove the float hinge pin, float and needle assembly. Float needle may be removed from float. (Fig. 9-151)

10. Remove 2 choke valve retaining screws (file off staked ends). Remove choke valve. (Fig. 9-152)

11. Remove choke shaft and choke trip lever.

12. Remove the float needle seat, fiber gasket and needle seat screen. (Use Tool BT-52)

13. Remove the air horn gasket.

14. Remove power piston by depressing shaft, allowing spring to snap, thus forcing piston from casting.

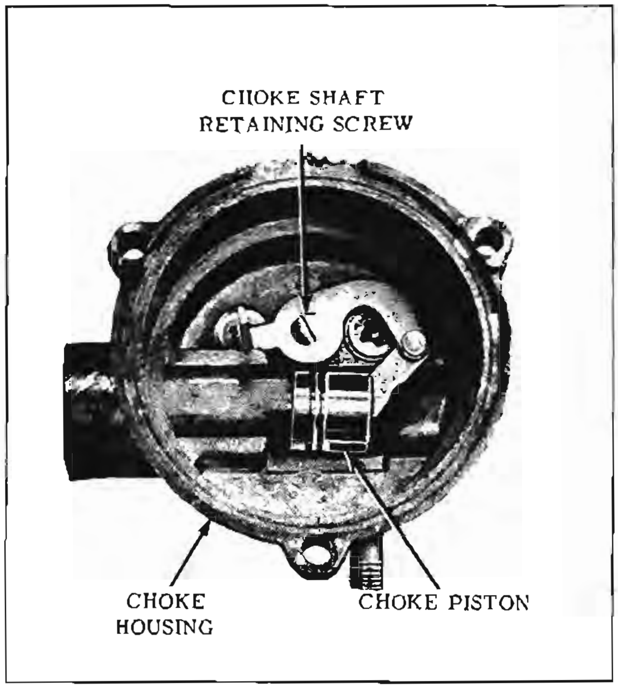


Fig. 9-148 Choke Piston Removal

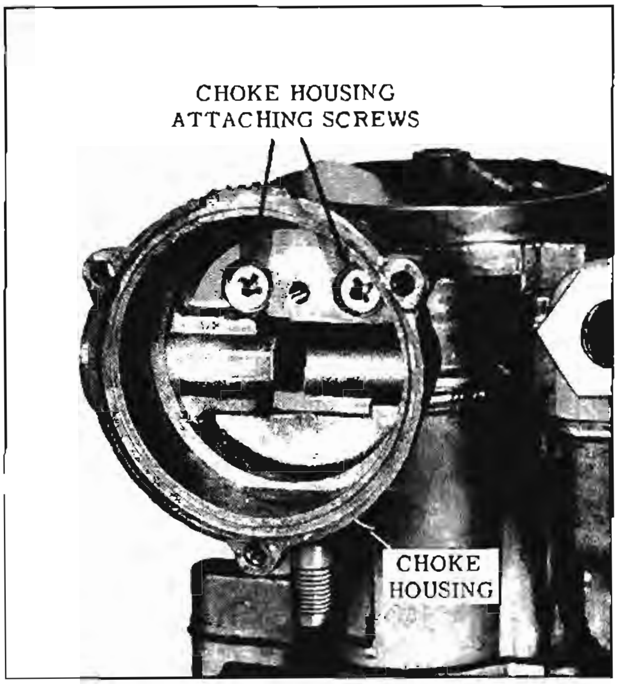


Fig. 9-149 Choke Housing Attaching Screws

NOTE: If heavy staking is encountered, remove from around power piston retaining washer.

15. Remove the retainer from the pump plunger shaft and remove pump plunger.

16. The pump lever and shaft may be removed by loosening set screw on inner arm and removing outer lever and shaft assembly.

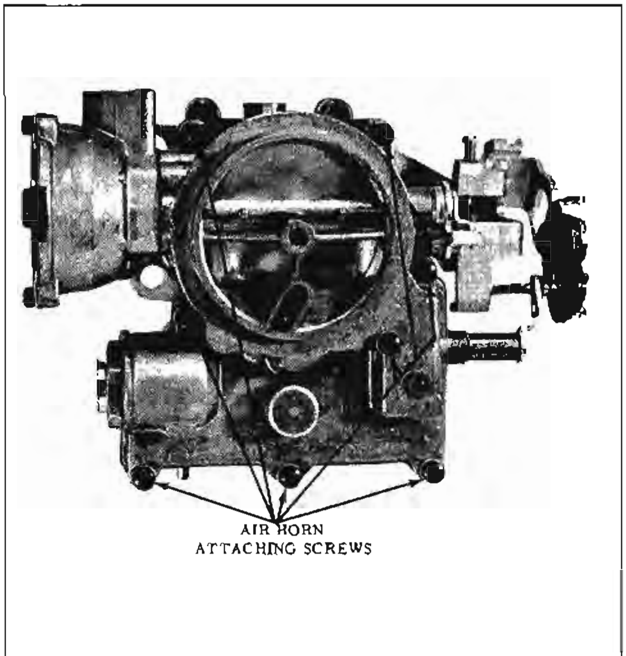


Fig. 9-150 Air Horn Attachment

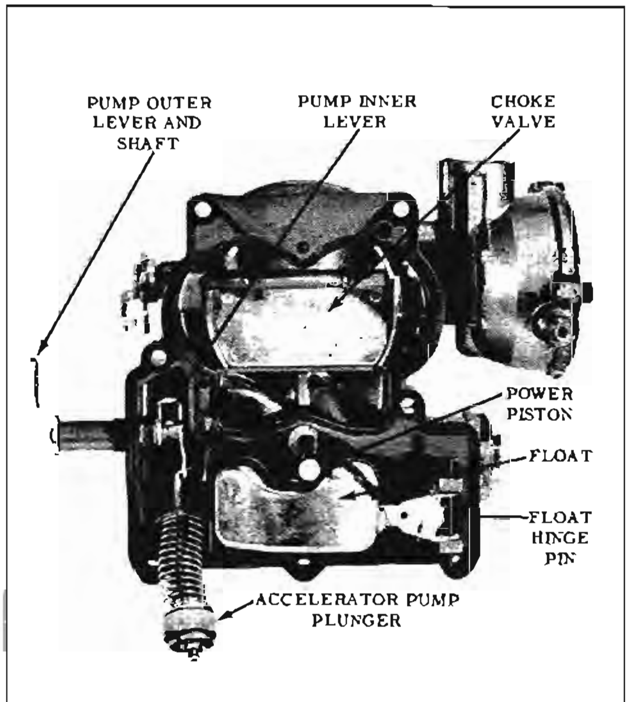


Fig. 9-151 Air Horn Assembly

Float Bowl

1. Remove pump plunger return spring from the pump well. (Fig. 9-153)

2. Remove the 2 main metering jets and power valve and gasket.

3. Remove 3 venturi cluster attaching screws and remove cluster and gasket.

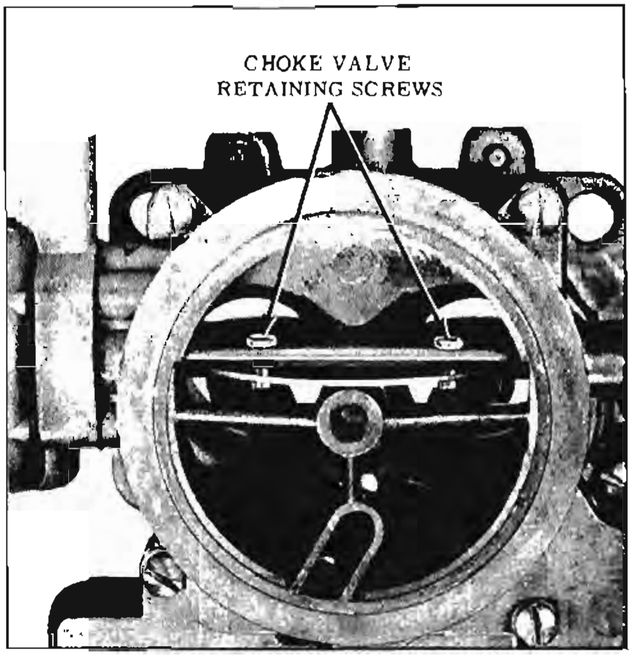


Fig. 9-152 Choke Valve and Shaft

NOTE: The cluster center screw is larger and has a gasket since it is located in the pump discharge passage.

4. Using a pair of needle nosed pliers, remove the pump discharge spring guide, then remove the spring and steel ball. (Fig. 9-154)

5. Remove 2 main well inserts from the main well.

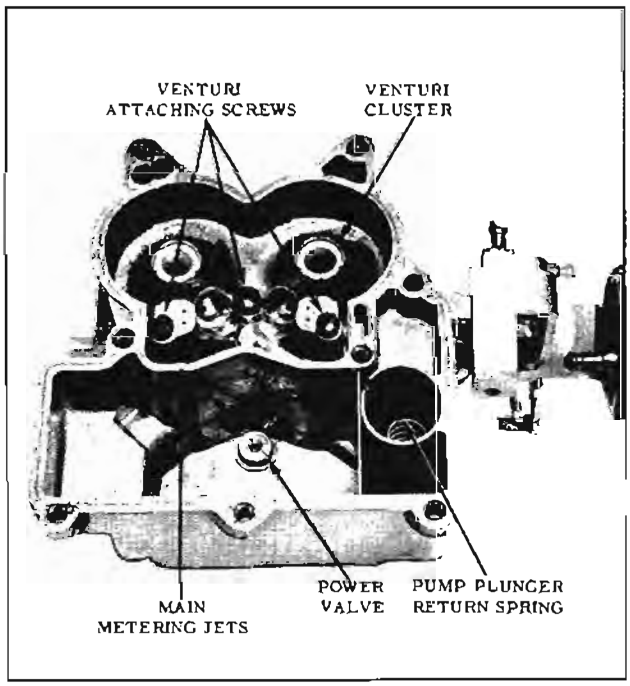


Fig. 9-153 Float Bowl Assembly

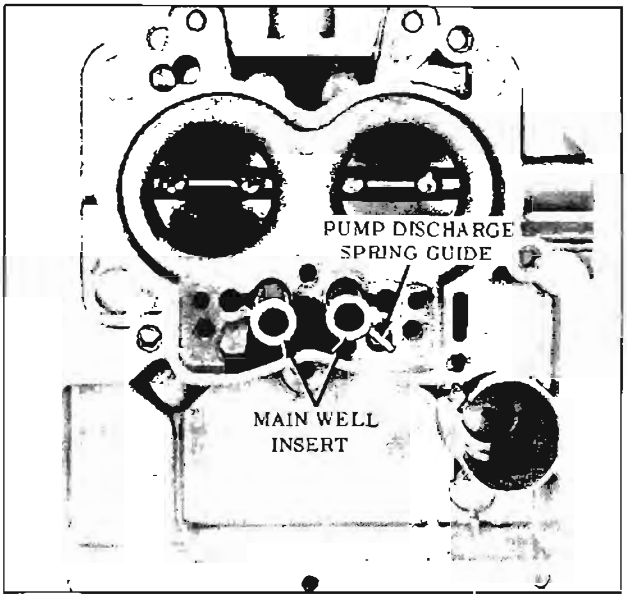


Fig. 9-154 Pump Discharge Spring Guide

Throttle Body

1. Invert float bowl and remove 3 throttle body attaching screws, then remove the throttle body and gasket. (Fig. 9-155)

2. Remove idle mixture adjusting needles and springs.

3. Remove idle screw from throttle body if replacement is necessary.

No other disassembly of the throttle body is

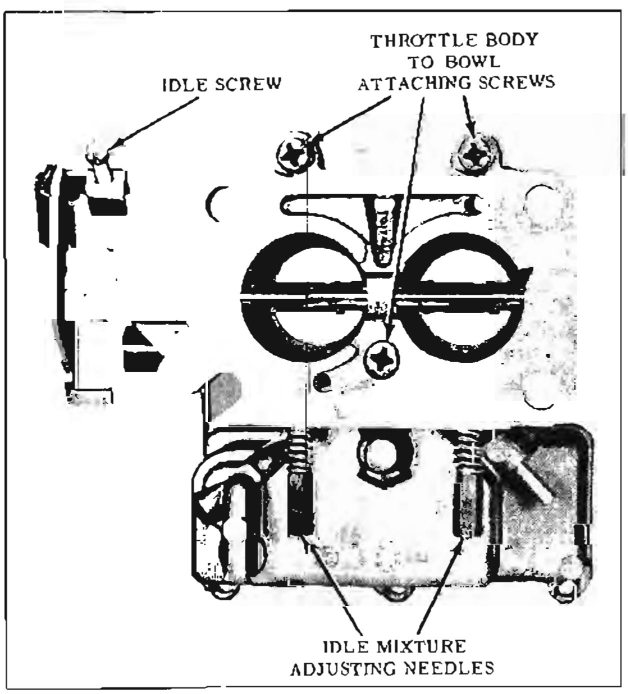


Fig. 9-155 Throttle Body

necessary. The throttle valves should not be removed, as the idle ports are located in direct relation to the location of the throttle valves. Removal of the throttle valves will upset this location. The throttle body is serviced as a complete unit with throttle valves intact.

CLEANING OF PARTS

The carburetor should not be cleaned in any solution other than a cold immersion type cleaner.

1. Thoroughly clean carburetor castings and metal parts in carburetor solvent.

   CAUTION: The pump plunger, gaskets and any fiber or rubber parts should not be immersed in the carburetor cleaner. Clean the pump assembly in clean gasoline only.

2. Clean and dry all passages in castings with compressed air. Do not pass drills or wires through jets or passages, as this may score the passage and upset metering.

3. Clean filter screens of dirt or lint. If filter screens are distorted or plugged, they should be replaced.

INSPECTION OF PARTS

1. Check floats for dents or excessive wear at hinge pin holes.

2. Shake floats to check for leaks.

3. Examine float needle and seat. If grooved or scored, replace with a new matched float needle seat and gasket assembly.

4. Inspect the idle mixture adjusting needles for burrs or ridges, or being bent out of alignment. Replace if necessary.

5. Inspect the upper and lower surface of the float bowl to see if the small sealing beads are not damaged. Damaged beading may result in air or fuel leaks at this point.

6. Inspect holes in pump rocker arm, fast idle cam and throttle shaft lever. If holes are worn excessively or out of round to the extent of improper operation of the carburetor, the worn parts should be replaced.

7. Inspect the steps on the fast idle cam for excessive wear. If worn, replace cam to assure proper engine operation during the warm up and choking period.

8. Inspect the pump plunger leather for cracks and pliability. If the pump leather is damaged, replace the pump plunger as an assembly.

9. Inspect the throttle body to make sure the idle passages and vacuum channels are open.

ASSEMBLY

Throttle Body

1. If removed, install the idle speed screw. (Fig. 9-155)

2. Install the idle mixture needles and springs into the throttle body. Tighten the screws until finger tight, then back out 1-1/2 turns as a preliminary idle adjustment.

3. Place a new gasket on the bottom of the float bowl with holes aligned, then position the throttle body assembly on the gasket and install the 3 attaching screws. Tighten screws evenly and securely.

Float Bowl

1. Install steel pump discharge ball, spring and guide into the pump discharge passage, in the venturi cluster mounting surface. (Fig. 9-154)

2. Install the 2 main well tube inserts into the main wells. Make sure the lip on the main well inserts are seated properly in the casting. (Fig. 9-154)

3. Install the venturi cluster, gasket and attaching screws. Screw with gasket must be inserted in center hole.

4. Install the main metering jets and power valve with gasket.

5. Install pump return spring into the pump well. Push the pump return spring downward with finger to make sure the spring is seated in the bottom of the pump well.

Air Horn

1. Install pump lever and shaft if removed.

2. Install pump plunger (pump shaft pointing inward) and retainer.

3. Install screen on the float needle seat and assemble float needle seat, screen and gasket to the air horn. Tighten securely, using Tool BT-52.

4. Install choke shaft and choke trip lever.

5. Install choke valve in the choke shaft with letters "RP" facing upward. Install 2 choke valve retaining screws but do not tighten securely until choke valve is centered.

6. Install power piston into vacuum cavity; piston should travel freely in cavity. Lightly stake retainer in place.

7. Install air horn gasket on the air horn.

8. Attach float needle to float, carefully position float and insert hinge pin.

FLOAT LEVEL ADJUSTMENT (Fig. 9-156)

1. With the air horn inverted and gasket in place, position the adjustable gauge BT-6310 on the gasket as shown. The sharp edge of the seam of the float should be even with the top edge of the gauge.

2. Bend the float arm, as shown in Fig. 9-156.

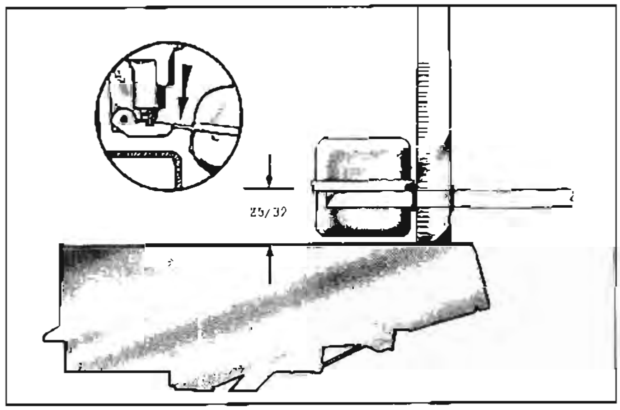


Fig. 9-156 Float Level Adjustment

FLOAT DROP ADJUSTMENT (Fig. 9-157)

1. With the air horn held upright and gasket in place, measure the distance from the gasket to the bottom of the float. Use adjustable gauge BT-6310 as shown, to check this setting.

2. If necessary to adjust, bend the float tang which contacts the needle and seat. Bend the tang toward the needle and seat to decrease float drop and away from the seat to increase the drop.

COMPLETION OF ASSEMBLY (Fig. 9-158)

1. Install the air horn on the float bowl while guiding accelerator pump in place. Install and tighten the air horn screws evenly and securely.

2. Insert the choke rod into the upper choke lever and install the idle cam on the lower end of the lever; then attach idle cam to float bowl, retaining with the idle cam screw. (Fig. 9-159)

3. Install accelerator pump rod retaining in position with 2 horseshoe clips.

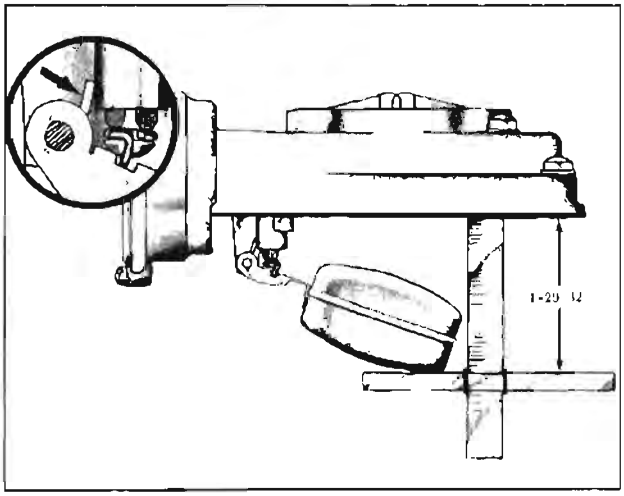


Fig. 9-157 Float Drop Adjustment

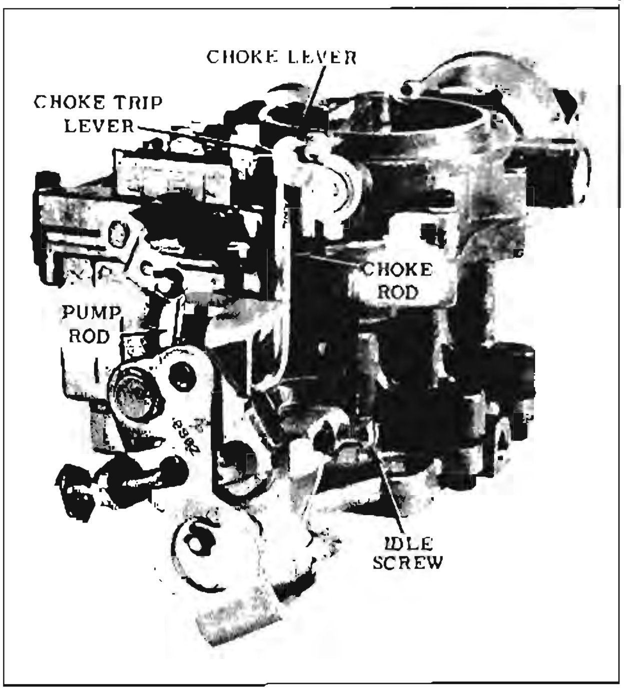


Fig. 9-158 Model 2GC Carburetor

NOTE: Place upper end of pump rod in outer hole on upper pump lever for normal setting. Inner hole should be used only when a leaner pump is desired, for abnormal operating conditions.

4. Place new choke housing gasket in position on air horn and install choke housing, retaining with 2 Phillips head attaching screws. Tighten screws evenly and securely.

5. Install choke piston assembly and install retaining screw.

6. Place baffle plate into choke housing and then install thermostatic coil, cover assembly and gasket.

7. Rotate thermostatic cover counterclockwise until the choke valve begins to close and continue in rotation until the proper index marking is aligned as specified. (Fig. 9-160)

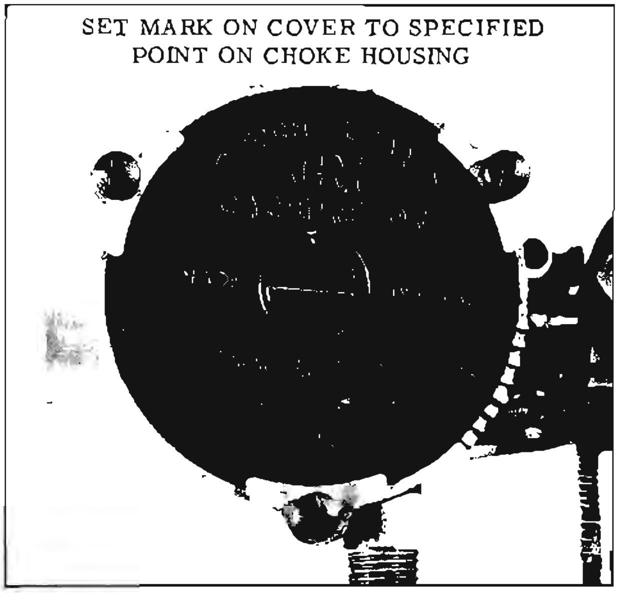


Fig. 9-159 Choke Cover Index

8. Attach 3 choke cover retainers and screws to choke housing and tighten securely. Choke setting: Index on Hydra-Matic equipped cars and 1 notch lean on Synchromesh.

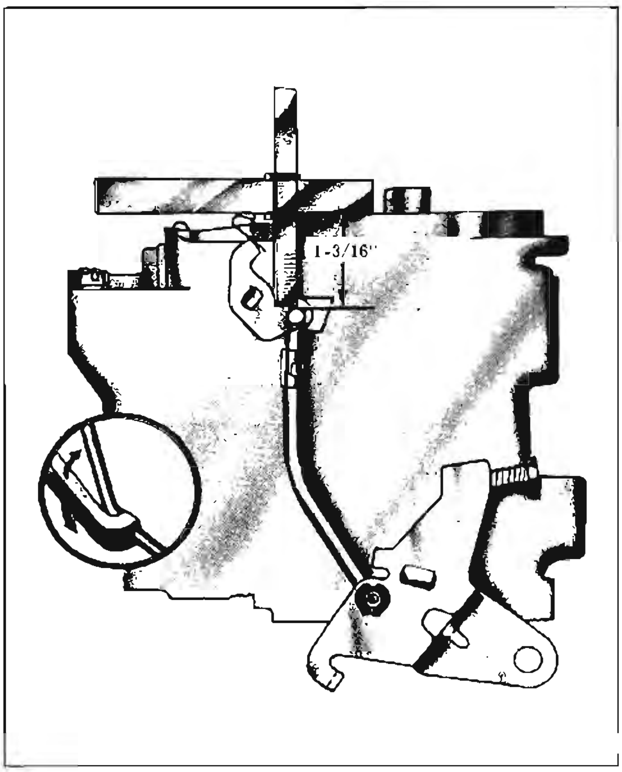


Fig. 9-160 Pump Rod Adjustment

ADJUSTMENTS (Off Car)

PUMP ROD (Fig. 9-161)

NOTE: Place pump rod in outer hole. Back out idle screw until the throttle valves are completely closed in the throttle bore. Place gauge across top of air horn casting, as shown, with leg of gauge pointing downward towards the top of the pump rod. Bend the pump rod, as shown, until the top of the pump rod is 1-3/16" below the top of the air horn casting.

CHOKE ROD (Figs. 9-162, 9-163)

1. Turn the idle screw in until it just contacts the second step of the fast idle cam. With the screw resting on the second step and against the high step, bend the choke lever tang as necessary to obtain .080" clearance between the upper edge of the choke valve and the air horn wall.

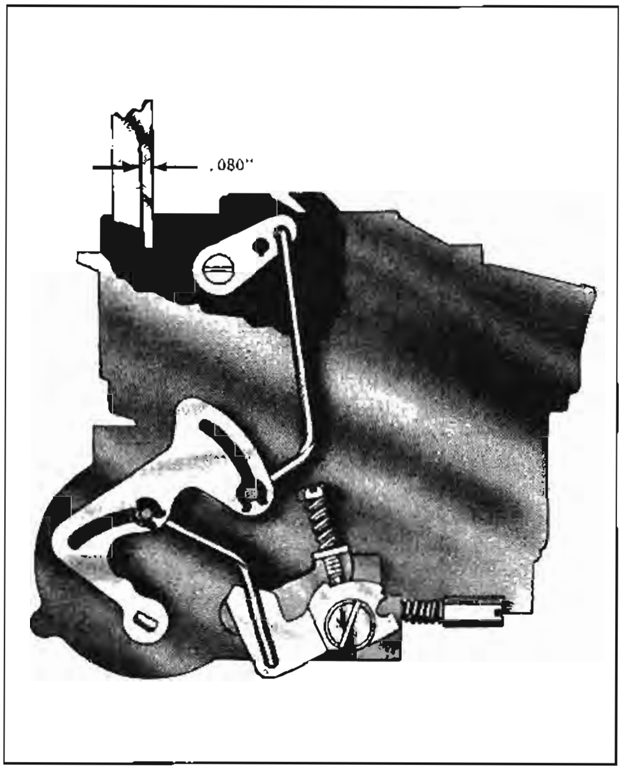


Fig. 9-161 Choke Rod Adjustment

UNLOADER ADJUSTMENT (Fig. 9-164)

1. Hold the throttle valves in the wide open position.
2. Obtain .260" clearance between the upper edge of the choke valve and the inner air horn wall.
3. To adjust, bend the tang on the throttle lever as shown.

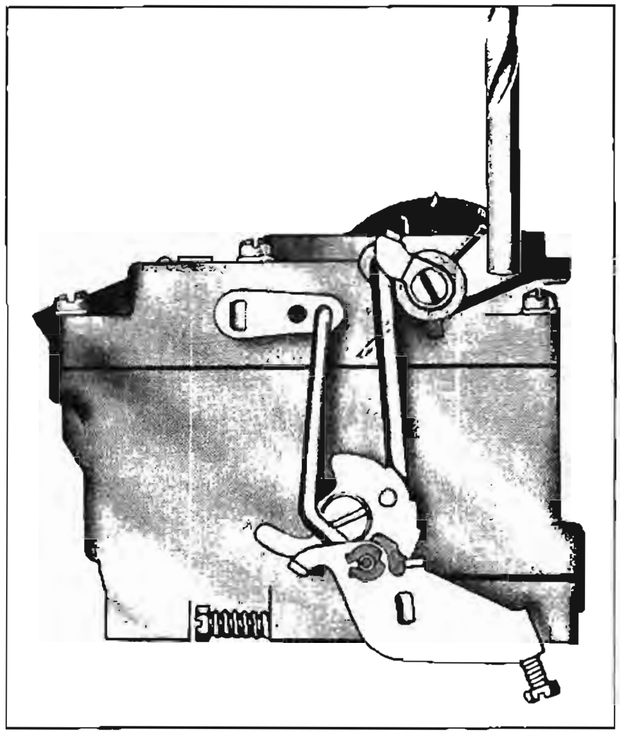


Fig. 9-162 Unloader Adjustment

ADJUSTMENTS (On the Car)

SLOW IDLE

1. The engine must be at normal operating temperature.
2. Remove the air cleaner.
3. If Hydra-Matic, be certain that return check

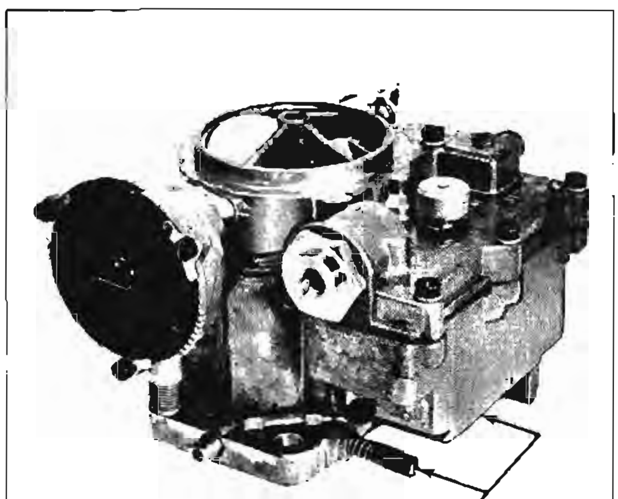


Fig. 9-163 Model 2GC Carburetor

adjusting screw has ample clearance.

4. With the choke in "OFF" position adjust idle screw to rpm indicated on chart.

5. After idle rpm is stabilized, turn in or out each idle adjusting screw until the smoothest possible idle is obtained.

SYNCHROMESH		
	TRANS.	RPM
With Air Conditioning (Off)	N	600
Without Air Conditioning	N	550

HYDRA-MATIC		
	TRANS.	RPM
With Air Conditioning (Off)	"DR"	600
Without Air Conditioning	"DR"	500

6. Adjust throttle return check screw to obtain .050" clearance.

THROTTLE RETURN CHECK ADJUSTMENT

The throttle return check adjustment can be made as follows:

1. Rotate idle cam so that the idle screw rests on top of the highest step of the cam.

2. Measure clearance between the plunger and the stop screw. Clearance should be .050".

3. If adjustment is necessary, adjust the stop screw.

NOTE: For throttle linkage adjustment, refer to the Hydra-Matic Section (3) or refer to Synchromesh Throttle Linkage Adjustment in Carburetion Section (9).

ACCELERATOR LINKAGE ADJUSTMENT

1. The choke must be fully off and the idle screw backed out to permit the throttle valve to be held at closed bore by the throttle return spring.

2. Adjust the auxiliary bellcrank as shown in the Hydra-Matic section. Side clearance of the bellcrank should be not more than .010".

3. If adjustment is necessary, this is done by bending the auxiliary bellcrank to carburetor link.

4. Adjust accelerator pedal with Tool BT-33-2 as shown in Fig. 9-164.

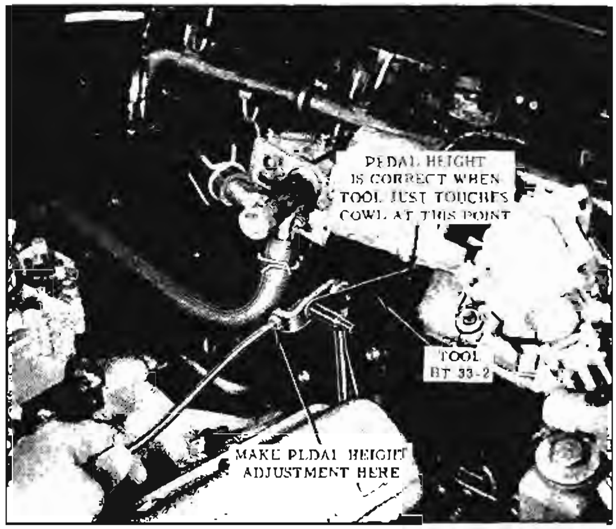


Fig. 9-164 Accelerator Pedal Height

CARB-AIRATOR

The "Carb-airator" is an external breather attached to the carburetor on air conditioned cars equipped with 2-Barrel carburetors. Its purpose is to assist in reducing rich fuel and air mixture brought about during hot idling conditions.

Adjustments

Adjust normal idle with the engine cool (approximately 70° outside temperature). When the engine is started, be sure the Carb-airator valve closes (Fig. 9-165).

If in extreme hot temperatures, (95° outside temperature), the idle is rough and erratic, or stalling occurs, tighten the temperature screw one turn and road test. CAUTION: Do not upset normal idle and do not overtighten the temperature screw. If the engine idles too fast under extreme hot conditions (95° outside temperature), tighten the air screw.

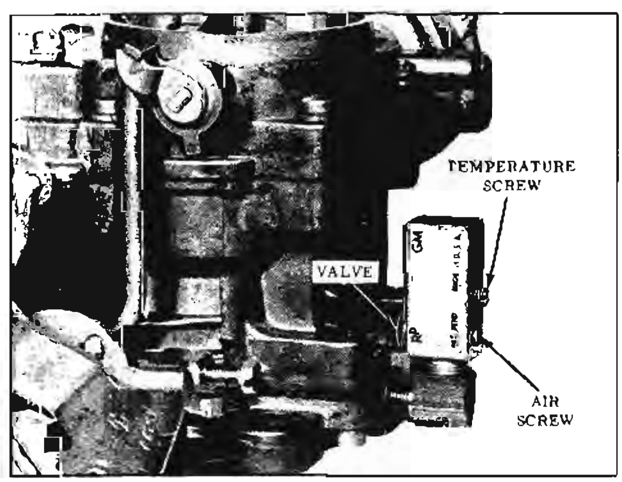


Fig. 9-165 Carb-Airator Adjustment

MODEL 4GC CARBURETOR

(F-85)

CONTENTS

THEORY OF OPERATION

FLOAT SYSTEM (Fig. 9-166)

The Rochester 4GC carburetor employs two sets of twin floats to maintain correct fuel level in both float bowls under all conditions of operation.

Fuel enters the carburetor on the primary side. Some of this fuel passes through a channel in the air horn and enters the inlet passage on the secondary side at (9). As the fuel level on the primary side drops, the floats (5) drop, moving the inlet needle (12) off its seat (14). The fuel pump forces fuel through the filter screen (2) into the inlet passage (3), through the small filter screen (4), and then into the float bowl. As the fuel level in the bowl rises, the floats rise and close off the inlet needle.

As fuel is drawn from the bowl on the secondary side, the float action is similar to that on the primary side. As the floats (7) drop, the fuel pump forces fuel through the fuel inlet (1) and the filter screen (2). Fuel then passes through the fuel channel in the air horn, the small filter screen (9), and secondary needle seat (10) and into the fuel bowl. When the fuel level rises, the floats (7) rise and when the proper fuel level is reached in the carburetor bowl, the inlet needle closes, shutting off all fuel flow. A float balance spring (11) installed between the float hanger posts applies pressure on the float tang at the rear of the float arm to assist in closing the needle seat.

Both float systems are provided with float needle pull-clips (8 and 13), which pull the inlet needles from their seats by a drop in fuel level in the float bowls. This is to prevent the possibility of gum deposits causing a sticking condition.

Both sides of the carburetor are individually and internally vented by the channels shown at (6). These vents transmit the air pressure from beneath the air cleaner to the fuel in the float bowl. The amount of fuel metered by the carburetor is dependent upon the pressure in the float bowl. By locating the vents below the air cleaner, or internally, the carburetor automatically compensates for air cleaner restriction, since the same pressure causing air to flow will also be causing fuel to flow.

A cored passage in the float bowl, slightly above the normal fuel level, links the primary and secondary float bowls together. In this way, any abnormal rise in level on one side will be absorbed by the other and will not seriously disrupt the operation of the engine.

IDLE SYSTEM (Fig. 9-167)

At small throttle openings (1) vacuum created by the main venturi is not sufficient to cause fuel to flow. Therefore, an additional system has been

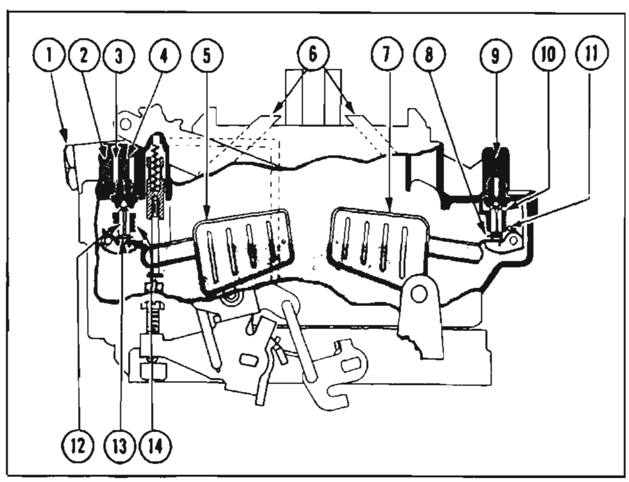


Fig. 9-166 Float System

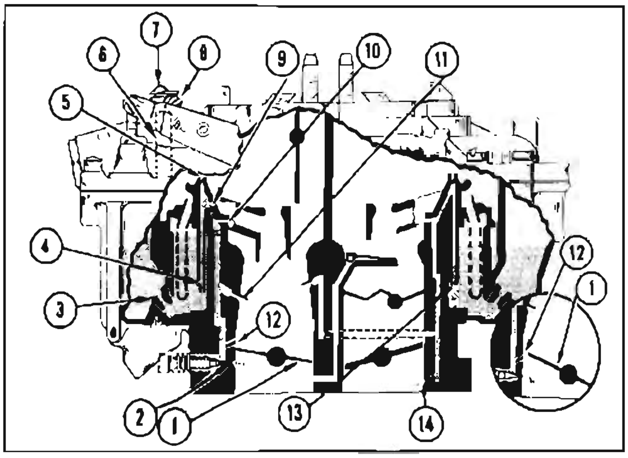


Fig. 9-167 Idle System

provided to furnish the proper mixture ratios required throughout the low speed range.

An adjustable idle system (2) in the primary side and a fixed idle system (14) in the secondary side of the carburetor supplies the fuel required for normal curb idle, off-idle and low speed range.

In the primary bores, the quantity of air/fuel mixture supplied for curb idle is controlled by the idle mixture needles (2) which may be adjusted to provide smooth idle operation. In the secondary bores, the quantity of idle air/fuel mixture is controlled by the fixed size of the discharge holes (14) located in the rear of the secondary throttle bores. The secondary fixed idle mixture supplements the primary adjustable idle mixture to provide a stable air/fuel mixture for the engine cylinders.

Operation of the primary and secondary idle system is similar. The idle fuel is drawn from the float bowl through the main metering jets (3) into the main well, passing through the calibrated idle tube restriction (4) and idle tubes. Air joins this fuel at the calibrated air bleed at (5). The air/fuel mixture then passes through a calibrated restriction (9). More air is added at the secondary idle air bleeds (10) and passes down through the lower idle air bleeds (11) and secondary idle discharge holes (12). The resultant mixture is then discharged into the throttle bore from the idle needle holes (2).

As the throttle valves (1) are opened from the curb idle position, air entering the secondary idle discharge holes (12) gradually diminishes. When these holes become exposed to manifold vacuum, they then become fuel discharge holes to meet the increased demand of the engine.

Further opening of the throttle valves increases the air velocity through the carburetor sufficiently to cause the air to strike the end of the extended lower idle air bleed (11), creating a lower pressure within the bleed tube. As a result, fuel begins to discharge from this bleed tube and continues to do so throughout the part throttle and wide open throttle ranges, supplementing the nozzle delivery.

To adjust the idle mixture, a tapered needle (2) is used to vary the opening of the discharge hole. When the needle is turned in, the area is decreased and the idle mixture becomes leaner.

In order to minimize difficult hot weather starting or rough idling due to fuel vapor formation in the carburetor bowl, the model 4GC carburetor incorporates an external vent (6) which opens when the throttle valves are in the idle position. The external idle vent (6) is located in the center of the carburetor air horn on the primary side of the carburetor. It consists of an actuating tang (8) integral with the pump lever which operates a rubber valve (7) mounted over the vent hole. The rubber vent is attached to a spring steel arm.

When the throttle valves are closed, the actuating tang contacts the spring arm and holds the vent valve open. This permits vapors from the fuel bowl to be vented to the outside. As the throttle valves are opened, the spring closes the vent valve returning the carburetor to an internal balance.

Carburetors, on cars equipped with factory installed air conditioning, incorporate an idle compensator to prevent stalling under prolonged "hot idle" conditions. (Fig. 9-168) The idle compensator consists of a bi-metal strip, a valve and a mounting bracket. It is mounted between the venturi on the secondary side. The valve seats on a hole drilled into the center throttle body attaching bolt hole leaking to the underside of the primary throttle valves.

When underhood temperatures rise to a predetermined value, the bi-metal strip lifts the valve off its seat. This allows additional idle air to enter below the throttle valves, offsetting the enrichening effects of the high engine tempera-

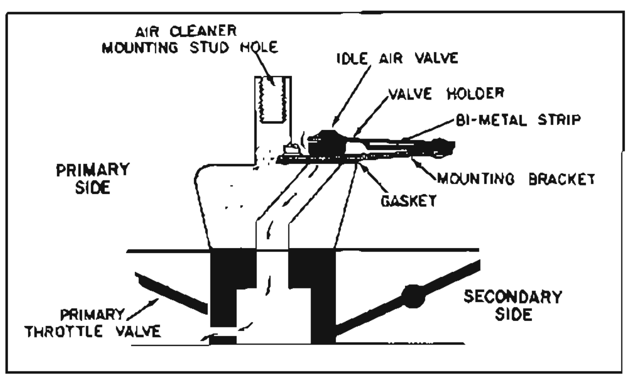


Fig. 9-168 Idle Compensator

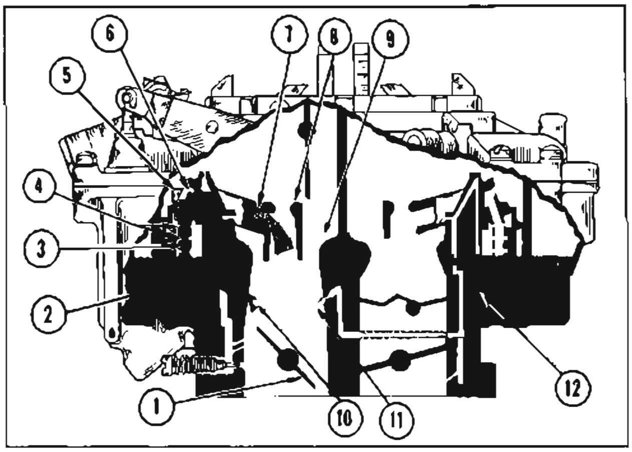


Fig. 9-169 Part Throttle System

tures. When underhood temperatures are lowered, the valve closes and the idle operation returns to normal.

PART THROTTLE SYSTEM (Fig. 9-169)

As the throttle valves are opened to a greater degree and more air is drawn through the carburetor, it is necessary to provide means, other than the idle system, for supplying additional fuel to meet the engine requirements. The primary side of the carburetor meets the increased demand for fuel in the following manner:

At a point of sufficient throttle opening, manifold vacuum, multiplied several times in the primary (9) and secondary venturi (8), is transmitted to the tip of the main well tubes or main discharge nozzles (6). This vacuum draws fuel from the float bowl through the calibrated main metering jets (2) and into the main well tubes (3). After passing through the main well tubes (3), air joins the mixture at the main well bleeds (4). The mixture then passes from the tip of the nozzle (6) through the mixture passage (7), to the secondary venturi (8), and into the intake manifold.

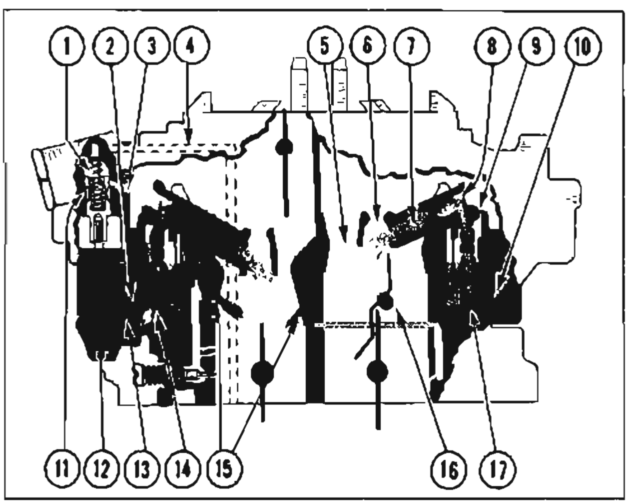


Fig. 9-170 Power System

As the throttle opening is progressively increased and more fuel is drawn through the main well tubes, the fuel level in the main well drops. The calibrated holes (4) in the main well tubes are proportionately exposed to the air in the upper well area. When this occurs, they become air bleeds mixing progressively more air with the fuel passing through the main well tubes. Although the nozzle suction is increased by increasing the throttle opening, the fuel mixture to the engine remains constant throughout the part throttle range.

As throttle opening increases, the lower idle air bleeds become part throttle feed nozzles in the main bore below the primary venturi (9). Discharge nozzles (11) are located in the venturi wall on the primary side, and are fed by the idle tubes (12) on the secondary cluster. These nozzles provide an additional source of fuel to maintain a constant mixture ratio at wide primary throttle openings. The tubes act as nozzles and supplement the fuel discharge of the main system to fill the gap between late part throttle and prepower system operation. Fuel is discharged from these nozzles at throttle openings which correspond to a steady speed of approximately 70 to 90 m.p.h. No fuel is discharged until the primary throttles are opened sufficiently to allow air flow to create a low pressure area at the tube. Fuel then flows throughout the remainder of the part and wide-open throttle range. The secondary throttle valves of the carburetor do not open until the primary linkage engages the secondary throttle shaft. They then open fully during the final few degrees of primary throttle travel. The secondary side, therefore, supplies fuel through a portion of the part throttle range and through the power range.

POWER SYSTEM (Fig. 9-170)

To achieve the proper mixtures required when more power is desirable or sustained high speed driving is to be maintained, the carburetor employs the use of a vacuum-operated power piston (11) in the air horn and a power valve (12) in the float bowl.

The power system is located on the primary side of the carburetor. The power piston vacuum channel (4) is exposed to manifold vacuum beneath the throttle valves. The vacuum in this channel varies directly with manifold vacuum. In the idling and part throttle ranges, the manifold vacuum is normally quite high. This vacuum is sufficient to hold the power piston (11) in its extreme up position. However, as the throttle valves are progressively opened, the vacuum drops.

When the vacuum drops below approximately 9" hg., the calibrated spring (1) beneath the power piston forces the piston down. This situation occurs at very high driving speeds or on rapid accelerations. When the piston drops, it unseats the spring loaded power valve (12). This permits additional fuel to flow from the float bowl through the calibrated power restriction (13), and into the main wells. The additional fuel supplements fuel already flowing through the main metering jets (2) and main well tubes, (14) (on the primary side) making the mixture being delivered to the manifold considerably richer than normal part throttle mixtures.

This power mixture continues to be supplied as long as the manifold vacuum remains below approximately 9" hg. When the manifold vacuum again increases sufficiently, the force of the power piston spring (1) is overcome and the piston is drawn up, returning the carburetor to the economical part throttle mixtures. It will be noted that the power piston cavity in the carburetor air horn is connected to the main air flow passage by a vacuum break hole (3). This hole prevents the vacuum, acting on the piston, from also acting on the top of the fuel in the float bowl. Any leakage of air past the upper grooves of the piston will be compensated for by this vacuum break hole and will not affect carburetor calibration.

It is also in this range that the secondary side of the carburetor provides additional air and fuel to the engine for increased power. For high speed operation, beyond the part throttle range, the throttle linkage engages the secondary throttle valves and opens them completely in the remaining few degrees of primary throttle travel. Manifold vacuum acting on the secondary side of the carburetor is multiplied at the primary (5) and secondary (6) venturi, drawing fuel from the float bowl through the calibrated main metering jets (10) into the main wells. This fuel then passes through the main well tubes (17) and is bled in a manner similar to that described previously in the operation of the primary main well air bleeds.

This mixture is bled further at the main well bleeds (9) and is then drawn to the tips of the main well tubes (8). It then passes through the mixture passage (7) to the secondary venturi (6) and is discharged into the intake manifold.

The lower idle air bleeds (15) also supply fuel throughout the power range in a manner similar to that described under the part throttle system operation.

The auxiliary valves (16) provide a means for controlling secondary bore opening according to air velocity at wide open throttle. High velocity allows good metering and also holds the valves open, so that the secondary metering system can supply the correct air/fuel mixture.

Low air velocity, in turn, reduces metering efficiency. When this condition occurs, the spring tension overcomes the air velocity and closes the valves. Air which was going through four bores, now passes through only two; the velocity is twice as high and good metering control is extended over a wider range of low speed, wide-open-throttle operation.

PUMP SYSTEM (Fig. 9-171)

When the throttle is opened rapidly, the air flow and manifold vacuum change almost instantaneously, while the heavier fuel tends to lag behind, causing a momentary leanness. The accelerator pump provides the fuel necessary for smooth operation during rapid acceleration. Since the throttle valves on the secondary side of the carburetor remain fully closed throughout part throttle operation, it is necessary to have only one accelerator pump located on the primary side of the carburetor.

A double spring pump plunger is used on the carburetor. The rates of compression of the top spring (7) and the bottom spring (4) are calibrated to insure a smooth sustained charge of fuel for acceleration. On the pump intake, or up-stroke of the plunger, fuel from the float bowl passes through the pump filter screen (2), unseating the aluminum inlet ball (3), and filling the pump well. The accelerator pump is connected through the pump shaft and lever assembly, and pump rod to the throttle lever.

Upon acceleration or down stroke of the pump plunger, the force of fuel in the pump well seats the inlet ball (3). The fuel is then forced through the discharge channel (1), unseating the pump outlet ball (11), and then discharges through the pump jets (9) into the air stream. At the end of the discharge, the outlet ball is returned to its seat by the spring (10), which prevents air being drawn back into the fuel channel during the intake stroke.

The pump plunger head is vented to minimize

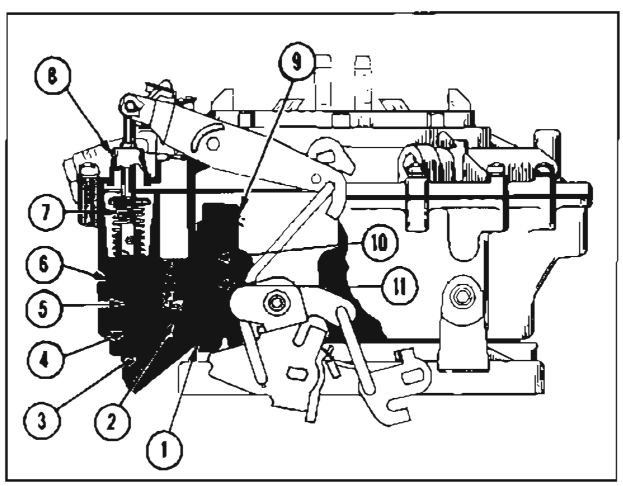


Fig. 9-171 Pump System

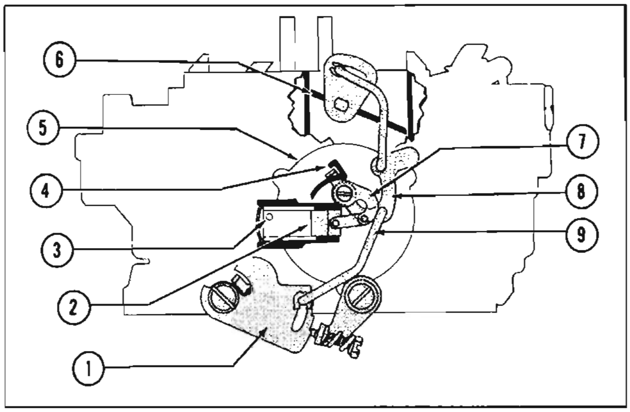


Fig. 9-172 Choke System

the effect of fuel percolation in the pump well. This is accomplished by the design of a ball check and seat in the plunger head (5). Any build-up of fuel vapors in the pump well will rise, by-pass the ball and vent into the float bowl. This insures a solid charge of fuel beneath the plunger head for rapid acceleration. Without this feature, any vapor pressure build-up would evacuate the charge of fuel in the pump system, causing poor initial acceleration as well as difficult hot weather starting.

The carburetor also makes use of a pump plunger shaft dust boot (8) which serves the dual purpose of preventing dirt and foreign material from entering the fuel bowl through the shaft opening on the top of the air horn and also provides the proper seal necessary to maintain internal balance.

CHOKE SYSTEM (Fig. 9-172)

The choke system permits the fast idle speed to be regulated independently of the choke valve. The system is fully automatic to insure proper starting and driving when the engine is cold, with the added advantage of a shorter choking period while maintaining fast idle speeds adequate for fast warm-up. It also allows easier re-starting on a partially warm engine.

Choking of the carburetor is necessary only on the primary side because the secondary throttle valves are locked in the closed position whenever the choke valve is even partially closed. This is accomplished by a secondary throttle shaft lockout lever, located on the choke housing side of the throttle body, and a slot on the fast idle cam. Whenever the choke valve is closed, the lockout lever prevents opening of the secondary throttle valves. When the choke valve is wide open, the fast idle cam drops down so that the lockout lever clears the cam, permitting the secondary throttle valves to open.

The choke system is composed of a thermostatic coil (4), vacuum piston (2), offset choke valve (6), and fast idle cam (1). Operation is controlled by a combination of intake manifold vacuum, the offset choke valve, atmospheric temperature and exhaust manifold heat.

When the engine is cold, the thermostatic coil is calibrated to hold the choke valve closed. As the engine is started, air velocity against the offset choke valve causes the choke valve to open against the torque of the thermostatic coil (4). Intake manifold vacuum is applied to the vacuum piston (2) through the vacuum channel (3) which also tends to open the choke valve. The choke valve is not balanced between the torque of the thermostatic coil against vacuum pull upon the choke piston and air velocity against the offset choke valve, causing a regulated air flow into the carburetor providing a richer mixture during the warm-up period.

During warm-up, the vacuum piston modifies choke action to compensate for varying engine loads or acceleration. Any acceleration or increased load, decreases the vacuum applied on the choke piston. This allows the thermostatic coil to momentarily decrease choke valve opening providing the engine with a richer mixture for acceleration.

As the engine warms up, hot air from the choke stove located in the exhaust manifold is drawn into the thermostatic coil housing (5). The hot air raises the temperature and causes the coil to slowly relax its tension allowing the choke valve to move gradually to the full open position. The air supplied to the choke stove is filtered through a polyurethane filter which prevents foreign material from being drawn into the choke housing.

To prevent stalling during the warm-up period, it is necessary to run the engine at a slightly higher idle speed. This is accomplished by the fast idle screw which rests on the steps of the fast idle cam located next to the choke housing opposite the main throttle levers.

The fast idle cam is linked to the choke lever (7) by the fast idle cam rod (9) and the intermediate lever (8). This makes the movement of the fast idle cam directly related to the movement of the coil, allowing the choke valve to open sooner while maintaining increased idle r.p.m. until the choke coil is completely released.

While the automatic choke is in operation, the driver may wish to advance the throttle to the wide open position. Since this would decrease pull upon the vacuum piston (2), thereby closing the choke valve, it is necessary to provide increased carburetor air flow by opening the choke valve mechanically. To accomplish this, a tang on the fast idle cam is made to contact the throttle lever at wide open throttle position so as to sufficiently open the choke valve. This is also called a choke unloader and also serves to dechoke a

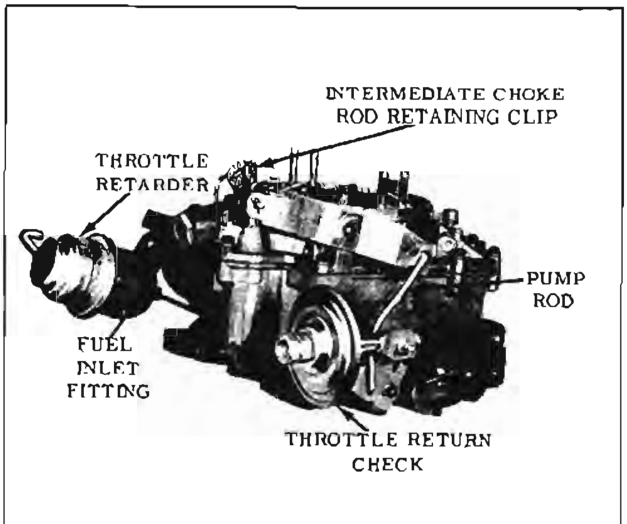


Fig. 9-173 4GC Carburetor

flooded carburetor during starting operation whenever the engine is cranked with the accelerator held fully depressed.

CARBURETOR ASSEMBLY

REMOVAL AND INSTALLATION

1. Remove air cleaner assembly.
2. Disconnect linkage.
3. Disconnect choke tube.
4. Disconnect fuel and vacuum lines.
5. Remove four throttle body to intake manifold bolts and remove carburetor.

   To install, reverse removal procedure and make adjustments outlined under ADJUSTMENTS (ON CAR). Torque carburetor to intake manifold bolts 14 to 17 ft. lbs.

DISASSEMBLY

Disassembly of Air Horn (Fig. 9-173)

1. Mount the carburetor on Holding Fixture J-5923-B, or 30-14.
2. Remove the fuel inlet fitting and gasket, then remove the filter screen from the air horn.
3. Remove idle vent valve screw, shield and valve.
4. Remove the retainer from the upper end of the pump rod and disengage rod.
5. Remove the retainer from pump plunger shaft and remove the pump plunger and pump rod from carburetor.
6. Remove the retainer from the intermediate choke rod and unhook rod from choke lever.
7. If the choke shaft is to be removed:
   a. Remove the small screw holding the choke unloader lever to the choke shaft, then remove the lever.
   b. Remove the two small brass choke valve retaining screws and discard. Remove the choke valve and the choke shaft.
8. Remove the 13 air horn attaching screws, (one screw is recessed in the top of the air horn) and remove the throttle retarder.
9. Carefully lift the air horn until the float assemblies are clear of the carburetor body.
10. Remove the hinge pin from the primary float assembly, and remove the float and needle. (Fig. 9-174)
11. Remove the primary float needle seat and gasket, using Tool BT-52. Remove the small filter screen from the needle seat bore.

    NOTE: The float needle and seat are matched and must be installed as an assembly.
12. Remove the hinge pin, float assembly, needle seat gasket and filter screen from the secondary side of the air horn. Do not remove the float balance spring unless it is distorted and needs replacement.
13. Remove the air horn gasket.

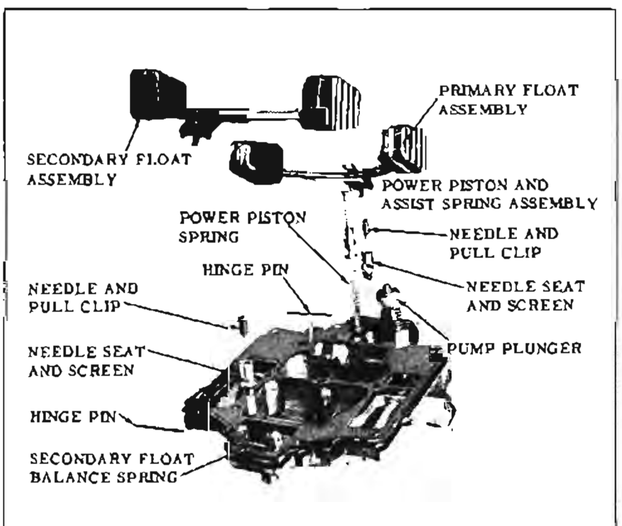


Fig. 9-174 Air Horn Assembly

14. Remove burrs around power piston bore due to staking and remove the power piston assembly by depressing the stem and allowing it to snap back into position. Remove the spring under the piston.

15. Remove the pump plunger assembly by sliding the shaft through the seal. Remove the seal from the top side of the air horn casting.

Disassembly of Float Bowl

1. Remove the fast idle cam attaching screw. (Fig. 9-175)

2. Remove the three choke cover attaching screws and retainers, then remove the choke cover, gasket and baffle from the choke housing.

3. Remove the two choke housing attaching screws, then remove the choke housing and linkage from the carburetor body.

4. Remove the intermediate choke lever and shaft with linkage from the choke housing, then remove choke housing gasket.

5. Remove the throttle return check by removing the attaching screw, and the rubber tee from the vacuum fitting on the throttle body.

6. Remove the three attaching screws and lock washers from the venturi cluster on the primary side, then remove the cluster and gasket. (Fig. 9-176)

7. Remove the three attaching screws and lock washers from the venturi cluster on the secondary side, then remove the cluster and gasket.

8. If equipped with idle compensator, remove attaching screws then remove the idle compensator and gasket.

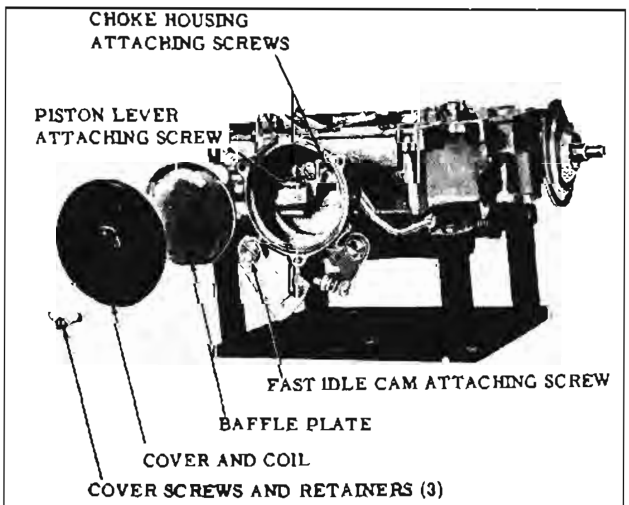


Fig. 9-175 Choke Assembly and Fast Idle Cam

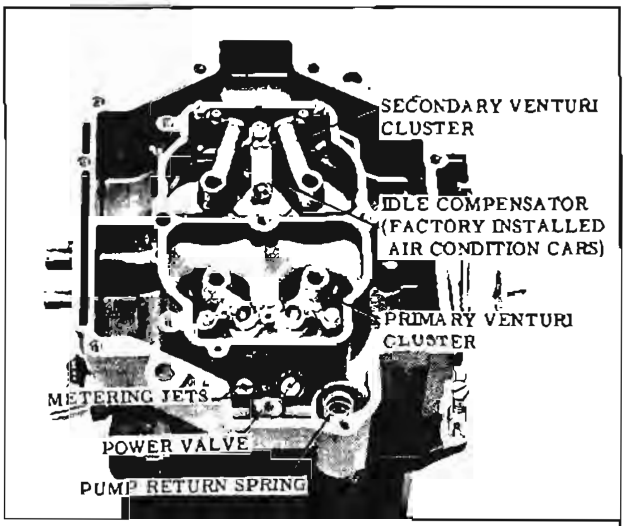


Fig. 9-176 Float Bowl Assembly

9. Remove both metering jets from the primary (pump) side of the carburetor body.

10. Remove the power valve and gasket.

11. Remove both metering jets from the secondary side of the carburetor. Keep them in a separate group.

12. Remove the pump return spring from the pump well, then invert the carburetor body to remove the aluminum pump inlet ball from the well.

13. Remove the small "T" shaped pump discharge spring guide with needle nose pliers, then remove the small spring and steel ball. (Fig. 9-177)

14. If it is necessary to clean or replace the small screen next to the pump plunger bore, remove the retainer ring and screen.

15. Invert the carburetor body and remove the four throttle body attaching screws. Remove the throttle body and gasket. (Fig. 9-178)

16. Remove the secondary auxiliary throttle valve assembly from the carburetor body.

Disassembly of the Throttle Body

NOTE: No attempt should be made to remove the throttle valve or shaft from the throttle body as it may be impossible to reassemble the throttle valves correctly in relation to the vacuum advance and idle discharge orifices.

The idle mixture needle screws may be removed for cleaning or replacement. Also the slow and fast idle speed screws can be removed if necessary.

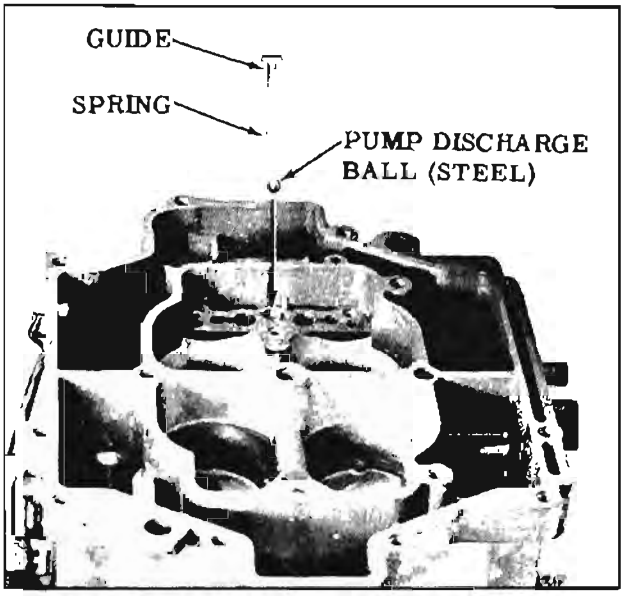


Fig. 9-177 Pump Discharge Spring Guide

CLEANING OF PARTS

The carburetor should not be cleaned in any solution other than a cold immersion type cleaner.

1. Thoroughly clean carburetor castings and metal parts in carburetor cleaning solvent.

   CAUTION: The choke coil, housing and pump plunger should not be immersed in solvent. Clean pump in clean gasoline only.

2. Blow all passages in casting dry with compressed air. DO NOT PASS DRILLS THROUGH JETS OR PASSAGES.

3. Clean filter screens of dirt or lint. If the filter screens are distorted or plugged they should be replaced.

INSPECTION OF PARTS

1. Check floats for dents or excessive wear at hinge pin holes.

2. Shake floats to check for leaks.

3. Examine float needle and seat. If grooved, replace with a factory matched float needle, seat and gasket assembly.

4. Inspect the idle mixture adjusting needles for burrs or ridges.

5. Inspect the upper and lower surfaces of the carburetor body to see that the small sealing beads are not damaged. Damaged beading may result in air or fuel leaks at that point.

6. Inspect holes in pump rocker arm, fast idle cam and throttle shaft lever. If holes are worn excessively or out of round to the extent of improper operation of the carburetor, worn parts should be replaced.

7. Inspect the steps on the fast idle cam for excessive wear. If excessive wear is noted, cam should be replaced to assure proper engine operation during the warm-up and choking periods.

8. Inspect the pump plunger leather for cracks or creases. If the pump plunger leather is damaged, replace the pump plunger as a complete assembly.

9. Inspect the throttle body assembly. Make sure the idle passages and vacuum channels are clean.

10. Inspect filter screens. If screens are distorted or plugged, they should be replaced.

As mentioned during the disassembly of the carburetor, there is a very close tolerance fit of the throttle valves in the throttle body. Also the idle discharge orifices are drilled in relation to a properly fitting valve. Therefore, if the throttle valves, levers or shafts are worn excessively or damaged, a complete throttle body assembly is required.

ASSEMBLY

Throttle Body

1. Install the idle mixture needles and springs finger tight. Back out the needles 1-1/2 turns as a preliminary idle adjustment.

2. If removed, install the slow and fast idle screws in the throttle levers.

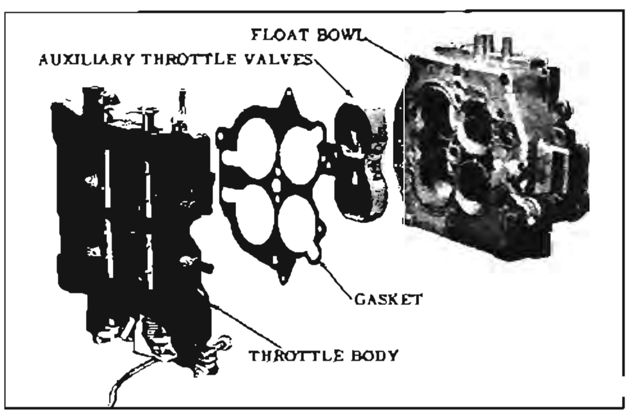


Fig. 9-178 Throttle Body and Auxiliary Throttle Valves

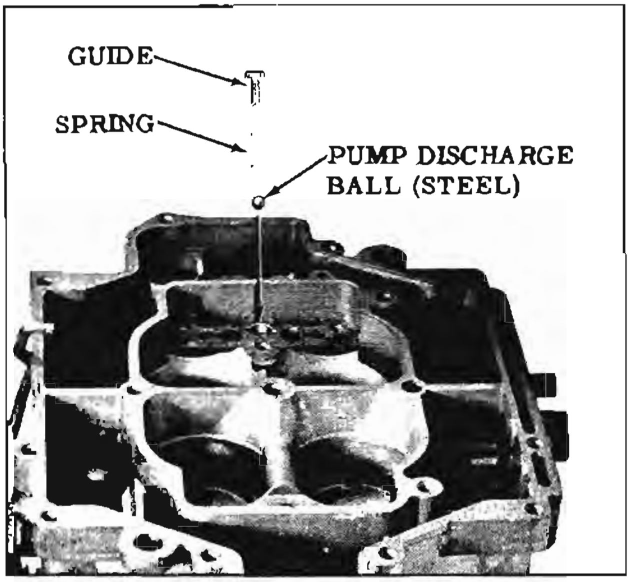


Fig. 9-179 Pump Discharge Spring Guide

Float Bowl

1. With the carburetor body in the inverted position, install the auxiliary throttle valve assembly so that the calibrated spring operating pin is down. (Fig. 9-178)

2. Position the throttle body gasket on the float bowl so that all holes are properly aligned.

3. Place the throttle body on the float bowl and install the four attaching screws. Tighten the center screw 9 to 10 ft. lbs. and the outer screws 3 to 4 ft. lbs.

4. Place the float bowl upright on the holding stand.

5. Install the pump outlet steel ball, spring and "T" shaped guide in the center hole of primary venturi cluster mounting surface in float bowl. (Fig. 9-179)

6. Install the power valve and gasket, and the two primary main metering jets. (Fig. 9-180)

   NOTE: The metering jets have a number stamped on the slotted end. The two jets with the lower number are the primary metering jets.

7. Install the two secondary main metering jets.

8. If equipped with idle compensator, install compensator and gasket and retain with 2 screws. Make sure the compensator is seated firmly in the passage and tighten screws securely.

9. Install the secondary venturi cluster and gasket and retain with three attaching screws and washers.

   NOTE: The secondary cluster does not have pump discharge nozzles.

10. Install primary venturi cluster and gasket and retain with three attaching screws and lock washers.

11. Install the pump inlet aluminum ball and the pump return spring in the pump plunger well. Be sure the spring is seated over the ball.

12. Install the pump inlet screen and retainer if removed.

13. Install the choke housing gasket, intermediate choke lever and shaft with linkage, in the choke housing. (Fig. 9-181)

14. Install the choke housing on the float bowl and retain with two attaching screws. Be

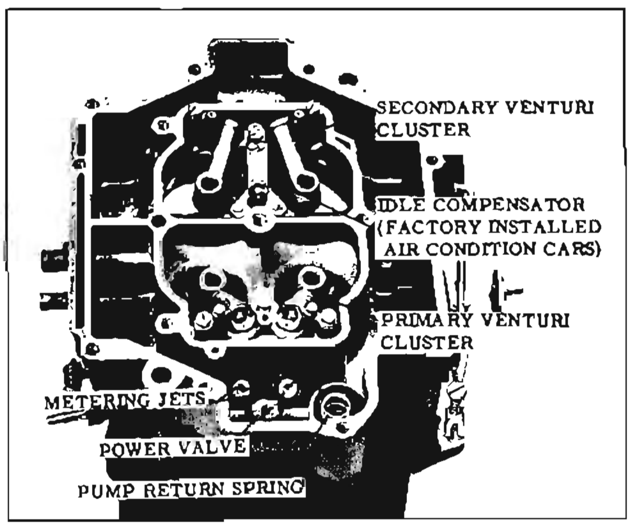


Fig. 9-180 Float Bowl Assembly

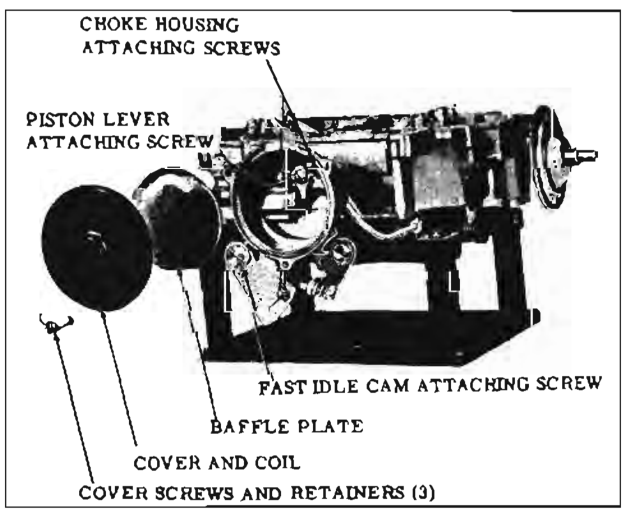


Fig. 9-181 Choke Assembly and Fast Idle Cam

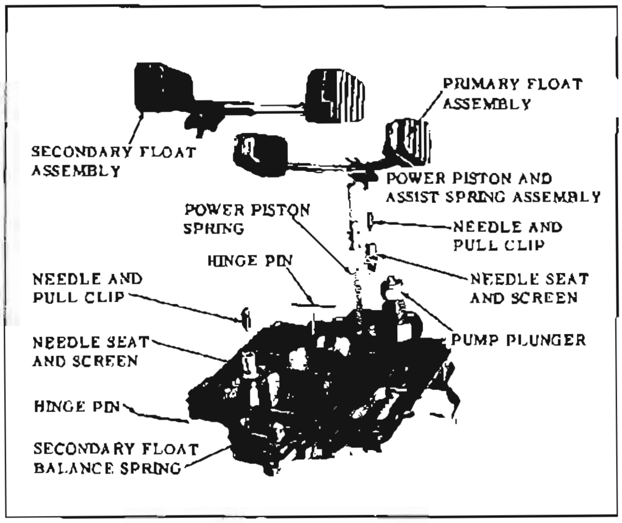


Fig. 9-182 Air Horn Assembly

sure the intermediate choke shaft lever is extending downward between the two attaching screw bosses.

15. Install the choke lever, link and piston assembly and attach lever to the intermediate choke shaft.

    NOTE: The choke piston pin hole in the piston should be pointing inward.

16. Install fast idle cam with attaching screw.

ASSEMBLY OF THE AIR HORN (Fig. 9-182)

1. Install the power piston spring in the bore, then install the power piston in the air horn and stake the casting very lightly to hold the piston in place.

2. Install the pump plunger rubber seal in the air horn by inserting the small end through from the bottom. The lips of the seal must be seated on both sides of the cover.

3. Insert the pump plunger shaft through the rubber seal.

4. Position the gasket on the air horn.

5. Install both float needle seats and gaskets, with filter screens attached, using Tool BT-52.

6. Install secondary float assembly on the air horn, retaining in place with hinge pin. Make sure tang on rear of the float arms is over the balance spring.

7. Install primary float assembly.

8. Make float adjustments as outlined under float adjustments.

FLOAT ADJUSTMENTS

Float Level

When checking the primary float level, be sure that the float arms do not rest on the baffles. A minimum of .030" must be maintained between the float arms and the baffles. If the minimum clearance does not exist after the float adjustments are made, it will be necessary to file the float arms.

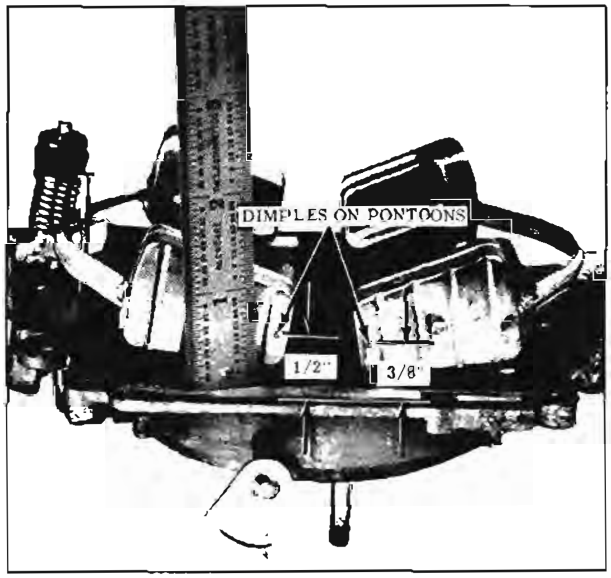


Fig. 9-183 Checking Primary Float Level

NOTE: Do not file the baffles.

1. With gasket in place and the air horn inverted, position gauge BT-6310 as shown in Fig. 9-183.

2. Measure the dimension from the gasket on the air horn to the dimple on the float pontoon. This dimension should be 1/2" for the primary floats and 3/8" for the secondary float.

   NOTE: The floats must be positioned so that they do not contact the side of the carburetor body.

3. Using the adjustable gauge BT-3210, check the dimension from the gasket to the highest point of the float pontoons. This dimension should be 1-7/16" for the primary and 1-3/8" for the secondary.

4. If necessary to adjust, bend the float arm as indicated in Fig. 9-184.

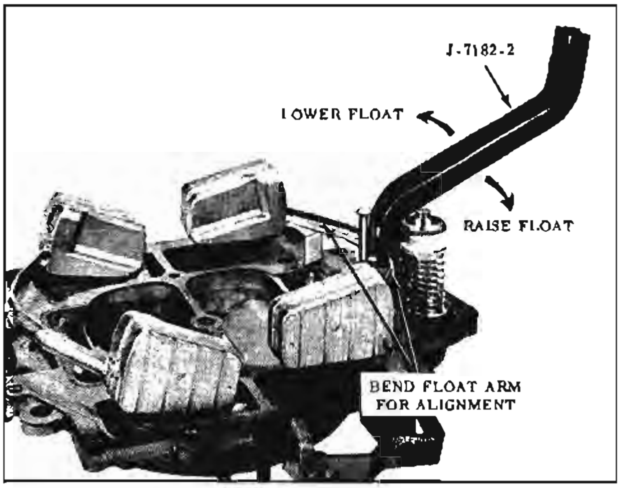


Fig. 9-184 Adjusting Float Level (Primary Shown)

Float Drop

1. Position the air horn as shown in Fig. 9-185.
2. Bounce the floats lightly and, using tool BT-6310, measure the distance from the air horn gasket to the dimple on the float pontoon. This distance should be 1-3/8" for the primary and 1-1/8" for the secondary.
3. If an adjustment is necessary, bend the tang at the rear of the float arms toward the needle and seat to decrease the setting; away from the needle and seat to increase the setting.

Completion of Carburetor Assembly

1. Carefully guide the air horn assembly on the carburetor body so that the pump plunger, power valve stem, and floats will not be damaged.
2. Position the throttle retarder, align the holes in the air horn, gasket and body and just start the 13 air horn attaching screws.
3. Tighten evenly and securely the inner attaching screws (including the screw through the inner wall), then tighten the remaining outside attaching screws in the same manner.
4. If choke shaft was removed, install the choke shaft in the air horn by inserting it in the hole from the same side as the choke.
   a. Slide the choke valve through the shaft so that the letters "RP" on the valve are facing up when the valve is closed.
   b. Install two new small choke valve-to-shaft attaching screws. Close the choke valve to align choke in air horn, then tighten screws.
5. Install the rubber idle vent valve and shield on top of the air horn. Make sure valve seats properly on air horn.
6. Insert upper end of the pump rod through the outer hole in the pump lever by lifting up on the lever, then install the retainer. Insert pump plunger shaft in pump lever and install retainer.
7. Install the fuel inlet screen, gasket and fitting in the air horn.
8. Install the choke unloader lever on the choke shaft.
9. Install the intermediate choke rod into the choke lever.
10. Adjust intermediate choke rod and choke coil as outlined under ADJUSTMENTS (ON OR OFF THE CAR).
11. Install the rubber tee on the vacuum fitting in the throttle body.
12. Adjust fast idle cam rod, secondary lockout, secondary throttle lockout, pump rod and unloader as outlined under ADJUSTMENTS (ON OR OFF CAR).

ADJUSTMENTS (ON OR OFF THE CAR)

Intermediate Choke Rod and Choke Coil Adjustment

The choke vacuum piston must be properly positioned with respect to the vacuum slots in the choke housing bore to provide proper choke pull off action.

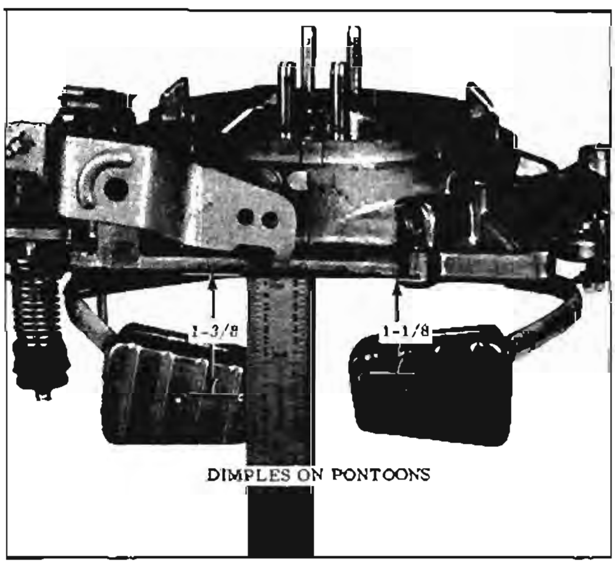


Fig. 9-185 Checking Float Drop

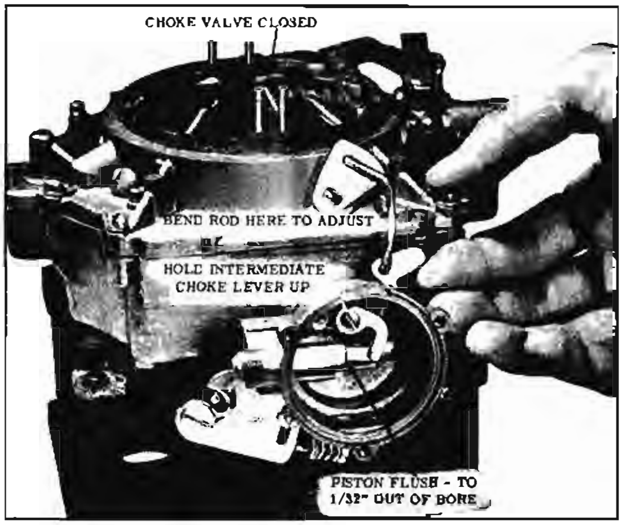


Fig. 9-186 Intermediate Choke Rod Adjustment

1. With the choke cover and baffle removed, position the fast idle screw on the high step of the fast idle cam. Raise the intermediate choke lever to its full up position, then push lightly on the end of choke piston to remove all lash in the linkage; check to see if the choke piston is flush to 1/32" out of the choke piston bore. (Fig. 9-186)

2. Bend the intermediate choke rod if necessary, to correctly position choke piston.

3. Position baffle in choke housing, then install cover gasket, cover and coil assembly, and three screws and retainers.

4. Rotate cover counterclockwise until coil pick up tang on piston linkage. Continue rotatin cover until scribe line on cover indicates two notches rich. (Fig. 9-187)

5. Tighten the three cover attaching screws.

Fast Idle Cam Rod Adjustment

In addition to the intermediate choke rod and choke coil adjustment, it is necessary to adjust the fast idle cam rod to the cam. This insures proper positioning of the fast idle cam when the choke coil is in operation.

1. Turn in the fast idle screw until it just contacts the middle step of the fast idle cam.

2. With the shoulder of the highest step of the fast idle cam held against the fast idle screw, hold the intermediate choke lever in the extreme up position. The intermediate choke rod and the fast idle cam rod must be at the upper limit of travel in the slot to remove all travel. Check the clearance between the top edge of the choke valve and the dividing wall of the air horn. Clearance should

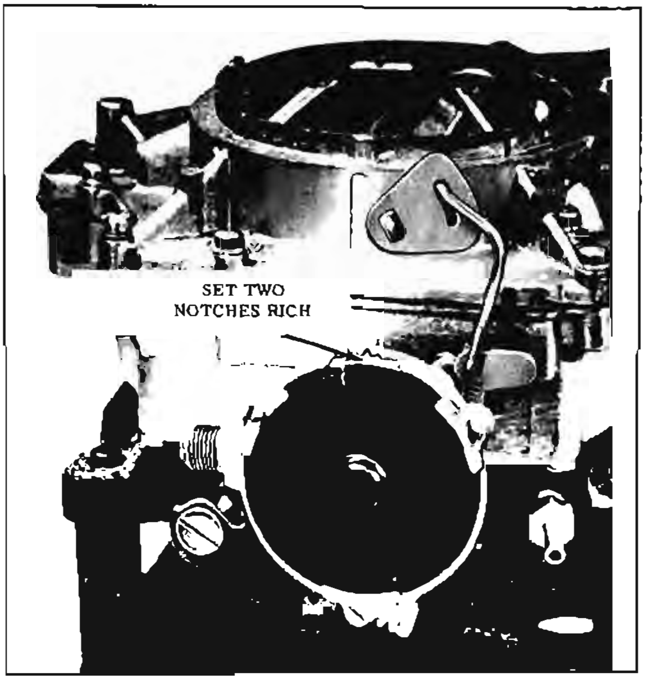


Fig. 9-187 Choke Coil Setting

be .053". (Fig. 9-188)

3. If necessary to adjust, bend the fast idle cam rod (lower rod).

Secondary Throttle Lockout Adjustment

The secondary throttle lockout prevents opening of the secondary throttle valves until the engine has reached normal operating temperature. Insufficient clearance at the lock point will allow the fast idle cam to strike the tang and prevent

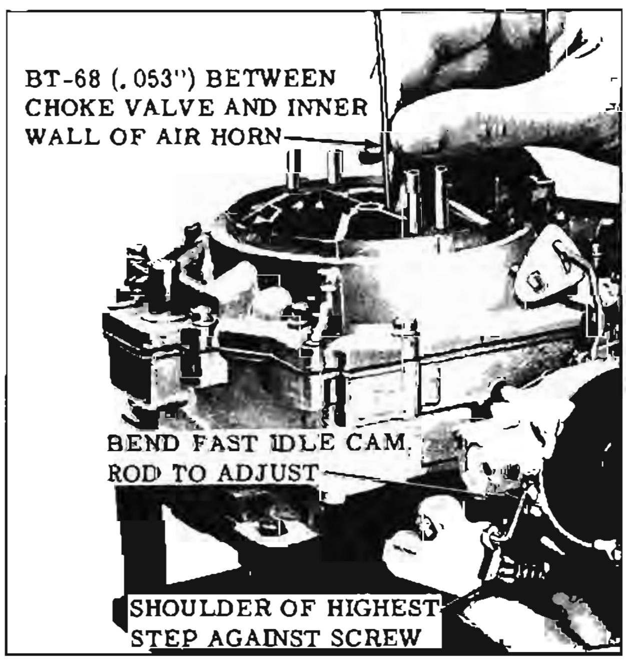


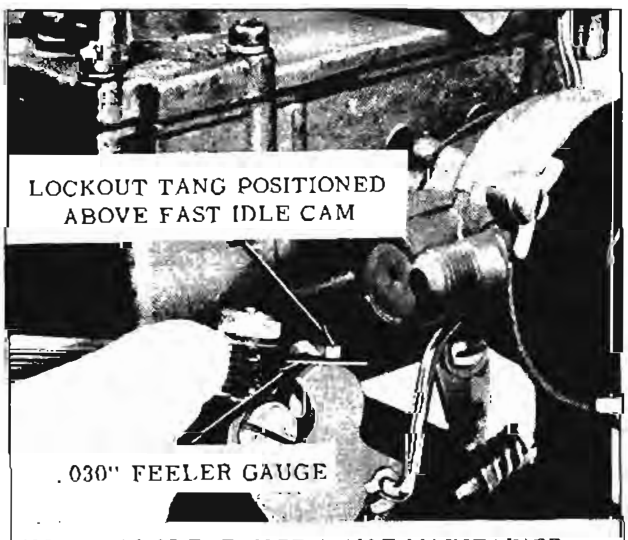
Fig. 9-188 Fast Idle Cam Rod Adjustment

Fig. 9-189 Secondary Throttle Lockout Adjustment

the choke from closing.

1. Measure the clearance between the lockout tang and the top edge of the slot in the fast idle cam. The clearance should be .015" ± .005". (Fig. 9-189)

2. If adjustment is necessary, bend the tang sideways using Tool BT-18 until the proper clearance is obtained.



NOTE: IF CLEARANCE IS NOT MAINTAINED, SECONDARY THROTTLE VALVES CAN HANG-UP.

Fig. 9-190 Secondary Throttle Contour Clearance Adjustment

Secondary Throttle Contour Clearance Adjustment

The secondary throttle contour clearance adjustment, which is performed after the lockout adjustment, actually times the unlocking of the secondary throttle valve in relation to engine temperature.

1. Hold the choke valve in the wide open position so that the secondary lockout tang is positioned over the fast idle cam, then measure the clearance between the tang and the fast idle cam. The clearance should be .030" ± .010". (Fig. 9-190)

2. If adjustment is necessary, allow the choke to close so that the tang is again in the slot of the fast idle cam, then use Tool BT-91 to bend the tang straight up or down as required for proper clearance.

Pump Rod Adjustment

1. While holding the throttle valves closed, idle speed screw backed out, measure the distance from the top of the air horn casting to the bottom edge of the pump plunger shaft. It should be 1-1/64". (Fig. 9-191)

2. If adjustment is necessary, bend the pump rod using Tool BT-18.

3. Operate the pump rod several times to be sure the movement is free.

Unloader Adjustment

If the engine "loads up" or becomes flooded when cold starting, it is necessary to mechanically open the choke valve a small amount to admit more air and facilitate starting. This is accomplished when the tang on the pump lever contacts a tang on the choke shaft at wide-open throttle.

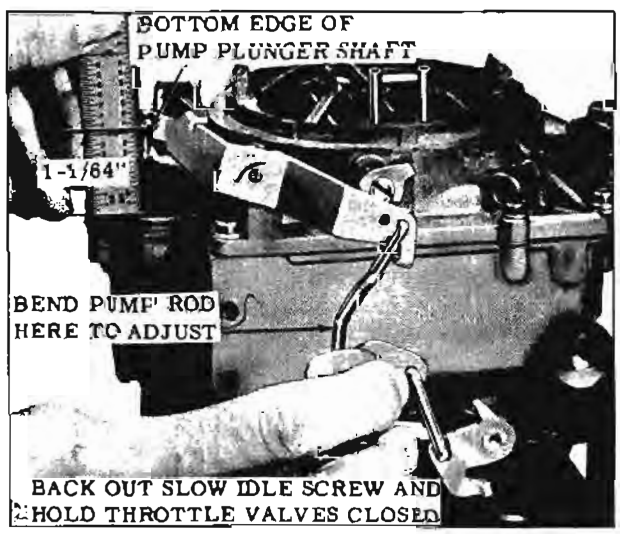


Fig. 9-191 Pump Rod Adjustment

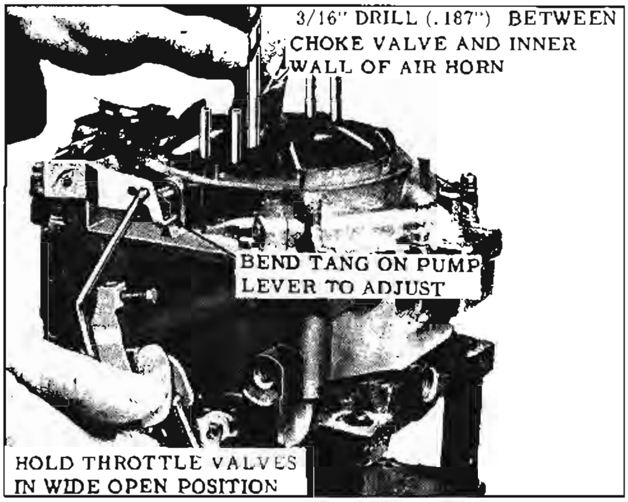


Fig. 9-192 Unloader Adjustment

1. Be sure the pump rod adjustment is correct.

2. While holding the throttle lever in the wide open position (with carburetor off car), or with accelerator pedal completely depressed (with carburetor on car), check the clearance between the top edge of the choke valve and the dividing wall. The correct clearance is .115". (Fig. 9-192)

3. If necessary, bend the small tang on the pump lever with Tool BT-91 to obtain the correct dimension.

IMPORTANT: If the unloader adjustment was made off the car, it will be necessary to recheck the adjustment with the accelerator pedal completely depressed after the carburetor is installed.

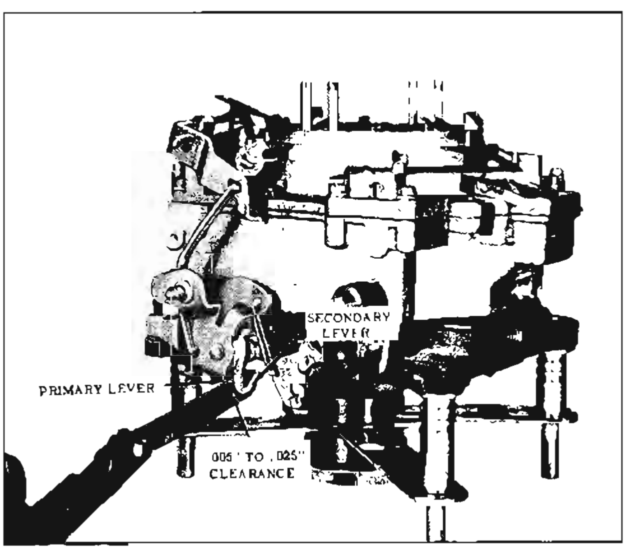


Fig. 9-193 Secondary Actuating Level Adjustment

Secondary Actuating Lever Adjustment

1. Loosen screw and position throttle return check out of the way.
2. Back out the fast idle adjusting screw until the throttle valves are fully closed. Be sure the fast idle screw is not resting against the fast idle cam.
3. Remove slack from linkage and insert a feeler gauge between the actuating lever and the primary lever. (Fig. 9-193)
4. Clearance should be between .005" and .025".
5. To adjust, open the throttle valves and bend the actuating tang with Bending Tool BT-18.
6. Reposition throttle return check.

ADJUSTMENT (ON CAR)

There are six adjustments that must be made with the carburetor mounted on the engine. They are: Carburetor Lever to Auxiliary Bellcrank Link Clearance Adjustment, Slow Idle Adjustment, Fast Idle Adjustment, Throttle Return Check Adjustment and Atmospheric Idle Vent Adjustment and Accelerator Pedal Height Adjustment.

Adjust Carburetor Lever to Auxiliary Bellcrank Link

a. Measure clearance as shown in Fig. 9-194 with feeler gauge. To obtain proper clearance of .020"-.040", remove carburetor lever to auxiliary bellcrank link and bend. Reinstall link and recheck clearance. Link can be installed up or down.

Slow Idle Adjustment (Air Cleaner Removed)

Engine must be at operating temperature.

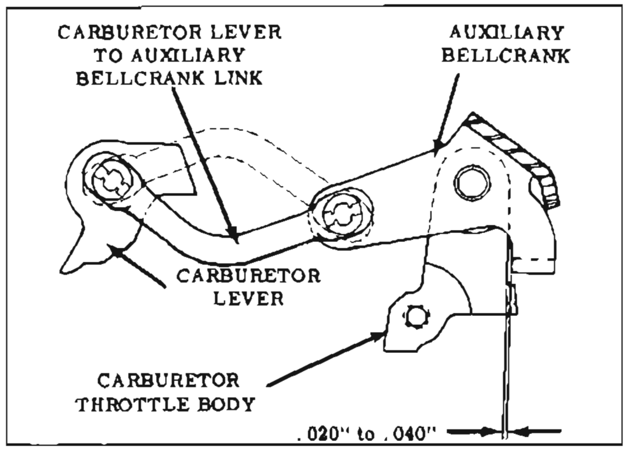


Fig. 9-194 Checking 4GC Carburetor Link

Throttle return check must be positioned out of way when making the slow idle speed adjustment on Hydra-Matic equipped cars.

Slow Idle Speed

TRANSMISSION	GEAR	R.P.M.
Hydra-Matic - exc. A/C	Drive	500
Hydra-Matic - with A/C	Drive	550
Synchromesh	Neutral	550
Factory Installed Air Conditioning - Air Conditioning turned "OFF", Idle Compensator held closed.		
Dealer Installed Air Conditioning (Without Idle Compensator) - Air Conditioning turned "ON".		

After the idle r.p.m. is stabilized, turn in or out each idle mixture adjusting needle screw until the smoothest possible idle is obtained. This normally is accompanied by a higher manifold vacuum reading and/or an increase of idle r.p.m. Then, turn out (rich) each needle 1/4 turn, at which time both the idle vacuum and r.p.m. will drop off slightly. This adjustment will prove to be correct for all normal requirements.

NOTE: Idle speed and mixture should be rechecked with air cleaner installed.

When setting the idle speed and mixture on cars with an idle compensator (factory installed air conditioning only) make sure the idle compensator stays closed by holding it down. If the idle speed increases when the air cleaner is installed, do not reduce the idle speed setting since the idle compensator is open. If the speed decreases, re-adjust idle to correct r.p.m.

Fast Idle Adjustment

When the engine is cold and the choke valve is partially closed, it is necessary that the engine r.p.m. at idle be higher than normal to prevent stalling. This adjustment, if correct, will assure proper engine r.p.m. during the warm-up period.

1. Open throttle valves and rotate the fast idle cam so that the fast idle screw is resting on the high step of the cam.

2. With the engine running at operating temperature, transmission selector lever in neutral and the parking brake applied, adjust the fast idle screw to obtain an engine speed of 1800 r.p.m.

   NOTE: Any time the fast idle is changed, it will be necessary to adjust the throttle return check. (Hydra-Matic equipped cars only)

Throttle Return Check Adjustment (Hydra-Matic Equipped Cars Only)

The throttle return check is designed to open the throttle valves to increase engine speed when engine vacuum drops if the engine loads up and starts to stall. It also acts to retard throttle closing when the driver suddenly takes his foot off the accelerator pedal.

The vacuum to the throttle return check has an air bleed above the throttle valves to give faster response to the return check on decelleration.

1. Be sure that the fast idle adjustment has been made, then shut off the engine.

2. Rotate the fast idle cam so that the fast idle screw rests on the highest step of the fast idle cam.

3. Measure the clearance between the contact screw and the contact on the throttle lever. The clearance should be .040".

4. If adjustment is necessary, adjust the throttle return check contact screw using two wrenches.

   NOTE: Any time the fast idle is changed, it will be necessary to readjust the throttle return check.

Atmospheric Idle Vent Adjustment

The atmospheric idle vent is designed to vent any vapor formed in the float bowl during slow idle operation. It is opened by a tang on the pump lever whenever the throttle valves are in the slow idle position.

1. Rotate fast idle cam until the fast idle screw is resting on the highest step of the fast idle cam. (1800 r.p.m.) The idle vent valve should just be closed.

2. If necessary to adjust, bend the idle vent tang on the pump lever, using Tool BT-69.

3. Run the engine on slow idle. The idle vent must be open.

Accelerator Pedal Height Adjustment

The pedal height is adjusted by using Tool BT-33-2. Place the tool in position (with the hole nearest the pin) over the T.V. bellcrank pin. Swing the gauge in an arc and adjust the length of the accelerator lever rod until the end of the gauge just contacts the closest surface of the cowl.

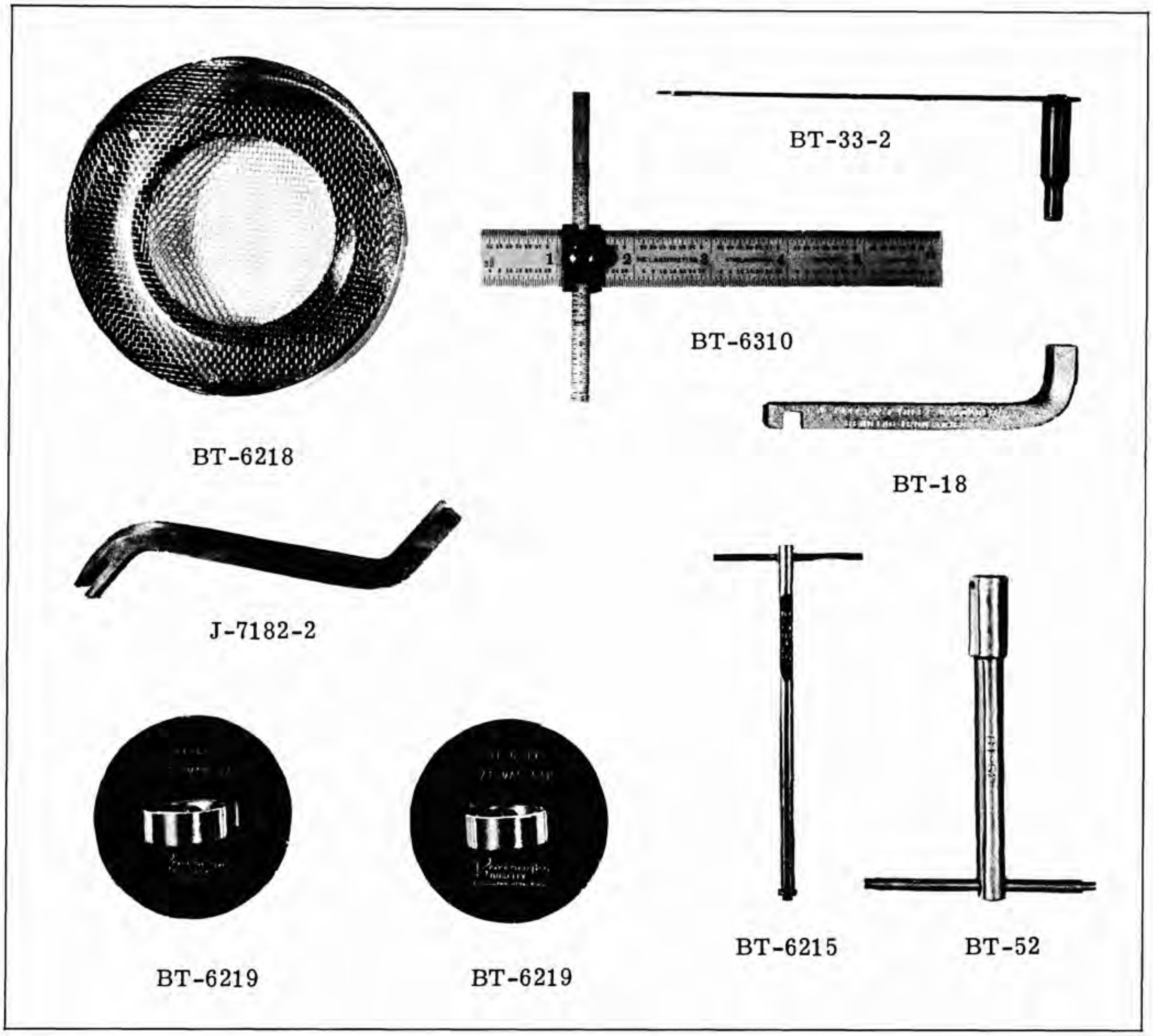


Fig. 9-195 Tools

BT-18	Bending Tool-Pump Rod	BT-6218	Protective Screen
BT-33-2	Accelerator Pedal Height Gauge	BT-6219	Protective Caps
BT-52	Float Needle Seat Remover	3T-6310	Carburetor Float Gauge
BT-6215	Main Metering Jet Wrench	J-7182-2	Bending Tool-Float and Vacuum Assist Tang 4GC

ENGINE TUNE-UP
(F.S.C. AND F-85)

CONTENTS OF SECTION 10

ENGINE TUNE-UP

To maintain the most satisfactory engine performance, it is recommended that the following items be performed every 12,000 miles: Service the spark plugs and ignition points, check the timing, idle mixture, slow and fast idle speed.

SPARK PLUGS

1. Remove foreign material from around the spark plug holes and remove the spark plugs.
2. Clean exterior of plugs and inspect for cracked insulators or excessively burned electrodes.
3. Clean all serviceable plugs with an abrasive type cleaner. File center electrode flat. (Fig. 10-1) Do not file center electrode on new plugs.
4. Adjust spark plug gap to .030" using a round feeler gauge.
5. Install plugs using new gaskets and torque 18 to 34 ft. lbs.

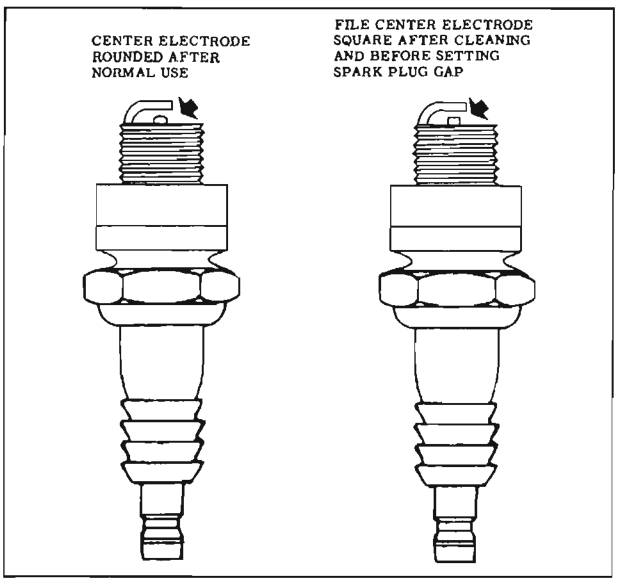


Fig. 10-1 Filing Center Electrodes

SPARK PLUGS

Model	Plug Type	Plug Gap
Full Size Car		
Regular Fuel	AC45	.030"
Premium Fuel	AC44	.030"
Export	AC46	.030"
F-85		
2 Bbl.	46FFX	.030"
4 Bbl. S.M.T. & Jetfire	45FF	.025"
4 Bbl. H.M.T.	44FF	.030"

Torque Specifications
Full Size Car — 18 to 34 ft. lbs.
F-85 -- Lubricate with a drop of engine oil — 12 to 17 ft. lbs.

DISTRIBUTOR CONTACT POINTS

1. Inspect points, check for excessive burning or pitting. Replace if necessary.
2. Remove scale from points with a fine cut contact point file. Do not attempt to remove all roughness.
3. Apply a film of cam and ball bearing lubricant or equivalent to the breaker cam.

DWELL ANGLE

1. Calibrate dwell meter to set line and connect one lead of dwell meter to the primary distributor lead terminal and the other lead to ground.

2. With engine running at idle speed, insert Dwell Adjusting Tool J-6296 or BT-1501 through distributor window into the head of the adjusting screw. (Fig. 10-2) Adjust dwell angle to 30°.

IGNITION TIMING

The ignition timing marks are located on the engine front cover. A saw slot on the balancer indicates engine top dead center. (Fig. 10-3)

To adjust ignition timing, proceed as follows:

1. Disconnect distributor vacuum line at carburetor and cover fitting with tape.

2. Adjust engine speed to 850 R.P.M.

3. With the use of a timing light set timing according to chart. To adjust the ignition timing loosen the distributor clamp bolt and rotate the distributor.

ENGINE TIMING

FULL SIZE CAR	
All S.M.T.	2-1/2° B.T.D.C.
All Others	5° B.T.D.C.
F-85	
2 Bbl. S.M.T.	5° B.T.D.C.
2 Bbl. H.M.T. & All 4 Bbl.	7-1/2° B.T.D.C.
Jetfire	10° B.T.D.C.
Cam Angle Range .	28° to 32° (Adjust to 30°)
Contact Point Opening	.016"
Contact Arm Spring Tension . . .	19 to 23 oz.
Condenser Capacity	.18 to .23 Mfd.

NOTE: If a tuned engine detonates with this setting, the cause is low octane fuel or excessive carbon build-up in the combustion chamber. If these factors are not corrected, the timing should be retarded 2-1/2° from the specified settings. In areas that have an extra high octane, the timing may be advanced beyond the specified setting providing spark knock is not encountered.

4. Tighten the distributor clamp bolt and recheck timing to make sure distributor was not moved during tightening of bolt.

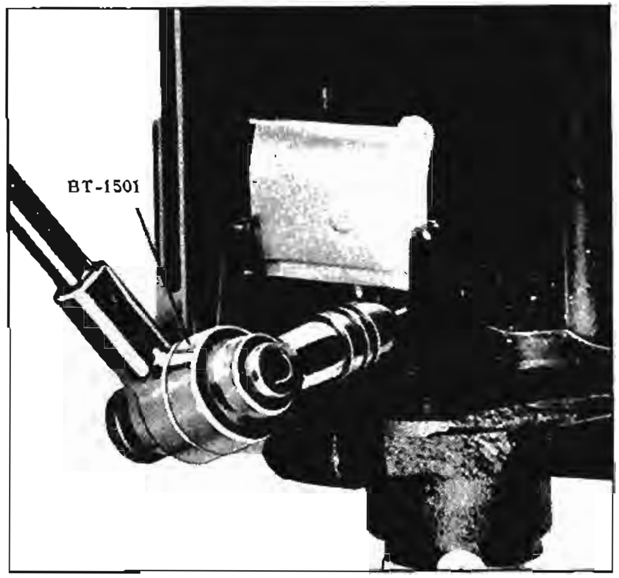


Fig. 10-2 Adjusting Dwell Angle

5. Remove tape and connect distributor vacuum advance line.

SLOW IDLE ADJUSTMENT

With the engine at normal operating temperature, Throttle Return Check Holding Fixture J-6342 in place, and air cleaner removed, adjust slow idle as outlined in chart. Tool BT-1501 can be used to turn idle mixture adjusting screws.

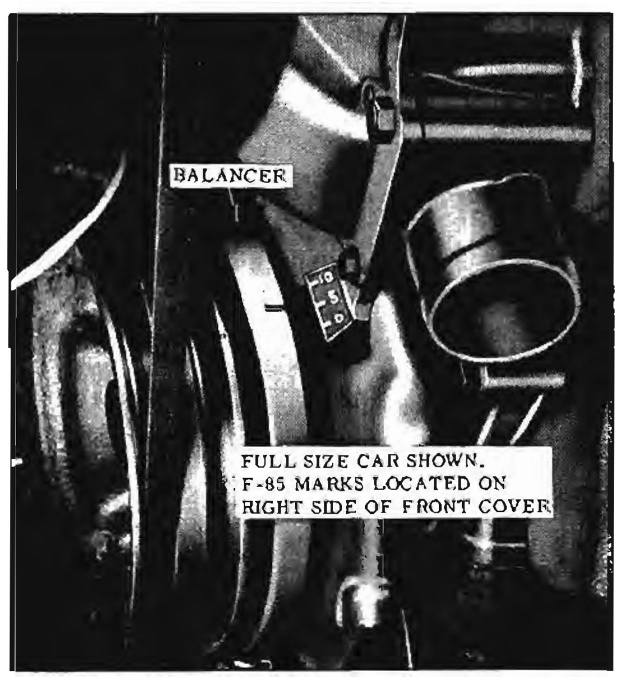


Fig. 10-3 Timing Marks

		DISTRIBUTOR		BASED ON DISTRIBUTOR R.P.M.		
Series	Model	Distr. No.	Vacuum Unit No.	Vacuum Advance Per Inch of Vacuum	Mechanical Advance Per Distributor R.P.M.	
Full Size Car	All Models	1111033	1116220	Start - 9 to 11 in. Hg. 12^{o} to 14^{o} - at 19 in. Hg.	0^{o} to 2^{o} 9^{o} to 11^{o} 12^{o} to 14^{o}	400 R.P.M. 1200 R.P.M. 2000 R.P.M.
F-85	2 Bbl. S.M.T. 4 Bbl. S.M.T.	1110975	1116184	Start - 5 to 7 in. Hg. 11^{o} to 13^{o} - at 16 in. Hg.	0^{o} to 2^{o} 5^{o} to 7^{o} 11^{o} to 13^{o}	500 R.P.M. 1000 R.P.M. 2200 R.P.M.
	2 Bbl. H.M.T. 4 Bbl. H.M.T.	1111034	1116221	Start - 9 - to 11 in. Hg. 11^{o} to 13^{o} - 17 in. Hg.		
	Jetfire S.M.T.	1111021	1116209	Start - 9 to 11 in. Hg. 11^{o} to 13^{o} - 17 in. Hg.	0^{o} to 4^{o} 5^{o} to 7^{o}	500 R.P.M. 1000 R.P.M.
	Jetfire H.M.T.	1111013	1116205	Start - 4 to 6 in. Hg. 11^{o} to 13^{o} - at 17 in. Hg.		

SLOW IDLE ADJUSTMENT

Model	Trans.	Gear	R.P.M.	Air Conditioning Notes
Full Size Car	H.M.T. S.M.T.	Dr. N	500* 550*	With or Without Air Conditioning *With Factory Installed Air Conditioning -- Air Conditioning--"OFF" and Idle Compensator Held Closed *With Dealer Installed Air Conditioning -- Air Conditioning--"ON"
F-85 - 2 Bbl.	S.M.T.	N	550	With Air Conditioning — Air Conditioning "OFF"*
	H.M.T.	Dr.	500 550	Without Air Conditioning With Air Conditioning -- Air Conditioning "OFF"* *CARB-AIRATOR HELD CLOSED
F-85 - 4 Bbl.	S.M.T.	N	550	With or Without Air Conditioning
	H.M.T.	Dr.	550 500	With Air Conditioning Without Air Conditioning With Factory Installed Air Conditioning -- Air Conditioning—"OFF" and Idle Compensator Held Closed With Dealer Installed Air Conditioning (Without Idle Compensator) — Air Conditioning "OFF"
F-85 Jetfire	H.M.T. S.M.T.	Dr. N	600 600	Air Conditioning—"OFF" Air Conditioning—"OFF"

After the idle r.p.m. is stabilized, turn in or out each idle adjusting screw until the smoothest possible idle is obtained. This is normally accompanied by a higher manifold vacuum reading and/or an increase in idle r.p.m. Then turn out each needle 1/4 turn, at which time both vacuum and idle R.P.M. will drop off slightly.

NOTE: It may be necessary to readjust idle speed and mixture after air cleaner is installed on car.

When setting idle speed and mixture on carburetors with an idle compensator (factory installed air conditioning only), make sure the idle compensator is closed by holding it down with a pencil or other suitable tool. If the idle speed increases when the air cleaner is installed, do not reduce idle speed setting since the idle compensator is open. If idle speed decreases, readjust to correct r.p.m.

FAST IDLE ADJUSTMENT

ADJUST WITH ENGINE AT NORMAL OPERATING TEMPERATURE AND TRANSMISSION IN NEUTRAL

Series	Carb. Model	Adjust To	Adjusting Conditions
Full Size Car	2GC	1900	Fast idle screw on high step of cam
	4GC	1600	Fast idle screw on high step of cam
F-85	4GC	1800	Fast idle screw on high step of cam
	RC(H.M.T.)	1500	Fast idle screw on second step of cam
	RC(S.M.T.)	2400	Fast idle screw on high step of cam

CHOKE SETTING

Full Size Car	
2GC	1 Notch Lean
4GC	Index
F-85	
All 2-Bbl. & 3147 (H.M.T.)	Index
All 4-Bbl.	2 Notches Rich
Jetfire (S.M.T.)	Refer to RC Model Carburetor Section

ROAD TEST

Road test car thoroughly. Check engine performance at HIGH SPEED, LOW SPEED and IDLE. After road test is complete, inspect engine for oil and coolant leaks.

If car does not perform properly after the plugs and points have been serviced and the timing, idle mixture, slow and fast idle speed have been checked and adjusted, additional possible causes are as follows:

IGNITION SYSTEM

1. High resistance in spark plug cables (Refer to MILLIAMP TEST - ELECTRICAL SECTION).
2. Loose or faulty primary ignition wiring or connections.
3. High resistance in ignition system (Refer to ELECTRICAL SECTION).
4. Distributor mechanical advance mechanism binding or sticking.
5. Distributor vacuum advance unit leaking vacuum.

FUEL SYSTEM

1. Carburetor float level adjusted too low or too high or leak at float needle seat.
2. Dirt and/or corrosion in carburetor fuel or air passages.
3. Low capacity fuel pump. (See ENGINE SECTION).
4. Plugged fuel filter.
5. Water in fuel filter bowl.

Careful examination of the carburetor and fuel system should reveal defects if present. Always be ACCURATE with the carburetor adjustments.

VALVE SYSTEM

1. Sticking valve due to carbon and/or varnish deposits.
2. Broken or weak valve springs.
3. Warped, cracked or burned valve.
4. Valve not seating correctly.
5. Faulty hydraulic valve lifter.
6. Bent push rod, push rod worn excessively or push rod seat worn in rocker arm.
7. Incorrect valve timing.

COMPRESSION TEST

To determine if the valves or pistons are at fault, a test should be made to determine the cylinder compression pressure. When checking cylinder compression, the throttle and choke should be open, all spark plugs removed, and the battery at or near full charge. The lowest reading cylinder should not be less than 80% of the highest, and no cylinder reading should be less than 100 pounds.

NORMAL - Compression builds up quickly and evenly to specified compression on each cylinder.

PISTON RINGS - Compression low on first stroke tends to build up on following strokes but does not reach normal. Improves considerably with addition of oil.

VALVES - Low on first stroke does not tend to build up on following strokes. Does not improve much with addition of oil.

MISCELLANEOUS CAUSES

1. Restricted exhaust system.
2. Pre-ignition, due to carbon deposits in the combustion chamber.
3. Poor ground connection between engine and frame or body.
4. Malfunctioning manifold heat control valve. (Refer to ENGINE SECTION)

DIAGNOSIS

CONDITION	POSSIBLE CAUSES
Hard Starting	Distributor, Battery, Starter, Ignition Coil, Wiring
Rough Idle	Carburetion - Spark Plugs, Engine Valves, Leaking Intake Manifold
Stalls On Idle	Idle Speed, Fuel Mixture, Choke, Intake Manifold Leak
Poor Acceleration	Timing, Fuel System, Compression, Turbo-Charger Inoperative (F-85 only)
Cuts Out On Acceleration	Carburetion, Ignition System
Miss On Acceleration	Spark Plugs, Points, Carburetor, Wiring, Condenser
Steady Low Top Speed	Fuel Lines, Fuel Filter, Fuel Pump, Gas Tank Vent, Timing, Distributor, Air Filter, Low Compression, Exhaust System Clogged, Lifters
Surges on Steady Throttle	Fuel Line, Fuel Filter, Gas Tank Vent, Fuel Pump, Carburetion
High Speed Miss	Spark Plugs, Ignition Points, Fuel System, Valve Mechanism, Ignition Coil, Wiring
Valve Noise	Incorrect Oil Level In Crankcase, Lifters Dirty, Worn Rocker Arms, Worn Lifters, Oil To Rocker Arms Restricted

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specification.

APPLICATION	Ft. Lbs.
1. Battery Hold-Down Nut	1.5 to 2.5
2. Connector Strap to Starting Motor Bolt	6 to 8
3. Distributor Clamp to Cylinder Block Bolt	11 to 14
4. Delcotron Bracket to Cylinder Head Bolts	28 to 38
5. Ignition Coil to Intake Manifold Stud Nuts	9 to 11
6. Ignition Coil to Intake Manifold Bolts (F-85)	20 to 25
7. Starter Motor to Flywheel Lower Housing Nut and Bolt	45 to 50
8. Starter Motor to Cylinder Block Bolts (F-85)	30 to 35
9. Battery Cable to Starter Motor Nut	10 to 12
10. Junction Block Nut	8 to 10
11. Starter Terminals (Solenoid)	1.50 to 1.75
12. Ignition Coil Terminal Nuts	2 to 3
13. Delcotron "BAT" Terminal Nuts	2 to 3
14. Intake Manifold to Head Bolts	22 to 34
15. Intake Manifold to Head Bolts (F-85)	25 to 30
16. Exhaust Manifold to Head Bolts and Nuts	19 to 25
17. Carburetor to Turbo-Charger Nuts (F-85)	14 to 17

SYNCHROMESH AND CLUTCH

(FULL SIZE CAR)

CONTENTS OF SECTION 11

PERIODIC MAINTENANCE

The lubricant level should be checked at each engine oil change interval and if found to be below the filler plug level, add SAE 80 (preferred) or SAE 90 Multi-Purpose Gear Lubricant. Periodic or seasonal change of lubricant is not recommended.

ADJUSTMENT OF SHIFT RODS

The Synchromesh transmission requires two linkage adjustments to properly position the hand shift lever with respect to the steering wheel.

Shift Lever Adjustment (Fig. 11-1)

1. Set the transmission outer shift lever "A" in the second gear position (Lever "A" forward, lever "C" rearward).
2. Disconnect the shift rod from the steering column lower shift lever at clevis "B".
3. Hold the steering column lower shift lever upward against its stop in the steering column.
4. Install clevis pin through lower shift lever from the bottom side, then adjust clevis so it slides over pin freely (Inset Fig. 11-1). Then shorten shift rod by turning clevis five and one-half turns.
5. Install the clevis pin and cotter pin, then tighten the clevis lock nut.

Cross Shift Linkage Adjustment

1. Disconnect the cross shift rod from the steering column cross shift lever "E".

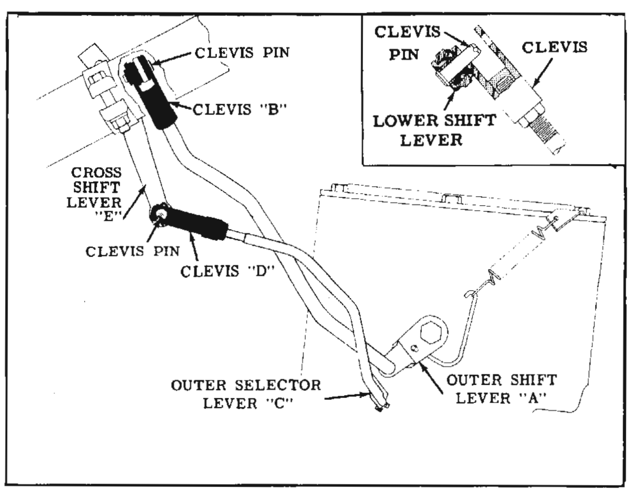


Fig. 11-1 Shift Lever Adjustment

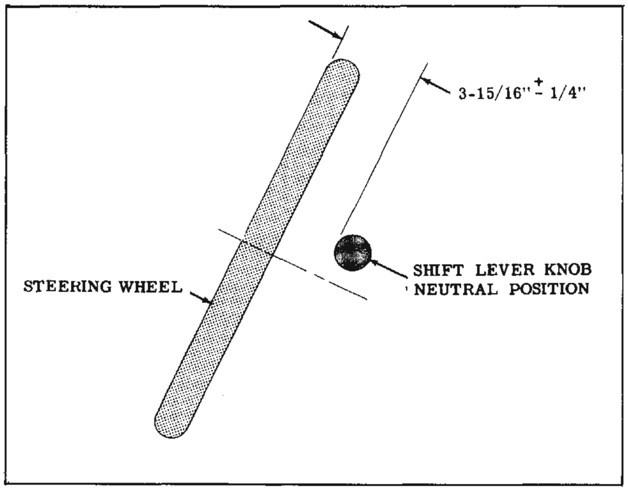


Fig. 11-2 Position of Shift Lever

2. With the transmission selector lever "C" rearward against its stop, adjust clevis "D" so that the clevis pin will easily enter the hole in lever "E" while holding the cross shift lever rearward to take up the lash. Then remove the clevis pin and lengthen the rod by five full turns of the clevis. This should bring the hand shift knob to within 3-15/16" ± 1/4" of the top of the steering wheel. (Fig. 11-2)

3. Install the clevis pin and cotter pin, then tighten the clevis lock nut.

THROTTLE CONTROL ADJUSTMENT (Fig. 11-3)

The throttle control adjustment must be made with the choke open and the throttle valves completely closed.

NOTE: Due to the split choke design, make sure fast idle cam is not touching fast idle adjusting screw.

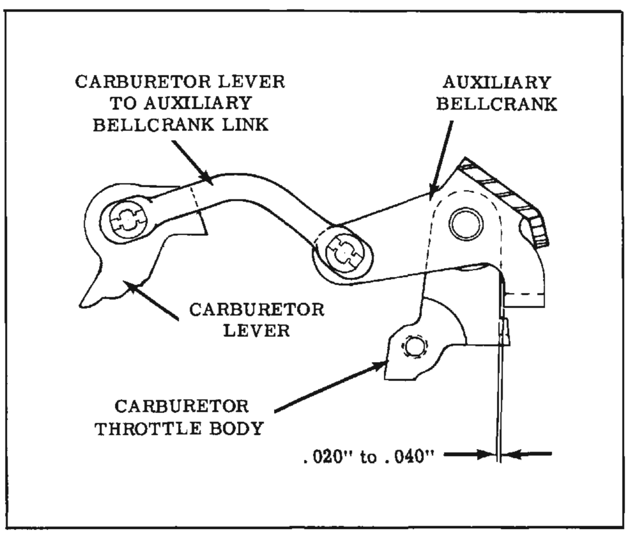


Fig. 11-3 Carburetor Lever to Auxiliary Bellcrank Adjustment (4 Barrel)

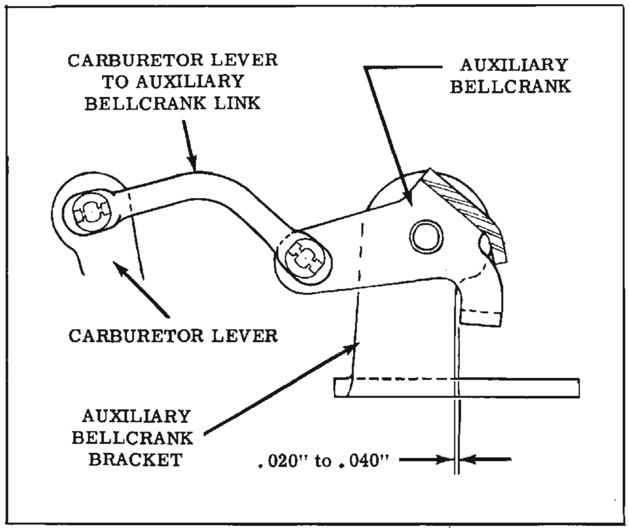


Fig. 11-4 Carburetor Lever to Auxiliary Bellcrank Adjustment (2 Barrel)

1. Place transmission in neutral.

2. Remove air cleaner.

3. Adjust throttle lever to auxiliary bellcrank link as follows:

   a. 4GC - With the use of a feeler or wire gauge, measure distance between machined surface of carburetor throttle body and the auxiliary bellcrank gauging tang. Clearance should be .020" to .040". If adjustment is necessary, remove auxiliary bellcrank link and bend as required. Install link and recheck clearance. (Fig. 11-3)

   b. 2GC - Repeat Step "a" with the exception that the clearance is measured between the auxiliary bellcrank bracket, bolted to the manifold, and the auxiliary bellcrank. (Fig. 11-4)

4. Adjust throttle rod to obtain the correct accelerator pedal height as indicated in Fig. 11-5.

5. Adjust slow idle as outlined in the TUNE-UP SECTION.

REAR BEARING RETAINER OIL SEAL

REMOVE AND INSTALL (With Propeller Shaft Removed)

1. Remove oil seal by prying seal from bearing retainer.

2. Coat outside diameter of new seal sparingly with Sealer Part No. 557622. Apply lubricant

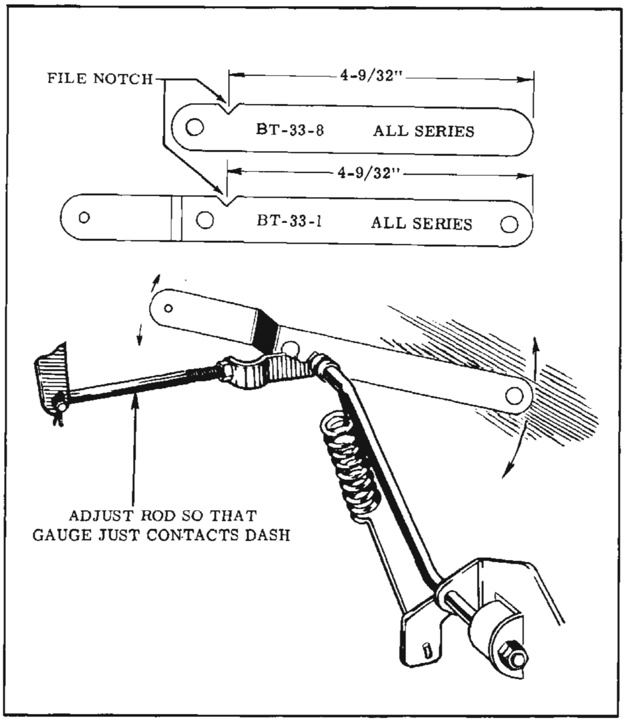


Fig. 11-5 Accelerator Pedal Adjustment

Part No. 567196 to the sealing lip of seal.

3. Drive seal into the rear bearing retainer using Seal Installing Tool J-5154 until seal is fully seated. (Fig. 11-6)

TRANSMISSION REMOVE AND INSTALL

1. Drain transmission and disconnect control rods at the transmission.

2. Remove the propeller shaft.

3. Remove the 4 transmission to clutch housing attaching bolts and slide the transmission rearward until the main drive shaft clears the clutch housing. Lower the transmission.

To install the transmission, apply a light film of lubricant Part No. 567196 to the pilot on the main drive gear. Reverse the removal sequence and torque the transmission to clutch housing bolts 60 to 70 ft. lbs. Install propeller shaft and torque universal joints to differential companion flange 14 to 18 ft. lbs. Remove the hex plug on the rear bearing retainer and fill the rear bearing retainer with 1/2 pint of SAE 80 Multi-Purpose Gear Lubricant. (This will eliminate any chance of the rear bearing retainer bushing running dry until enough oil passes through the main shaft bearing to fill the rear bearing retainer.) Install the hex plug and torque 6 to 8 ft. lbs. Fill the transmission to the level of the filler plug hole with SAE 80 Multi-Purpose Lubricant, approximately 2 pints additional.

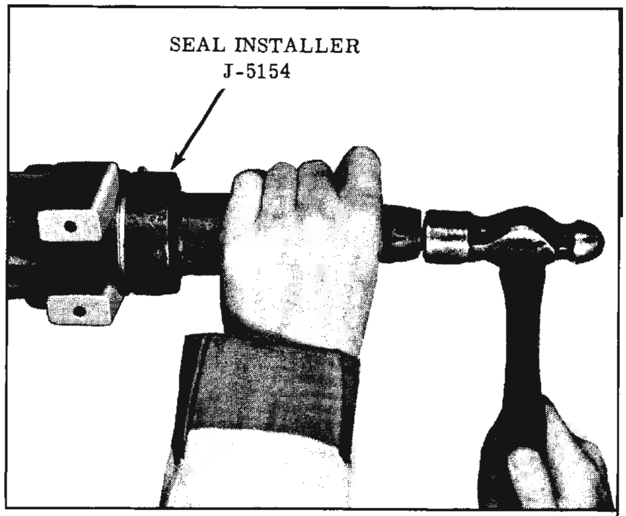


Fig. 11-6 Installing Rear Bearing Retainer Oil Seal

TRANSMISSION DISASSEMBLY

(TRANSMISSION REMOVED)

1. Clean the exterior of the transmission thoroughly.

2. Remove the return spring, spring extension, spring clip, cover, and cover gasket. (Fig. 11-7)

3. Remove rear bearing retainer and gasket.

4. Remove the set screws from two shifter yokes. (Fig. 11-13)

5. Pull the mainshaft rearward until the rear bearing clears the case.

NOTE: If fit between bearing and transmission case is tight, it may be necessary to

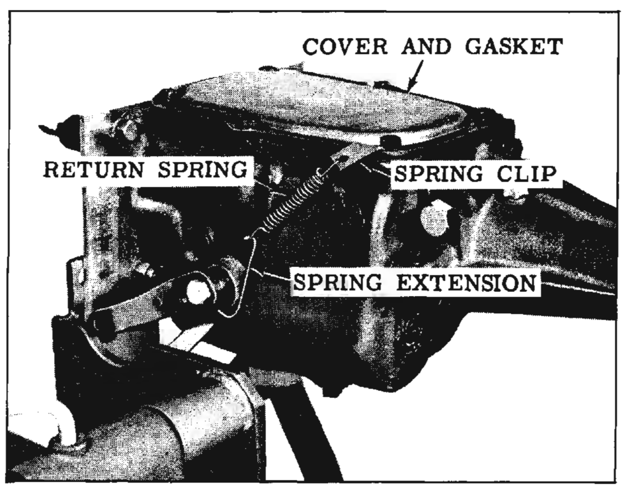


Fig. 11-7 Return Spring Assembly

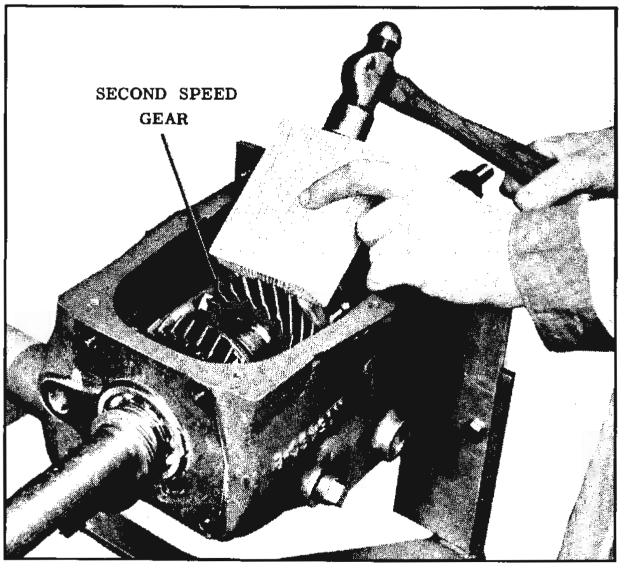


Fig. 11-8 Freeing Rear Bearing From Case

tap the second speed gear as shown in Fig. 11-8.

6. Remove the synchronizing clutch from the main shaft. (Fig. 11-9)

   NOTE: If necessary to service only the main drive shaft, main drive gear, or main drive shaft bearing, the assembly can be removed at this point in the disassembly. (Refer to Step 19)

7. Remove the snap ring holding the second speed gear on the main shaft. (Fig. 11-10)

8. Remove the keyed thrust washer, the second speed gear, and the rear thrust washer from the main shaft. (Fig. 11-11)

9. Remove the low and reverse gear retaining ring and slide the gear off the main shaft. (Fig. 11-12)

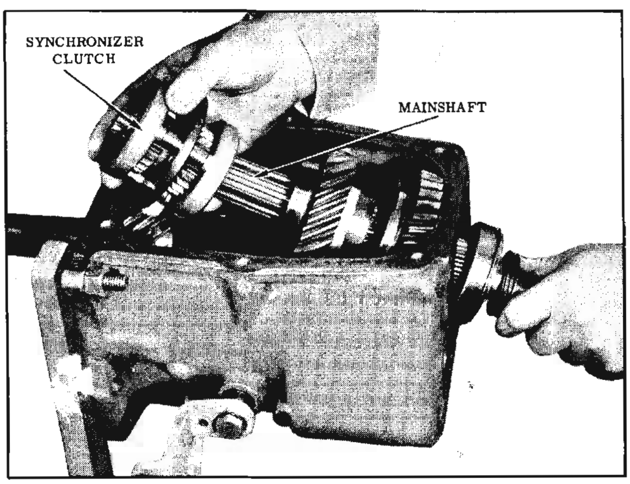


Fig. 11-9 Removing Synchronizing Clutch

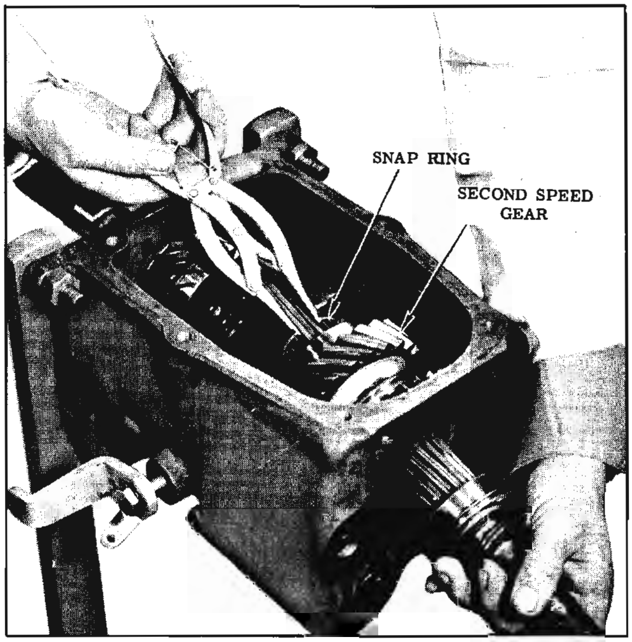


Fig. 11-10 Removing Second Speed Gear Snap Ring

10. Pull the main shaft from the rear of the case.

11. Loosen the outer shift lever bolt. Position the lever so that the inner shift levers are vertical and remove the outer shift lever. (Fig. 11-12)

12. Remove the set screws from the inner shift levers. (Fig. 11-13)

13. Pull selector shaft away from the second and third speed shifter shaft and remove the interlock retainer. (Fig. 11-14)

14. Drive the selector shaft out through the right side of the case. The welch plug will be driven out by the shaft. Do not allow levers of interlock to drop into the case.

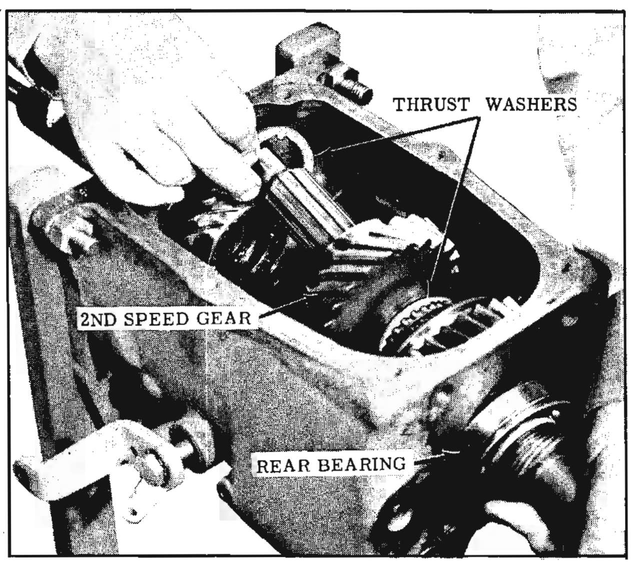


Fig. 11-11 Removing Second Speed Gear

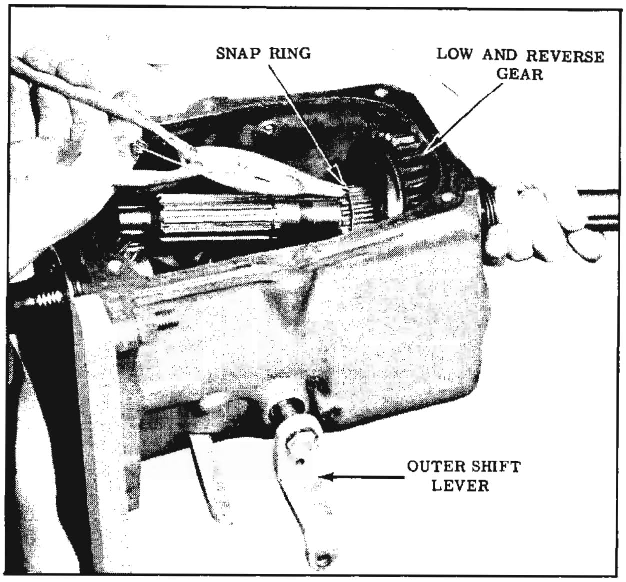


Fig. 11-12 Low and Reverse Gear Snap Ring

NOTE: The selector shaft can be removed from the left side of the case, however, damage to the selector shaft seals will result.

15. Push or tap the 1st and reverse shifter shaft out through the rear of the case, taking care to prevent the poppet ball and spring from flying out. Remove the first and reverse shifter yoke, ball and spring.

16. Push or tap the second and third shifter shaft out through the front of the transmission case, taking care to prevent the poppet ball and spring from flying out. Remove the second and third shifter yoke, ball and spring.

17. Remove the first and reverse interlock pin

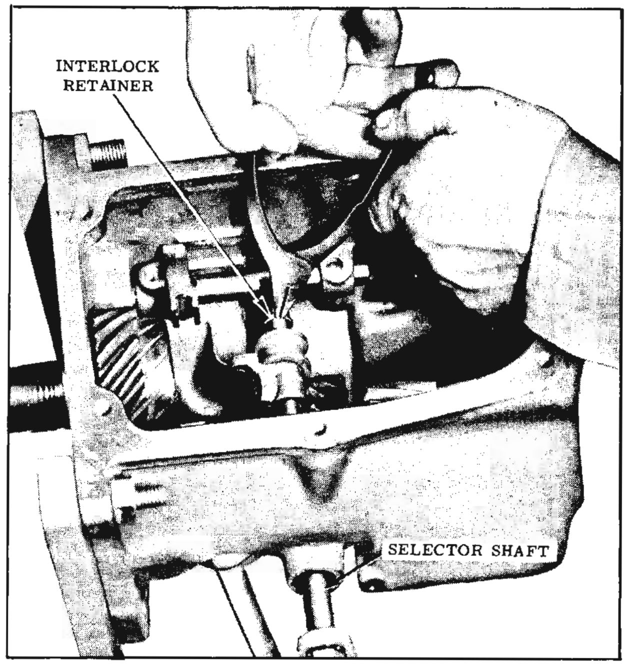


Fig. 11-14 Removing Interlock Retainer

from the case near the selector shaft seals. (Fig. 11-15)

18. Drive the counter gear shaft lock pin into the shaft. (Fig. 11-16)

19. Remove the retaining ring from the main drive gear bearing outer race and tap the drive gear and bearing assembly toward the rear of the case. Remove the main drive gear assembly from the case.

20. Drive the counter gear shaft out through the rear end of the case using Bearing Loader Tool J-1001-A and a brass hammer. Make

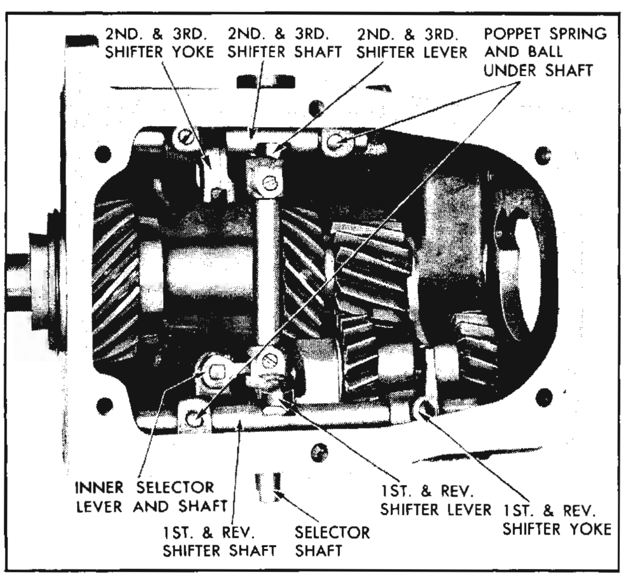


Fig. 11-13 Shift Mechanism

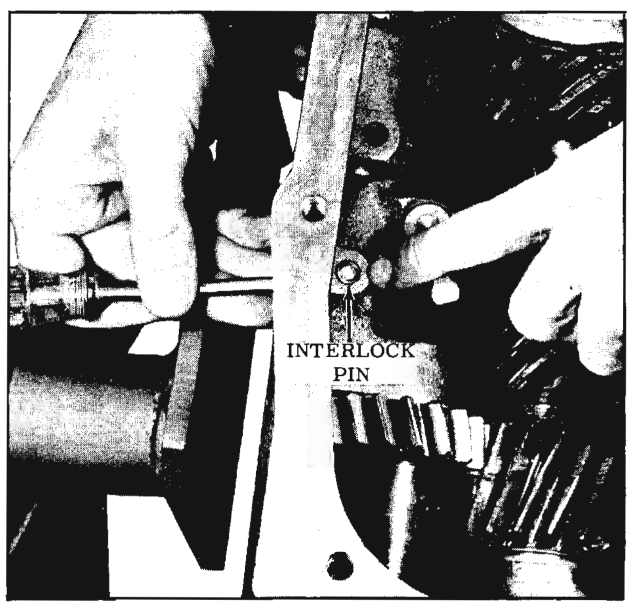


Fig. 11-15 Removing First and Reverse Interlock Pin

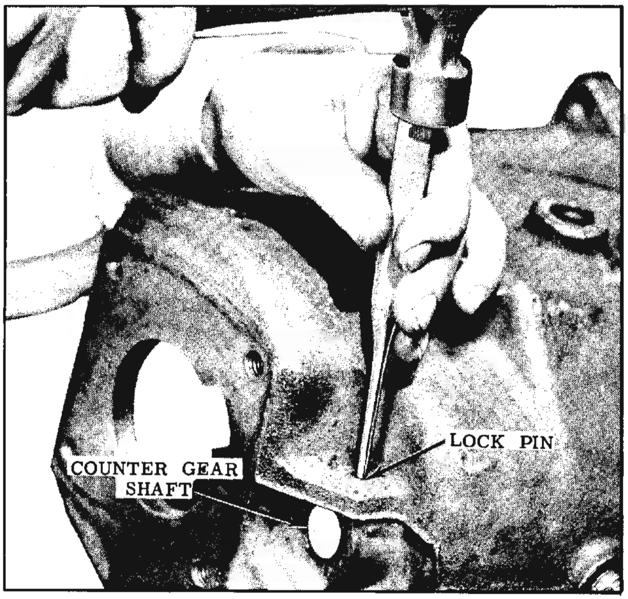


Fig. 11-16 Driving Lock Pin Into Shaft

sure that the bearing loader tool follows the shaft closely so that the counter gear bearings and thrust washers will be held in place. (Fig. 11-17)

21. Remove the counter gear assembly from the case.

22. Remove the transmission outer selector lever nut, lock washer, lever and seal, then remove the inner selector shaft and lever assembly.

23. Drive the reverse idler gear shaft lock pin into the shaft. (Fig. 11-18)

24. Drive the reverse idler gear shaft out the rear of the case.

    NOTE: A 1/2" x 8" brass drift should be used to remove the shaft by driving on the

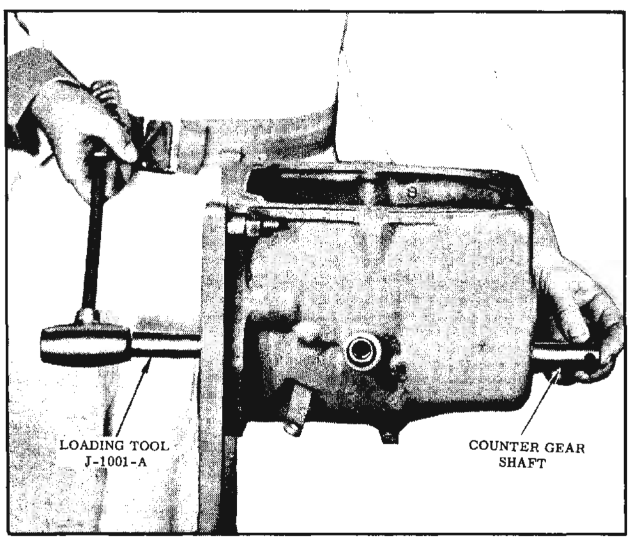


Fig. 11-17 Removing Counter Gear Shaft

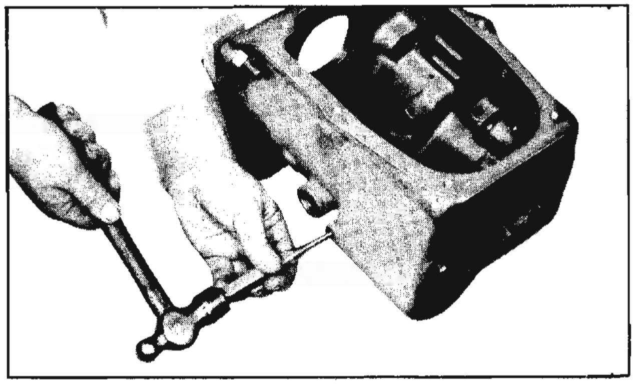


Fig. 11-18 Driving Lock Pin Into Idler Shaft

idler gear shaft through the counter gear shaft boss in front of case.

25. Remove the reverse idler gear shaft, gear, and thrust washer from the case. (Fig. 11-19)

26. Remove lock pin from reverse idler gear shaft.

CLEANING AND INSPECTION

1. Wash all bearings thoroughly in clean solvent, then air dry. Lubricate bearings with light engine oil and check for roughness.

2. Wash the transmission case thoroughly inside and out with cleaning solvent. Inspect case for cracks, burrs on the front or rear faces of case and for rough or damaged bearing or shaft bores.

3. Wash the rear bearing retainer thoroughly inside and out with cleaning solvent. Inspect retainer for cracks, roughness or scores in bearing bore.

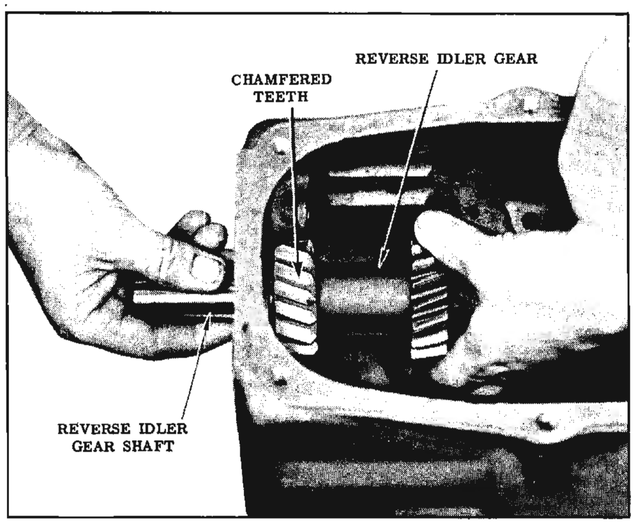


Fig. 11-19 Removing Reverse Idler Gear Shaft

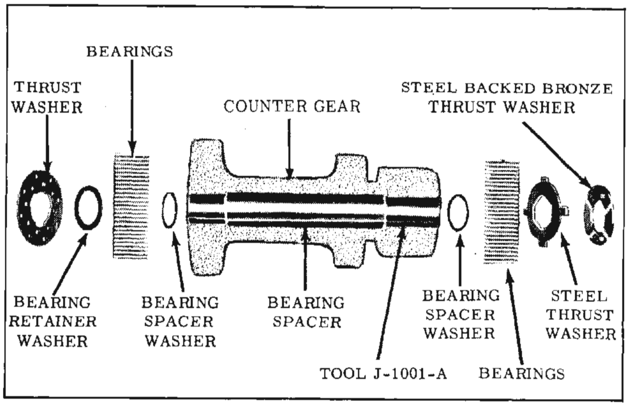


Fig. 11-20 Counter Gear Assembly

4. Inspect all gears for excessive wear, chips or cracks. Replace gears as necessary.

5. Inspect main shaft and main drive gear splines for nicks or excessive wear.

6. Inspect companion flange for SCARS, NICKS or excessive wear on the bearing or sealing surfaces. Any of these conditions requires replacement of the flange.

SERVICING INDIVIDUAL UNITS

Counter Gear Assembly (Fig. 11-20)

If the counter gear bearings or gear requires replacement, the bearings, retaining washer, thrust washers, and bearing spacer must be removed from the counter gear. Assemble the parts as follows:

1. Install the bearing spacer and the bearing spacer washers on Bearing Loader Tool J-1001-A, then insert the tool into the counter gear.

2. Install 26 needle bearings in each end of the gear around the bearing loader tool. Position the first bearing under the loader tool so that the tool is centered in the bore of the gear.

3. Install the bearing retainer washer and large perforated thrust washer on the loader tool at the large end of the counter gear. Use petrolatum to retain the washers in place.

4. Install the steel thrust washer on the loader tool at the small end of the counter gear, indexing the 4 tangs with the 4 slots in gear. Then install the bronze and steel thrust washer on the tool. Retain with petrolatum.

   NOTE: Steel side of washer must be toward case.

5. Leave the Bearing Loader Tool J-1001-A in place until the counter gear is installed in the case.

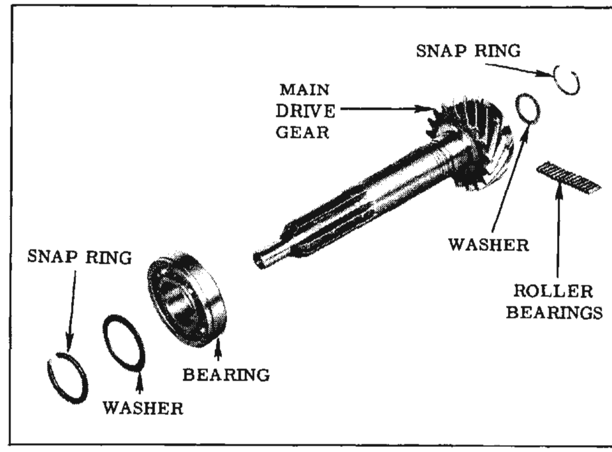


Fig. 11-21 Main Drive Gear Assembly

Main Drive Gear

If necessary, the main drive gear ball bearing or roller bearings may be replaced.

1. Remove the retaining ring and washer holding the main drive gear bearing to the main drive gear. (Fig. 11-21)

2. Remove the bearing by jarring the shaft on a block of wood.

3. Pry the wire lock ring from the bore of the main drive gear, then remove retaining washer and 14 needle bearings.

4. To assemble, hold the shaft in the vertical position and install the needle bearings in the bore of the gear, using petrolatum if neces-

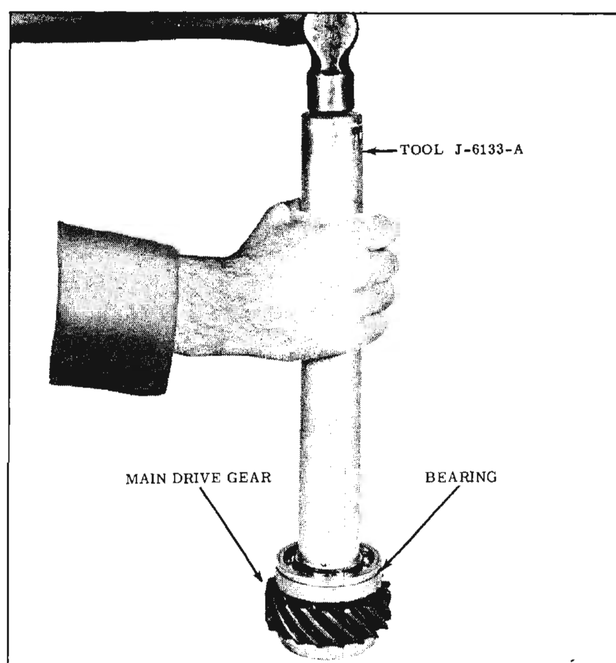


Fig. 11-22 Installing Bearing

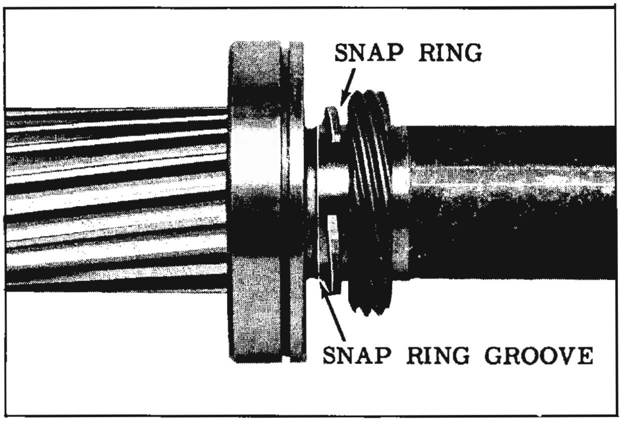


Fig. 11-23 Snap Ring Position Prior to Disassembly of Main Shaft

sary to retain the bearings. Install the retaining washer and lock ring.

5. Install the main drive gear bearing on the shaft, shielded side toward gear with Tool J-6133-A. (Fig. 11-22)

6. Install the washer, dished side TOWARD the bearing, then install the retaining ring on the shaft against the washer.

Main Shaft

The speedometer drive gear and rear bearing can be removed from the main shaft as follows:

1. Bend the speedometer gear spacer and remove from the shaft. Discard spacer.

   NOTE: In some cases the spacer and speedometer drive gear may have already been removed from the main shaft.

2. Remove the retaining ring from the groove and slide along the shaft toward the speedometer drive gear. (Fig. 11-23)

3. Place the first and reverse gear on the main shaft with the flat side of the gear toward the bearing. Using the first and reverse gear as a slide hammer, remove the speedometer drive gear, retaining ring and bearing from the shaft. (Fig. 11-24)

4. To assemble the parts, install the bearing on the main shaft with the shielded side toward the shoulder of the first and reverse splines on the main shaft and seat the bearing against the first and reverse gear splines on the main shaft. (Fig. 11-25)

5. Install the retaining ring against the inner race of the bearing.

   NOTE: It is not necessary to install a spacer or speedometer drive gear as the speedometer is driven by the left front wheel.

Rear Bearing Retainer

The only item serviced in the rear bearing retainer is the seal. If the seal requires replacement, pry seal out and install a new one as follows:

1. Apply a coating of lubricant Part No. 567196 to the sealing lip of the seal.

2. Apply a light coat of sealer, Part No. 557622 to the outer diameter of the seal.

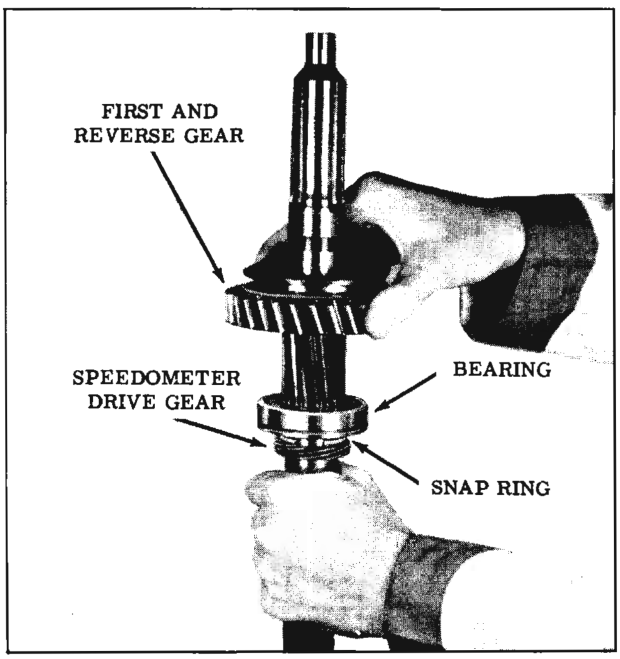


Fig. 11-24 Removing Bearing and Gear

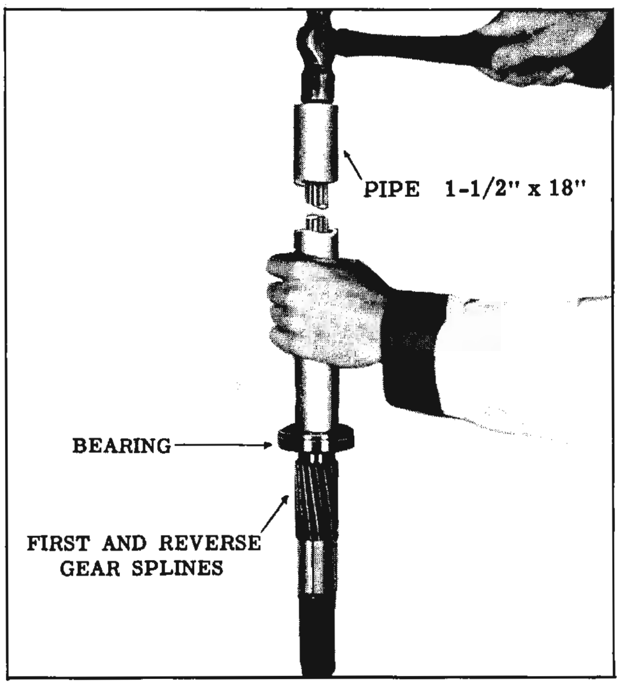


Fig. 11-25 Installing Rear Bearing

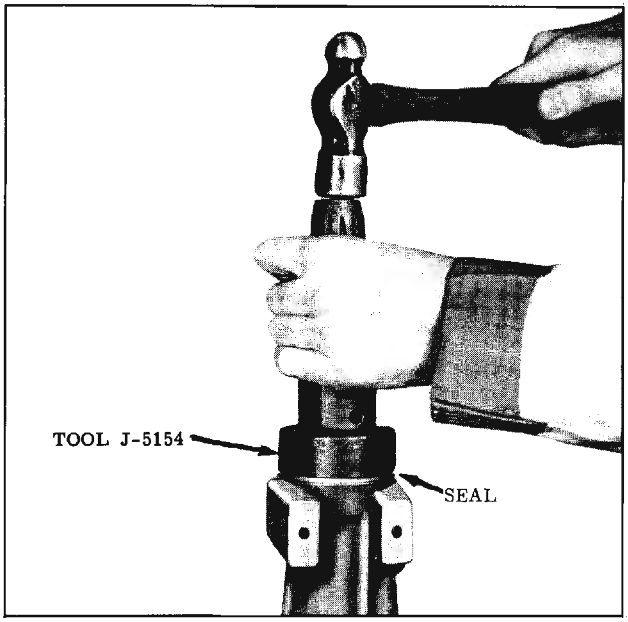


Fig. 11-26 Installing Rear Bearing Retainer Oil Seal

3. Install the seal into the rear bearing retainer using Seal Installing Tool J-5154. (Fig. 11-26)

Synchronizing Clutch

The synchronizing clutch detent springs are serviced separately and replacement, if necessary, can be accomplished by prying each spring loose from the gear and pushing it out of the groove. (Fig. 11-27) New springs can be installed by pushing them into position in the grooves.

Selector Shaft Seals

The selector shaft seals can be removed and replaced if necessary. Pry out the old seals from the case. Coat the sealing lip of the new seals with lubricant, Part No. 567196, coat the outer diameter of the seals with Sealer, Part No. 557622. Install the seal without the garter spring in the case using a tool such as a socket until it bottoms in the case. Install the seal, with the garter spring, toward the transmission until it is flush with the case.

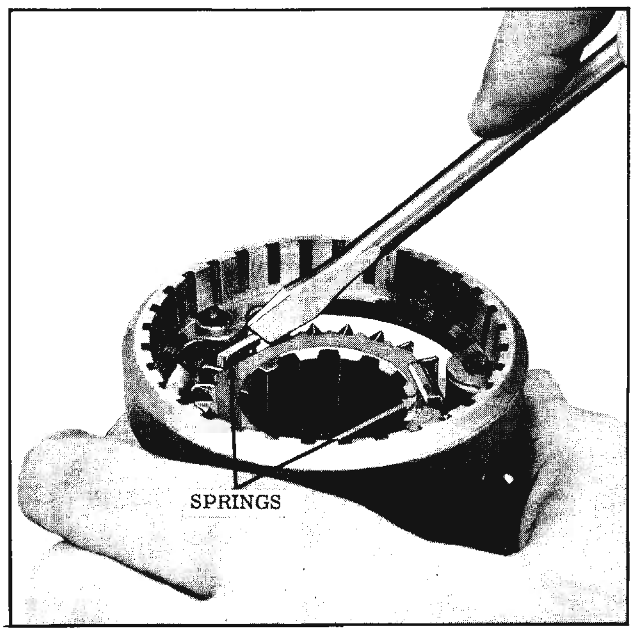


Fig. 11-27 Removing Synchronizing Clutch Springs

Reverse Idler Gear Bushings

The reverse idler gear bushings can be replaced if necessary. However, the new bushings must be line reamed after they are installed. Drive out the old bushings, then install the new ones until they are positioned just beyond the chamfer in the gear. New reverse idler gears contain bushings which are machined to size.

ASSEMBLY OF TRANSMISSION

1. Install the reverse idler gear as follows:

   a. Position the reverse idler gear and bronze thrust washers into the case (chamfered teeth to the rear of the case), then install the idler gear shaft (slotted end out) until the front of the shaft picks up the front thrust washer and just starts into the inner support in the case. (Fig. 11-28)

   b. Coat the protruding end (slotted) of the shaft with sealer Part No. 557622.

   c. Make sure the lock pin hole in the shaft is in line with the lock pin hole in the case. The slot in the end of the idler gear shaft is for this purpose. Finish driving the shaft into the case using a brass drift and a hammer.

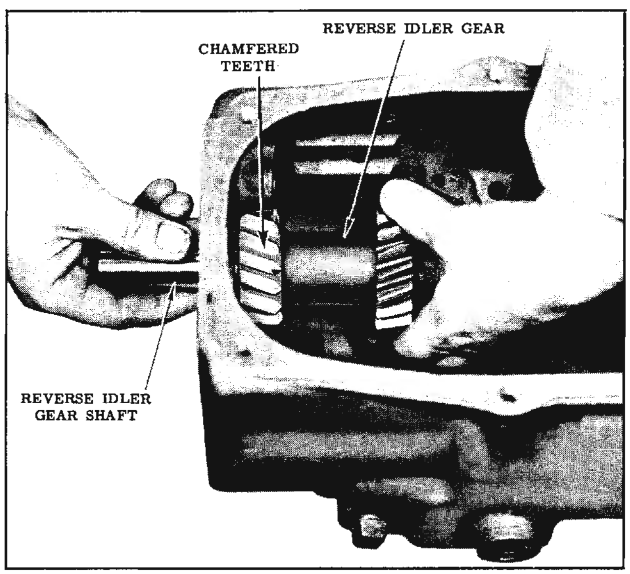


Fig. 11-28 Installing Reverse Idler Shaft

d. Coat a new lock pin with sealer Part No. 557622. Drive the lock pin 1" below the surface of the boss on the case.

2. Install the counter gear as follows:

a. Position the counter gear assembly into the case, with the large bronze thrust washer toward the front of the case.

b. Align the counter gear assembly with the counter gear shaft holes in the case. The tang of the combination steel and bronze thrust washer must index with the case. Install the counter gear shaft, small end first, from the rear of the case until the front end of the shaft just enters the bore in the front wall of the case. Make sure that the shaft closely follows the bearing loader Tool J-1001-A so that the bearings and thrust washers are held in place.

c. Line up the lock pin hole in the shaft with the lock pin hole in the case, then coat the protruding end of the shaft with sealer Part No. 557622. Finish driving the shaft into the case using a brass drift and a hammer.

d. Coat a new lock pin with sealer, Part No. 557622, and drive pin flush with case.

3. Install the spring washer, flat washer, and the oil seal on the inner selector shaft in that order, with the crowned side of the spring washer against the flat washer. (Fig. 11-29)

4. Apply lubricant Part No. 567196 to the inner selector shaft, insert the shaft in the transmission case, then install the seal, outer selector lever, washer, and nut so that the bend of the lever is down.

5. Install the main drive gear shaft into front of case. Install bearing retainer ring.

6. Install a new welch plug coated with sealer, Part No. 557622, in the side of the case opposite the selector shaft seals. The welch plug is seated when it bottoms in the bore in the case.

7. Install the selector shaft and shifter levers as follows: (Fig. 11-30)

a. Coat the sealing lips of the seals with lubricant, Part No. 567196, then insert the selector shaft through the seals until it just protrudes inside the case.

b. Engage the first and reverse shifter lever with the inner selector lever in the case, then depress the inner selector lever while sliding the selector shaft through the first and reverse shifter lever.

NOTE: The flat ground surface of the shifter lever must face left side of case.

c. Install the second and third shifter lever on the selector shaft, installing the flat ground surface of the lever toward the right side of case. Place the second and third speed interlock on the selector shaft. Install a new interlock retainer on the shaft. Do not install set screws at this time.

NOTE: The retainer can be installed and clinched with a pair of needle nose pliers.

8. Install the selector shaft interlock pin in the case. Move selector shaft until the interlock pin engages groove in selector shaft. (Fig. 11-30)

9. Install the spring and poppet ball for the first and reverse shifter shaft in the case, then install the shifter shaft from the rear of the case with the grooved end rearward and place the first and reverse shifter yoke on the shaft with the set screw hole facing up. Use a punch to depress the poppet ball and spring when

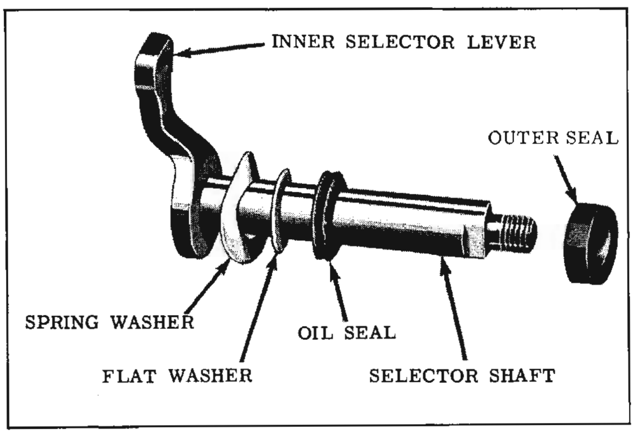


Fig. 11-29 Inner Selector Lever and Shaft

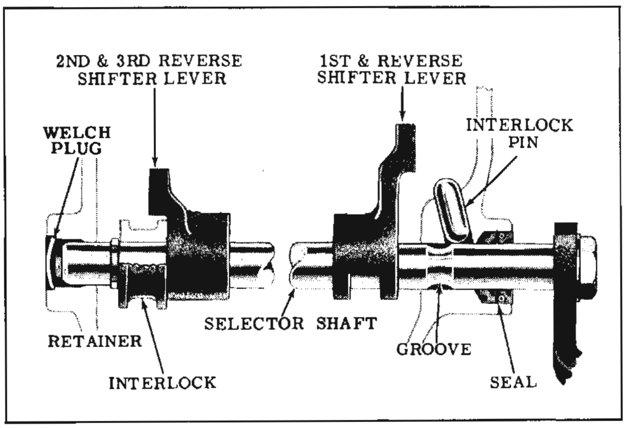


Fig. 11-30 Selector Shaft and Related Parts

installing the shaft. Do not install the set screw at this time.

10. Install the spring and poppet ball for the second and third speed shifter shaft in the case. Move selector shaft so that the second and third interlock will be directly under the second and third shifter shaft. Install the shaft from the front of the case with 3 notched detents rearward and place the second and third shifter yoke on the shaft with the set screw hole facing up. Do not install the set screw at this time.

11. Position first and reverse and the second and third shifter shafts so that the notch in each shaft is directly above the selector shaft.

    NOTE: This is the neutral position.

12. Install NEW set screws in the shifter levers and tighten with a screwdriver socket and torque 15 to 20 ft. lbs. Stake set screws to prevent loosening.

13. Install the outer shift lever, lock washer and bolt on the selector shaft.

14. Insert the main shaft through the bore in the rear of the transmission case, then slide the first and reverse gear on the shaft with flat side of the gear rearward. Install the first and reverse gear (thin) retaining ring in groove in spline.

15. Line up the small wire spacer ring in the ring groove in the main shaft with the machined thrust washer keyway groove on the second speed gear bearing surface. (Fig. 11-31)

    NOTE: There are two grooves machined the full length of the second speed gear bearing surface of the main shaft. The shallow angle groove is for lubrication purposes only and should not be obstructed. The deep groove, similar to a spline, is designed to receive the tangs of the two second speed gear thrust washers.

16. Install the second speed gear inner thrust washer, indexing the tang with the proper groove on the main shaft.

17. Place the second speed gear on the main shaft with the cone clutch surface facing forward, install outer thrust washer and retain with a NEW retaining ring.

18. Install the synchronizing drum on the main shaft with the counterbored end of the gear toward the second speed gear. (Fig. 11-32) Engage the synchronizing drum with the second and third speed shifter yoke and index the first and reverse shifter yoke, then tap the main shaft forward until it pilots in the main drive gear and the rear bearing pilots in the case.

19. Install the rear bearing retaining ring.

20. Install NEW set screws in the shifter yokes and tighten 15 to 20 ft. lbs. Stake set screws to prevent loosening.

    NOTE: These screws are deformed at the slotted end to provide a self-locking feature to prevent screws from loosening. This feature is lost if the screws are used a second time.

21. Coat the rear bearing retainer bushing with SAE 80 Multi-Purpose Gear Lubricant, then

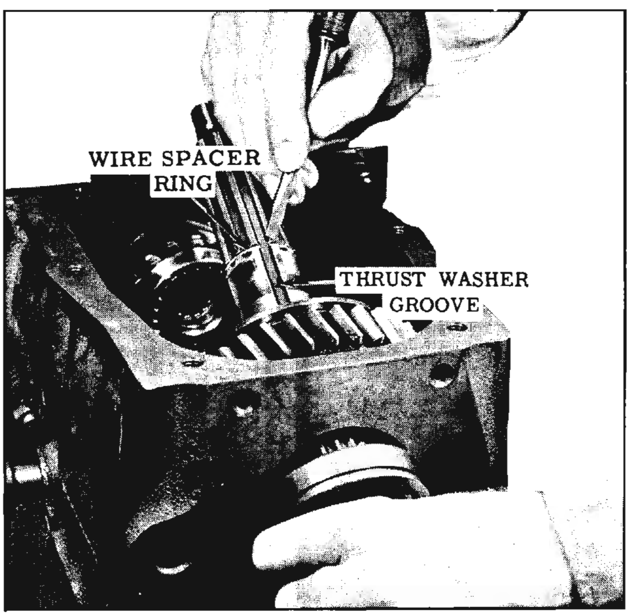


Fig. 11-31 Lining Up Wire Spacer Ring

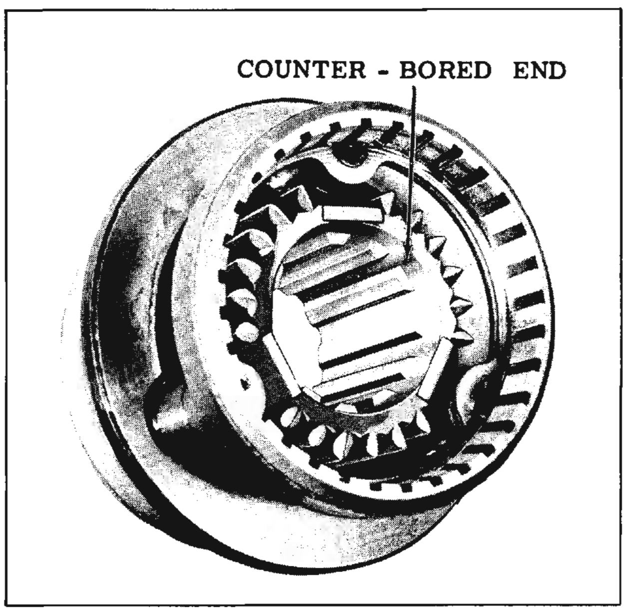


Fig. 11-32 Synchronizing Drum

position a new rear bearing retainer gasket and the rear bearing retainer on the transmission case.

22. Apply sealer, Part No. 557622 on the rear bearing retainer screws. Install the screws and tighten 28 to 33 ft. lbs.

23. Coat the sealing lip of the rear bearing retainer oil seal with lubricant Part No. 567196. Coat the outer diameter of the seal with sealer, Part No. 557622.

24. Install the seal into the rear bearing retainer using Seal Installing Tool J-5154.

25. Position a new top cover gasket on the transmission case and install the top cover, spring clip, attaching screws and lock washers. Torque screws 10 to 12 ft. lbs.

26. Install the toggle spring and spring extension between the spring clip and the outer shift lever.

To install the transmission, apply a light film of lubricant, Part No. 567196, to the pilot on the main drive gear. Reverse the removal sequence and torque the transmission to clutch housing bolts 60 to 70 ft. lbs. Install propeller shaft and torque universal joints to differential companion flange 14 to 18 ft. lbs. Remove the hex plug from the rear bearing retainer and fill the rear bearing retainer with 1/2 pint of SAE 80 Multi-Purpose Gear Lubricant. (This will eliminate any chance of the rear bearing retainer bushing running dry until enough oil passes through the main shaft bearing to fill the rear bearing retainer.) Install the hex plug and torque 6 to 8 ft. lbs. Fill the transmission to the level of the filler plug hole with SAE 80 Multi-Purpose Lubricant (approximately 2 pints additional).

CLUTCH HOUSING ALIGNMENT

(WITH TRANSMISSION AND CLUTCH ASSEMBLY REMOVED)

If any of the following conditions arise, a misaligned flywheel housing is indicated.

1. Excessive gear noise.
2. Transmission jumps out of third gear.
3. Early bearing failure.

FACE RUNOUT (Fig. 11-33)

NOTE: It is not necessary to have the lower flywheel housing in place when checking face and radial runout.

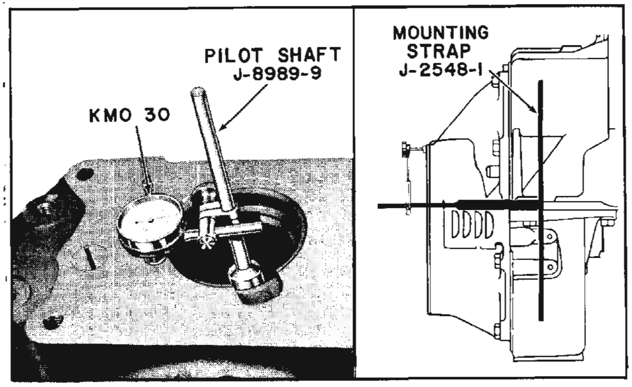


Fig. 11-33 Checking Face Runout

1. Install Pilot Mounting Strap J-5248-1 on flywheel.
2. Install Pilot Shaft J-8989-9 to mounting strap. Mount Dial Indicator KMO-30 (with a large contact button) on the shaft.
3. Tap crankshaft to the rear of the engine.
4. Bring the indicator into contact with the face of the housing with approximately .015" compression. The point of contact should be 2-1/4" from the center of the crankshaft.
5. Rotate the flywheel through 360° (Tool J-972-A may be used to rotate flywheel) and note the indicator reading. If the total indicator reading exceeds .003", shim as necessary between the housing and the engine block.

RADIAL RUNOUT (Fig. 11-34)

1. Assemble Dial Indicator KMO-30 so that the lever rides in the bore of the housing with approximately .015" compression.
2. Position the indicator at (A) and set the dial at zero. Rotate the flywheel until indicator is at (B) and note indicator reading. Indicator

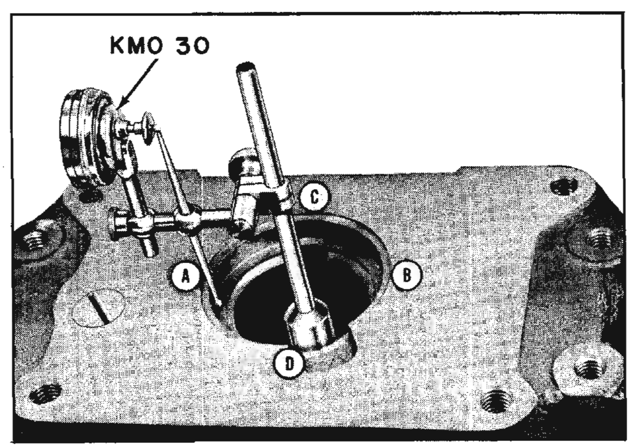


Fig. 11-34 Checking Radial Runout

reading at (B) must not be more than .004" on either side of the initial reading, indicating that the center of housing bore is within .002" on either side of crankshaft.

3. Position the indicator lever at the top of the bore (C) with the dial set at .000". Rotate the flywheel until the indicator is at (D). Reading must be between .000" to + .008", indicating the center of housing bore is .000" to .004" below center of crankshaft.

4. If readings are not within specifications, it will be necessary to remove the clutch housing and the dowel pins.

   NOTE: Saw off the dowel pins close to the block before driving pins through; otherwise, the pins will strike the flywheel before clearing the dowel pin holes.

5. Install the clutch housing and recheck radial runout as outlined under steps 1 through 3. If dial indicator readings are not within specifications, loosen the clutch housing to block cap screws slightly, then shift the housing to bring within limits. After aligning housing again tighten housing attaching bolts and recheck radial runout.

6. Using Reamer J-4832-3 (roughing reamer) and Ratchet Wrench J-808-6, ream the two engine block to clutch housing dowel pin holes. Then finish ream using Reamer J-4832-4 and install oversize dowel pins, Part No. 557754 (large chamfer end out).

   NOTE: The above reamers must be shortened to 4" overall length in order to perform this operation with engine in the car.

7. Clean all cuttings from housing.

8. Remove dial indicator set-up.

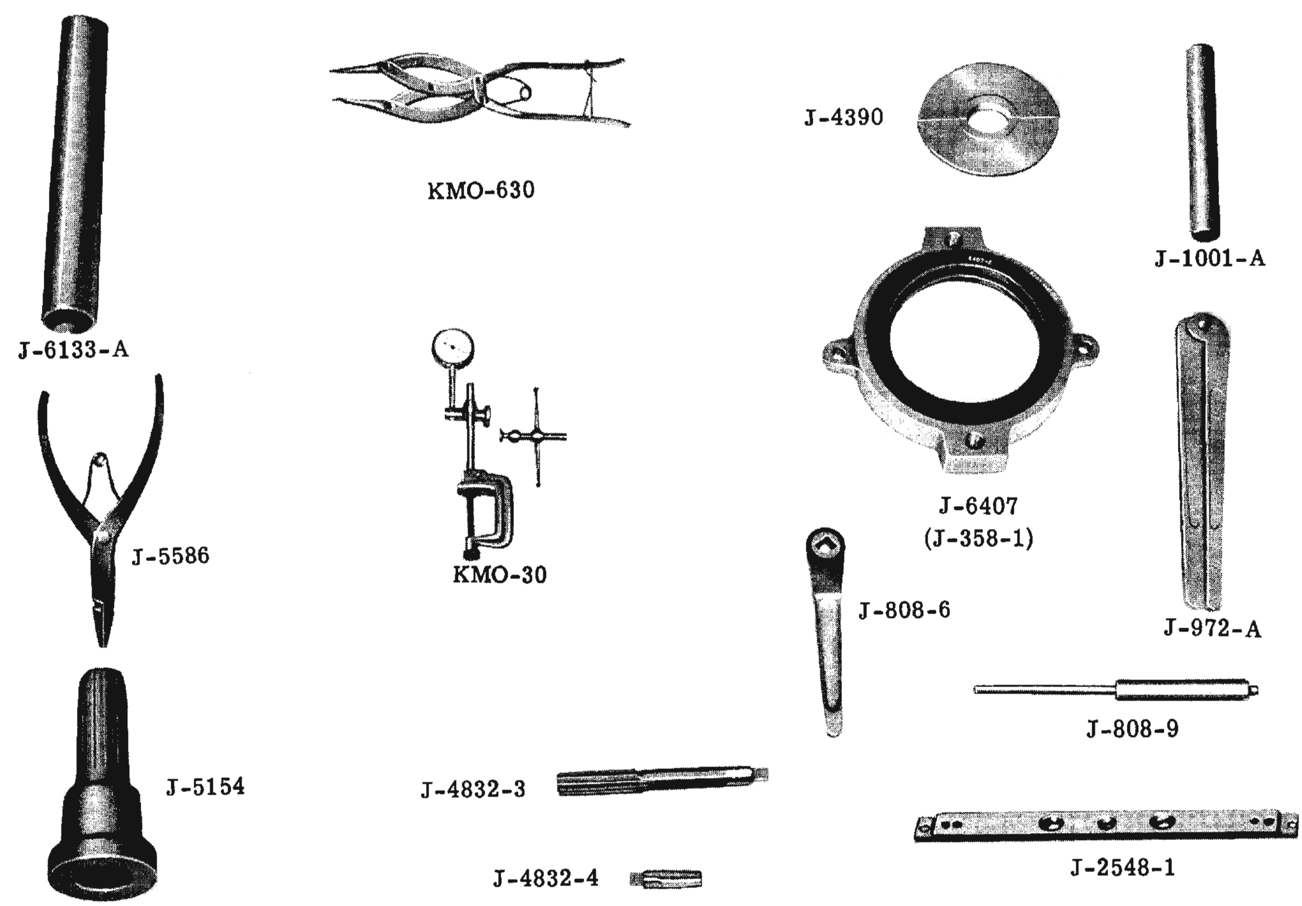
SYNCHROMESH TRANSMISSION SPECIFICATIONS

CAPACITY	2-1/2 Pts.
GEAR RATIOS	
1st	2.15:1
2nd	1.37:1
3rd	Direct
Rev	2.28:1

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified minimum.

Application	Ft. Lbs.
Transmission to Clutch Housing Bolts	60 to 70
Cover Bolts	10 to 12
Rear Bearing Retainer Bolts	28 to 33
Hex Plug (Rear Bearing Retainer)	6 to 8
Shifter Lever and Yoke Set Screws	15 to 20



KMO-30	Dial Indicator Set
KMO-630	Snap Ring Pliers
J-808-6	Ratchet Handle
J-808-9	Pilot Shaft
J-972-A	Differential Adjusting Nut Wrench (Used to Turn Flywheel)
J-1001-A	Needle Bearing Loader
J-2548-1	Flywheel Housing Alignment Tool Set
J-4390	Speedometer Gear Remover and Installer (Used as Mainshaft Bearing Installer)
J-4832-3	Roughing Reamer
J-4332-4	Finish Reamer
J-5154	Rear Bearing Retainer Seal Driver
J-5586	Snap Ring Pliers
J-6133-A	H. M. Rear Oil Pump Bearing and Speedometer Gear Installer
J-6407 (J-358-1)	Press Plate Holder

Fig. 11-35 Synchromesh Tools

CLUTCH

PERIODIC MAINTENANCE

The clutch linkage should be lubricated with SAE 20 engine oil at each engine oil change interval. The clutch pedal free travel should also be checked at this time.

The clutch release bearing should be lubricated sparingly with a sodium soap, fine fiber grease whenever the transmission is removed or major clutch service is required.

GENERAL DESCRIPTION (Fig. 11-51)

The single plate, dry disc clutch is mounted with a free sliding fit on the splines of the Synchromesh Transmission mainshaft. Engagement of the clutch is accomplished by a spring loaded pressure plate.

When the clutch pedal is depressed, the clutch release yoke moves the release bearing forward on the transmission bearing retainer sleeve until the bearing moves the inner end of the release levers. The release levers pivot at yokes (attached to the cover plate) and overcome the pressure spring force to move the pressure plate rearward to disengage the driven plate.

When the clutch pedal is released, the pressure springs compress the driven plate between the pressure plate and the flywheel to engage the clutch. The engagement of the clutch is cushioned by springs mounted between the facing discs of the clutch plate. As the speed of the engine increases, the weighted outer ends of the release levers, through centrifugal force, add to the spring force exerted on the driven plate, thereby increasing clutch pressure and increasing the clutch torque capacity.

Torsional vibrations from the engine are prevented from being transmitted to the transmission by coil springs mounted in the hub of the driven plate. Balance is obtained by means of narrow sheet metal strips crimped around the webs of the driven disc.

CLUTCH LINKAGE (Fig. 11-52)

The clutch linkage consists of the clutch pedal, pedal to bellcrank pedal rod, pedal bellcrank to clutch release bellcrank rod and the clutch release bellcrank to release yoke rod.

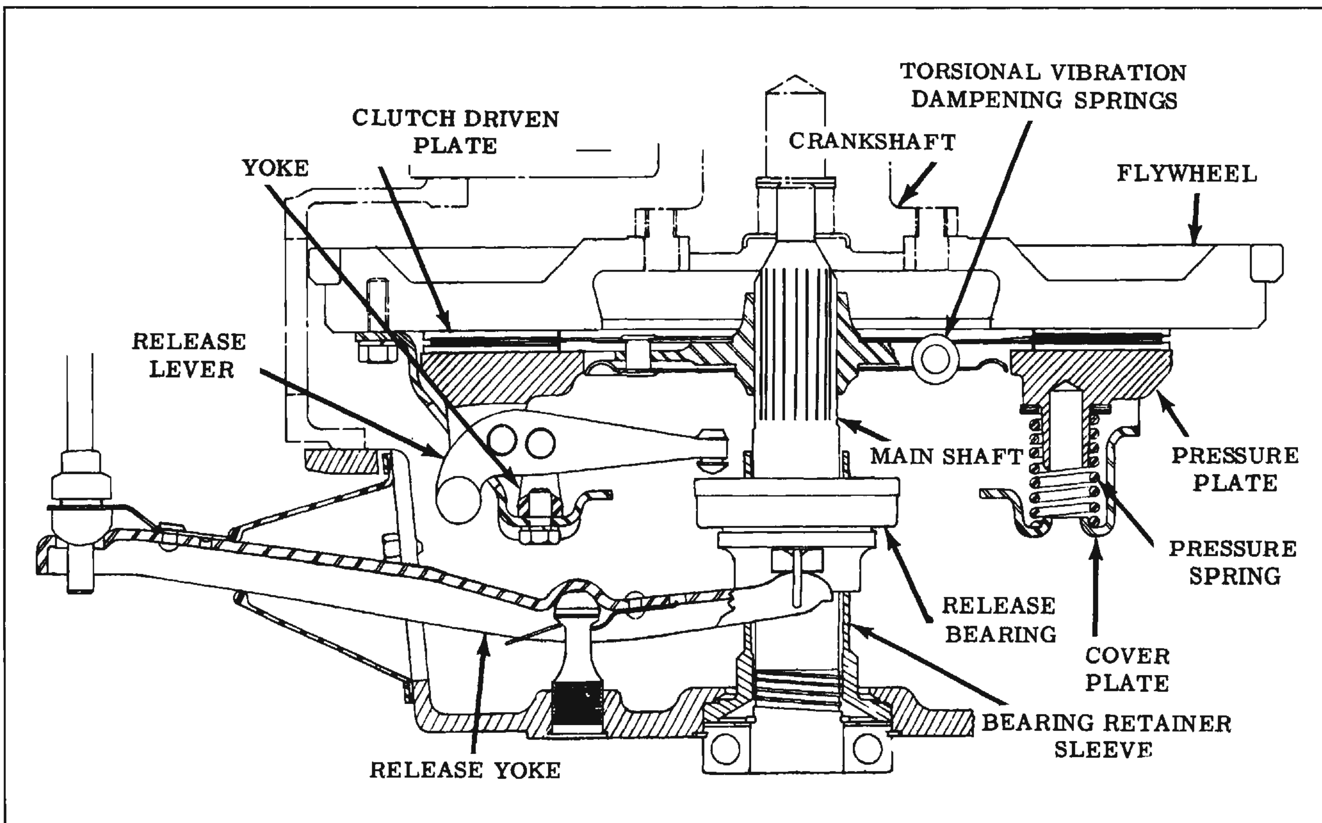


Fig. 11-51 Clutch Assembly

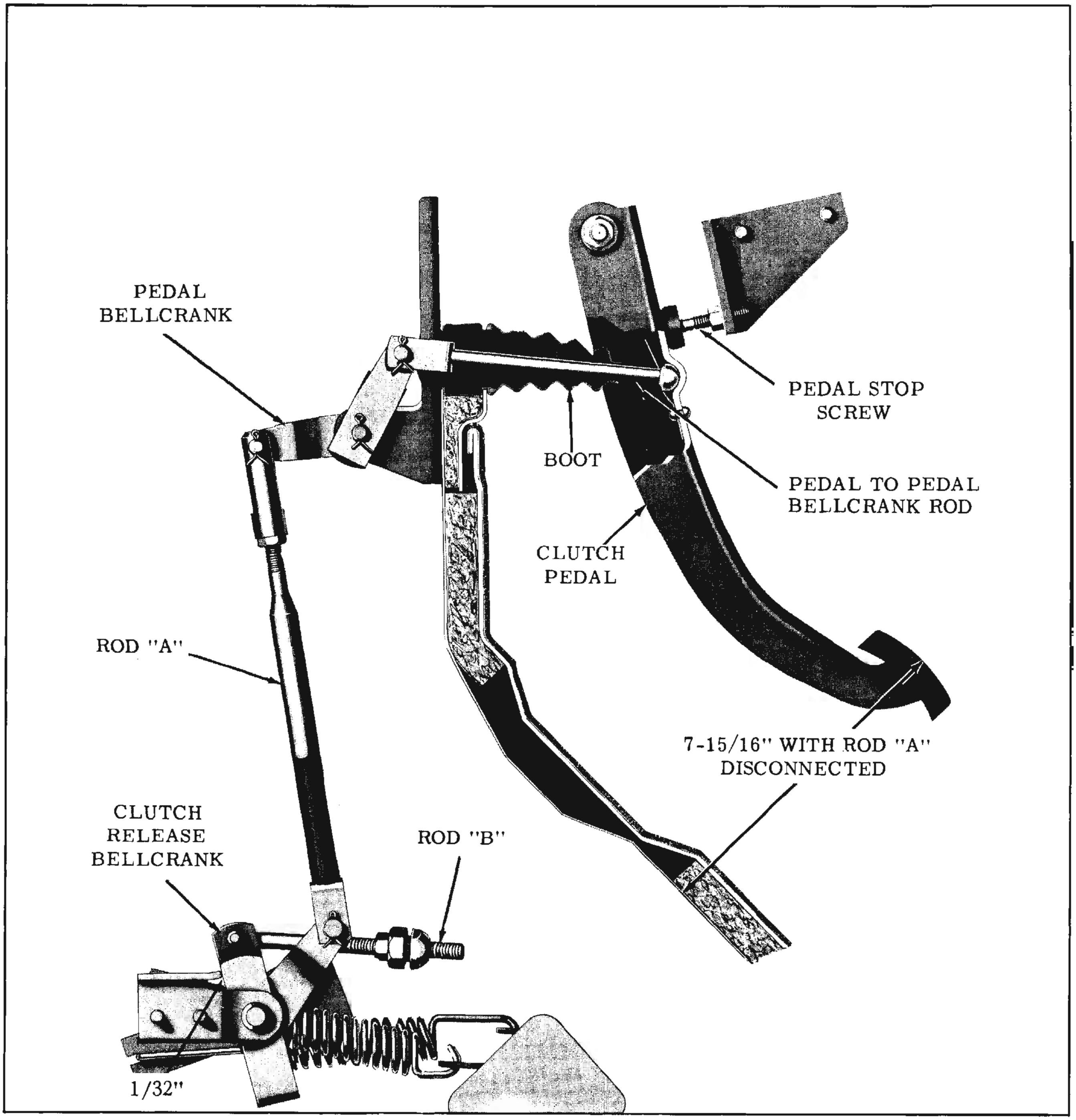


Fig. 11-52 Clutch Linkage

MINOR SERVICE OPERATIONS

CLUTCH PEDAL

REMOVE AND INSTALL

1. Remove cotter pin, clevis pin and spring washer from clutch pedal to pedal bellcrank rod.

2. Remove nut, washer and spring washer from clutch pedal pivot shaft.

3. Slide clutch pedal from pivot shaft and disconnect clutch pedal rod from pedal.

To install, lubricate nylon bushings and pedal rod ball socket with lubricant Part No. 567196 and reverse removal procedure. Torque pivot shaft nut 10 to 18 ft. lbs.

ADJUSTMENTS

CLUTCH LINKAGE (Fig. 11-52)

1. Turn back floor mat and adjust clutch pedal

bumper until the top of the pedal pad is 7-15/16" from the floor pan.

NOTE: Clutch pedal height of 7-15/16" must be obtained with clearance between the clutch release bellcrank and its stop.

2. Remove cotter pin, clevis pin and spring washer from clevis at upper end of rod "A".
3. Move spherical nut on rod "B" forward until the clutch release yoke is free.
4. With the pedal bellcrank in the raised position, adjust clevis on rod "A" until holes in the clevis line up with the hole in the bellcrank.
5. Lengthen rod "A" by turning clevis approximately three turns, then install rod "A" into bellcrank.
6. Check clearance between clutch release bellcrank and stop. Clearance should be 1/32".
7. Rotate spherical nut until 1" to 1-1/4" free pedal travel is obtained.

CLUTCH—REMOVE AND INSTALL

(Transmission Removed)

1. Remove transmission bearing retainer sleeve.
2. Remove the right and left lower flywheel housing bolts.
3. Disconnect adjustable rod at yoke.
4. Support rear of engine using Engine Support Tool 30-16. Remove the engine rear mount bolts at the clutch housing, then remove frame cross member.
5. Remove remaining bolts securing clutch housing to flywheel housing and remove clutch housing and release yoke.
6. Mark flywheel and clutch cover for correct positioning at reassembly.
7. Alternately loosen the 6 clutch cover to flywheel attaching bolts one or two turns at a time so as not to distort the cover, then remove clutch assembly.

To install, reverse sequence of operations. Seal the area between the bearing retainer sleeve and the clutch housing as shown in Fig. 11-53. Use an old transmission drive gear to align clutch disc while tightening clutch to flywheel. Repack reservoir behind the crankshaft pilot bearing with 1/4 ounce (level tablespoonful) of front wheel bearing grease. Lubricate bearing surface of release

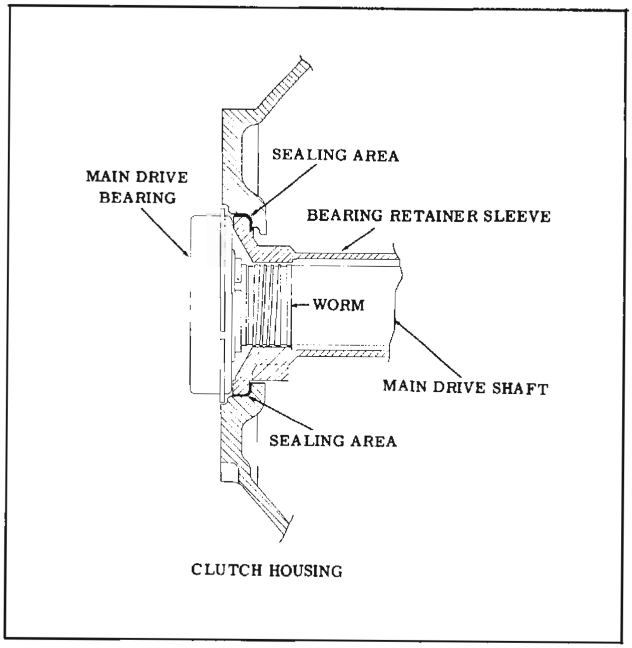


Fig. 11-53 Sleeve Installation

levers with front wheel bearing grease. Adjust transmission and clutch linkage. Lubricate clutch release bearing as outlined under PERIODIC MAINTENANCE.

INSPECTION

1. Inspect the clutch driven plate for broken or distorted torsion springs and worn, loose or oily facings. If any of these conditions exist, install a new clutch plate assembly.
2. Inspect the pressure plate and cover assembly for scores or cracks. If the pressure plate springs have been overheated, the paint will be burned off or they will show a pronounced blue color indicating the temper has been drawn. If any defects are found, the pressure plate and cover must be replaced as an assembly.

ADJUSTMENT OF CLUTCH RELEASE LEVERS

1. Before adjustment of clutch release levers is attempted, levers must be worked several times to center the bearings.
2. Place Gauge J-1048 on a flywheel in the position normally occupied by the driven plate.
3. Mount pressure plate assembly to flywheel, alternately tightening attaching screws one or two turns at a time so as not to distort pressure plate assembly cover.
4. Lay a short straight edge across the center boss of the gauge as a guide for positioning release levers. (Fig. 11-54)

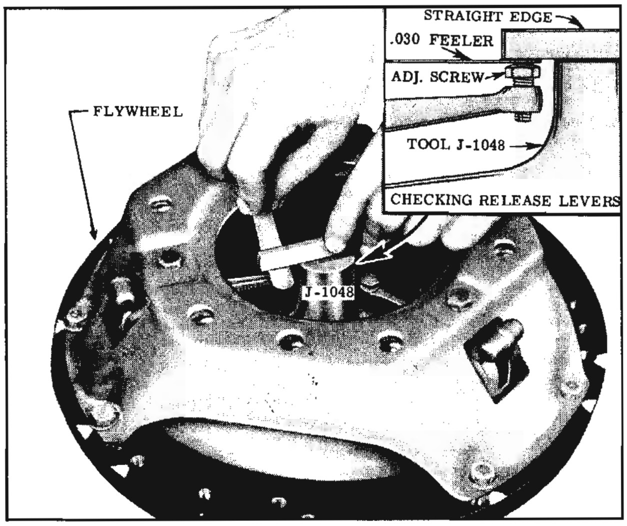


Fig. 11-54 Checking Release Levers

5. The level of bearing surfaces on all lever adjusting screws should be from .000" to .062" below the level of the gauge center boss, and each lever should lie within .031" of the other two levers.

6. If the levers are more than .031" out of plane or do not lie within .000" to .062" below the center boss, it will be necessary to adjust the release lever screws as follows:

   a. Using a standard hack-saw blade, remove the original stakes from the required release lever adjusting screws.

   b. Adjust screw (or screws) until all levers are within .031" of each other and lie not more than .062" below the level of the gauge center boss.

   c. With head of screw resting on a solid block, use a blunt chisel to restake the screws to the lever.

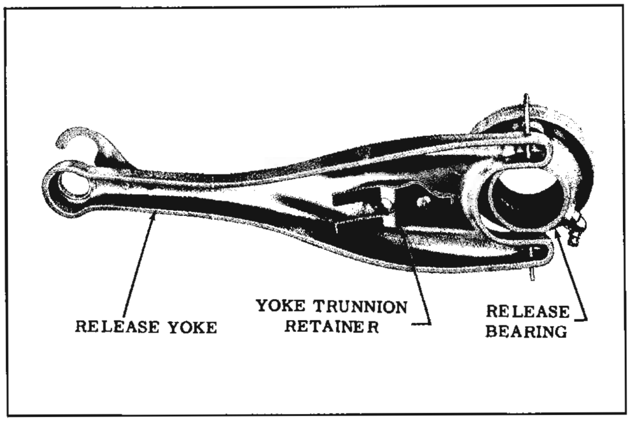


Fig. 11-55 Clutch Yoke Assembly

   d. Recheck release lever adjustment as outlined in steps 1 through 5.

RELEASE YOKE, REMOVE AND INSTALL (Fig. 11-5)

To remove the clutch release yoke, proceed as follows:

1. Remove transmission and bearing retainer sleeve.

2. Disconnect adjusting rod from yoke.

3. Remove the clutch housing.

4. Snap yoke off ball stud by pushing in on end of yoke, then remove yoke.

To install, reverse sequence of removal operations. Lubricate clutch release bearing as outlined in the Lubrication Section. Lubricate clutch release yoke trunnion with lubricant, Part No. 567196. Check and adjust clutch linkage. (Refer to Clutch Linkage Adjustment)

CLUTCH SPECIFICATIONS

1. DISC FACINGS
   - a. Area - Total Square Inches 56.5
   - b. Diameter - Inside . . . . . 7"
   - c. Diameter - Outside . . . . . 11"
   - d. Number Used 2
   - e. Thickness . . . . . .136"
2. DRIVEN DISC ASSEMBLY
   - a. Overall Thickness (Clutch Engaged) . . . . . .315"
3. PEDAL FREE TRAVEL . . . . . 1" to 1-1/4"
4. PEDAL HEIGHT . . . . . 7-15/16"
5. PRESSURE SPRINGS
   - a. Number Used 9
   - b. Compression Pressure - lbs. . . . . . 209 at 1-47/64"
     - 1. Color . . . . . Aluminum Paint
6. RELEASE BEARING
   - a. Thickness . . . . . .665"
   - b. Type . . . . . Ball

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified minimum.

Application	Ft. Lbs.
Clutch to Flywheel Bolts	14 to 17
Clutch Release Ball Stud	35 to 40
Clutch Housing to Block Bolts	50 to 55
Rear Engine Mount to Clutch Housing Bolts	45 to 60
Frame Cross Member Bolts	45 to 65
Frame Cross Member to Rear Engine Mount	45 to 60

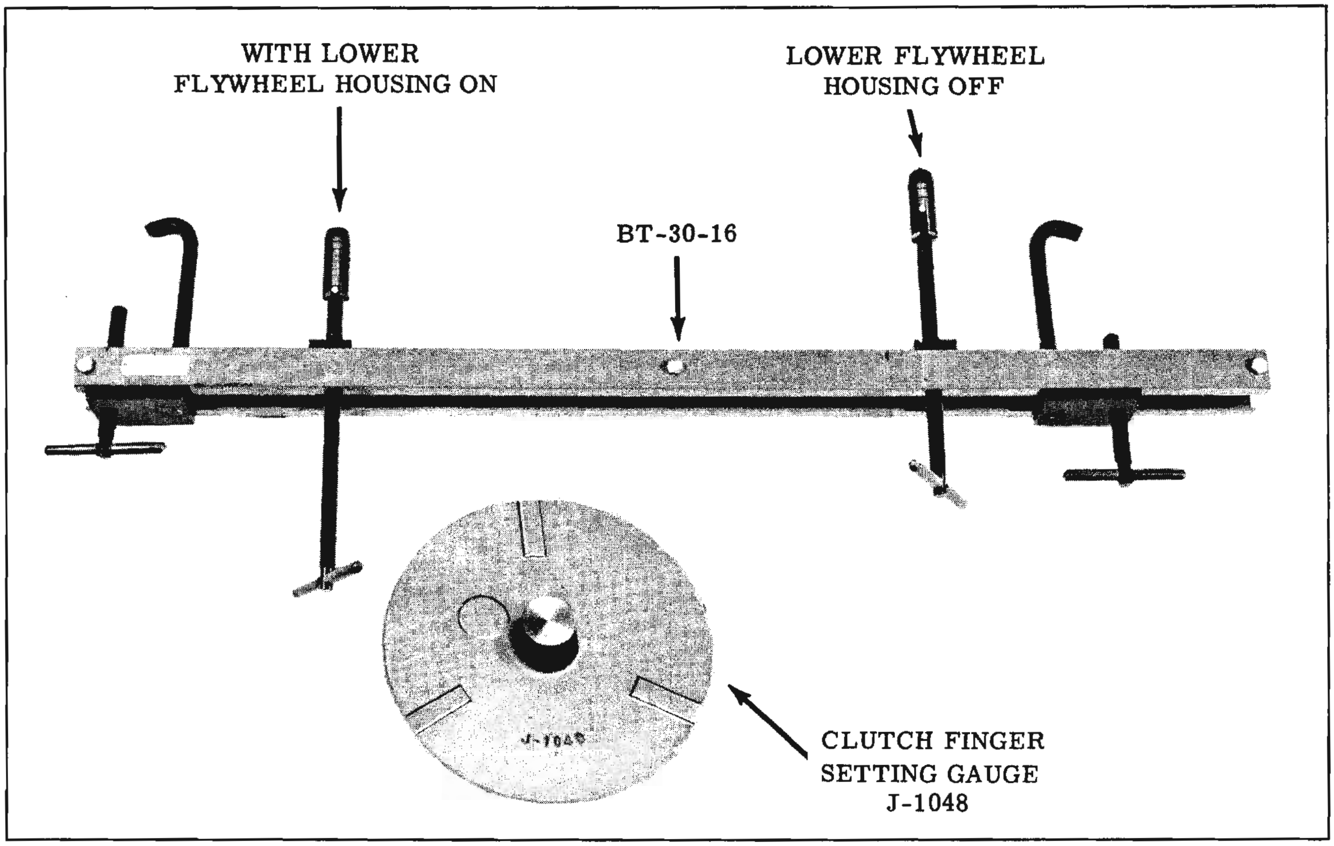


Fig. 11-56 Clutch Tools

SYNCHROMESH AND CLUTCH

(F-85)

CONTENTS OF SECTION 11

THREE-SPEED SYNCHROMESH TRANSMISSION

FOUR-SPEED SYNCHROMESH TRANSMISSION

CLUTCH

THREE-SPEED SYNCHROMESH TRANSMISSION

MAINTENANCE RECOMMENDATIONS

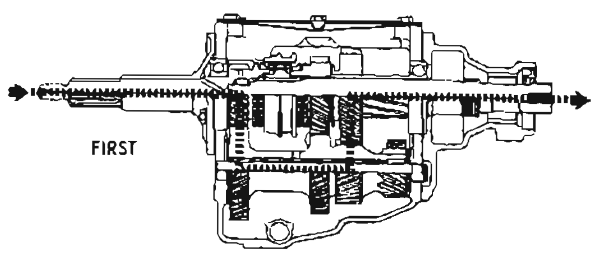
Clean dirt from around filler plug, and check the lubricant level every oil change interval. If level is low, inspect the transmission for leaks and correct any leaks found. Fill the transmission to the level of the filler plug opening with S.A.E. 80 or 90 Multi-Purpose Gear Lubricant. Seasonal change of the Synchromesh transmission lubricant is not recommended. The capacity of the transmission is 2-1/2 pints. It is important that the shift linkage be properly adjusted.

DESCRIPTION

A three-speed Synchromesh transmission (Figs. 102 and 103) is used as standard equipment. The main drive gear is supported by a heavy duty ball bearing at the front end of the transmission case. The main drive gear shaft is piloted at its front end in an oil impregnated bushing in the engine crankshaft. The front end of the main shaft is piloted in a set of roller bearings set into the hollow end of the main drive gear and the rear end is carried by a ball bearing mounted in the rear of the case.

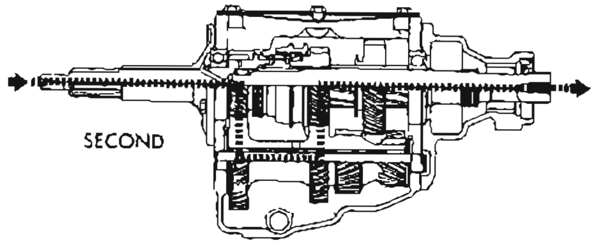
The countershaft cluster gear is carried on roller bearings at both ends while thrust is taken by thrust washers located between each end of the countergear and the case. Retaining washers and a tubular spacer maintain the positioning of the countergear bearing rollers.

The reverse idler gear is carried on ball indented bronze bushings on the reverse idler gear shaft. Gearshifting is manual through a concentric steering column gearshift mechanism to the transmission shift lever shafts located on the side of the transmission. Shifting is accomplished by two yokes which directly engage the gears to be shifted.



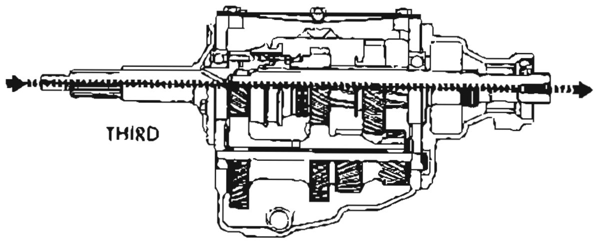
Operation in First - The first and reverse gear is moved forward on the main shaft splines so that it engages its corresponding gear on the counter gear. The second speed gear and reverse idler gear are idling.

First Gear 2.571:1



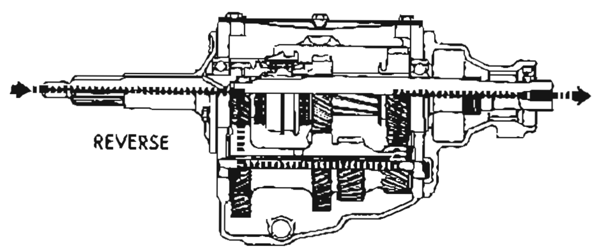
Operation In Second - The clutch sleeve is moved rearward on the synchronizer hub so that it first synchronizes the spread of the second speed gear, then engages the projecting teeth on the second speed gear. The first and reverse and reverse idler gears are idling.

Second Gear 1.550:1



Operation in Third - The clutch sleeve is moved forward on the synchronizer hub so that it first synchronizes the speed of the drive gear, then engages the projecting teeth on the main drive gear. Counter gear, second speed gear, first and reverse gear and reverse idler gear are idling.

Third Gear 1:1



Operation in Reverse - The first and reverse gear is moved rearward on main shaft splines so that it engages the reverse idler, which is in constant mesh with a corresponding gear on the counter gear. The idler gear reverses the direction of rotation of the complete drive train in the rear of the reverse idler. Second speed gear is idling.

Reverse Gear 3.489:1

Fig. 11-101 Power Flow Through 3-Speed Synchromesh Transmission

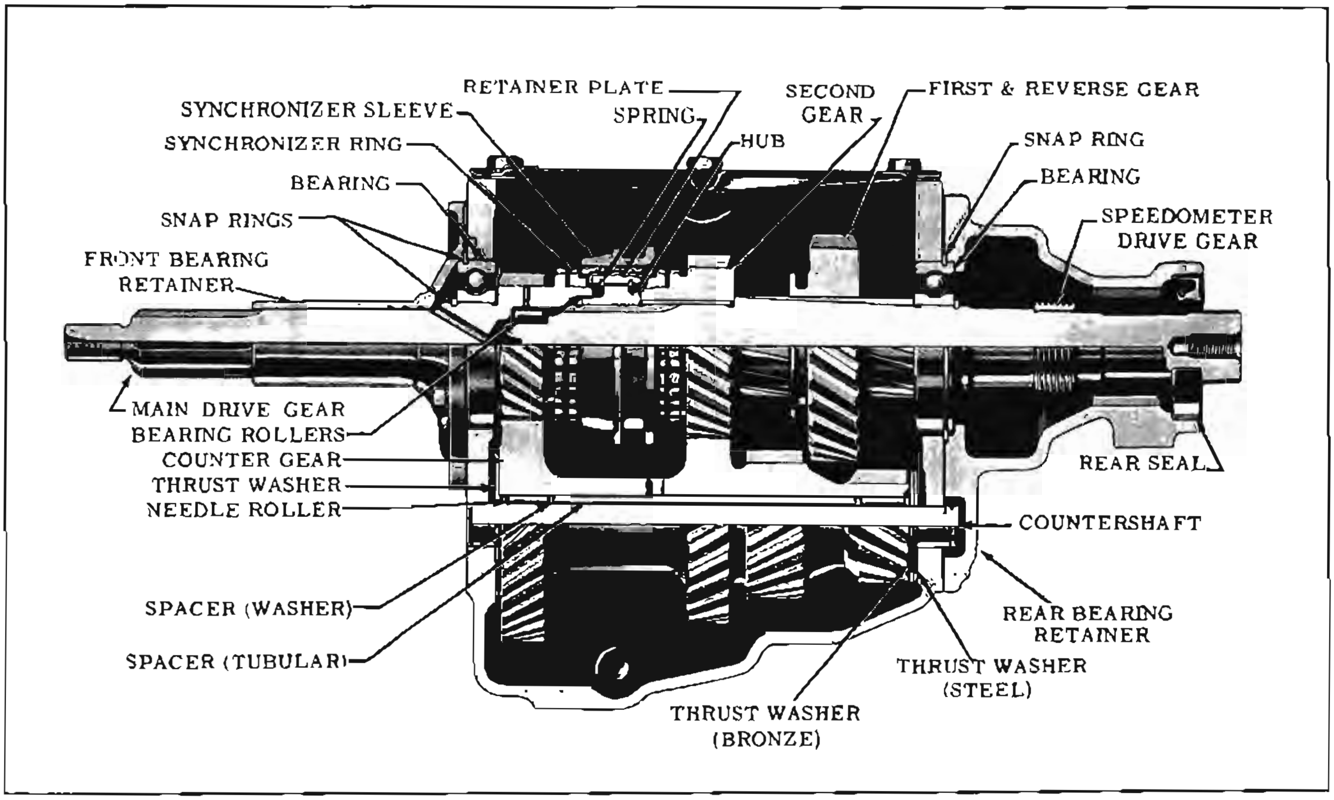


Fig. 11-102 Cross Section (Side View)

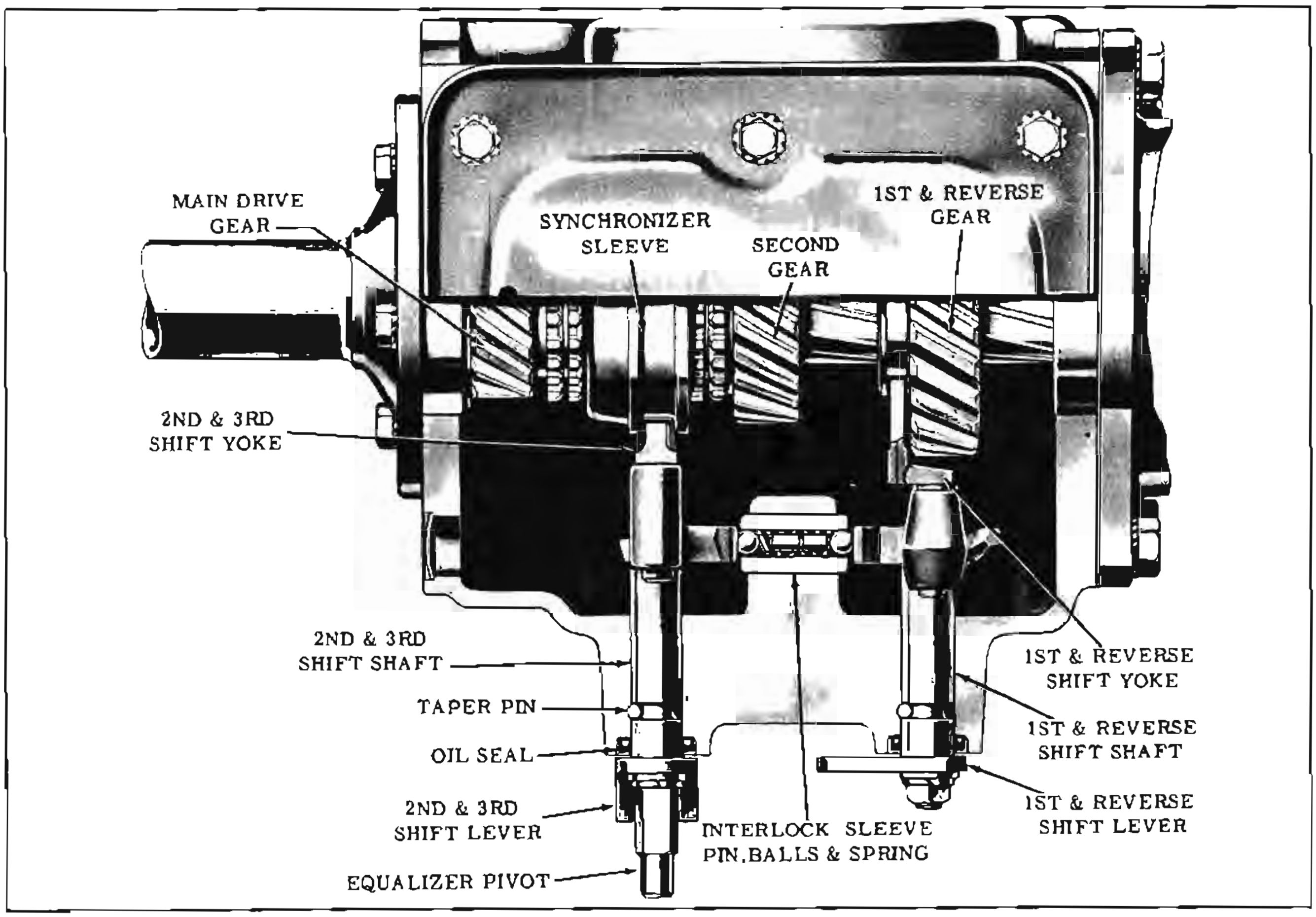


Fig. 11-103 Cross Section (Top View)

SHIFT LINKAGE ADJUSTMENT

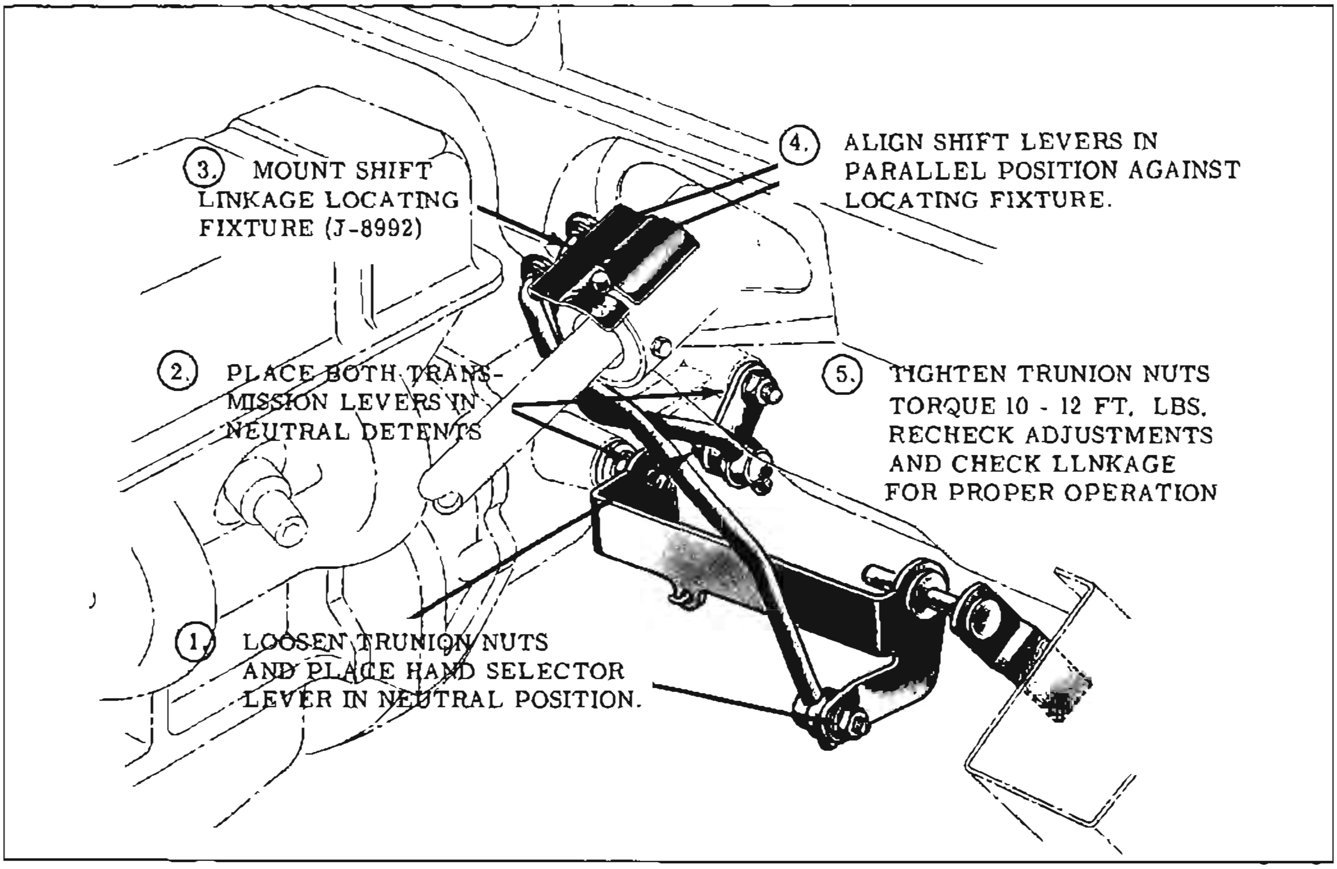


Fig. 11-104 Shift Linkage Adjustment

COMPANION FLANGE

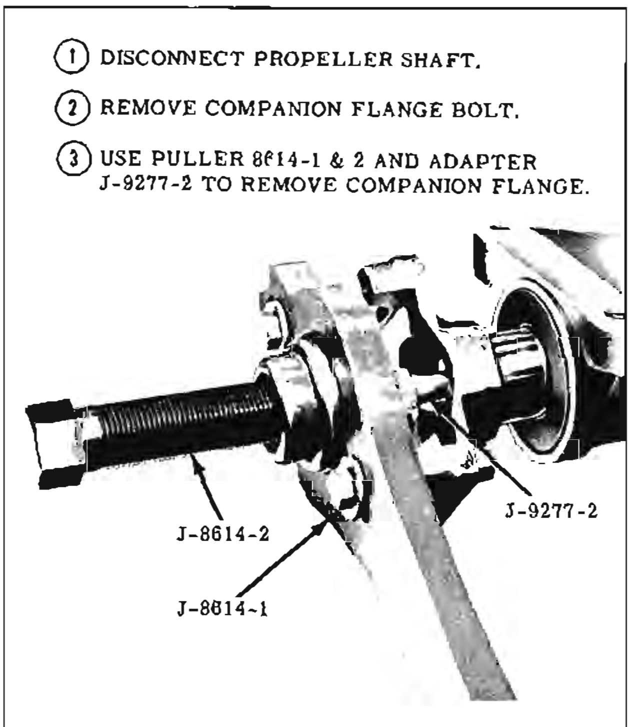


Fig. 11-105 Companion Flange Removal

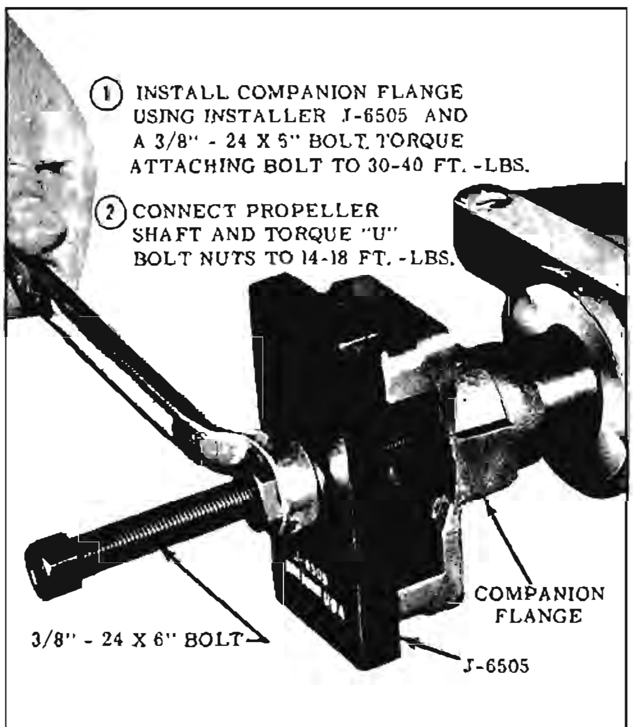


Fig. 11-106 Companion Flange Installation

REAR OIL SEAL

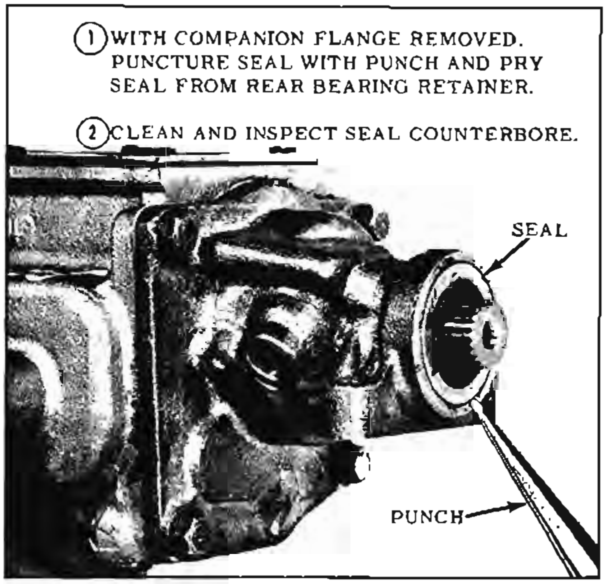


Fig. 11-107 Rear Oil Seal Removal

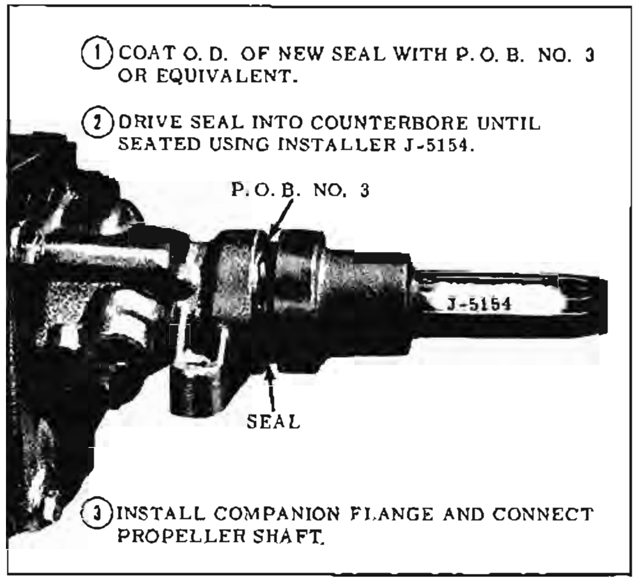


Fig. 11-108 Rear Oil Seal Installation

SHIFT LEVER SHAFT SEALS

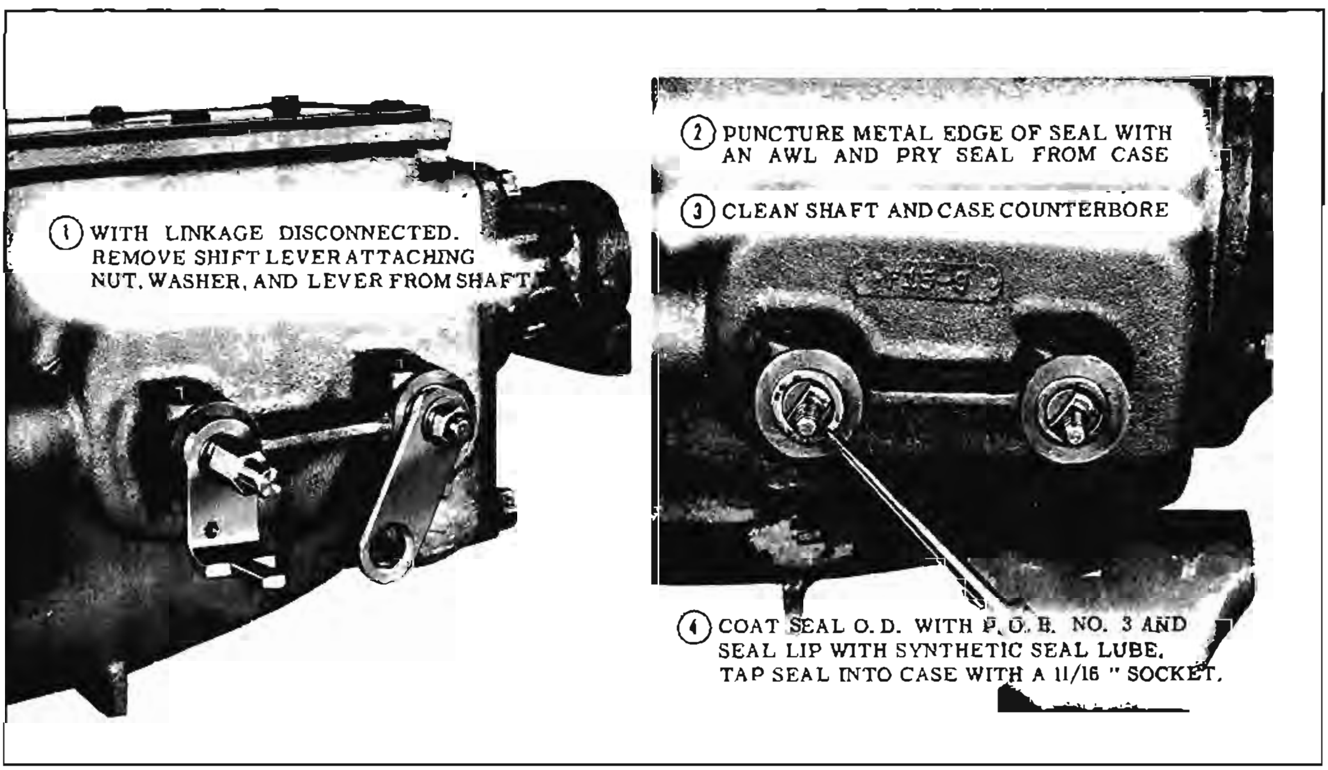


Fig. 11-109 Shift Lever Shaft Seal Removal and Installation

SPEEDOMETER DRIVEN GEAR

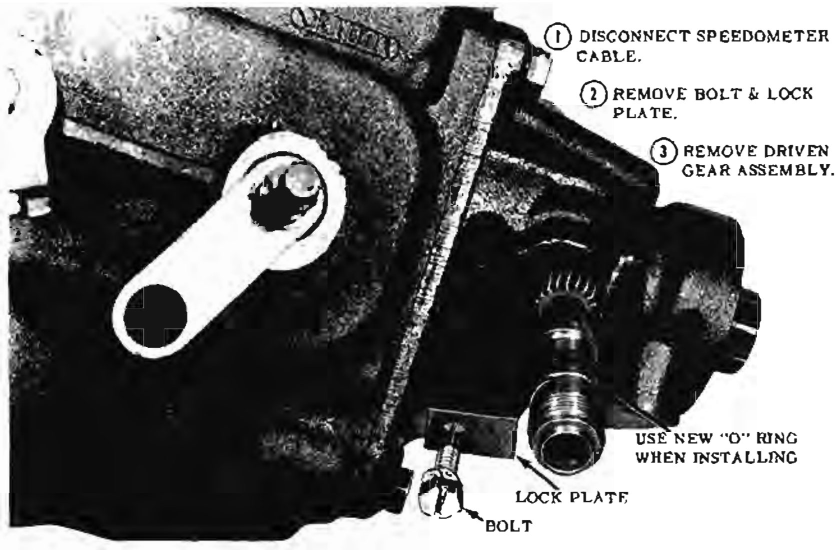


Fig. 11-110 Speedometer Driven Gear

TRANSMISSION REMOVAL

(1) DISCONNECT SHIFT RODS AND SPEEDOMETER CABLE.

(2) DISCONNECT PROPELLER SHAFT FROM TRANSMISSION REAR COMPANION FLANGE.
NOTE: DO NOT LET FRONT SECTION OF PROPELLER SHAFT FALL LOOSE. MOVE TO SIDE AND TIE TO EXHAUST PIPE TO AVOID DAMAGE TO CENTER JOINT BALL AND SEAT.

(3) SUPPORT REAR OF ENGINE AND REMOVE REAR TRANSMISSION MOUNT.

(4) REMOVE THE TRANSMISSION TO CLUTCH HOUSING BOLTS AND REMOVE THE TRANSMISSION.

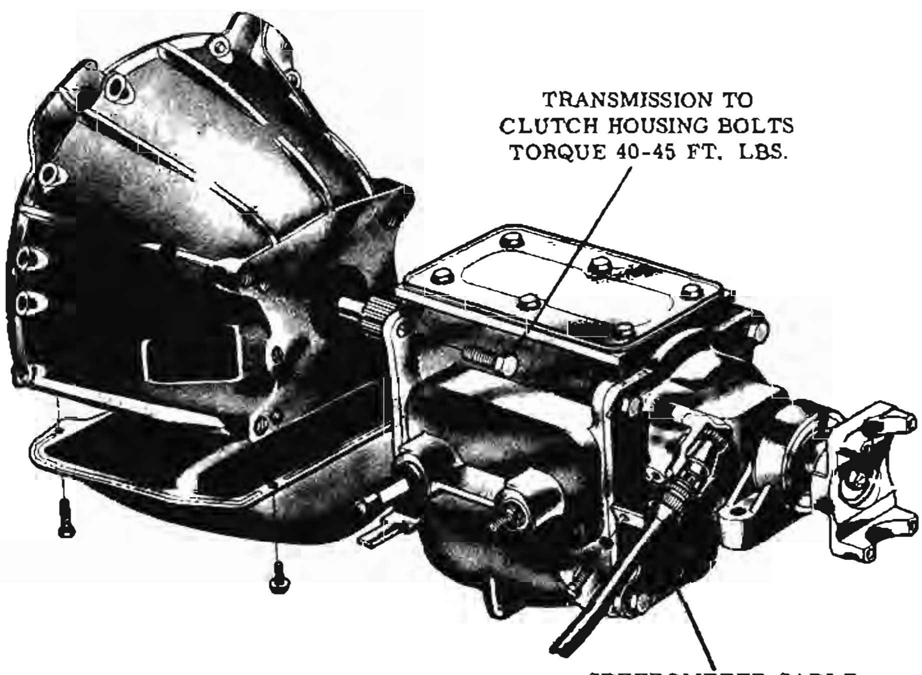
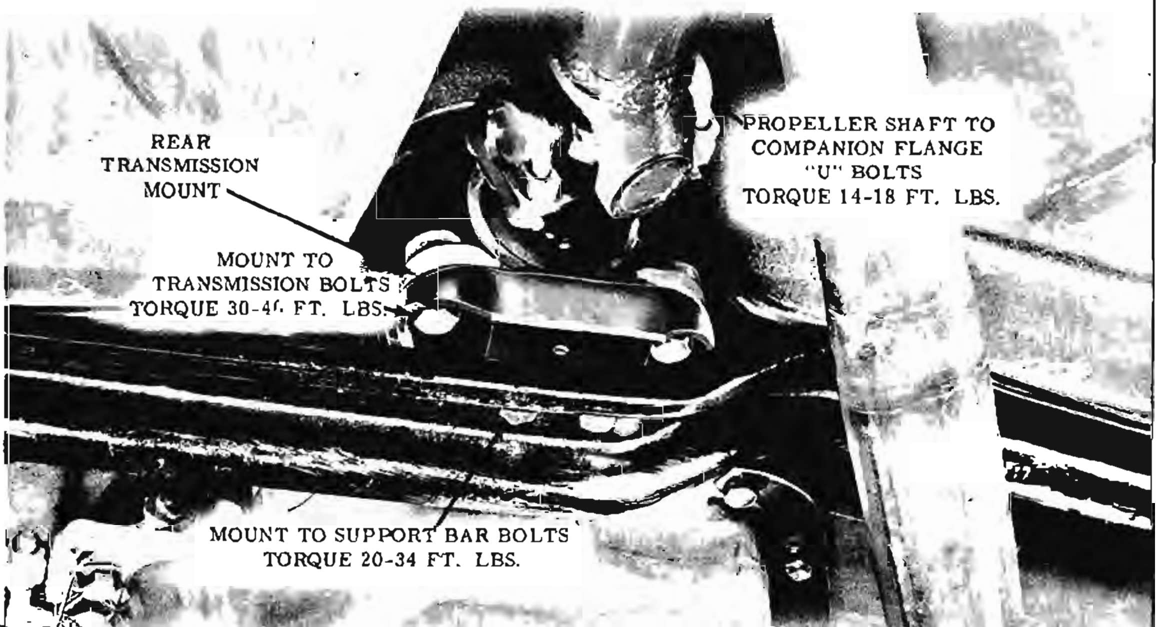


Fig. 11-111 Transmission Removal

TRANSMISSION INSTALLATION

1. INSPECT CLUTCH PILOT BUSHING AND LUBRICATE WITH WHEEL BEARING GREASE.
2. INSTALL 2 GUIDE PINS IN CLUTCH HOUSING. ONE IN THE UPPER LEFT BOLT HOLE, 3" LONG AND ONE IN THE LOWER RIGHT 4" LONG.
3. CAREFULLY INSTALL TRANSMISSION ASSEMBLY MAIN DRIVE GEAR THROUGH CLUTCH DISC AND INSTALL 2 TRANSMISSION TO CLUTCH HOUSING BOLTS. REMOVE GUIDE PINS. INSTALL 2 REMAINING BOLTS. TIGHTEN ALTERNATELY AND TORQUE 30-35 FT. LBS.



4. INSTALL REAR MOUNT AND SUPPORT BAR. CONNECT PROPELLER SHAFT.
5. CONNECT AND ADJUST LINKAGE. CONNECT SPEEDOMETER CABLE. AND CHECK FLUID LEVEL.

Fig. 11-112 Transmission Installation

TRANSMISSION DISASSEMBLY

1. REMOVE TOP COVER AND GASKET AND VISUALLY INSPECT CONDITION OF PARTS.

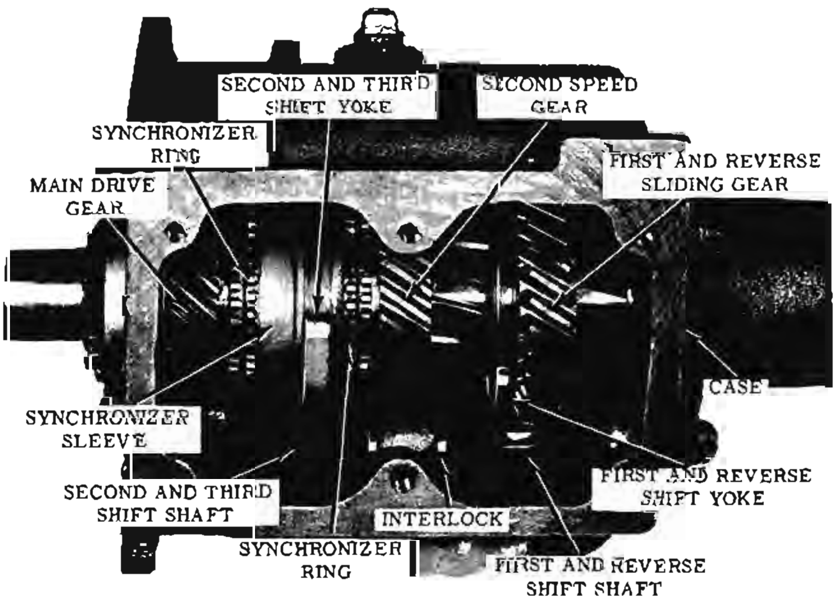


Fig. 11-113 Top Cover Removal

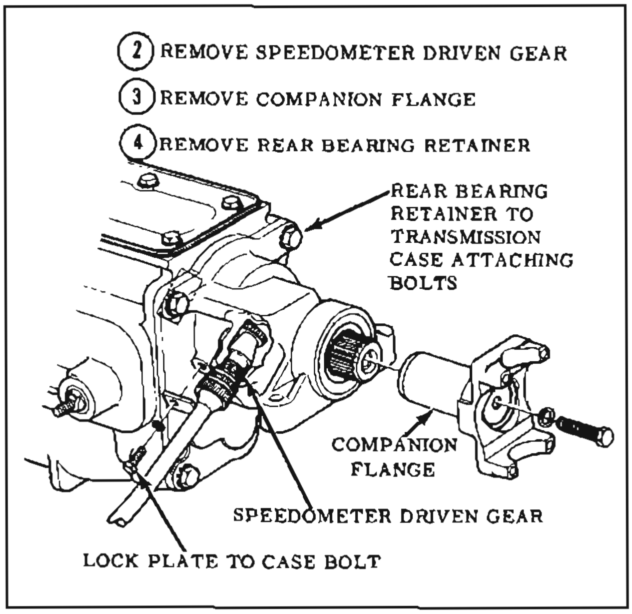


Fig. 11-114 Rear Bearing Retainer Removal

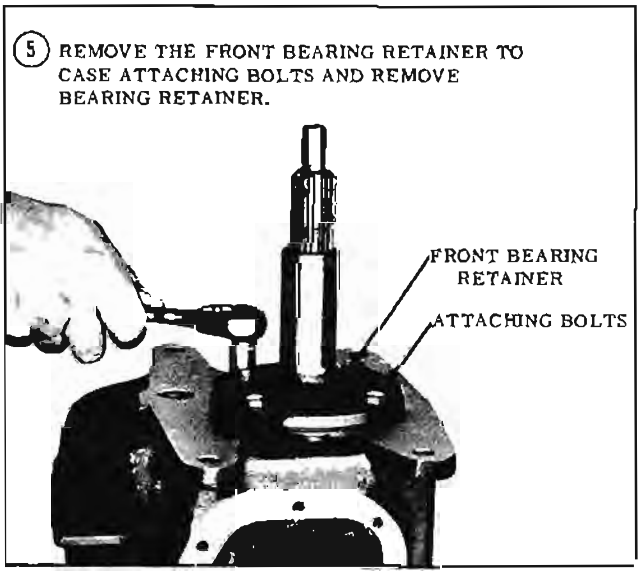


Fig. 11-115 Front Bearing Retainer Removal

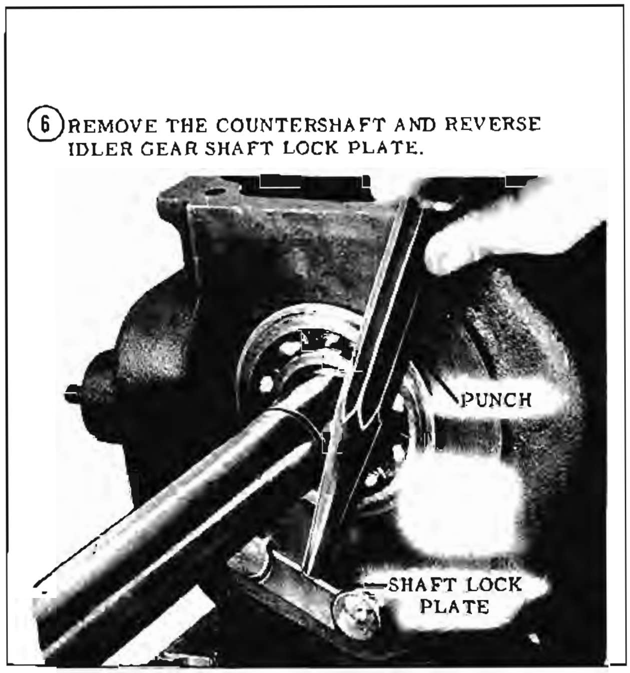


Fig. 11-116 Lock Plate Removal

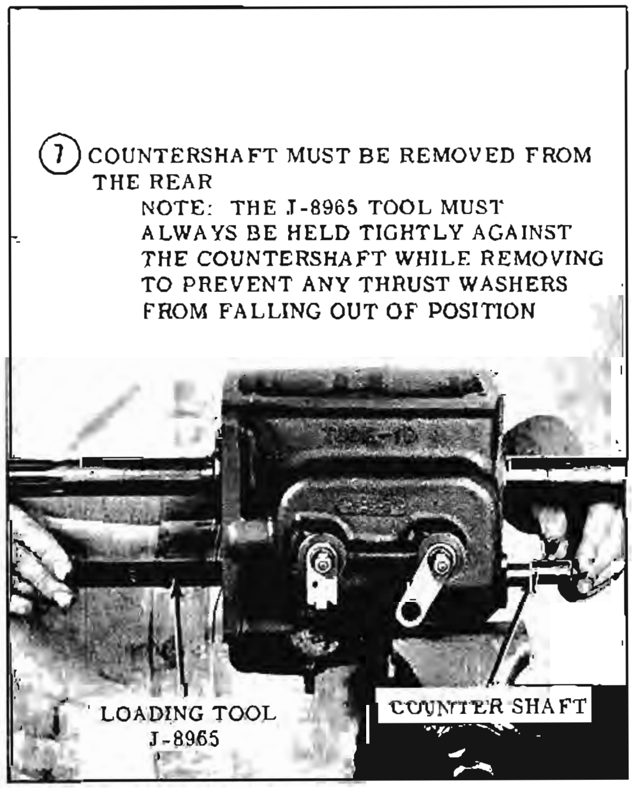


Fig. 11-117 Countershaft Removal

(8) CLUSTER GEAR MUST BE LOWERED TO BOTTOM OF CASE BEFORE REMOVING MAIN DRIVE GEAR. USE SCREWDRIVER TO PREVENT ROLLERS FROM FALLING OUT OF THE REAR OF THE GEAR.

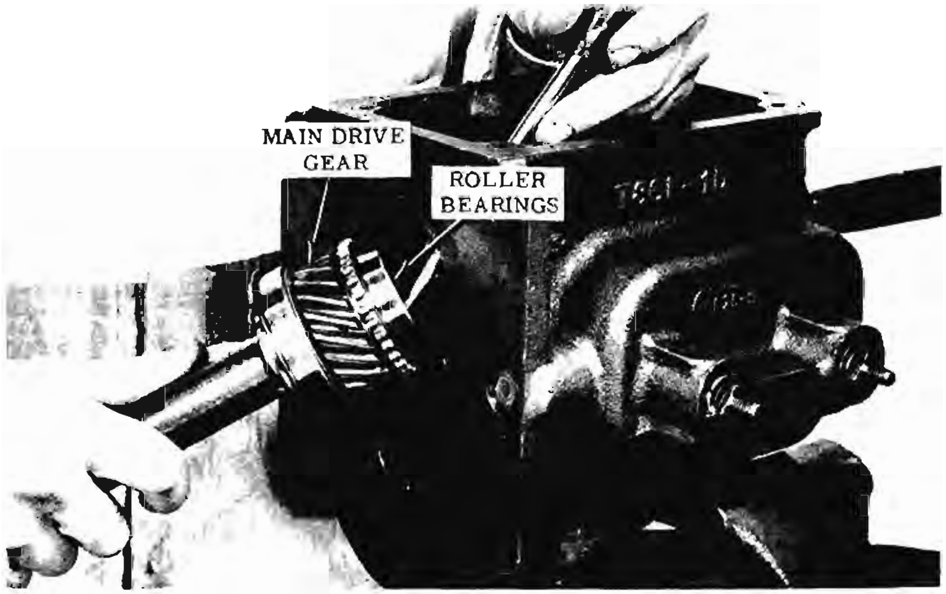


Fig. 11-118 Main Drive Gear Removal

(9) PULL MAINSHAFT REARWARD SUFFICIENT TO MOVE BEARING OUT OF CASE.

NOTE: DO NOT PULL TOO FAR AS SYNCHRONIZER RETAINERS MAY FALL OUT

REMOVE 2ND AND 3RD SHIFTING YOKE

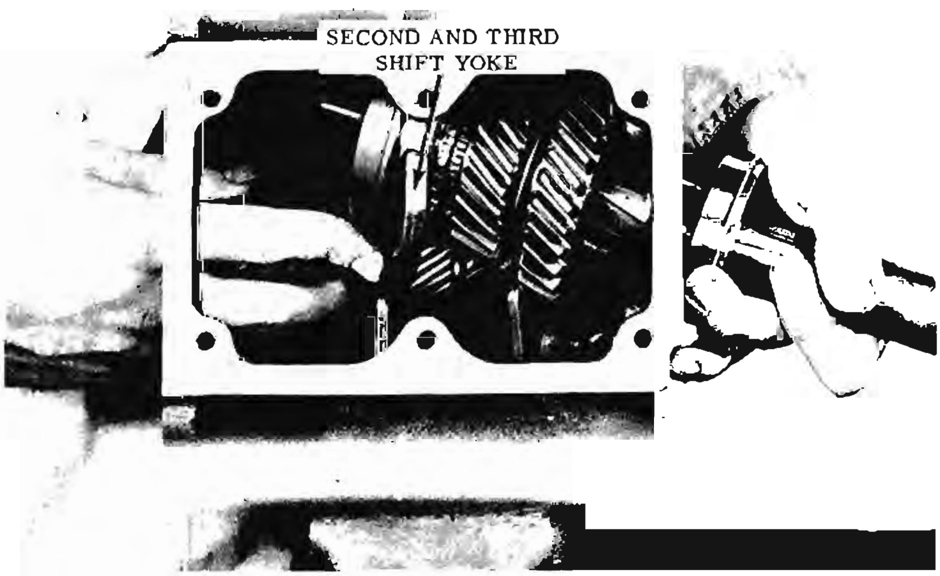
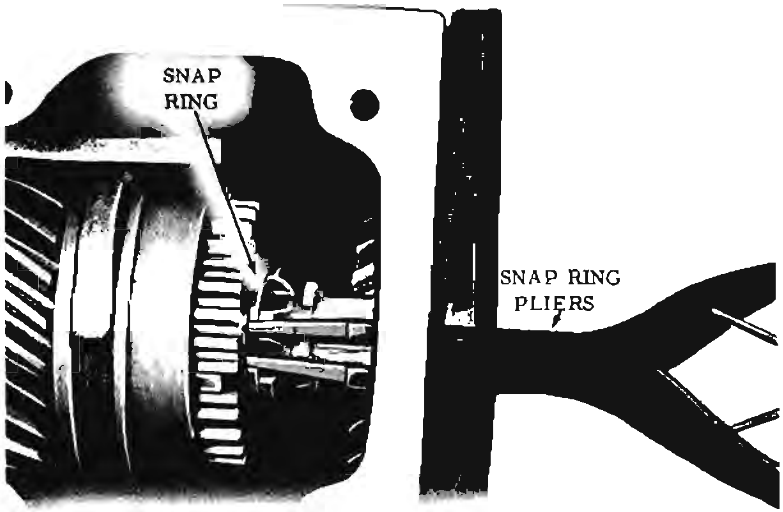


Fig. 11-119 Shifting Yoke Removal

(10) REMOVE THE SYNCHRONIZER ASSEMBLY TO MAIN SHAFT SNAP RING.



(11) REMOVE SYNCHRONIZER ASSEMBLY AND SECOND SPEED GEAR AS A UNIT.

(12) REMOVE FIRST AND REVERSE SHIFTER YOKE, MAIN SHAFT, AND FIRST AND REVERSE GEAR FROM CASE.

Fig. 11-120 Snap Ring Removal

(13) USING A LONG BRASS DRIFT, REMOVE IDLER GEAR FROM CASE LIFT COUNTERSHAFT CLUSTER GEAR AND SHAFT ASSEMBLY AND TOOL OUT OF CASE. CAREFULLY NOTE POSITION OF THRUST WASHERS.

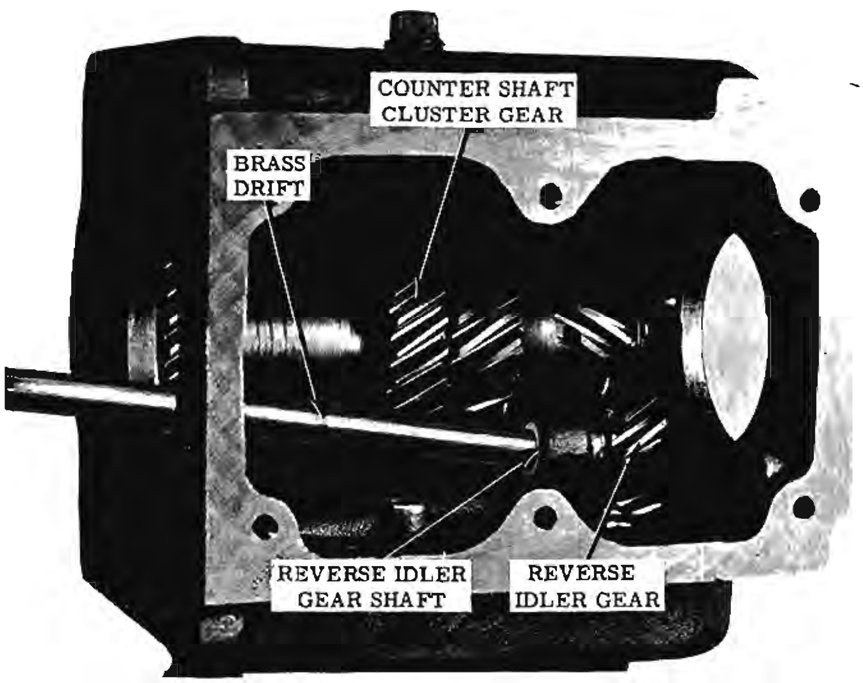


Fig. 11-121 Reverse Idler and Cluster Gear Removal

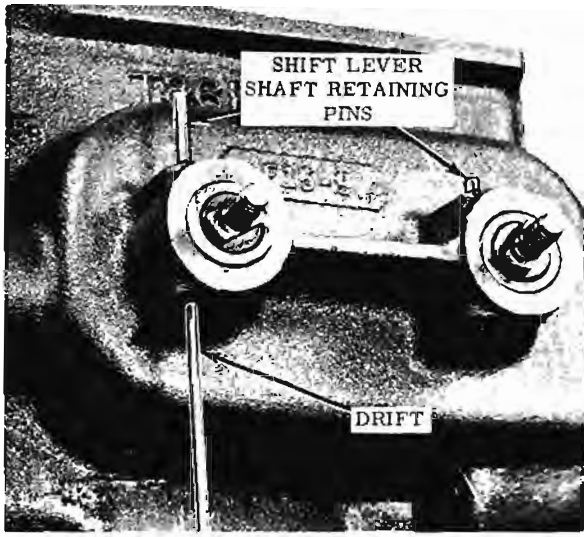


Fig. 11-122 Removing Shift Lever Shaft Pins

(17) REMOVE SHIFT LEVER INTERLOCK SLEEVE, SPRING AND PIN.

(18) REMOVE THE COUNTERSHAFT CLUSTER GEAR BEARING ROLLERS (22 ON EACH END), BEARING RETAINER WASHERS (2 ON EACH END), AND SPACER FROM THE GEAR.

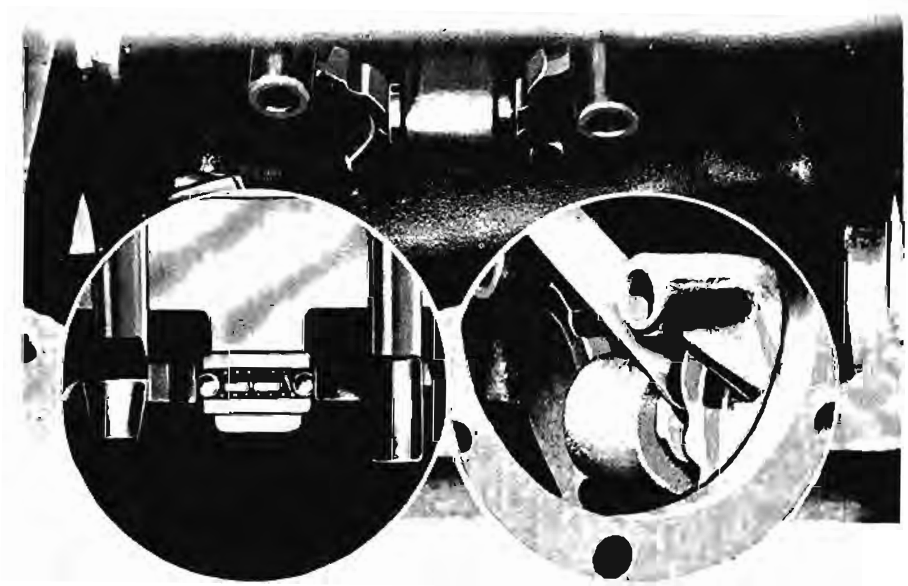


Fig. 11-123 Shift Lever Mechanism

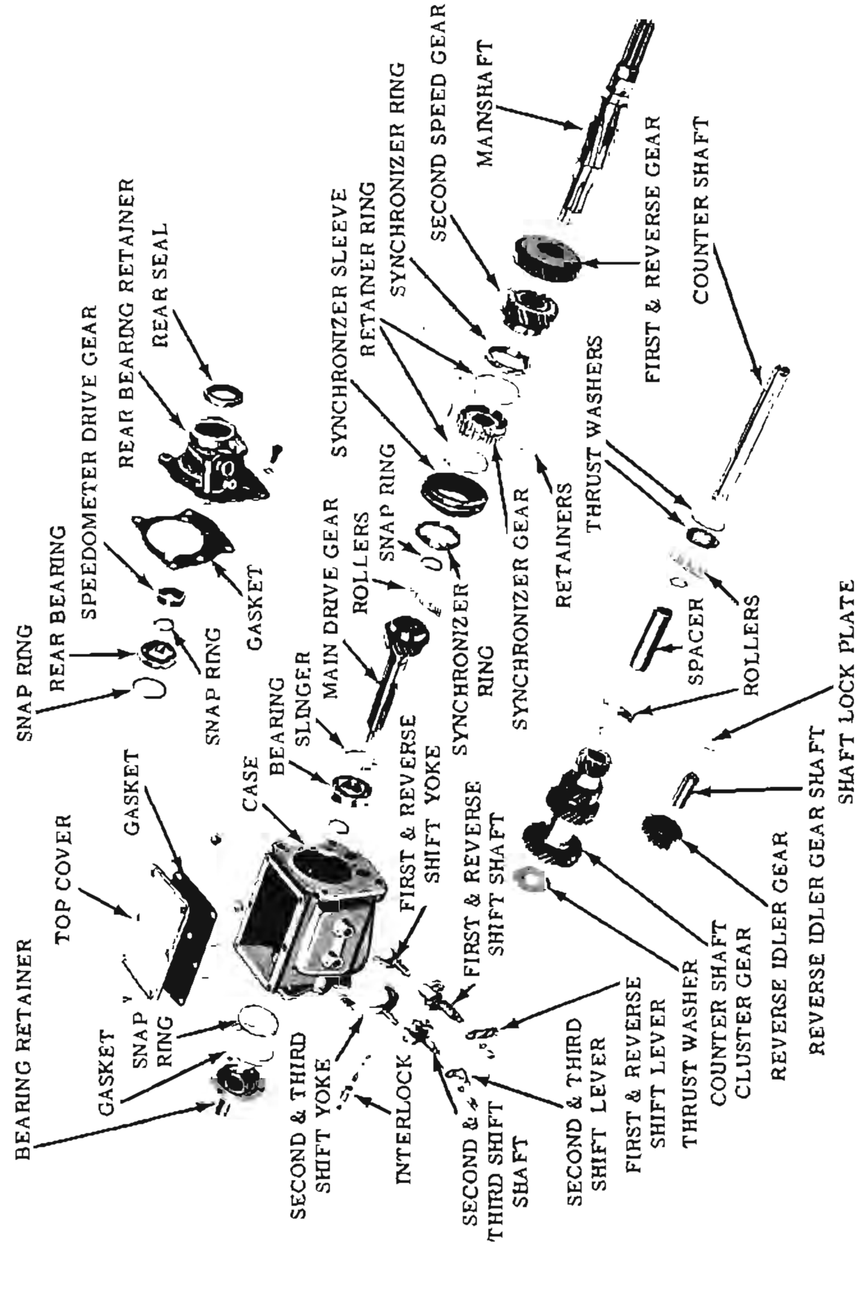


Fig. 11-124 Synchromesh Transmission—Exploded View

MAIN DRIVE GEAR BEARING

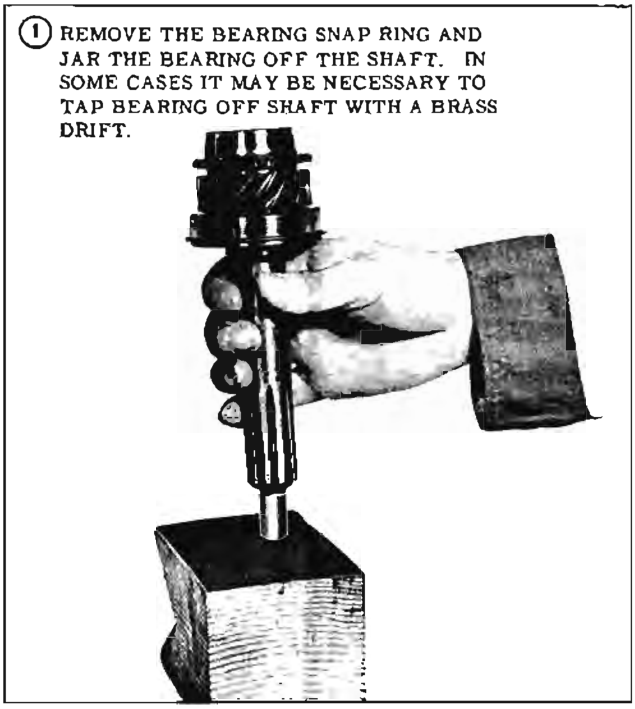


Fig. 11-125 Main Drive Gear Bearing Removal

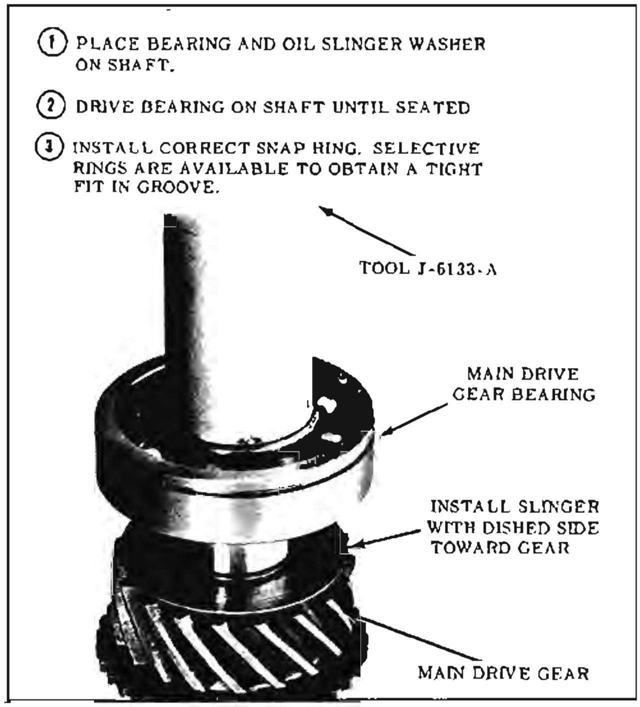


Fig. 11-126 Main Drive Gear Bearing Installation

MAIN SHAFT BEARING

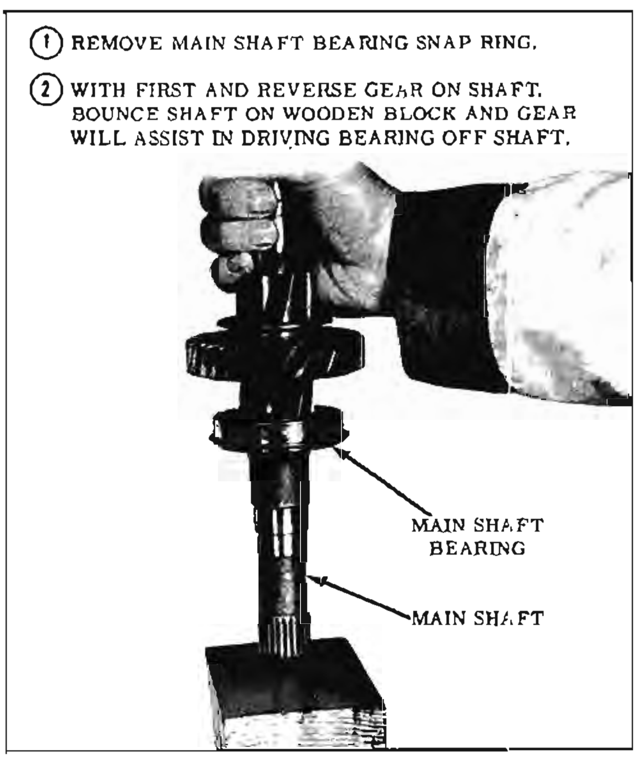


Fig. 11-127 Main Shaft Bearing Removal

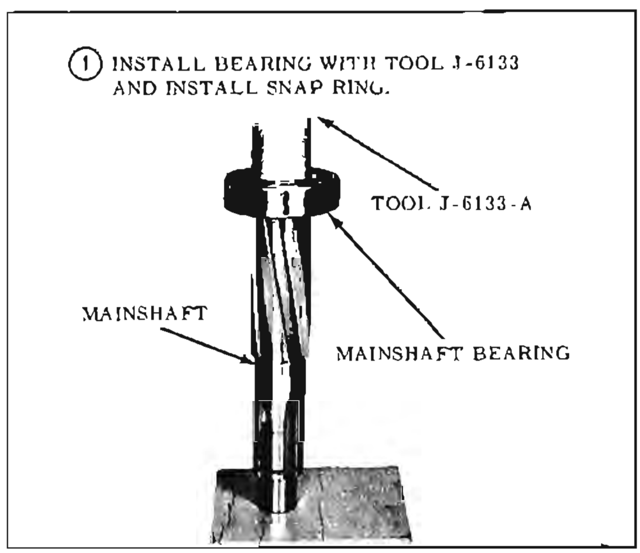


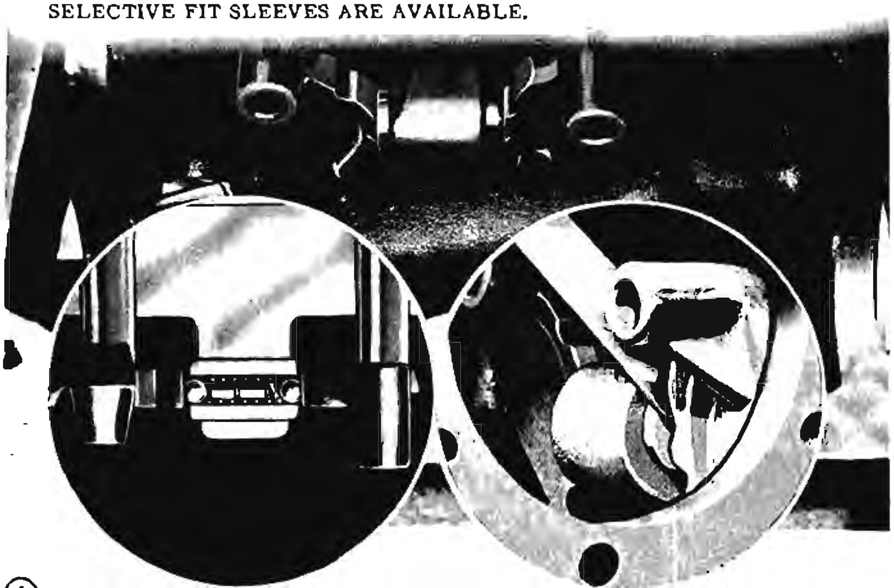
Fig. 11-128 Main Shaft Bearing Installation

TRANSMISSION ASSEMBLY

(1) INSTALL INTERLOCK SPRING AND PIN IN INTERLOCK SLEEVE AND INSTALL SLEEVE IN CASE.

(2) INSTALL SHIFT LEVERS.

(3) INSTALL THE TWO INTERLOCK BALLS IN THE INTERLOCK SLEEVE AND RETAIN WITH THE SHIFT LEVERS. WITH ONE LEVER IN NEUTRAL DETENT, AND THE OTHER IN A GEAR DETENT, HOLD THE INTERLOCK SLEEVE AGAINST ONE LEVER AND THE CLEARANCE BETWEEN THE SLEEVE AND THE OTHER SHAFT MUST BE .001"-.007". SELECTIVE FIT SLEEVES ARE AVAILABLE.



(4) INSTALL SHIFT LEVER RETAINING PINS.

Fig. 11-129 Shift Lever Mechanism

5. CENTER THE SPACER IN THE COUNTERSHAFT CLUSTER GEAR AND PLACE ONE BEARING RETAINER WASHER AGAINST EACH END.

6. USING PETROLATUM, INSTALL THE 22 ROLLERS IN EACH END OF THE COUNTERSHAFT. THE 2 OUTER BEARING RETAINING WASHERS, THE SMALLER BRONZE FACED STEEL THRUST WASHER WITH THE TANGS IN THE SLOTS OF THE GEAR, THE SMALL STEEL THRUST WASHER WITH THE TANG UP AND THE LARGER BRONZE FACED THRUST WASHER WITH THE BRONZE FACE TOWARD GEAR AND THE TANG UP.

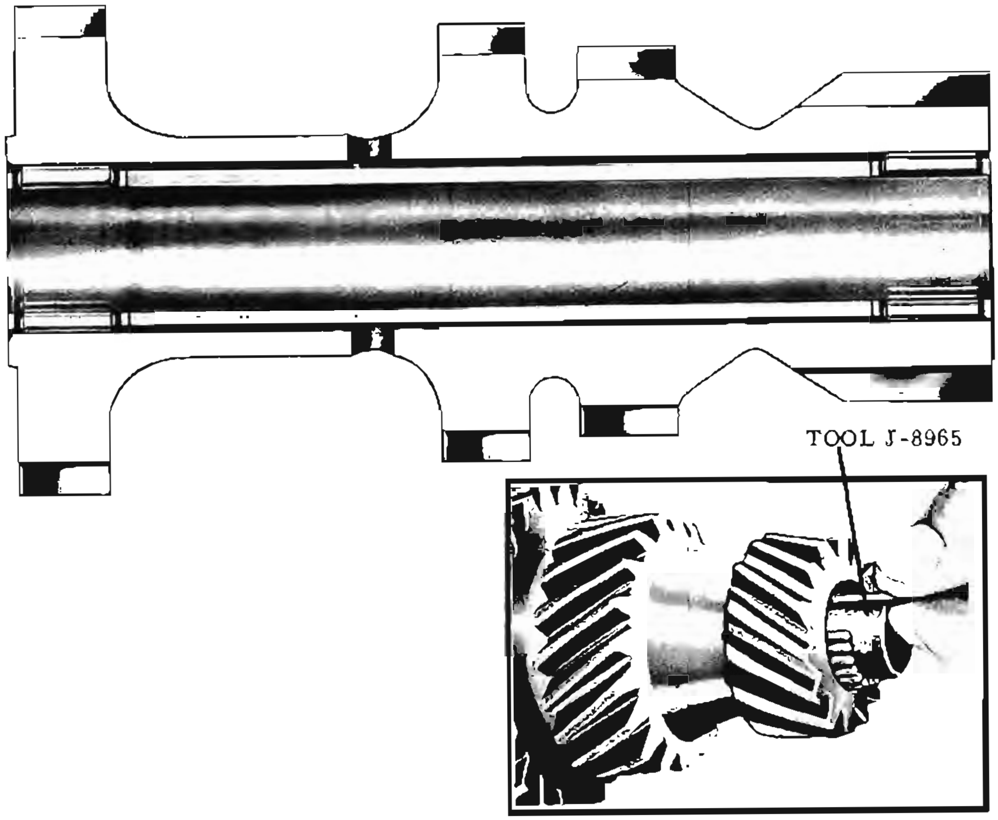
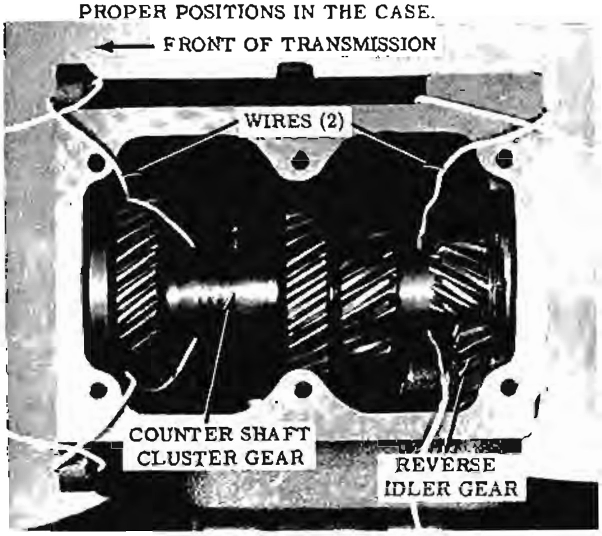


Fig. 11-130 Countershaft Cluster Gear

(7) POSITION TWO PIECES OF WIRE (14 GAUGE ELECTRICAL) AS SHOWN.

(8) HOLD TOOL IN GEAR FLUSH WITH WASHERS ON EACH END, AND CAREFULLY POSITION CLUSTER GEAR IN BOTTOM OF CASE. TANGS OF THRUST WASHERS MUST BE IN THEIR PROPER POSITIONS IN THE CASE.



(9) POSITION REVERSE IDLER GEAR IN CASE AND INSTALL REVERSE IDLER SHAFT.

Fig. 11-131 Positioning Cluster Gear

(10) INSTALL THE FIRST AND REVERSE GEAR SHIFT YOKE IN FIRST AND REVERSE GEAR SHIFT LEVER.

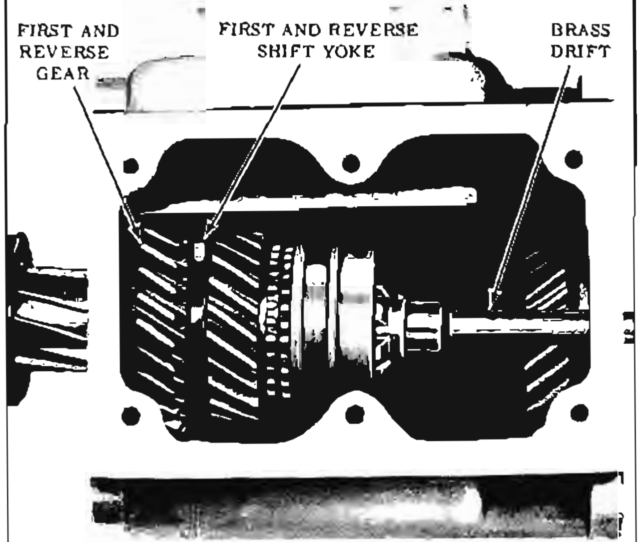


Fig. 11-132 Installing First and Reverse Shift Yoke

THE SYNCHRONIZER RINGS MUST BE INSPECTED FOR WORN TEETH AND IF WORN OR DAMAGED, SHOULD BE REPLACED. ALSO, INSIDE OF RINGS MUST HAVE VERY FINE MACHINE GROOVES VISIBLE IF WORN SMOOTH, THEY MUST BE REPLACED.

(11) PLACE 3 SYNCHRONIZER RETAINING PLATES ON SYNCHRONIZER GEAR AND INSTALL IN SLEEVE.

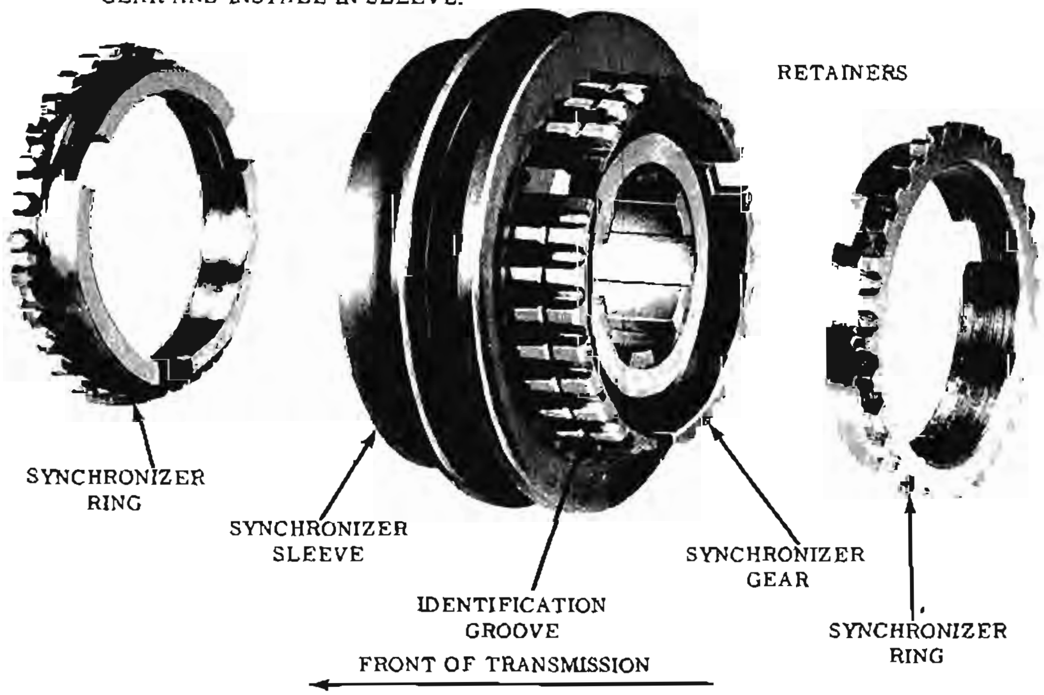


Fig. 11-133 Synchronizer Assembly

(12) INSTALL WIRE RETAINING RINGS

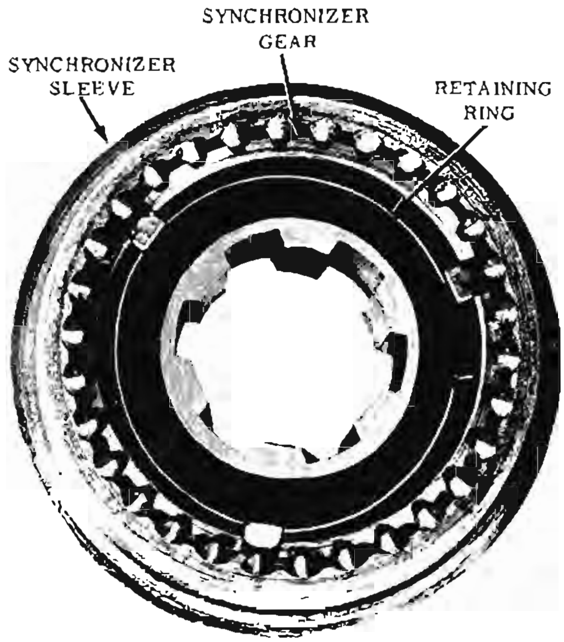
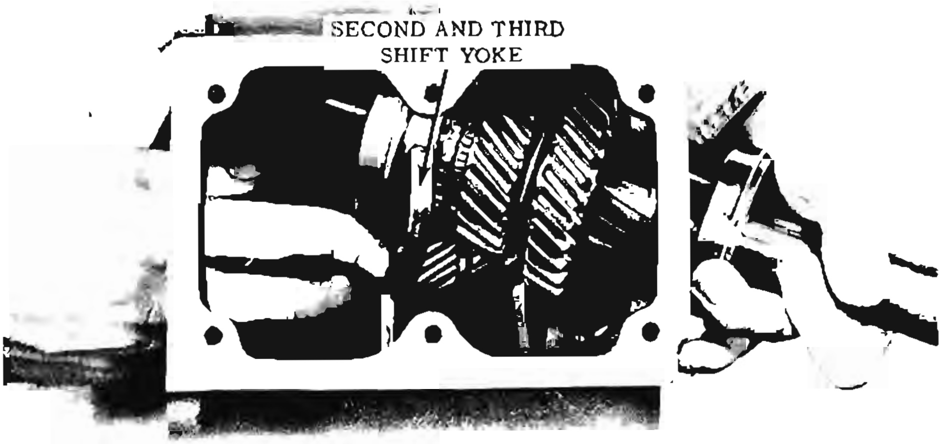


Fig. 11-134 Synchronizer Retaining Ring

(13) PLACE MAIN SHAFT AND BEARING ASSEMBLY INTO CASE. PLACE FIRST AND REVERSE GEAR ON SHAFT AND ENGAGE GEAR WITH YOKE. PLACE SECOND SPEED GEAR ON SHAFT, THEN SYNCHRONIZER ASSEMBLY WITH REAR SYNCHRONIZER RING.

(14) INSTALL THE SYNCHRONIZER ASSEMBLY SNAP RING RETAINER ON THE MAIN SHAFT.

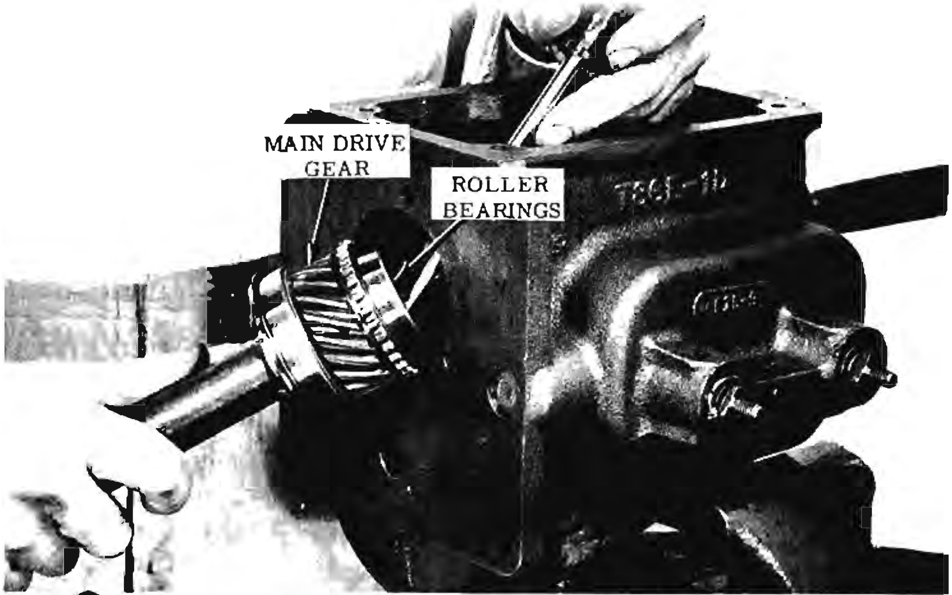


INSTALL SECOND AND THIRD SPEED YOKE

Fig. 11-135 Main Shaft Installation

(16) POSITION MAIN SHAFT AND BEARING IN CASE BEING CERTAIN BOTH YOKES ARE ENGAGED.

(17) PLACE FRONT BRASS SYNCHRONIZER RING IN SYNCHRONIZER, ALIGNING NOTCHES WITH THE 3 RETAINER PLATES.



(18) WITH 14 BEARINGS INSTALLED IN MAIN DRIVE GEAR WITH SUFFICIENT GREASE TO HOLD THEM IN POSITION, INSTALL MAIN DRIVE GEAR INTO FRONT OF CASE. CARE MUST BE TAKEN TO BE SURE BRASS SYNCHRONIZER RING IS PROPERLY ENGAGED IN SYNCHRONIZER, AND MAIN DRIVE GEAR BEARING SNAP RING IS TIGHT AGAINST CASE.

Fig. 11-136 Main Drive Gear Installation

(19) INSTALL MAIN DRIVE GEAR BEARING RETAINER AND GASKET. SEAL BOLTS WITH P.O.B. #3 TO PREVENT LEAKAGE. TORQUE BOLTS 17-20 FT. LBS.

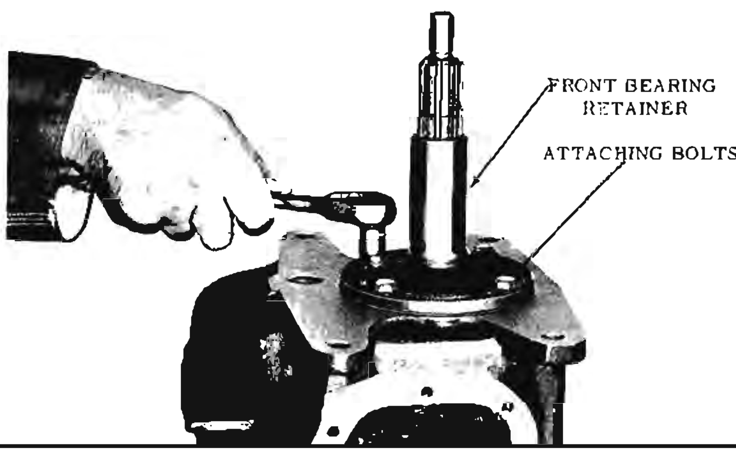


Fig. 11-137 Front Bearing Retainer Installation

(20) USING PREVIOUSLY POSITIONED WIRES. CAREFULLY RAISE COUNTERSHAFT CLUSTER GEAR ASSEMBLY AND INSTALL COUNTER-SHAFT THROUGH REAR OF CASE, ROTATING SHAFT SO THAT THE LOCK PLATE GROOVE IS TOWARDS THE REVERSE IDLER GEAR SHAFT. USE AN AWL TO ASSIST IN ALIGNING SHAFT.

NOTE: COUNTER GEAR SHAFT AND TOOL MUST BE HELD TIGHTLY TOGETHER WHILE INSTALLING COUNTER SHAFT SO WASHERS DON'T FALL OUT OF POSITION.

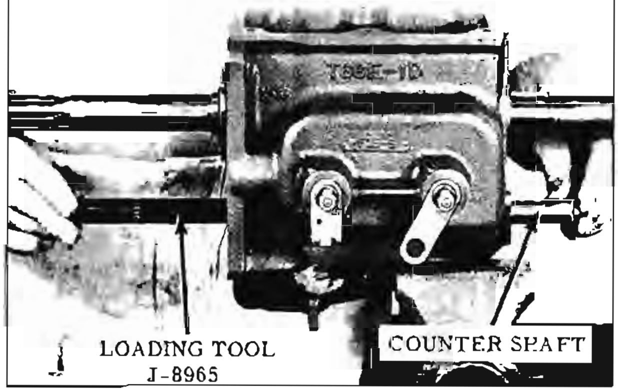


Fig. 11-138 Countershaft Installation

(21) TAP COUNTERSHAFT INTO CASE UNTIL THE LOCK PLATE GROOVE IS JUST SHORT OF BEING FLUSH WITH THE CASE. POSITION THE LOCK PLATE INTO SHAFT GROOVES AND TAP INTO PLACE. TAP SHAFTS INTO CASE UNTIL LOCK PLATE IS AGAINST CASE.

(22) REMOVE THE TWO PIECES OF WIRE.

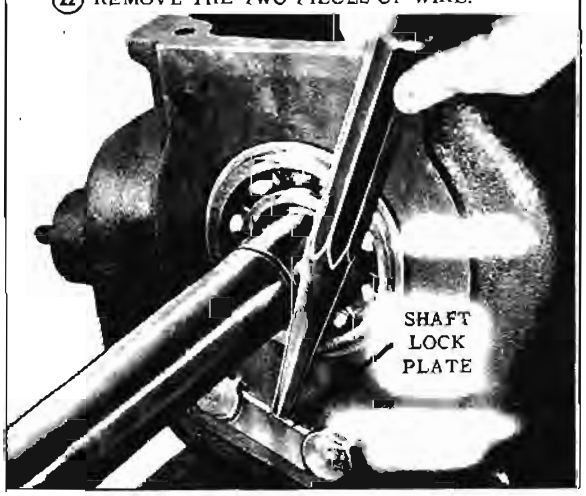


Fig. 11-139 Lock Plate Installation

Check shift lever and synchronizer for operation.

NEUTRAL: Both levers in center detent position, hold main shaft and turn main drive gear shaft. Main shaft should not turn.

FIRST: With shift lever, move first and re-

(23) INSTALL THE REAR BEARING RETAINER AND GASKET. TORQUE BOLTS 28-33 FT. LBS.

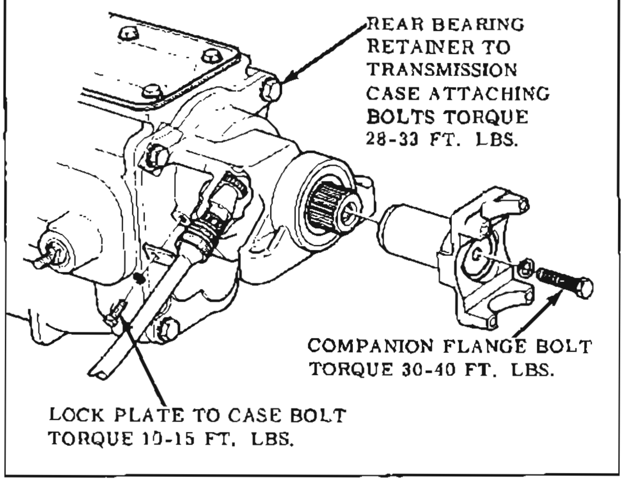


Fig. 11-140 Rear Bearing Retainer Installation

(24) INSTALL SHIFT LEVER SHAFT SEALS, OUTER SHIFT LEVERS, WASHERS, AND ATTACHING NUTS.

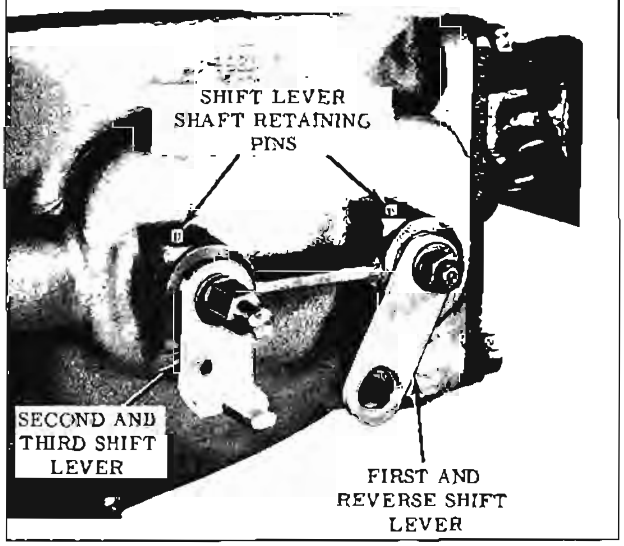


Fig. 11-141 Outer Shift Lever Installation

verse gear forward, turn main drive approximately 2-1/2 times and main shaft should turn around once.

2ND: With shift lever, move synchronizer assembly rearward, other shift lever should be in center detent. Turn main drive approximately 1-1/2 turns and main shaft should turn once.

3RD: Move synchronizer assembly forward and turn main drive one turn and main shaft should turn once.

REVERSE: With synchronizer lever in center detent, first and reverse gear rearward, main drive gear should turn approximately 3-1/2 times and main shaft once.

Install speedometer gear, companion flange, top cover and gasket, and torque top cover attaching bolts 10-12 ft. lbs.

NOTE: Speedometer drive gear is a slip fit. It is held securely in place by the companion flange. When installing companion flange bolt use P.O.B. #3 sealer around lock washer and head of bolt.

TORQUE SPECIFICATIONS

Application	Ft. Lbs.
Companion Flange to Output Shaft	30 to 40
Cross Bar to Body Frame Side Rail	20 to 34
Main Drive Gear Bearing Retainer to Case	17 to 20
Propeller Shaft to Companion Flange "U" Bolt Nuts	14 to 18
Rear Bearing Retainer to Transmission Case	28 to 33
Rear Engine Mount to Cross Bar	20 to 34
Rear Engine Mount to Rear Bearing Retainer	30 to 40
Speedometer Cable to Speedometer	Finger tight
Speedometer Cable to Transmission	3 to 4
Speedometer Driven Gear Lock Plate to Rear Bearing Retainer	4 to 7
Top Cover to Case	10 to 12
Transmission Drain Plug	35 to 40
Transmission Filler Plug	35 to 40
Transmission to Clutch Housing	40 to 45

FOUR—SPEED SYNCHROMESH TRANSMISSION

(F-85)

CONTENTS OF SECTION 11

MAINTENANCE RECOMMENDATIONS

Clean dirt from around filler plug, and check the lubricant level at every oil change interval. If level is low, inspect the transmission for leaks and correct any leaks found. Fill the transmission to the level of the filler plug opening with S.A.E. 80 or 90 Multi-Purpose Gear Lubricant. Seasonal change of the Synchromesh transmission lubricant is not recommended. The capacity of the transmission is 2-1/2 pints. It is important that the shift linkage be properly adjusted. All pivot points should be lubricated periodically with engine oil.

DESCRIPTION

The four-speed Synchromesh Transmission is available as optional equipment.

All four forward gears are provided with synchronizing clutches which can be engaged without clashing gears while the car is in motion. Closely spaced gear ratios provide excellent ratio matching with minimum loss of engine speed at the shift points. Reverse gear is not synchronized; therefore, the car must be brought to a complete stop before engaging reverse gear.

The transmission may be used as an aid in deceleration by downshifting in SEQUENCE without double clutching or gear clashing, since all forward speeds are synchronized.

The four-speed Synchromesh Transmission Gear Ratios are as follows:

First	2.54:1
Second	1.92:1
Third	1.51:1
Fourth	1.00:1
Reverse	2.61:1

This four-speed Synchromesh Transmission incorporates helical gears especially designed to provide high torque capacity without additional weight. Shafts, bearings, high capacity clutches, and other precision parts are held to close limits, providing proper clearances necessary for durability and extended heavy usage.

Gear shifting is manual with a floor-type gear shift lever through shift rods connected to the transmission cover shifter levers for first through fourth gears, and to the reverse lever located at the case extension housing. The shift lever at the rear of the transmission cover controls the first

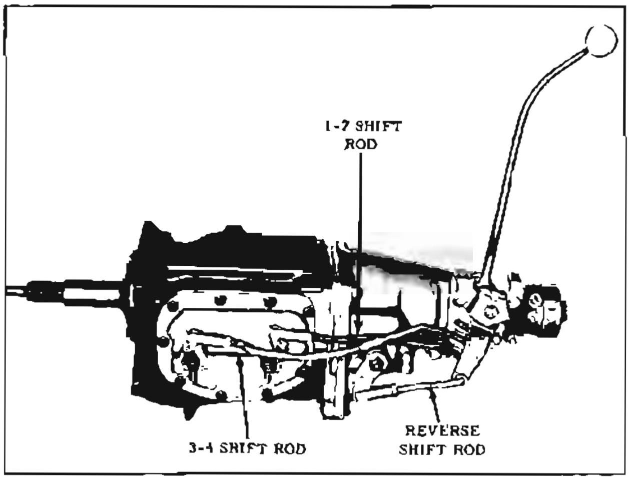


Fig. 11-201 Four Speed Synchromesh

and second speed gears, while the lever to the front of the cover controls third and fourth speed gears. (Fig. 11-201)

The rear of the main drive gear shaft is supported by a heavy-duty ball bearing at the front of the transmission case. (Fig. 11-202) The front end of the main drive gear shaft pilots in an oil impregnated bushing in the engine crankshaft. The front of the main shaft pilots in 14 roller bearings set into the end of the main drive gear. The rear of the main shaft is supported by a heavy-duty ball bearing identical to the one that supports the main drive gear.

The counter gear is carried on a double row of roller bearings at each end, while thrust is taken on thrust washers located between the ends of the gear and the front and rear of the case.

The reverse idler gears are carried on bronze bushings while thrust is taken on thrust washers located between the front gear and the back of the reverse idler thrust boss and between the rear gear and the reverse idler shaft boss in the case extension.

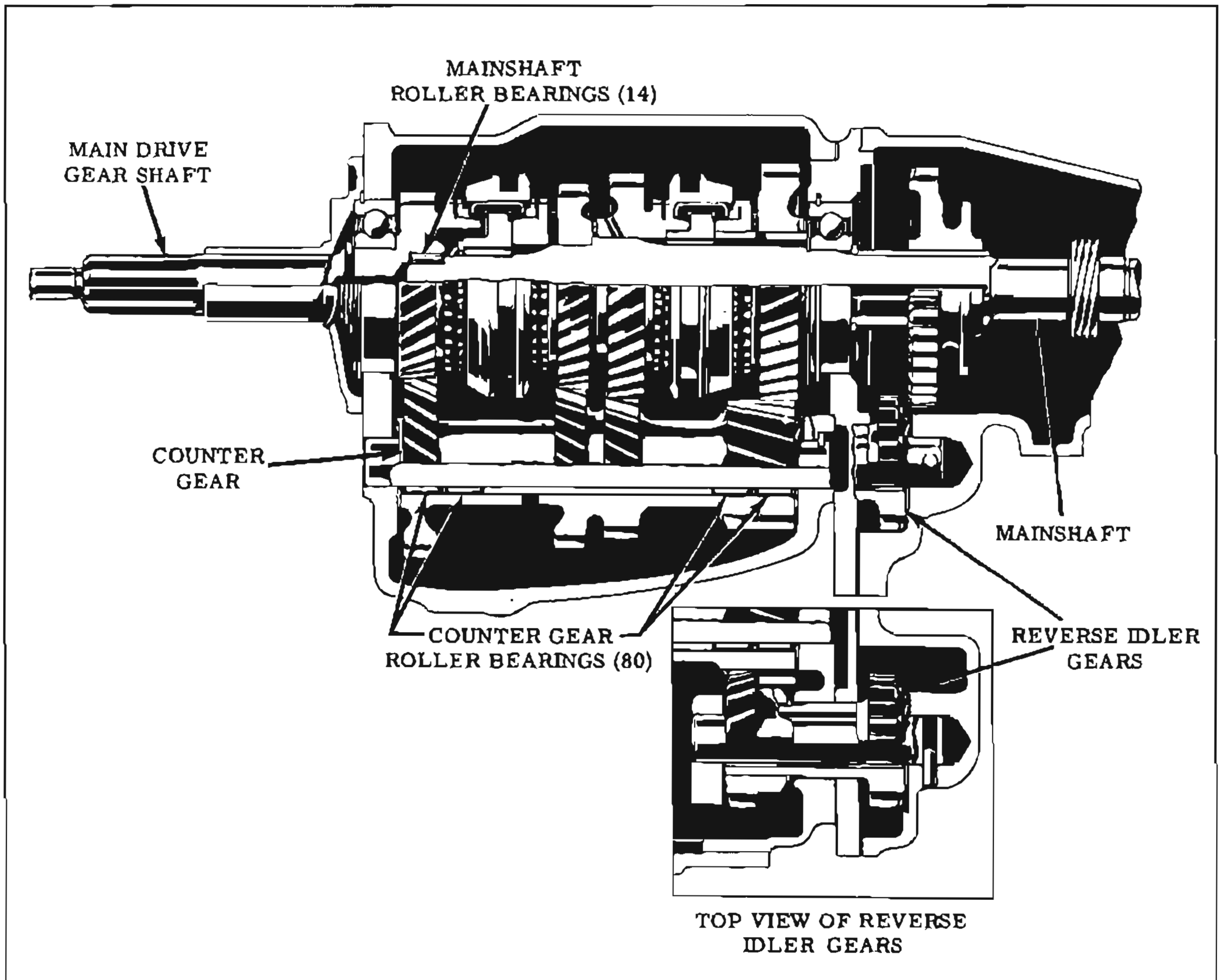


Fig. 11-202 Transmission Cross Section

POWER FLOW THROUGH TRANSMISSION

1. Operation in Neutral. (Fig. 11-203)

In neutral, with the clutch engaged, the main drive gear turns the counter gear. The counter gear then turns the third, second, first, and reverse idler gears. Since the 3-4 and 1-2 speed clutches (sleeves) are neutrally positioned, and the reverse gear is positioned rearward, away from the reverse idler gear, power will not flow through the main shaft.

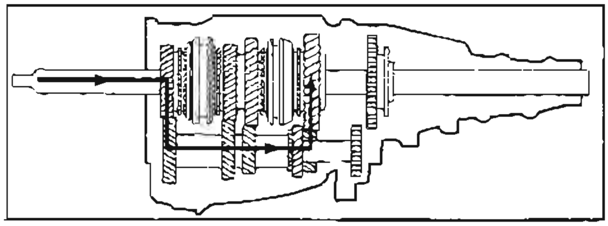


Fig. 11-203 Power Flow in Neutral

2. Operation in First Gear (Fig. 11-204)

In first gear, the 1-2 speed clutch (sleeve) is moved rearward to engage the first speed gear, which is being turned by the counter gear. Since the 1-2 speed clutch (hub) is splined to the main shaft, torque is imparted to the main shaft from the first speed gear through the clutch assembly.

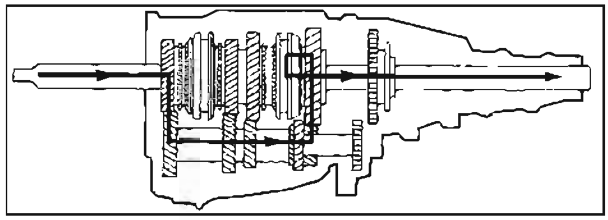


Fig. 11-204 Power Flow in First

3. Operation in Second Gear (Fig. 11-205)

In second gear, the 1-2 speed clutch (sleeve) is moved forward to engage the second speed gear, which is being turned by the counter gear. The engagement of the clutch (sleeve) with the second speed gear imparts torque to the main shaft since the first and second speed clutch (hub) is splined to the main shaft.

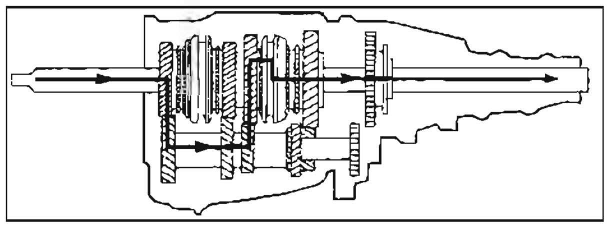


Fig. 11-205 Power Flow in Second

4. Operation in Third Gear (Fig. 11-206)

In third gear the 1-2 speed clutch is moved to the neutral position. The 3-4 speed clutch (sleeve) moves rearward to engage the third speed gear, which is being turned by the counter gear. Since the 3-4 speed clutch (hub) is splined to the main shaft, torque is imparted to the main shaft from the third speed gear through the clutch assembly.

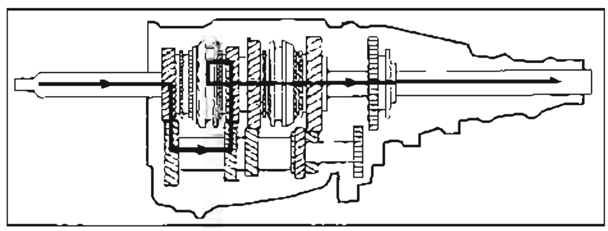


Fig. 11-206 Power Flow in Third

5. Operation in Fourth Gear (Fig. 11-207)

In fourth gear, or direct drive, the 3-4 speed clutch (sleeve) is moved forward to engage the main drive gear. The 1-2 speed clutch remains in a neutral position. This engagement of the main drive gear with the 3-4 speed clutch assembly imparts torque directly to the main shaft.

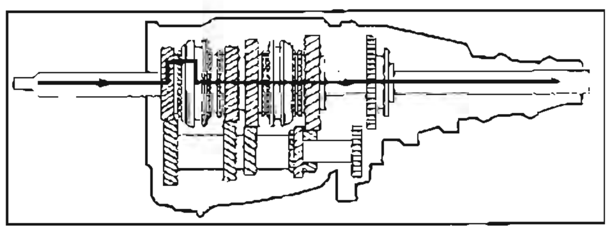


Fig. 11-207 Power Flow in Fourth

6. Operation in Reverse Gear (Fig. 11-208)

In reverse gear, both the 3-4 and 1-2 clutch assemblies are in the neutral position. The reverse speed gear is moved forward to engage the rear reverse idler gear, which is being turned by the counter gear. Since the reverse speed gear is splined to the main shaft, this engagement causes the main shaft to turn; however, because power flows from

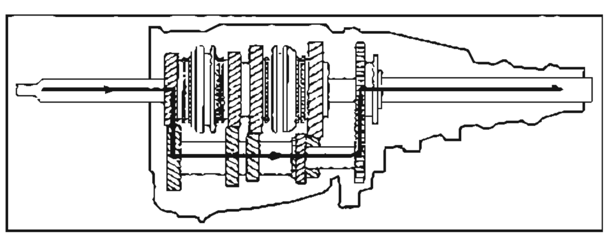


Fig. 11-208 Power Flow in Reverse

main drive gear to counter gear and through reverse idler gear to reverse speed gear, the direction of rotation of the main shaft will be reverse of the engine.

ADJUSTMENTS

Shift Linkage

1. Remove transmission gear shift lever seal from floor pan.
2. Place transmission gear shift lever in neutral position.
3. Remove the cotter pin, anti-rattle washer, and clevis pin at each shift lever.
4. Install Tool J-9574, Linkage Gauge Block, in notch of the retainer bracket as shown in Fig. 11-209.
5. Adjust each shift rod clevis to obtain a free pin at the shift lever and clevis. Tighten clevis lock nut.
6. Reconnect the clevises to the shift levers. Remove the gauge block and check the shifts.

REAR OIL SEAL

Removal

1. Disconnect propeller shaft from transmission companion flange.
2. If tie wire has been removed, use tape or other suitable means to retain bearings to journals to prevent loss of needle bearings where joint is disconnected.
3. Position shaft to one side and support shaft by retaining end of shaft to exhaust pipe with wire or any other suitable means.
4. Remove transmission companion flange.
5. Using a punch or other suitable tool, loosen seal and remove from extension housing. (Fig. 11-210)
6. Wash counterbore with cleaning solvent and inspect for damage.
7. Inspect transmission companion flange for nicks, burrs, or scratches which would cause new seal to leak or damage bushing.

Installation

1. Coat outside diameter of new seal with P.O.B. #3 or equivalent and, using Tool J-5154, drive seal into counterbore until seated. (Fig. 11-211)

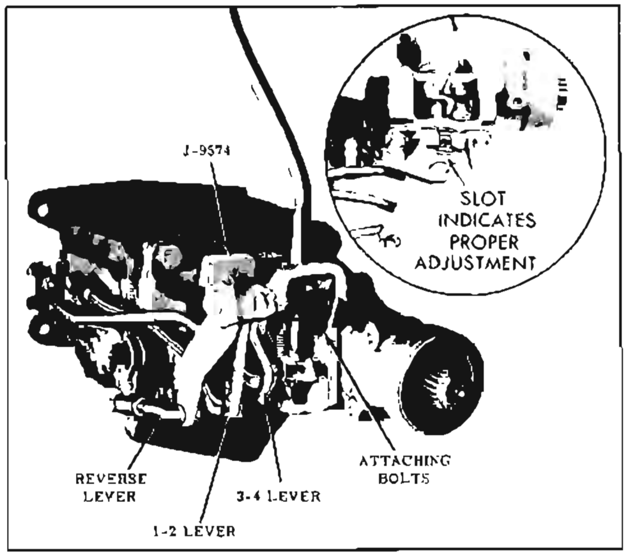


Fig. 11-209 Shift Linkage Adjustment

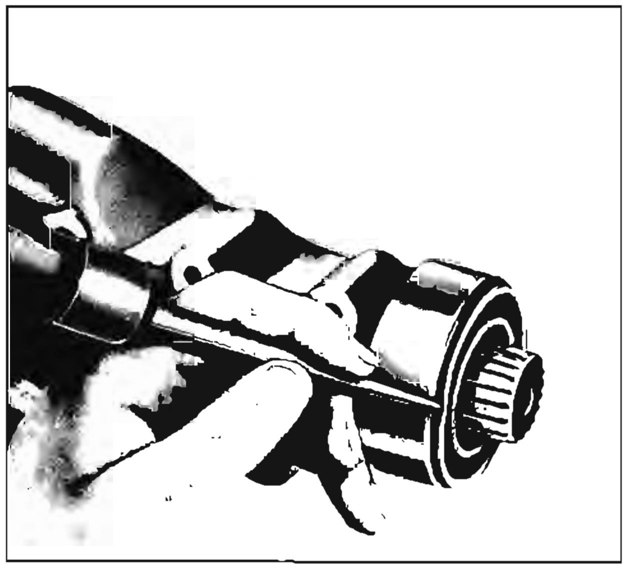


Fig. 11-210 Removing Rear Oil Seal

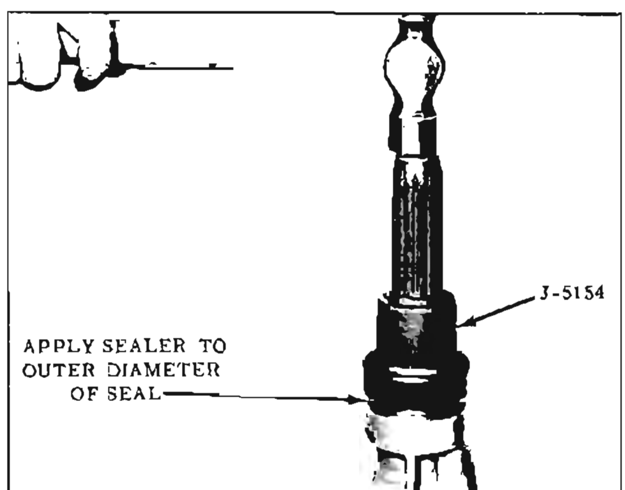


Fig. 11-211 Installing Rear Oil Seal

2. Position companion flange on output shaft.

3. Seal lock washer and bolt head thoroughly with P.O.B. #3 or equivalent. Install and tighten bolt to 30-40 ft. lbs. torque.

4. Connect propeller shaft and tighten "U" bolt nuts to 14-18 ft. lbs. torque. Bend tangs of lock plates to retain nuts.

SPEEDOMETER DRIVEN GEAR

Removal

1. Disconnect speedometer cable.

2. Remove retainer to housing bolt, lock washer, and retainer.

3. Insert screwdriver into slot and pry driven gear from extension housing.

4. Remove "O" ring from groove in fitting.

Installation

1. Install new "O" ring in groove and install speedometer driven gear assembly in extension housing aligning slot in gear assembly with boss on housing.

2. Push gear assembly into housing until retainer can be inserted into groove.

3. Install retainer bolt and lock washer.

4. Reconnect speedometer cable to driven gear and torque 3-4 ft. lbs.

TRANSMISSION REMOVAL (Fig. 11-212)

1. Raise car on hoist and, if repair requires, drain lubricant from transmission.

2. Disconnect speedometer cable from speedometer driven gear.

3. Disconnect the three shift control rods from the shifter levers at the transmission. Disconnect back-up lamp switch wires if car is so equipped.

4. Disconnect propeller shaft from transmission companion flange. Position end of propeller shaft to one side and support shaft by retaining end of shaft to exhaust pipe.

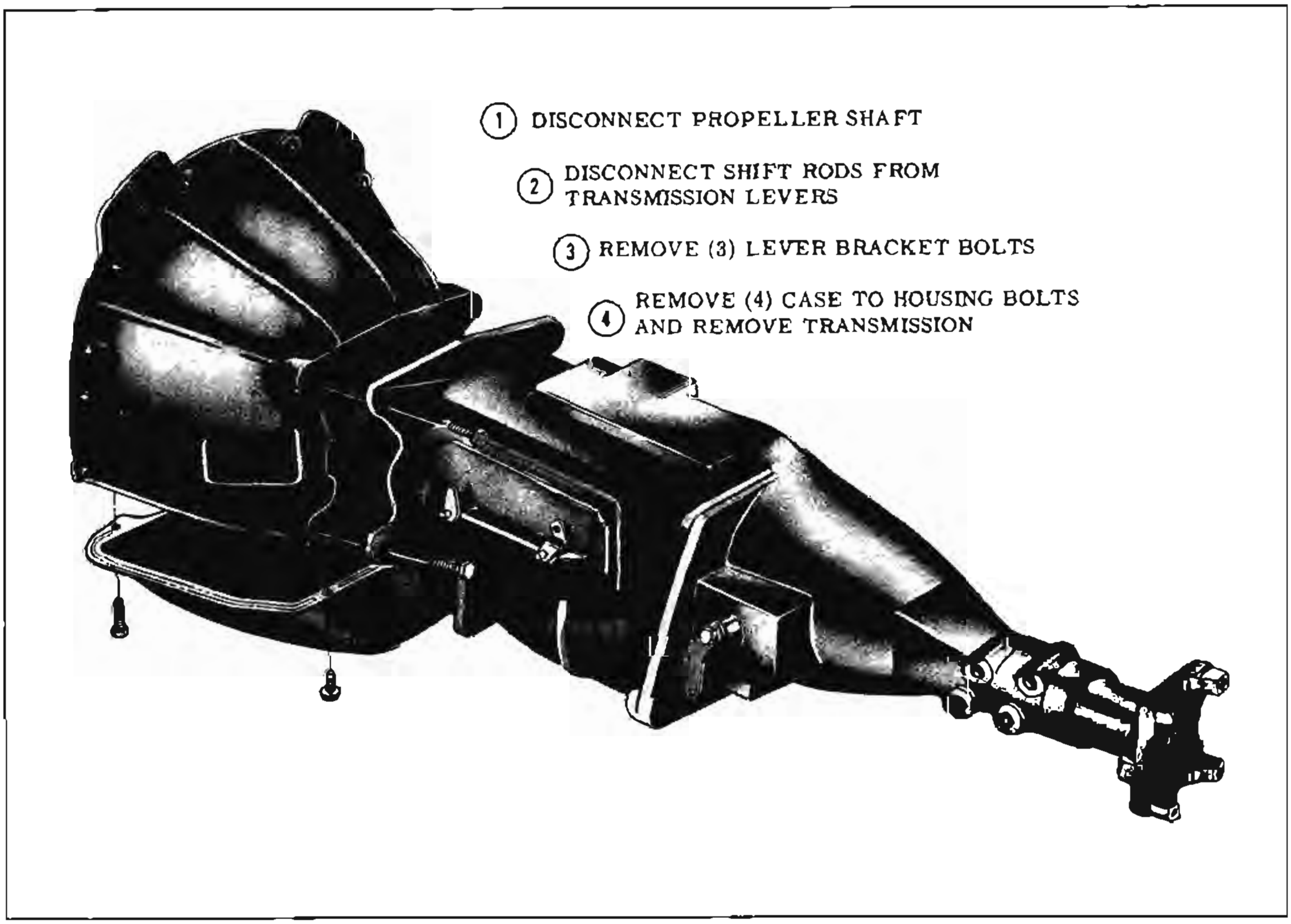


Fig. 11-212 Transmission Removal

5. Disconnect intermediate exhaust pipe from crossover pipe.

6. Support rear of engine and remove rear mount to cross bar bolts. Remove cross bar to side rail bracket bolts and remove cross bar.

7. Remove (3) bolts that retain shift lever assembly to extension housing. If shift lever assembly removal is not required, it may be left hanging in floor seal.

8. Remove the two upper transmission to clutch housing bolts and install two transmission guide pins in these holes.

   NOTE: The use of two guide pins during removal of transmission will support the transmission and prevent damage to the clutch disc from springing.

9. Remove the two lower transmission to clutch housing bolts. Loosen and slide crossover pipe hanger to one side.

10. Slide the transmission straight back until the main drive gear is free of splines in the clutch disc and remove transmission from car.

TRANSMISSION INSTALLATION

1. Inspect clutch pilot bushing and lubricate with wheel bearing grease.

2. Install transmission to clutch housing using guide pins for alignment. Rotate transmission output shaft as required to start main drive gear shaft into clutch drive.

3. Position exhaust crossover hanger to transmission lower right hand retaining bolt hole. Install the two lower transmission mounting bolts and lock washers and torque to 40-45 ft. lbs.

4. Remove guide pins and install upper mounting bolts and lock washers and torque to 40-45 ft. lbs.

5. Install rear mount cross bar. Torque cross bar to side rail bolts to 20-34 ft. lbs. Install rear mount to cross bar bolts and torque to 20-34 ft. lbs.

6. Connect propeller shaft to companion flange and torque "U" bolt nuts to 14-18 ft. lbs.

7. Connect intermediate pipe to crossover pipe.

8. Install (3) bracket to extension housing retaining bolts and torque to 20-30 ft. lbs.

9. Connect the three shift control rods to their respective shift levers at transmission.

10. Connect speedometer cable to driven gear and torque to 3-4 ft. lbs.

11. Replenish transmission lubricant with S.A.E. 80 or 90 Multi-Purpose Gear Lubricant. (2-1/2 pints capacity)

12. Check and, if necessary, adjust shift linkage as outlined under "Adjustments".

TRANSMISSION DISASSEMBLY

The main shaft assembly must be removed from the transmission case in order to remove the counter gear assembly or the main drive gear.

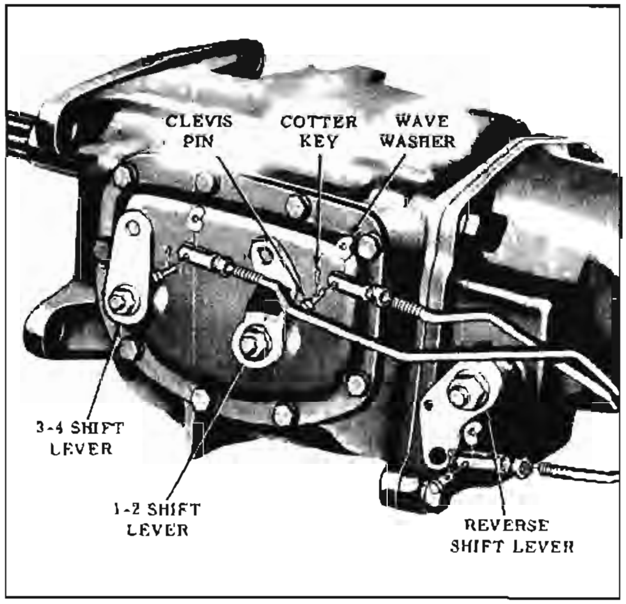


Fig. 11-213 Shift Rod Removal

REMOVING MAIN SHAFT ASSEMBLY

1. Remove the 3-4, 1-2, and reverse shift rods from the outer shift levers at the transmission side cover and extension housing. (Fig. 11-213)

2. Drain the transmission and place on bench with the side cover up.

3. Remove the nine side cover bolts, cover, and gasket. (Fig. 11-214)

4. Remove the 3-4 and 1-2 shifter forks. (Fig. 11-215)

   NOTE: The shift forks are interchangeable but should be kept separate so they can be installed on the original clutch sleeve.

5. Remove the speedometer driven gear.

6. Drive the retaining pin from the reverse shifter lever. (Fig. 11-215)

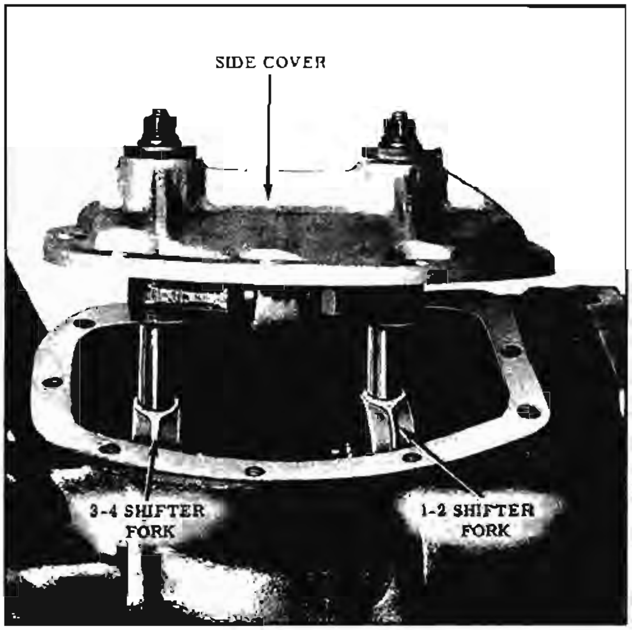


Fig. 11-214 Side Cover Removal

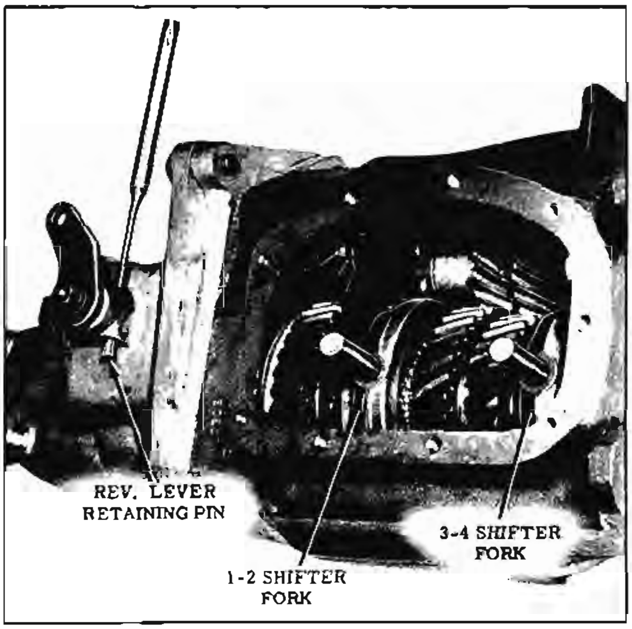


Fig. 11-215 Reverse Lever Retaining Pin Removal

NOTE: The retaining pin is a tapered pin and must be driven out from the bottom of the boss toward the top.

7. With the reverse shift lever facing down, pry the reverse shift shaft from the extension housing until "O" ring seal is visible. (Fig. 11-216)

NOTE: This will disengage the reverse shift fork from the reverse gear without dropping the reverse detent ball.

8. Remove the five extension housing bolts, extension housing, and gasket. (Fig. 11-217)

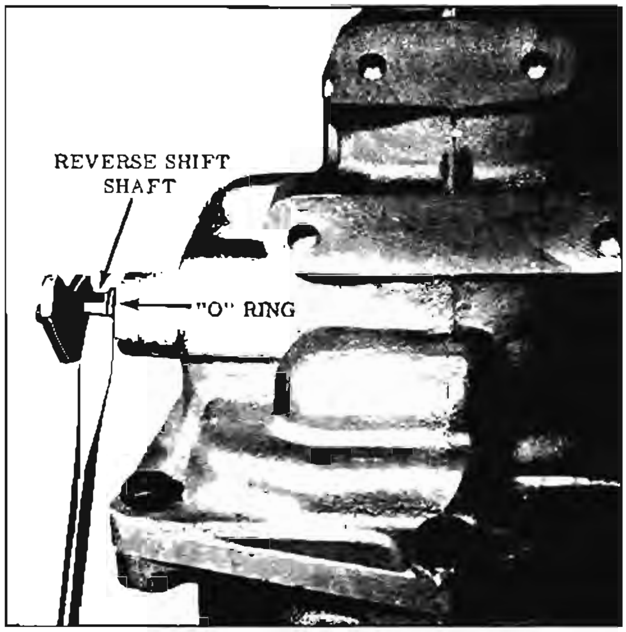


Fig. 11-216 Disengaging Reverse Shift Fork

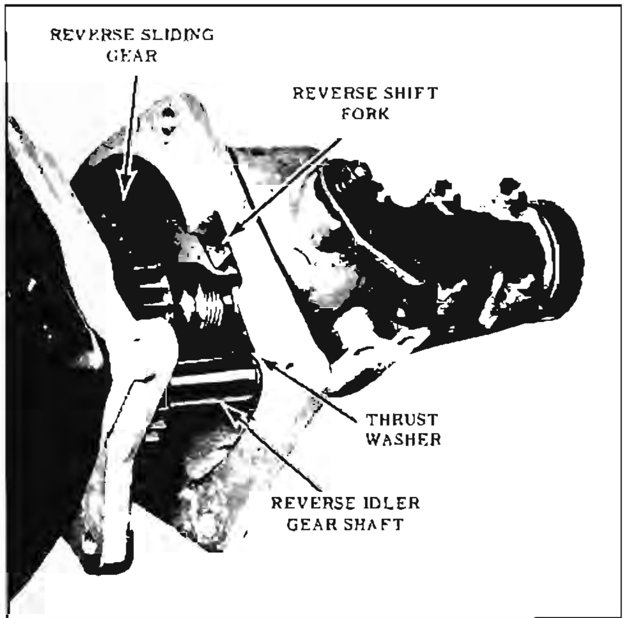


Fig. 11-217 Extension Housing Removal

NOTE: To remove the extension housing it may be necessary to tap the housing with a soft hammer. If the reverse shift fork has not disengaged from the sliding gear it will be necessary to rotate the extension housing slightly on the reverse idler gear shaft.

9. Remove the rear reverse idler gear thrust washer (tanged) from the idler gear shaft. (Fig. 11-217)

10. Remove the rear reverse idler gear assembly.

11. Remove the retainer to case bolt from the

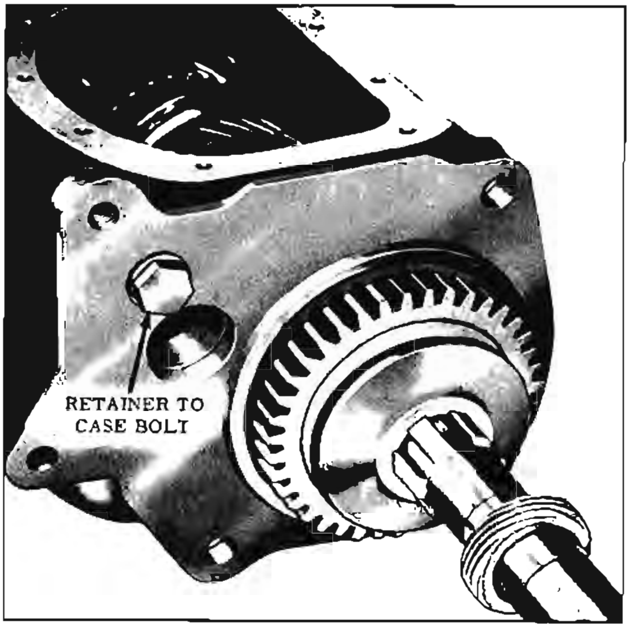


Fig. 11-218 Rear Bearing Retainer Removal

Fig. 11-219 Front Reverse Idler Gear and Thrust Washer Removal

rear bearing retainer. (Fig. 11-218)

NOTE: The bolt threads and the threads in the case are slightly mismatched to obtain a self-locking feature.

12. Remove the rear bearing retainer and gasket. It may be necessary to tap the retainer rearward to pull the dowel pin out of the case.

13. Slide the main shaft assembly out of the case.

14. Remove the 4th speed synchronizing ring from 3-4 speed clutch assembly. Ring may

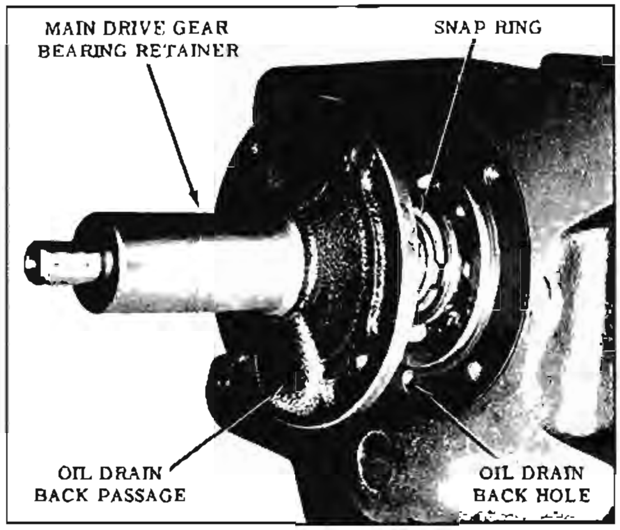


Fig. 11-220 Main Drive Gear Bearing Retainer Removal

Fig. 11-221 Main Shaft Snap Ring Removal

stay on main drive gear.

15. Remove the 14 roller bearings from the main drive gear.

16. Remove the front reverse idler gear and thrust washer from inside of case. (Fig. 11-219)

The main drive gear must be removed from the transmission case before the counter gear assembly can be removed.

REMOVING MAIN DRIVE GEAR

1. Remove the four bolts from the main drive gear bearing retainer and remove the retainer and gasket. (Fig. 11-220)

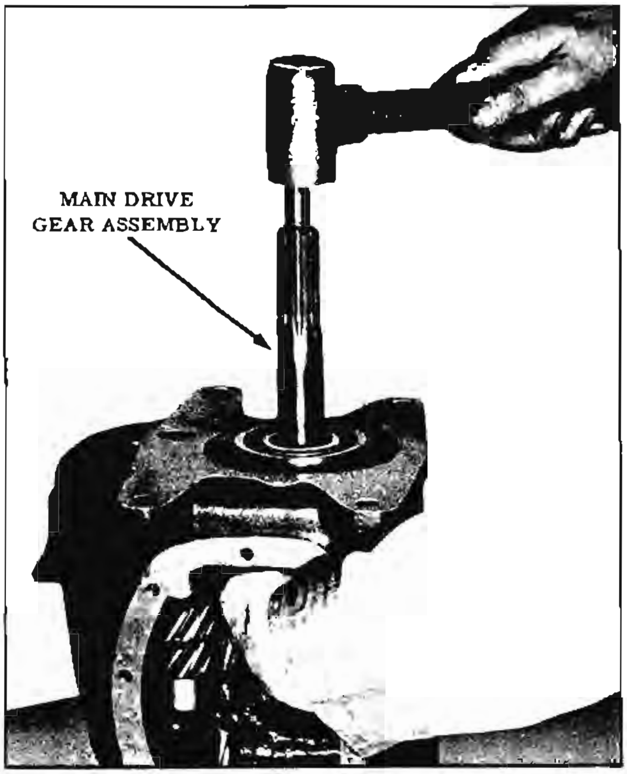


Fig. 11-222 Main Drive Gear Assembly Removal

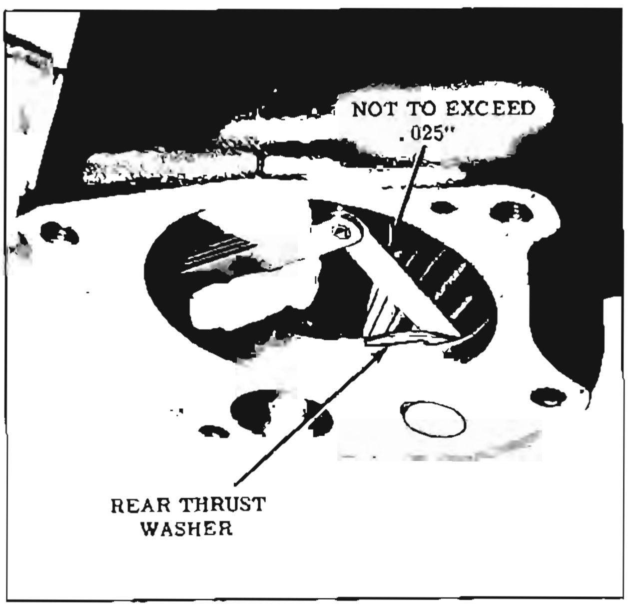


Fig. 11-223 Checking Counter Gear End Play

2. Remove the small snap ring and thrust washer from the main drive gear shaft. (Fig. 11-221)

   NOTE: Always use new snap rings when reassembling the transmission. Do not expand the new snap rings further than necessary for installation.

3. With a lead or bronze hammer, tap the main drive gear assembly through the bearing and into the case as shown. (Fig. 11-222)

REMOVING COUNTER GEAR

1. Check the counter gear end play with a feeler gauge between the rear thrust washer and the counter gear as shown in Fig. 11-223. Record for reassembly. The end play must not exceed .025".

   NOTE: If end play exceeds .025" it will be necessary to install new front and rear thrust washers on assembly.

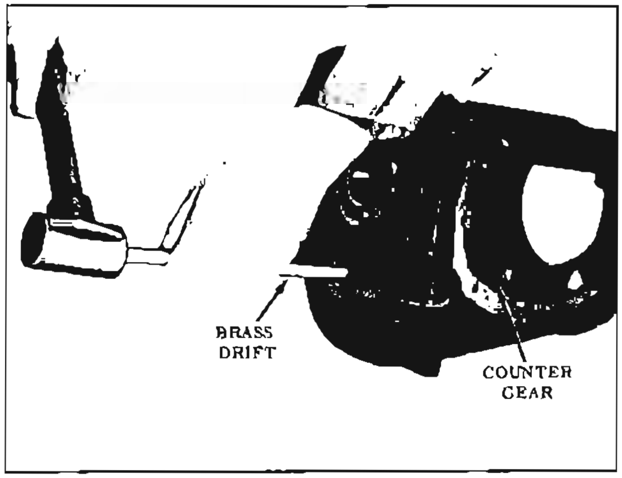


Fig. 11-224 Counter Gear Removal

2. From the front of the case JUST START the counter gear shaft until free in case by using a brass drift and hammer as shown in Fig. 11-224. Remove the key from rear of shaft. Then use counter gear loading tool J-9573 to push the counter gear shaft from the counter gear.

   NOTE: Keep the loading tool and countershaft together when removing shaft or the 80 roller bearings will be dropped.

3. Lift the counter gear with the front and rear tanged thrust washers from the rear of the case being careful not to allow the loading tool to slide out of counter gear.

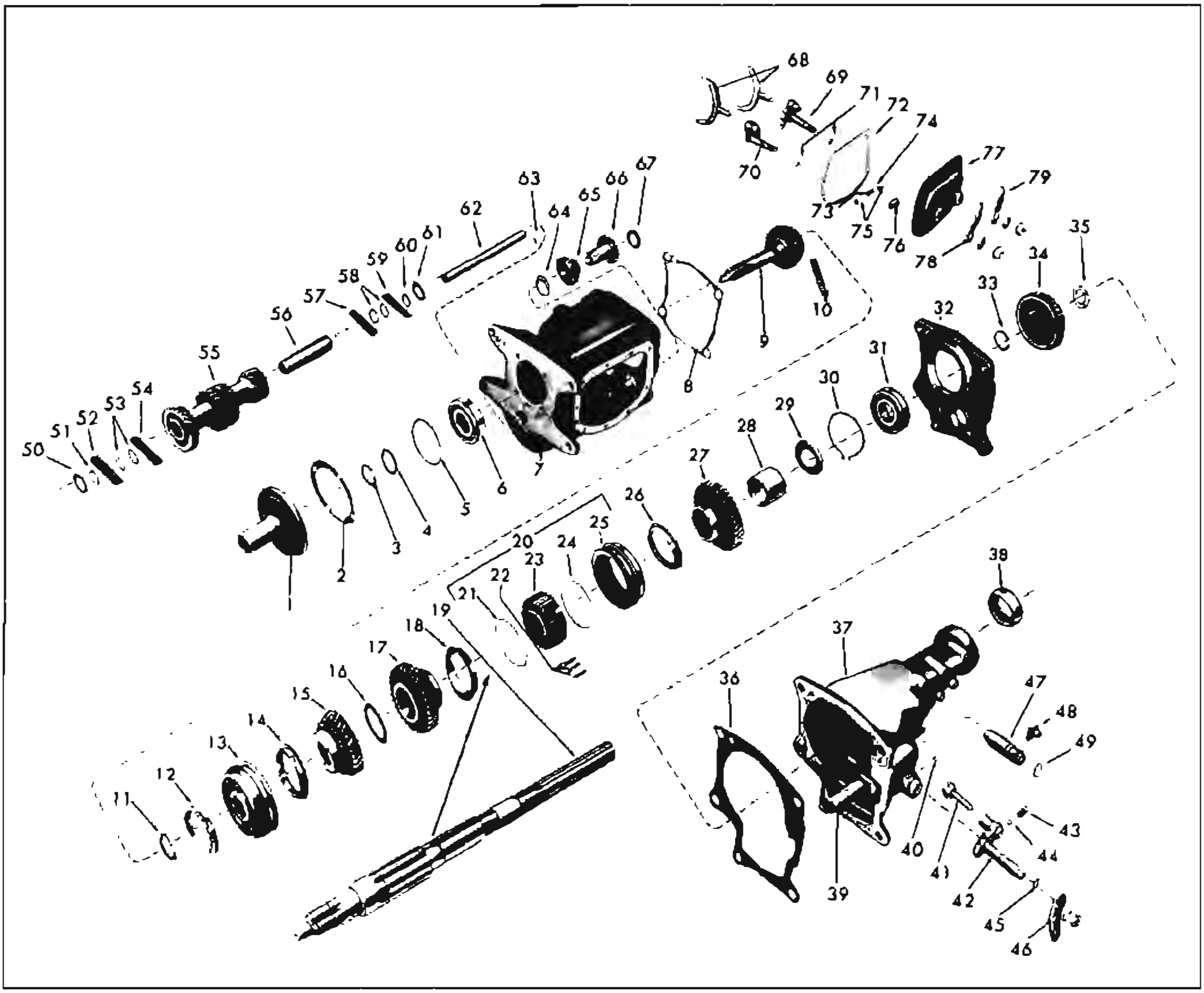
REMOVING MAIN DRIVE GEAR BEARING

1. Place the transmission case on two pieces of 2" x 4" board approximately 12" long with the front of case down as shown. (Fig. 11-226)

2. Using tools J-6133, Bearing Driver, and J-5154, Jetaway Extension Housing Seal Installer, drive the bearing out of case as shown. (Fig. 11-226)

CLEANING AND INSPECTION

1. Wash the transmission case with solvent and inspect for cracks. Inspect the machined surfaces of the case for burrs, if any are present,



1. Bearing Retainer
2. Gasket
3. Snap Ring
4. Spacer Washer
5. Bearing Snap Ring
6. Main Drive Gear Bearing
7. Transmission Case
8. Rear Bearing Retainer Gasket
9. Main Drive Gear
10. Bearing Rollers (14)
11. Snap Ring (.086" to .088")
12. Fourth Speed Gear Synchronizing Ring
13. Third and Fourth Speed Clutch Sliding Sleeve
14. Third Speed Synchronizing Ring
15. Third Speed Gear
16. Second and Third Speed Gear Thrust Washer (Needle Roller Bearing)
17. Second Speed Gear
18. Second Speed Gear Synchronizing Ring
19. Mainshaft
20. First and Second Speed Clutch Assembly
21. Clutch Key Spring
22. Clutch Keys
23. Clutch Hub
24. Clutch Key Spring
25. First and Second Speed Clutch Sliding Sleeve
26. First Speed Gear Synchronizing Ring
27. First Speed Gear
28. First Speed Gear Bushing
29. First Speed Gear Thrust Washer
30. Rear Bearing Snap Ring
31. Rear Bearing
32. Rear Bearing Retainer
33. Snap Ring
34. Reverse Gear
35. Speedometer Drive Gear

35A. Special Snap Ring

36. Rear Bearing Retainer to Case Extension Gasket
37. Case Extension
38. Rear Oil Seal
39. Reverse Idler Shaft
40. Reverse Shifter Shaft Lock Pin
41. Reverse Shift Fork
42. Reverse Shifter Shaft and Detent Plate
43. Reverse Shifter Shaft Ball Detent Spring
44. Reverse Shifter Shaft Detent Ball
45. Reverse Shifter Shaft "O" Ring Seal
46. Reverse Shifter Lever
47. Speedometer Driven Gear and Fitting
48. Retainer and Bolt
49. "O" Ring Seal
50. Tanged Washer
51. Spacer
52. Bearing Rollers (20)
53. Spacer
54. Bearing Rollers (20)
55. Countergear
56. Countergear Roller Spacer
57. Bearing Rollers (20)
58. Spacers
59. Bearing Rollers (20)
60. Spacer
61. Tanged Washer
62. Countershaft
63. Countershaft Woodruff Key
64. Reverse Idler Front Thrust Washer (Flat)
65. Reverse Idler Gear (Front)
66. Reverse Idler Gear (Rear)
67. Tanged Thrust Washer
68. Forward Speed Shift Forks
69. First and Second Speed Gear Shifter Shaft and Detent Plate
70. Third and Fourth Speed Gear Shifter Shaft and Detent Plate
71. "O" Ring Seals
72. Gasket
73. Interlock Pin
74. Interlock Spring
75. Detent Balls
76. Interlock Sleeve
77. Transmission Side Cover
78. Third and Fourth Speed Shifter Lever
79. First and Second Speed Shifter Lever

Fig. 11-225 Four Speed Synchromesh Transmission dress them off with a fine cut file.

2. Wash the front and rear bearing in a clean solvent and air dry.

   NOTE: Do not spin the bearings with compressed air, as it may damage the races and balls.

3. After the bearings have been thoroughly cleaned, lightly lubricate them with S.A.E. 80 or 90 Gear Lubricant and check for roughness.

4. Inspect the main drive gear and the counter gear (80) roller bearings for wear.

5. Inspect the counter gear shaft, sleeve, and spacers for excessive wear.

6. Inspect all gears for excessive wear or chipped teeth.

7. Check the synchronizing rings for the locking action by rotating them on their respective ramps. Check synchronizing ring teeth for wear and chipping. Check for wear and chipping at clutch teeth of gears.

8. Inspect all thrust washers for wear.

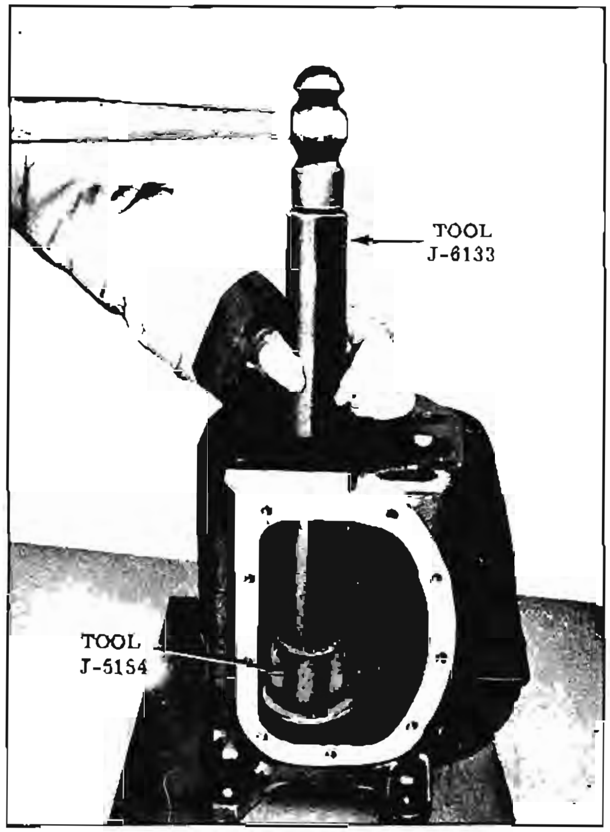


Fig. 11-226 Main Drive Gear Bearing Removal

TRANSMISSION ASSEMBLY

COUNTER GEAR AND MAIN DRIVE GEAR

1. Place transmission case on bench with the side cover opening up.

   NOTE: The case may be held in a vise by the lubrication filler plug. Check the plug to be sure it is tight in the case before clamping in the vise.

2. Using tool J-9573, load the sleeve, bearings, and spacers in order shown in Fig. 11-227.

3. When the counter gear is loaded with the sleeve, the 80 roller bearings, the 6 spacers,

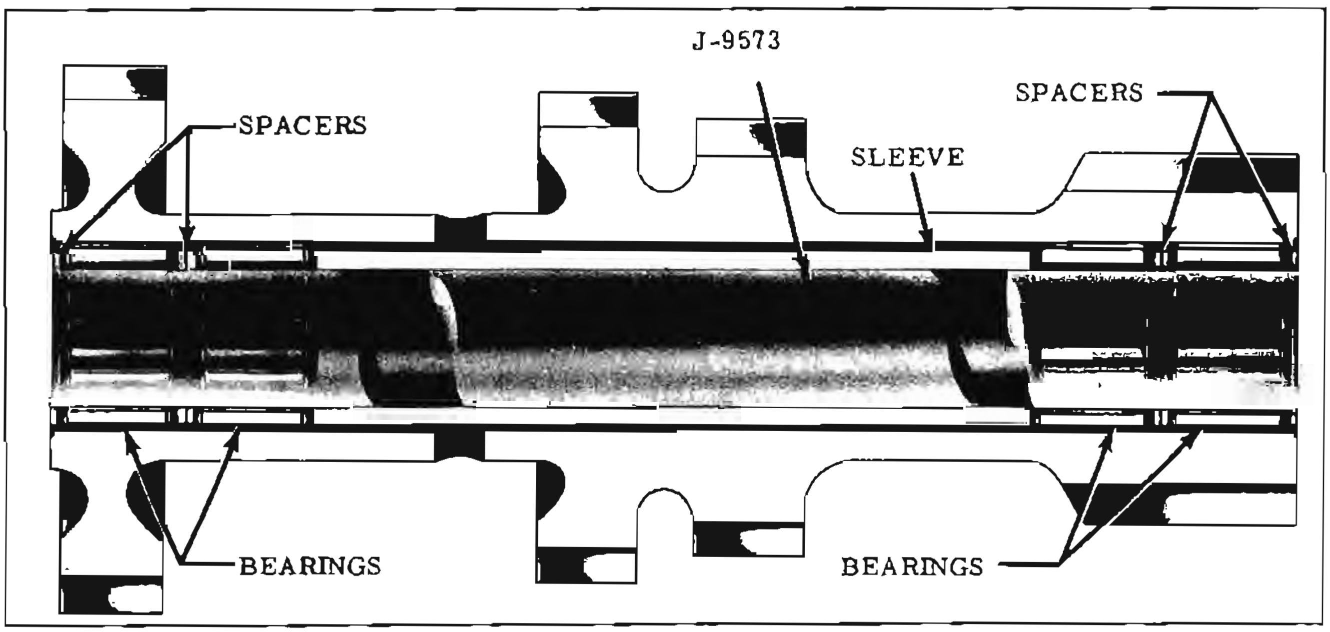


Fig. 11-227 Loading Counter Gear Parts

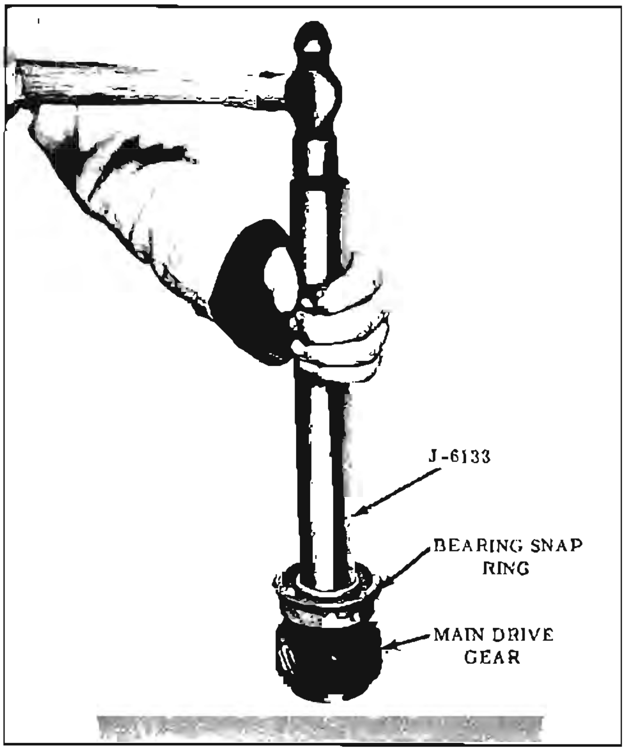


Fig. 11-228 Main Drive Gear Bearing Installation

and the loading tool J-9573, install the tanged thrust washers on each end of the counter gear with the tangs facing out. Retain the thrust washers on the counter gear with petrolatum.

NOTE: If the counter gear end play exceeded .025", when checked on disassembly, new tanged thrust washers must be installed.

4. Install the counter gear assembly, with large gear towards the front of the case. Be sure the tangs on both thrust washers enter the grooves in the case. Allow the counter gear assembly to lay on bottom of the case.

5. Using tool J-6133 install the main drive gear bearing on the main drive gear shaft with the snap ring in the outer race of the bearing toward the front of the shaft. (Fig. 11-228)

   NOTE: Be sure bearing fully seats against the shoulder on the gear.

6. Install the small thrust washer and snap ring.

7. Remove the large snap ring from the outer diameter of the main drive gear bearing.

8. Install the main drive gear and bearing assembly through the side cover opening and into the front of the transmission case. Tap lightly into position with a brass drift (12" - 15" long) and hammer until the snap ring groove in the bearing is exposed. (Fig. 11-229)

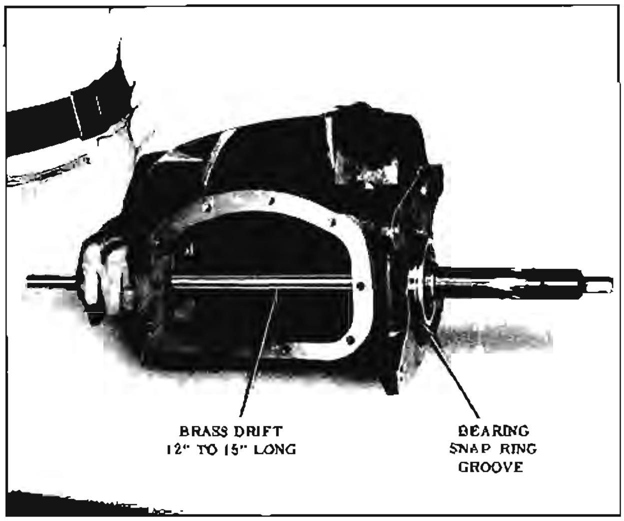


Fig. 11-229 Positioning Main Drive Gear Bearing in Case

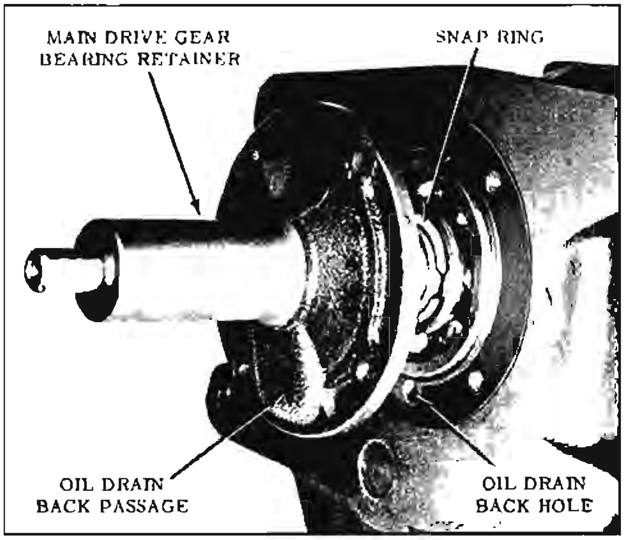


Fig. 11-230 Main Drive Gear Bearing Retainer Removal

9. Install the large snap ring on the bearing and tap the end of the shaft with a plastic hammer until the snap ring is positioned against the case.

10. Install main drive gear gasket and retainer with the oil return holes aligned; use sealer such as P.O.B. #3 Sealer on the four retaining bolts and torque 15-20 ft. lbs. (Fig. 11-230)

11. Hold the counter gear in alignment with the holes in the case. Insert the counter gear shaft through the rear of the case with the notch in the shaft to the rear and aligned with the notch in the case. Then push loading tool J-9573 out the front of the case.

    NOTE: Be sure tanged thrust washers at front and rear of counter gear remain in position.

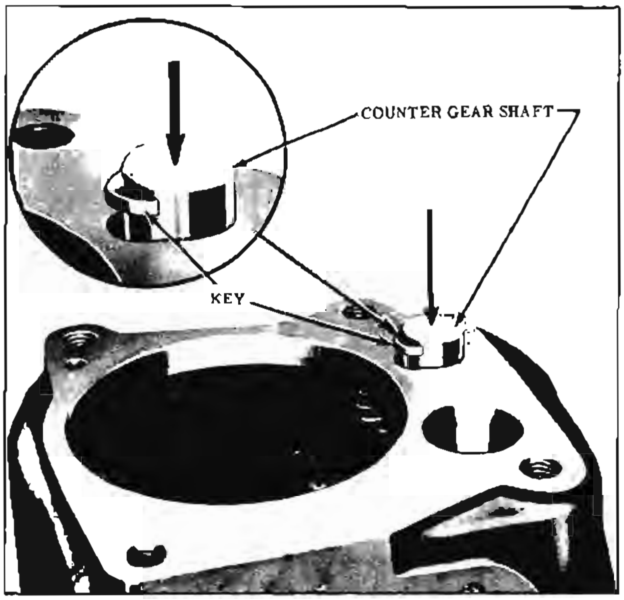


Fig. 11-231 Countershaft Installation

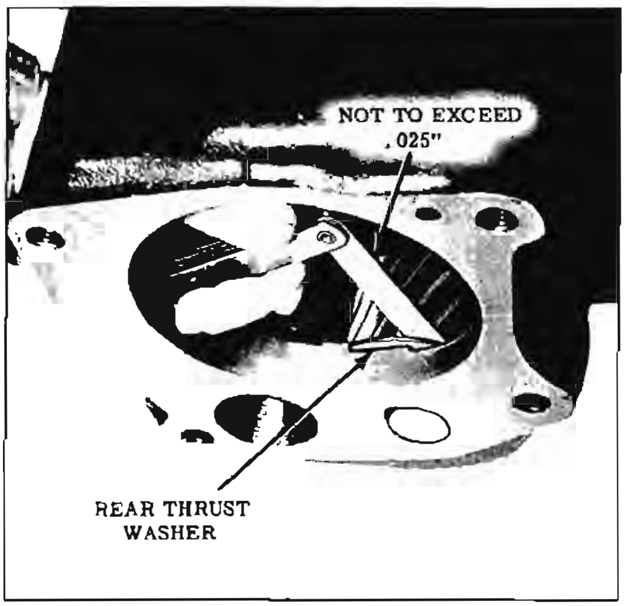


Fig. 11-232 Checking Counter Gear End Play

12. Install the woodruff key into end of countershaft and tap shaft until end of shaft is flush with rear face of transmission case. (Fig. 11-231)

13. Recheck the counter gear end play with a feeler gauge between the rear thrust washer and the counter gear. New front and rear thrust washers are required if end play exceeds .025". (Fig. 11-232)

MAIN SHAFT DISASSEMBLY

1. Remove the companion flange stop ring from the main shaft as shown. (Fig. 11-233)

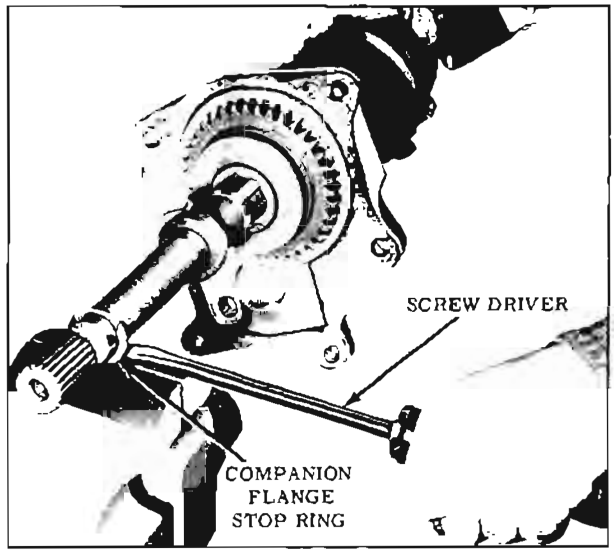


Fig. 11-233 Companion Flange Stop Ring Removal

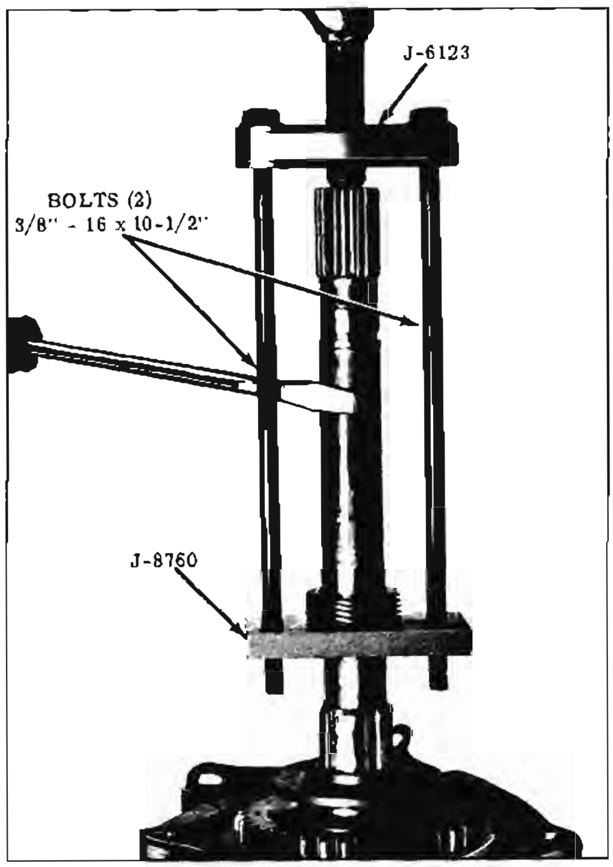


Fig. 11-234 Speedometer Drive Gear Removal

2. Remove the speedometer drive gear with tools J-6123 and J-8760. (Fig. 11-234)

NOTE: It will be necessary to use two bolts 3/8" - 16 x 10-1/2" to remove the speedometer drive gear. These bolts were furnished with 1961 essential tools to remove the full size car Hydra-Matic speedometer drive gear.

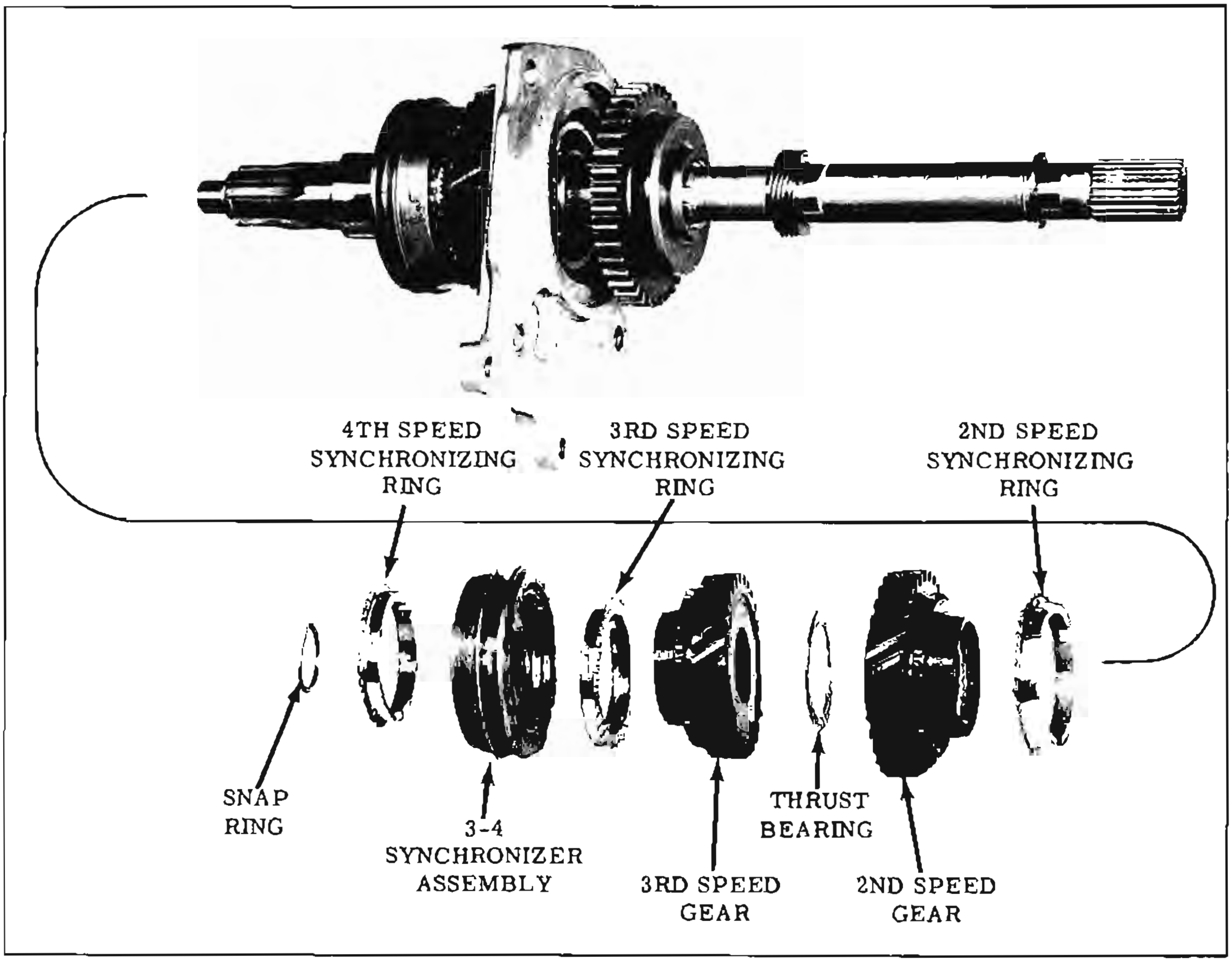


Fig. 11-235 Mainshaft Disassembly

3. Slide the reverse gear off the main shaft splines.

4. Remove the main shaft front snap ring. (Fig. 11-235)

5. Slide the 3-4 synchronizer assembly, third speed gear and synchronizing ring, second and third speed gear Torrington thrust bearings, second speed gear, and second speed synchronizing ring from front of main shaft. (Fig. 11-235)

6. Clamp the main shaft in a vise with the front of the shaft up. Avoid the machined areas of the shaft. (Fig. 11-236)

7. Spread the rear bearing retainer snap ring and tap the retainer off the bearing. (Fig. 11-236) Remove main shaft from vise and remove bearing retainer.

8. Remove the rear bearing snap ring from the main shaft. (Inset, Fig. 11-237)

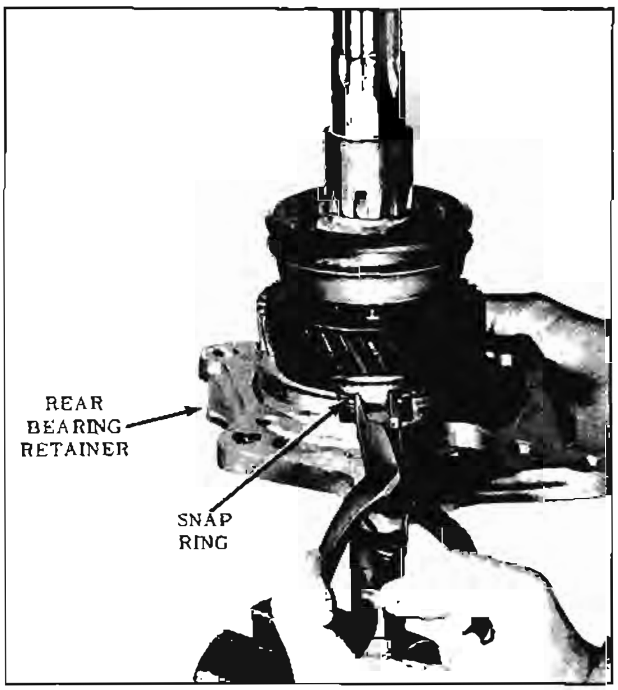


Fig. 11-236 Rear Bearing Retainer Removal

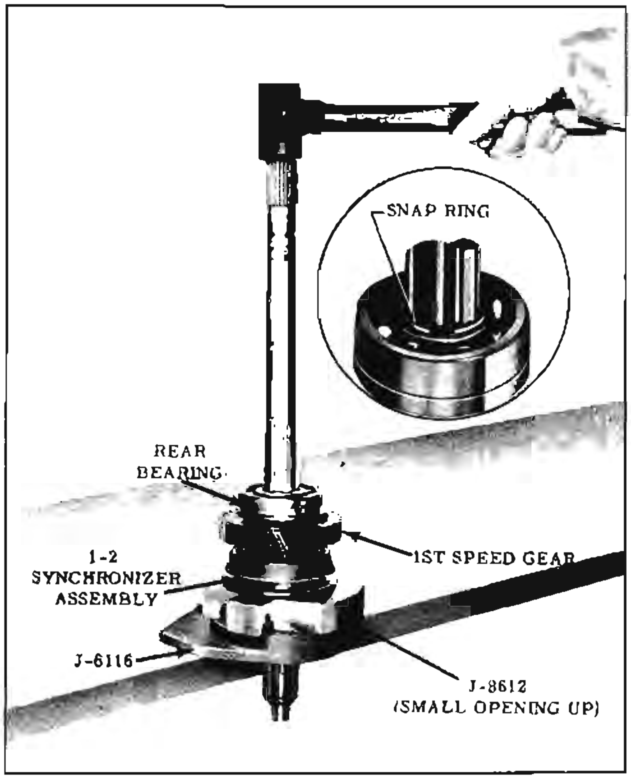


Fig. 11-237 Rear Bearing Removal

9. Place the front of the main shaft through the smaller opening side of tool J-8612, F-85 Rear Pinion Bearing Remover. Tool J-8612 may be placed on Jetaway clutch Holding Fixture J-6116 with front of main shaft through fixture. (Fig. 11-237)

10. Drive the main shaft out of the bearing using a lead or bronze hammer (shaft may be removed by using a press). (Fig. 11-237)

    NOTE: Do not allow main shaft to drop when driving from bearing.

11. Remove the rear bearing, first speed gear, synchronizing ring, 1-2 synchronizer assembly, and first speed gear bushing from the main shaft.

SYNCHRONIZER DISASSEMBLY AND ASSEMBLY

The synchronizer gears and synchronizer sleeves are a selected assembly and should be kept together as originally assembled. The three retainer plates and two retainer springs may be replaced if worn or broken.

1. Push the synchronizer gear from the synchronizer sleeve. The retainer plates will fall free and the retainer springs may be removed.

2. When reassembling, place the two retainer springs in position (one on each side of synchronizer gear) so a tanged end of each retainer spring falls into the same retainer plate keyway in the gear. Place the retainer plates in position and while holding them in place slide the gear into the sleeve. (Fig. 11-238)

ASSEMBLY OF MAIN SHAFT

1. With the wide taper of the 1-2 synchronizer sleeve towards the rear of the main shaft, slide the synchronizer assembly onto the main shaft. (Fig. 11-239)

   NOTE: Do not install the brass synchronizer ring at this time.

2. Place the rear of the main shaft through the small opening side of tool J-8612 and using a lead or bronze hammer, tap the main shaft to position the synchronizer hub against the shoulder on the main shaft. (Fig. 11-239)

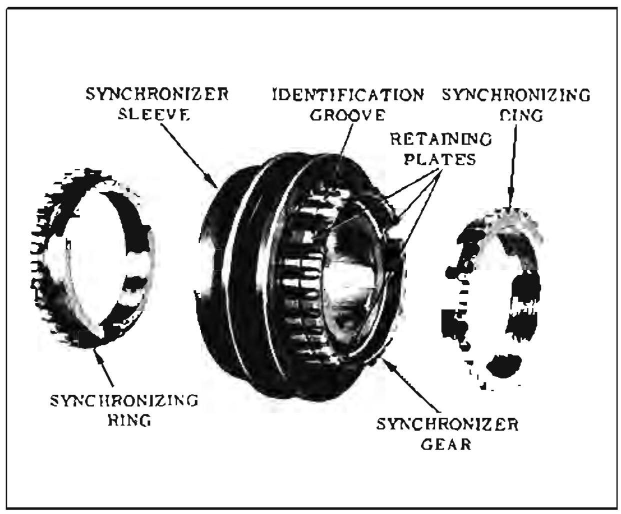


Fig. 11-238 Synchronizer Assembly

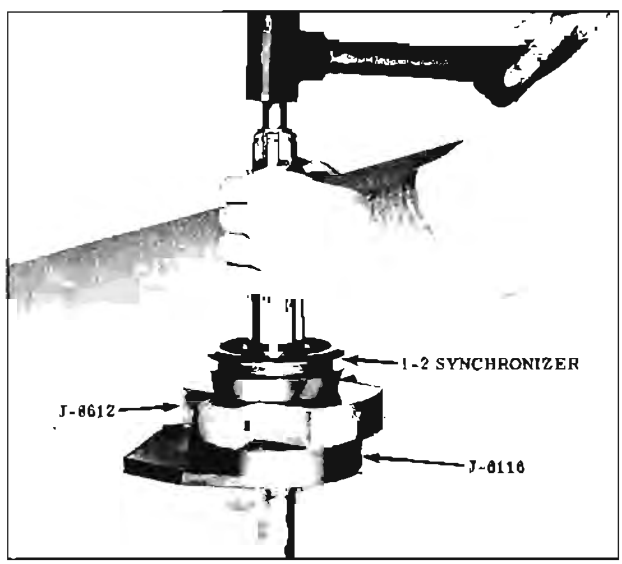


Fig. 11-239 1-2 Synchronizer Installation

3. Remove the main shaft from tool J-8612 and install the first speed gear steel bushing over the rear end of the main shaft. (Fig. 11-240)

   NOTE: The bushing is a snug fit over the splines of the main shaft. After the bushing is started over the splines, it may be necessary to tap it into position.

4. Install the first speed gear synchronizing ring with the notches in the ring aligned with the retainer plates in the synchronizer gear. (Fig. 11-240)

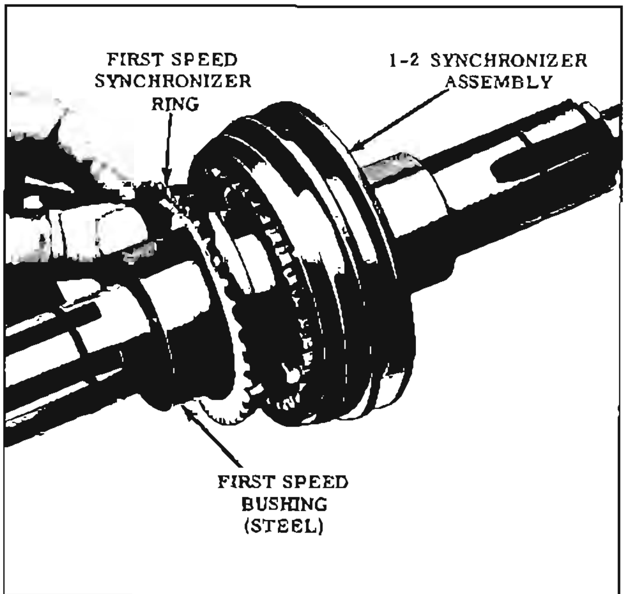


Fig. 11-240 Bushing and Synchronizer Ring Installation

5. Install first speed gear with the hub toward the front of the main shaft. Install the first speed gear thrust washer. (Fig. 11-241)

6. Install the rear bearing with the snap ring groove in the outer race toward the front of the main shaft. Firmly seat bearing against the shoulder on the main shaft with tools J-6133 and J-8808. (Fig. 11-242)

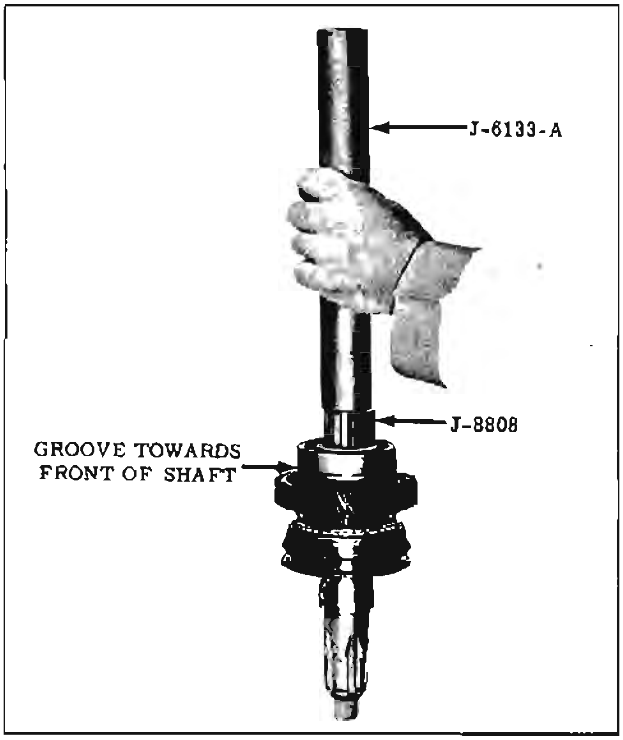


Fig. 11-242 Seating Rear Bearing

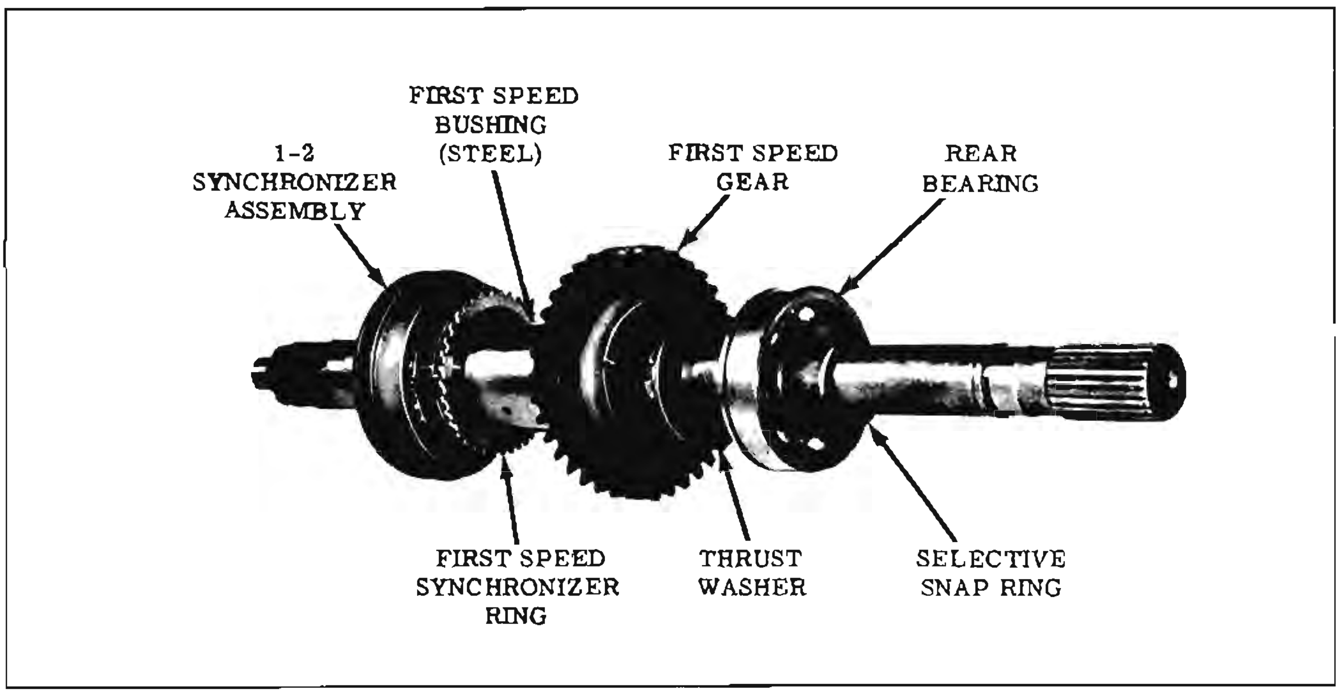


Fig. 11-241 Positioning First Speed Gear and Rear Bearing on Mainshaft

Fig. 11-243 Installing Rear Bearing Retainer

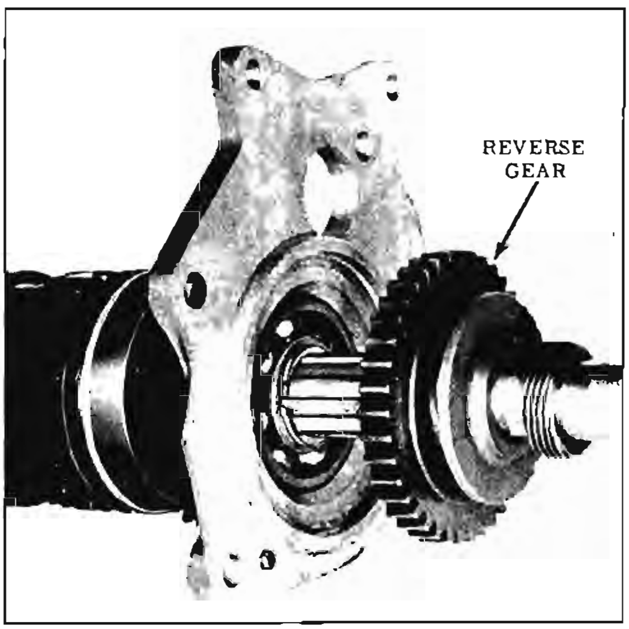


Fig. 11-244 Installing Reverse Gear

7. Install the rear bearing snap ring in the groove in the main shaft behind the rear bearing.

8. Install the rear bearing retainer as shown. Spread the snap ring in the retainer to allow the snap ring to drop around the rear bearing then press on the end of the main shaft until the snap ring engages the groove in the bearing. (Fig. 11-243)

9. Install the reverse gear with the shift collar to rear on the splines of the main shaft. (Fig. 11-244)

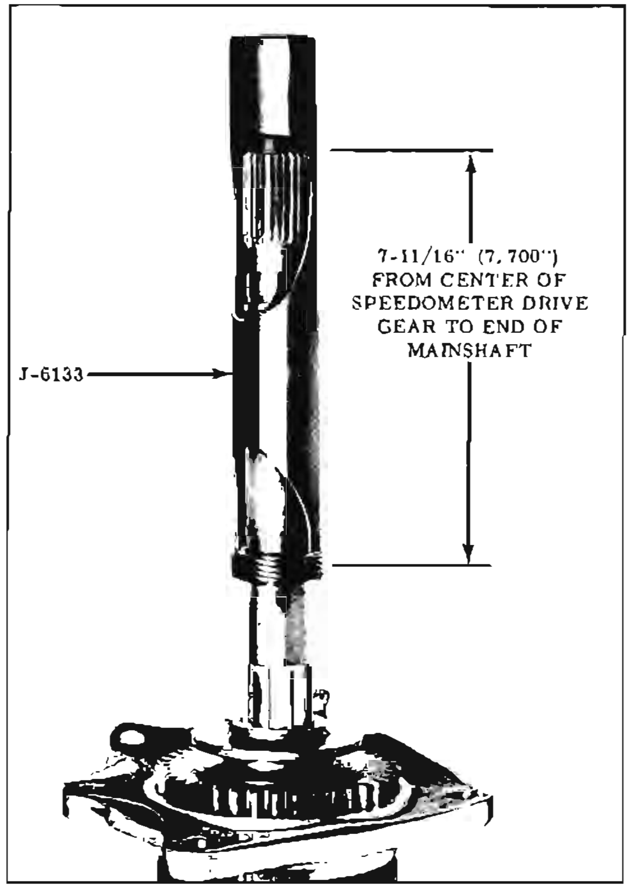


Fig. 11-245 Installing Speedometer Drive Gear

10. Install the speedometer drive gear onto the main shaft using tool J-6133. Position the gear 7-11/16" (7.7") from the center of the gear to the end of the main shaft. (Fig. 11-245)

    NOTE: There are two speedometer drive gears used for different ratios. They are different in width, therefore, the center of the gear and end of the shaft must be used to properly position the drive gear on the main shaft.

11. Install the flange stop ring in the groove in the main shaft.

12. From the front of the main shaft, install the second speed gear synchronizing ring so notches in the ring correspond to the keys in the hub. (Fig. 11-246)

13. Install the second speed gear (with the hub of the gear toward the back of the main shaft) and install the thrust bearing (needle roller bearing).

14. Install the third speed gear (hub to front of main shaft) and the third speed gear synchronizing ring (notches to front of transmission).

15. Install the 3-4 synchronizer assembly (gear and sleeve) with taper toward the front, making

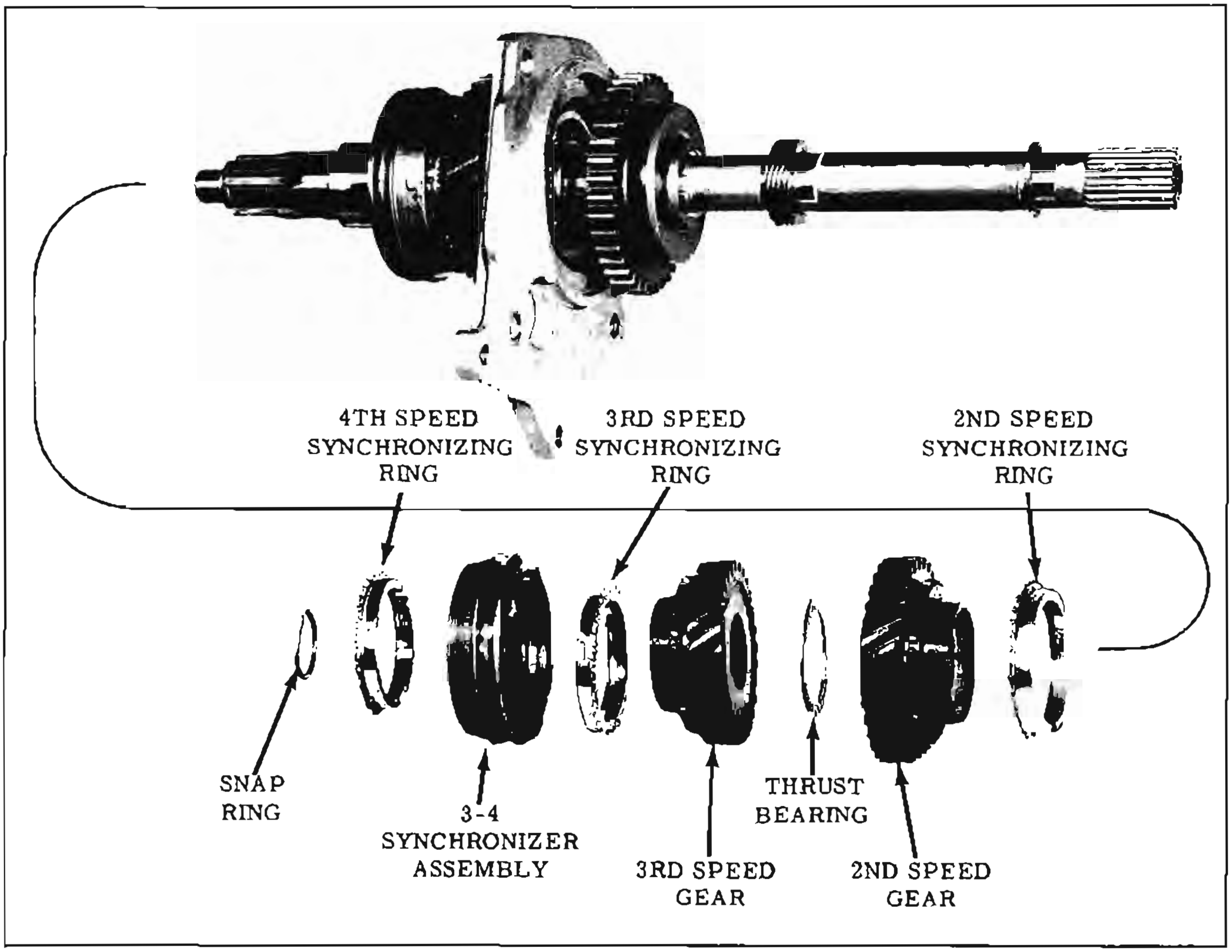


Fig. 11-246 Mainshaft Assembly

sure that the retainer plates in the gear correspond to the notches in the third speed gear synchronizing ring.

16. Install snap ring in the groove in main shaft in front of the third and fourth synchronizer assembly.

    NOTE: This snap ring is not a selective fit but should be .086" to .088" thick.

INSTALLING MAIN SHAFT ASSEMBLY AND REVERSE IDLER GEAR IN CASE

1. Place the transmission case on holding fixture J-6116 with the front of the case down.
2. Position the reverse idler gear thrust washer (untanged) on the machined surface of the boss in the case. Use petrolatum to retain. (Fig. 11-247)
3. Position the front reverse idler gear on the thrust washer with the teeth toward the front of the case.

Fig. 11-247 Installing Thrust Washer and Front Reverse Idler Gear

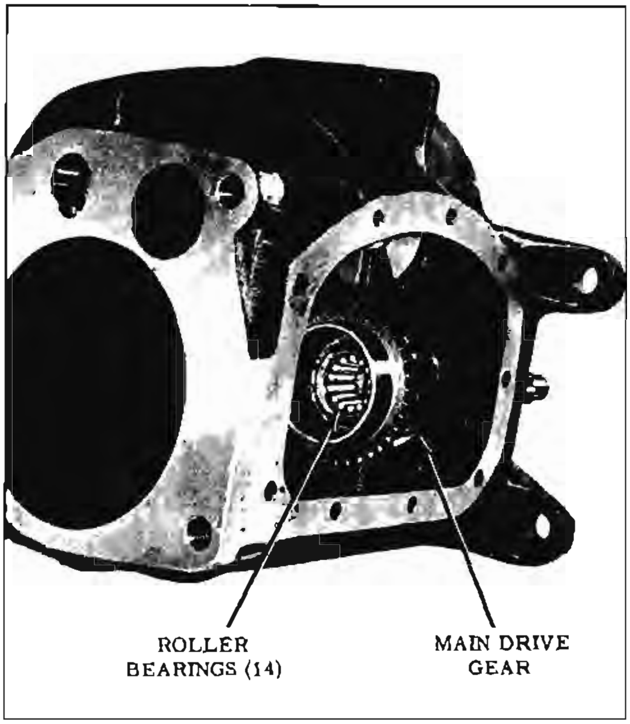


Fig. 11-248 Installing Bearings in Front Reverse Idler Gear

4. Position the rear bearing retainer gasket on the front face of the rear bearing retainer. Use petrolatum to retain.

5. Install the fourth speed synchronizing ring on the main drive gear with the notches toward the rear of the case.

6. Install the fourteen roller bearings into the main drive gear, using petrolatum to hold the bearings in place. (Fig. 11-248)

7. With both synchronizing clutches in the neutral position, lower the main shaft assembly into the case, making certain that the notches on the fourth speed synchronizing ring align with the retainer plates in the synchronizer assembly. Turn the main drive gear shaft to mesh the gears.

8. Be sure the dowel pin in the rear bearing retainer is aligned with the hole in the case, then install the self-locking bolt attaching rear bearing retainer to transmission case. Torque 20-30 ft. lbs. (Fig. 11-249)

9. From the rear of the case, insert the rear reverse idler gear, engaging the splines with the front reverse idler gear.

10. Using petrolatum to retain, place the gasket into position on rear face of the rear bearing retainer.

EXTENSION HOUSING BUSHING

The extension housing bushing may be replaced if upon inspection it is found to be worn or scored.

The extension housing must be removed from the transmission in order to replace the bushing.

REMOVING EXTENSION HOUSING BUSHING

1. Remove the oil seal with a blunt chisel by tapping between seal flange and housing.
2. Drive the bushing into the extension housing with Bushing Installer and Remover Tool J-9575 and handle J-8092. (Fig. 11-250)

Fig. 11-249 Installing Rear Bearing Retainer

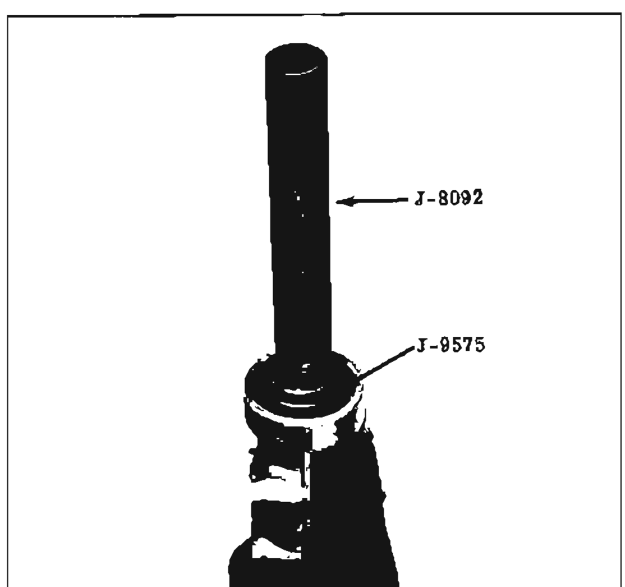


Fig. 11-250 Removing Extension Housing Bushing

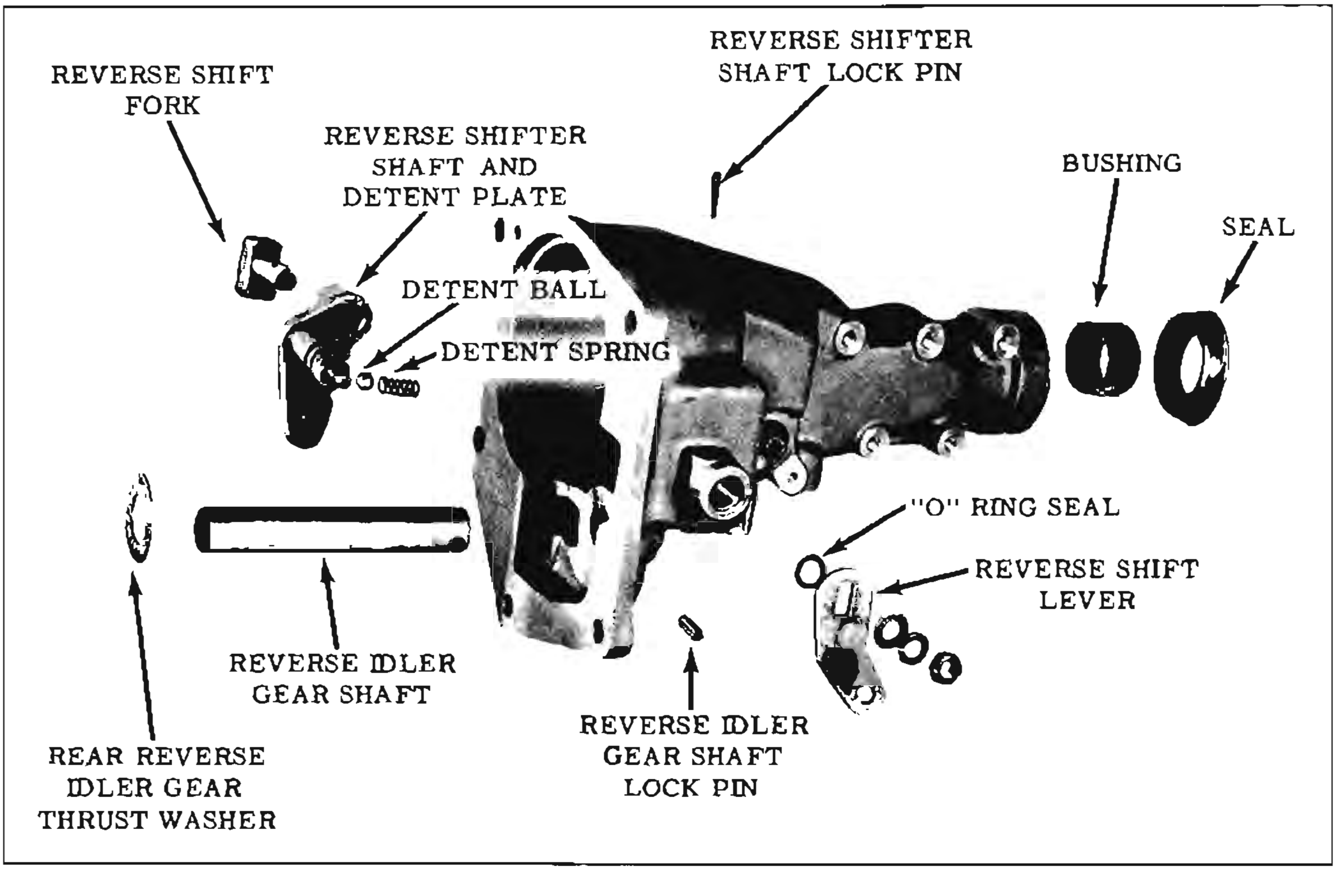


Fig. 11-251 Extension Housing Disassembly

INSTALLING EXTENSION HOUSING BUSHING

1. Install the bushing from the rear of the housing with tool J-9575, the bushing must be positioned so it is 1/16" below the machined area in the extension housing.

2. Install the extension housing seal.

DISASSEMBLY OF EXTENSION HOUSING

1. With the extension housing removed from the transmission, the reverse shifter shaft lock pin will have been previously removed.

2. Remove the reverse shift fork from the detent plate. (Fig. 11-251)

3. Carefully drive the shift shaft into the extension housing, allowing the detent ball to drop into the housing. (Fig. 11-251)

4. Remove the shift shaft assembly and the detent spring. (Fig. 11-251)

5. The reverse idler gear shaft may be replaced by carefully driving the lock pin into the shaft, then pull the shaft and pin from the front of the extension housing. (Fig. 11-252)

   NOTE: The pin hole in the shaft is larger than the pin, therefore, the pin will fall from the shaft when the shaft clears the housing.

ASSEMBLY OF EXTENSION HOUSING

1. Install the reverse idler gear shaft in the extension housing, lock pin end first, and

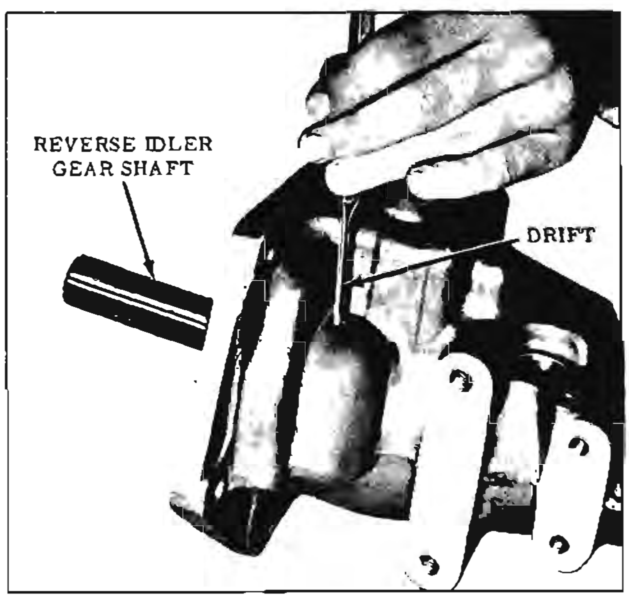


Fig. 11-252 Removing Reverse Idler Gear Shaft

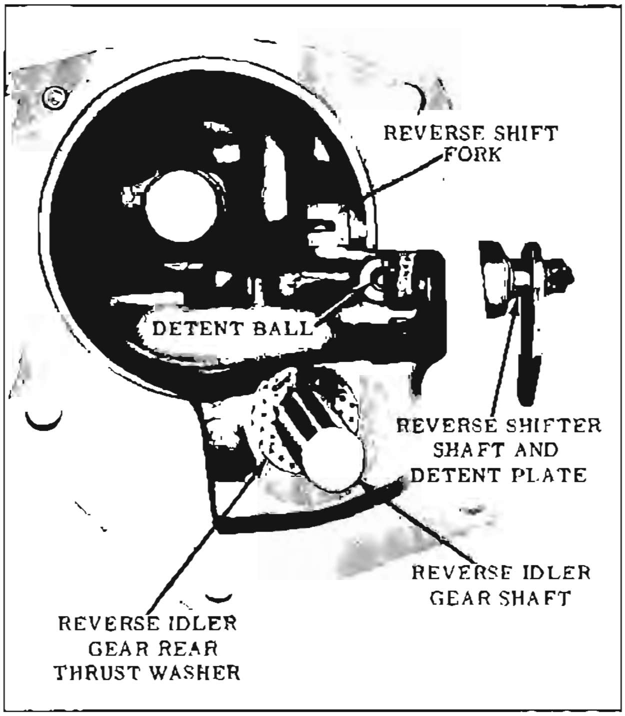


Fig. 11-253 Assembling Extension Housing

align the lock pin hole in the shaft with the hole in the housing.

2. Put a sealer such as P.O.B. #3 on the lock pin and in the hole and drive the pin into the extension housing and shaft until pin is flush with housing.
3. Place the detent spring into the detent spring hole and start the reverse shifter shaft into the hole in the boss.
4. Place the detent ball on the spring and while holding the ball down with a small screwdriver, push the shift shaft into place and turn, so the ball can drop into place in the detent plate. (Fig. 11-253)
5. Install the reverse shift fork on the detent plate.

   NOTE: Do not install the shifter shaft lock pin until the extension housing has been installed on the transmission.

INSTALLING EXTENSION HOUSING

1. Using petrolatum to retain, install the remaining thrust washer on the reverse idler shaft, making sure the tang on the thrust washer is in the notch in the housing.
2. Check the extension housing to be sure the detent ball is in position and the shifter shaft is pulled out until the "O" ring is visible. The "O" ring must be visible so the shift fork will clear the flange on the reverse gear. (Fig. 11-253)
3. Move the reverse shift fork to the forward position in the extension housing and line up the front and rear reverse idler gears with the thrust washers.
4. Position the extension housing over the end of the main shaft.
5. While holding the reverse sliding gear to the rear of the splines, push the extension housing forward to engage the reverse shift fork over the reverse gear shift collar.
6. Push in on the reverse shifter shaft to maintain engagement of the shift fork with the sliding gear then guide the reverse idler shaft through the reverse idler gears and thrust washers.
7. Line up the groove in the reverse shifter shaft with the hole in the extension housing and install the taper lock pin through from the top of the boss.
8. Move the shift lever to the reverse and neutral position and turn the main drive gear shaft to check for proper operation.
9. Use a sealer such as P.O.B. #3 on one of the larger bolts (extension housing and bearing retainer to case) and install in the lower right side of the extension housing (in line with the filler plug). (Fig. 11-254)
10. Install the other two larger bolts and torque ALL three bolts 35-40 ft. lbs. (Fig. 11-254)
11. Install the two extension housing to bearing retainer bolts and torque 20-30 ft. lbs. (Fig. 11-254)

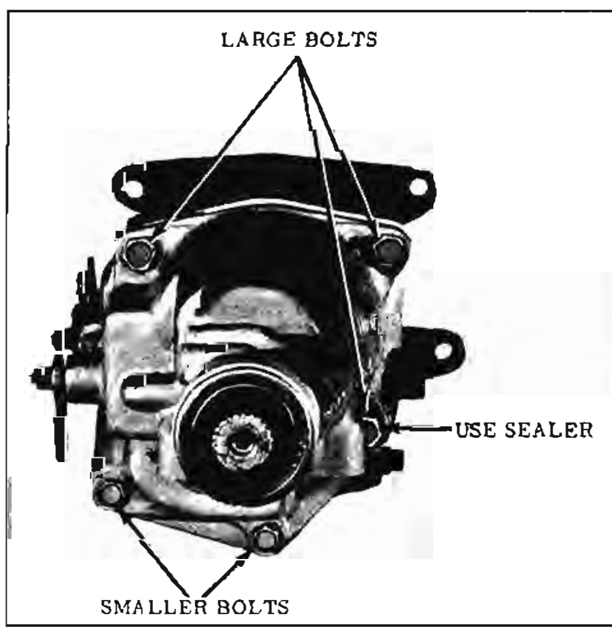


Fig. 11-254 Installing Extension Housing

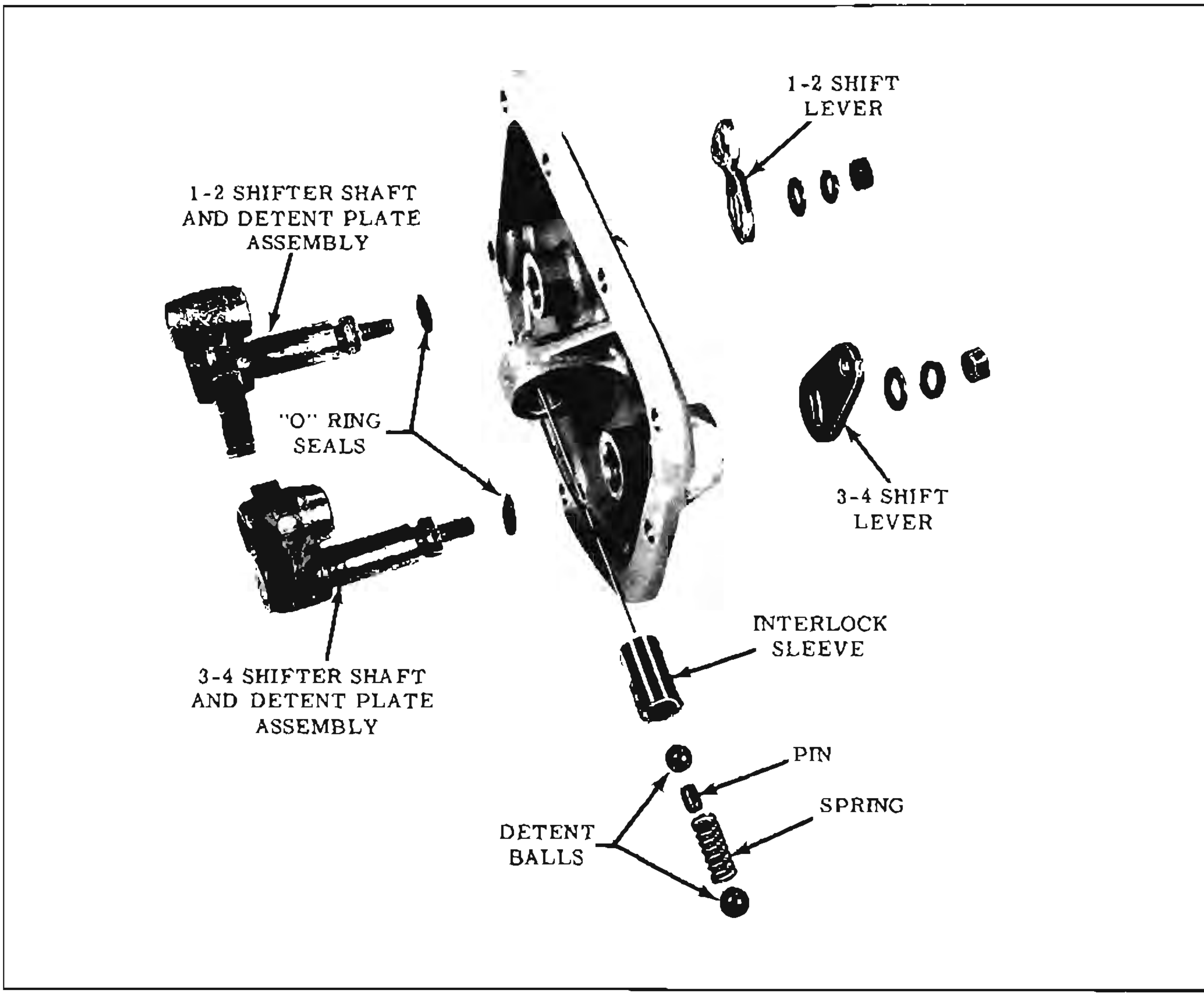


Fig. 11-255 Side Cover Assembly

12. Align the groove in the reverse shifter shaft with the hole in the boss and install the tapered lock pin from the top of the boss.

13. Place the transmission on the bench with the side cover opening up.

SIDE COVER

The side cover may be disassembled if upon inspection it is found that any of the following parts need to be replaced.

1. The side cover
2. The 1-2 shift shaft and detent plate
3. The 3-4 shift shaft and detent plate
4. Shaft "O" ring seals
5. The interlock pin
6. The interlock spring
7. The detent balls
8. The interlock sleeve
9. The 1-2 shifter lever
10. The 3-4 shifter lever

DISASSEMBLY OF SIDE COVER (Fig. 11-255)

1. Remove the outer shifter lever nuts and lock washers and pull levers from shafts.
2. Carefully push the shifter shafts into cover, allowing the detent balls to fall free, then remove both shifter shafts.
3. Remove interlock sleeve, interlock pin and spring. The interlock sleeve is selective and prevents the transmission from being shifted into two forward gears at the same time.

There are four different sizes of interlock sleeves with .005" difference between each sleeve. The four sizes are: 1.0235", 1.0185", 1.0135", and 1.0085".

ASSEMBLY OF SIDE COVER (Fig. 11-255)

1. Install interlock sleeve and one shifter shaft. Place one detent ball into sleeve followed by the spring and interlock pin.
2. Start second shifter shaft into position and place second detent ball on the spring. Compress ball and spring with screwdriver and push the shifter shaft fully in.
3. Position one detent plate in the neutral position and the other detent plate in any gear position.
4. Check the clearance between the end of the interlock sleeve and the detent plate. This clearance should be .002" to .008", if not it will be necessary to install the correct selective detent sleeve to obtain this clearance.
5. Install the outer shift levers, lock washers, and nuts on the shift shafts.

INSTALLING SIDE COVER ON CASE

1. Install a shift fork in each clutch sleeve.
2. Check the 1-2 and 3-4 synchronizers to be sure they are in the neutral position.
3. Check the detent plates in the side cover to be sure they are in the neutral position (detent balls in center notches). (Fig. 11-256)
4. Position the gasket on the case, retain with petrolatum.
5. Install the side cover over the shift fork shafts.
6. Apply a sealer such as P.O.B. #3 to the lower right cover bolt and install all bolts. Torque evenly 10-20 ft. lbs. (Fig. 11-257)

GEAR SHIFT ASSEMBLY

Removal

1. Place lever in neutral position and remove shift knob and lock nut.
2. With car raised, remove the (3) shift rod retainer clips and disconnect shift rods from the reverse, 1-2 and 3-4 shift levers. (Fig. 11-258)
3. Remove (3) bolts which retain lever assembly bracket to the rear extension housing. (Fig. 11-258)

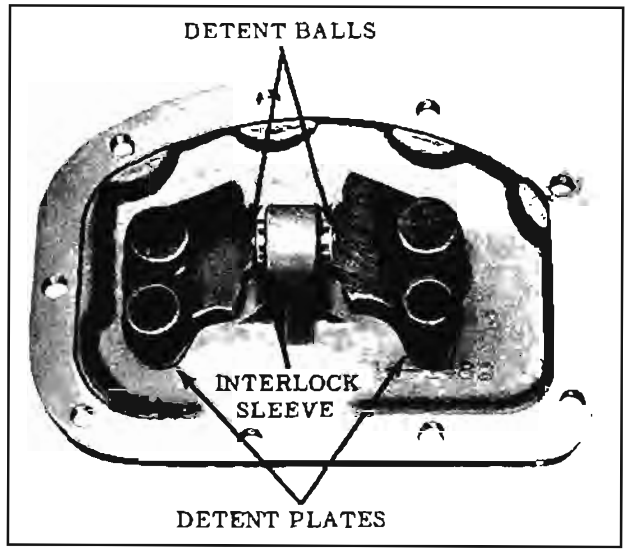


Fig. 11-256 Correct Positioning of Detent Plates

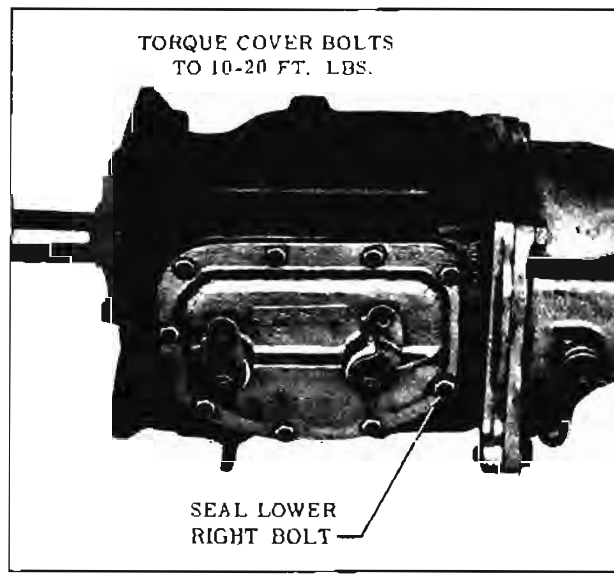


Fig. 11-257 Side Cover Installation

4. Remove gear shift lever assembly by sliding gear shift lever down through rubber seal at floor pan.

DISASSEMBLY (Figs. 11-259 & 260)

1. Remove the two retainer bolts and the retainer. (Fig. 11-259)
2. Remove the reverse lever, interlock plate, 1-2 lever, and the 3-4 lever. (Fig. 11-260)
3. Remove the sleeve nut from the control shaft, the reverse crossover spring assembly and the second to third gear crossover spring. (Fig. 11-260)
4. Remove the two guide plate bolts and washers and the guide plate and shift lever spring bracket. (Fig. 11-260)

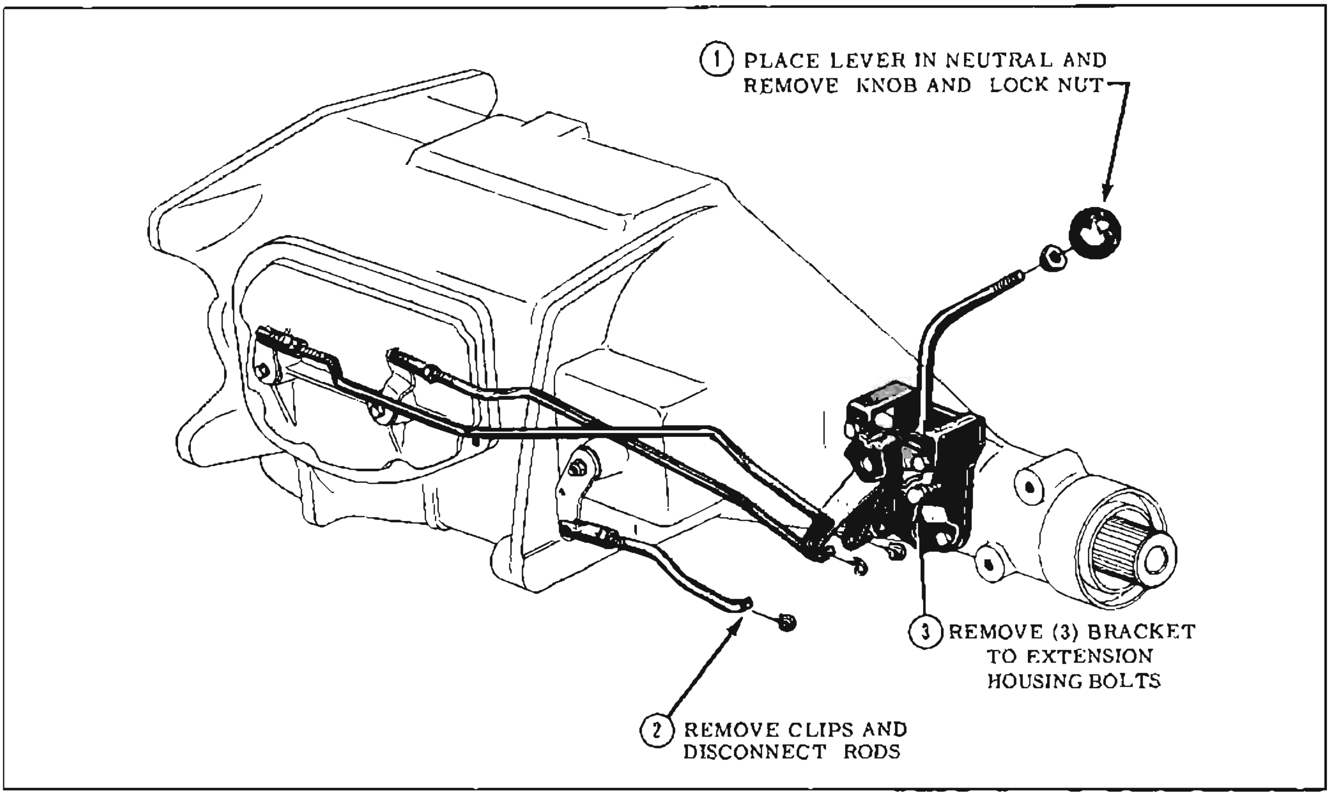


Fig. 11-258 Removing Gear Shift Assembly

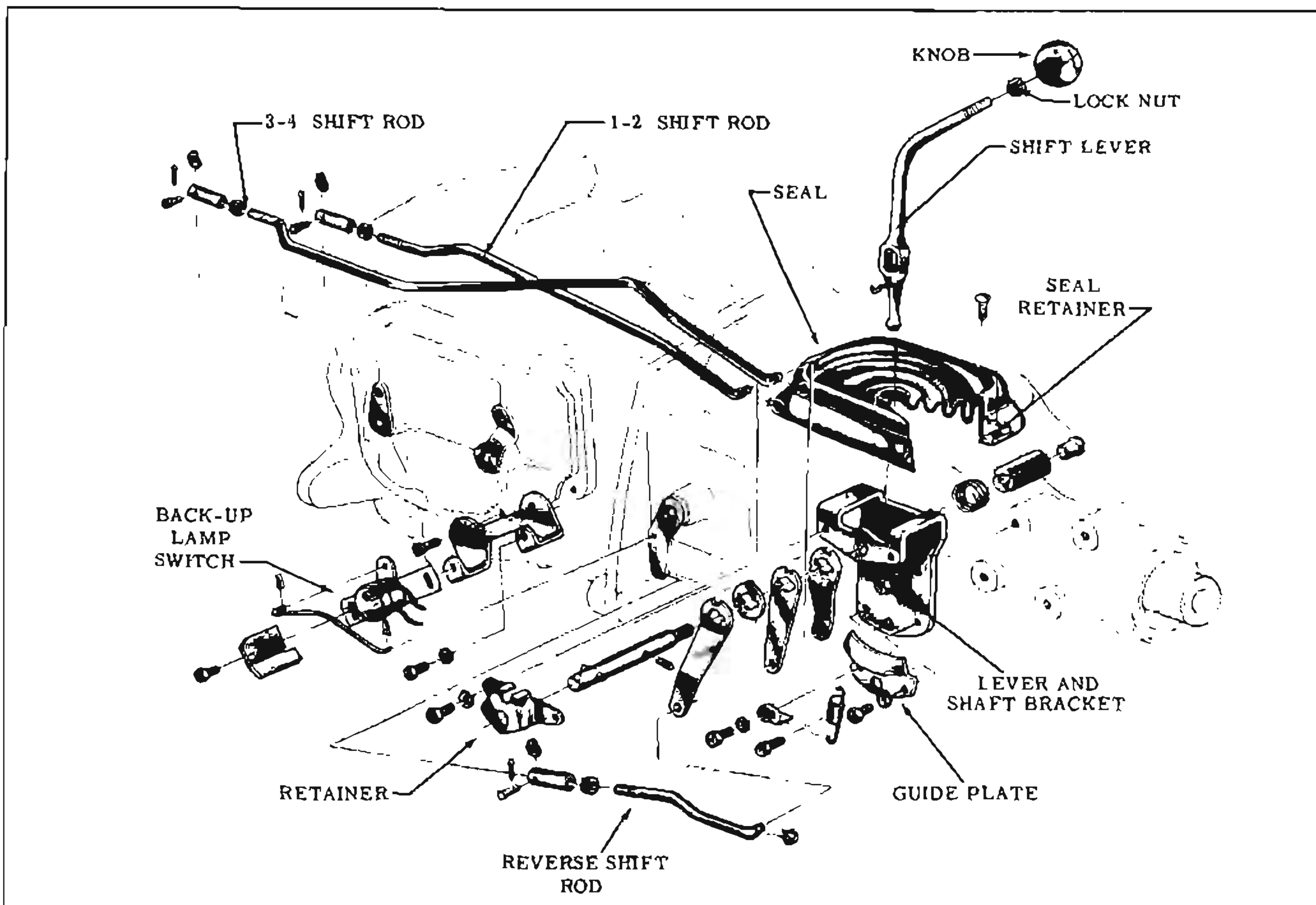


Fig. 11-259 Gear Shift Assembly

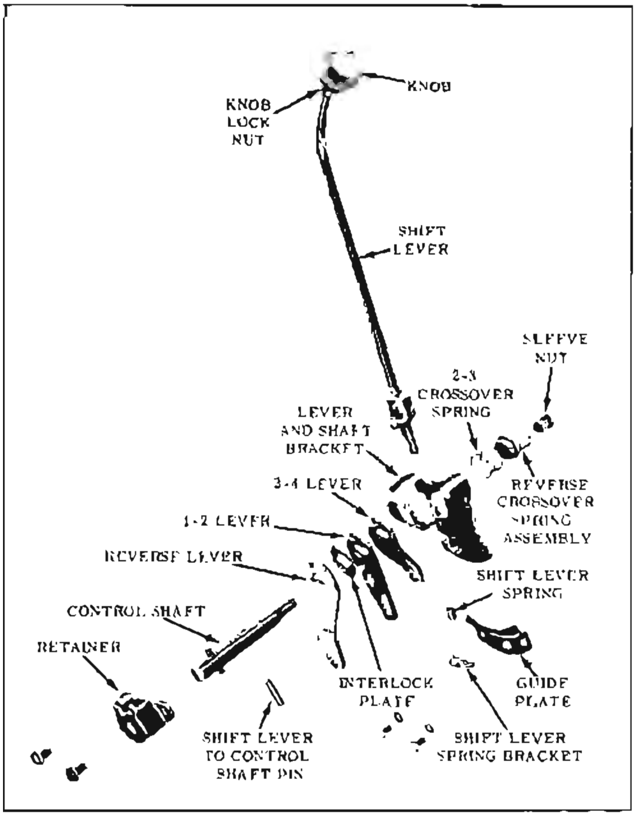


Fig. 11-260 Gear Shift Assembly

5. Drive the retaining pin from the shift lever and control shaft with a small straight punch, then remove the control shaft and shift lever from the bracket. (Fig. 11-260)

NOTE: The pin through the control shaft that engages with the levers is not serviced separately.

ASSEMBLY (Figs. 11-259 & 260)

1. Position the shift lever through the bracket then install the control shaft and a new retaining pin.

2. Position the guide plate and shift lever spring bracket on the lever and shaft bracket, then install the two lock washers and bolts. (Fig. 11-260)

3. Connect the shift lever spring to the spring anchor on the shift lever and the bracket. (Fig. 11-260)

4. Install the 3-4 lever (short), the 1-2 lever (straight), the interlock plate with tang up, and the reverse lever (long) on the control shaft. (Fig. 11-260)

5. Install the retainer and the two attaching bolts. (Figs. 11-259 & 260)

6. Check the clearance between the levers of the interlock plate with a feeler gauge. This clearance should be .002" to .030".

   NOTE: Three interlock plates are used to obtain this clearance. They are .060", .075", and .090" thick.

7. Install the second to third crossover spring on the control shaft then the reverse crossover spring assembly and the sleeve nut. (Fig. 11-260)

   NOTE: Adjust the tension on the crossover as follows:

   A. Move the shift lever so the control shaft pin is fully engaged with the 1-2 lever.

   B. Tighten the sleeve nut until the reverse crossover spring assembly just contacts the lever and shaft bracket.

   C. Check adjustment by moving shift lever into first and second gear positions with the reverse crossover spring assembly just contacting the bracket to make sure that the control shaft pin does not catch in the 3-4 lever or in the interlock plate. If the control shaft pin does catch, then the sleeve nut must be adjusted in or out to correct.

   D. Stake the threads so the sleeve nut will not loosen.

INSTALLATION

1. Position the control lever assembly to transmission by inserting shift lever through seal and with bracket against the mounting bosses on the transmission housing, install the three bracket to housing bolts. Torque bolts to 20-30 ft. lbs.

2. Position the three shift levers (3-4 and 1-2 located at transmission side cover, reverse located at extension housing) in the neutral position. Check the control lever assembly to be sure it is in the neutral position. Connect shift rods to respective shift levers and retain with clips.

3. Install tool J-9574, Linkage Gauge Block, in the notch of the retainer bracket as shown to check shift rod clevis adjustments. (Fig. 11-261)

4. If the shift rod clevises require adjustment, remove the cotter pin. Disconnect clevis from transmission shift levers and loosen clevis lock nut.

5. Adjust each shift rod clevis so that the pin will enter freely into the holes in the clevis

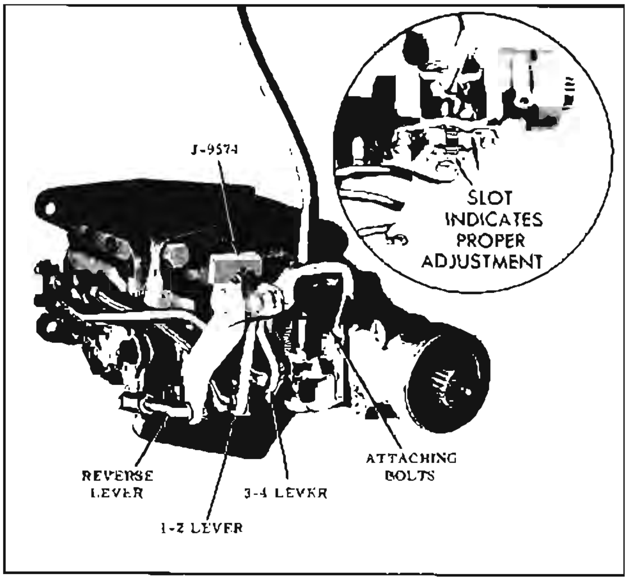


Fig. 11-261 Shift Linkage Adjustment

and the shift levers. Tighten the clevis lock nut.

6. Install the three clevis pins, the wave washers and the cotter pins.
7. Install shift knob and lock nut.
8. Check for smooth shift operation in all gears.

SHIFT LEVER SEAL (WITHOUT CONSOLE)

Removal

1. Loosen shift knob lock nut, and remove knob and lock nut.
2. Lift edge of seal and remove (6) seal retainer to floor pan attaching screws. (Fig. 11-262)
3. Lift seal and retainer through floor carpet and off shift lever.
4. To install, reverse removal procedure.

SHIFT LEVER SEAL AND/OR CONSOLE

Removal

1. Remove shift knob and lock nut.
2. Remove (4) trim panel screws and remove trim panel. (Fig. 11-263)
3. Lift edge of seal and remove (6) seal and con-

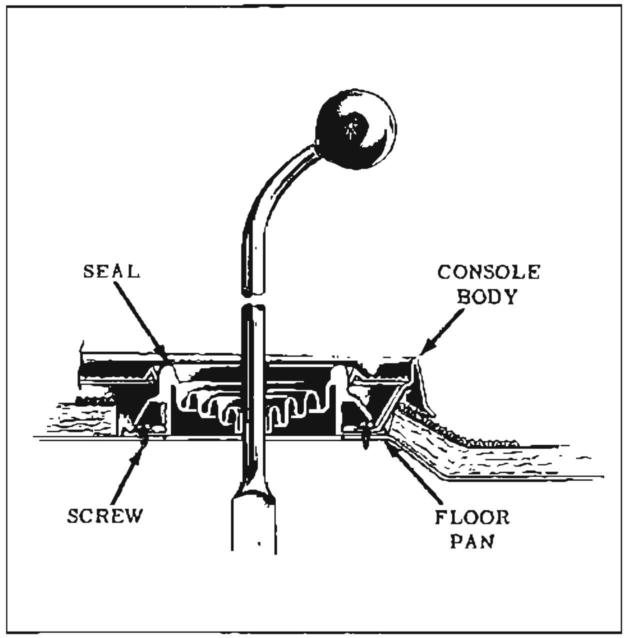


Fig. 11-262 Shift Lever Seal

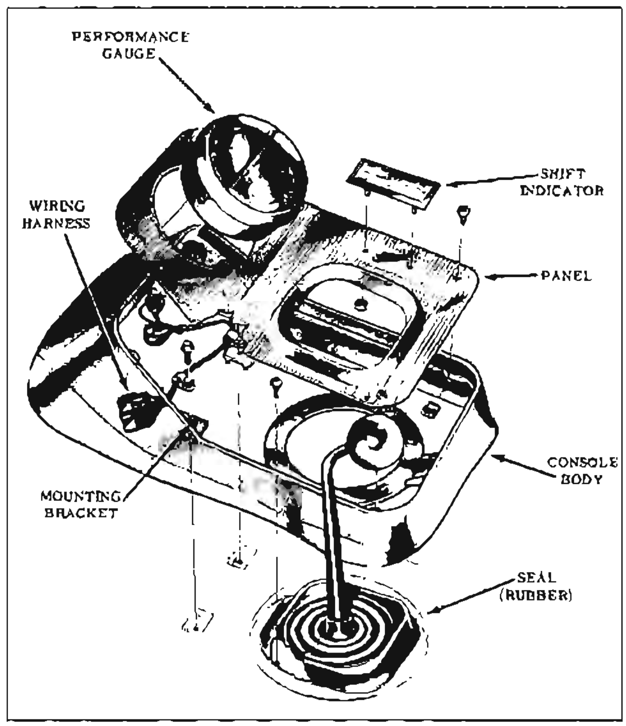


Fig. 11-263 Console and Seal Assembly

sole to floor pan screws. (Fig. 11-262)

4. Remove (2) console front bracket to floor pan screws.
5. Lift console and seal off shift lever.
6. Remove seal from console.
7. To install, reverse removal procedure.

4-SPEED SYNCHROMESH TRANSMISSION SPECIFICATIONS

GEAR RATIOS	
First	2.54:1
Second	1.92:1
Third	1.51:1
Fourth	1.00:1
Reverse	2.61:1
CAPACITY	2-1/2 Pts.
LUBRICANT:	S.A.E. 80 or 90 Multi-Purpose Gear Lubricant

4-SPEED SYNCHROMESH TRANSMISSION TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking torque during inspection may be 15% below the specified.

Application	Ft. Lbs.
Companion Flange to Output Shaft	30 to 40
Cross Bar to Body Frame Side Rail	20 to 34
Extension Housing to Case Bolts (larger)	35 to 40
Extension Housing to Case Bolts (smaller)	20 to 30
Propeller Shaft to Companion Flange "U" Bolt Nuts	14 to 18
Rear Engine Mount to Cross Bar	20 to 34
Rear Engine Mount to Extension Housing	30 to 40
Seal and Retainer to Floor Pan	1 to 1.5
Self-Locking Rear Bearing Retainer to Case	20 to 30
Shift Control Bracket to Extension Housing	20 to 30
Shift Lever Knob Lock Nut	10 to 15
Side Cover Bolts	10 to 20
Speedometer Cable to Speedometer	Finger Tight
Speedometer Cable to Transmission	3 to 4
Speedometer Driven Gear Lock Plate to Extension Housing	4 to 7
Transmission Drain Plug	35 to 40
Transmission Filler Plug	35 to 40
Transmission to Clutch Housing	40 to 45

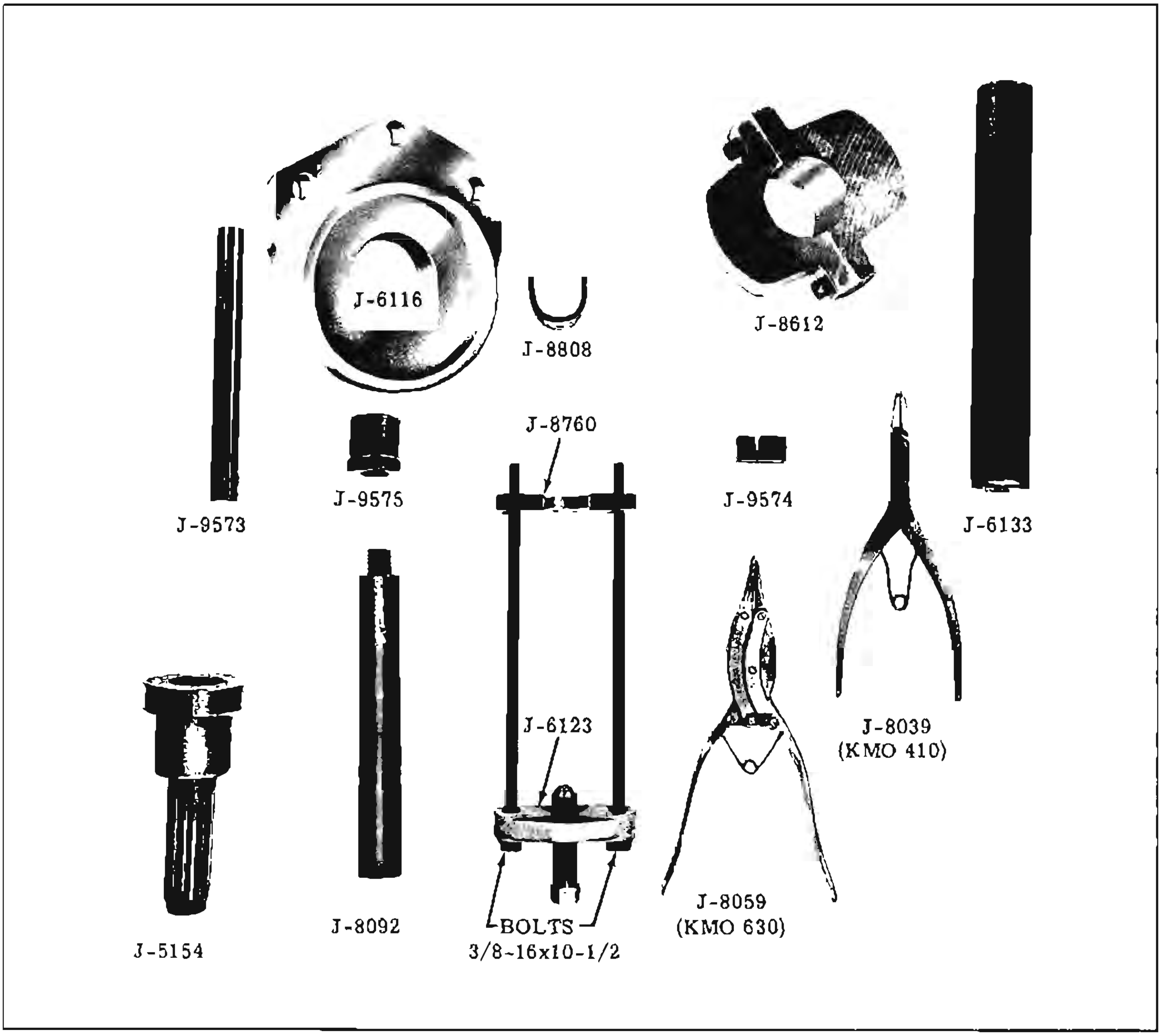


Fig. 11-264 4-Speed Synchromesh Transmission Tools

J-5154 Rear Seal Installer

J-6116 Fixture

J-6123 Speedometer Gear Puller

J-6133 Speedometer Gear Installer

J-8039 (KMO410) Pliers

J-8059 (KMO630) Pliers

J-8092 Handle

J-8612 Differential Rear Pinion Bearing Remover (used to remove rear bearing from main shaft)

J-8760 Speedometer Gear Remover Adapter Set

J-8808 Lower Control Arm Spacer (used with Tool J-6133 to provide sufficient length to install speedometer gear)

J-9573 Counter Gear Loading Tool

J-9574 Linkage Gauge Block

J-9575 Extension Housing Bushing Remover and Replacer

Bolts 3/8"- 16 x 10-1/2" (used with Tool J-6123 and Tool J-8760)

CLUTCH

(F-85)

CONTENTS

MAINTENANCE RECOMMENDATIONS

The clutch release bearing is a prepacked sealed unit which requires no periodic lubrication. The clutch linkage should be lubricated at each lubrication period with Engine Oil. The clutch pedal free travel should be checked whenever the car is in the service area. Free travel should be 7/8" to 1".

DESCRIPTION

The single plate, dry disc clutch, is mounted with a free sliding fit on the splines of the Synchromesh Transmission main drive gear. Engagement of the clutch is accomplished by a spring loaded pressure plate.

The clutch pedal is suspended from a support under the instrument panel. When the clutch pedal is depressed, the clutch release yoke moves the release bearing forward on the transmission bearing retainer sleeve until the bearing moves the inner end of the release levers. The release levers pivot at yokes (attached to the cover plate) and overcomes the pressure spring force to move the pressure plate rearward to disengage the driven plate. (Fig. 11-301)

When the clutch pedal is released, the pressure springs compress the driven plate between the pressure plate and the flywheel to engage the clutch. The engagement of the clutch is cushioned by springs mounted between the facing discs of the clutch plate. As the speed of the engine increases, the weighted outer ends of the release levers, through centrifugal force, add to the spring force exerted on the driven plate, thereby increasing clutch pressure and increasing the clutch torque capacity.

Torsional vibrations from the engine are prevented from being transmitted to the transmission by coil springs mounted in the hub of the driven plate. Balance is obtained by means of narrow sheet metal strips crimped around the webs of the driven disc.

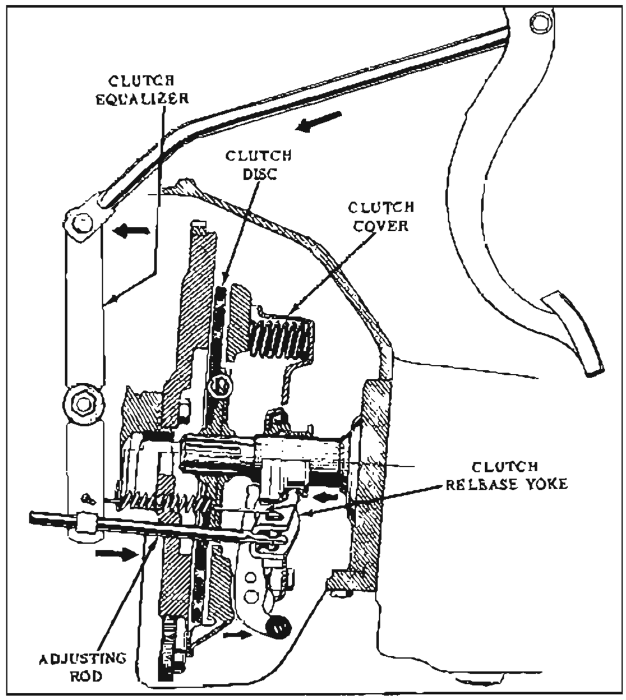


Fig. 11-301 Clutch Assembly

ADJUSTMENTS

PEDAL FREE TRAVEL

(See Fig. 11-302)

CLUTCH PEDAL

Removal (Fig. 11-303)

1. Disconnect the clutch rod from the clutch pedal and disconnect brake pedal return spring.
2. Remove the clutch pedal stop from pedal support and remove pedal return spring.

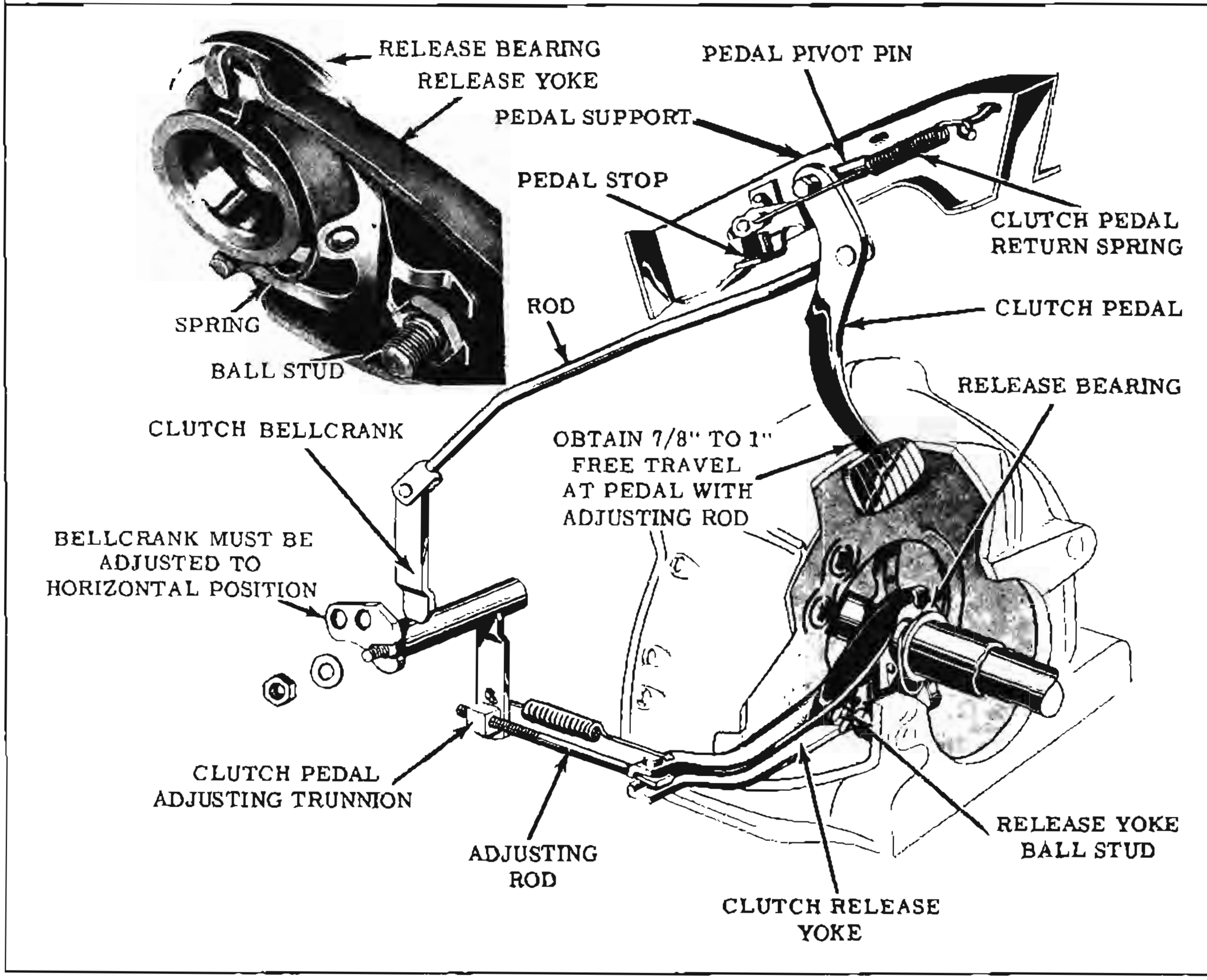


Fig. 11-302 Clutch Mechanism

3. Remove clutch and brake pedal pivot pin nut and slide pivot pin out of clutch pedal while sliding a 5/16" rod through the bracket and brake pedal, to support brake pedal.

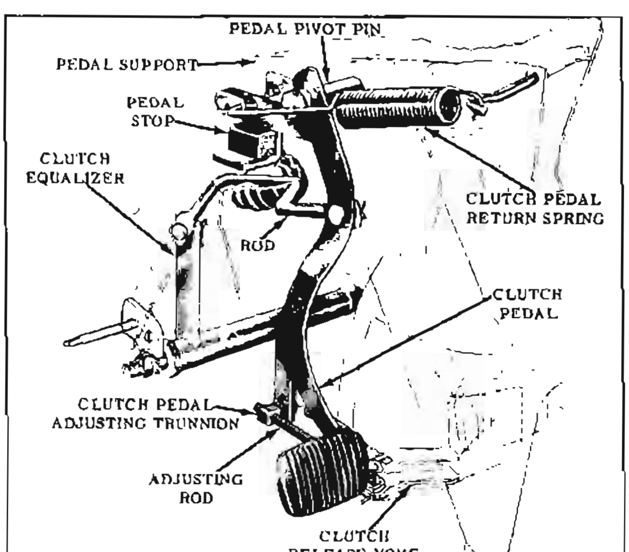


Fig. 11-303 Clutch Pedal Removal

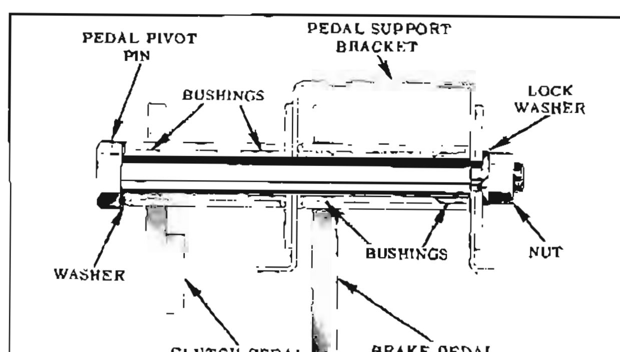


Fig. 11-304 Clutch Pedal Support

4. Lower clutch pedal from support.

Installation (Fig. 11-304)

1. Position clutch pedal in support and insert pivot pin through clutch and brake pedal

assemblies. Lubricate pivot pin with 567196 lubricant.

2. Install pivot pin nut and torque to 8-16 ft. lbs.

3. Attach pedal return spring, move pedal forward and install stop bracket and clutch rod. Lubricate spring ends with 567196 lubricant.

CLUTCH

Removal

1. Remove transmission.
2. Remove flywheel dust cover and release bearing.
3. Mark flywheel and clutch cover for reassembly, and alternately loosen the 6 clutch cover attaching bolts, two turns at a time to prevent distortion.

Installation

1. Lubricate pilot bearing with wheel bearing grease.

   NOTE: If necessary to replace pilot bearing, refer to Engine Section for procedure.

2. Place new disc in cover assembly, and attach to flywheel. Do not tighten bolts.

3. Place an old main drive gear in disc and into pilot bearing to align disc. Tighten cover bolts alternately and torque 14-17 ft. lbs.

4. Lubricate internal groove of release bearing and release yoke ball stud with 567196 lubricant and install bearing.

5. Remove old main drive gear, install transmission and adjust linkage.

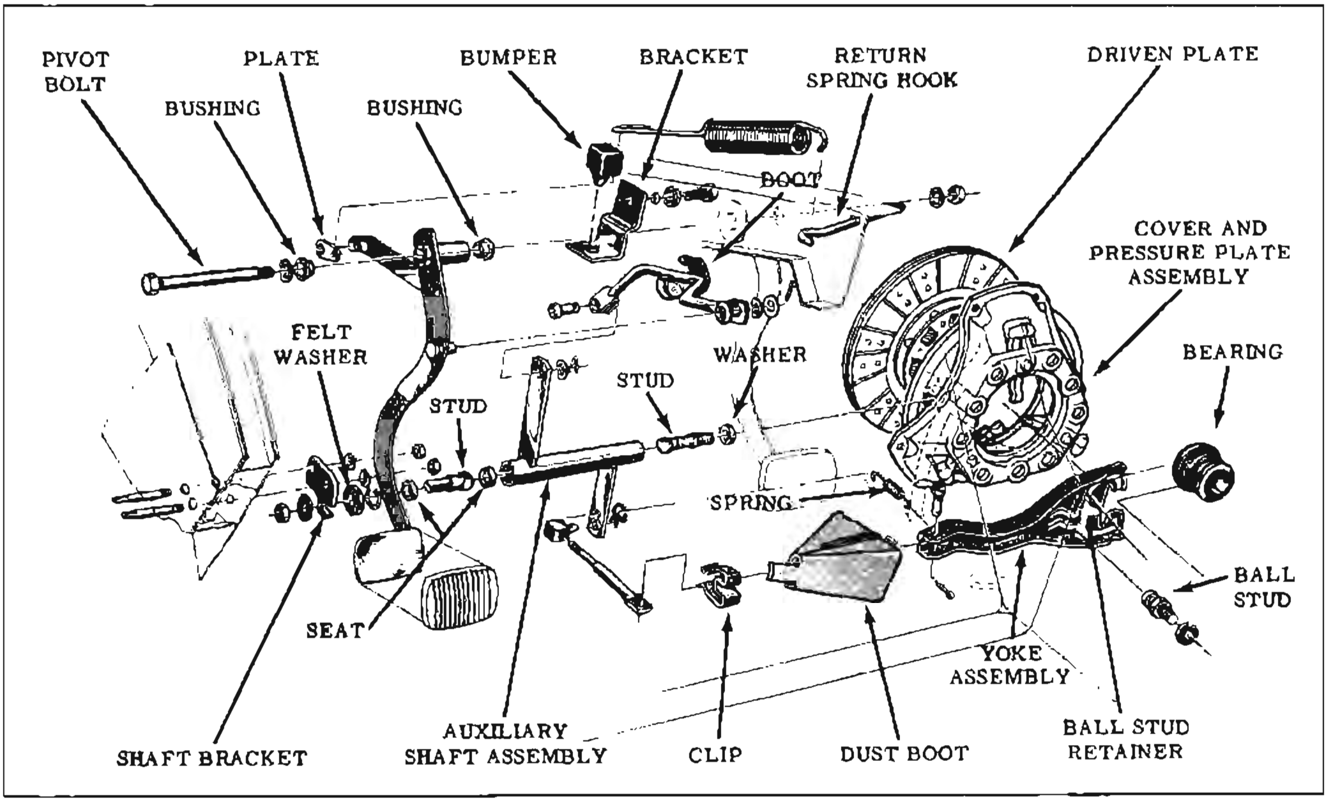


Fig. 11-305 Exploded View

RELEASE BEARING

Removal

1. Remove transmission and lower clutch housing dust cover.

2. Disconnect release bearing from release yoke and remove bearing through clutch housing bore.

Installation

1. Lubricate groove in bearing with 567196 lubricant and attach to release yoke with the thrust surface adjacent to the clutch pressure plate fingers.

2. Install transmission.

3. Install lower clutch dust cover and torque bolts 20-25 ft. lbs.

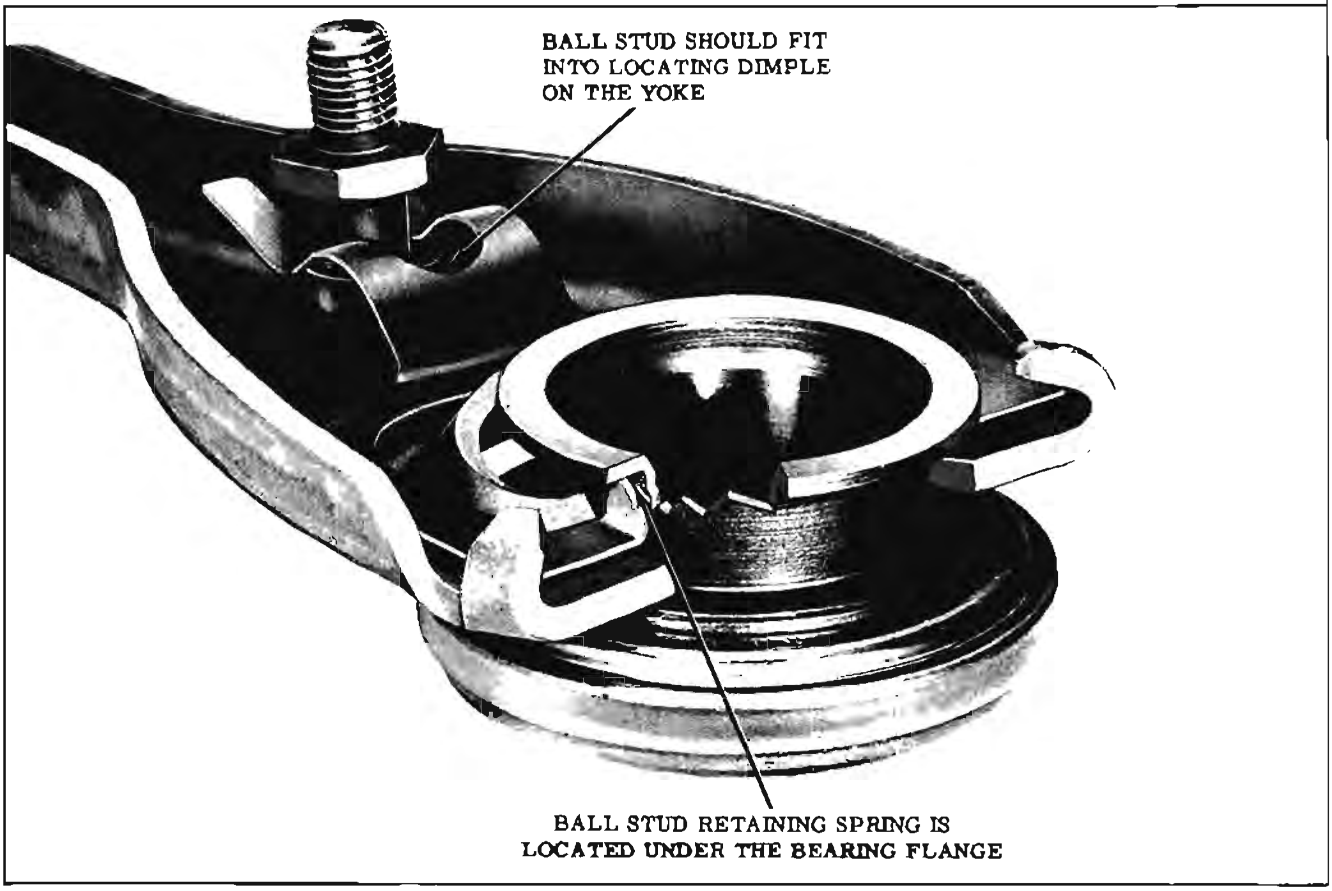


Fig. 11-306 Clutch Release Yoke

4. Check clutch pedal free travel.

RELEASE YOKE

Removal

1. Follow procedure under "RELEASE BEARING REMOVAL" and proceed to remove bearing.
2. Disconnect clutch adjusting rod from release yoke.
3. Disconnect release yoke from ball pivot stud.
4. Remove ball stud to provide clearance to remove yoke.
5. Remove yoke through lower flywheel dust cover opening.

Installation

1. Insert release yoke in position through the lower flywheel dust cover opening.
2. Install ball pivot stud and torque 35-40 ft. lbs. Lubricate threads with 980131 lubricant and ball with 567196 lubricant.

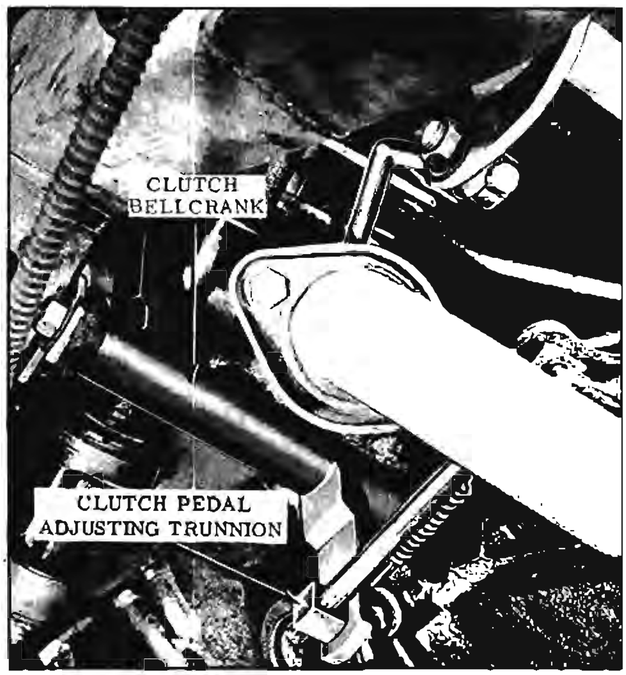


Fig. 11-307 Clutch Equalizer

3. Attach release yoke to ball pivot stud by sliding yoke over stud until spring clip retainer snaps into place.

4. Connect clutch adjusting rod to release yoke.

5. Proceed to install release bearing following steps under "RELEASE BEARING INSTALLATION".

EQUALIZER SHAFT

The equalizer shaft is attached to the frame rail and a ball stud mounted on the engine block. (Fig. 11-307)

When replacing assembly, it should be lubricated with chassis lubricant.

The mounting stud threads should be lubricated with 980131 lubricant before being installed in block.

CLUTCH SPECIFICATIONS

DISC FACINGS	
Diameter - Inside (All Except Jetfire)	6"
(Jetfire)	6-3/4"
Diameter - Outside (All Except Jetfire)	9-1/2"
(Jetfire)	10"
Number Used	2
Thickness	.125"
DRIVEN DISC ASSEMBLY	
Overall Thickness (Clutch Engaged)	0.300"
Hub Dimensions	1-1/8" - 10 Spline
PEDAL FREE TRAVEL	7/8" - 1"
PEDAL HEIGHT	Approx. 6-1/2"
PRESSURE SPRINGS	
Number Used (All Except Jetfire)	6
(Jetfire)	9
RELEASE BEARING	
Type	Sealed Ball
CLUTCH PILOT BEARING	
Type	Oil Impregnated Bushing

CLUTCH TORQUE SPECIFICATIONS

NOTE: Use Special Lubricant #980131 when installing bolts to aluminum block or housing.

Application	Ft. Lbs.
Clutch Cover to Flywheel (pressure plate)	14 to 17
Clutch Equalizer Stud to Block	30 to 35
Clutch Housing to Cylinder Block	30 to 35
Clutch Pedal Bumper Bracket to Dash Bracket	20 to 25
Clutch Release Ball Stud	35 to 40
Companion Flange to Output Shaft	30 to 40
Cross Bar to Body Frame Side Rail	20 to 34
Equalizer Bracket to Frame	14 to 17
Flywheel Lower Housing to Cylinder Block	20 to 25
Flywheel Lower Housing to Upper Housing	4 to 7
Flywheel to Crankshaft	85 to 95
Propeller Shaft to Companion Flange "U" Bolt Nuts	14 to 18
Rear Engine Mount to Cross Bar	20 to 34
Rear Engine Mount to Rear Bearing Retainer or Extension Housing	30 to 40
Speedometer Cable to Transmission	3 to 4
Stud to Equalizer Bracket	14 to 17
Transmission to Clutch Housing	40 to 45

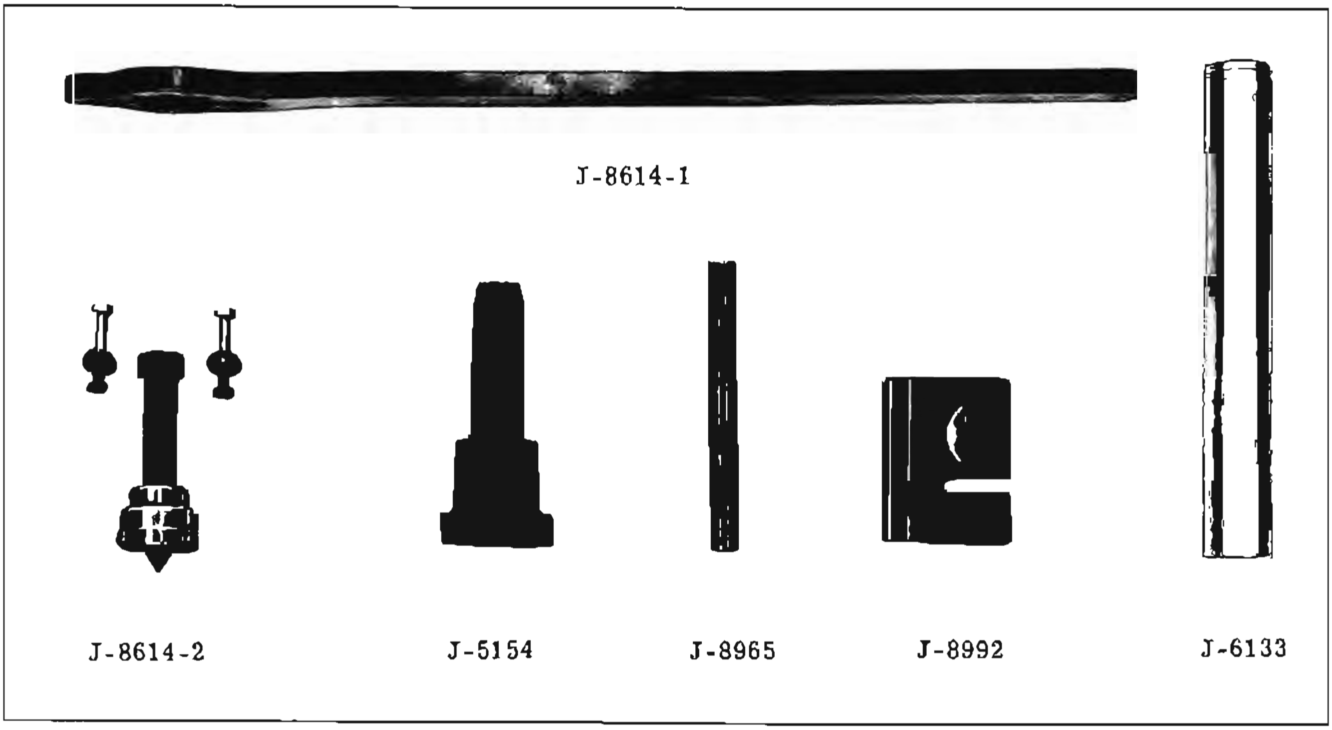


Fig. 11-308 Tools

J-5154 Rear Seal Installer
J-6133 Bearing Installer
J-8614-1 Companion Flange Tool
J-8614-2 Companion Flange Tool
J-8965 Countershaft Needle Bearing Loader
J-8992 Shift Linkage Locating Fixture

FRAME, BUMPERS AND CHASSIS SHEET METAL

CONTENTS OF SECTION 12

FRAME

When supporting car on a floor jack or floor stands, the car should be supported at the suspension points only. Under no conditions should the car be supported at the extreme ends of frame or at the center of a frame side rail.

When using a frame contact hoist the car should be lifted at the torque boxes (where the front and rear frame sections join the frame side rails).

CHECKING FRAME ALIGNMENT

The diagram shown in Fig. 12-1 can be used to check the alignment of a car frame that has been distorted.

The reference points indicated in the illustration are to be checked with a tram gauge. The dimensions between the various reference points will show where straightening operations are necessary.

NOTE: Corresponding measurements must be equal within 1/4".

1. Measure A-A. If not equal, rear end of frame is misaligned.
2. Measure B-B. If not equal, center portion of frame is misaligned.
3. Measure C-C. If not equal, then front suspension cross member is misaligned.

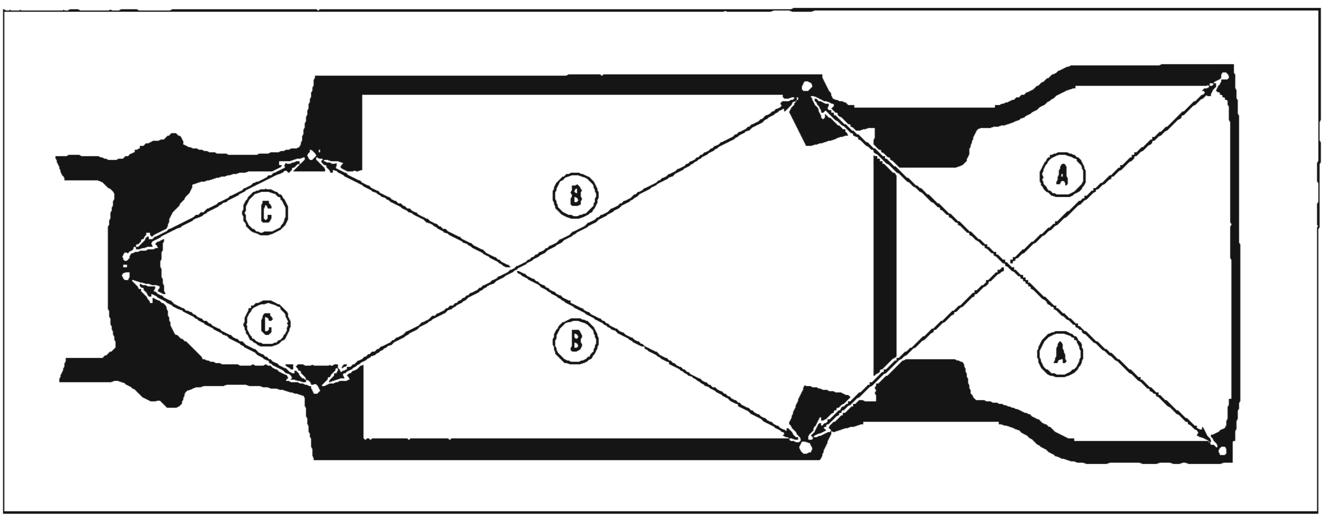


Fig. 12-1 Frame Alignment Diagram

STRAIGHTENING FRAME

In case of collision, frame members can often be satisfactorily straightened to the required limits. However, the front suspension cross member is made to unusually close limits necessary for proper front wheel alignment; therefore, straightening of this unit may not be successful.

It is possible that the ordinary straightening methods will suffice for minor damage to the front suspension cross member; however, in case of serious damage or fracture, the entire front suspension cross member must be replaced. Before the member is replaced, it is essential that the frame alignment be checked, and corrected if necessary.

Whenever possible, frame members should be securely fastened with hot rivets. In case riveting equipment is not available, finished bolts snugly fitted in reamed holes may be used. The nuts should be securely tightened and lock washers used, care being taken that washers do not spread. (Cold driven rivets are not recommended unless the heavy power press equipment necessary to make secure fastening is available.)

After frame members are riveted or bolted securely, all welded joints and areas that were cut to permit removal of a frame member should be welded.

When the frame repair is completed and inspected, the various parts of the suspension may be assembled.

BUMPERS

BUMPER ALIGNMENT

Vertical, horizontal, fore and aft, and angular alignment of the front and rear bumper assemblies is provided for through the use of elongated holes in the bumper to bracket and bracket to frame. Angular adjustment may be provided for by the use of washer(s) between the bumper and brackets.

NOTE: The front bumper bracket to frame bolts are serrated. To make fore and aft adjustments, the nuts must be loosened and the bolt tapped until serrations are clear of frame and bracket. Then position bumper and tighten nuts.

To align bumpers, loosen bumper bolts and shift bumper to desired position. Make sure that bumpers are horizontal and clearance between bumper and fenders is even on both sides. Torque bolts as indicated under Torque Specifications.

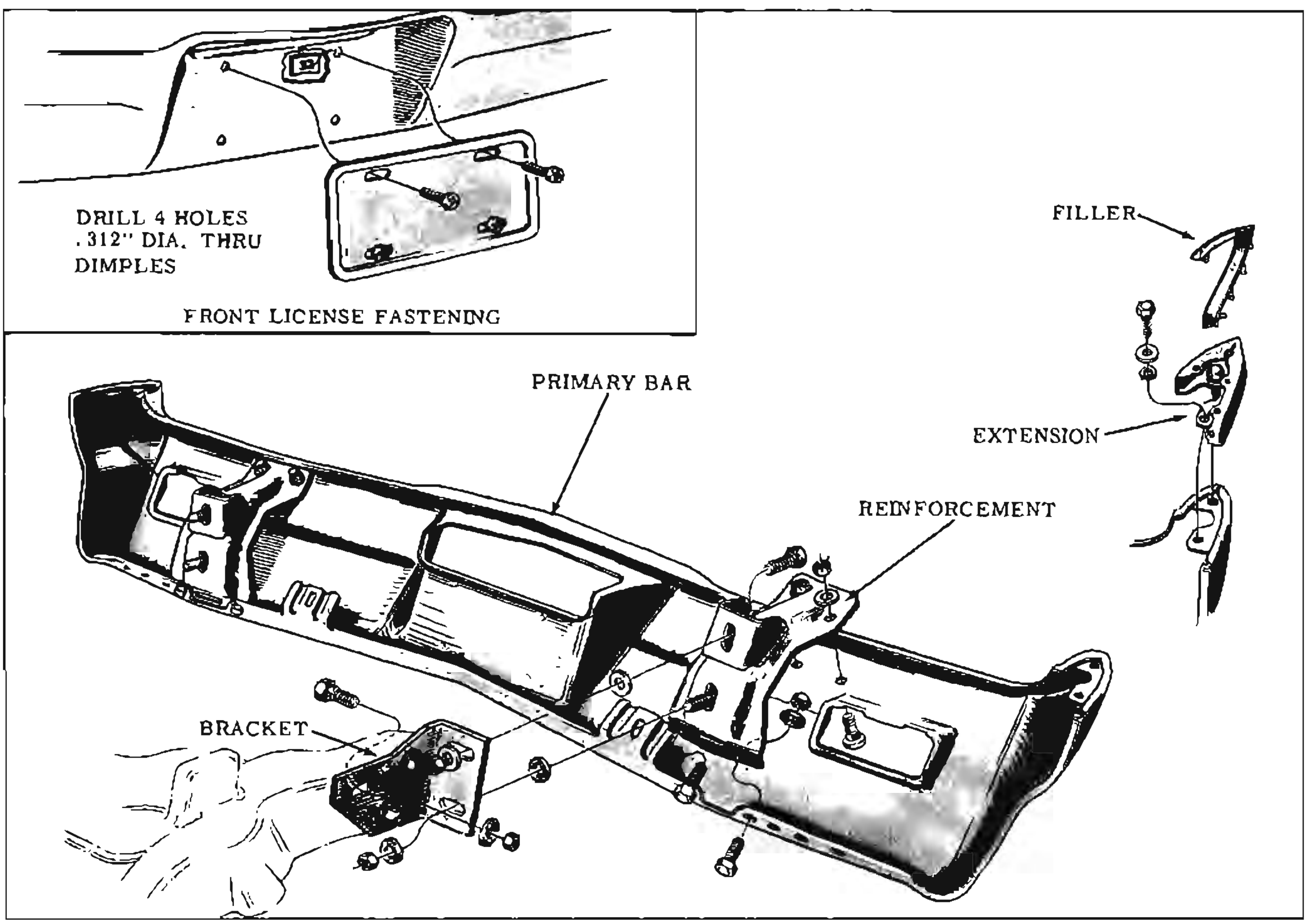


Fig. 12-2 Front Bumper Assembly

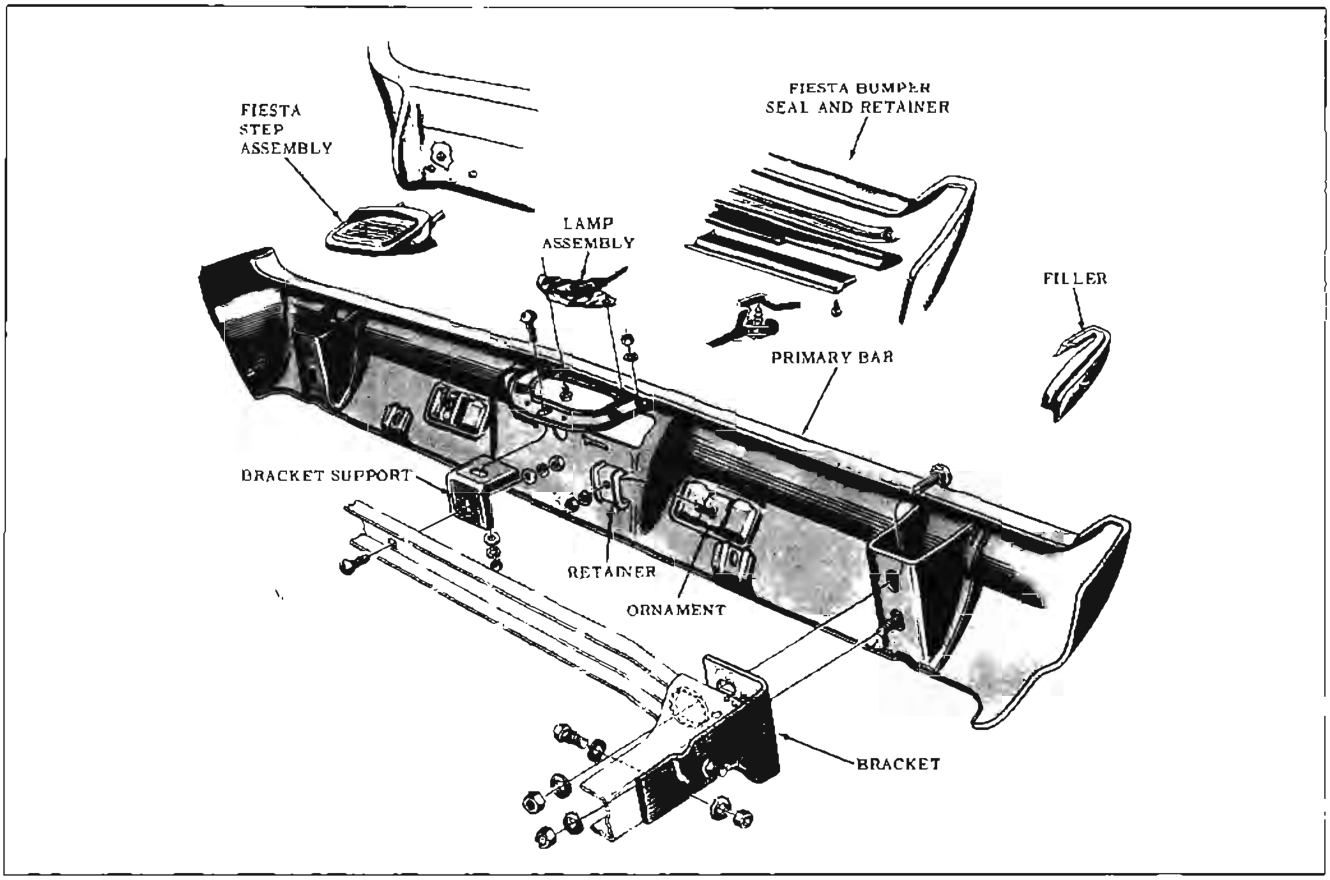


Fig. 12-3 Rear Bumper Assembly (32, 35 & 36 Series)

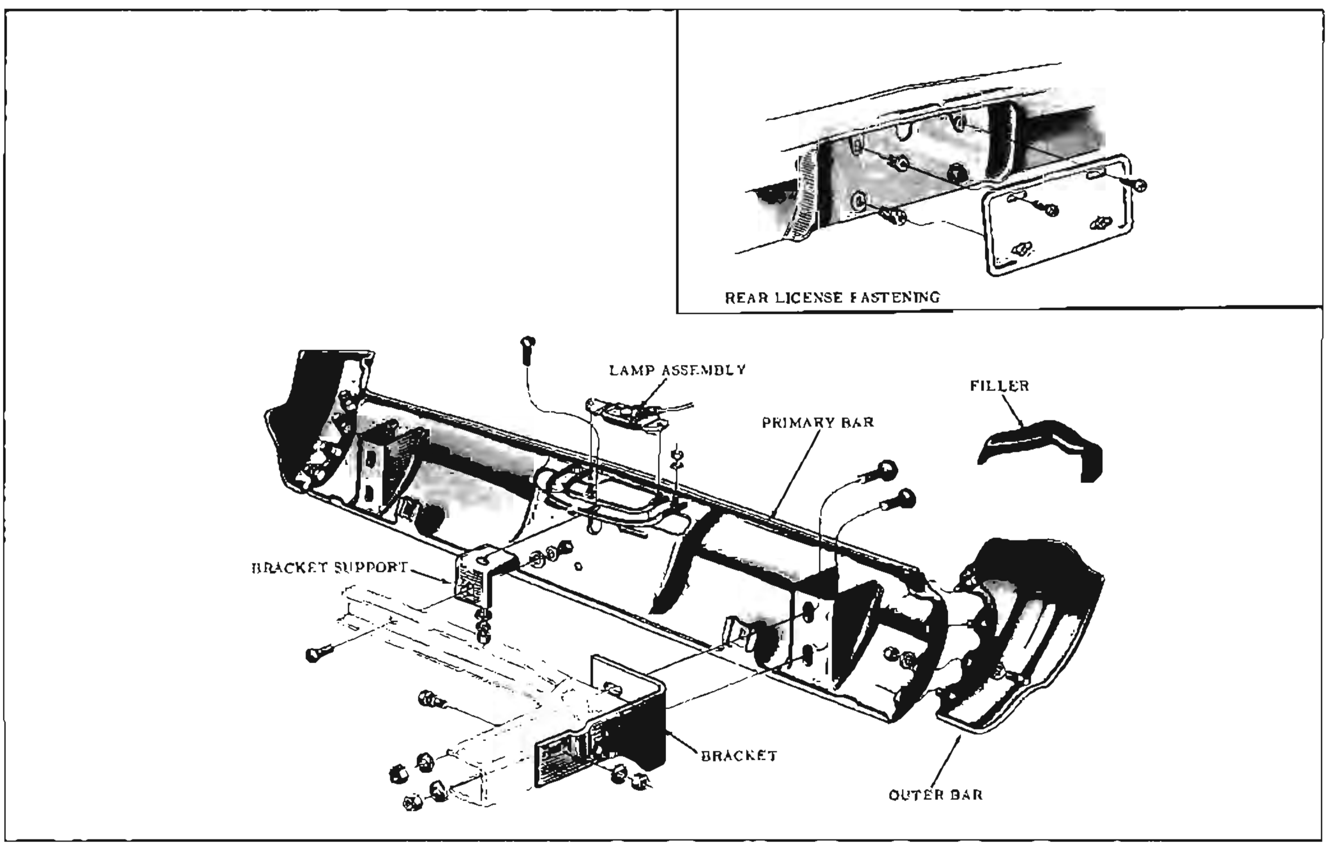


Fig. 12-4 Rear Bumper Assembly (38 & 39 Series)

BUMPER TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified minimum.

Application	Ft. Lbs.
FRONT BUMPER	
Extensions to Primary Bar	22 to 28
Reinforcement to Bracket	80 Min.
Bracket to Frame	80 Min.
Outer Support to Primary Bar	80 Min.
REAR BUMPER	
Back-up Light or Ornament to Bumper	6 Max.
Bumper to Bracket	80 Min.
Bracket to Frame	80 Min.
Step to Bumper (45 Style)	22 to 28
Center Support to Frame and Inner Support	30 to 40

CHASSIS SHEET METAL

HOOD ALIGNMENT

The hood hinge adjustment provides lateral and vertical alignment of the rear edge of the hood in relation to the cowl vent grille.

1. Raise hood and loosen hinge bracket to cowl bolts and the hinge bracket to fender bolt on each side of car. (Fig. 12-5) For fore or aft adjustment, loosen hood hinge to hood bolts.
2. Shift hood until clearances shown in Fig. 12-6 are obtained.
3. Tighten bolts and recheck alignment.

HOOD PILOT BOLT ADJUSTMENT

After aligning the hood hinges, the hood pilot

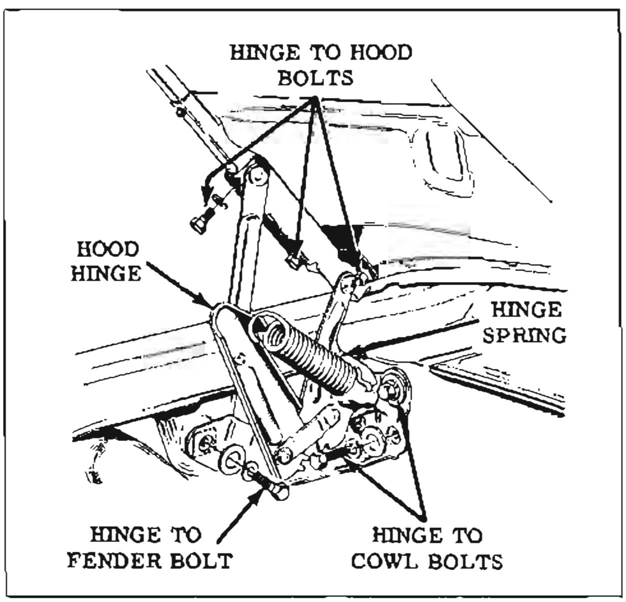


Fig. 12-5 Hood Hinge Assembly

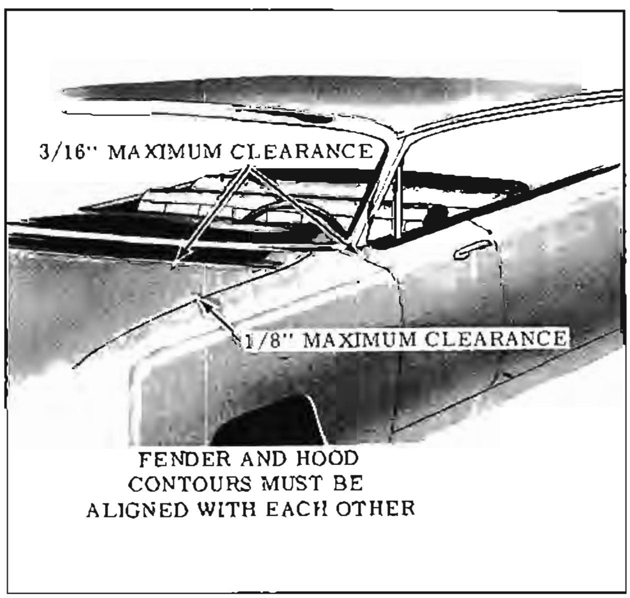


Fig. 12-6 Sheet Metal Clearances

bolts and rubber bumpers, located on the fender tie bar, should be adjusted. The pilot bolts position the hood as it is lowered. Vertical adjustment can be made by loosening the pilot bolt lock nuts and adjusting the threaded pilot bolts up or down for proper engagement with the latch assemblies. Lateral and fore and aft adjustment can be made by loosening the lock nuts on the pilot bolts and moving the pilots right or left, or fore or aft. Front hood to fender clearances are 1/8" maximum. (Fig. 12-6)

The rubber bumpers must be adjusted for alignment of the forward edge of the hood with the forward edge of the fenders. Vertical adjustment can be made by loosening the lock nuts on the rubber bumpers and turning bumpers either up or down.

HOOD ASSEMBLY REMOVE AND INSTALL

1. Raise hood and install protective coverings over cowl and fender areas to prevent damage to paint and moldings when removing or installing hood.
2. Disconnect underhood lamp wire.
3. Remove hinge to hood bolts on each side of hood. (Fig. 12-5)
4. While supporting hood, remove mounting stud nuts on each side of hood.
5. Remove hood assembly.

To install, reverse removal procedure and check hood alignment.

If necessary to install a new insulator, apply

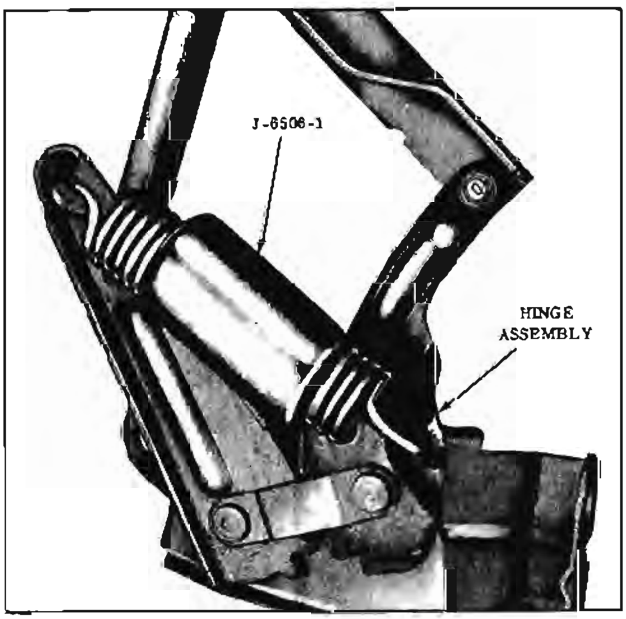


Fig. 12-7 Hinge Spring Tool in Position

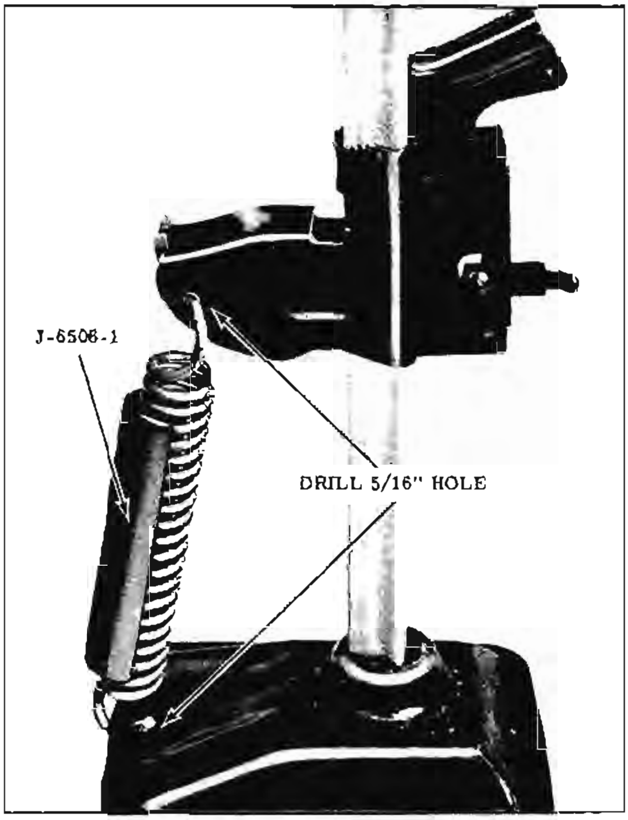


Fig. 12-8 Installing Hinge Spring Tool

cement to within 2 inches of outer edges of insulator and install with smooth side exposed.

NOTE: The mounting holes in the hood hinge bracket are enlarged to provide a slight fore and aft adjustment of the hood panel.

HOOD HINGE SPRING REMOVE AND INSTALL

1. Raise hood just enough to place Tool J-6506-1 over the spring. (Fig. 12-7)
2. Raise hood and remove spring.

   NOTE: When installing new spring, a suitable expander must be used to stretch the spring so that Tool J-6506-1 can be placed over the spring. (Fig. 12-8)
3. Position spring (with tool in place) on hinge.
4. Lower hood slightly to expand spring, then remove Tool J-6506-1.

HOOD HINGE REMOVE AND INSTALL (With Spring Removed)

1. Mark the hinge outline on the cowl to facilitate alignment on installation.
2. While supporting hood, remove the hinge to

hood bolts and nut, then remove the hinge to cowl and fender bolts.

To install, apply auto body caulking compound around cowl bolt holes and reverse removal procedure. Align hood after hinge is installed.

HOOD MOLDINGS AND LETTERS

The hood moldings and letters are attached by self-threading nuts which are accessible from the underside of the hood.

COWL VENT GRILLE

REMOVE AND INSTALL

1. Remove windshield wiper arms.
2. On all series except 88, remove wiper transmission to escutcheon nut and escutcheon with Tool J-6592-02.
3. Raise hood and remove five cowl vent grille to cowl screws.
4. Remove cowl vent grille.

To install, apply a medium-bodied sealer around vent grille attaching screw holes and vent grille tab slots in cowl, also be sure anti-squeak tape is installed on both ends of the grille. Then, carefully slide grille rearward to engage rear edge of grille between windshield lower reveal moldings and molding attaching clips and reverse removal procedure.

FENDER

REMOVAL (Fig. 12-9)

Before removing and installing a fender, painted

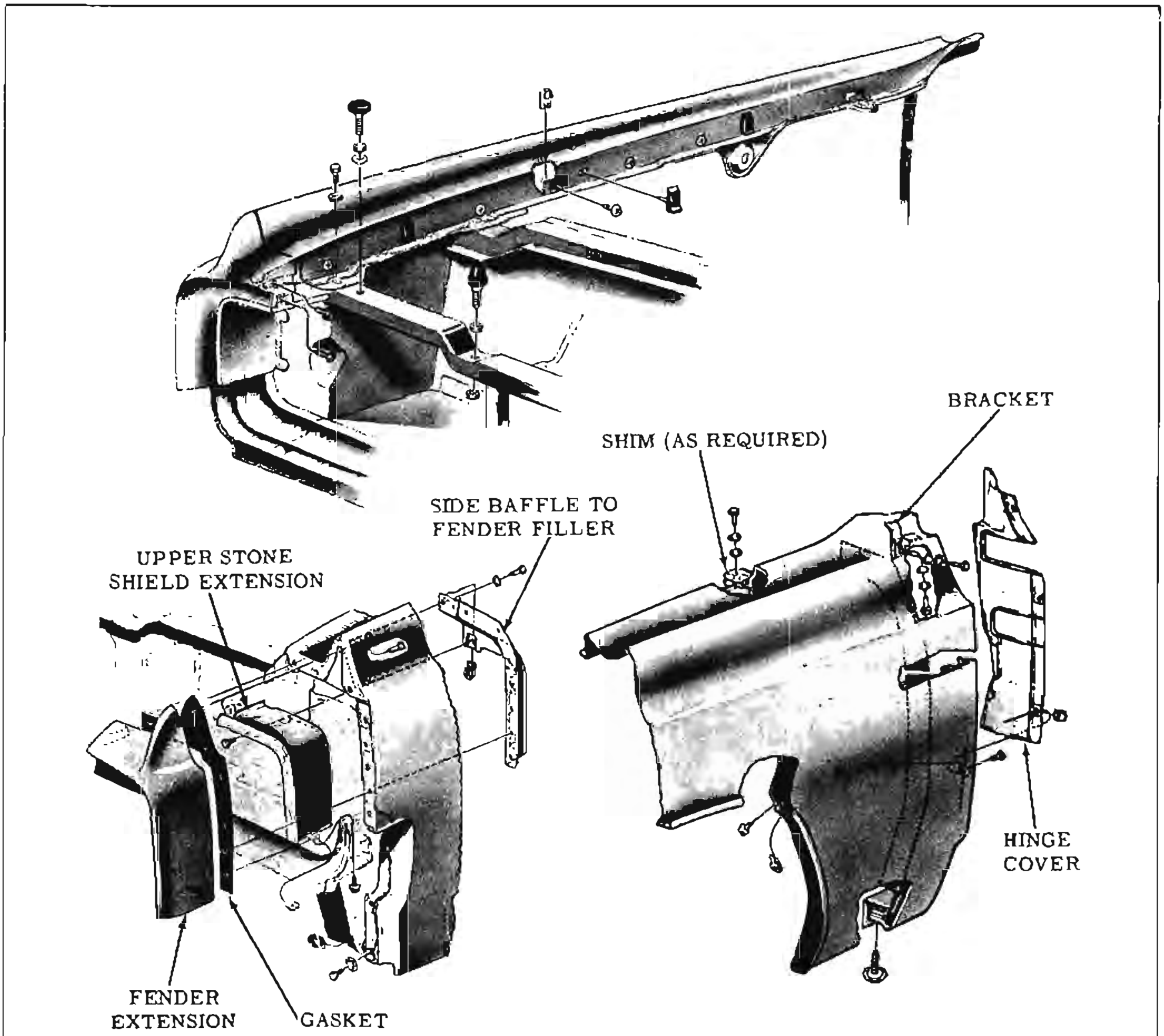


Fig. 12-9 Fender Attachment

areas and moldings adjacent to the fender should be covered for protection against scratches. When installing a fender, it is important that all anti-squeaks and seals be reinstalled. If the anti-squeaks and seals are damaged, they should be replaced.

FENDER ALIGNMENT

The holes in the fenders are enlarged to permit adjustment. When making installation, fender should first be placed firmly into position, and before replacing any bolts, make sure the rear edge of the fender matches the contour of the door. (This adjustment is made by positioning fender in or out at upper and lower attachment by using shims as required.) After this contour adjustment, install and tighten all fender bolts just enough to permit shifting as required. After fender is properly positioned tighten all attaching screws and bolts.

FENDER FILLER PLATE

All necessary wiring and parts should be disconnected or removed before removing the fender filler plate. It is important that all seals and anti-squeaks be checked and replaced, if necessary, before installing.

When removing a fender, the baffle assembly unless damaged, should be left attached to the fender filler plate. If the baffle has been damaged and a new fender and baffle plate is to be installed, alignment of mounting holes is made easier by attaching the baffle to the filler plate first. After the fender has been installed, the baffle plate can be bolted to the fender.

Fender Moldings and Script (Figs. 12-10, 12-11, 12-12 and 12-13)

To remove the fender side molding(s), it is necessary to loosen the fender at the cowl, disconnect it at the lower bracket then move fender outward to reach the rear molding attaching nuts.

RADIATOR SUPPORT AND BAFFLES

For construction and assembly details refer to Figs. 12-14 and 12-15.

GRILLE ASSEMBLY

HEADLAMP HOUSINGS (Figs. 12-16 and 12-17)

The headlamp housings are retained by self tapping sheet metal screws. To remove housing

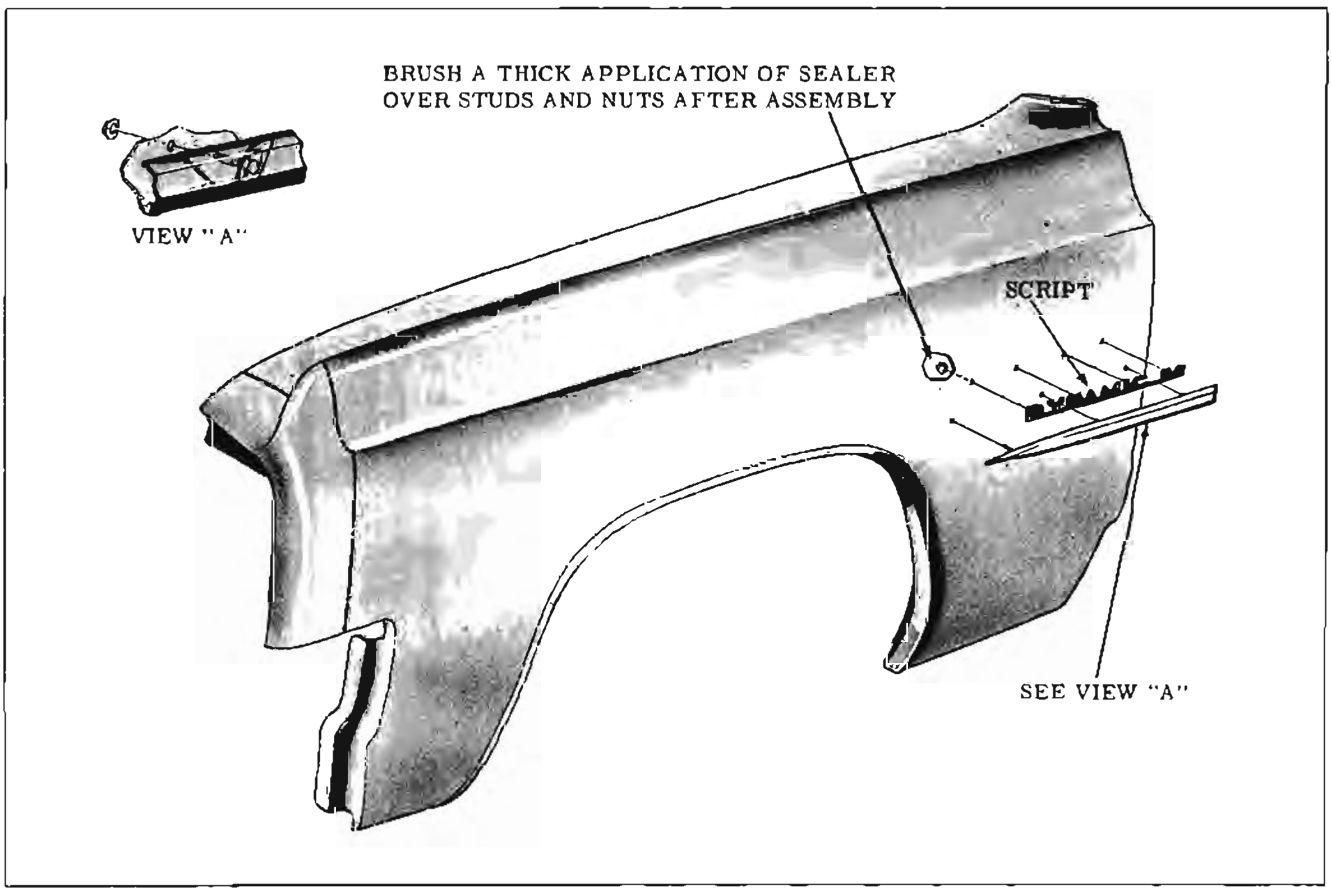


Fig. 12-10 88 Fender Script and Molding

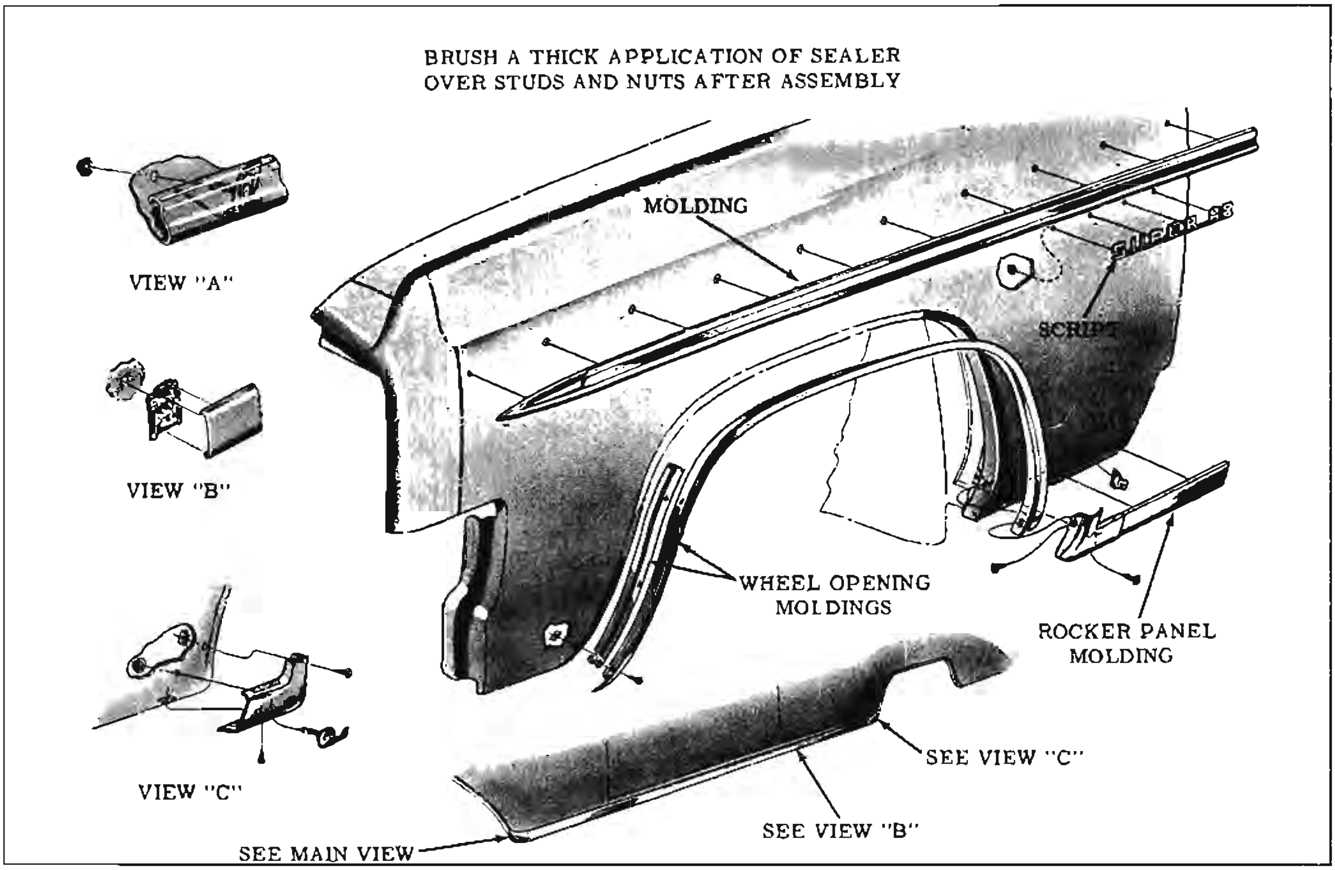


Fig. 12-11 S 88 Fender Moldings and Script

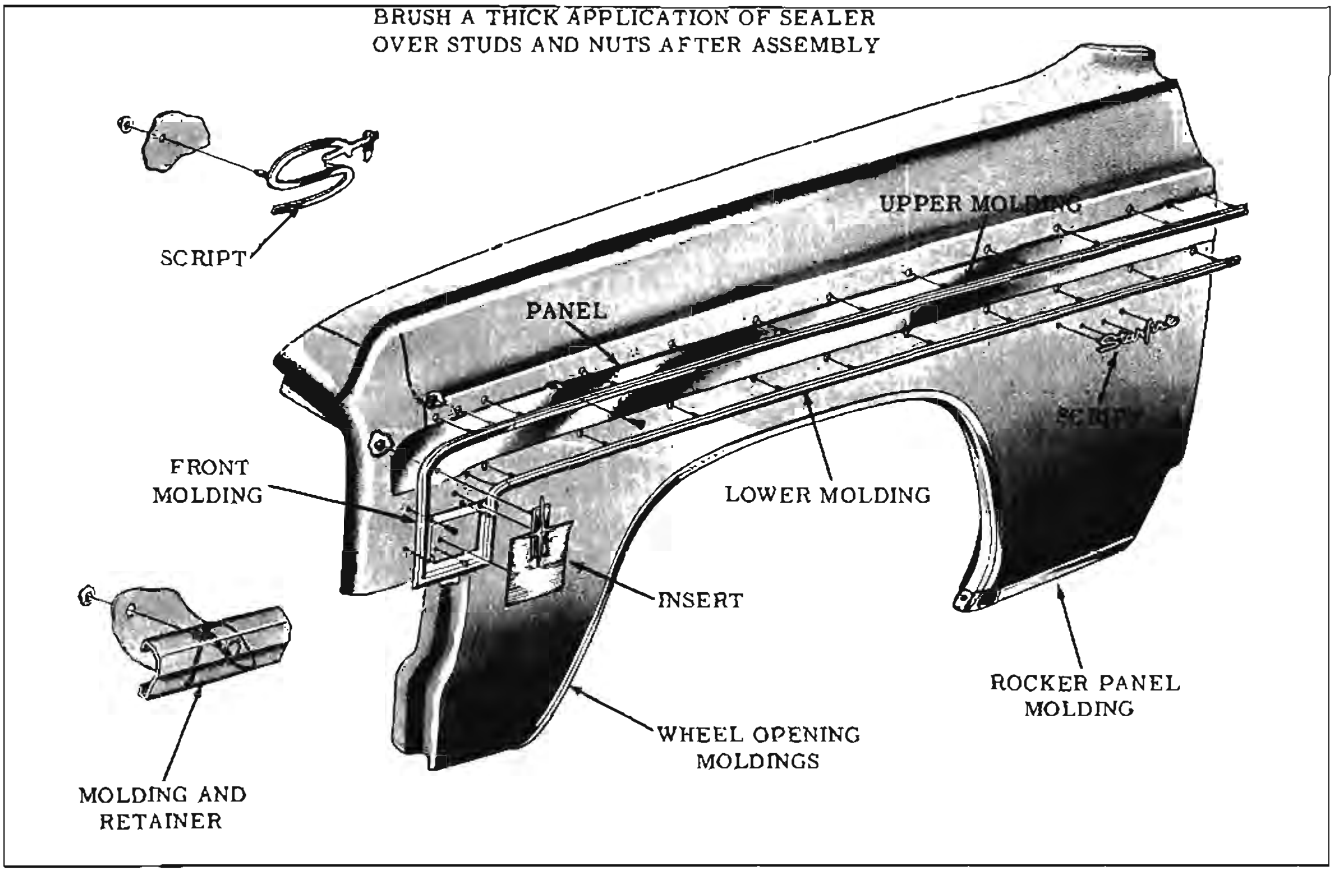


Fig. 12-12 Starfire Fender Moldings and Script

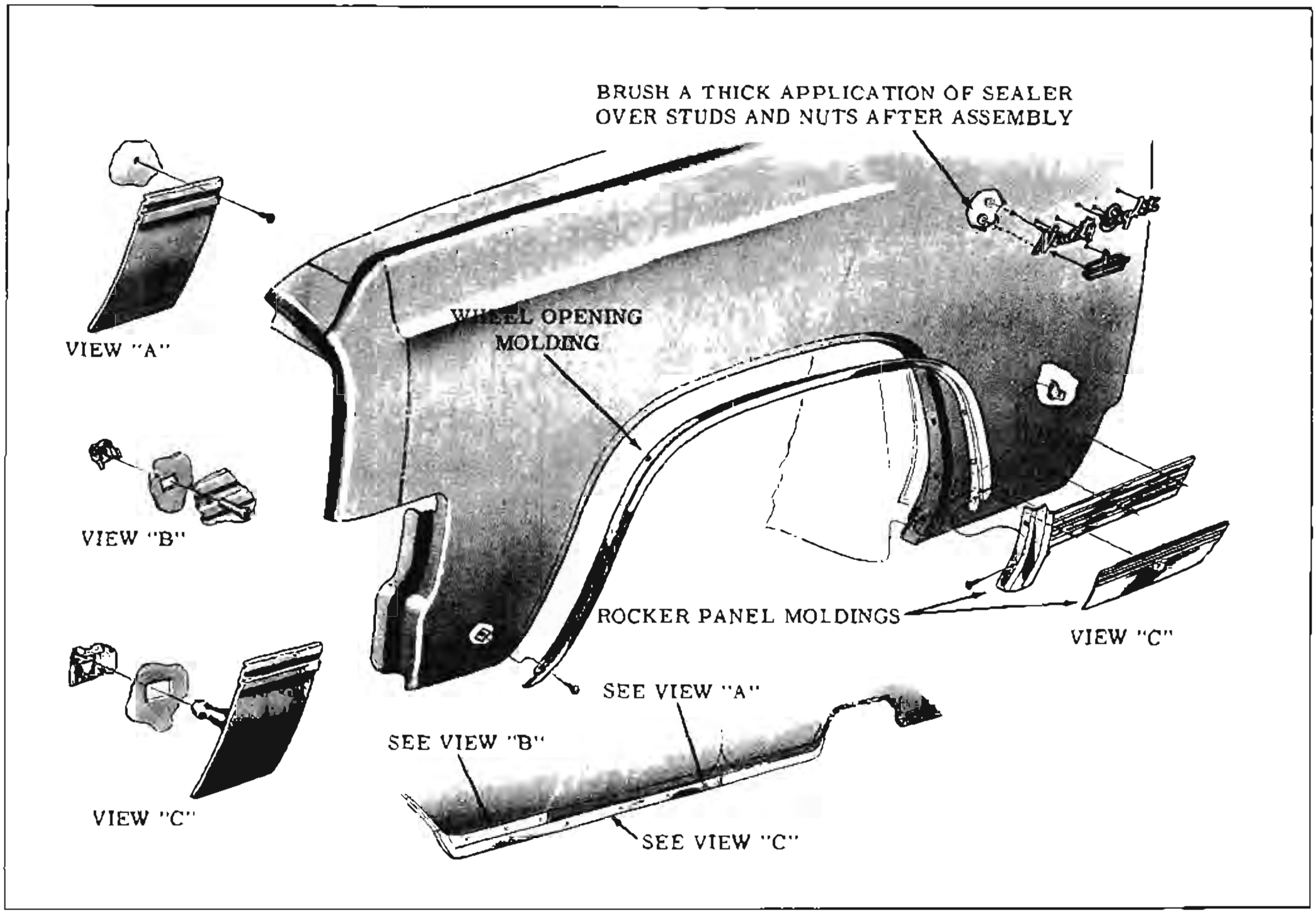


Fig. 12-13 98 Fender Moldings and Script

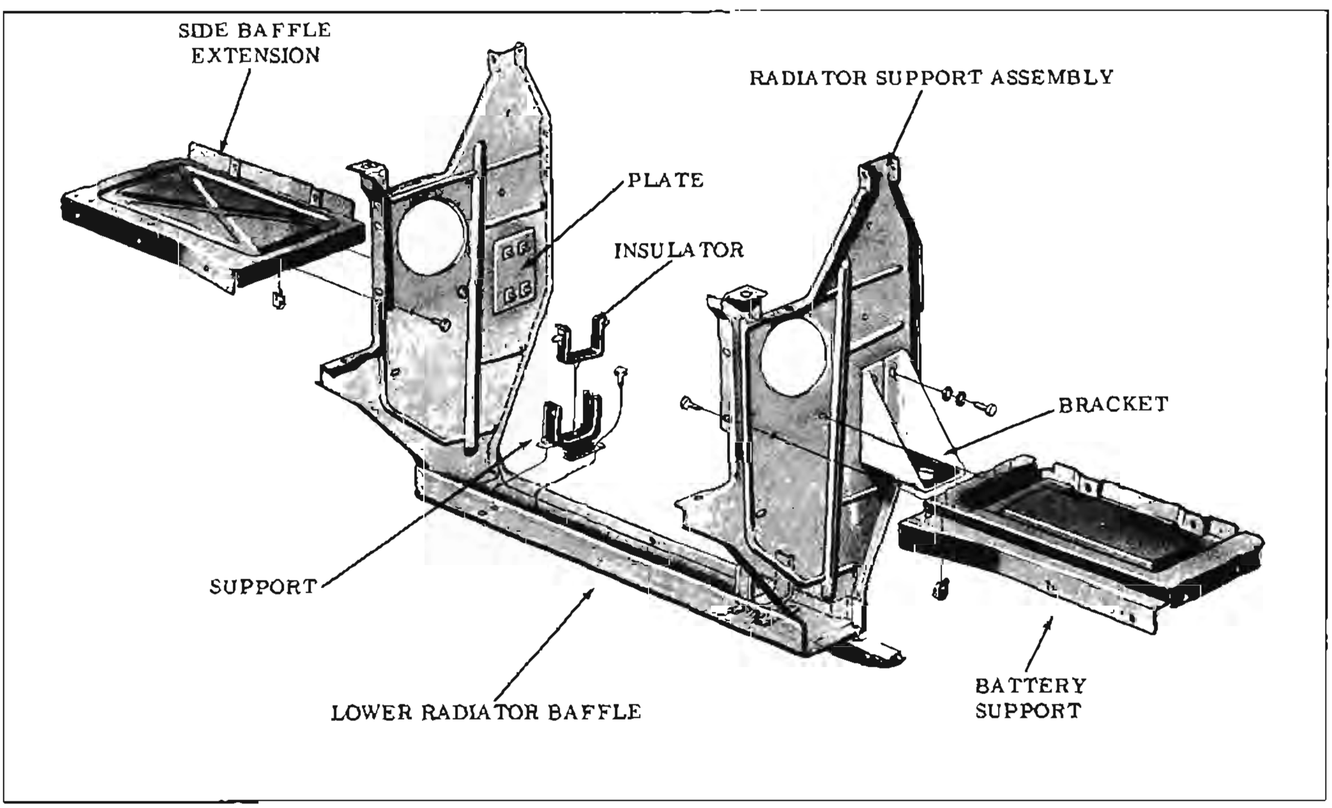


Fig. 12-14 Radiator Support

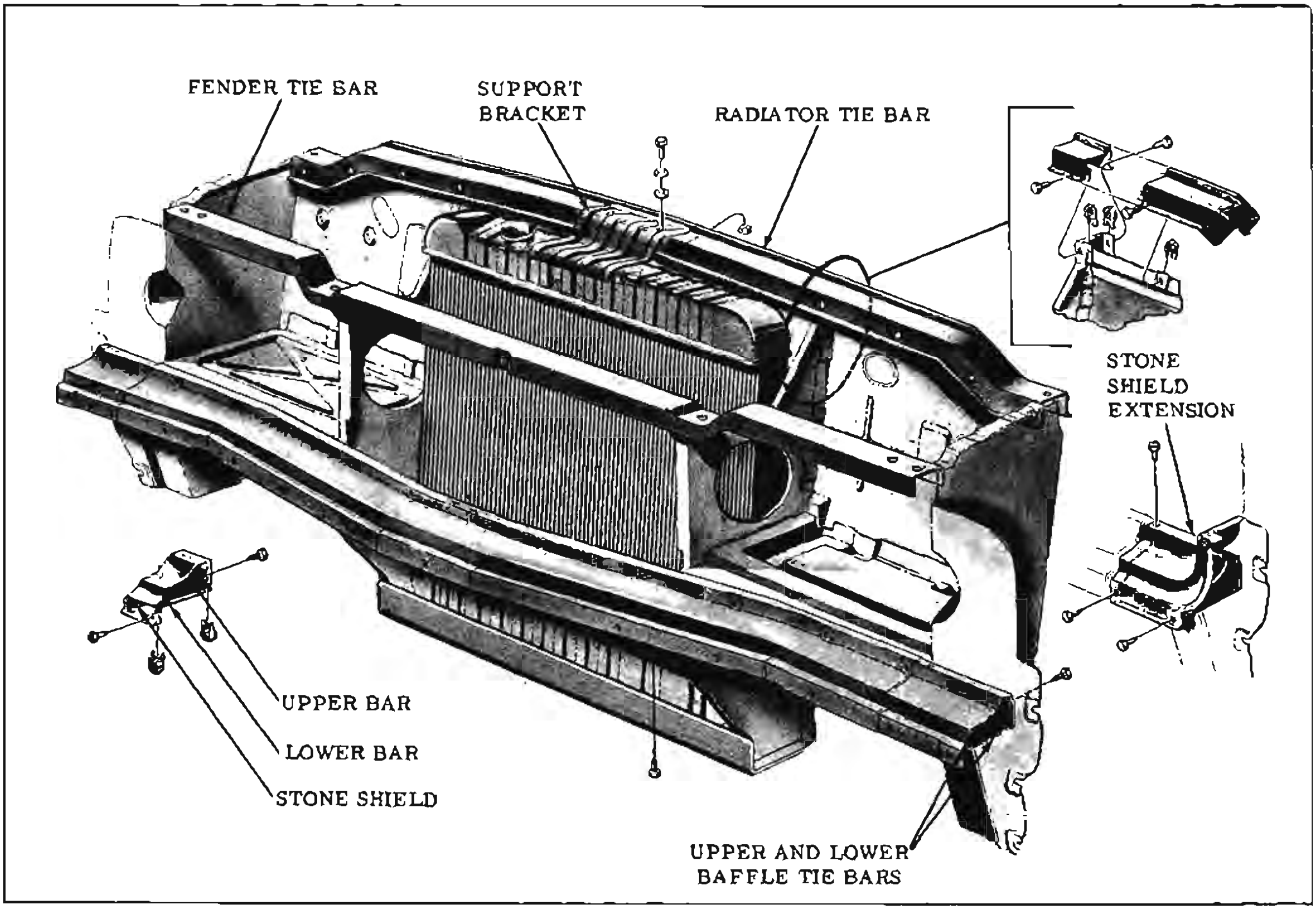


Fig. 12-15 Radiator Support Baffles and Tie Bars

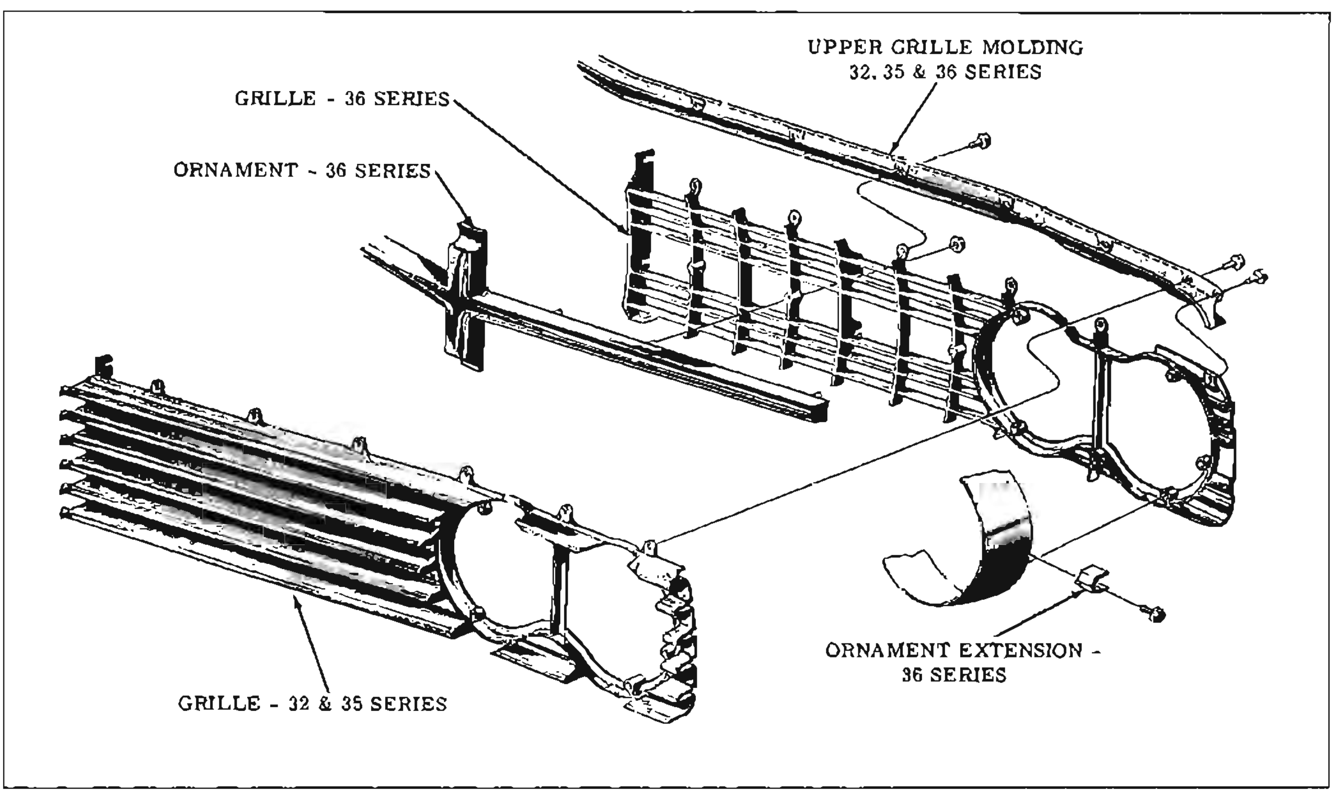


Fig. 12-16 88, S 88 and Starfire Grilles

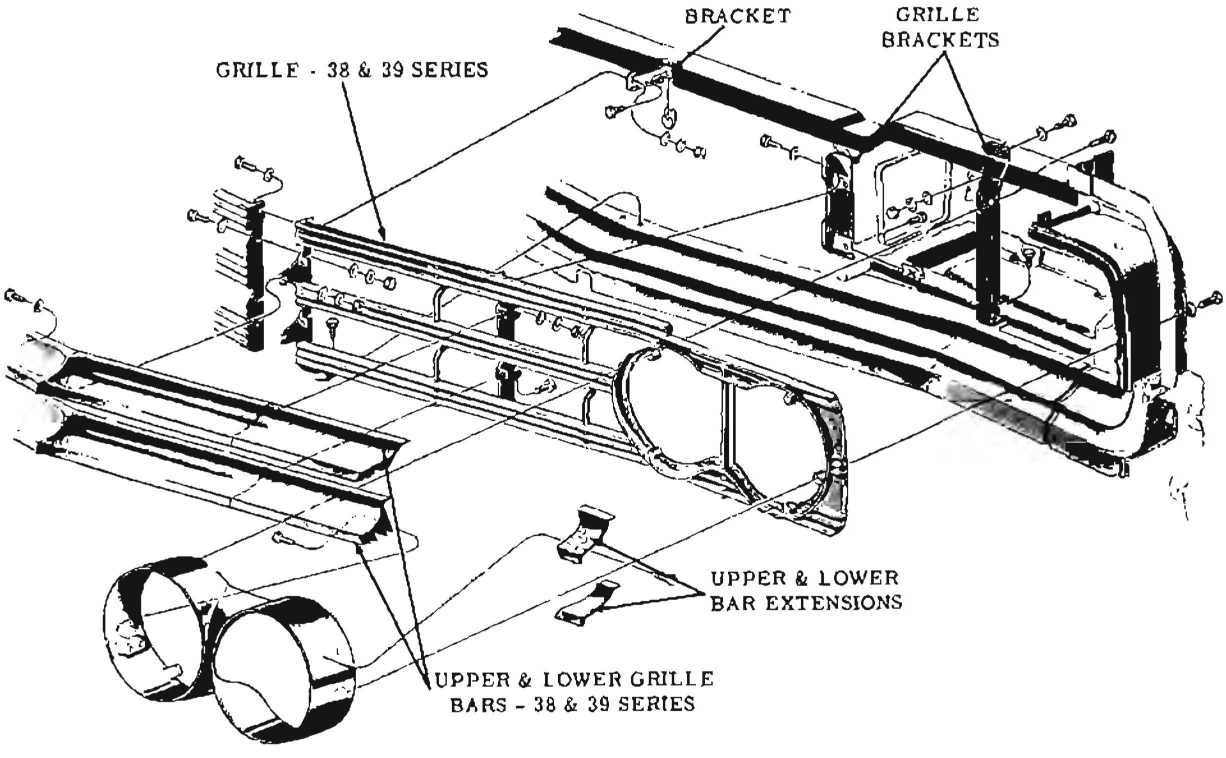


Fig. 12-17 Ninety Eight Grille

It is not necessary to remove the headlamp assemblies.

To install, reverse removal procedure. Check headlamp aim and adjust if necessary.

GRILLE (Figs. 12-16 and 12-17)

The grilles are of two piece construction held in place by bolts thru six grille brackets.

GRILLE BARS (NINETY EIGHT ONLY) (Fig. 12-17)

The grille bars are retained by clips and screws which are easily accessible. The grille bars can be removed by removing the clips and screws.

ORNAMENT (STARFIRE ONLY) (Fig. 12-16)

The ornament is a single piece construction and fastened by studs and nuts to the grille.

CHASSIS SHEET METAL AND BUMPERS

(F-85)

CONTENTS OF SECTION 12

HOOD ASSEMBLY

Removal and Installation

Prior to removal of the hood, it is suggested that adjoining areas be covered to prevent damage.

With the hood supported, scribe the hinge position on the hood reinforcement and remove the two hinge hood nuts from each hinge. (Fig. 12-101)

When installing hood, position the hinges to the scribed lines. If further adjustment is necessary, follow the hood and hinge alignment procedure.

HOOD HINGE SPRING

Removal and Installation

To remove the spring from the hood hinge, raise hood approximately 12" and place Tool J-8923-1 over the spring. (Fig. 12-102) Raise hood and the spring will unhook. Block hood in this position and remove spring.

When installing a new spring, stretch the spring and place Tool J-8923-1 over the spring. Position spring (with tool in place) on hinge. Lower hood slightly to expand spring, then remove tool.

HOOD HINGE

Removal and Installation (With Spring Removed)

Place protective covers on fender and grille at

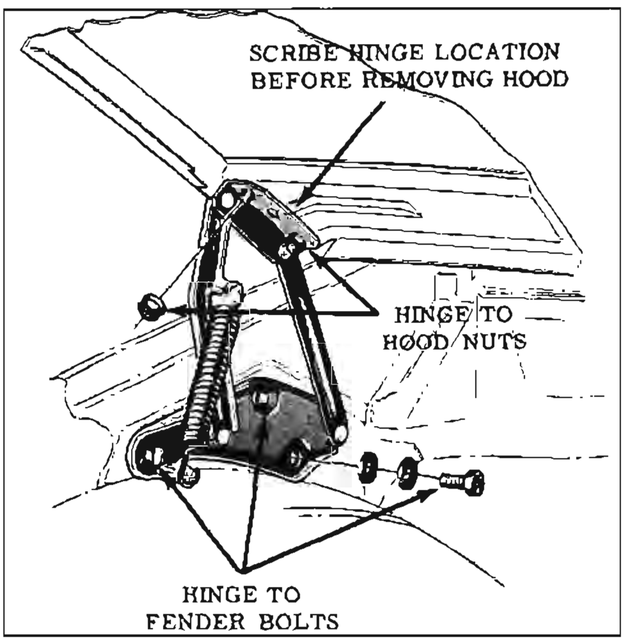


Figure 12-101 Hood Hinge and Spring

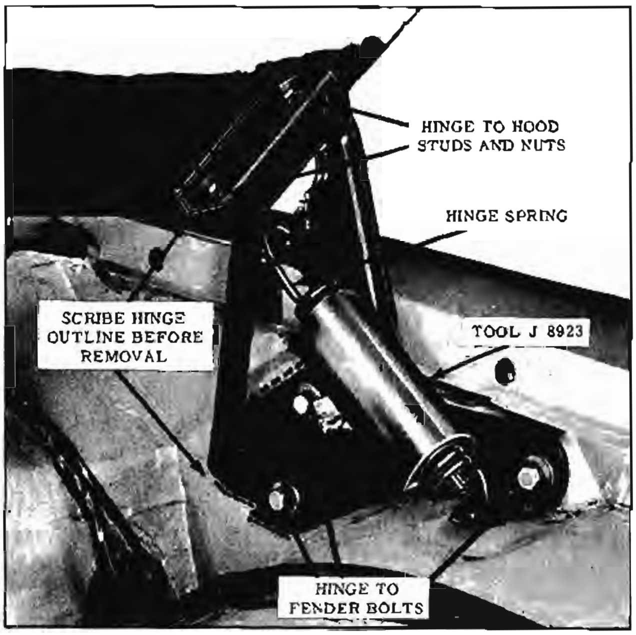


Fig. 12-102 Hood Hinge or Spring Removal

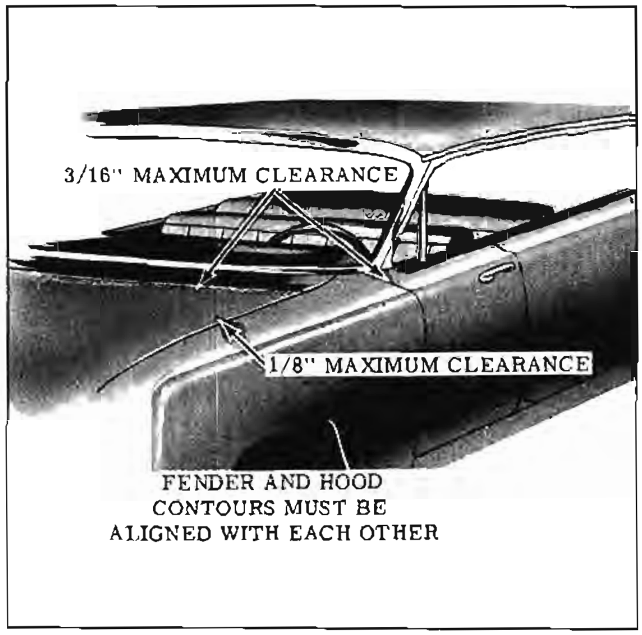


Fig. 12-103 Hood and Fender Clearances

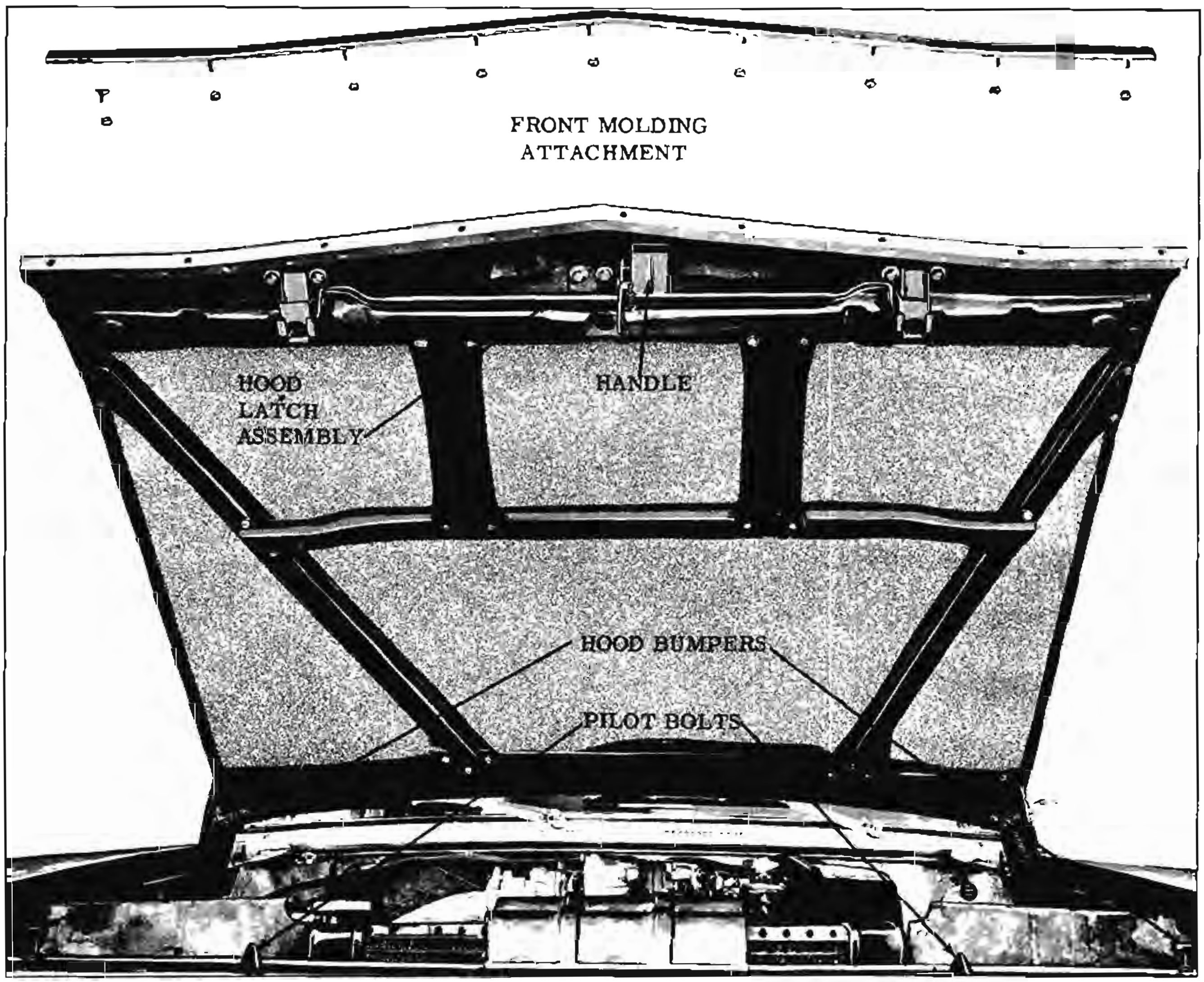


Fig. 12-104 Hood and Hood Latch

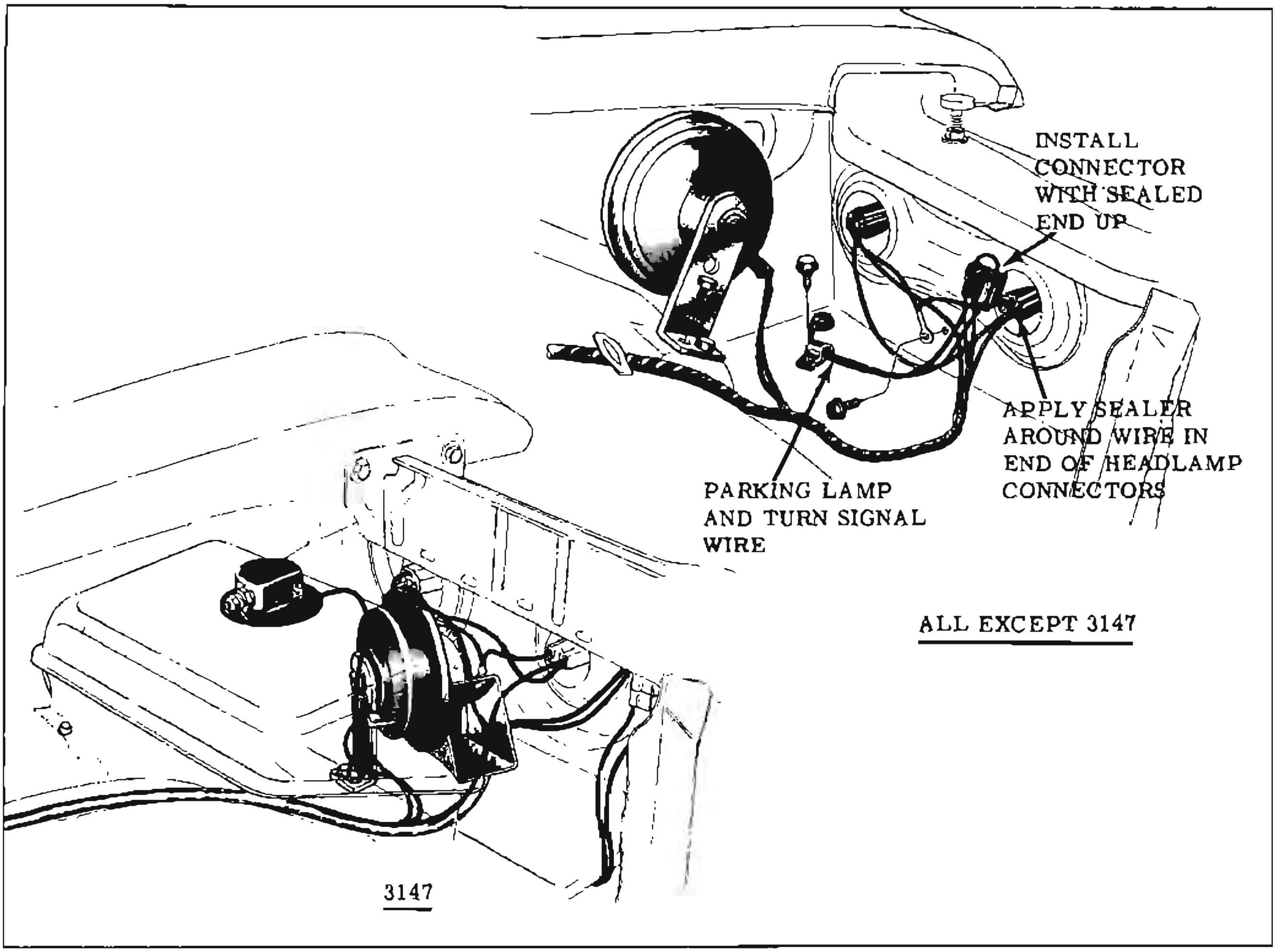


Fig. 12-105 Headlamp Wiring

hinge area. Mark the hinge outline on wheelhouse and hood to facilitate alignment. (Fig. 12-102) Support the hood at front and rear and remove the two hinge to hood nuts then remove the hinge to wheelhouse bolts.

Using the scribe marks as a guide, install the hinge to wheelhouse bolts and torque 15-20 ft. lbs. Torque hinge to hood nuts 12-16 ft. lbs. Check hood alignment after hinge installation. The hinge is provided with elongated holes for alignment and if necessary, shift hood to properly align. (Fig. 12-102)

HOOD LATCH ASSEMBLY (Fig. 12-104)

The latch assembly is bolted to the hood and is serviced and adjusted as an assembly. The latch assembly should be lubricated periodically with lubriplate. The latch assembly is actuated by a handle located above the grille. (Fig. 12-104)

HOOD MOLDINGS, INSULATOR AND PILOT BOLT (Fig. 12-104)

The moldings are attached by nuts accessible on the underside of the hood. To gain access to the top hood moldings, make small slits in the insulator. The hood pilot bolt is attached to the front fender tie bar and should be adjusted to fully engage the latch assembly after the rubber bumpers have been adjusted to give proper hood and fender alignment at the front. The pilots may

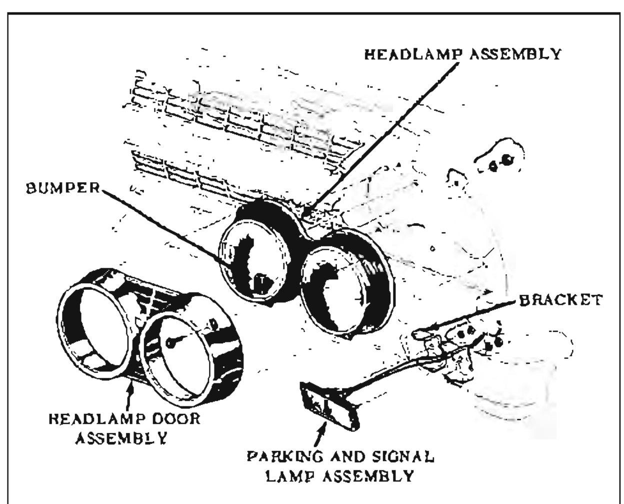


Fig. 12-106 Headlamp Wiring

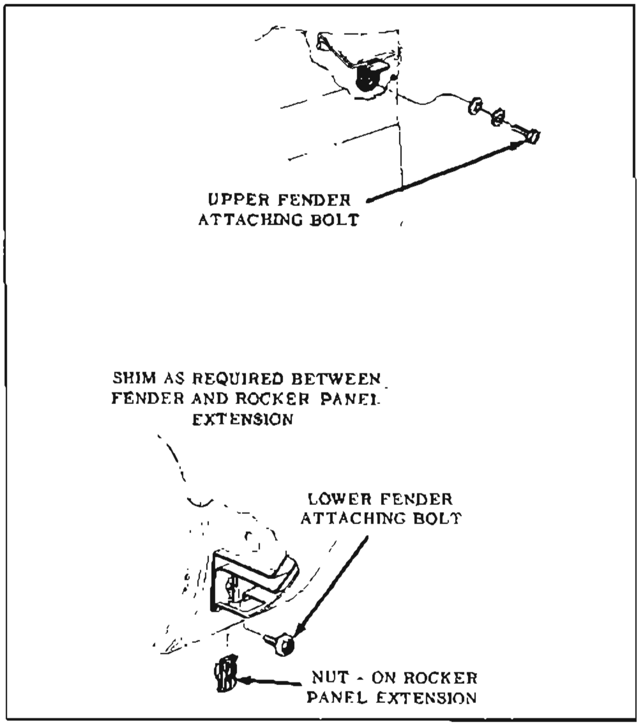


Fig. 12-107 Fender Rear Attachment

be adjusted slightly right or left to give proper lateral clearance when the hood is closed.

FENDER ASSEMBLY

Removal

Before removing a fender, painted areas and moldings adjacent to the fender should be covered for protection against scratches.

1. Disconnect both headlamp connectors and remove the main wiring harness connector from the retaining clip, then remove ground screw. (Fig. 12-105)
2. Remove headlamp door attaching screws and remove headlamp door. (Fig. 12-106)
3. Remove bumper to fender attachment bolt.
4. Remove fender to side baffle and fender to inner fender extension screws.
5. Remove fender to wheelhouse extension brace.

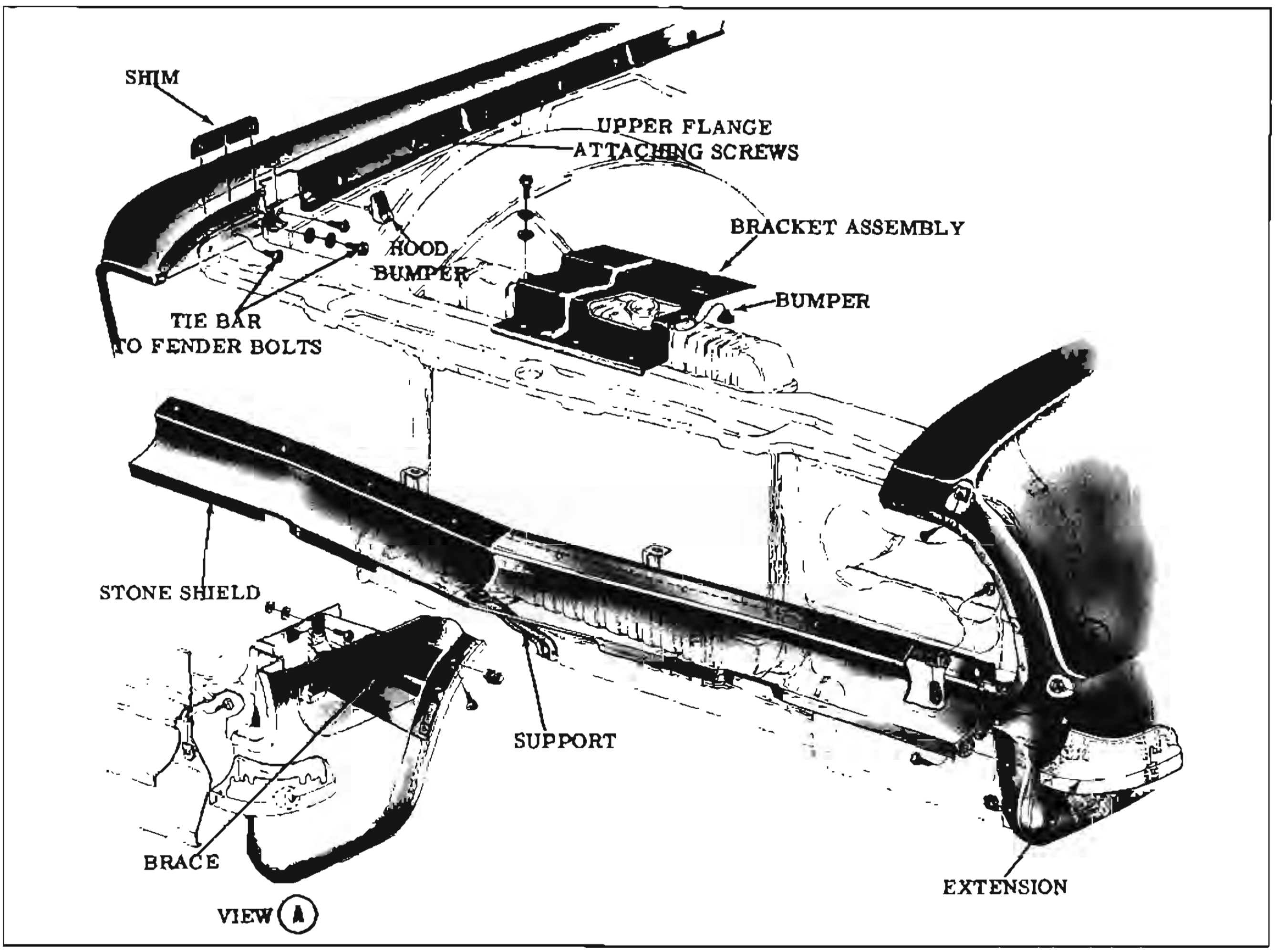


Fig. 12-108 Stone Shield and Fender Attachment

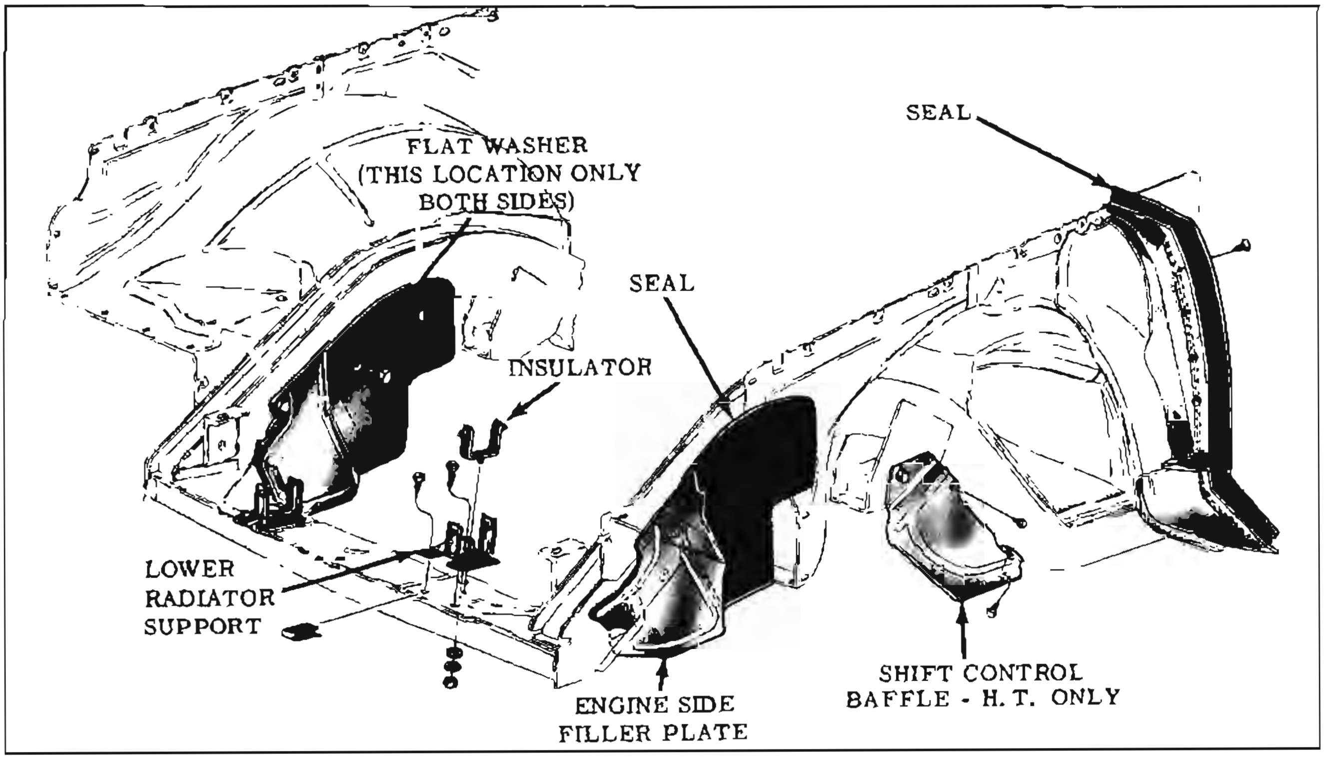


Fig. 12-109 Engine to Frame Filler Plate

6. Remove fender to rocker panel extension bolt, (and shims if used), and upper fender to cowl bolt and washer. (Fig. 12-107)

7. Remove fender to tie bar bolts. (Fig. 12-108)

8. If car is radio equipped, for right fender, remove the antenna mast, nut, spacer and gasket.

9. Remove the fender upper flange attaching screws. (Fig. 12-108)

10. Pull fender forward to clear lower windshield corner cowl area.

11. With the rear lower corner pulled away from inner rocker panel, lift the rear of fender sufficient to (on right hand) clear the antenna base and move fender forward and up off front end sheet metal.

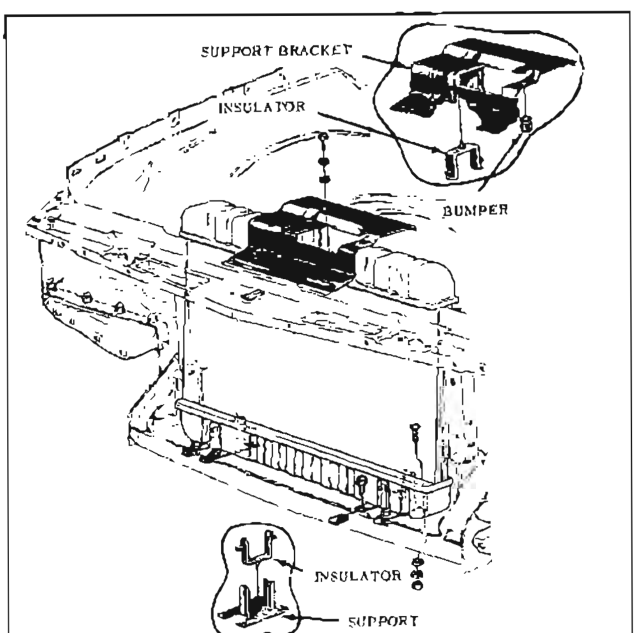


Fig. 12-110 Radiator Supports (All Except 3147 and/or A/C Equipped Cars

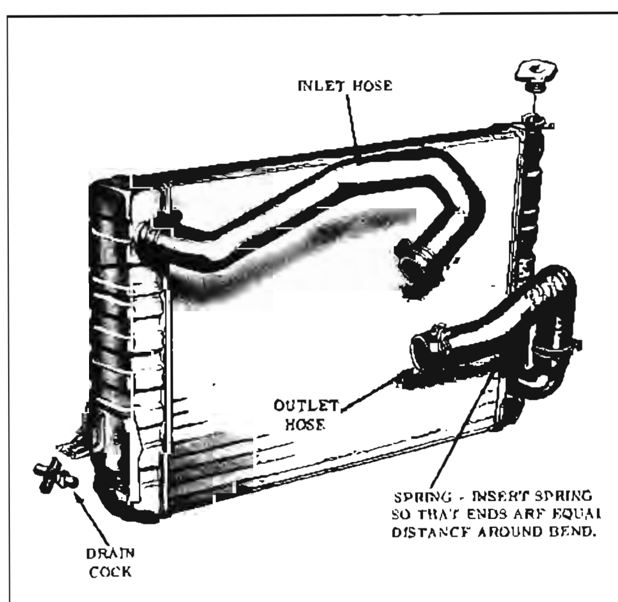


Fig. 12-111 Crossflow Radiator

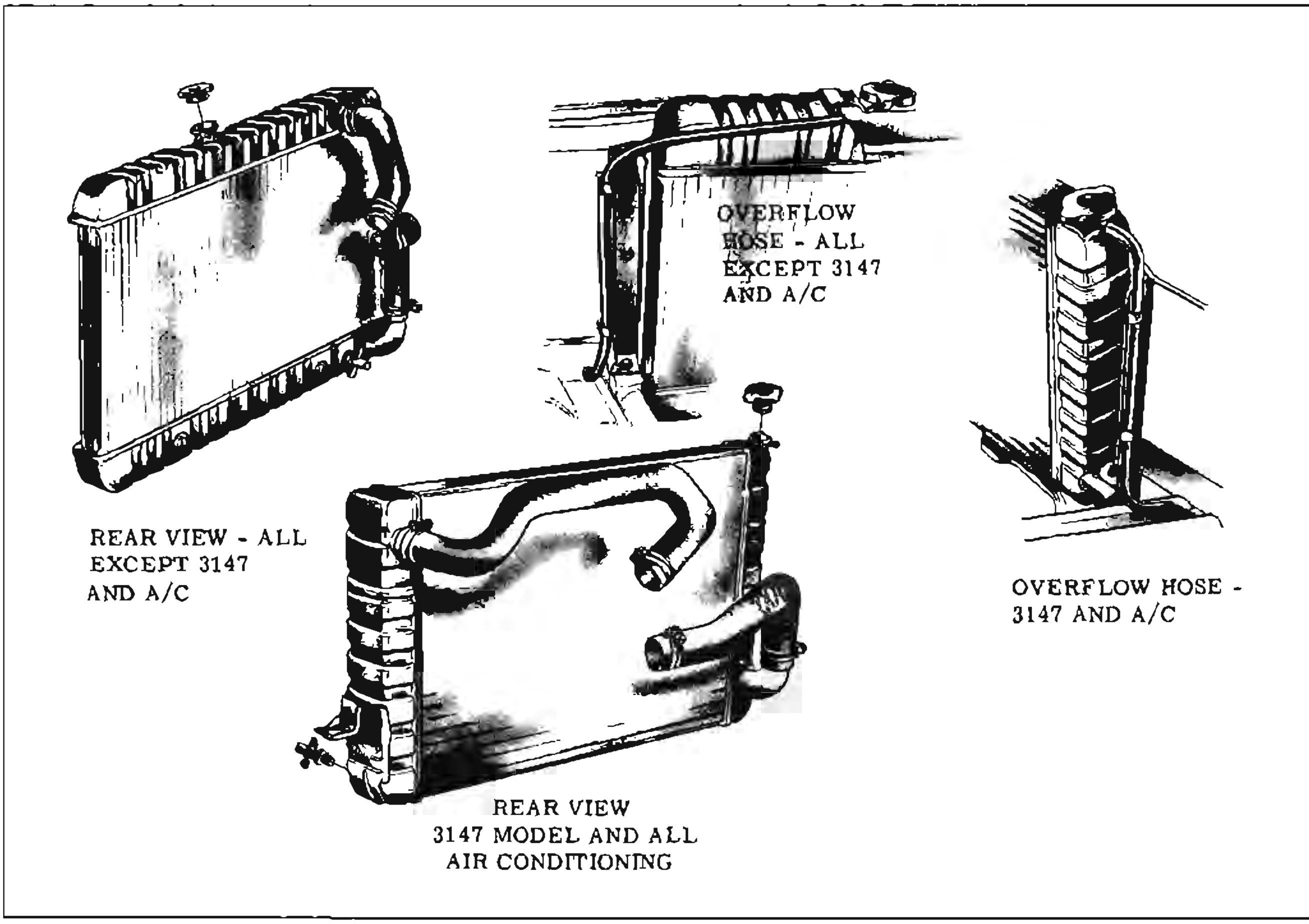


Fig. 12-112 Radiators

Installation

When installing a fender, it is important that all anti-squeaks and seals be reinstalled. If damaged, they should be replaced.

RADIATOR AND RADIATOR SUPPORTS

RADIATOR (Figs. 12-110, 12-111, 12-112)

There are two types of radiators used. All except 3147 models and air condition equipped cars use a vertical flow radiator as on the past model F-85.

The 3147 model and all air condition equipped cars use a crossflow type radiator. This type of radiator offers more efficient cooling.

RADIATOR SUPPORTS (Figs. 12-109, 12-110, 12-113, 12-114)

All except 3147 models and/or air condition equipped cars. (Figs. 12-109, 12-110)

The standard radiator is supported in three places, one upper and two lower supports. Each support has a rubber insulator which should be inspected and if necessary, replaced anytime the radiator or a support is removed.

3147 MODELS AND/OR AIR CONDITION EQUIPPED CARS (Figs. 12-113, 12-114)

The crossflow type radiator is supported in four places as shown. The rubber insulators should be inspected, and if necessary, replaced anytime the radiator or a support is removed.

RADIATOR SIDE BAFFLE and BRACKETS (Fig. 12-115)

The side baffle is a plate between the tie bar support and the fender. The side baffle is attached by sheet metal screws and is supported by the wheelhouse extension assembly. The radiator side baffle can be removed without removing the fender. The anti-squeaks and rubber seal should be inspected and replaced if necessary before installation. Use sealer as indicated in Fig. 12-115. Tighten attaching screws and bolts enough only to hold fender in place and yet allow movement by

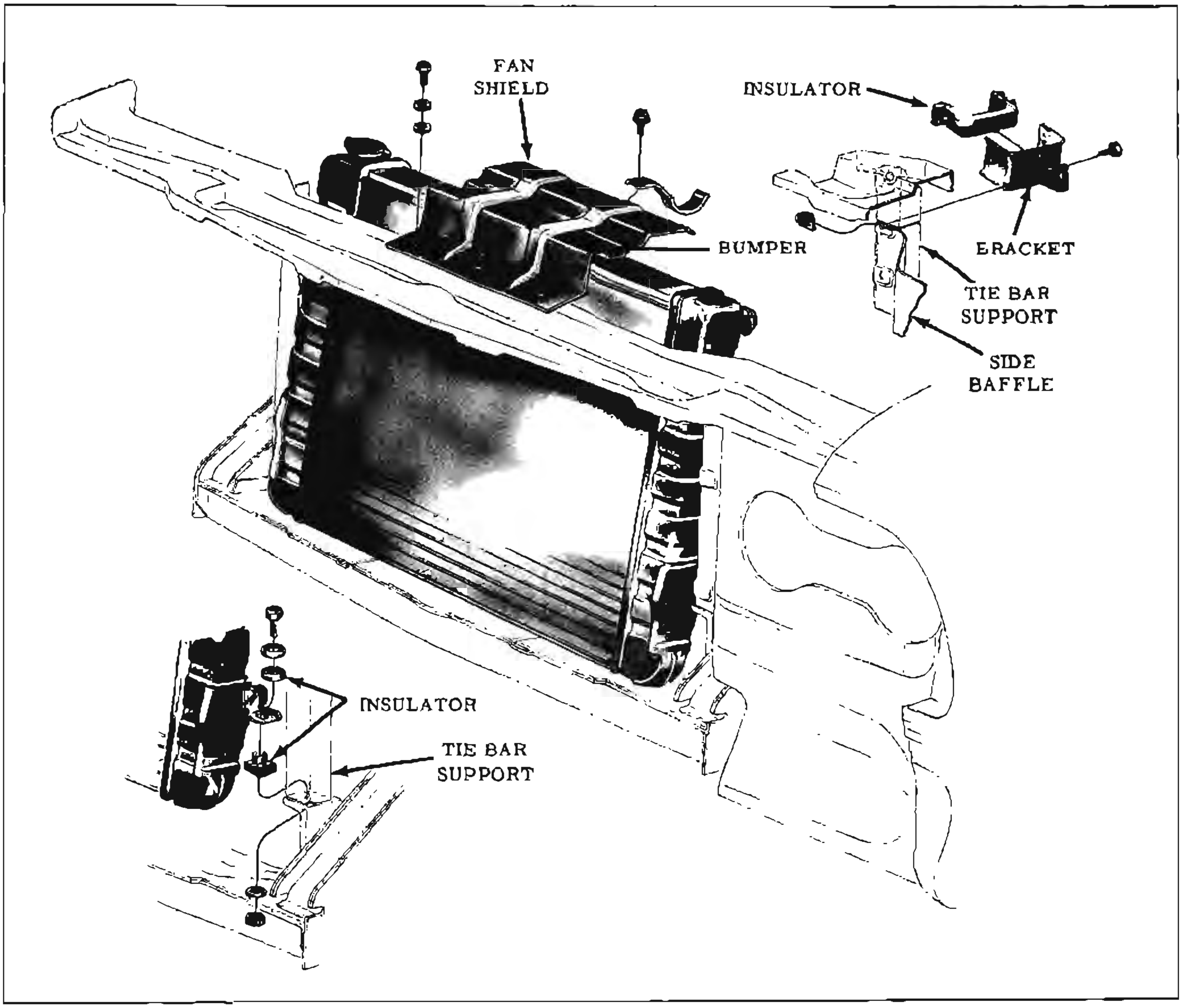


Fig. 12-113 Crossflow Radiator Supports

tapping, then check alignment. It may be necessary to use shims as shown in Fig. 12-107.

ENGINE TO FRAME FILLER PLATES (Fig. 12-109)

The front engine to frame filler plate is attached to the frame side rail. A rubber seal is clipped to the plate and frame as shown.

FRONT STONE BUMPER SHIELD

Removal and Installation

1. Remove stone shield to side baffle screws.
2. After installation of stone shield, check alignment of front bumper. Torque bumper bracket nuts 20-28 ft. lbs.
3. Remove two lower grille to support attaching screws.

MOLDINGS AND SCRIPT (Figs. 12-116, 12-117, 12-118, 12-119)

The fender side moldings are retained as illustrated. To remove the moldings, it is necessary to loosen the fender at the rear lower attaching bolts. (Figs. 12-108 and 12-109) Use sealer at each retainer location.

The rocker panel molding is retained at the front and side by a retainer and nut which is accessible from beneath the fender and in the center by snap on clips. The rear retainer is different for the left and right side. Use sealer over script attaching nuts as illustrated.

FENDER TIE BAR (Fig. 12-120)

The fender tie bar is held in position by two bolts to each side support, one screw to each

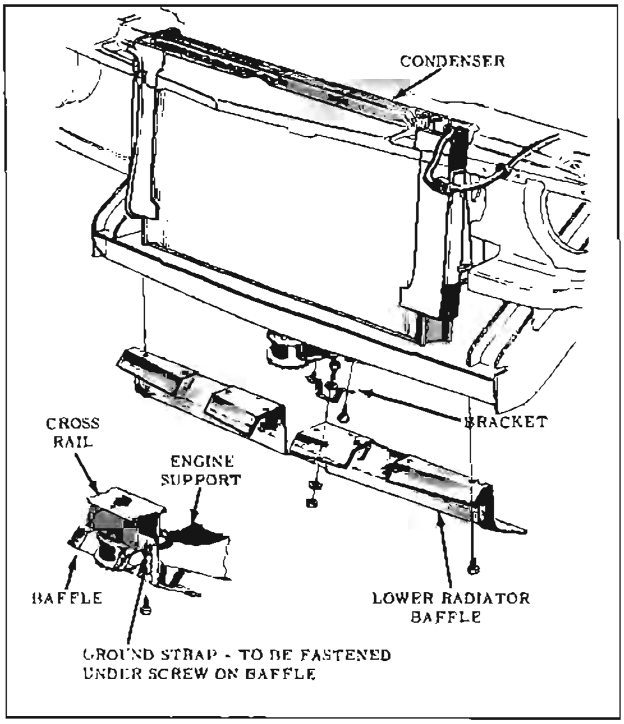


Fig. 12-114 Pipe Routing and Baffle Installation

fender, located on each side of the radiator, and one bolt to each tie bar support.

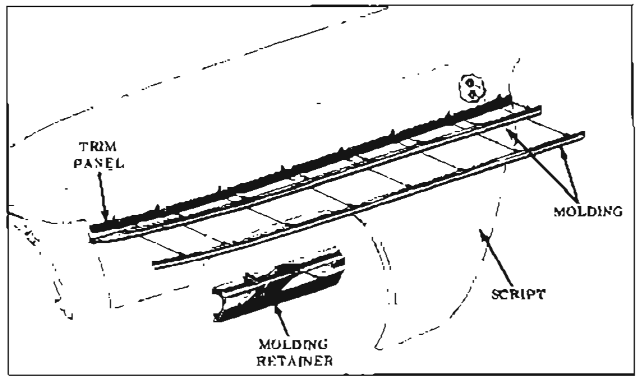


Fig. 12-116 Molding Attachment

GRILLE (Fig. 12-121)

The grille can be removed by raising the hood and removing the grille to tie bar screws and the lower grille to support screws. The grille assembly must be removed to remove or install the letters.

HEADLAMP DOOR AND HOUSING

Removal and Installation

The headlamp housing is retained to the radiator side baffle by sheet metal screws. To remove the housing, it is necessary to disconnect wiring, remove headlamp doors and remove the housing

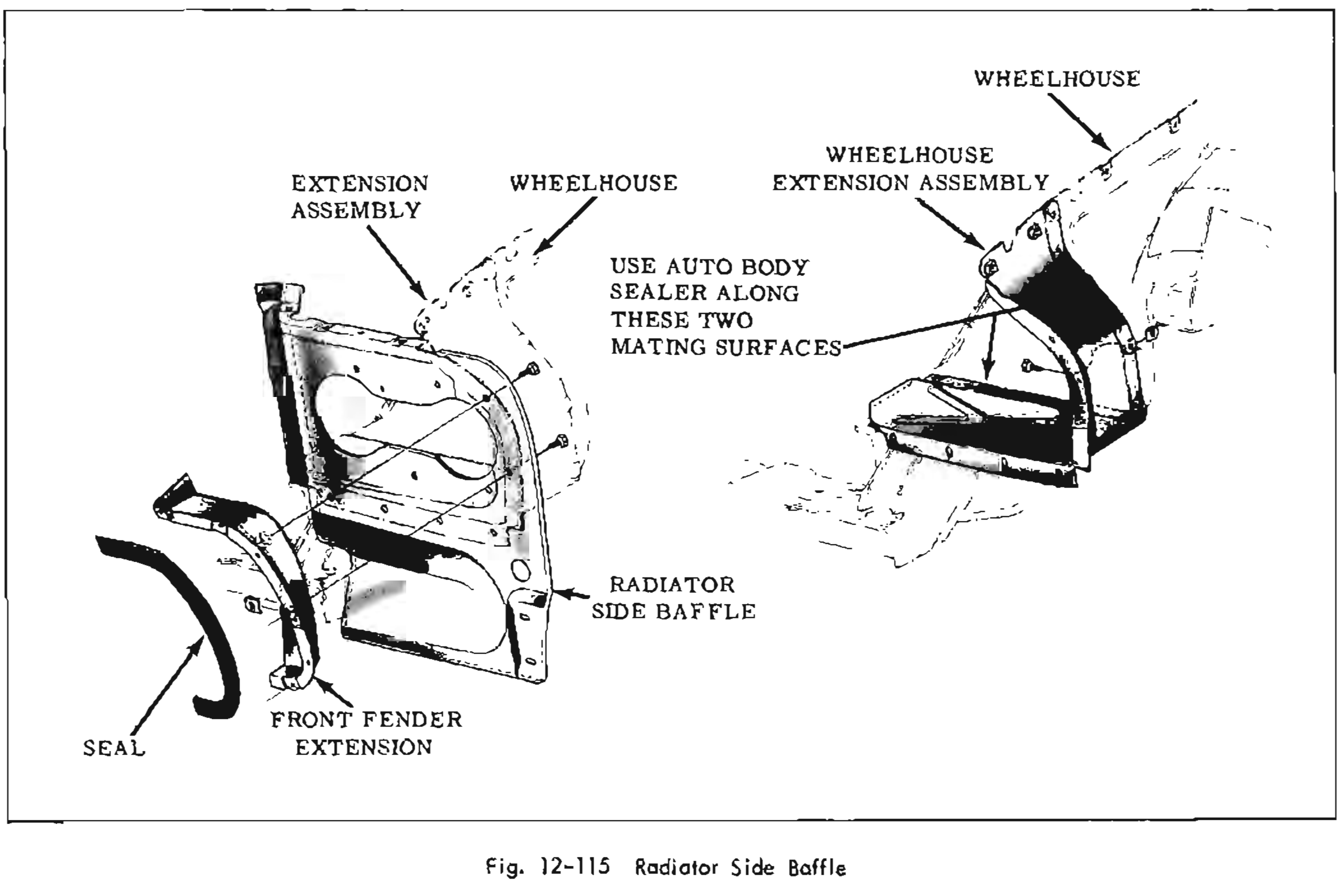


Fig. 12-115 Radiator Side Baffle

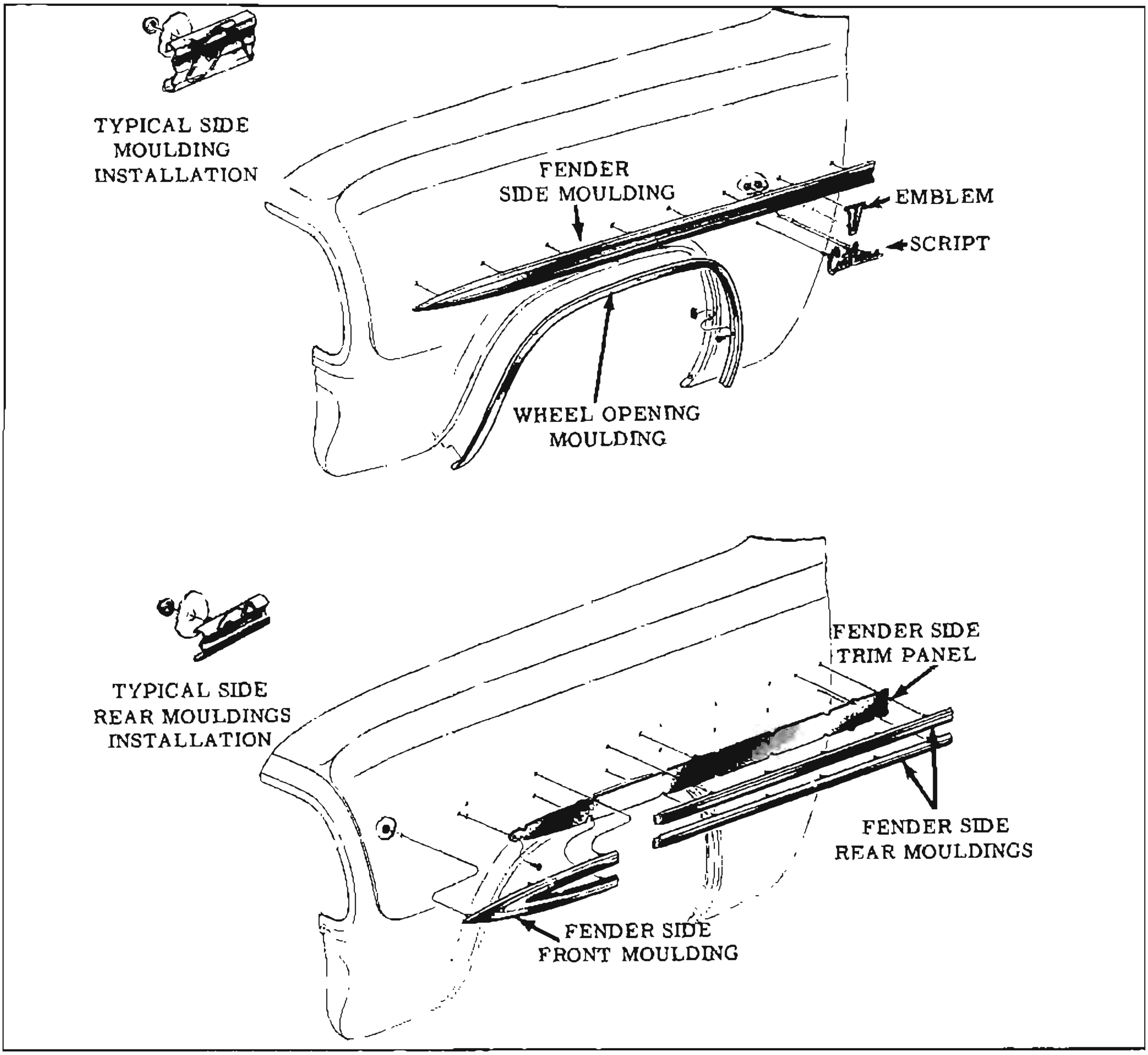


Fig. 12-117 Molding Attachment

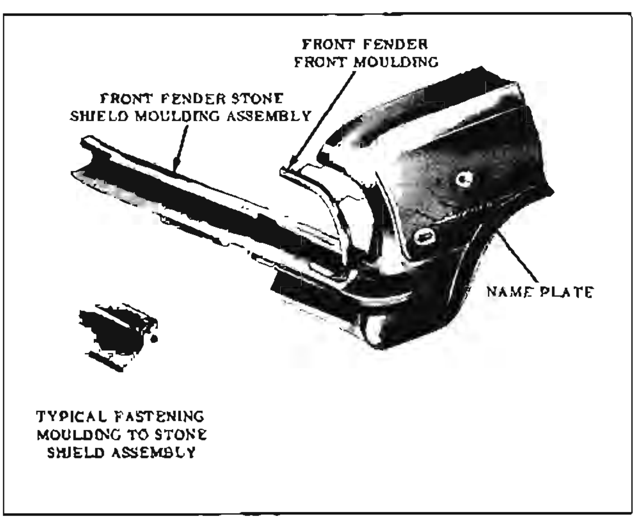


Fig. 12-118 Script Attachment

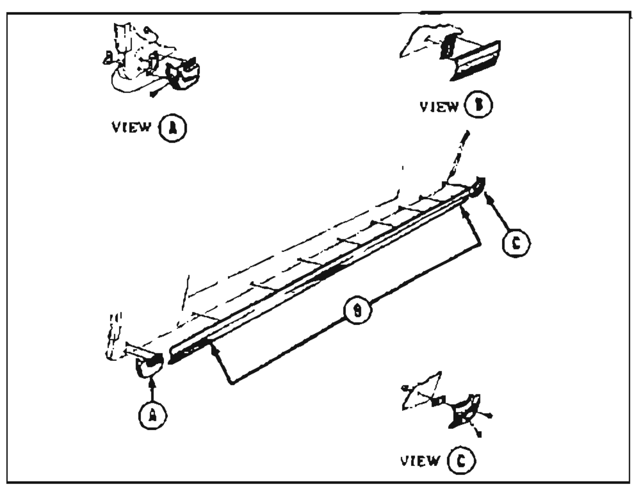


Fig. 12-119 Rocker Panel Molding Attachment

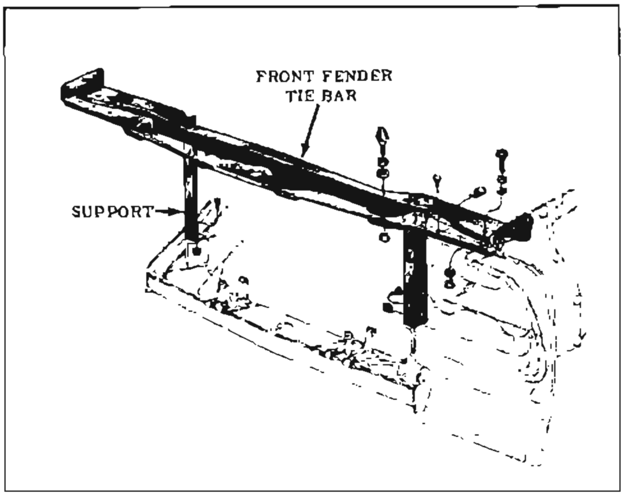


Fig. 12-120 Front Fender Tie Bar

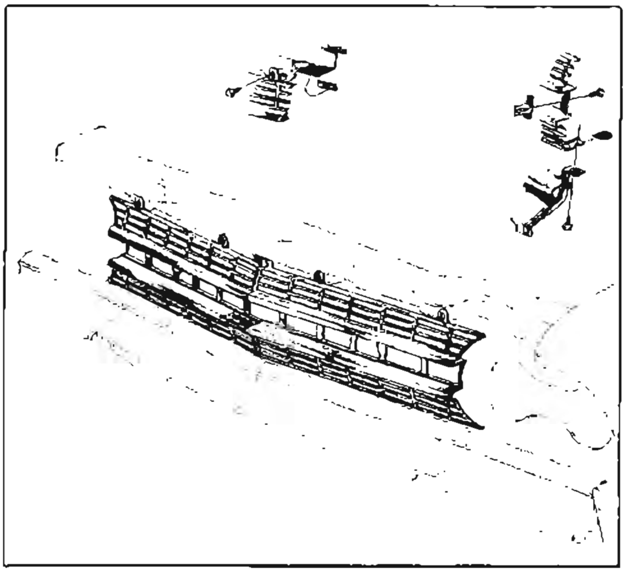


Fig. 12-121 Grille

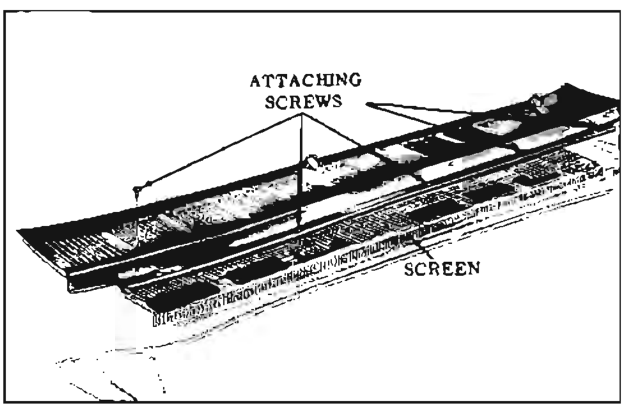


Fig. 12-122 Cowl Vent Grille

retaining screws. To install, reverse the removal procedure. After installation, check headlamp aim and adjust if necessary.

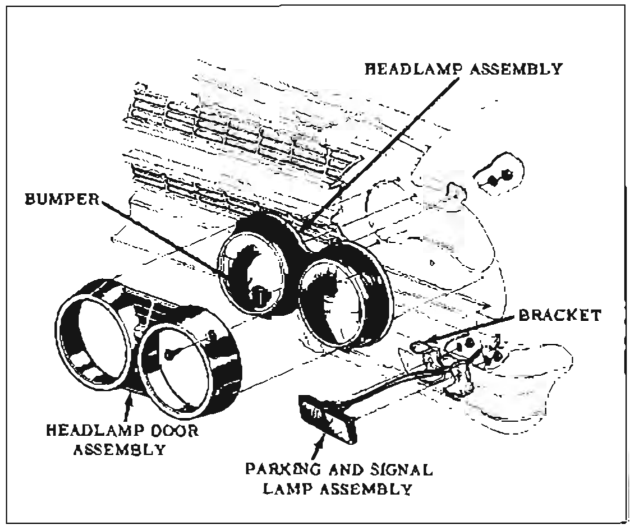


Fig. 12-123 Headlamp Assembly

SEALED BEAM LAMPS

To replace a sealed beam lamp:

1. Remove headlamp door.
2. Disengage lamp retainer spring.
3. Disconnect electrical plug from back of lamp. (Fig. 12-105)
4. Remove two lamp retainer screws and remove lamp.

When installing lamp only, it should not be necessary to aim headlamps.

COWL VENT GRILLE

Removal

1. Remove windshield wiper arms.
2. Raise hood and remove cowl vent grille to cowl screws. (Fig. 12-122)
3. Remove cowl vent grille by lifting up forward edge and pulling away from windshield.

Installation

Apply caulking around vent grille attaching screw holes and vent grille tab slots in cowl, then carefully slide grille rearward to engage rear edge of grille between windshield lower reveal moldings and molding attaching clips and install grille to cowl screws.

REAR END BODY PANEL LETTERS

On all 3100 series except 3147, each letter is fastened to the rear end body molding. When

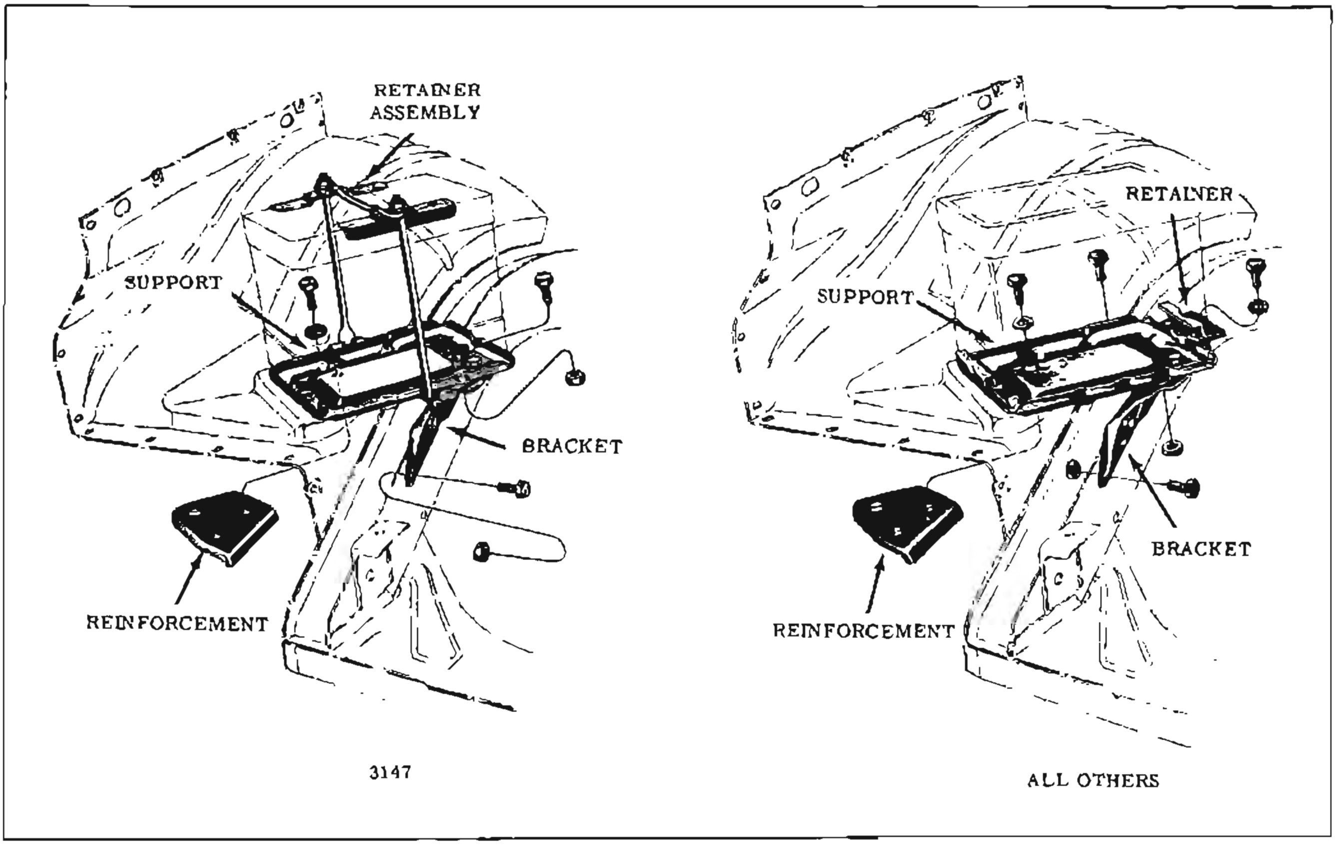


Fig. 12-124 Battery Supports

installing the letters, place a daub of auto body caulking compound around letter studs after installation. On 3147 models, the molding and letters are on the rear compartment lid.

TAIL LAMP ASSEMBLY

Removal and Installation

The tail lamp assembly is assembled to the rear quarter panel with nuts accessible from inside the trunk compartment on all except 35 styles, and by removing rear quarter trim on 35 styles. Bulbs may be replaced on 35 styles by removing lens from outside and by removing the socket from inside the trunk compartment on other styles.

PARKING LAMPS

The parking lamp assemblies may be removed by disconnecting the wiring and removing the two stud nuts and two clamps. (Fig. 12-123) Bumper removal is not necessary.

LICENSE LAMP

The license lamp is attached by screws accessible from lower side of the bumper primary bar.

To replace, disconnect wire and remove the attaching screws. The lens may be removed for bulb replacement without removing the lamp from the bumper.

BATTERY SUPPORT

The battery support is bolted to the bracket and reinforcement as shown in Fig. 12-124. Apply petrolatum to both battery terminals before attaching cables.

QUARTER PANEL BAFFLES

The quarter panel baffles are retained by sheet metal screws. After installation, check for clearance between inner and outer wheelhouse panel.

BACK-UP LAMP

The back-up lamp is an integral part of the tail lamp assembly. The bulb can be replaced by removing the socket and bulb from inside the trunk.

BUMPERS

FRONT

Removal and Installation (Fig. 12-125)

Disconnect the parking lamp wiring, then remove the fender to bumper bolts (1 per side) and the four bumper to bumper bracket bolts (two on each side) as shown.

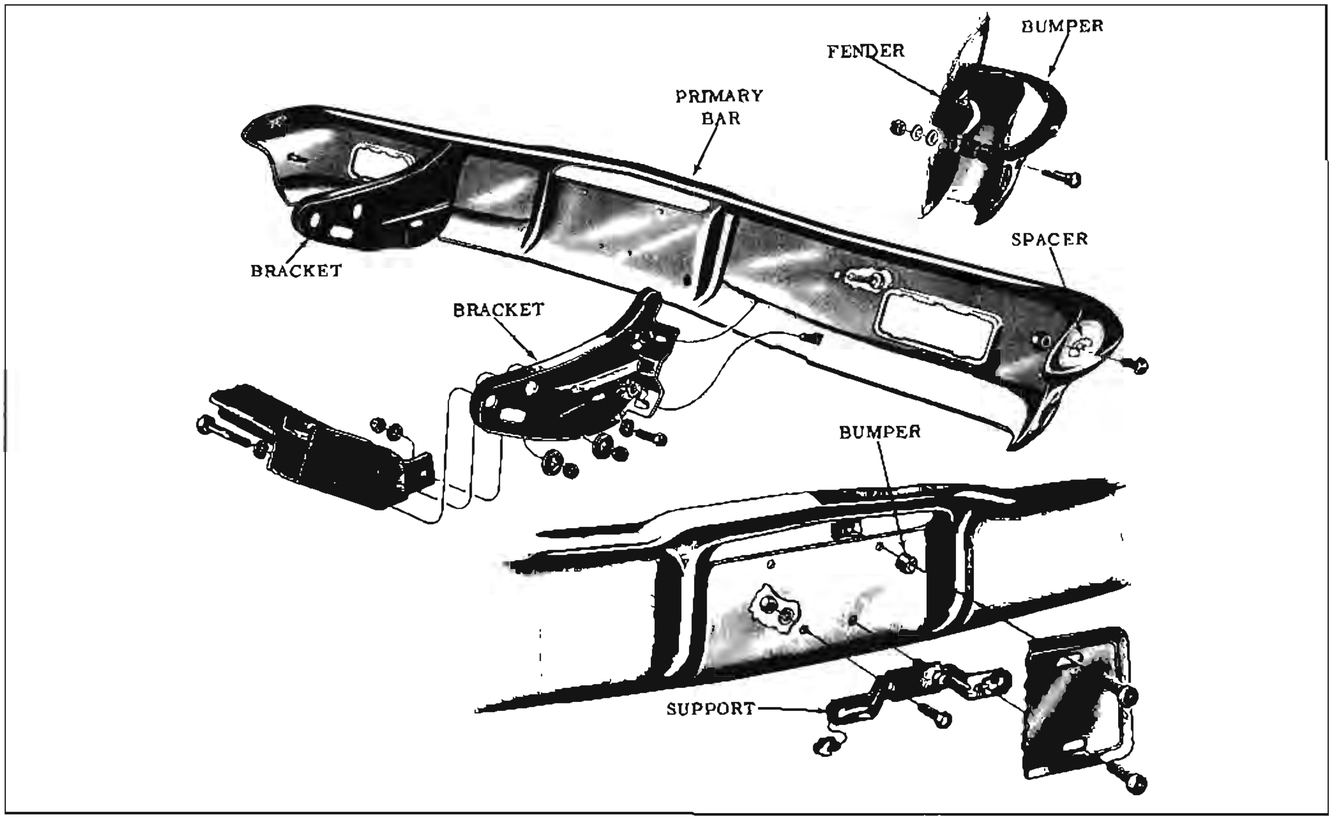


Fig. 12-125 Front Bumper

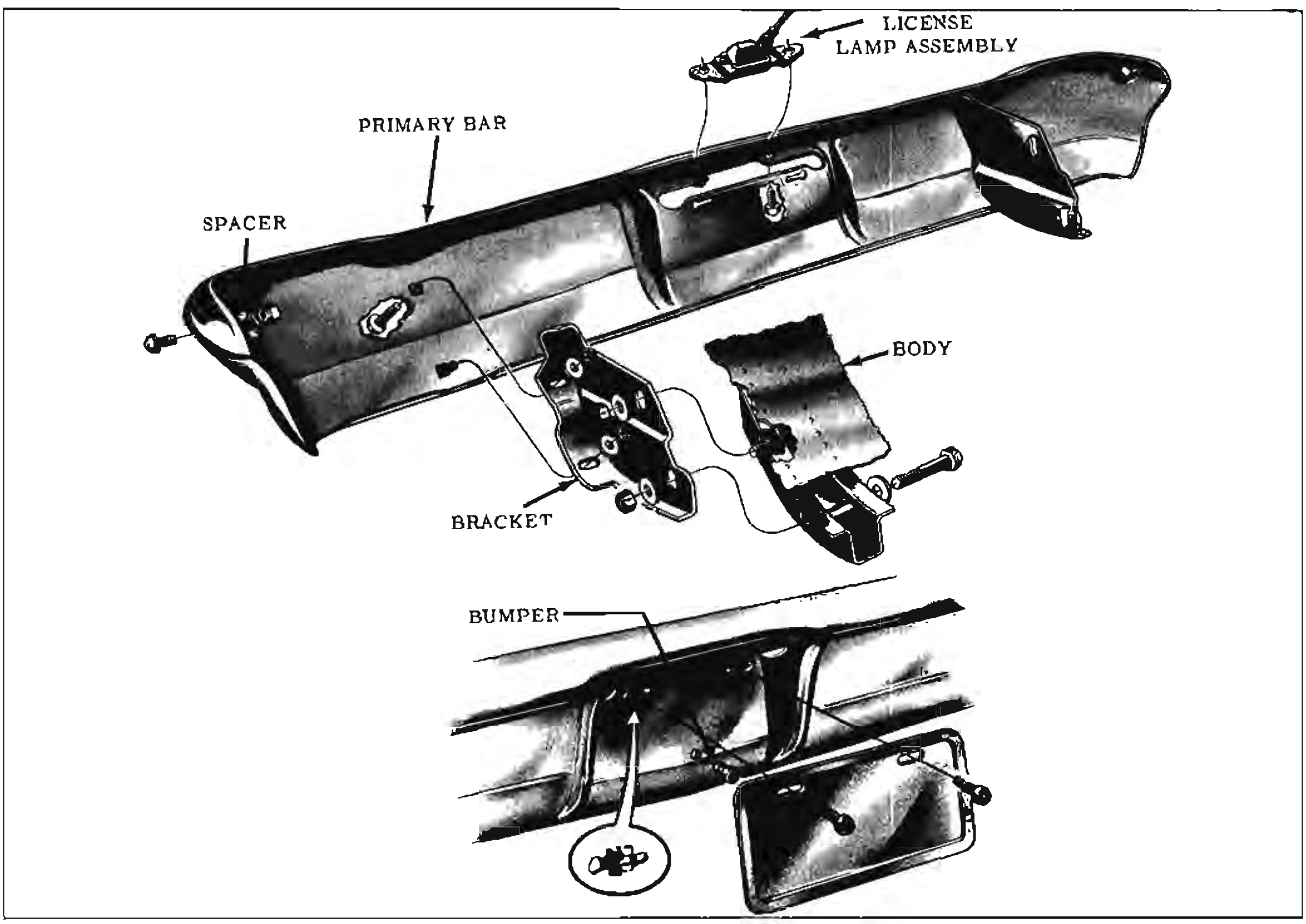


Fig. 12-126 Rear Bumper

On assembly, it is necessary to maintain alignment which is adjustable through the use of elongated holes at both bumper brackets. Bumper should be level with car and centered. Check parking lights for proper operation.

BRACKETS

The brackets are attached to the frame as shown in Figs. 12-125 and 12-126.

REAR BUMPER

Removal (Fig. 12-126)

Disconnect license lamp wire. Then remove the four bolts attaching the bumper to the brackets as shown.

Installation

Loosely install four attaching bolts. The slotted holes in the bracket allow horizontal alignment of the bumper. If vertical alignment is necessary, this can be accomplished by loosening the bracket-to-frame attaching bolts, aligning bumper as necessary, and re-tightening bolts. Torque primary bar nuts to 20-28 ft. lbs. and lower guard bolts to 15-20 ft. lbs. Torque bracket to frame bolts to 35-43 ft. lbs.

Alignment

Bumper alignment is obtained by elongated holes in the brackets. It necessitates merely loosening attaching bolts and nuts, positioning bumper to desired position and tightening. Make sure that bumpers are horizontal and clearance between bumper and fenders is even on both sides.

BUMPER TORQUE SPECIFICATIONS

APPLICATION	FT. LBS.
FRONT BUMPER	
Front Bumper Wing to Stone Shield Panel	20 to 28
Brackets to Frame	35 to 43
Brackets to Primary Bar	20 to 28
Bumper Bracket to Cross Bar	15 to 20
REAR BUMPER	
Brackets to Primary Bar	20 to 28
Brackets to Body Bracket	35 to 43

INSTRUMENT PANEL AND ACCESSORIES

(FULL SIZE CAR)

CONTENTS OF SECTION 13

INSTRUMENT PANEL

The instrument panel lower section is a removable panel and is retained by bolts and sheet metal screws. All instruments and units can be removed without removing the instrument panel lower section, with the exception of the safety pad.

Remove and Install

1. Remove the windshield side garnish moldings.

2. If equipped with:

   a. Power Steering - Disconnect steering column assembly.

   b. Standard Steering - Disconnect steering column assembly and loosen gear at frame to provide clearance.

3. The following wiring and/or controls must be disconnected:

   a. Heater, ventilation and/or air conditioning control.

   b. Printed circuit connectors.

   c. Speedometer cable.

   d. Radio, front and rear seat speaker and antenna leads.

   e. Ignition and headlight switch connectors.

   f. Power top, courtesy light and power antenna switch leads.

   g. Instrument panel wiring harness connector.

h. Hoses from deck lid vacuum release control.

i. Courtesy or map lights.

j. Cruise Control selector.

k. Cigar lighter lead.

l. Guide-Matic amplifier.

4. Remove instrument panel attaching screws. (Fig. 13-1)

5. With aid of a helper, lower panel and remove assembly from car.

6. To install the lower panel assembly, reverse the removal procedure.

INSTRUMENTS

All the instruments are electrically operated, except the speedometer and Hydra-Matic indicator which are mechanically operated. A speed warning device (Safety Sentinel) is offered as optional equipment on all models. A knob on the instrument cluster allows the driver to pre-set his desired speed. When this speed is reached, a light goes on and a buzzer sounds.

The generator, temperature, and oil pressure indicators use colored lights to warn the driver of conditions other than normal when the engine is operating at speeds above idle or is at normal operating temperature.

When removing an instrument cluster light bulb, the bulb must be pulled straight out of the socket. Before installation of the bulb, be sure bulb wires are parallel with the center line of the bulb to prevent a short or open circuit. (Fig. 13-2)

INSTRUMENT CLUSTER

Removal and Installation

1. Disconnect the printed circuit connectors.

2. Disconnect the speedometer cable from the speedometer head.

3. Remove the two cluster to instrument panel attaching nuts from beneath the instrument panel. (Fig. 13-4)

4. Remove the three cover to instrument panel attaching screws.

5. Rotate top of cluster downward and remove cluster assembly from instrument panel.

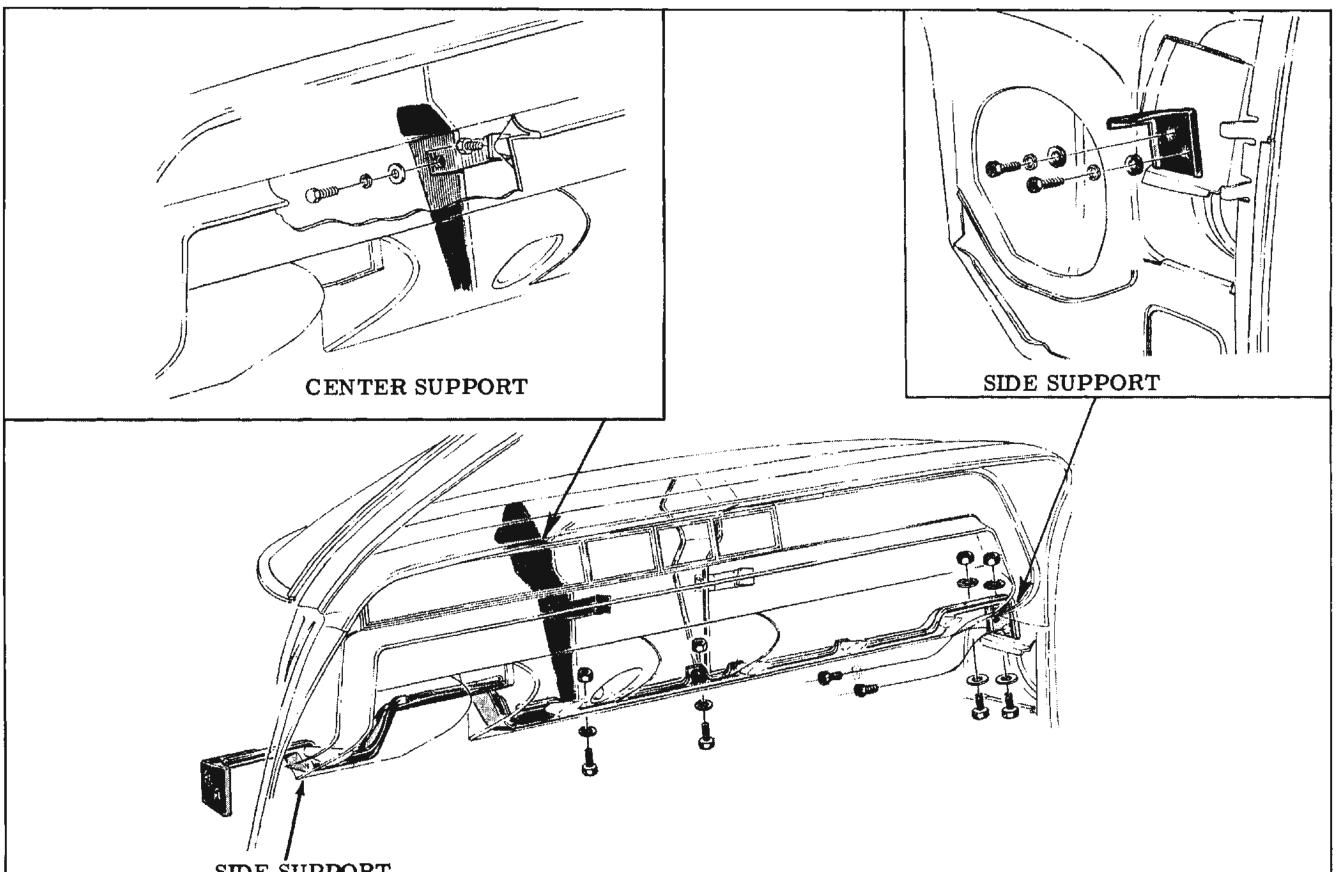


Fig. 13-1 Instrument Panel Attachment

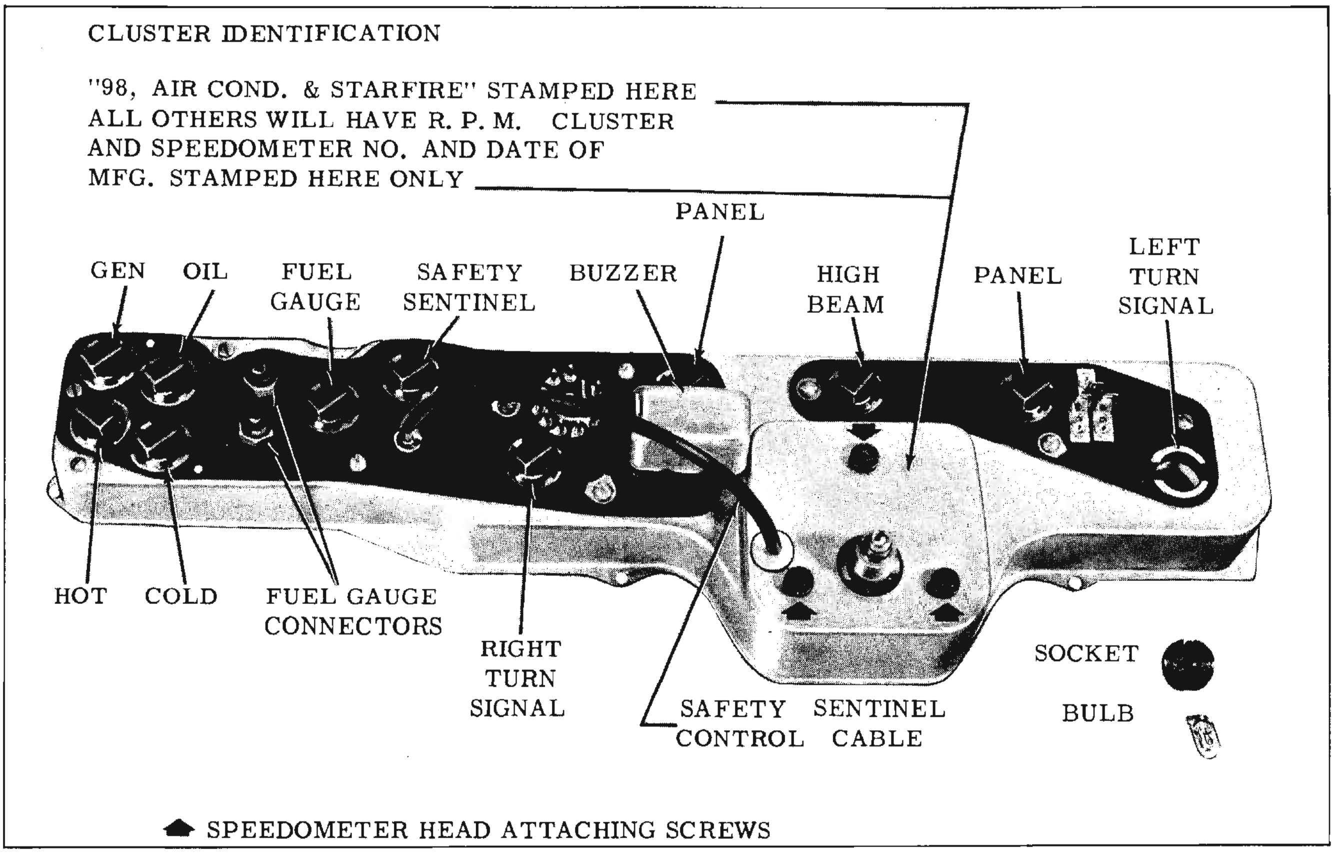


Fig. 13-2 Speedometer Cluster

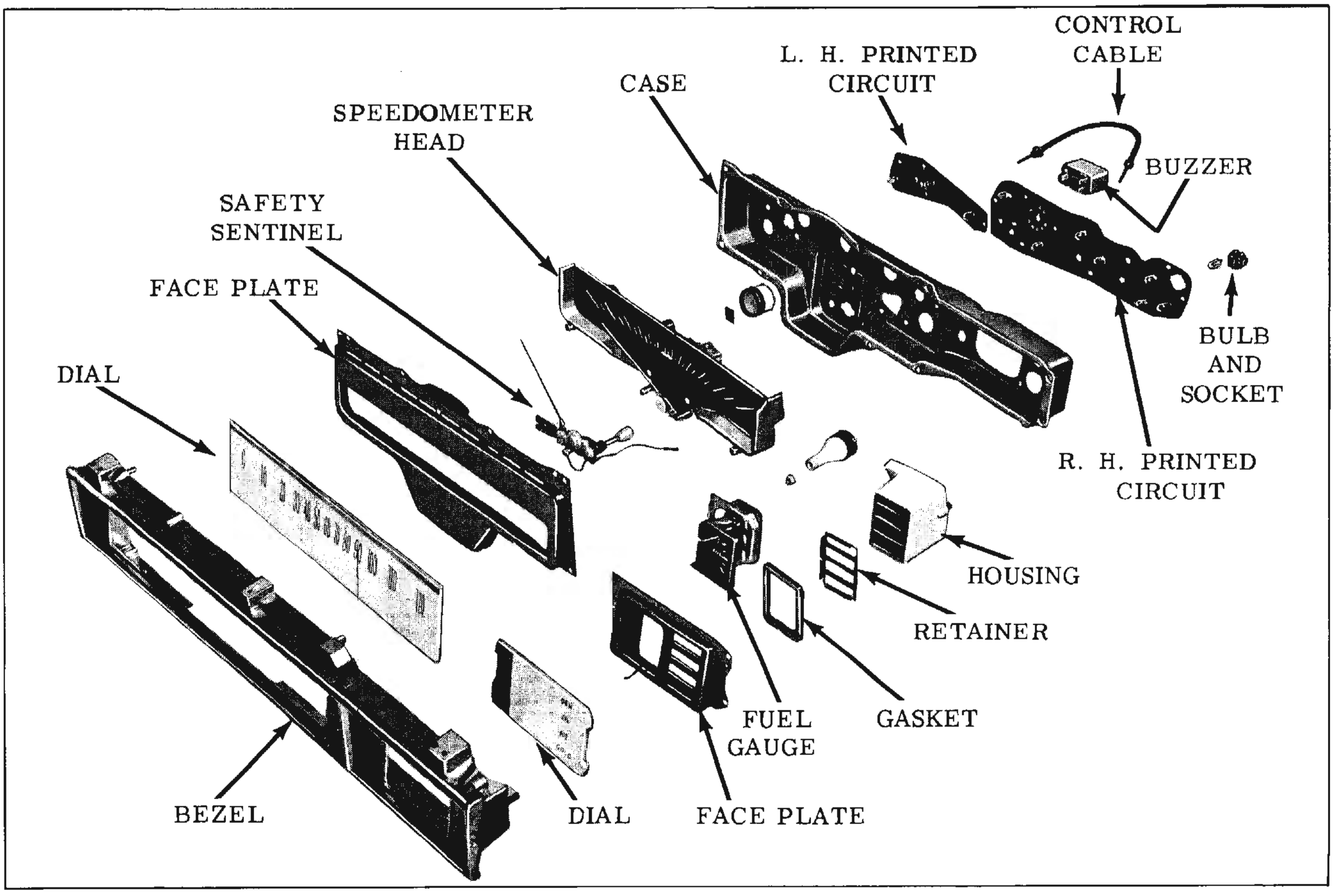


Fig. 13-3 Speedometer Head Exploded

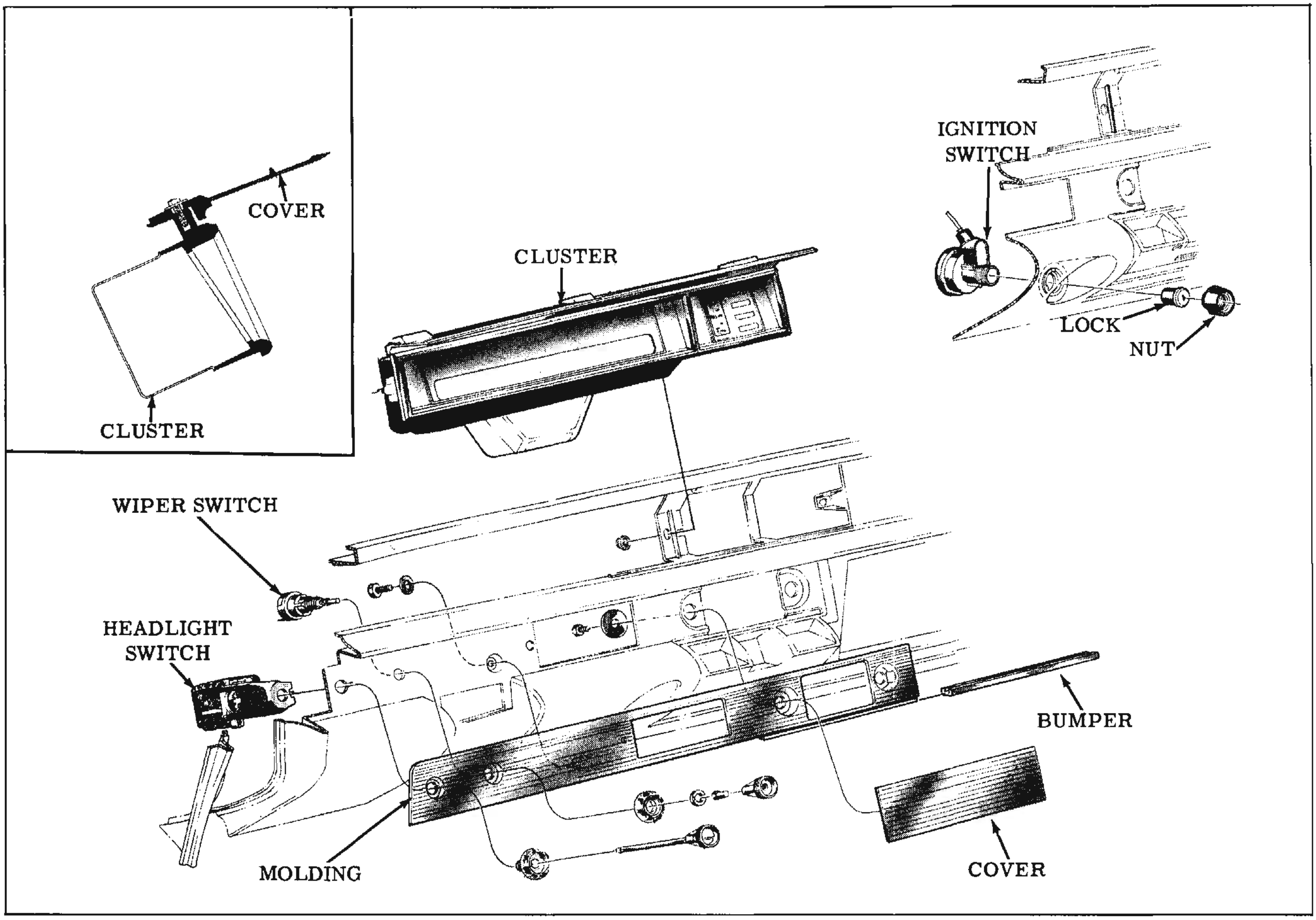


Fig. 13-4 Instrument Panel Components

6. If necessary to replace any internal components of the instrument cluster, refer to Fig. 13-3.

7. To install, reverse removal procedure.

PRINTED CIRCUITS OR FUEL GAUGE

Remove and Install (Fig. 13-2)

1. Remove the speedometer cluster assembly.

2. To remove the left hand printed circuit, remove the attaching screws, then remove the printed circuit.

3. To remove the right hand printed circuit or fuel gauge, proceed as follows:

   a. If equipped with safety sentinel, remove the control cable from the printed circuit.

   b. Remove the protective caps from the fuel gauge terminals, then remove the nuts and flat washers.

   c. Remove the printed circuit attaching screws, then lift the printed circuit from the cluster.

   NOTE: If equipped with safety sentinel, disconnect the wire lead from the printed circuit.

   d. To remove the fuel gauge, remove the attaching screw; then lift the fuel gauge out of the cluster.

   To install fuel gauge and printed circuits, reverse the removal procedure.

   NOTE: If equipped with safety sentinel, connect the wire lead to the printed circuit before installing printed circuit on the cluster.

SPEEDOMETER CABLE

Removal and Installation (Fig. 13-5)

1. Disconnect cable from speedometer head.

2. Remove the speedometer cable clamp and guide.

3. Remove the grommet from the cowl and withdraw cable.

4. Loosen the cable housing retaining nut at the knuckle, then remove the cable.

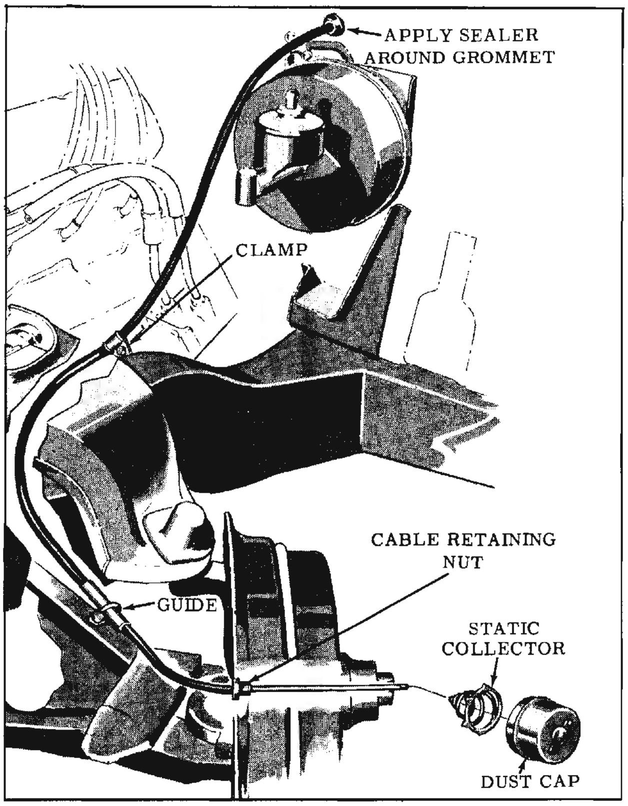


Fig. 13-5 Speedometer Cable

5. To install, reverse removal procedure.

NOTE: If the cable housing retaining nut cannot be readily started into the knuckle, the cable is not indexed with the dust cap. Rotate wheel or drive cable slightly to index drive cable.

INSTRUMENT PANEL COMPONENTS

The various instrument panel components are attached as shown in Figs. 13-6, 13-7 and 13-8.

CONSOLE

The console is assembled in three sections: upper body, lower body, and upper front body. The tachometer can be removed by removing the upper front body. The window switches, Hydra-Matic indicator components or neutral safety and back-up light switch can be serviced after removing the selector handle and control panel. For detailed disassembly and assembly, refer to Fig. 13-9.

HYDRA-MATIC INDICATOR NEEDLE

Remove and Install (Fig. 13-10)

To remove the Hydra-Matic indicator needle, remove the steering column cap from steering column bracket, loosen the set screw on the shifter tube, then carefully remove the needle. To install, reverse the removal procedure, using extreme care to prevent damage to the needle. Move selector lever through entire range to check for needle interference.

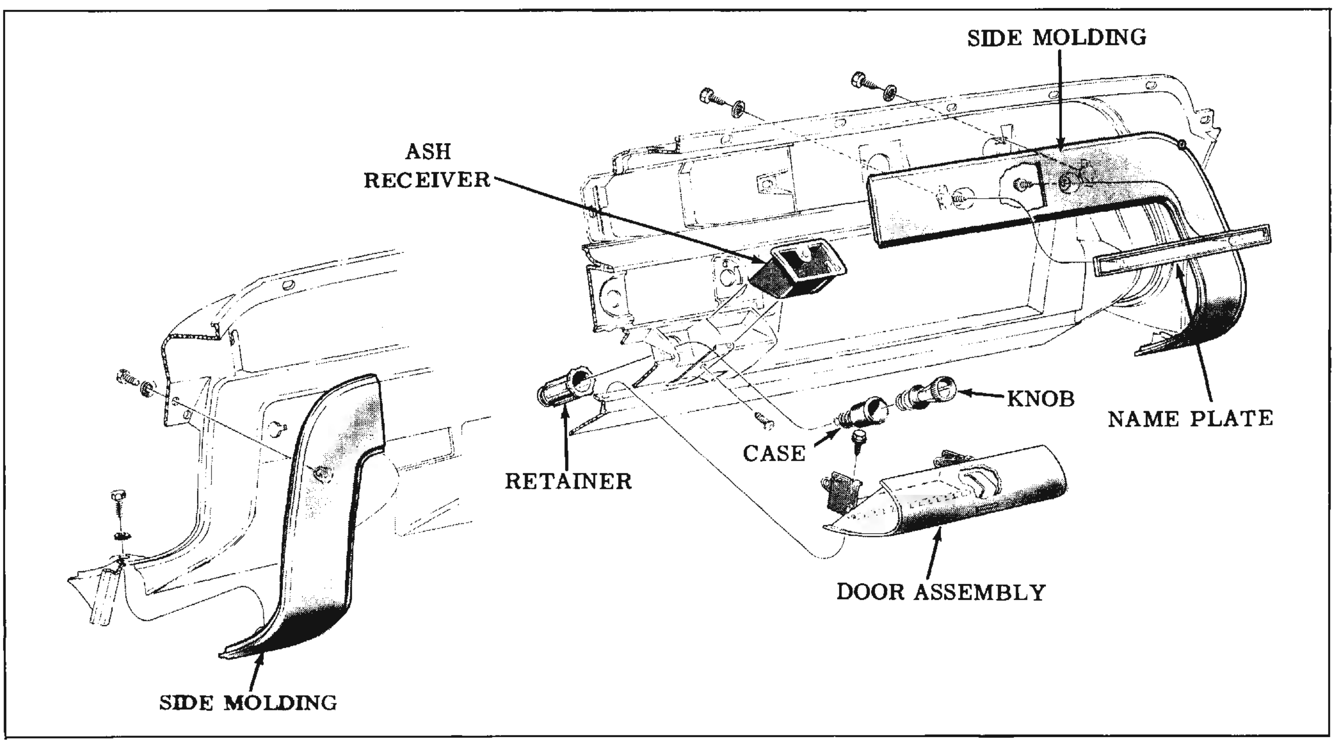


Fig. 13-6 Instrument Panel Components

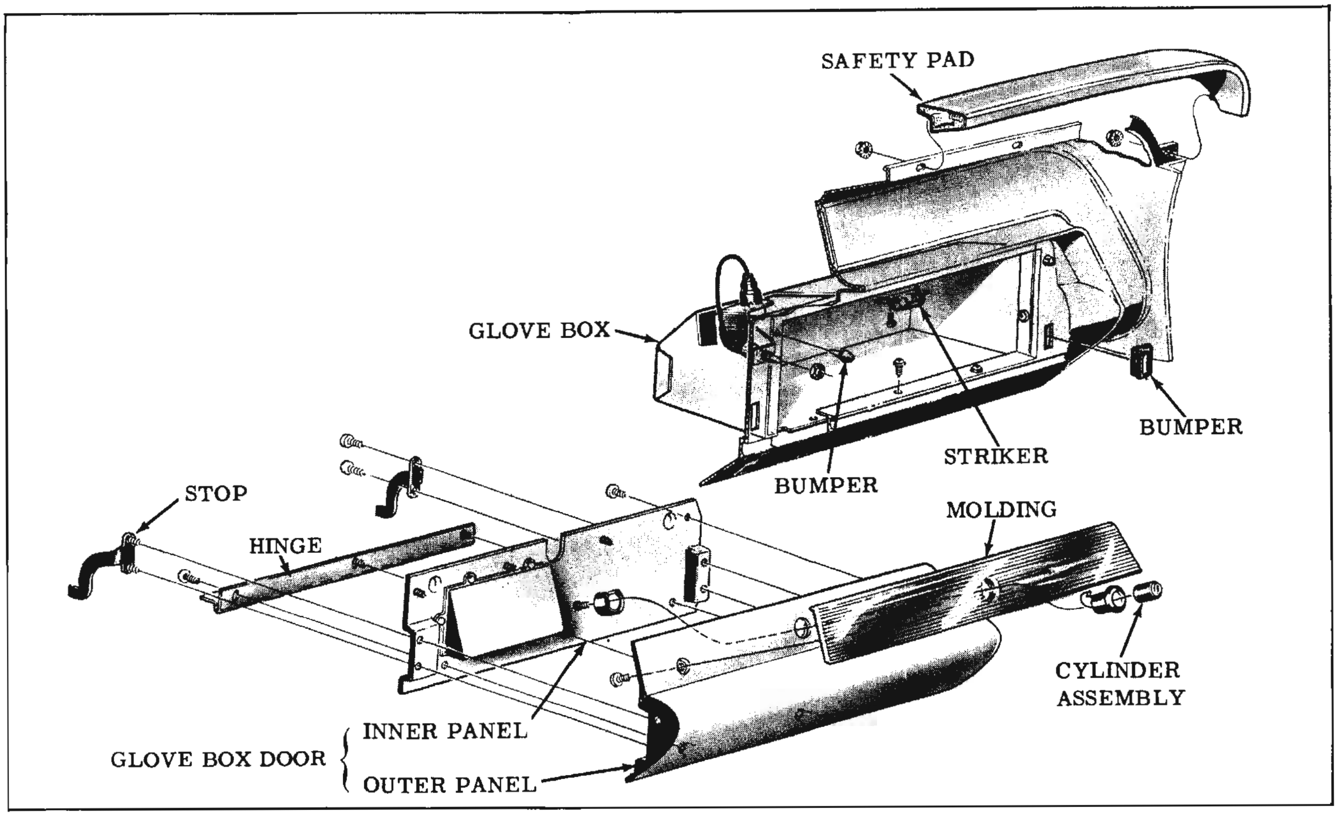


Fig. 13-7 Instrument Panel Components

Adjust

With the steering column cap removed from the steering column bracket, move the selector lever to "neutral" position. Align Hydra-Matic needle with "N", tighten the set screw, then move selector lever through entire range to check needle alignment with remaining selector positions. Readjust needle if necessary.

Steering Column Bracket

The steering column bracket is fastened to the instrument panel by studs, washers, and nuts.

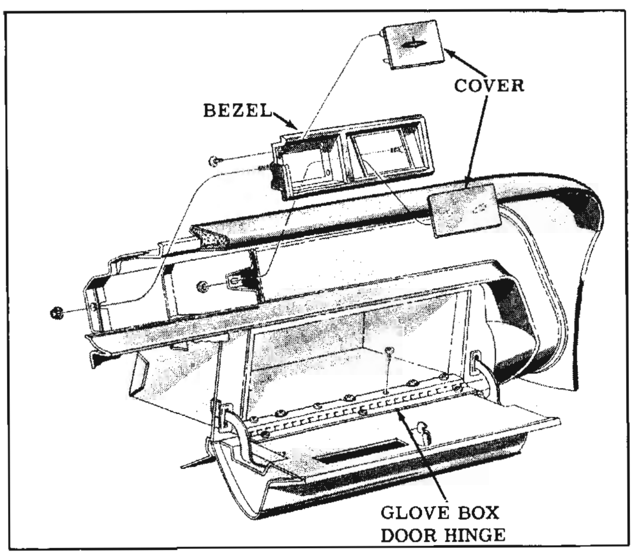


Fig. 13-8 Instrument Panel Components

Anti-squeak gaskets are used between the steering column bracket and the instrument panel.

IMPORTANT: Hydra-Matic indicator needle must be removed before removing bracket.

ACCESSORIES

RADIO (Fig. 13-11)

Three types of radios are available: Deluxe, Super Deluxe and AM-FM. The receiver circuit in all radios is transitorized. The outer left knob operates the On-Off switch and volume control, while the inner left knob operates the tone control. The right hand outer knob controls manual tuning of the radio.

On cars equipped with a rear seat speaker, a variable type control located behind the manual tuning knob modulates both the front and rear speakers simultaneously. As the control is turned counterclockwise, the volume of the front speaker increases while the volume of the rear speaker decreases. As the control is turned clockwise, the volume of the front speaker diminishes while the volume of the rear speaker increases. After the desired speaker modulation is obtained, the volume of both speakers can be regulated by the volume control knob.

All radios have five push buttons for touch tuning, which mechanically tunes the radio to

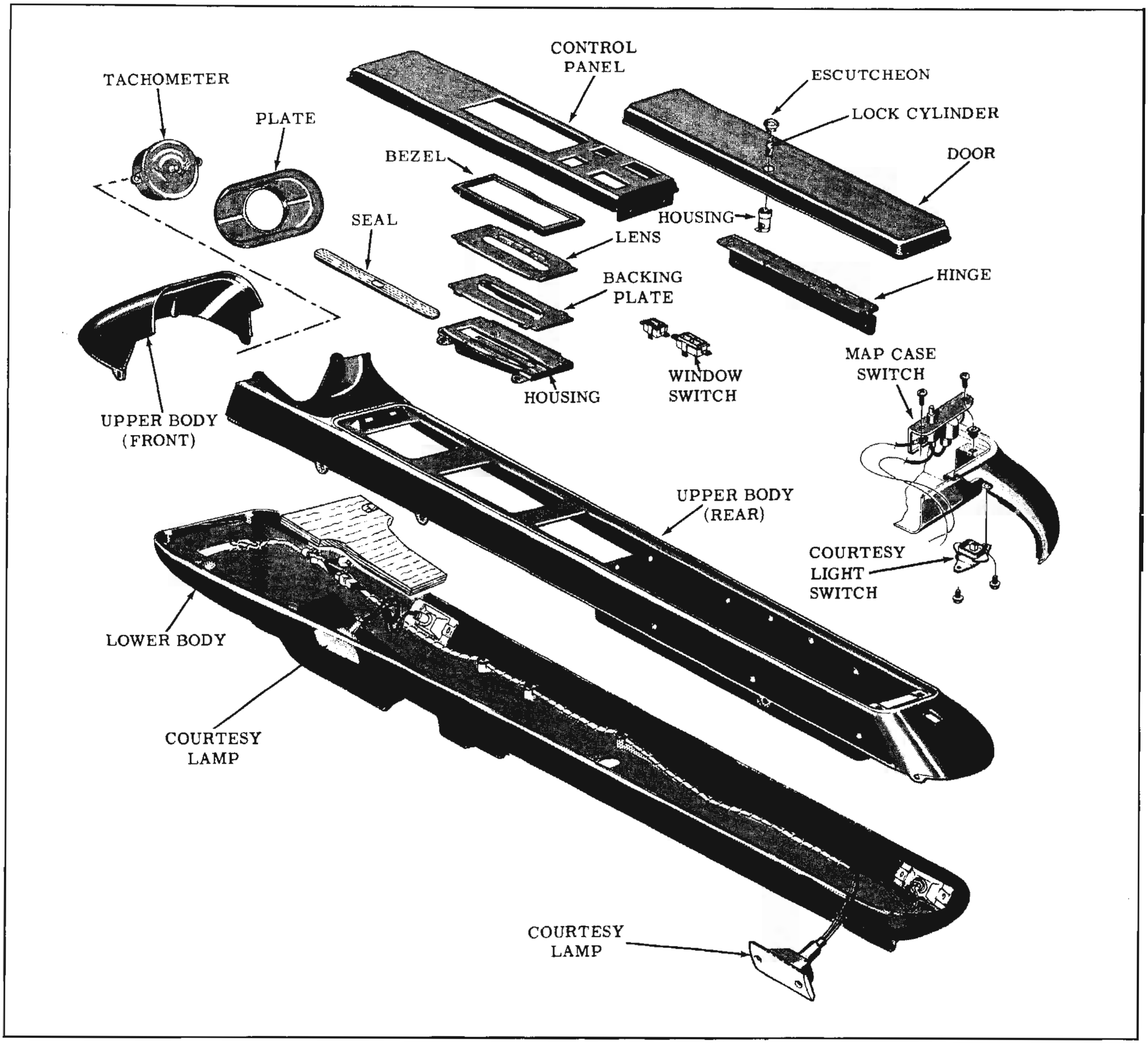


Fig. 13-9 Console

pre-selected stations, and a control knob for manual selection of stations.

In addition to push button tuning, the Super Deluxe model features automatic tuning. Depressing the foot selector switch or the center push bar, rejects any station previously selected and automatically selects and tunes the next available station.

The sensitivity of the automatic tuning mechanism can be increased or decreased by the sliding lever located under the bar. The lever has three positions. When the lever is to the left, only the stronger or local stations will be received. The sensitivity can be increased by moving the lever to the middle or extreme right position.

NOTE: The automatic tuning unit uses a vacuum tube. This tube requires a short warm-up period before the automatic tuning can be used, after the radio is first turned on.

Remove and Install (Fig. 13-12)

1. Remove radio knobs, wave washers, escutcheons or rear seat speaker control.
2. Remove the radio attaching nuts and washers.
3. Disconnect all radio connectors.
4. Remove the radio to instrument panel bracket attaching screw.
5. Remove radio from the rear of the instrument panel.

To install, reverse removal procedure.

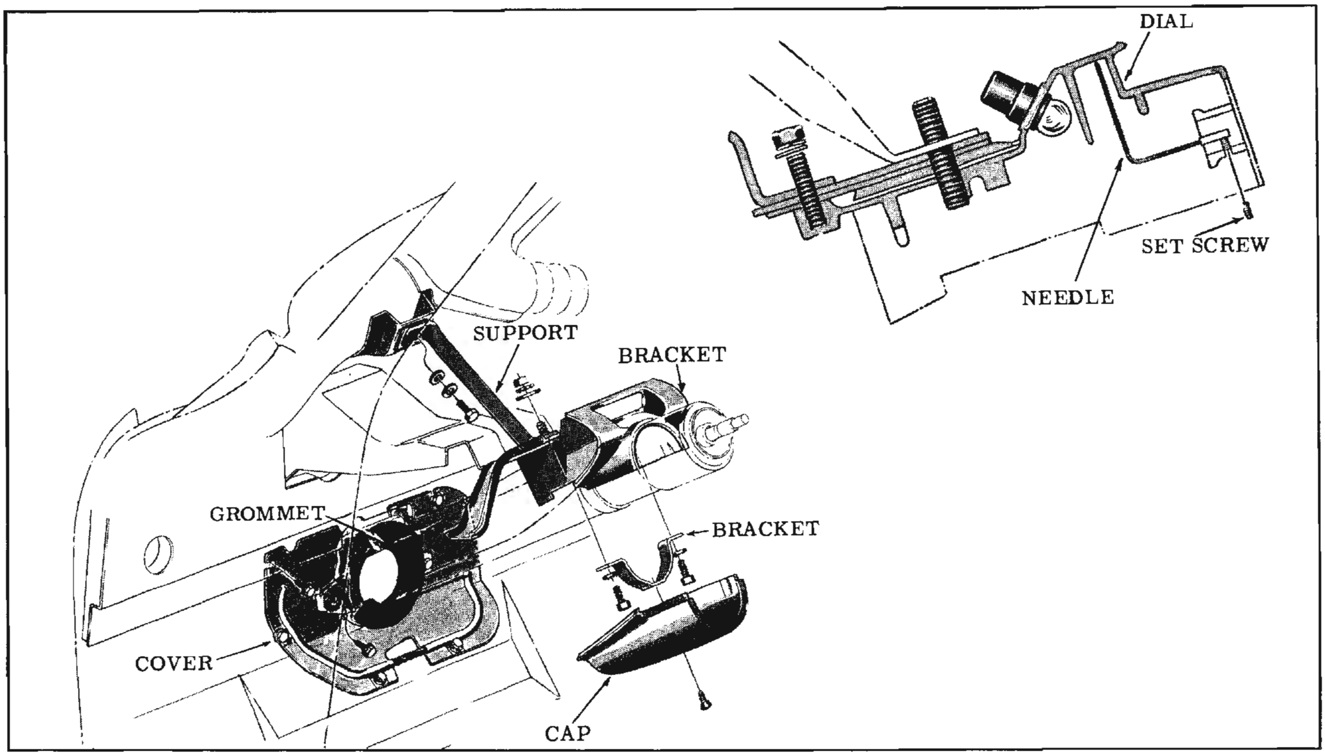


Fig. 13-10 Steering Column Bracket

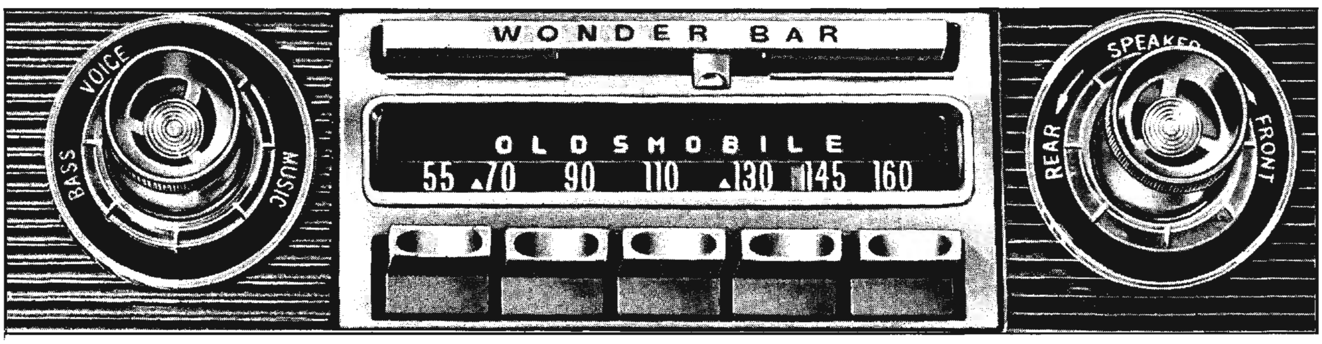


Fig. 13-11 Super Deluxe Radio

PUSH BUTTON ADJUSTMENT

Adjustment of the mechanical push button tuning system on the Deluxe, Super Deluxe and AM-FM models is the same.

1. Turn on the receiver.

2. Select a push button for the desired station. Pull the button slightly to the left and then out as far as it will go.

3. Tune in the desired station manually.

4. Push the selected button to its maximum "in" position. This is the locking operation.

5. Proceed in the same manner for the remaining stations.

6. After all the buttons have been adjusted, recheck the settings. Push each button, then see if the station can be tuned in more accurately manually. If so, repeat Step 2 and reset the station manually.

NOTE: Any single push button on the AM-FM radio, may be adjusted for either AM or FM reception. When a push button is adjusted for FM, it cannot be used for selecting a station on AM without first re-adjusting the push button for AM.

AM-FM RADIO (Fig. 13-13)

AM or FM radio broadcasts may be selected by sliding the control switch located above the radio dial, to the right or left. The letters AM or FM will appear in the upper left or right corners of

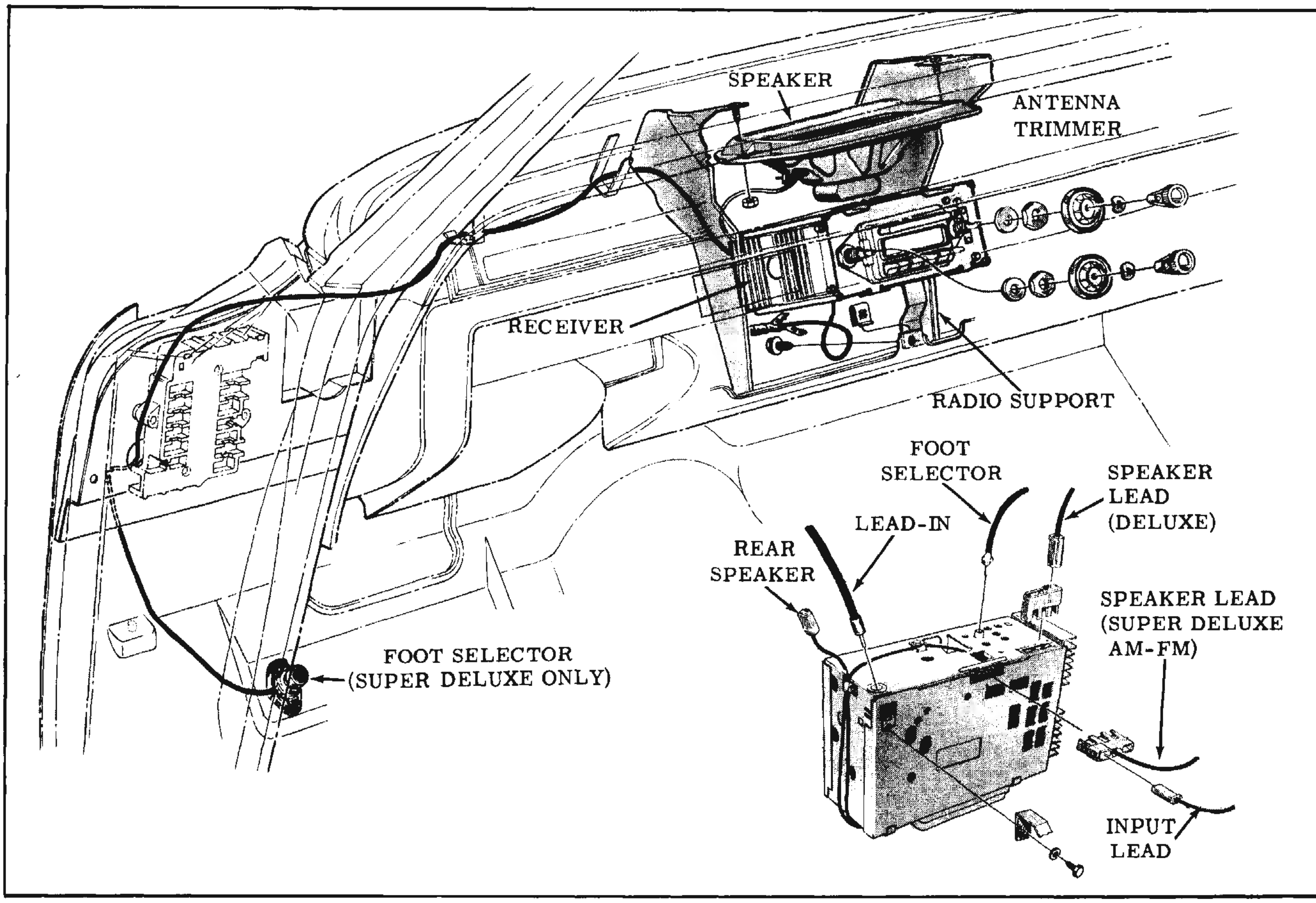


Fig. 13-12 Radio Installation

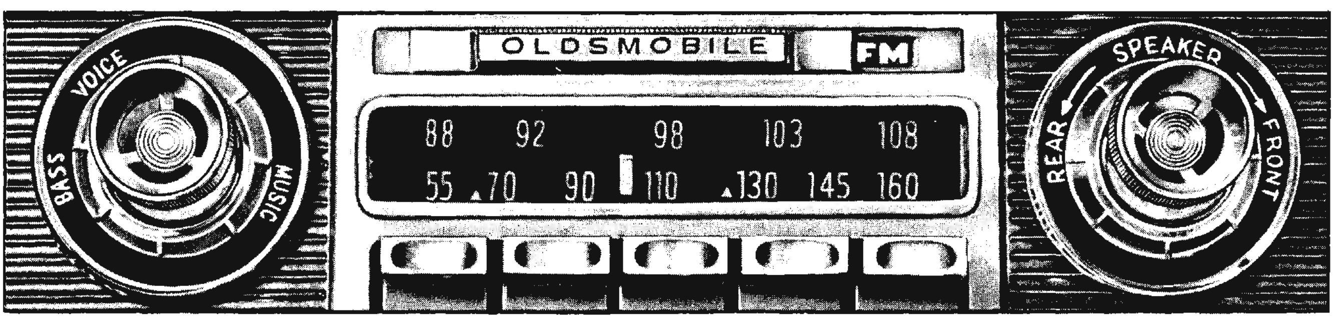


Fig. 13-13 AM-FM Radio

the control panel, indicating the type of broadcast being received.

Normal FM reception will be almost noise-free unless the radio is tuned to a weak station in a fringe area. It may be necessary, while driving, to manually re-tune FM stations slightly to maintain peak reception. The average FM station coverage is approximately 20 to 30 miles.

NOTE: Maximum FM reception is obtained with the antenna extended approximately 30".

TRIMMER ADJUSTMENT

1. With the antenna fully extended, turn the radio on.

NOTE: AM-FM radio must be set on the AM band.

2. Turn the volume control full on and tune the receiver to a weak station between 600 and 1000 K.C. on the dial.
3. Remove the manual tuning knob and escutcheon or rear seat speaker fader contol, if so equipped.
4. With a small screwdriver, adjust the antenna trimmer until loudest signal is received.

RADIO DIAL LIGHT

The radio dial light on the Deluxe radio is located on top of the receiver and can be removed without removing the radio. If equipped with air conditioning, the center outlet must first be removed before the bulb is accessible.

To remove the dial light on AM-FM or Super Deluxe radios, the radio receiver must first be removed. The bulb is located beneath the radio cover.

FOOT SELECTOR SWITCH—REMOVAL (Super Deluxe Radio)

1. Fold floor mat to expose foot switch and remove attaching screws.
2. Remove foot switch wiring lead from clips along upper side of dash, then remove plug-in connector from the rear of the radio receiver.

   To install switch, reverse the removal procedure.

SPEAKERS

Rear Speaker Removal

The rear seat speaker is mounted under the parcel shelf, and is accessible through the rear compartment. To remove speaker:

1. Disconnect lead from terminal.
2. Remove four mounting nuts, lock washers, and flat washers, while supporting speaker to prevent it from dropping. (Fig. 13-14)

To install, reverse removal procedure, being careful to avoid damaging the speaker cone while aligning the speaker assembly over the mounting screws.

CONVERTIBLES

The rear seat speaker on convertibles is mounted on the rear seat back. To remove speaker, proceed as follows:

1. Remove rear seat cushion.
2. Remove the upper two body to seat back attaching screws, accessible from the rear compartment.
3. Remove the two lower seat back attaching screws and tip seat back forward.

   NOTE: Place protective covering on floor panel to prevent soiling of seat back.
4. Remove four speaker assembly to seat back attaching screws.
5. Disconnect lead wire from speaker. Remove

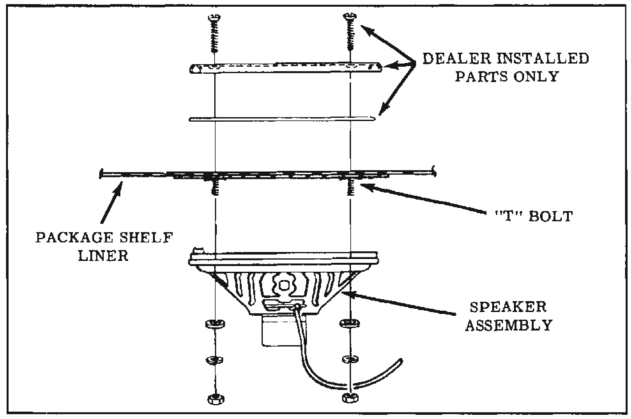


Fig. 13-14 Rear Seat Speaker (Except 35, 45 & 67)

the four speaker attaching screws and remove speaker. (Fig. 13-15)

6. If speaker grille is to be replaced, it can be moved by removing the four self-threading attaching nuts.
7. To install, reverse removal procedure.

FIESTAS

The rear speaker on Fiestas is mounted on the rear quarter trim panel on the left side of the car. To remove the speaker, proceed as follows:

1. Remove rear quarter trim panel.

   CAUTION: Speaker ground wire is attached to inner quarter panel. Do not break the ground wire.
2. Disconnect speaker ground wire from the inner quarter panel.
3. Remove speaker assembly from the quarter panel. (Fig. 13-16)
4. To install, reverse the removal procedure. The speaker lead is routed in the same manner as the rear antenna lead-in.

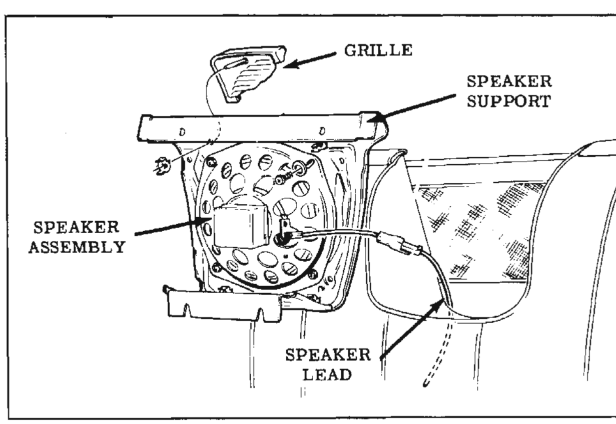


Fig. 13-15 Rear Seat Speaker (67 Styles)

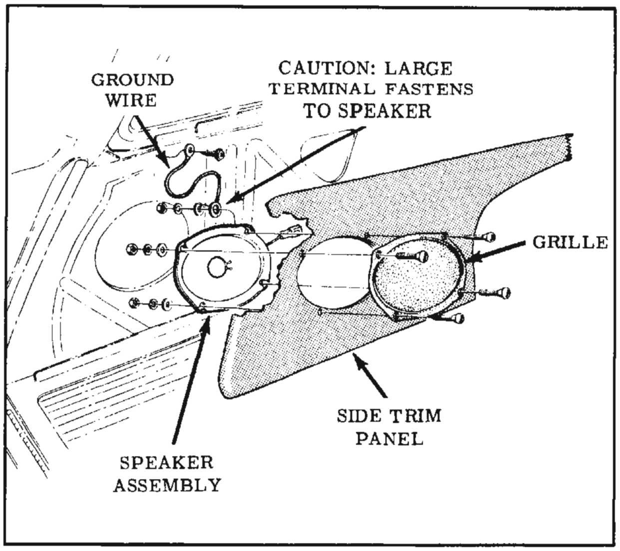


Fig. 13-16 Rear Seat Speaker (Fiestas)

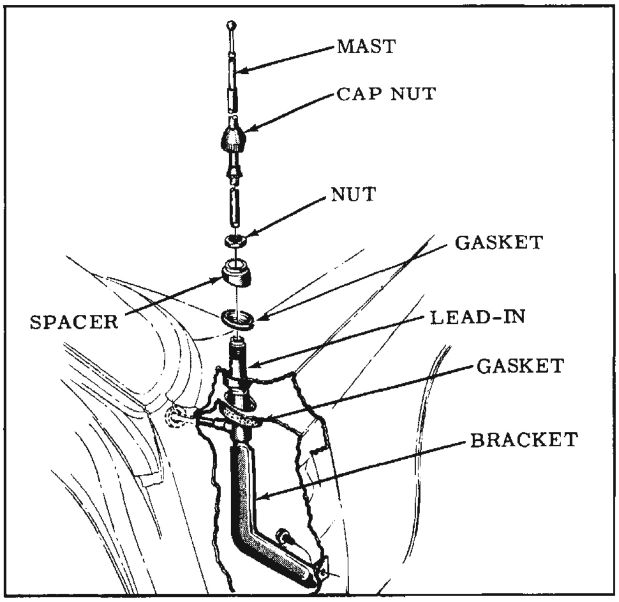


Fig. 13-17 Manual Antenna, Front Installation

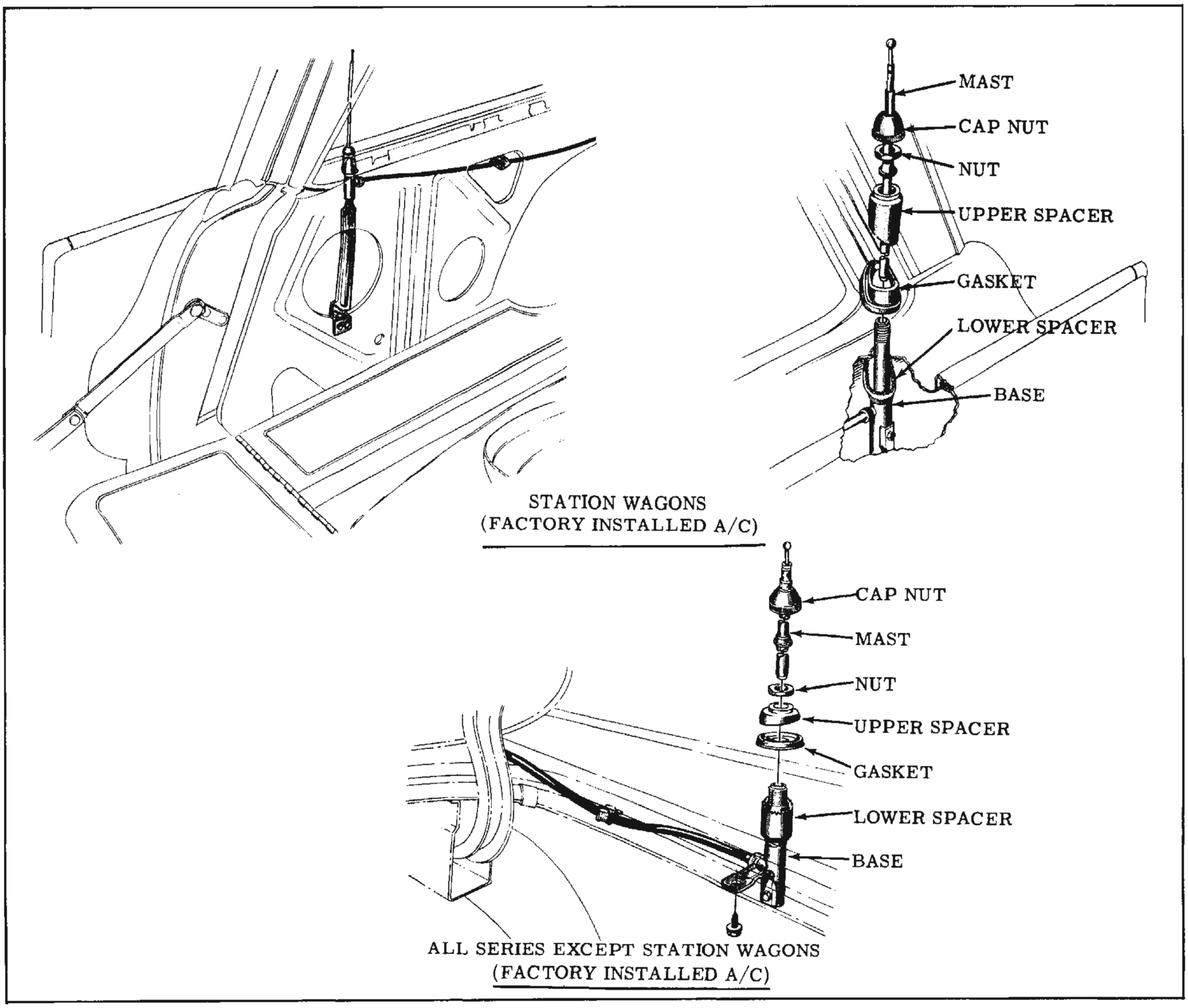


Fig. 13-18 Manual Antenna, Rear Quarter Installation

ANTENNA

Manual

The manual antennas are installed as shown in Figs. 13-17 and 13-18. On cars equipped with front manual antenna and dealer installed air conditioning, the evaporator must be removed before the antenna can be removed.

Power

Power antennas are installed as shown in Figs. 13-19 and 13-20. When replacing the lead-in or wiring, use the existing harness to route the new harness through body panels.

Disassembly (Fig. 13-21)

The following parts of the power antenna are serviceable: Drive Assembly, Mast Assembly and Support Tube Assembly. To service any of these parts, proceed as follows:

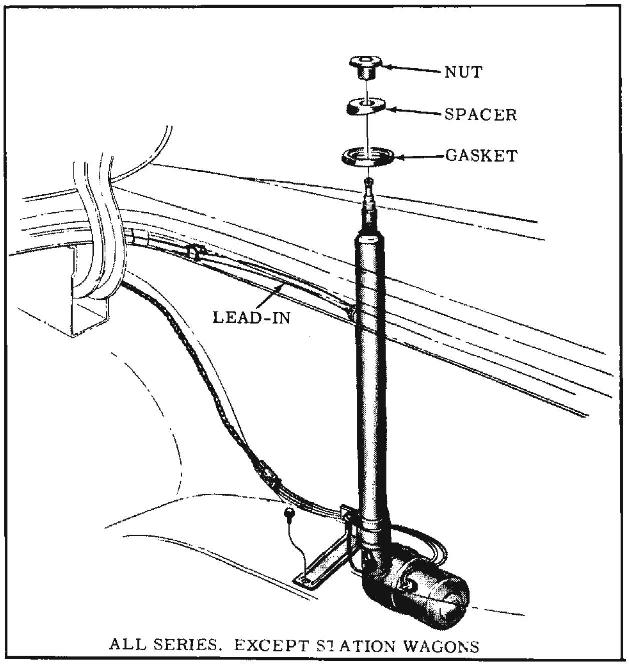


Fig. 13-19 Power Antenna Installation

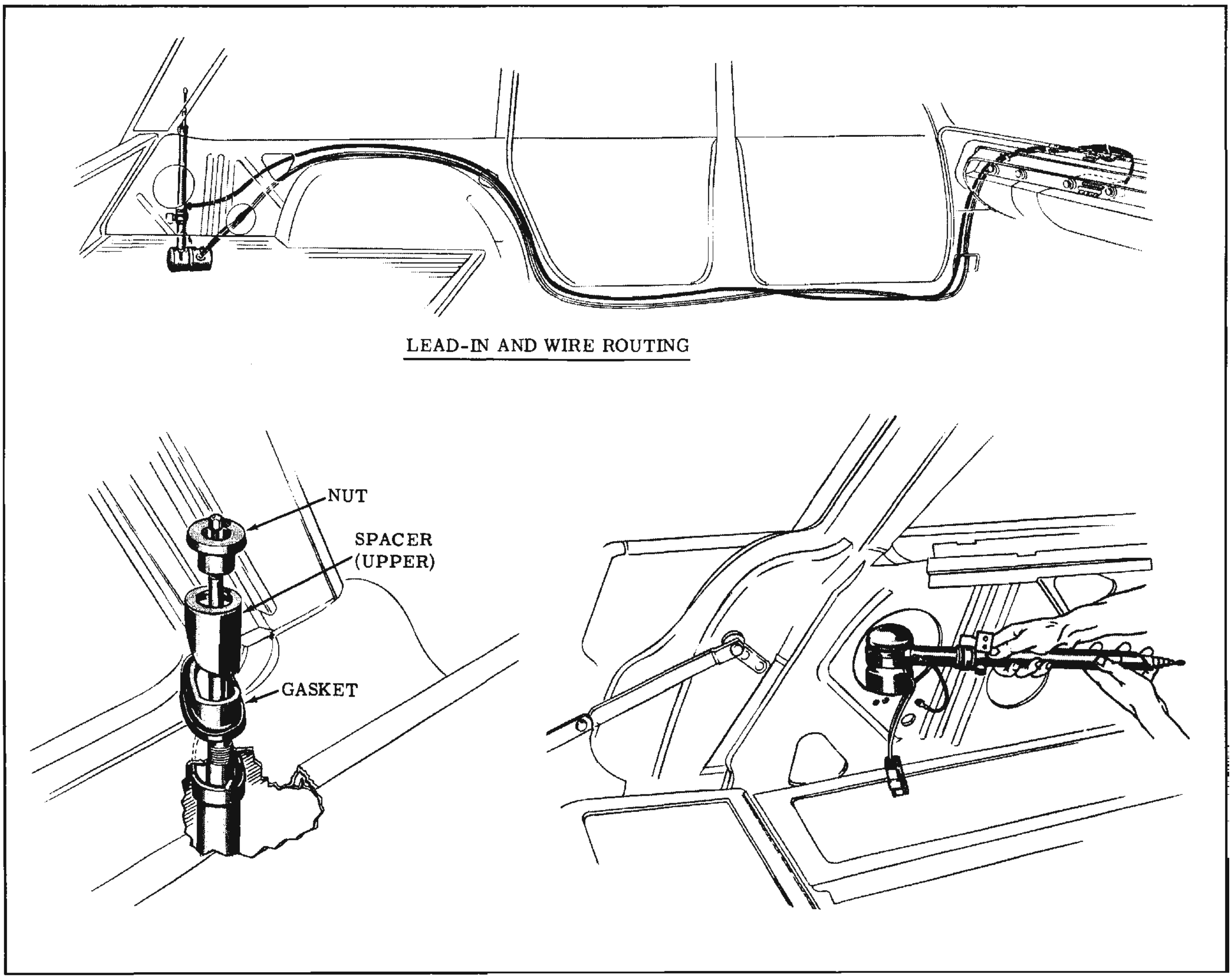


Fig. 13-20 Power Antenna Installation, Fiestas

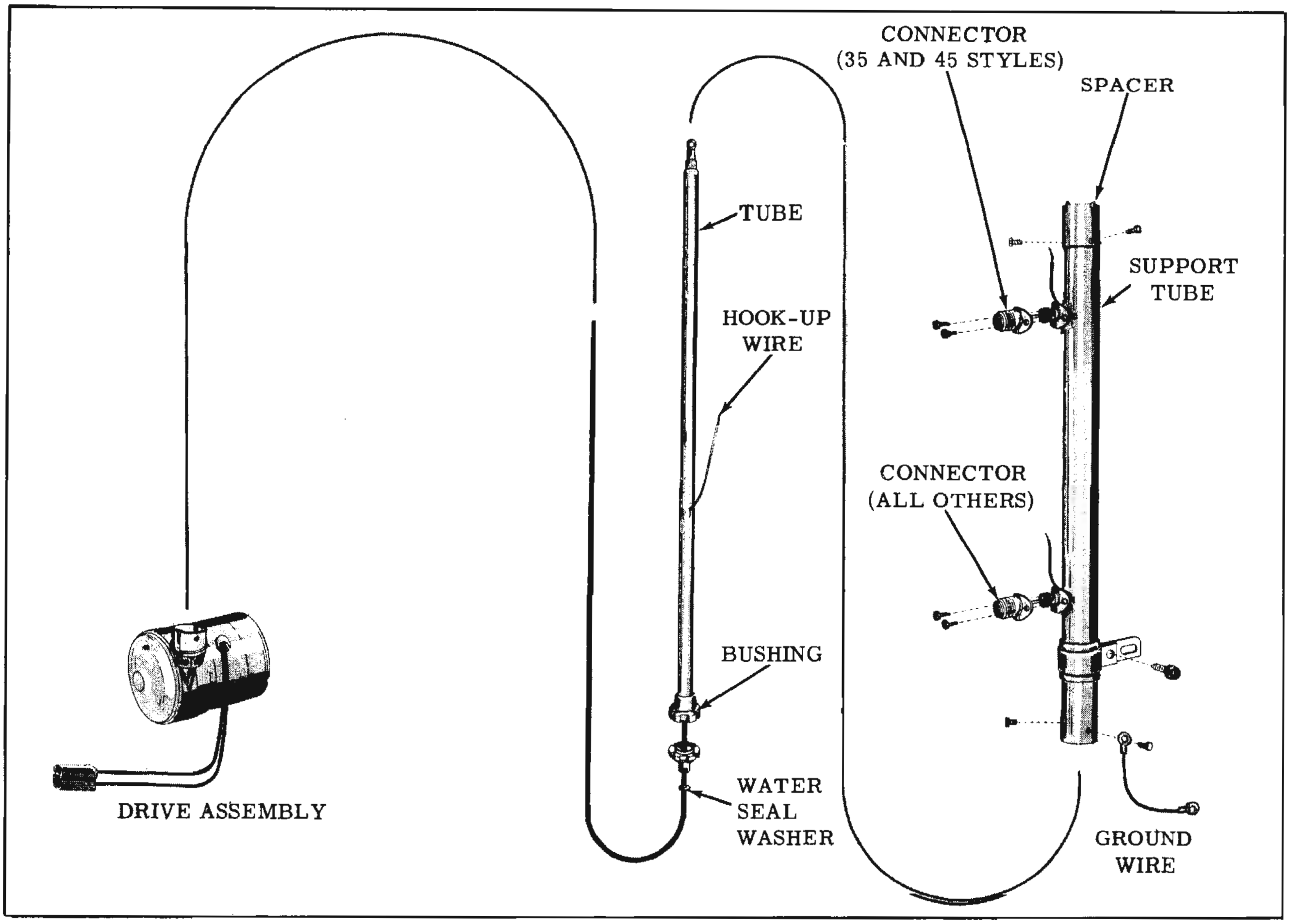


Fig. 13-21 Power Antenna Components

1. Remove the two connector to support tube screws and remove connector.

2. Unsolder hook-up wire at pin and remove pin and insulator assembly.

   NOTE: Do not overheat pin by slow soldering as the pin insulator will be destroyed.

3. Remove the three support tube to drive assembly screws.

4. While applying a back and forth rotary motion, pull until support tube is removed from antenna.

5. If the drive assembly or mast assembly is to be replaced, proceed as follows:

   a. While applying a rocking motion, pull on mast until insulator bushing is removed from the drive assembly tubular fitting.

   b. Energize motor until entire length of nylon cord is expelled from drive assembly. To prevent a kink or bend in nylon cord, keep it taut by pulling on mast.

   NOTE: If motor is inoperative, it will be necessary to manually remove the nylon cord from the drive assembly as follows:

   c. Place the assembly in a vise so that the normal plane of the nylon cord is parallel with the floor.

   d. Pull on nylon cord until it is completely expelled from the drive assembly.

   CAUTION: No attempt should be made to disassemble antenna further than Step 5-D.

Assembly

1. Thread nylon cord through bottom insulator, (small diameter end down) and water seal washer.

2. Energize motor and feed nylon cord into drive assembly. Do not allow nylon cord to bend or kink.

   NOTE: Push water seal washer and bottom insulator all the way down into tubular fitting (make sure that keyways in bottom insulator are rotated to key position) before nylon cord completely disappears into drive assembly.

3. Push mast assembly into tubular fitting making sure that the upper edge of the insulator bushing is below the center of the three support tube to drive assembly screw holes.

4. Install support tube over mast assembly, making sure hook-up wire is extended through proper hole in support tube. Line up three holes in support tube and install the three screws.

5. Solder hook-up wire to pin and insulator assembly being careful not to overheat.

6. Install connector over pin and insulator assembly and install two screws.

Diagnosis

If antenna fails to operate properly, check the following possible sources of trouble.

1. Excessive tightening of cap nut on quarter panel will result in excessive operating noise in the car.

2. A stalled or slowly operating mast may be caused by bent or dirty mast sections. If dirty, wipe with oily cloth.

3. See that fuse is not burned out.

4. See that ground wire is tight.

5. To determine whether fault is in the antenna or the control circuit, disconnect the leads coming from antenna. Connect a jumper wire from a known hot source and touch jumper wire to each of the terminals of the wires coming from the drive assembly. If antenna does not operate, the fault is in the antenna drive assembly. If antenna does operate, the fault is in the control circuit.

6. If trouble is in the control circuit:

   a. Examine electrical connections at switch, making sure they are securely connected.

   b. Check wiring at switch with lamp or motor.

If antenna lead-in is suspected of being bad, check radio operation using an antenna lead-in known to be good.

NOTE: If excessive static is encountered, check suppressors and static eliminators for proper installation. (Fig. 13-22)

CRUISE CONTROL

Cruise Control is a driver-operated speed regulating device. It can be used either as a SPEED REMINDER or as an AUTOMATIC SPEED CONTROL at any speed between 25 M.P.H. and 85 M.P.H.

The major components of Cruise Control are: the regulator mounted on the engine and the speed selector located on the left instrument panel side panel. (Figs. 13-23 and 13-24)

The regulator is driven by a flexible drive cable from the left front wheel. The drive cable also drives the speedometer cable that runs from the regulator to the speedometer.

The speed selector is connected to the regulator by a bowden cable. Mechanical linkage connects the regulator to the accelerator pedal bellcrank.

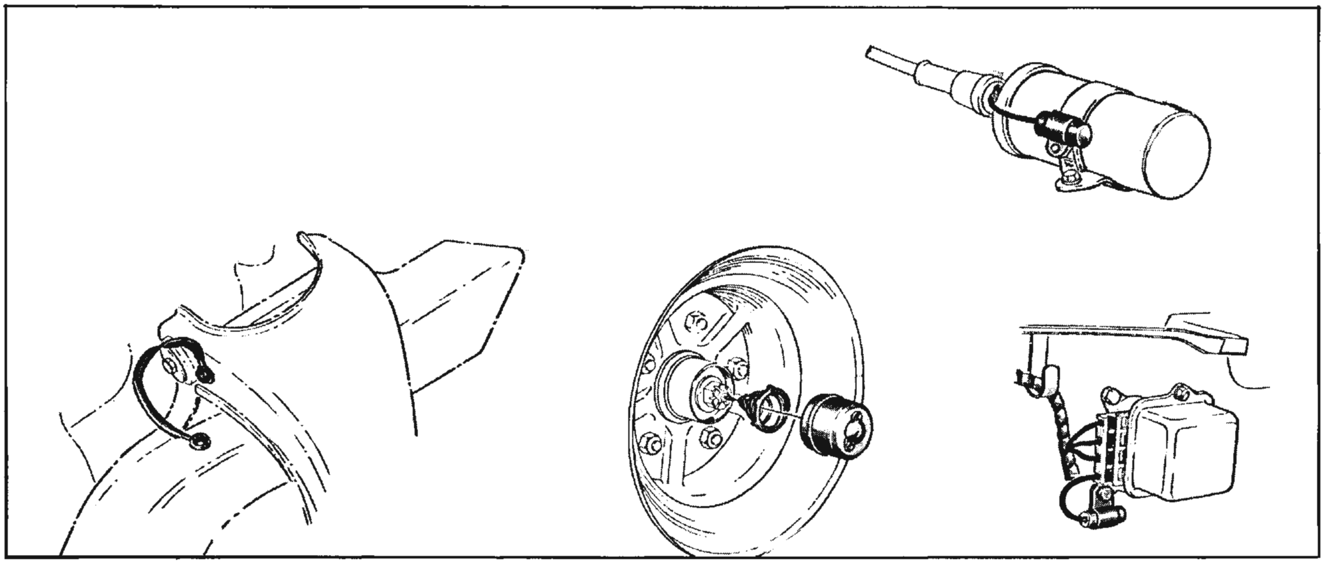


Fig. 13-22 Static Eliminators and Suppressors

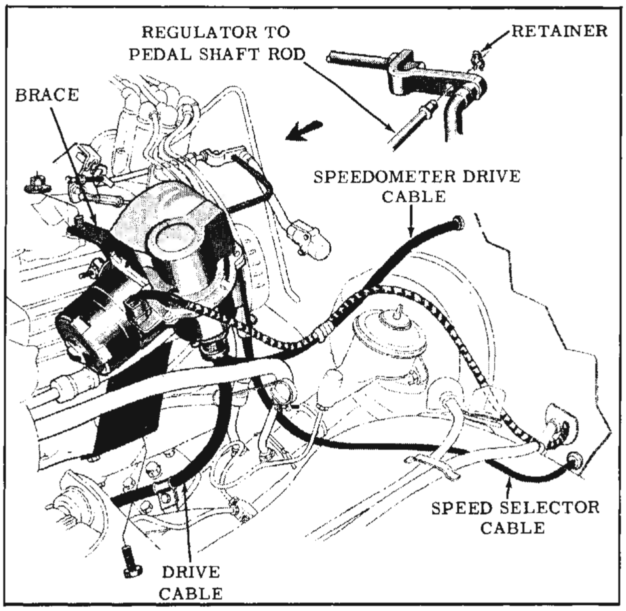


Fig. 13-23 Regulator Installation

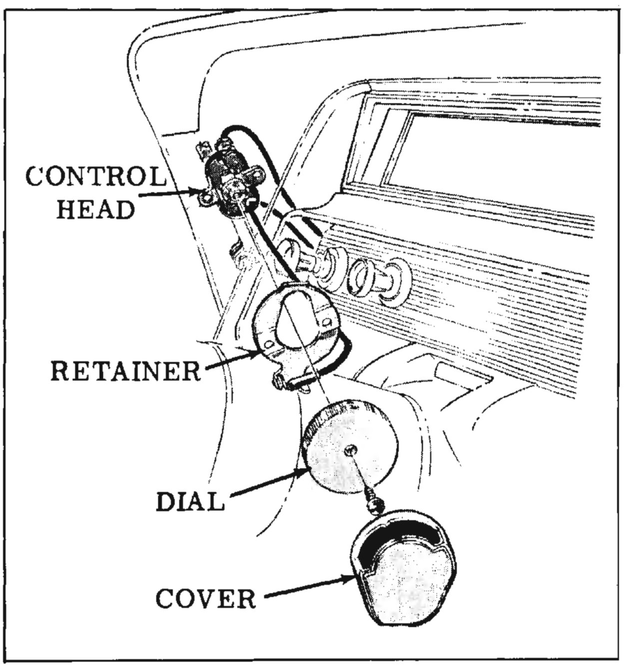


Fig. 13-24 Speed Selector Installation

Speed settings are secured by use of a calibrated dial control. The dial is numbered with markings from 3 through 8. It also includes an "off" position beyond the 8 setting. Approximate speed settings are obtained by rotating the dial to the desired speed. For accurate speed control after the unit has been locked in, the dial may be moved slightly forward or rearward.

The push button for automatic speed control operation is located on the edge of the dial cover. To operate, select the desired speed with the dial, accelerate until back pressure is felt on the accelerator pedal, then momentarily depress the push button to close the electrical circuit. Closing of this circuit energizes an electro-magnet in the regulator. A reversible electric motor in the regulator actuates the mechanical linkage between the regulator and the carburetor. Contact points for forward and reverse energizing of the motor are closed and opened by a centrifugal governor. Turning the speed selector dial changes spring tension on the governor which changes car speed automatically.

DIAGNOSIS, TESTS AND ADJUSTMENTS

Since the Cruise Control is mechanically driven and electrically operated, diagnosis and trouble shooting procedures involve both mechanical and electrical tests. Electrical tests are to be made with ignition switch in the accessory position.

Possible malfunctions requiring service on the Cruise Control unit will fall under one of the following categories:

1. Cruise Control does not respond to speed setting.
2. Constant pressure on accelerator pedal regardless of selector setting.
3. No automatic control when selector button is depressed.
4. Automatic control engages at selected speed without depressing selector button.
5. Automatic control remains engaged when brake or clutch pedal is touched.
6. Automatic control remains engaged when selector dial is rotated to the "off" position.
7. Pulsating accelerator pedal.
8. Engine does not return to normal idle.
9. Speedometer does not register or unit does not operate.
10. Noisy speedometer.
11. Blowing fuses.
12. Unit does not control at selected speed.

The following mechanical and electrical tests will aid in isolating and correcting the above conditions. Diagnosis and trouble shooting procedures must be followed to make certain that the trouble is in the unit itself, and not in some other component of the car.

OPERATIONAL TEST

1. Turn ignition switch to accessory position.

2. Move speed selector dial to lowest speed position.

3. Depress accelerator pedal to wide open position.

4. Depress push button. If accelerator pedal stays in the depressed position, electrical circuit and lock-in mechanism is operating properly. (If accelerator pedal comes up, see ELECTRICAL TESTS.)

5. Slowly depress brake pedal. If accelerator pedal returns to the idle position, brake pedal switch is operating properly. (If pedal remains depressed, refer to PEDAL SWITCH ADJUSTMENT.) If car is equipped with synchromesh, repeat Steps 3, 4 and 5 using clutch pedal.

6. Repeat Steps 3 and 4.

7. Turn off ignition switch. If accelerator pedal returns to the idle position, the ignition switch portion of the electrical circuit and latching mechanism is operating properly.

ELECTRICAL TESTS (Fig. 13-25)

1. Turn ignition switch to accessory position.

2. Using a test lamp, ground one test lamp lead and touch other end to regulator terminal #1. Test lamp should light. If lamp fails to light, check for blown fuse and check entire motor circuit.

3. With one test lamp lead grounded, touch other lead to regulator terminal #2. The circuit is normal if the lamp lights. If test lamp fails to light, make the following tests on the automatic cut-out circuit:

   If test lamp lights on red wire, test brown wire. If lamp does not light, the brake or clutch pedal is not in the released position or the switch is out of adjustment or has an open circuit.

4. If test lamp lights at both terminals #1 and #2, test the ground circuit as follows:

   Connect one end of the test lamp to regulator terminal #1 and the other end to terminal #3. Depress the push button on the

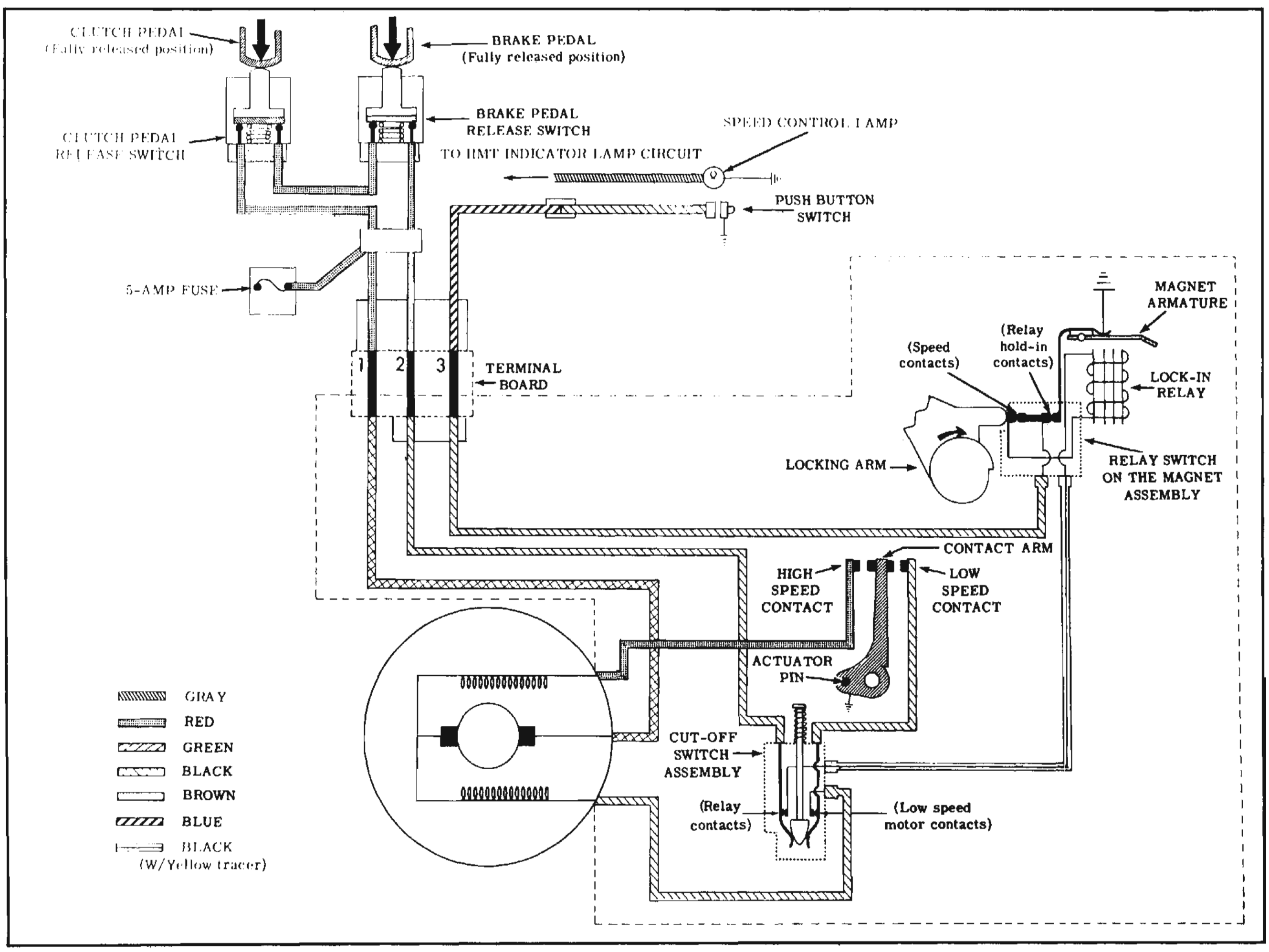


Fig. 13-25 Cruise Control Electrical Layout

dial cover. If test lamp lights, the circuit and control are satisfactory. If lamp does not light, check wiring between terminal #3 and lock-in switch on control by grounding wire at connector near control. If test lamp now lights, check ground wire for proper grounding at cable housing and/or dial cover. Repair or replace as necessary.

5. Turn ignition switch "off".

CHECKING MOTOR OPERATION

1. Check accelerator linkage adjustment. (See LINKAGE ADJUSTMENT.)

2. Remove four screws securing regulator cover and remove cover.

3. Turn ignition switch to accessory position.

4. Move locking arm against magnet and press down on armature plate to latch unit, simulating automatic control. (Fig. 13-26)

5. Move contact arm to touch contact point on motor side of magnet. Motor should rotate drive screw and open the throttle through the accelerator linkage.

6. Move contact arm to touch contact point on locking arm side of magnet. Motor should rotate drive screw and close the throttle through the accelerator linkage.

NOTE: If motor will not open or close throttle through accelerator linkage, motor may be binding. Check alignment of motor with housing. To check motor for binding, loosen motor from housing without disconnecting motor leads. Move contact arm against contact point on motor side of magnet assembly to check reverse operation, and against contact point on locking arm side of magnet assembly to check forward operation. If motor does run free, stall test motor as described under MOTOR STALL TEST.

The drive screw or carburetor linkage may also be binding. To check drive screw for binding, remove motor, insert screwdriver in slotted end of drive screw, and check for free rotation. If drive screw does not rotate freely, it is defective and should be replaced. If motor and drive screw operate satisfactorily, then adjust carburetor linkage.

7. Turn ignition switch "off" and install regulator cover.

NOTE: Before installing cover, check to see that roller at top of compressor rod is not binding and speed control dial is set at minimum speed so that cover will seat properly.

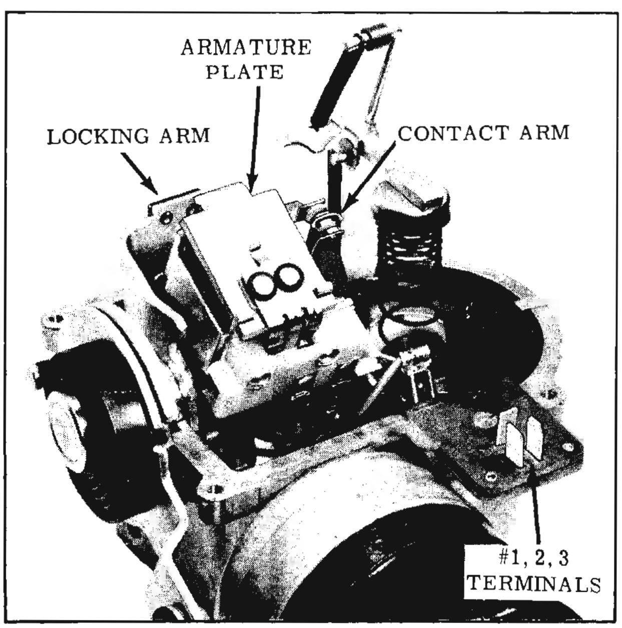


Fig. 13-26 Connections for Motor Operation

MOTOR STALL TEST

1. Disconnect multiple electric connector from regulator.

2. Remove four screws securing regulator cover to housing and remove cover.

3. Connect red lead of an ammeter tester to positive battery terminal.

4. Place Sleeve Gauge, J-7652, on gauge bolt to limit travel of locking arm and prevent rotation of drive screw.

NOTE: An unmarked sleeve gauge is included in the Cruise Control package.

5. Connect black lead of tester to #1 terminal.

6. Hold contact arm against contact point on locking arm side of magnet and observe reading on ammeter. If reading on ammeter indicates more than 7 amps, motor is drawing too much current and should be replaced.

7. Disconnect tester leads, remove sleeve gauge, install cover and connect multiple connector.

LINKAGE ADJUSTMENT

1. Start engine and operate at slow idle with transmission selector lever in "park" or "neutral".

2. Remove cotter pin securing linkage on exterior arm and separate linkage from exterior arm.

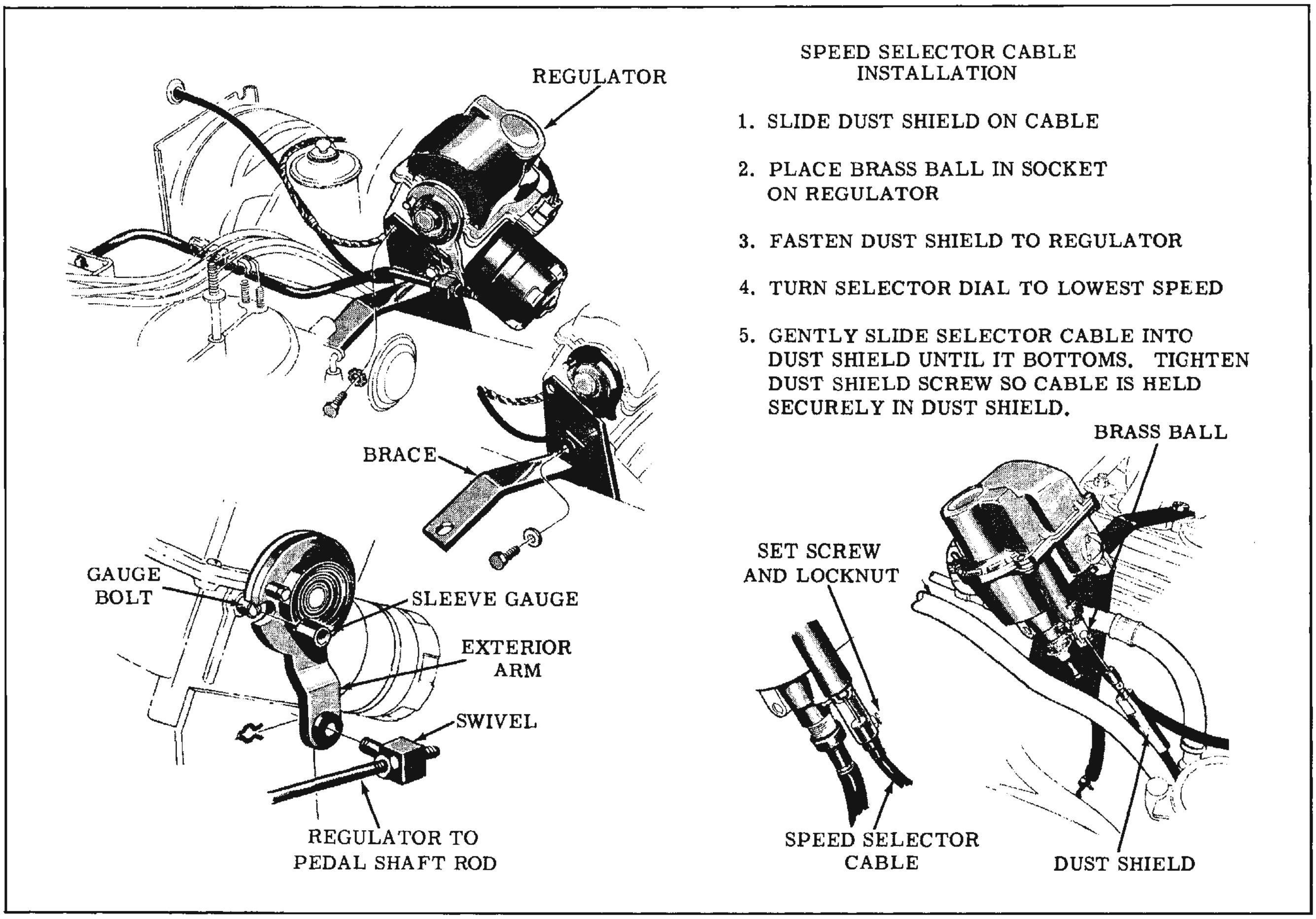


Fig. 13-27 Speed Selector Cable Adjustment

3. Insert Sleeve Gauge, J-7652, over gauge bolt and hold exterior arm securely against gauge. (Fig. 13-27)

4. Turn swivel until it aligns with and enters hole in exterior arm freely.

5. Secure swivel to exterior arm with cotter pin.

6. Remove gauge and shut off engine.

SPEED SELECTOR CABLE ADJUSTMENT

1. Loosen set screw on end of dust shield and

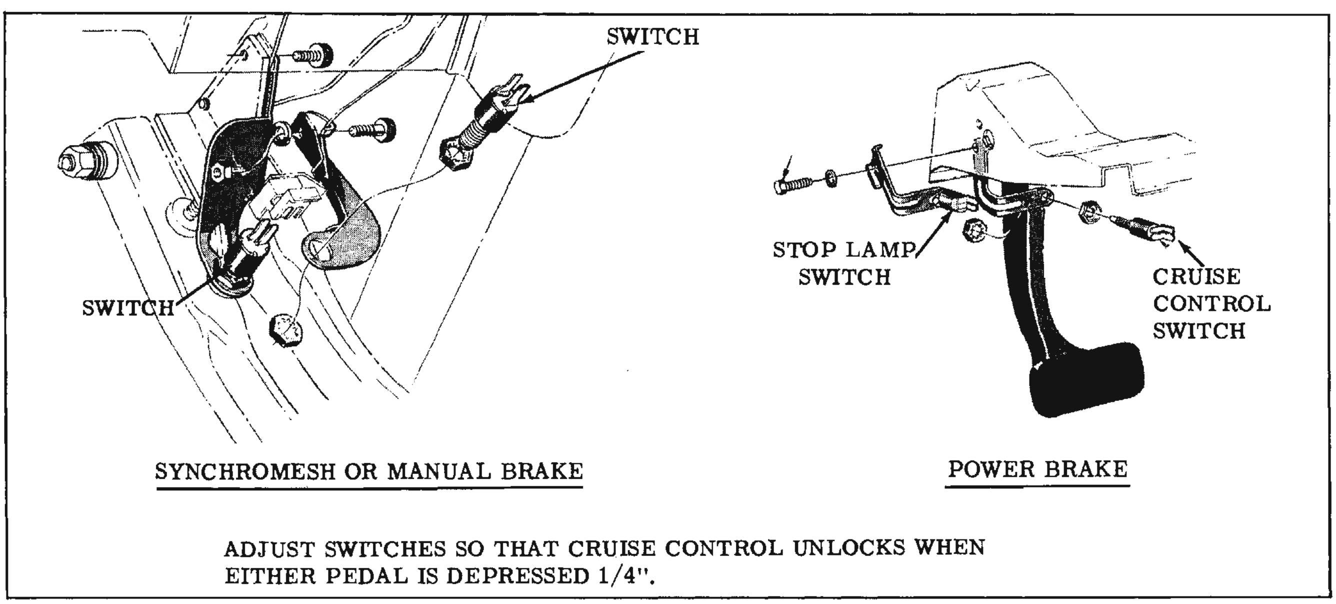


Fig. 13-28 Pedal Switch Adjustment

work control cable back and forth making certain that ferrule on end of cable is free to move when dial is rotated.

2. Rotate dial backward toward "3" position, as far as it will go without forcing it.

3. Carefully insert ferrule back into dust shield, without forcing it, until ball socket just bottoms in housing. (Fig. 13-27)

CAUTION: After positioning ferrule in dust shield, recheck dial to be sure it is still in extreme low speed position.

4. Tighten set screw securely on end of dust shield being careful not to change cable position.

PEDAL SWITCH ADJUSTMENT

Adjust the switch so that the electrical circuit is open when the brake or clutch pedal is depressed 1/4". A test light will aid in making this adjustment. (Fig. 13-28)

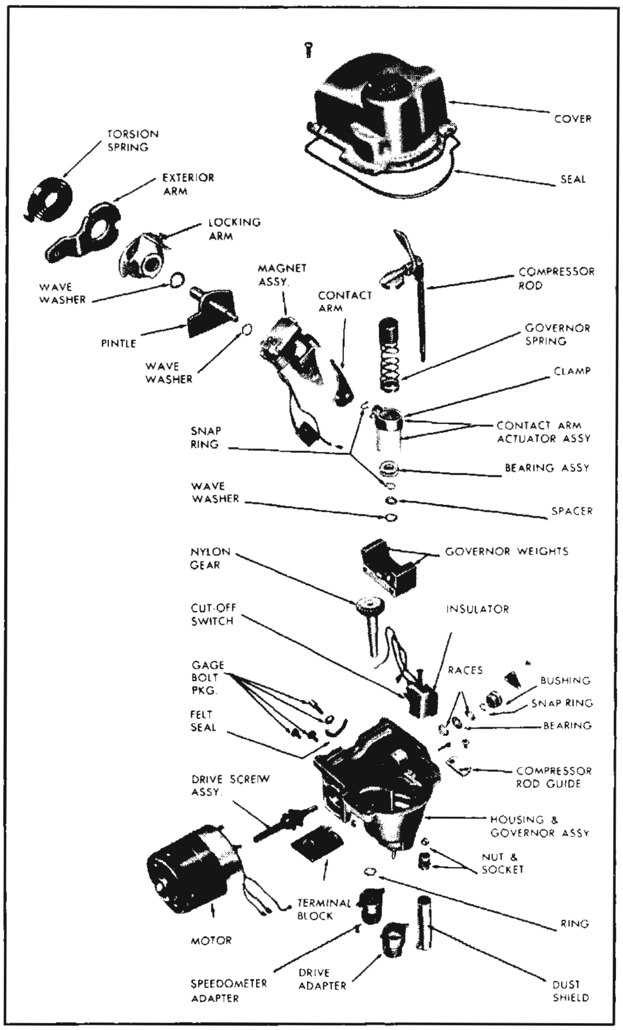


Fig. 13-29 Regulator Assembly

REGULATOR DISASSEMBLY (Fig. 13-29)

1. Remove the four cover screws and cover, being careful not to lose the rubber and felt seals in the cover groove.

2. Disconnect the green motor wire from terminal board.

   CAUTION: Do not attempt to straighten this terminal as it is angled to prevent shorting on the regulator cover.

3. Remove the governor spring.

4. Loosen the locknut at the top of the ball socket and remove the ball socket and locknut from the compressor rod. Remove the compressor rod from the housing.

5. Remove the screw from compressor rod guide and remove the rod guide from the housing.

6. Disconnect the red wire from the inboard terminal of the relay switch on the magnet assembly, and at the upper terminal on the side of the cut-off switch, then remove the wire.

7. Disconnect the red motor wire at the bottom of the contact point on motor side of magnet assembly.

8. Disconnect the black cut-off switch wire at the bottom of the contact point on the locking arm side of the magnet.

9. Disconnect the black motor wire at the lower terminal on the side of the cut-off switch.

10. Disconnect the black wire from the outboard terminal of the relay switch on magnet assembly.

11. Remove the two nuts securing the motor to the housing, then remove the motor.

12. Disconnect the double plug-in connector from the terminal board, and remove the wire retaining clip from lip of the housing.

13. Remove the screw securing the terminal board to the housing and remove the terminal board.

14. Remove the screw securing the cut-off switch to the housing and remove the switch and insulator.

15. To remove the torsion spring from the exterior arm, disengage the inner end of the spring coil from the flat on the locking arm hub by inserting a small screwdriver between the coil and the hub. Gently pry the coil out of the notch while removing the exterior arm. (Fig. 13-30)

16. Remove the locking arm gauge bolt, two pintle retaining bolts and lock washers located under the locking arm.

17. Lift the actuator, magnet and pintle assembly out of the housing, being careful not to lose the felt seal in the groove of the housing.

18. Pull the locking arm assembly from the pintle shaft and remove the wave washer.

19. Remove the snap ring from the end of the pintle shaft and remove the contact arm.

20. Remove the pintle shaft from the magnet assembly, then remove the wave washer.

    NOTE: Do not remove the relay switch from the magnet as they are serviced as an assembly.

21. Remove the three screws from serial number plate and remove the plate and bushing.

22. Remove the snap ring, outer bearing race, bearing and inner bearing race from the drive screw. Remove the drive screw and nut from the motor end of housing.

    CAUTION: When handling the drive screw assembly, keep the parts clean, as dirt particles can become wedged in the bearings on the end of the shaft and in the shaft nut and cause the drive screw to bind.

23. From the drive shaft, inside the housing, remove the snap ring, spacer, wave washer and governor weight assembly.

24. Remove the screws securing speedometer adapter to the housing and remove adapter.

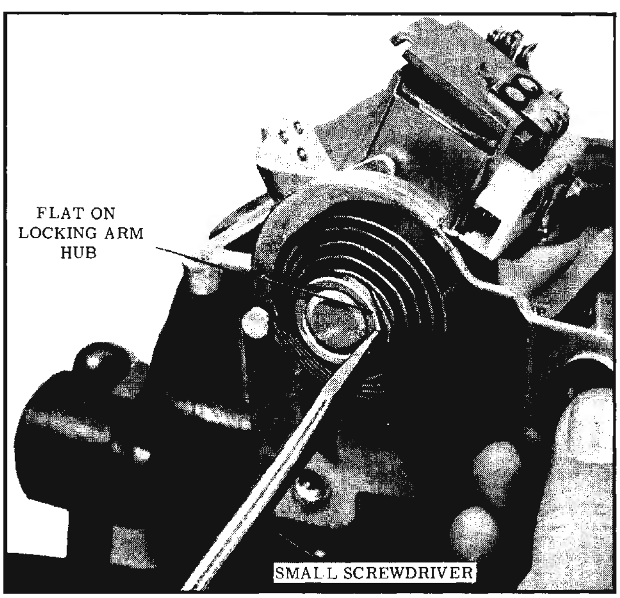


Fig. 13-30 Removing Torsion Spring

25. Tap the nylon shaft into the housing to disengage the retaining ring.

    NOTE: The drive shaft and gear are serviced with the housing as an assembly.

REGULATOR ASSEMBLY

1. Lubricate the nylon gear with cam and bearing lubricant, and install the gear in the housing.

2. Secure the gear in the housing with the retaining ring.

3. Install the speedometer adapter and secure with two screws.

4. Install the governor weight assembly, wave washer and spacer on the drive shaft securing with a snap ring.

5. Lubricate the drive screw assembly, sparingly, with cam and bearing lubricant.

6. Insert the pilot end of the drive screw through the motor side of the housing and into the housing boss, then install the inner bearing race, bearing, outer bearing race, and snap ring on the drive screw.

7. Install the bushing on the drive screw then install the serial number plate with the three screws.

8. Install the small wave washer on the pintle shaft, insert the pintle in the magnet assembly, through the side opposite the point.

9. Install the contact arm on the pintle shaft with the actuator pin facing away from magnet and secure with the snap ring.

10. Install the large wave washer and the locking arm on the pintle shaft.

11. Position the drive nut in the center of the drive screw.

12. Insert the pin of the contact arm into the hole in the actuator clamp.

13. Install the complete assembly in the housing, positioning the actuator over the governor shaft. Be sure the rollers on the bottom of the magnet assembly are aligned with the grooves in drive screw nut. Press down on the complete assembly to seat the locking arm hub on the felt seal in the housing.

14. Install the two pintle bolts, gauge bolt and lock washers to secure the pintle assembly to the housing. (Fig. 13-31)

15. Install the exterior arm on the hub of the

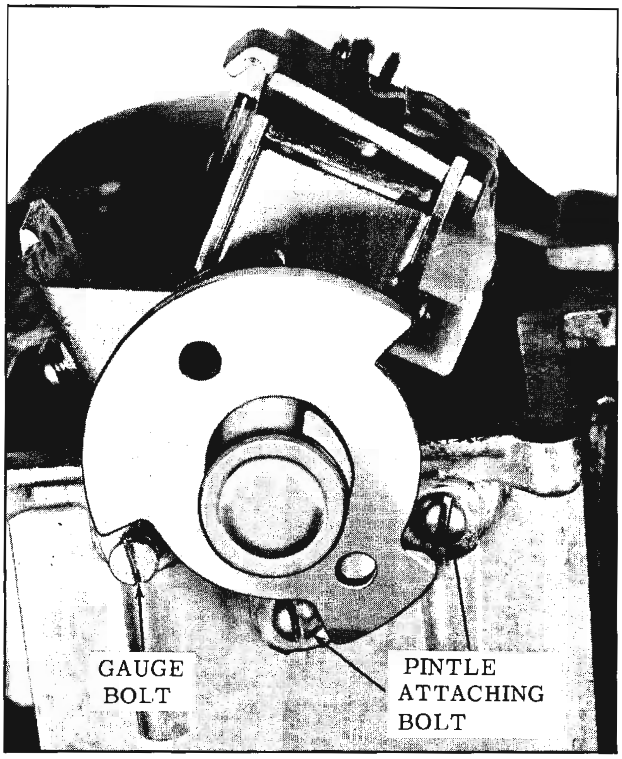


Fig. 13-31 Installing Pintle

locking arm so the arm is toward the motor mounting pad.

16. With the Sleeve Gauge on the gauge bolt, install the torsion spring over the locking arm hub, then rotate the spring until the flat on the spring and hub align. Engage the hook end of the spring over the exterior arm pin as shown in Fig. 13-32.

17. Install the cut-off switch and insulator in the housing and secure with a screw.

18. Install the terminal board on the housing with the numbered terminals outboard.

19. Plug the double connector onto the terminal board and secure the lead from the cut-off switch to the inside top edge of the housing with the retaining clip.

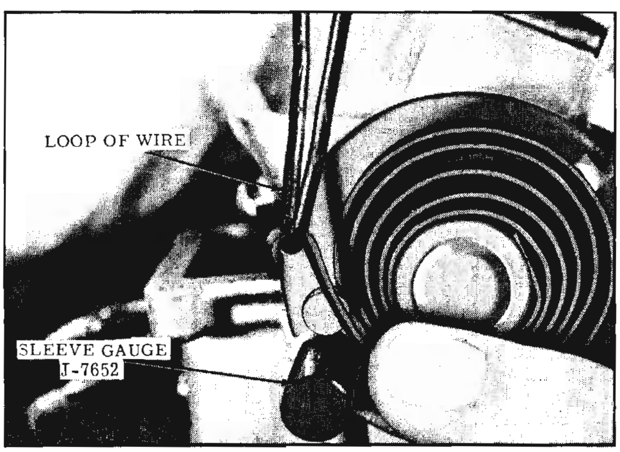


Fig. 13-32 Installing Torsion Spring

20. Route the loose black wire from the double connector under the pintle shaft and back over the top of the shaft. Connect this wire to the outboard terminal of the relay switch on the magnet assembly.

21. Route the loose black wire from the top of the cut-off switch under the pintle shaft and back over the top of the shaft. Connect this wire to the bottom of the contact point on the locking arm side of the magnet.

22. Install the motor to the housing by positioning the wires through the upper hole in the housing. Be sure that the end of the motor shaft fully engages in the slot of the drive screw. Install the motor mounting nuts and tighten these nuts securely.

    CAUTION: Do not tighten the nuts by using a screwdriver on the slotted bolt heads, as this will result in a binding condition of the motor bearings. Always use a wrench on the nuts.

23. Route the black motor wire under pintle shaft, and connect to the lower terminal of the cut-off switch.

24. Route red motor wire under the pintle shaft and back over the pintle shaft. Connect to the contact point on the motor side of the magnet assembly.

25. Connect green motor wire to the single connector on the terminal board.

    CAUTION: Do not attempt to straighten this terminal as it is angled to prevent shorting on the regulator cover.

26. Route the red wire under the pintle shaft and connect one end to the upper terminal of the cut-off switch and the other end to the inboard terminal of the relay switch on the magnet assembly.

    NOTE: Check the routing of all the wires to see that there is no interference with moving parts.

27. Install the nylon compressor rod guide on the housing.

28. Lubricate the compressor rod with cam and bearing lubricant, then install the compressor rod through the housing guide.

    a. Thread the locknut all the way on the compressor rod.

    b. Install the governor spring with the open coils in the actuator.

NOTE: The free length of the governor spring should be from 3-11/64" to 3-17/64". Replace this spring, if not within specifications.

29. Turn the drive screw to move magnet assembly all the way toward motor side of housing by temporarily connecting a battery lead to number 1 and 2 terminals and the negative lead to the housing. This will avoid any contact between contact arm and the contact point on the motor side of the magnet. This must be done to prevent preloading of the governor spring by the contact arm before adjusting the compressor rod.

30. Check that the locknut on the compressor rod is to the limit of the threads. Start the ball socket on the rod, then hold the housing in an upright position. Adjust the ball socket until the spring seat on the compressor rod just rests on the governor spring, without exerting any pressure against the spring. Loosen the ball socket one complete turn and tighten the locknut. This will provide the correct low speed calibration for the regulator.

LOCKING ARM LATCH ADJUSTMENT

The locking arm latch adjustment should be made if it becomes necessary to replace the locking arm or the magnet assembly.

1. Move the locking arm against the magnet assembly and press down on the armature to latch the unit simulating automatic control. While holding the armature down, use a feeler gauge to measure the gap between the locking arm and the latch on the armature. This gap must be between .001" and .006". If the gap is not within specifications, adjust the gap by turning the adjusting screw counterclockwise to increase the gap, or clockwise to decrease the gap.

2. Release the locking arm.

CONTACT POINT ADJUSTMENT

There are two sets of electrical contact points that operate the motor in the forward and reverse direction. One set of contact points, on the motor side of the magnet, limits acceleration; while the contact points on the locking arm side of the magnet, limits deceleration. The points of the contact arm (one on each side) serve as the grounding points.

The contact points are still operative when blackened or pitted; however, any build-up on the points should be removed.

CAUTION: When filing the points, use a cloth to catch filings as they could become wedged between the small ball bearings in the drive nut of the drive screw and cause the drive screw to stick.

The locking arm latch must be properly adjusted before attempting to adjust the contact points. The point adjustment may be made at either set of contact points on the magnet assembly, as a single adjustment takes care of both.

The following adjustments must be made if it becomes necessary to replace the magnet assembly or the regulator has been disassembled.

1. Move the contact arm against either contact point. Use a feeler gauge to check the gap between the contact arm and the other point. This gap must be .090" ± .010". If the gap is not within specifications, bend the contact point on the motor side of the magnet assembly until the proper gap is obtained.

2. Insert the Sleeve Gauge over the gauge bolt. Move the magnet to the low speed position (magnet away from the motor) as follows:

   a. Connect the battery positive lead to the #1 and #2 terminals of the terminal board.

   b. Connect the negative lead to the housing.

   c. Manually open the governor weights and disconnect the battery leads.

   d. Place the Governor Weight Wedge, J-8547 between the governor weights.

3. While pressing firmly down on the wedge and lightly on the actuator (weights held out to their stop position), the gap between the contact arm and the contact points on the magnet assembly should be equal.

4. If the contact arm is not centered, make the following adjustments.

   NOTE: When making the adjustment for centering the contact arm, make certain that the clamp is lightly pressed against the cam of the actuator, or the tangs on the clamp will not follow the cam as the actuator is rotated.

   a. Loosen the screw on the actuator clamp.

   b. Rotate the actuator until the contact arm is centered between the two contact points.

   c. Tighten the clamp and recheck the gap.

5. Remove the locking arm Sleeve Gauge and Governor Weight Wedge.

CRUISE CONTROL DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Speedometer Noise.	Cables bent or kinked.	Straighten or replace cables.
	Lack of cable lubrication.	Lubricate.
	Noisy Speedometer head.	Repair.
Blowing Fuses.	Short or ground in wiring circuit.	Check for short or ground. Repair or replace if necessary.
	Improper linkage adjustment.	Adjust accelerator linkage.
	Defective motor.	Check operation of motor. If more than 7 amps at 12.5 volts are noted in either direction, replace motor.
	Locked drive screw.	Check drive screw for binding.
No Cruise Control Response.	Accelerator linkage broken or disconnected.	Connect or replace linkage and adjust.
	Drive cable broken or disconnected.	Connect or replace cable.
	Loose connections or broken wires (internal or external).	Check condition of terminal block. Replace if necessary. Check for current at the unit. Repair wires or tighten wiring connections as required.
No Automatic Control When Push Button is Depressed.	Driver riding brake or clutch or not holding accelerator against back pressure when depressing push button.	Instruct owner.
	No current at #2 terminal.	Perform Electrical Tests. Correct as required.
	Loose or disconnected ground wire between push button and #3 terminal.	Tighten or connect ground wire.
	Inoperative cut-off switch on brake or clutch pedal.	Check switch and replace if necessary.
	Cut-off switch in regulator open.	Adjust or replace cut-off switch.
No Automatic Control When Button is Depressed.	Magnet assembly does not latch properly.	Check and adjust locking arm latch.
	Hold-in relay contacts on hinge side at armature not closing (grounding).	Check points to see if contacts touch when armature is depressed. Adjust as necessary.
	Grounding tang not contacting armature.	Bend tang to obtain contact.
Constant Pressure on Accelerator Pedal Regardless of Selector Setting.	Blown fuse.	Replace fuse and perform Electrical Test.
	No current at #1 terminal.	Perform Electrical Test, and correct as required.
	Speed Selector cable improperly adjusted.	Adjust cable.
	Speed Selector cable defective.	Replace cable.

CRUISE CONTROL DIAGNOSIS CHART (Cont'd.)

CONDITION	POSSIBLE CAUSE	CORRECTION
Constant Pressure (Cont'd.)	Inoperative motor or locked drive screw.	Check operation of motor and/or drive screw. Replace or repair.
Automatic Control Engages at Selected Speed Without Depressing Push Button.	Continuous ground in ground circuit or switch.	Check for ground and repair as required.
Automatic Control Remains Engaged When Brake or Clutch Pedal is Touched.	Inoperative cut-off switch on brake or clutch pedal.	Adjust switch or replace if necessary.
Automatic Control Remains Engaged When Selector Dial is in the "OFF" Position.	Improper Speed Selector cable adjustment.	Adjust speed selector cable or replace if necessary.
	Inoperative cut-off switch or mis-adjusted tang on compressor rod.	Check cut-off switch for closed circuit. Adjust tang on compressor rod.
Pulsating Accelerator Pedal.	Speedometer cable or drive cable kinked or lack of lubrication.	Lubricate or replace cables if necessary.
	Improper linkage adjustment.	Adjust accelerator linkage.
Carburetor Does Not Return to Normal Idle.	Improper carburetor or accelerator linkage adjustment.	Adjust TV linkage, and accelerator linkage.
Unit Does Not Control at Selected Speed.	Improper Speed Selector cable adjustment, linkage adjustment, or compressor rod adjustment.	Adjust as necessary.
Speedometer Does Not Register or Unit Does Not Operate.	Speedometer drive in left front wheel defective.	Replace dust cap.
	Broken drive cable from left front wheel to regulator.	Replace drive cable.
	Broken speedometer cable.	Replace speedometer cable.
	Defective speedometer.	Repair speedometer.

GUIDE-MATIC POWER HEADLIGHT CONTROL

The Guide-Matic Power Headlight Control consists of: the phototube, amplifier unit, power relay, and a combination override and foot dimmer switch. (Fig. 13-33)

The phototube unit picks up light from an approaching car and operates the amplifier unit.

The amplifier unit supplies voltage to the phototube unit and operates the power relay in response to a signal from the phototube unit. It is mounted under the instrument panel above the glove box.

The power relay is mounted on the cowl, below the fuse block, and switches the headlamps between high and low beam. The power relay also operates when the "Guide-Matic" switch is off.

The phototube unit has a sensitivity control knob which enables the driver to adjust the sensitivity for conditions such as heavy snow or fog. The knob has a "FAR" and "NEAR" at the extreme ends of the adjustment range and a detent position midway in the range for the normal setting. Adjustment toward the "FAR" (clockwise) position increases the sensitivity for driving during foggy weather conditions when light penetration from oncoming cars is poor. Adjustment toward the "NEAR" position (counterclockwise) decreases the sensitivity for driving during heavy snowstorms or similar conditions when there is abnormal light reflections.

REMOVAL AND INSTALLATION

NOTE: If diagnosis indicates that the phototube unit must be removed for repair by an authorized warranty repair dealer, the amplifier unit should also be removed and sent with the phototube unit. If the amplifier unit must be removed for repair, the phototube unit need not be sent with it if diagnosis indicated it was operating satisfactorily.

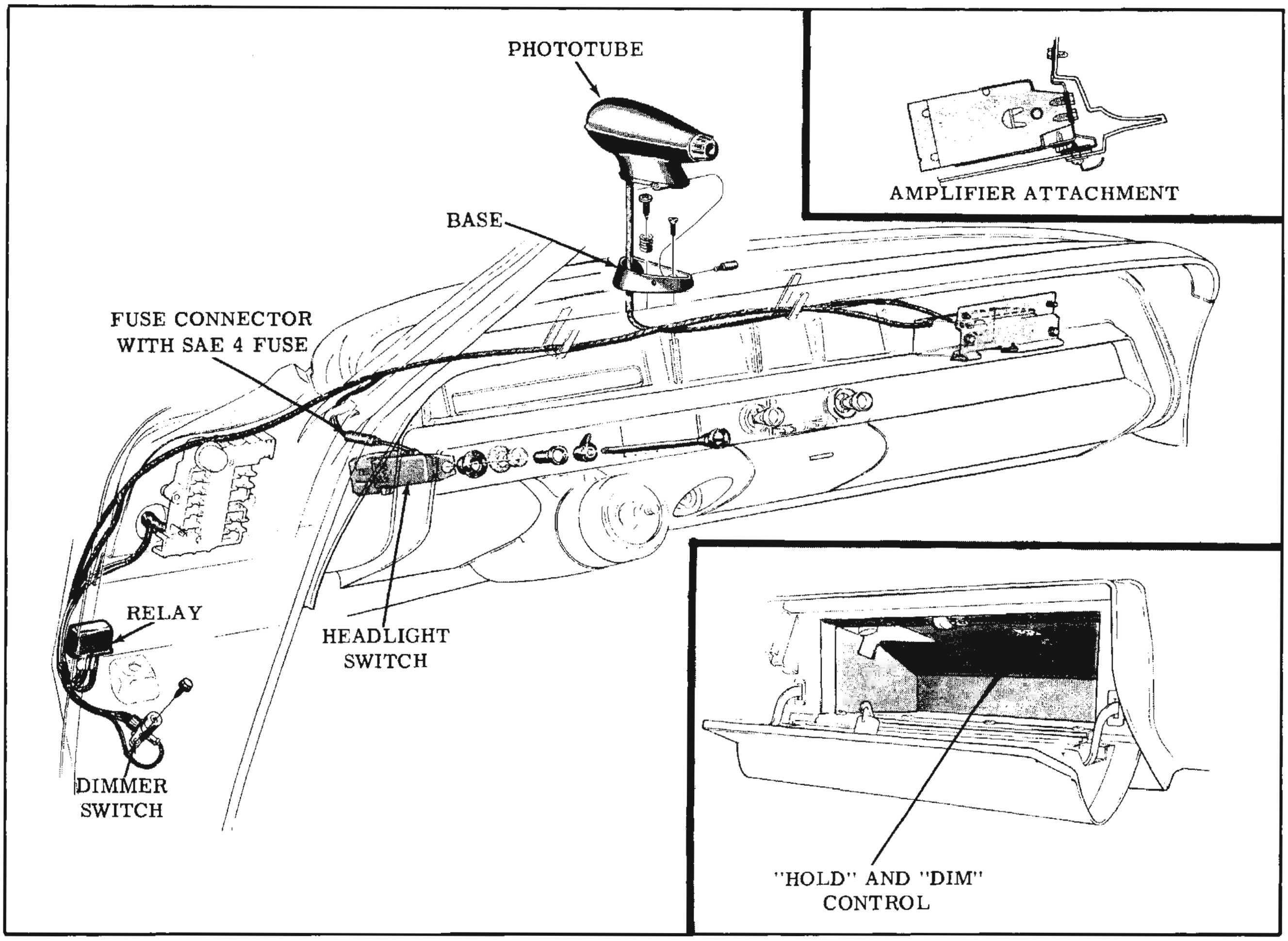


Fig. 13-33 Guide-Matic Installation

Phototube Unit

1. Disconnect the phototube unit harness plug from the amplifier. (Fig. 13-33)

2. Remove the pivot pin from the right side of the phototube unit base, then lift the unit off the mounting plate and remove the phototube unit and wiring.

To install, reverse the removal procedure, check vertical and horizontal aim, and the Dim and Hold sensitivity adjustment. (See ADJUSTMENTS AND TESTS)

Amplifier Unit

1. Disconnect the fuse connector from the Guide-Matic "off-on" switch terminal on the headlight switch. (Fig. 13-33)

2. Lift floor carpet and remove the two connectors from the foot switch.

3. Remove the dual connector from the power relay.

4. Remove the amplifier attaching screws and remove the amplifier.

To install, reverse the removal procedure. After installing the amplifier unit, check the Dim and Hold sensitivity adjustment. (See ADJUSTMENTS AND TESTS)

ADJUSTMENTS AND TESTS

"GUIDE-MATIC" TESTING EQUIPMENT

Level J-8465-20 and a test lamp, are required for the aiming and sensitivity adjustments, and must be used in conjunction with the AE-2 Tester. The test lamp and adapter are identified by tool number J-8662.

Vertical Aiming Adjustment

1. Phototube unit aiming should be done with the car unloaded, trunk empty except for spare tire, gas tank at least half full, and with correct tire pressure.

2. Position car on a level floor. Floor must be level within 1/4" fore and aft of car.

3. Rock car gently sideways to equalize springs.

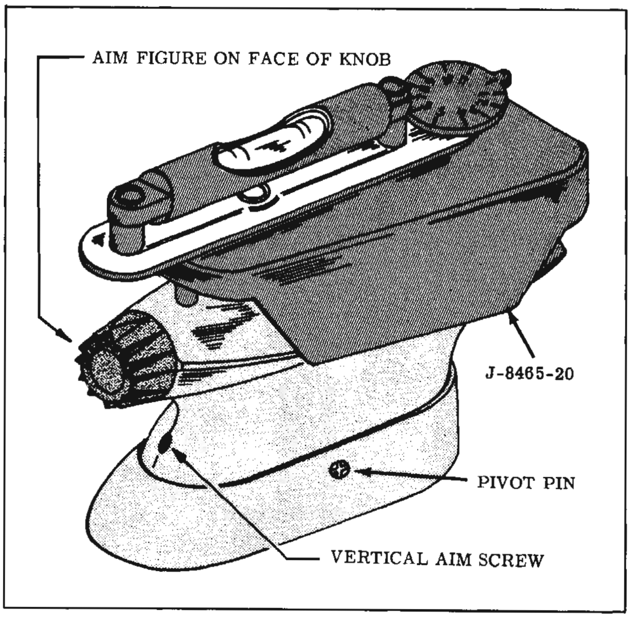


Fig. 13-34 Level Installation

4. Set the level J-8465-20 on top of phototube unit as shown in Fig. 13-34.

NOTE: The three points on aiming device must be resting on top of phototube unit and the aiming device must touch front of phototube unit.

5. Observe number stamped on driver control knob. Adjust aiming dial until corresponding number is under pointer.

6. Adjust vertical aim screw until bubble is centered in level.

NOTE: If the phototube unit is aimed too low, back reflections from the headlights of the car, on which the "Guide-Matic" is installed, will hold its own headlights on the lower beam. Also, the phototube unit must be aimed as low as possible to provide the maximum tolerance for car loading.

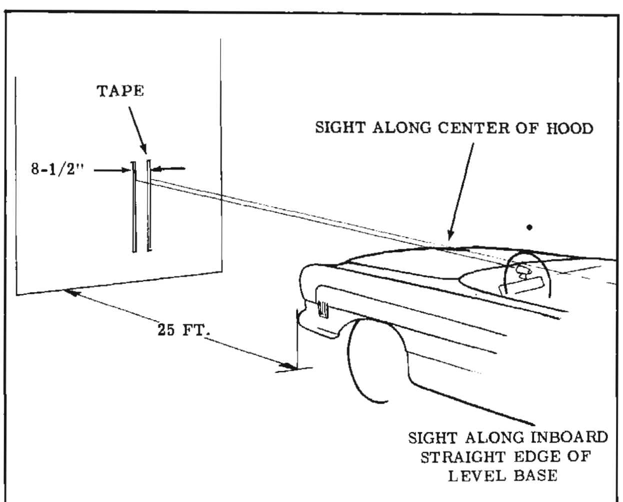


Fig. 13-35 Horizontal Aim

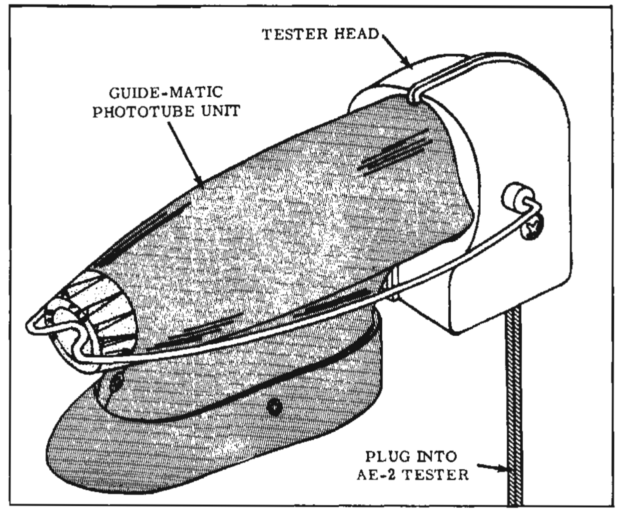


Fig. 13-36 Tester Head Installation

Horizontal Aiming Adjustment (Fig. 13-35)

NOTE: If the phototube unit has been removed for service, it must be aimed parallel to the centerline of the car after the installation is made.

1. Place two pieces of tape or chalk marks 8-1/2" apart on a wall or screen at hood level height.

2. Line up the center of the hood with the right hand tape or chalk mark. The car must be positioned perpendicular to and 25 feet from the wall or screen.

3. With level J-8465-20 installed on phototube unit, sight along inboard straight edge of level base to the left hand tape or chalk mark.

NOTE: If the unit is aimed more than 4" to the right or left of the left hand tape, horizontal aim must be readjusted by removing phototube base and elongating forward screw hole as necessary to aim phototube.

Hold Sensitivity Test

1. Place tester head against front of phototube unit and position bail into place over sensitivity control knob. Plug tester head into modified AE-2 tester. (Fig. 13-36)

2. Turn on headlights, and with Guide-Matic switch "On", WAIT AT LEAST FIVE MINUTES for amplifier to stabilize. Set standard foot dimmer switch to "Automatic" position. Upper beam will then be on.

IMPORTANT: SENSITIVITY CONTROL ON PHOTOTUBE UNIT MUST BE IN CENTER (DETENT) POSITION WHILE TESTING AND ADJUSTING HOLD SENSITIVITY.

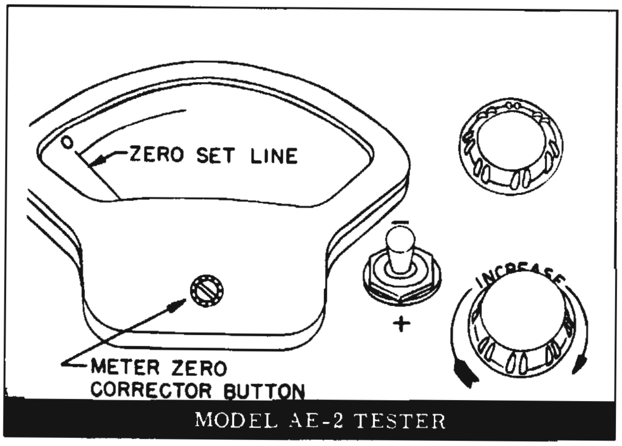


Fig. 13-37 Setting Zero Corrector

3. Turn Zero Corrector on face of tester until meter pointer is on zero set line. (Fig. 13-37)

4. Turn Intensity Rheostat of tester counter-clockwise.

5. Insert tester connector of Model AE-2 tester into cigar lighter receptacle.

6. Operate engine at fast idle while making sensitivity tests and adjustment.

7. Turn Tester Selector Switch to "dim" position. Be sure to use proper "dim" position for clear or tinted windshield.

8. Turn Intensity Rheostat all the way clockwise to turn headlights on lower beam.

NOTE: If lights do not switch to lower beam, the dim control in the amplifier must be turned completely clockwise and then readjusted after "hold" adjustment is correct.

9. Turn Tester Selector to "hold" position.

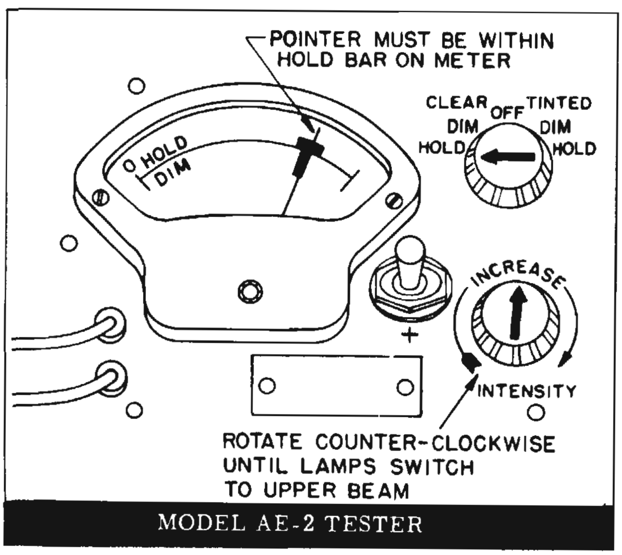


Fig. 13-38 Hold Sensitivity Test

10. Slowly turn Intensity Rheostat counterclockwise just to point where headlamps switch to upper beam. The meter pointer should now read in the Hold Sensitivity Adjustment Bar on the meter scale. (Fig. 13-38)

If Hold Sensitivity is not properly adjusted, proceed with HOLD SENSITIVITY ADJUSTMENT.

Hold Sensitivity Adjustment

The "hold" and "dim" adjusting controls are located in the amplifier unit and can be adjusted with a screwdriver through holes in the top of the glove box.

THE SENSITIVITY ADJUSTMENT MUST NOT BE MADE UNTIL AFTER THE HOLD SENSITIVITY IS CORRECTLY ADJUSTED.

1. Turn "hold" control clockwise to end of adjustment.

2. Rotate Intensity Rheostat all the way clockwise.

3. Turn Selector switch momentarily to "dim" position to switch lights to lower beam, then switch back to "hold" position.

NOTE: If lights do not switch to lower beam, the amplifier dim control must be turned completely clockwise and then readjusted after hold adjustment is correct.

4. Adjust tester Intensity Rheostat until meter pointer is at center of Hold Sensitivity bar. (Fig. 13-38)

5. Turn the "hold" control counterclockwise SLOWLY just to the point where headlights switch to upper beam.

6. Rotate tester Intensity Rheostat clockwise to end of travel, then turn Selector Switch momentarily to "dim" position and back to "hold". (Headlights should now be on lower beam.)

7. Recheck "hold" adjustment by turning Intensity Rheostat SLOWLY counterclockwise just to point where headlights switch to upper beam. Meter pointer should now read in the "hold" adjustment green bar if adjustment is correct. If not, repeat procedure starting with Step 1.

Dim Sensitivity Test

IMPORTANT: SENSITIVITY KNOB ON PHOTOTUBE UNIT MUST BE IN CENTER (DETENT) POSITION WHILE TESTING AND ADJUSTING DIM SENSITIVITY.

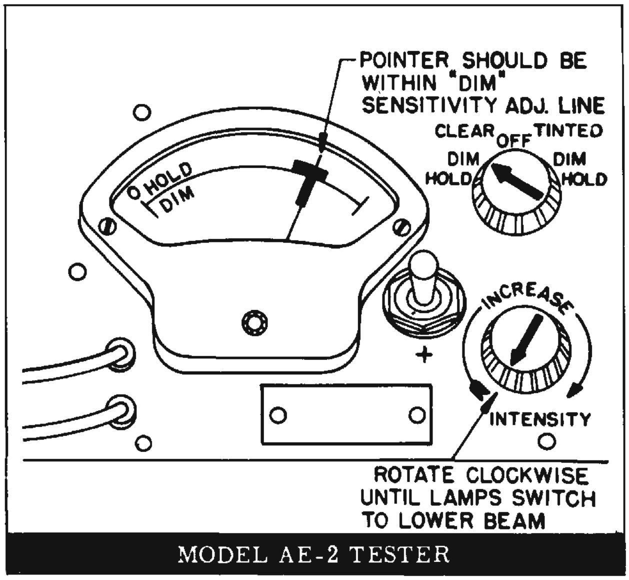


Fig. 13-39 Dim Sensitivity Test

1. Rotate tester Intensity Rheostat completely counterclockwise. (Fig. 13-39)

2. Turn Selector Switch momentarily to "hold" position, then back to "dim" position. Headlights should now be on upper beam.

3. Turn Intensity Rheostat SLOWLY clockwise stopping at the exact point where the headlights switch to lower beam. Meter pointer should read within the Dim Sensitivity Adjustment Line.

If Dim Sensitivity is not properly adjusted, proceed with DIM SENSITIVITY ADJUSTMENT.

Dim Sensitivity Adjustment

NOTE: DIM SENSITIVITY SHOULD NOT BE ADJUSTED UNTIL AFTER "HOLD" SENSITIVITY IS PROPERLY ADJUSTED.

1. Rotate "dim" control completely counterclockwise.

2. Momentarily turn tester "off", then back to "dim" position. Headlights should now be on upper beam.

3. Adjust Intensity Rheostat until meter pointer is at the Dim Sensitivity Adjustment Line.

4. SLOWLY rotate "dim" control clockwise just to point where headlights switch to lower beam. DO NOT GO BEYOND THIS SETTING.

5. Turn tester Intensity Rheostat completely counterclockwise, then momentarily turn tester to "hold" and back to "dim" to place headlights on upper beam.

6. Rotate tester Intensity Rheostat SLOWLY clockwise just to point where headlights switch to lower beam. Meter will read within Dim Sensitivity Line if adjustment is correct. If not, repeat Steps 1 thru 6.

7. Turn off headlights and remove tester.

"GUIDE-MATIC" DIAGNOSIS

IMPORTANT: Check the 4-amp fuse in fuse connector near headlight switch if "Guide-Matic" is inoperative.

Lights Stay On low Beam

1. With the headlight switch "on" and the Guide-Matic switch "off", operate the dimmer switch to see if lights can be switched from low to upper beam.

   a. If lights change beams when dimmer switch is operated, then the power relay and dimmer switch are functioning. Leave dimmer switch in upper beam (automatic) position, then proceed with Step 2.

   b. If the lights stay on low beam, the dimmer switch, power relay or wiring at these units is at fault.

2. With headlight switch and Guide-Matic switch "on", wait at least a minute for the amplifier to warm up, then cover the phototube unit with a dark cloth.

   a. If lights go to upper beam, system is operating but requires adjustment.

   b. If the lights stay on low beam, position the amplifier "hold" control in approximately the center of its travel to eliminate the possibility of complete misadjustment locking the headlights on low beam. If the headlights still stay on low beam when the phototube unit is again covered, the amplifier or phototube unit is defective. Proceed with Step 1.

   (1) Disconnect the phototube unit from the amplifier.

      (a) If the lights go to upper beam, the phototube unit is at fault. Remove the cover and substitute the phototube and pre-amplifier tube assembly with a known good tube assembly. (Remove attaching screw and unsolder wire from cap of tube.) If the condition still exists, remove the phototube unit and amplifier unit for testing and repair by an authorized warranty repair dealer.

(b) If the lights stay on low beam, the amplifier unit is at fault. Substitute known good tubes. If the condition still exists, remove the amplifier unit only for repair by an authorized warranty repair dealer.

Lights Stay On Upper Beam

1. With the headlight switch on and Guide-Matic switch "off", operate the dimmer switch to determine if lights can be switched from upper beam to low beam.

   a. If lights go to low beam, the power relay and dimmer switch are functioning. Leave the dimmer switch in upper beam (automatic) position, then proceed with Step 2.

   b. If lights stay on upper beam, the dimmer switch, the power relay or wiring at these units is at fault.

      (1) Check 4 amp fuse in holder at headlight switch.

      (2) Remove the two-way connector from the power relay and place on the dimmer switch. If headlights change beams, trouble is in the relay. If not, trouble is in dimmer switch harness wires or connectors.

2. With headlight switch and Guide-Matic switch "on", wait at least a minute for the amplifier to warm up, then remove the phototube unit control knob, "C" ring, cover screws and cover. Ground the white wire terminal in phototube unit.

   a. If the lights go to lower beam, trouble is in the phototube unit. Substitute the phototube and pre-amplifier tube assmebly with a known good tube assembly. (Remove attaching screw and unsolder wire from switch.) If condition still exists, remove the phototube unit and amplifier for testing and repair by an authorized warranty repair station.

   b. If the lights stay on upper beam when the white wire terminal in the phototube unit is grounded, the amplifier unit or dimmer switch is at fault.

      (1) Remove red wire from dimmer switch, if headlights go to low beam, the dimmer switch is at fault.

      (2) If headlights remain on upper beam, disconnect dimmer switch harness and amplifier harness. Connect car harness to dimmer switch. If headlights change from upper beam to lower beam, trouble is in the amplifier. Substitute known good tubes. If condition still exists, remove amplifier unit for testing and repair by an authorized warranty repair station.

SAFETY SENTINEL (Fig. 13-40)

A speed warning device (Safety Sentinel), is available as factory installed optional equipment. A knob on the instrument panel can be turned by the driver to adjust the sentinel dial in the cluster face to any desired speed setting between 25 and 100 M.P.H. When car speed is equal to, or exceeds the setting on the sentinel dial, a warning light and buzzer warn the driver that he is exceeding his desired speed.

The circuit is completed when a hair spring on the speedometer hand shaft contacts an insulated pin on the safety sentinel hand. The hair spring is grounded and the insulated pin is connected to the buzzer and warning light. If speed is increased further, the hair spring remains in contact with the pin on the safety sentinel hand and is wound up by the speedometer hand.

CHECKING THE SAFETY SENTINEL

1. Check the nine ampere fuse in the fuse block. The parking brake lamp, back-up lamps, temperature, generator, oil pressure warning lamps, and fuel gauge are also on this fuse.

2. Raise the car so that the left front wheel is off the floor.

3. Adjust the Safety Sentinel to 30 M.P.H.

4. Using a wheel spinner on the left front wheel, rotate wheel until speedometer reads approximately 32 M.P.H. The buzzer and light should operate.

5. If the buzzer operates and light does not, remove the bulb from the rear of the speedometer head assembly and install a new one.

6. If the light comes on and the buzzer does not sound, remove the buzzer and replace with one known to be working.

7. If the buzzer and light do not operate, but other panel units in the same circuit operate, check Safety Sentinel circuit connection to the printed circuit. If connection is good, remove the speedometer head for repair by an authorized warranty repair dealer.

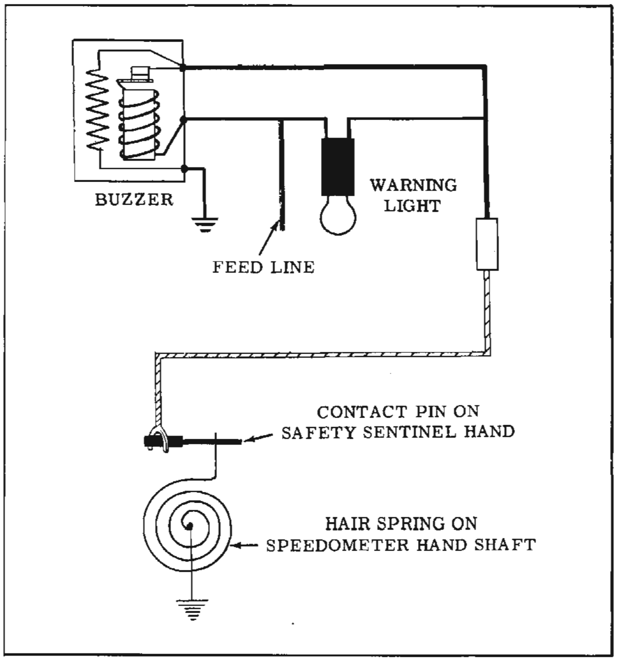


Fig. 13-40 Safety Sentinel Circuit

ACCESSORY LAYOUTS

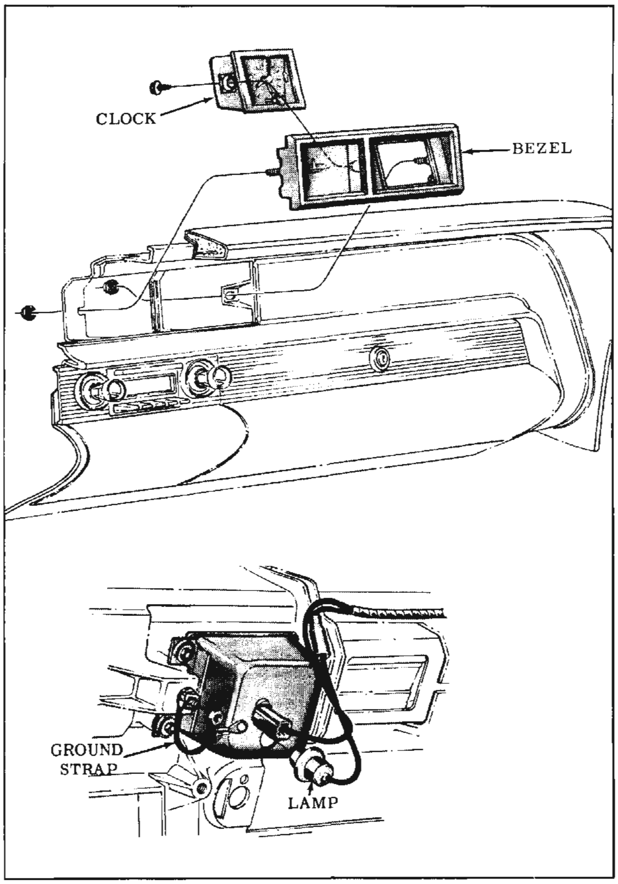


Fig. 13-41 Clock Installation

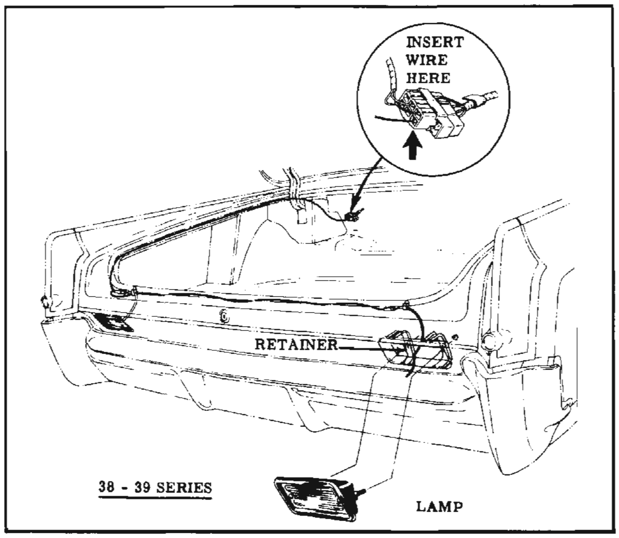


Fig. 13-42 Back-Up Lamp

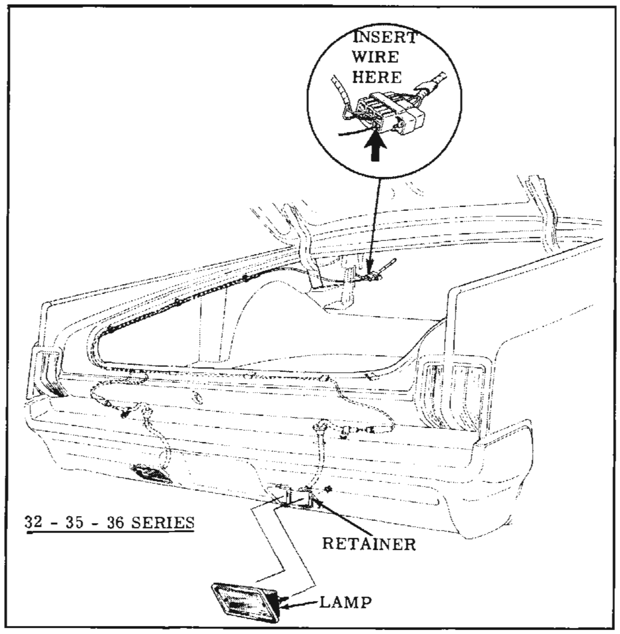


Fig. 13-43 Back-Up Lamp

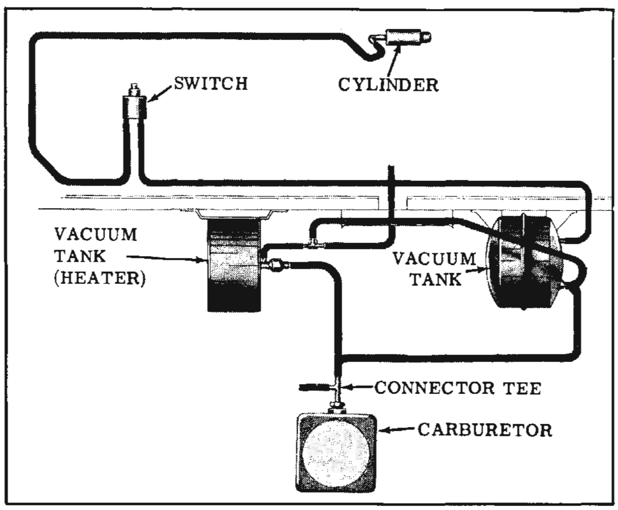


Fig. 13-44 Vacuum Trunk Lock Layout

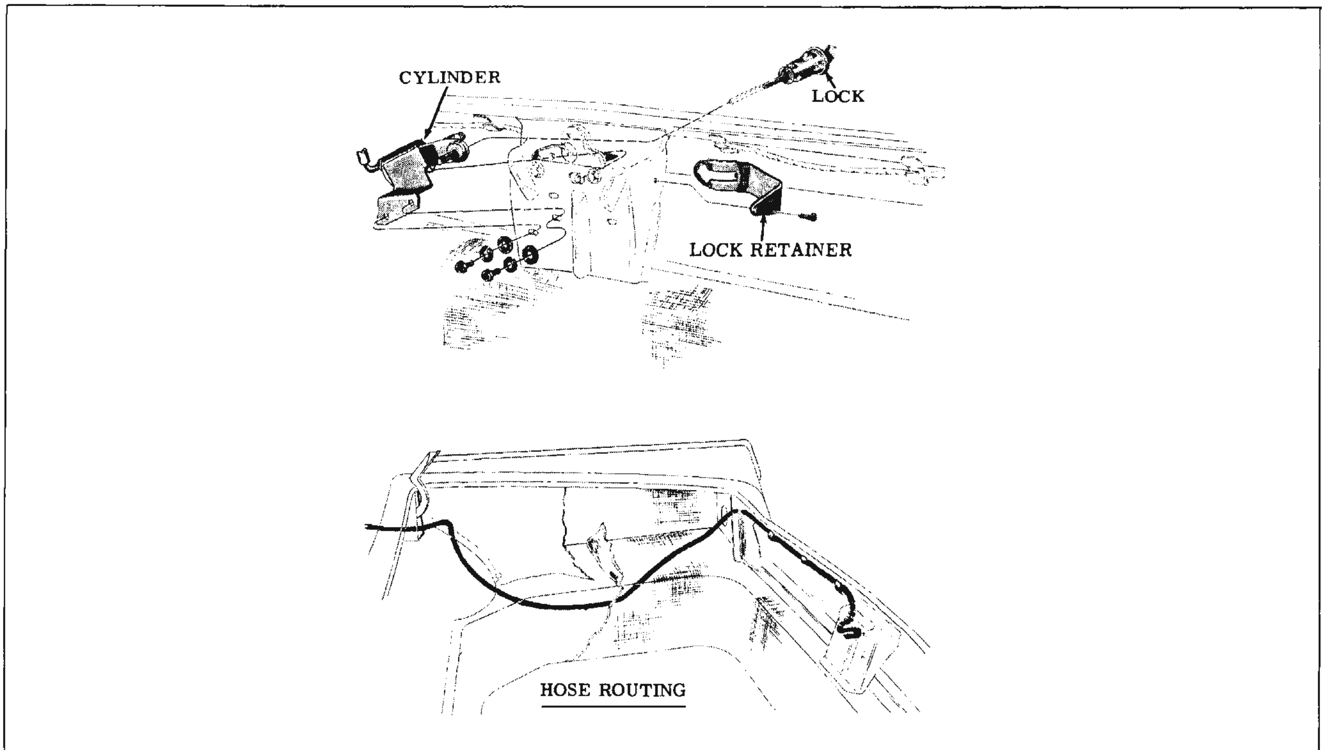


Fig. 13-45 Vacuum Trunk Lock Mechanism

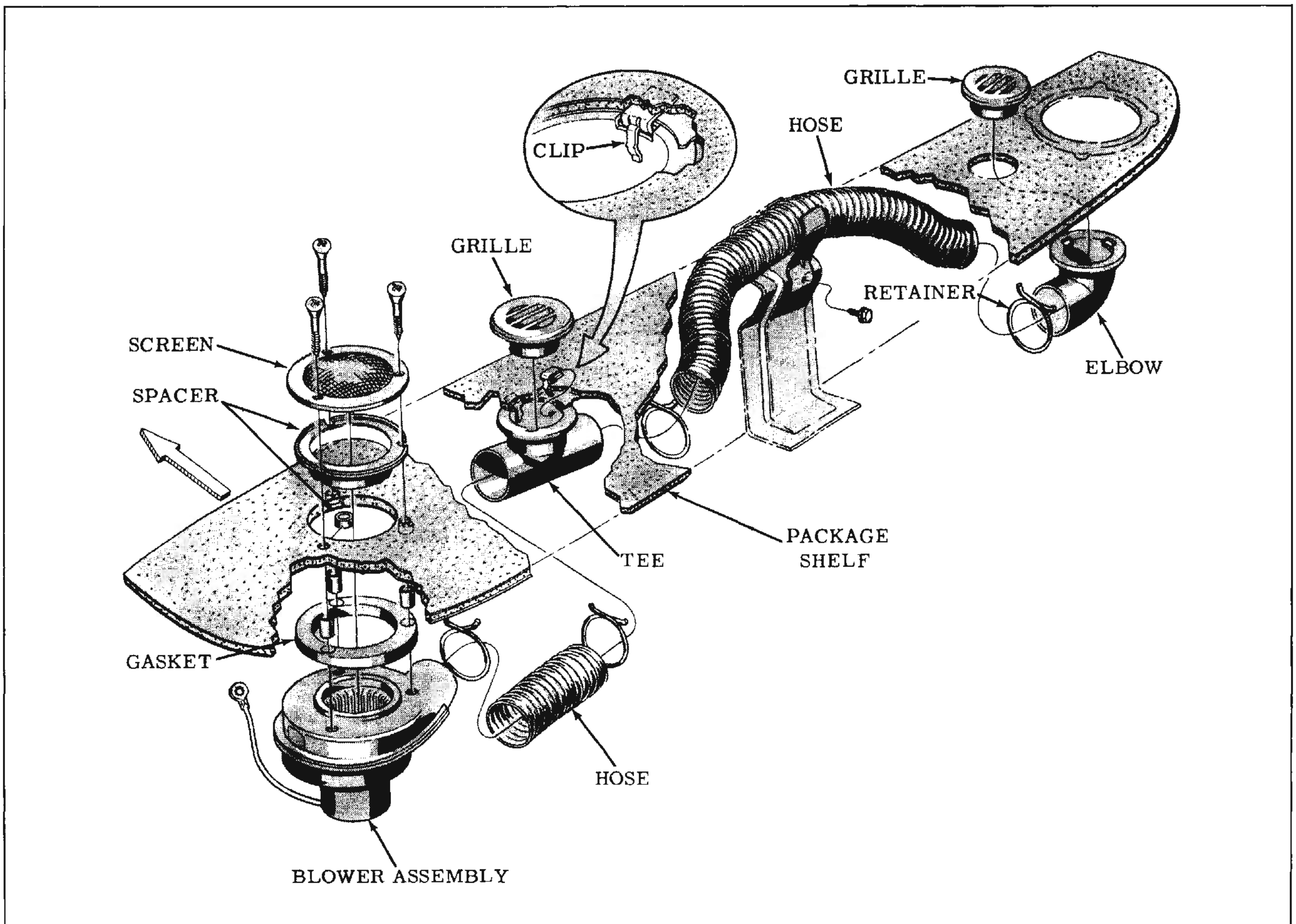


Fig. 13-46 Rear Seat Defroster

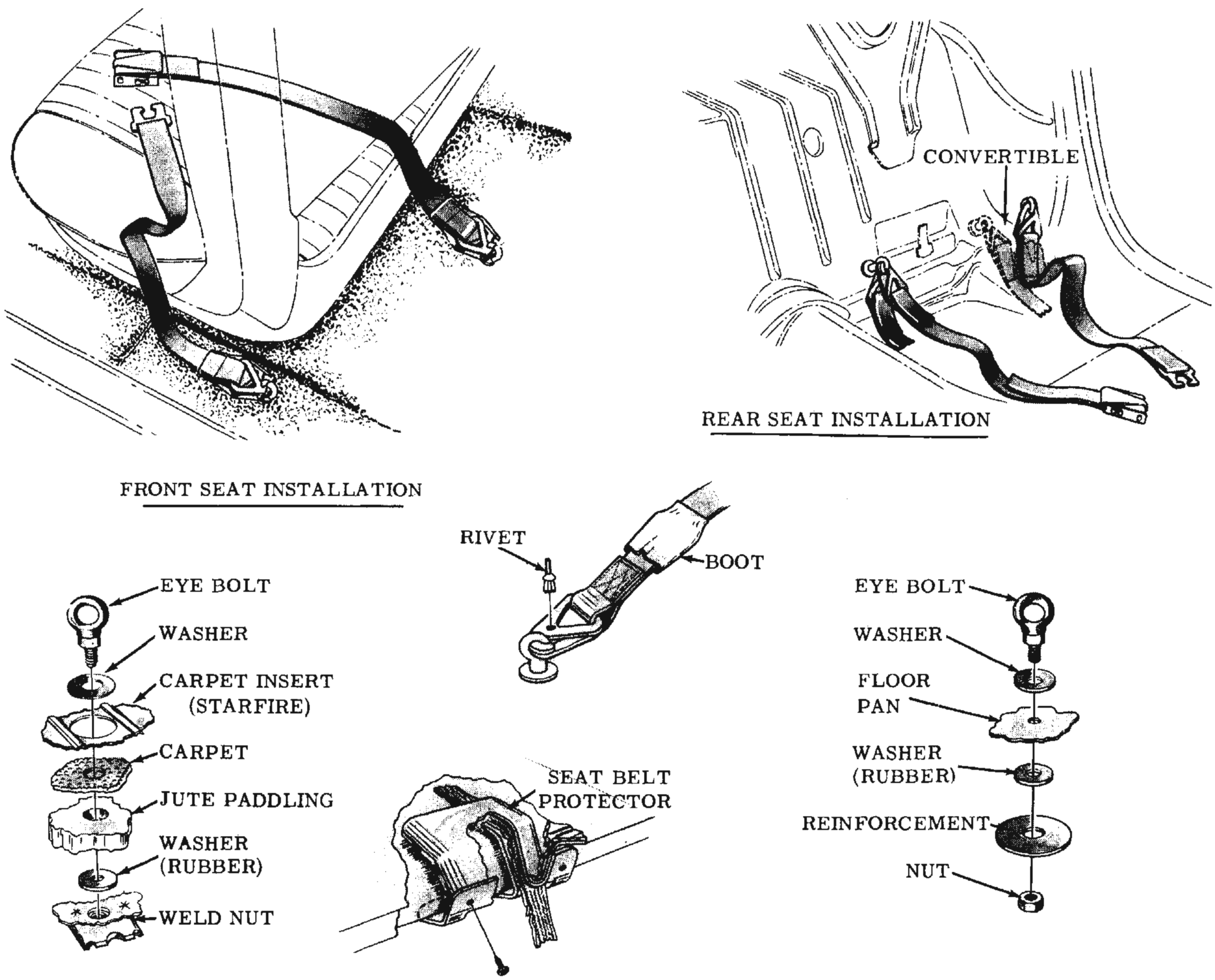


Fig. 13-47 Seat Belt Installation

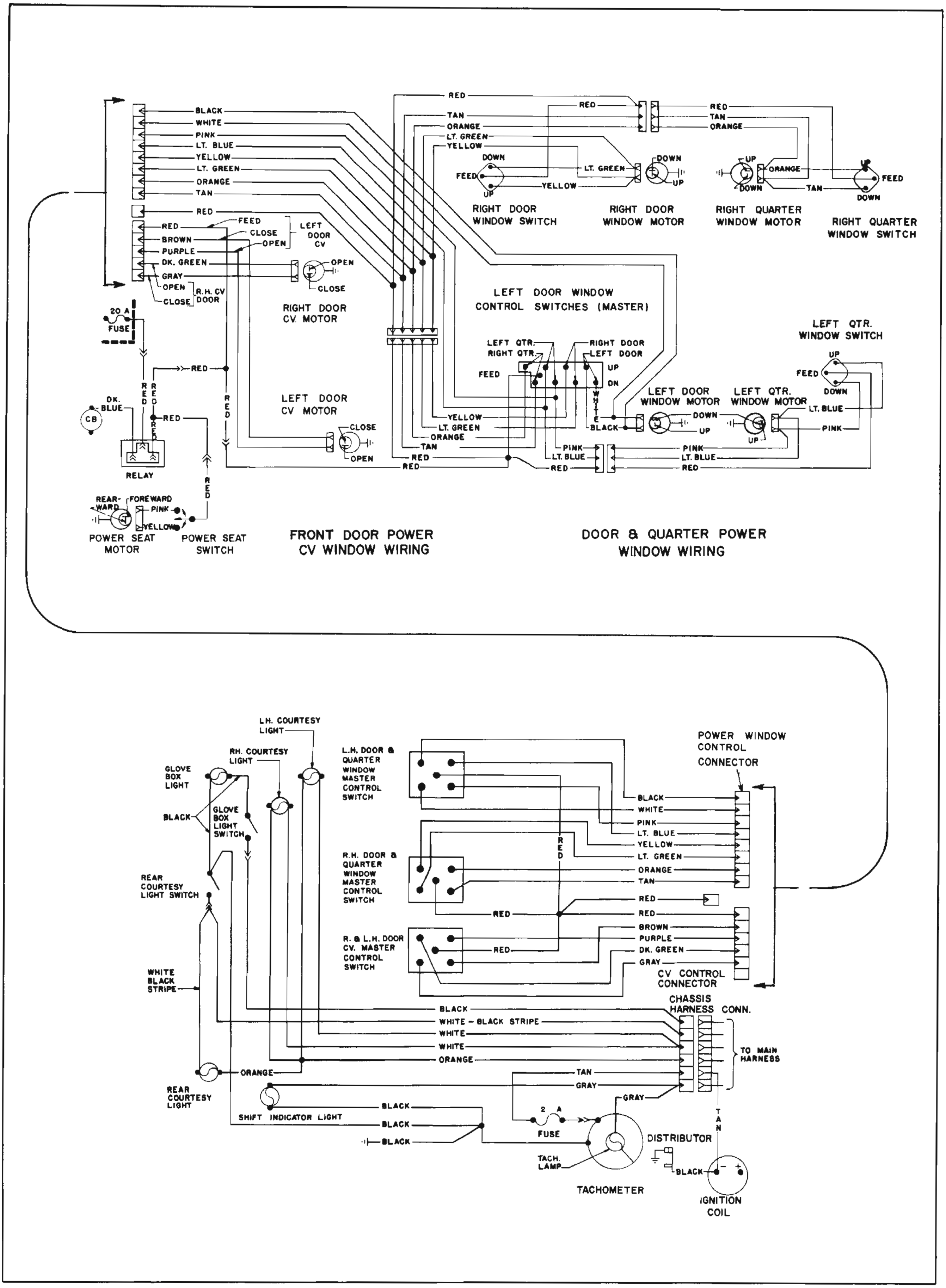


Fig. 13-48 Console Wiring Diagram

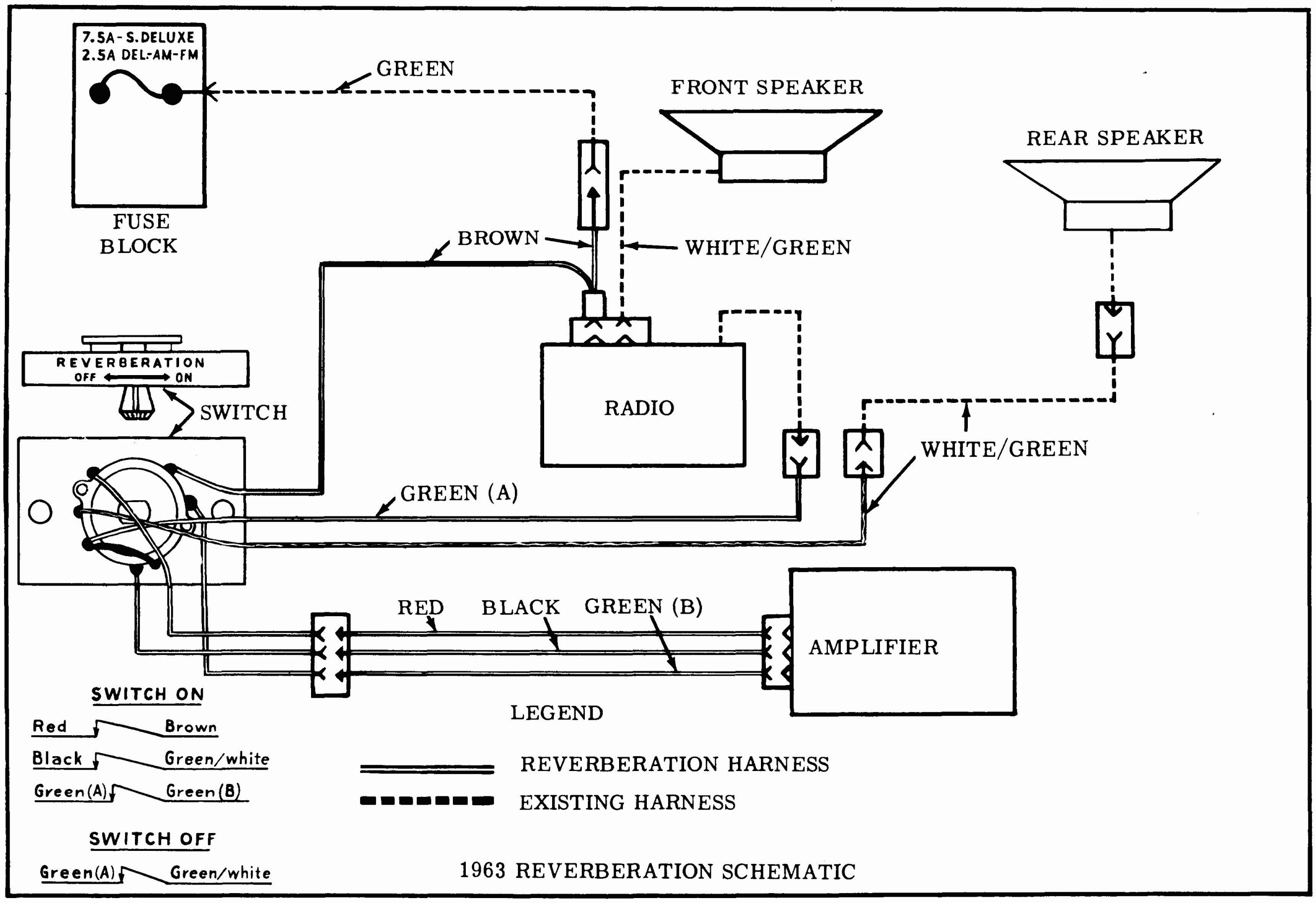


Fig. 13-49 Reverberation Wiring Diagram

INSTRUMENT PANEL AND ACCESSORIES

F-85

CONTENTS OF SECTION 13

DESCRIPTION

The instruments and instrument panel lamps are of the printed circuit type and they are connected to the wiring harness by a multiple connector plug which connects to the printed circuit board.

All the instruments are electrically operated, except the speedometer and Hydra-Matic indicator, which are mechanically operated. The generator, temperature, and oil pressure indicators use colored lights to warn the driver of conditions other than normal when the engine is operating at speeds above idle or when the engine is operating at normal operating temperature.

The lamp sockets used in the printed circuit board can be removed by turning the socket 1/8 of a turn counterclockwise. The lamp bulb can then be removed from the socket by simply pulling the bulb straight out of the socket.

NOTE: For servicing of instrument panel components, refer to the ELECTRICAL SECTION.

INSTRUMENT CLUSTER

Removal

1. Remove cluster cover attaching screws and remove cover. (Fig. 13-101) Disconnect wiring harness, clock wiring, and speedometer cable at the cluster.

2. Remove the four cluster to instrument panel attaching nuts from under instrument panel, then remove cluster from top of instrument panel. (Fig. 13-102)

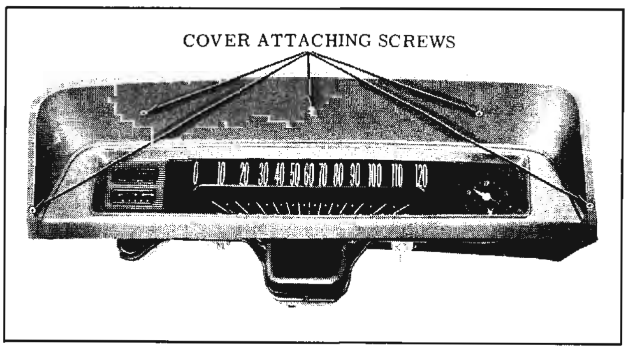


Fig. 13-101 Cover Removal

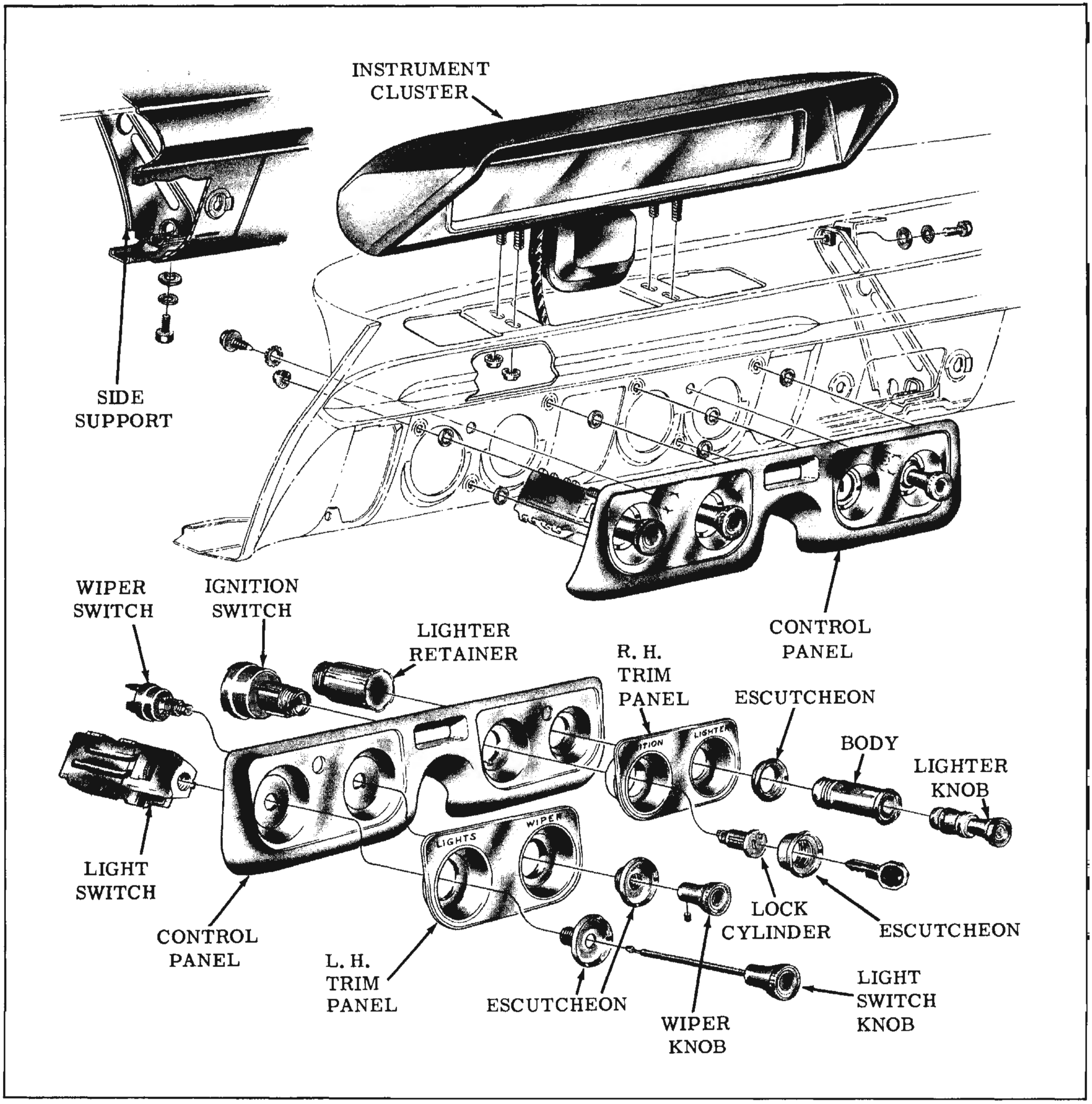


Fig. 13-102 Instrument Cluster and Panel Assembly

Installation

1. Position the instrument cluster on the instrument panel and retain with the four attaching nuts.

2. Connect wiring harness connector to printed circuit board, connect clock wiring if so equipped, and connect speedometer drive cable to speedometer head.

3. Position cluster cover on cluster and retain with five attaching screws.

SPEEDOMETER HEAD

Removal

1. Remove instrument cluster from instrument panel.

2. Remove the six instrument cluster bezel to case attaching screws and remove bezel and face from the cluster. (Fig. 13-103)

3. Remove the two speedometer head attaching screws from the case assembly and remove the speedometer head from the front of the case. (Fig. 13-103)

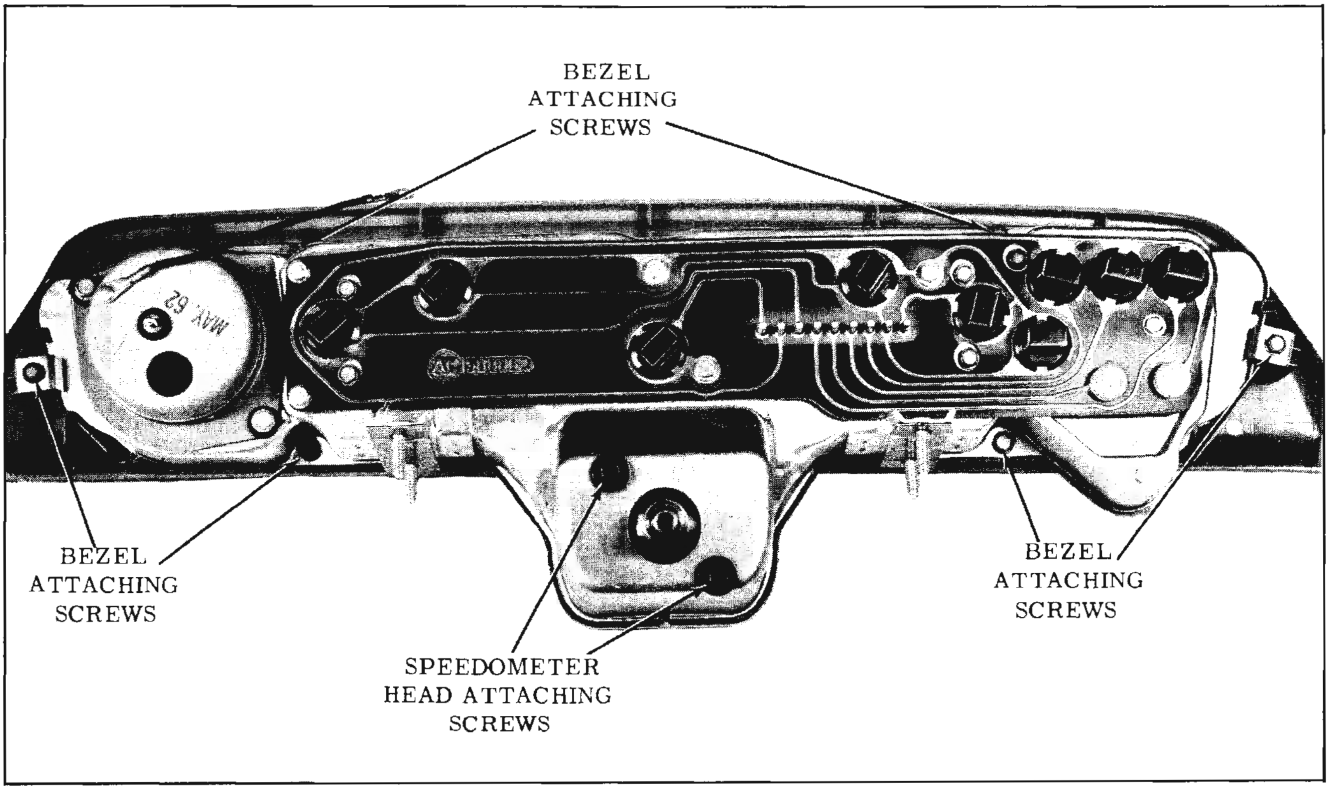


Fig. 13-103 Speedometer Head Removal

To install, reverse removal procedure.

PRINTED CIRCUIT

Removal

To prevent possible damage to the printed circuit, no attempt should be made to remove or install it without first removing the instrument cluster assembly.

1. Remove all cluster lamp sockets and the six circuit attaching screws. (Fig. 13-104)
2. Remove the two fuel gauge terminal nut insulators and terminal nuts from studs.
3. Lift printed circuit from cluster case.

Installation

When installing the printed circuit, care should be taken not to over tighten the attaching screws and nuts since they may result in cracking of the circuit board.

FUEL GAUGE

Removal

The fuel gauge assembly should not be removed without removing the cluster assembly from the instrument panel.

1. Remove cluster cover. (Fig. 13-101)
2. Remove cluster from instrument panel. (Fig. 13-102)
3. Remove the cluster bezel and face from cluster. (Fig. 13-103)
4. Remove the two fuel gauge terminal nuts and insulators at the printed circuit.
5. Remove the fuel gauge from the front of the cluster.

Use care when installing gauge to prevent damage to the indicator needle or the fine coil wire.

NOTE: For servicing and testing of the fuel gauge, refer to the ELECTRICAL SECTION.

HEADLIGHT SWITCH

All connections in the headlight switch are connected as a group by a multiple connector.

The brightness of the instrument panel lights is controlled through a variable resistor unit by turning the light switch knob right or left. Rotating the knob fully counterclockwise will cause the dome lamp to light.

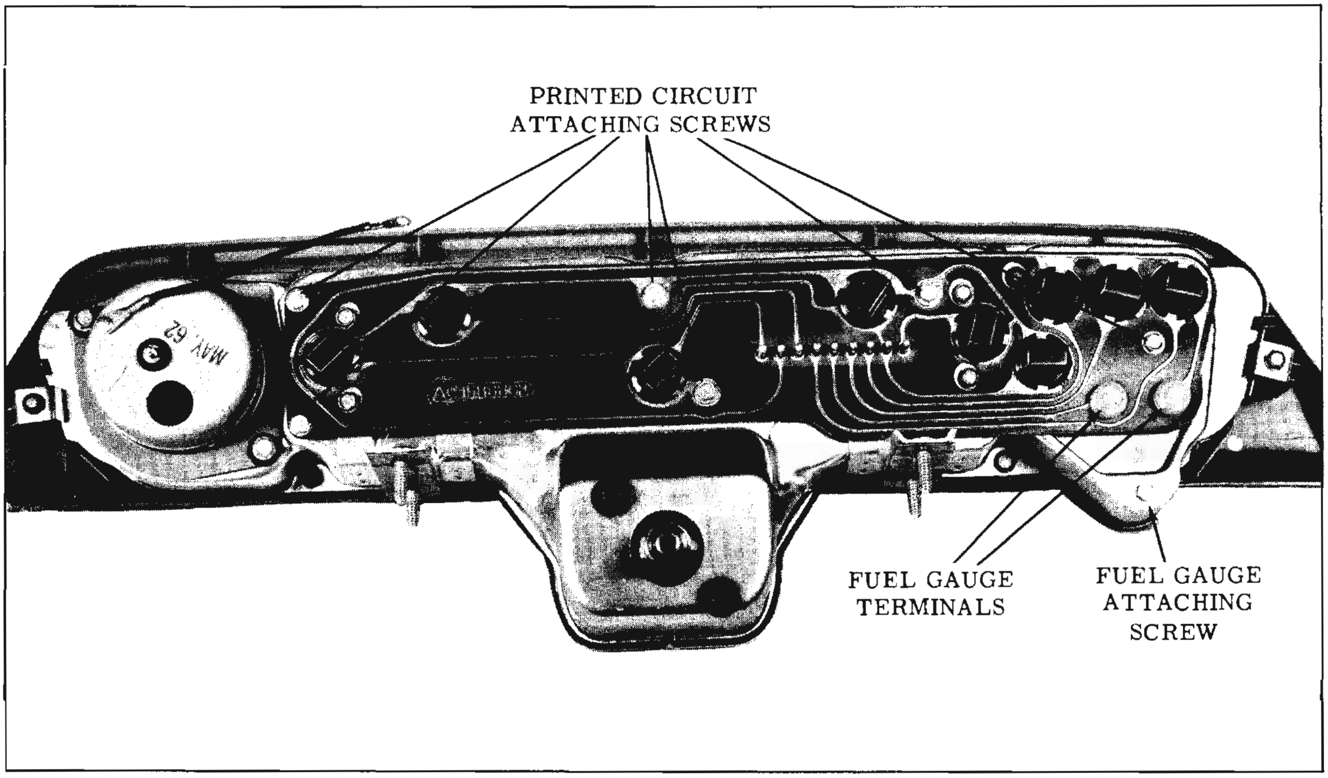


Fig. 13-104 Printed Circuit Removal

Removal

1. Disconnect wiring from light switch.

2. Remove knob by first pulling knob out to the "Headlight" position, then depress the spring loaded button on switch body and pull knob out of switch assembly.

3. Remove escutcheon nut using Tool J-6592-01.

4. Remove headlight switch from rear of instrument panel. (Fig. 13-102)

To install, reverse removal procedure and check switch operation.

WIPER CONTROL

Removal

1. Disconnect switch wiring harness.

2. Remove wiper control knob set screw and remove knob. (Fig. 13-102)

3. Using Tool J-6592-01, remove escutcheon nut and remove switch from rear of the instrument panel.

IGNITION SWITCH

1. Using Tool J-6592-01, remove escutcheon nut from switch body.

2. Disconnect wiring connector from back of ignition switch.

   NOTE: The ignition switch wiring connector is locked to the back of the ignition switch by means of a special terminal tang which fits in a hole in the terminal for the accessory wire. The connector plastic insulation has a slot in it to gain access to the tang. To remove the connector, insert a small punch or awl through the slot to depress the terminal tang and disengage it from the terminal, then pull the connector from the ignition switch. The tang automatically engages the terminal when the connector is reinstalled.

To remove lock cylinder:

1. Insert key and turn to the left.

2. Push a wire in hole in face of lock cylinder.

3. Turn cylinder to left as far as it will go and withdraw cylinder.

CIGAR LIGHTER

Removal

1. Disconnect fuse holder at back of lighter.

2. Unscrew the retainer from the lighter body behind the instrument panel and remove lighter body assembly.

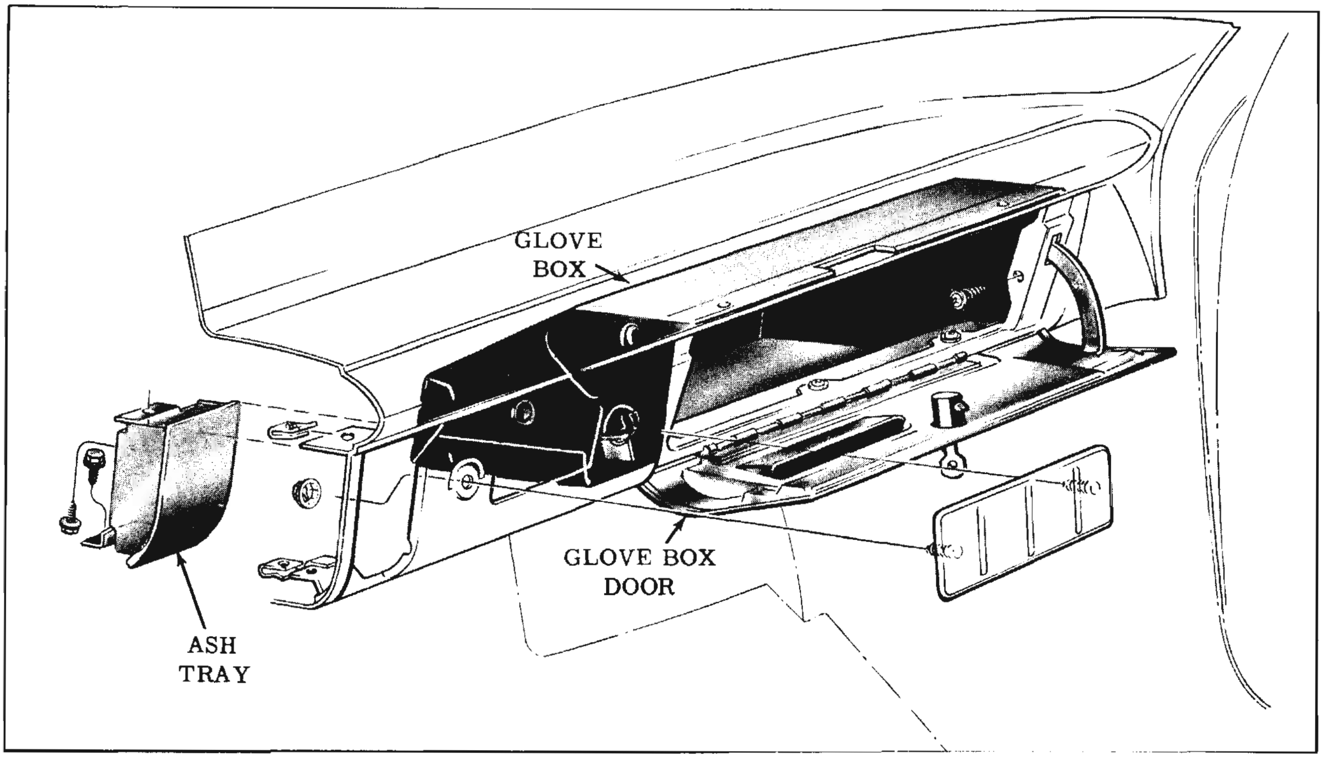


Fig. 13-105 Ash Tray and Glove Box Attachment

HYDRA-MATIC INDICATOR

Removal

1. Remove the shift indicator cover by prying off from the mast jacket.

2. Loosen the indicator set screw and remove shift indicator from shift tube.

When installing the shift indicator, align the indicator with the respective dial marking for the gear position of the selector lever before tightening indicator set screw.

VENTILATION CONTROLS

Refer to the F-85 "HEATER AND AIR CONDITIONER SECTION", Section 15.

HEATER CONTROLS

Refer to the F-85 "HEATER AND AIR CONDITIONER SECTION", Section 15.

ASH TRAY

The ash tray assembly is attached with two screws at the back of the instrument panel as shown in Fig. 13-105.

If car is equipped with air conditioning, it will be necessary to remove the glove box, the R.H. radio side support and the radio receiver to gain access to the ash tray attaching parts.

GLOVE BOX

The glove box door can be removed by rotating the rear downward after removing the three lower, two side, and two upper attaching screws. (Fig. 13-105)

GLOVE BOX DOOR

The glove box door may be adjusted vertically or horizontally by loosening the three screws holding the hinge to the door.

Fore and aft adjustment of the bottom edge may be made by loosening the three screws holding the hinge to the instrument panel.

Fore and aft adjustment of the top edge of the door or adjustment of the glove box door latch plate may be made by loosening the two screws holding the latch plate to the upper flange of the glove box door opening.

CONSOLE ASSEMBLIES

There are three basic console assemblies available on the F-85. However, variations of these three console assemblies will also be encountered since on cars equipped with air conditioning, the console map case has been eliminated, and the fact that Jetfire cars are

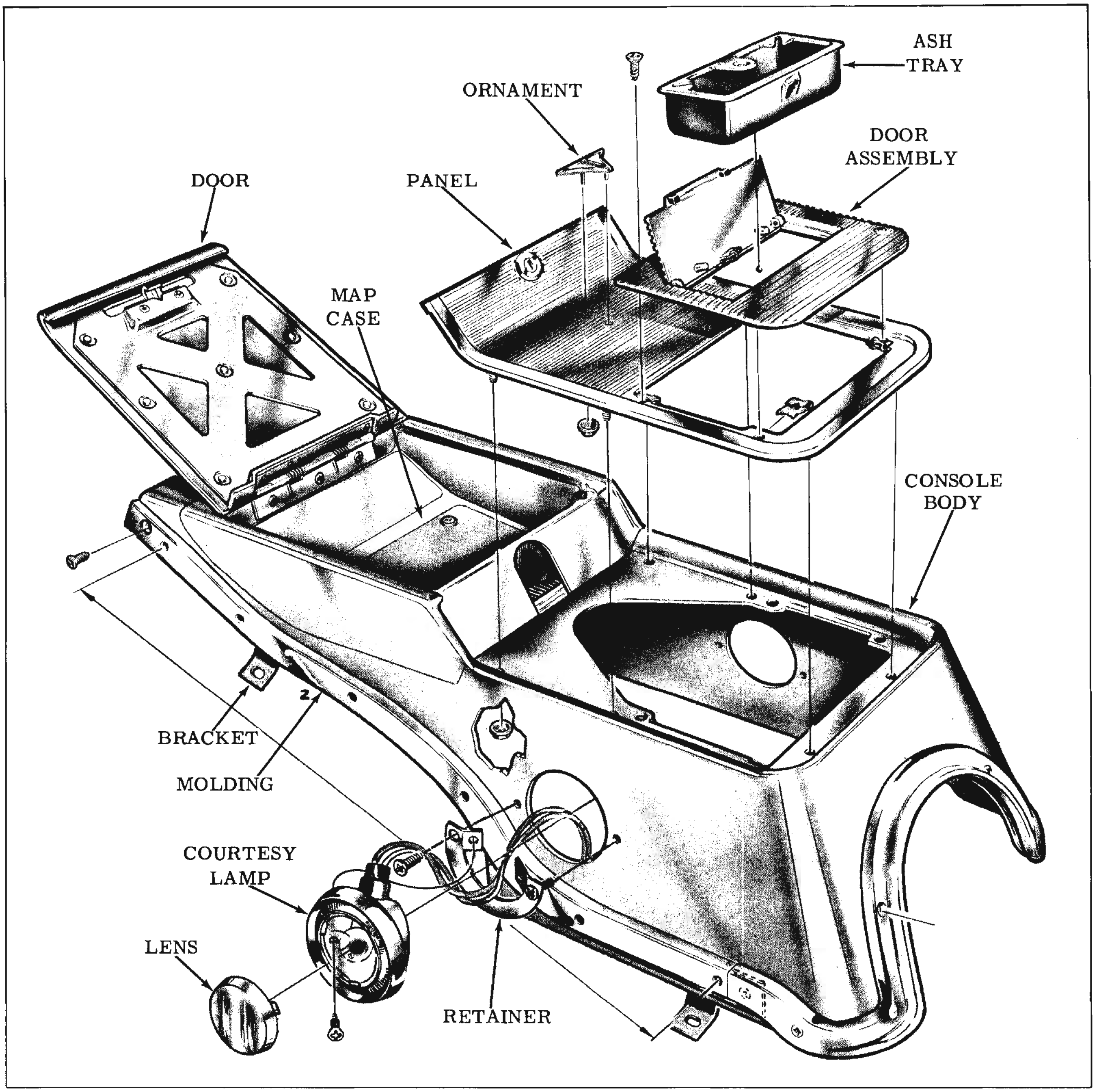


Fig. 13-106 Column Shift Console

equipped with a performance gauge rather than a tachometer; which is included with all other four-speed synchromesh transmission console equipped cars.

The console assemblies will be covered in the following order: "Column Shift Console", "Hydra-Matic Console", and "Four-Speed Synchromesh Transmission Console".

COLUMN SHIFT CONSOLE

The column shift console contains a map case, an ash tray, and two courtesy lamps. (Fig. 13-106)

Removal

The console is retained to the floor pan by sheet metal screws at four brackets on the sides of the console assembly. (Fig. 13-106) To remove, pull back the carpet from under the carpet retainers on each side and remove the bracket to floor pan attaching screws. Move the console rearward and disconnect the console courtesy lamp wiring harness. The console can then be lifted from the floor pan and if necessary it may be disassembled as shown in Fig. 13-106.

The glove box, glove box door, ash tray assembly, and the courtesy lamps may be removed without removing the console from the floor pan.

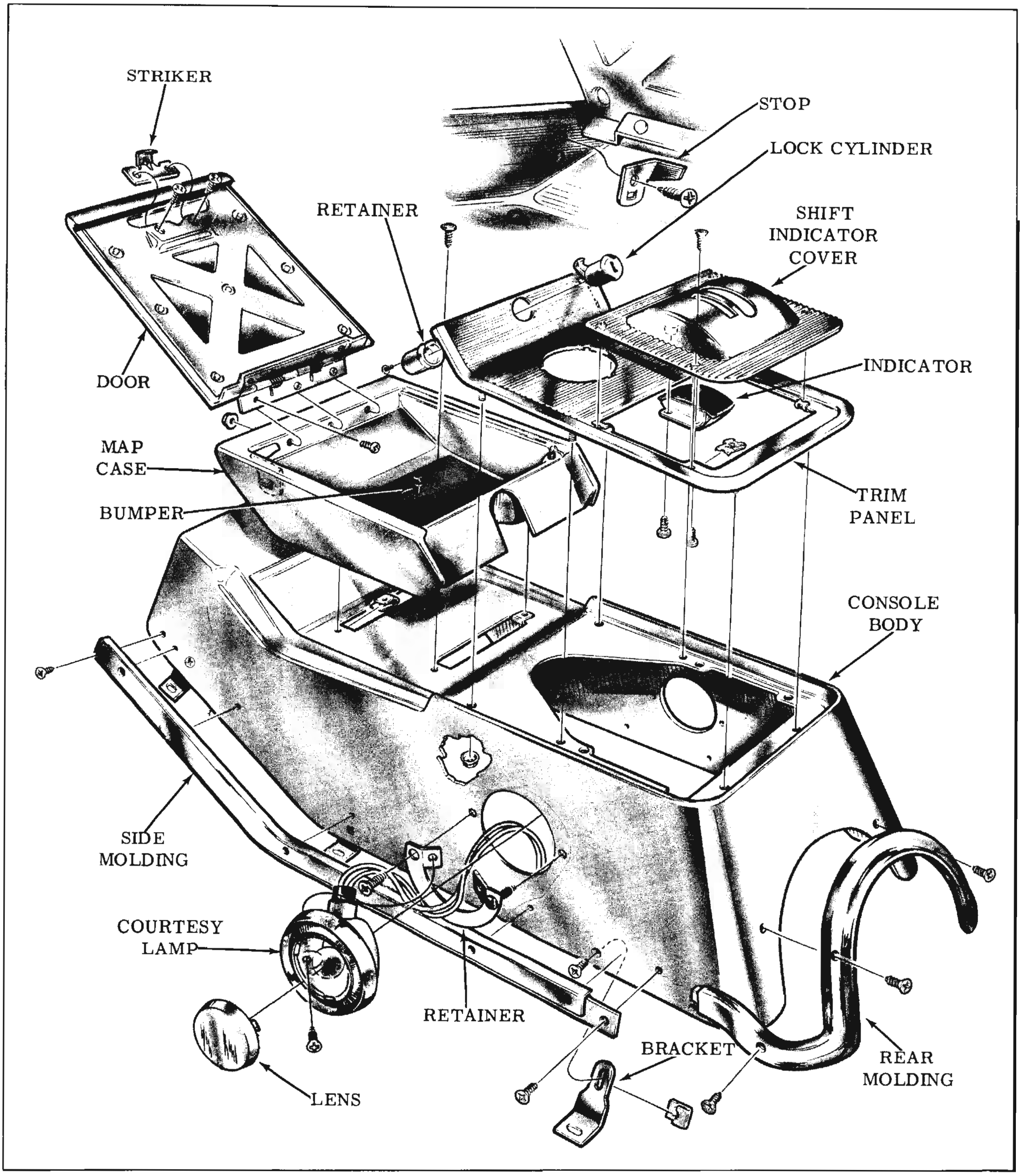


Fig. 13-107 Hydra-Matic Console

HYDRA-MATIC CONSOLE

The Hydra-Matic console contains the Hydra-Matic shift mechanism, two courtesy lamps and a map case.

Removal

The Console is retained to the floor pan by sheet metal screws at four brackets on the sides of the console assembly. To remove, pull back the carpet from under the carpet retainers on each side and remove the bracket to floor pan attaching screws. Next, remove the shift lever knob button and shift indicator pointer. Move the console rearward and disconnect the wiring harness plug. Lift the console up over the shift lever. To install, reverse the removal procedure. The console assembly may be disassembled as shown in Fig. 13-107.

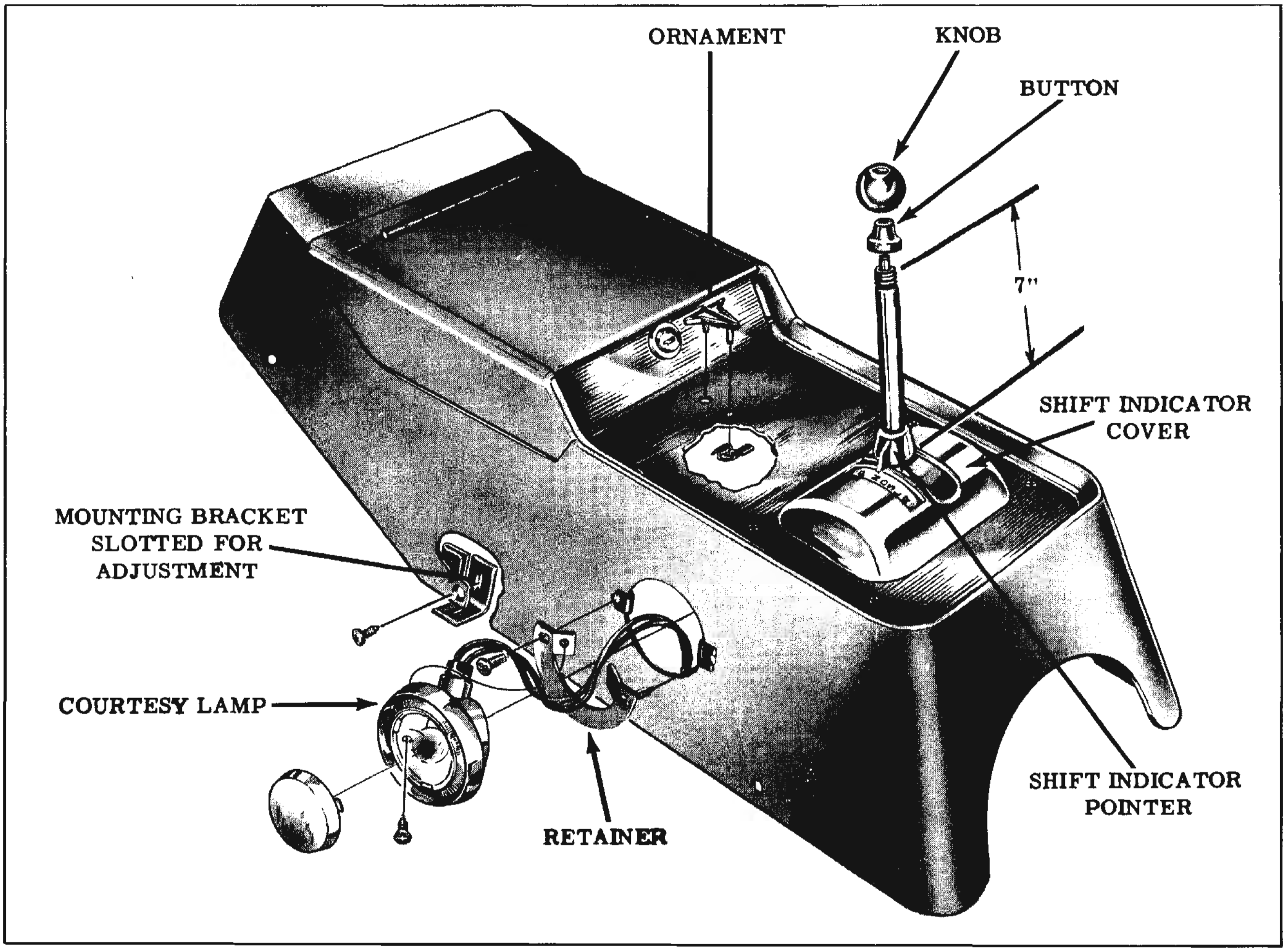


Fig. 13-108 Console Height Adjustment

NOTE: If the mounting brackets are removed from the console, it will be necessary when installing the console to establish a dimension of 7" between the end of the shift lever and the shift indicator cover as shown in Fig. 13-108.

MAP CASE AND DOOR

The map case can be removed without removing the console from the floor pan by removing the four attaching screws accessible from inside the map case compartment. The map case door can be removed at the hinge location by removing the attaching screws from inside the map case. An adjustable striker is provided on the door for proper closing.

MAP CASE LOCK

It is necessary to remove the console assembly from the car in order to remove the map case door lock.

TRIM PANEL

The trim panel is retained by six nuts accessible from the bottom side with console removed.

SHIFT INDICATOR COVER

To remove the cover,it is necessary to remove

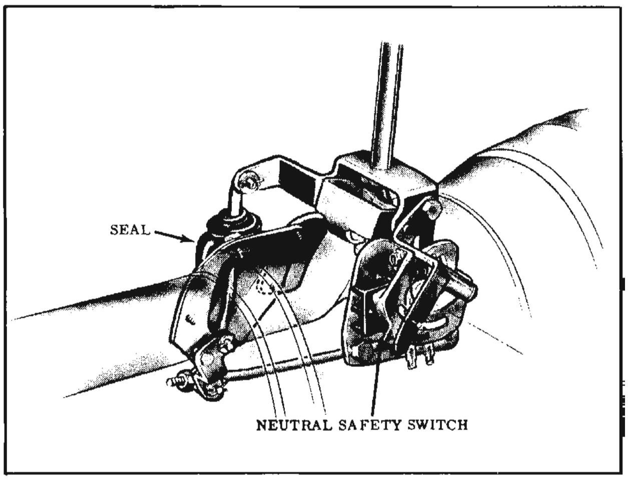


Fig. 13-109 Neutral Safety Switch

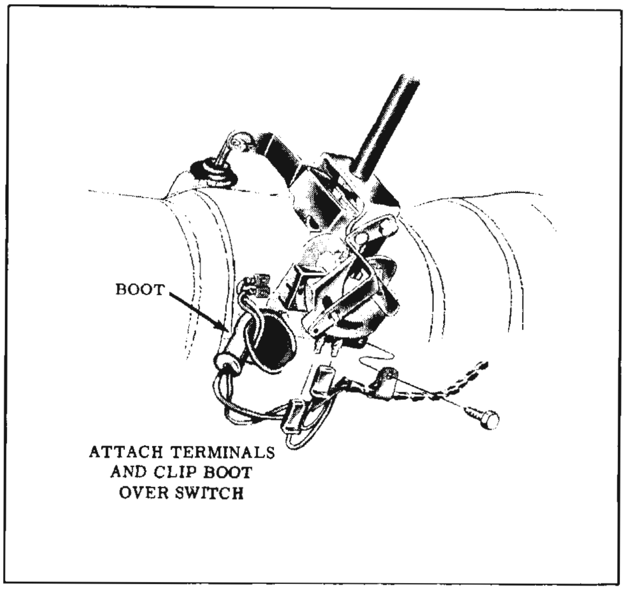


Fig. 13-110 Neutral Safety Switch Connections

the shift lever knob and button and the four cover attaching screws.

NEUTRAL SAFETY AND BACK-UP LAMP SWITCH

The neutral safety switch (Fig. 13-109) is mounted inside the console. The switch prevents starting of the engine with the transmission in gear. The engine may be started with the selector lever in "neutral" or "park" position. The switch is connected as shown in Fig. 13-110.

Checking

1. Apply parking brake firmly.

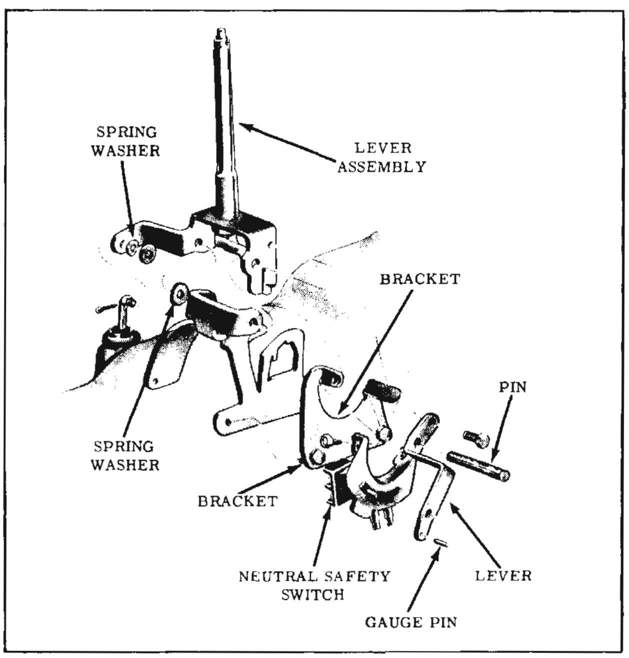


Fig. 13-111 Shift Mechanism and Neutral Safety Switch

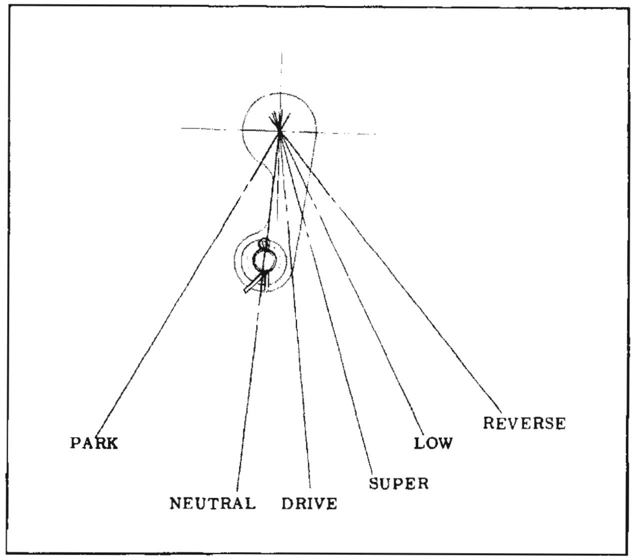


Fig. 13-112 Transmission Manual Lever Detent Positions

2. Position selector lever into "D" range and turn ignition switch to "start".
3. While holding ignition switch on "start", slowly move selector lever toward "N" position until engine cranks and starts.
4. Without moving selector lever after engine starts, depress accelerator pedal slightly to determine whether or not transmission is in gear. If neutral safety switch is properly adjusted, transmission will not be in gear.

NOTE: If equipped with back-up lights, the lights should operate with the ignition on and the selector lever in reverse.

Adjustment (Fig. 13-111)

1. Remove console.
2. Loosen the switch attaching screws.
3. With the selector lever in "neutral", position the switch so that a .090" gauge pin can be inserted through the hole in the switch arm and into the hole in the face of the switch.
4. Tighten the switch attaching screws and remove the gauge pin. Recheck adjustment.

Manual Lever Adjustment

The manual lever adjustment provides for proper clearance between the neutral detent in the transmission and the stop for the selector lever in the console.

1. Place the selector lever in the "neutral" position.

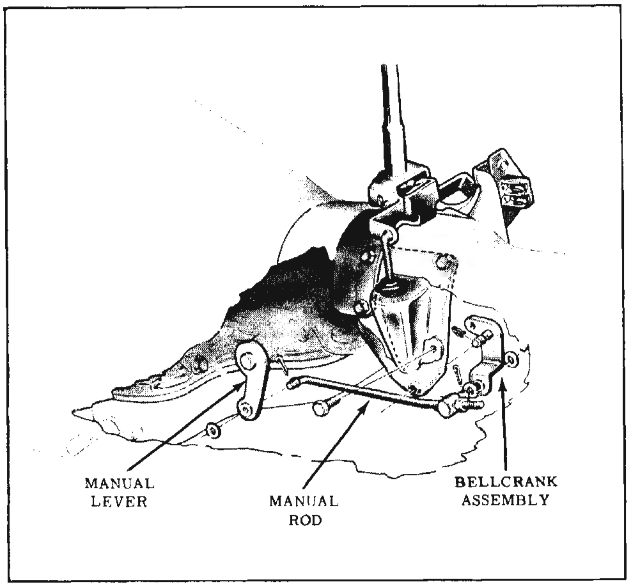


Fig. 13-113 Exploded View of Shift Linkage

2. Loosen both locknuts on the manual rod and place the transmission manual lever in the "neutral" position. (Fig. 13-112)

3. While holding the manual lever against its stop, tighten front locknut finger tight against the swivel, then tighten two more turns.

4. Lock the adjustment by tightening the rear nut. (Fig. 13-113)

Performance Gauge (Jetfire)

All 3147 models are equipped with a Performance Gauge which indicates the operation of the turbo-charger. Under normal (no boost) operation, there is a partial vacuum in the intake manifold. During this stage of operation, the Performance Gauge indicates in the "Economy" (green) or vacuum area. When the needle is centered between the "Economy" and "Power" sections, it indicates atmospheric pressure. The needle will be about centered when the engine is not operating. When the throttle is opened, additional pressure (boost pressure) is built up in the intake manifold causing the needle to indicate "Power" (red) or pressure. The gauge also contains a turbo-rocket fluid level warning lamp which lights up when the fluid tank level reaches 1-1/2 pints.

The Performance Gauge is mounted in the console directly ahead of the shift lever. To remove the gauge, it is necessary to remove the shift indicator cover to gain access to the back of the gauge. (Fig. 13-107) DO NOT ATTEMPT TO PRY GAUGE OUT SINCE THIS MAY BREAK OFF THE GAUGE RIM RETAINING TANGS.

Removal

1. Remove shift knob and button. (Fig. 13-108)

2. Remove four shift indicator cover to console panel attaching screws. Lift cover up off of shift lever and disconnect indicator dial lamp from lamp socket.

3. With the shift indicator cover removed, remove the gauge dial lamp and the turbo-rocket fluid level warning lamp from respective sockets in gauge body. Disconnect the performance gauge vacuum-pressure hose. (Fig. 13-114)

4. Depress gauge to panel retainer and push gauge up out of the console panel. (Fig. 13-114)

To install, reverse removal procedure.

Tachometer

The tachometer may be removed in the same manner as the Jetfire performance gauge.

FOUR-SPEED SYNCHROMESH TRANSMISSION CONSOLE

The four-speed console is equipped with a tachometer on all models except the Jetfire (3147) which is equipped with a Performance Gauge. (Fig. 13-115)

The console is retained by six sheet metal screws around the circumference of the shift lever seal and by two sheet metal screws at two mounting brackets, one on each side just forward of the center of the console. (Fig. 13-115)

Removal

1. Remove the four console panel attaching screws and remove the console panel, disconnecting the gauge wiring and/or vacuum-pressure hose.

2. Remove the two console side bracket screws.

3. Lift edge of seal and remove the six console and seal retaining screws.

4. Lift console body, seal, and seal retainer off shift lever. (Fig. 13-115)

To install, reverse removal procedure and after installation is completed, check position of seal on shift lever. Seal should be positioned with center of seal down on shift lever as shown in Fig. 13-116.

Tachometer

The tachometer may be removed from the console panel after removing the panel from the console. With the console panel removed, disconnect

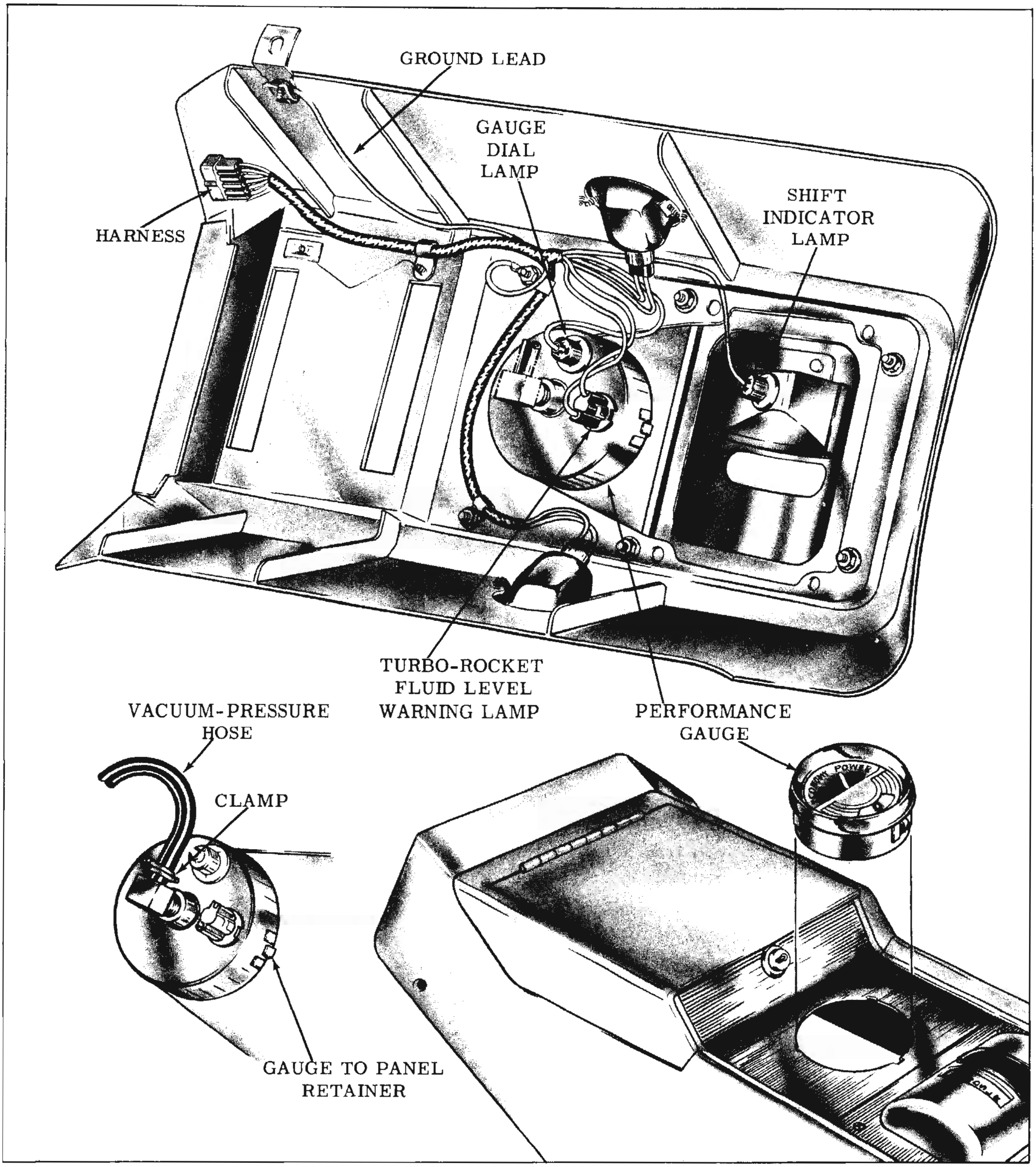


Fig. 13-114 Performance Gauge Removal

tachometer wiring and dial lamp. Depress tachometer retainer tabs and push tachometer out of console panel. (Fig. 13-117)

BACK-UP LAMPS

The back-up lamp bulb is accessible from inside the luggage compartment and may be removed from the socket assembly after removing the socket assembly from the back-up lamp housing. (Fig. 13-118)

The back-up lamps are controlled by four different types of switches (3-speed SMT, 4-speed SMT, column shift and console shift Hydra-Matics). The Hydra-Matic back-up lamp switch is combined with the neutral-safety switch.

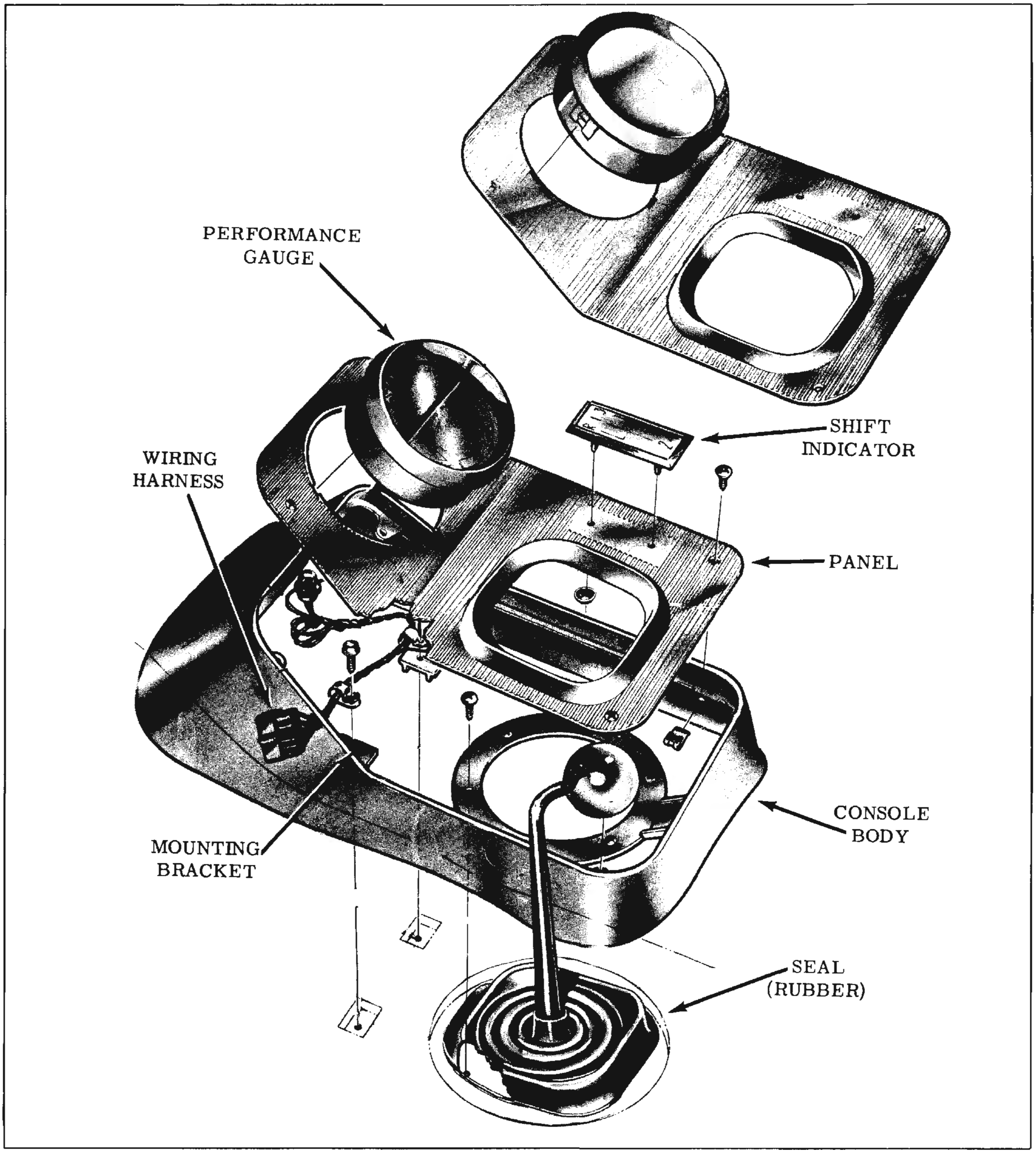


Fig. 13-115 Four-Speed Synchromesh Transmission Console

Removal of the three-speed synchromesh transmission back-up lamp switch is shown in Fig. 13-119. Wiring connections for the three-speed synchromesh transmission and the column shift Hydra-Matic transmission back-up lamp switches are also shown in Fig. 13-119.

The wiring and removal sequences for the four-speed synchromesh transmission are shown in Fig. 13-120.

BACK-UP LAMP SWITCHES

Column Shift Hydra-Matic (Neutral Safety)

Removal

1. With ignition switch in the "off" position, disconnect the neutral safety switch and

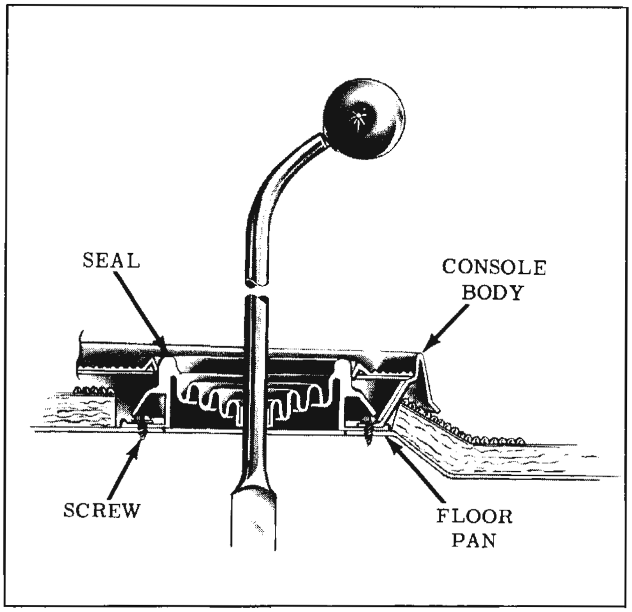


Fig. 13-116 Console Seal Position

back-up lamp switch wires, noting wire positions.

2. Remove two attaching screws and remove switch from mast jacket.

Installation

1. Position the selector lever in the "N" position.

2. Position the switch on the mast jacket so that a .090" pin can be inserted through the hole in the switch arm and into the hole in the face of the switch. (Fig. 13-121)

3. Tighten mounting screws and reconnect wires to switch.

4. Apply the parking brake firmly.

5. Place the selector lever in the "D" position and turn the ignition switch full clockwise to the "START" position.

6. While holding the ignition switch in the "START" position, slowly move the selector lever toward the "N" position until engine cranks and starts.

7. Without moving the selector lever after the engine starts, depress the accelerator pedal slightly to determine whether or not the transmission is in gear. If neutral safety switch is properly adjusted, the transmission will not be in gear.

8. Check operation of back-up lights. With neutral safety switch properly adjusted, the back-up lights should come on when the selector lever is in the "R" position.

Console Shift Hydra-Matic (Neutral Safety)

Refer to "NEUTRAL SAFETY AND BACK-UP LAMP SWITCH" under "HYDRA-MATIC CONSOLE" in this section.

THREE-SPEED SYNCHROMESH

Removal

1. Disconnect harness connectors from switch.

2. Remove two attaching screws and lift switch from mast jacket.

Installation

1. Position switch on mast jacket and install attaching screws.

2. Position adjustable operating lever so that it operates switch in reverse only. (Fig. 13-122)

Adjustment

1. Install switch on steering column using screw in single mounting hole, but do not tighten screw.

2. Place transmission shift lever in reverse. Move switch clockwise until there is approximately 1/8" gap between switch lever and stop. (Fig. 13-122) Tighten mounting screw.

3. Move shift lever to second gear. Operating lever should clear switch lever by a minimum of 1/16". (Fig. 13-123)

4. Move shift lever to neutral. Switch arm should be against stop and back-up lamps should be off. (Fig. 13-124)

5. Connect harness connectors to switch.

6. Check operation by turning on ignition and placing selector lever in reverse. Check second gear position to be sure lamps do not come on in second gear.

FOUR-SPEED SYNCHROMESH

Removal

Refer to Fig. 13-120.

Adjustment

The switch mounting bracket is slotted at both mounting bolt holes for adjustment purposes. (Fig. 13-120)

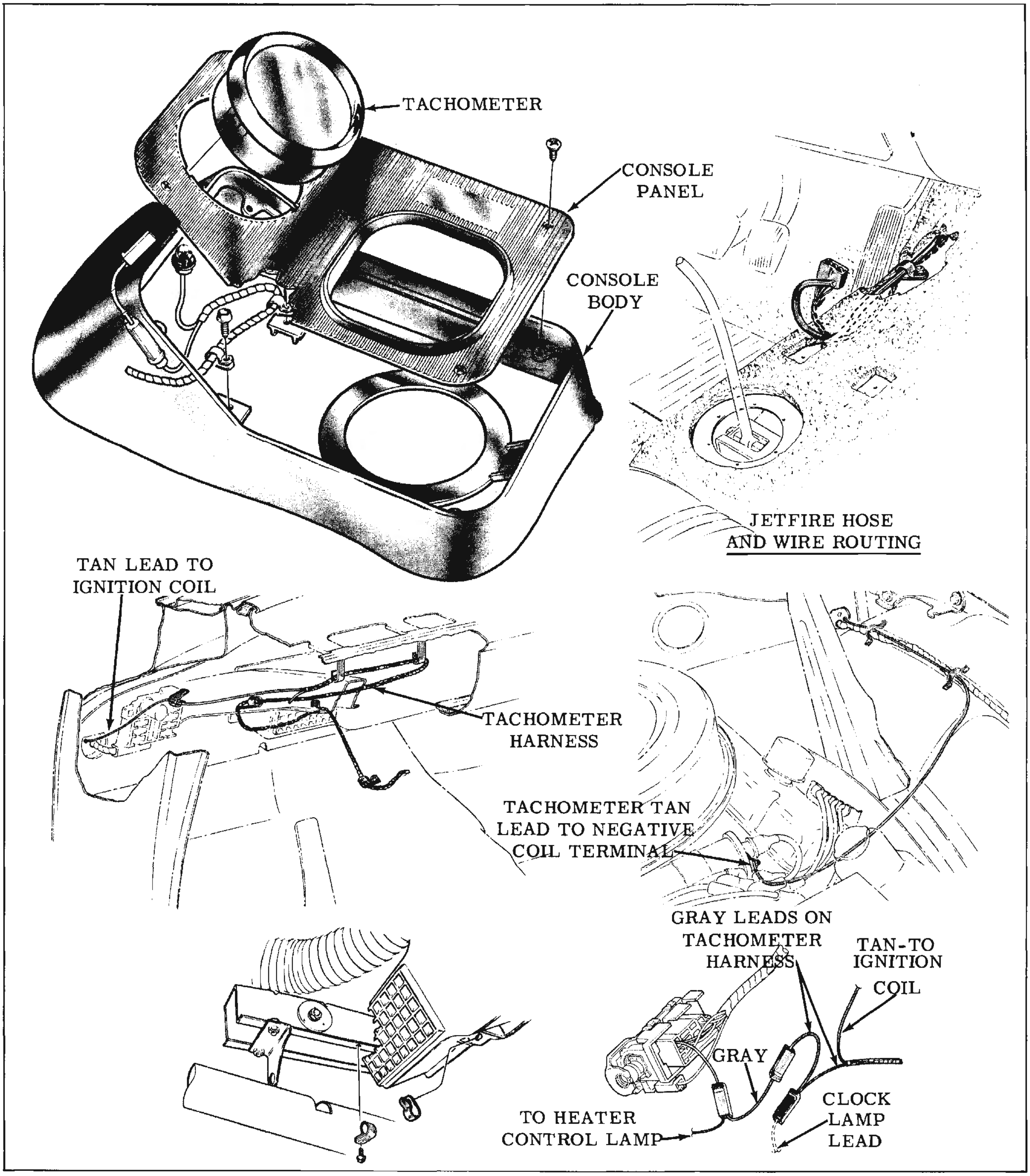


Fig. 13-117 Tachometer Wiring

CLOCK

The instrument cluster need not be removed to remove the clock.

Removal

1. Remove instrument cluster cover. (Fig. 13-125)
2. Remove the clock set knob and spacer. (Fig. 13-125)
3. Disconnect the clock ground strap at instrument cluster body.
4. Disconnect clock lead wire from terminal post and remove dial lamp from socket.
5. Remove two attaching screws and clock.

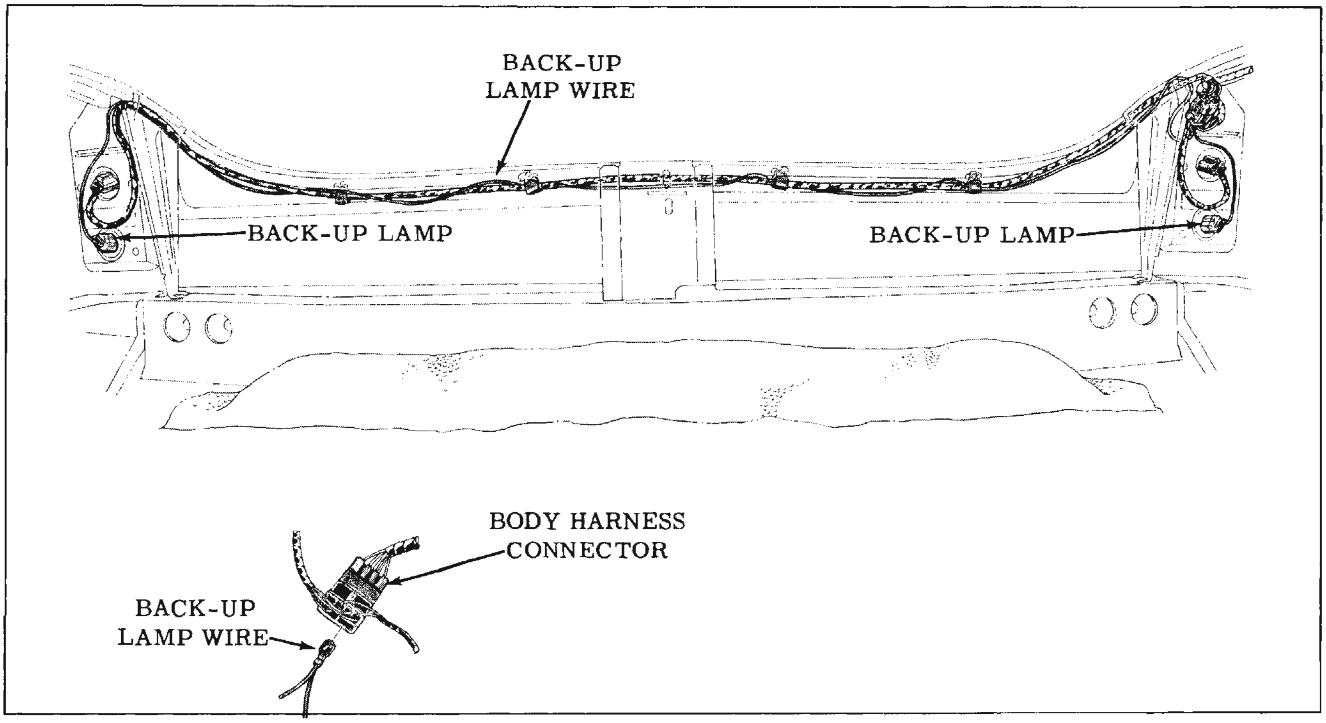


Fig. 13-118 Back-Up Lamps

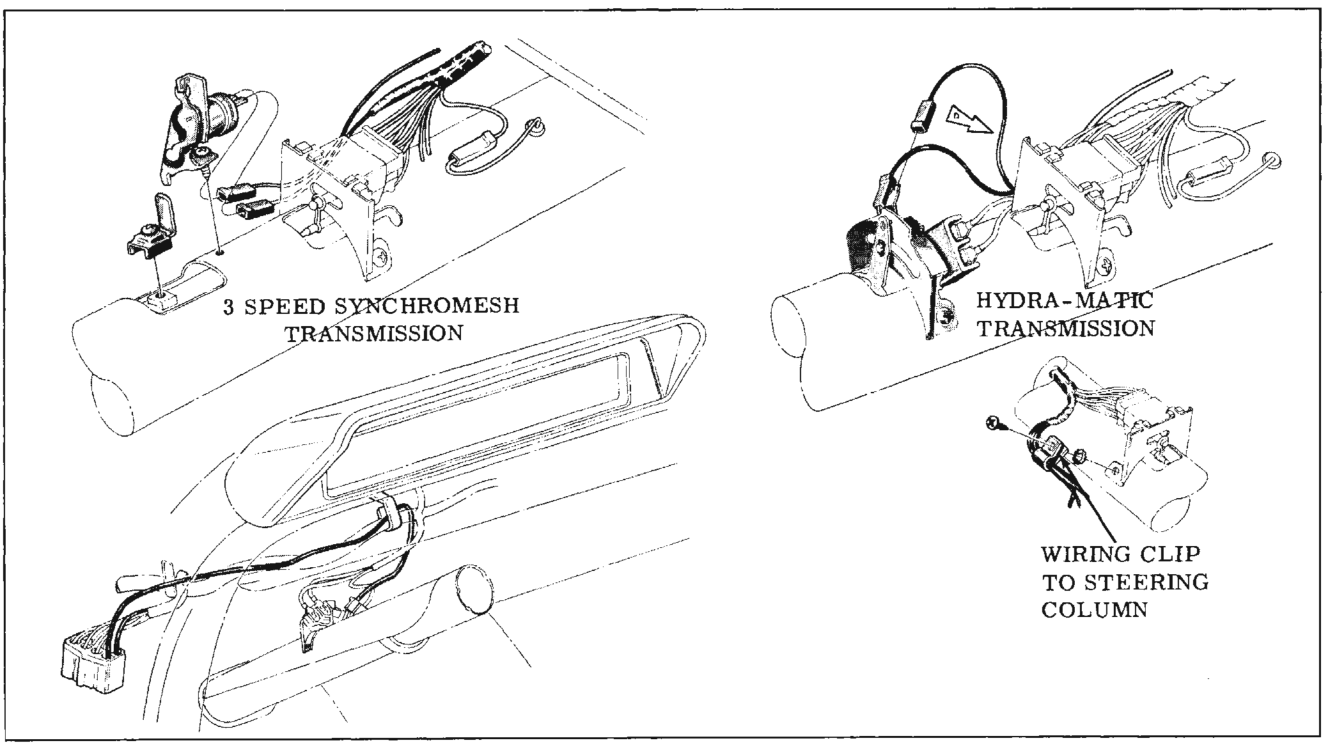


Fig. 13-119 Back-Up Lamp Switches

To install, reverse removal procedure.

INSTRUMENT PANEL COVER

Refer to the BODY Section, Section 16.

RADIO

The radio consists of the receiver unit and the speaker unit. The serial number plate on the radio is located on the r.h. side of the receiver chassis and it is visible through an opening in the l.h. end of the glove box.

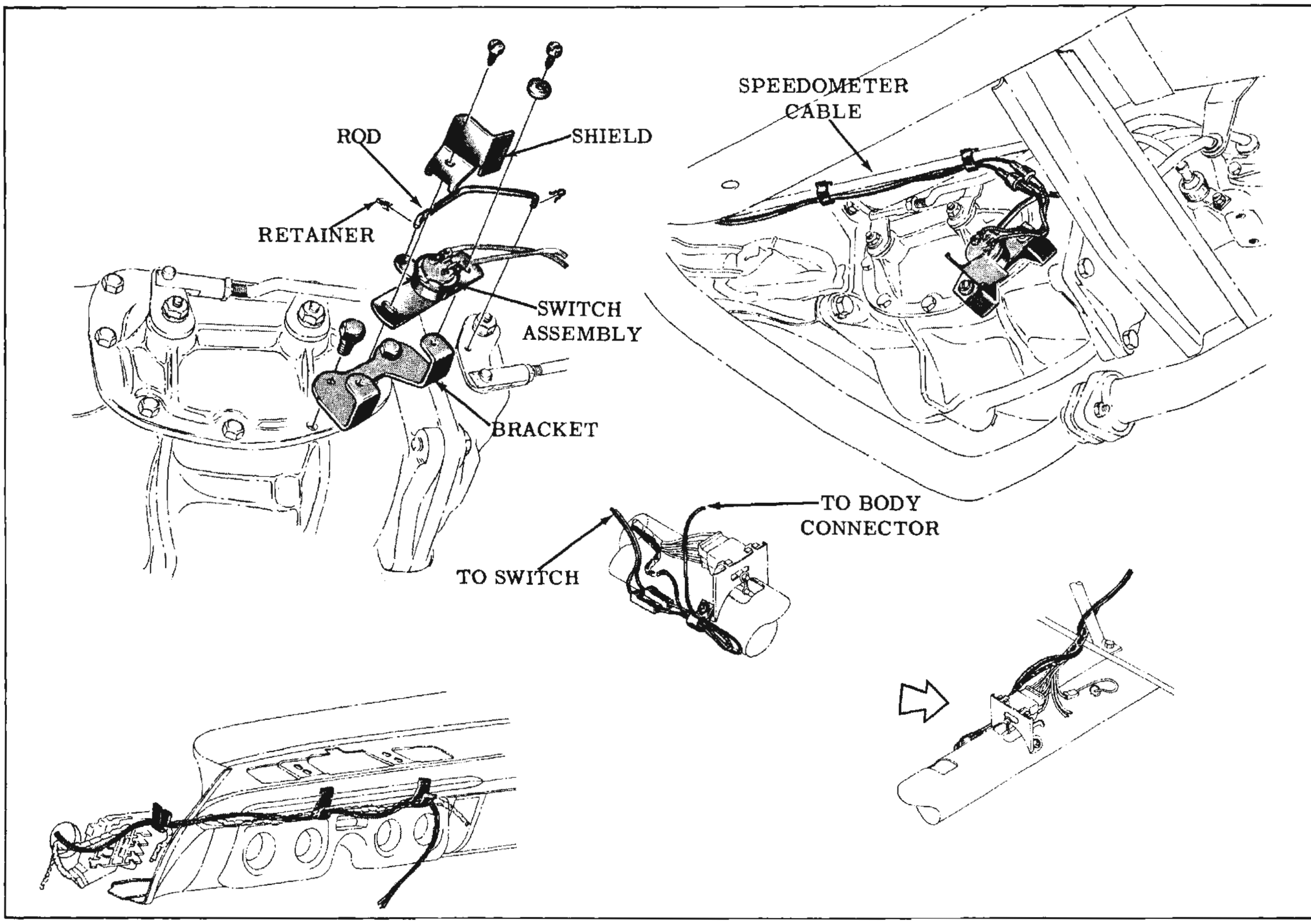


Fig. 13-120 Four-Speed Synchromesh Transmission Back-Up Lamp Switch

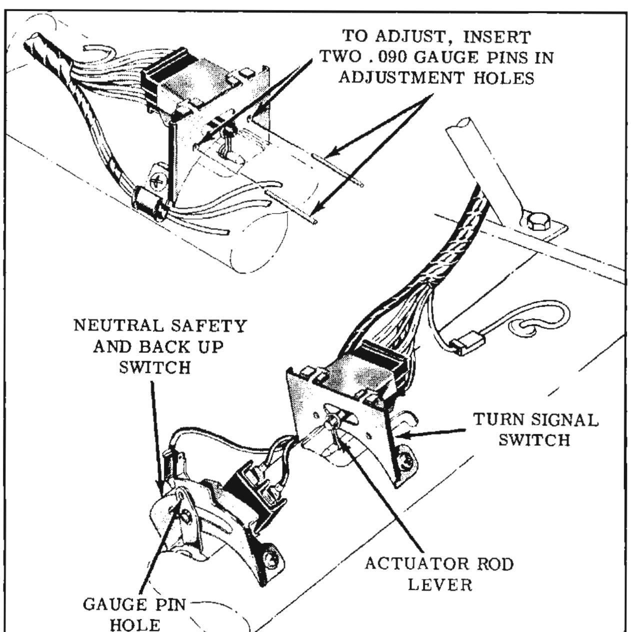


Fig. 13-121 Back-Up Lamp Switch

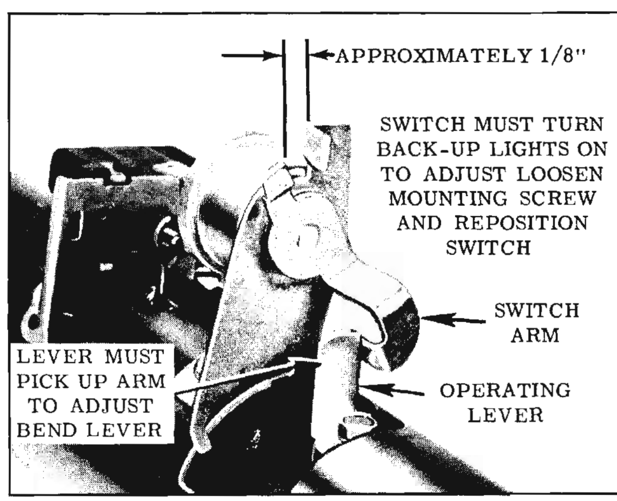


Fig. 13-122 Back-Up Lamp Switch (Rev. Pos.)

The radio receiver has five push buttons for touch tuning. By depressing a push button, the receiver can be mechanically tuned to a preselected station. The r.h. control knob can be used for manual selection of stations. The l.h. control knob is the "on-off" volume control switch. The tone control knob is stacked on the left hand shaft behind the "on-off" volume control knob.

On cars equipped with a rear seat speaker, a variable resistor control located behind the manual tuning knob (r.h. knob) modulates both the front and rear speakers simultaneously. As the

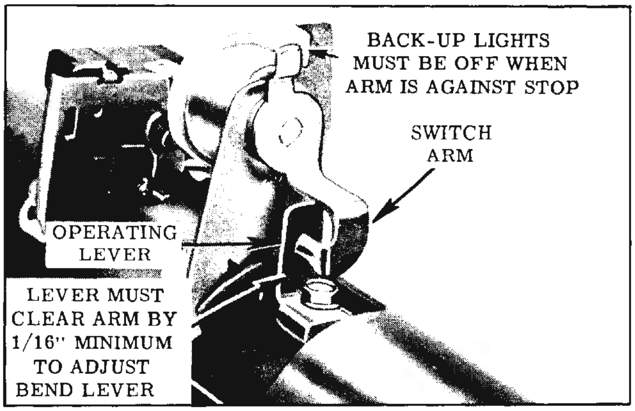


Fig. 13-123 Back-Up Lamp Switch (2nd)

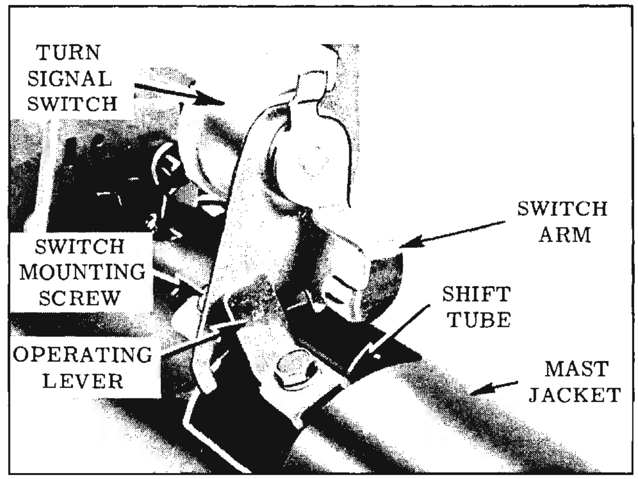


Fig. 13-124 Back-Up Lamp Switch (Neutral)

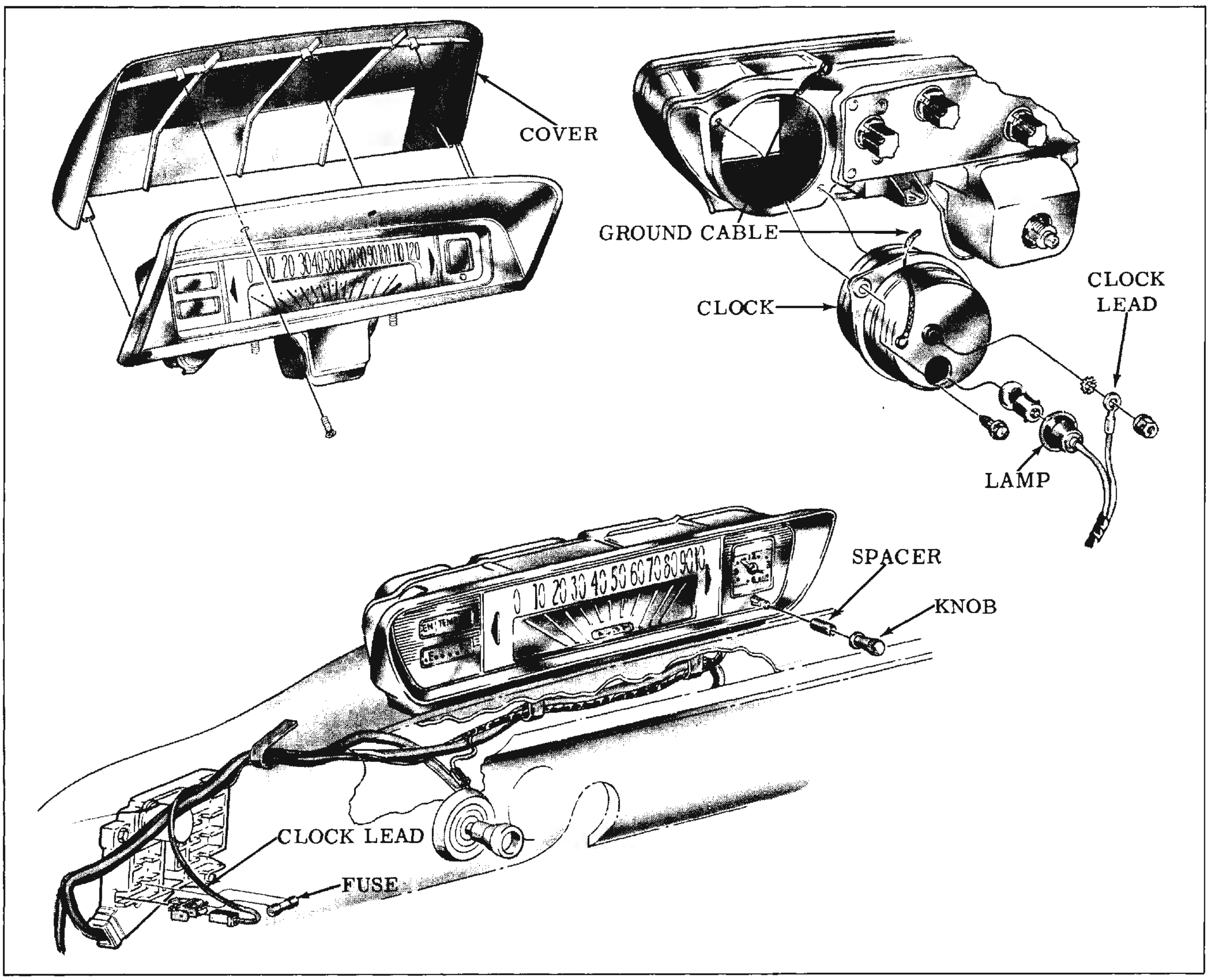


Fig. 13-125 Clock Installation

control is rotated counterclockwise, the volume of the front speaker increases while the volume of the rear speaker decreases. As the control is rotated clockwise, the volume of the front speaker decreases while the volume of the rear speaker increases. After the desired speaker modulation is obtained, the volume of both speakers can be simultaneously regulated by the volume control knob.

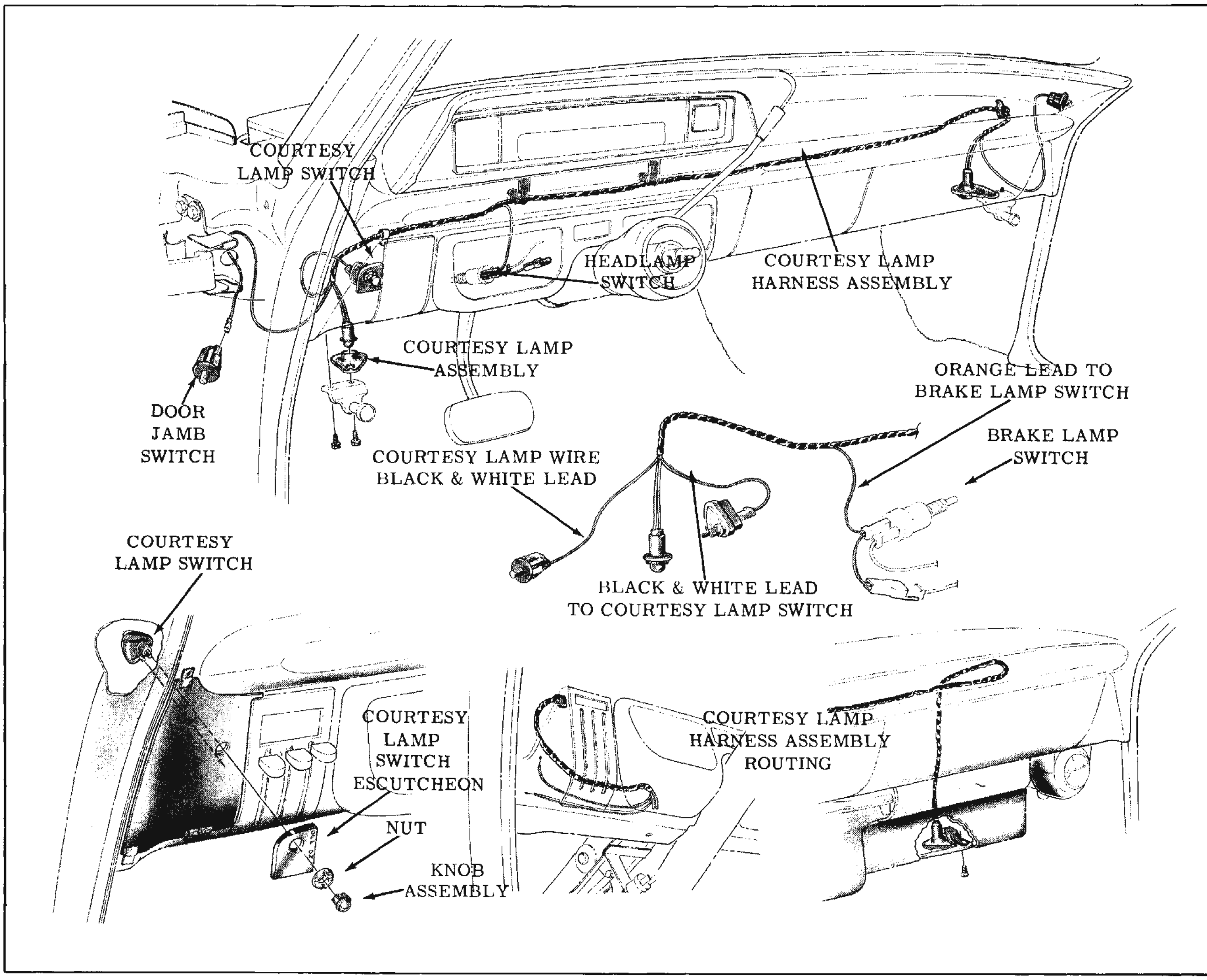


Fig. 13-126 Courtesy Lamps

Push Button Adjustment

1. Allow the receiver to warm up for a few minutes.

2. Select a push button for the desired station. Holding the button to the left, pull the button out to the extreme position.

3. Tune in the desired station manually.

4. Push the selected button to its maximum IN position. The button will then be locked on the selected station.

5. Proceed in the same manner to set the remaining push buttons.

6. After all the buttons have been adjusted, recheck the settings. Push each button, then see if the station can be tuned in more accurately manually. If so, repeat Steps 2, 3, and 4.

RECEIVER REMOVAL

1. Disconnect electrical connector from l.h. rear of receiver. Disconnect antenna lead-in and rear seat speaker wire (if so equipped) from r.h. rear of receiver. (Fig. 13-134)

2. Remove radio control knobs and nuts.

3. Remove r.h. radio mounting bracket to side support bolt, washer, and lockwasher, while supporting the receiver, then remove the receiver.

To install, reverse removal procedure.

On cars equipped with air conditioning, the radio may be removed without disturbing the air conditioning system as follows:

1. Remove the glove box from the front of the instrument panel.

2. Remove the radio bracket to side support bolt, washer, and lockwasher.

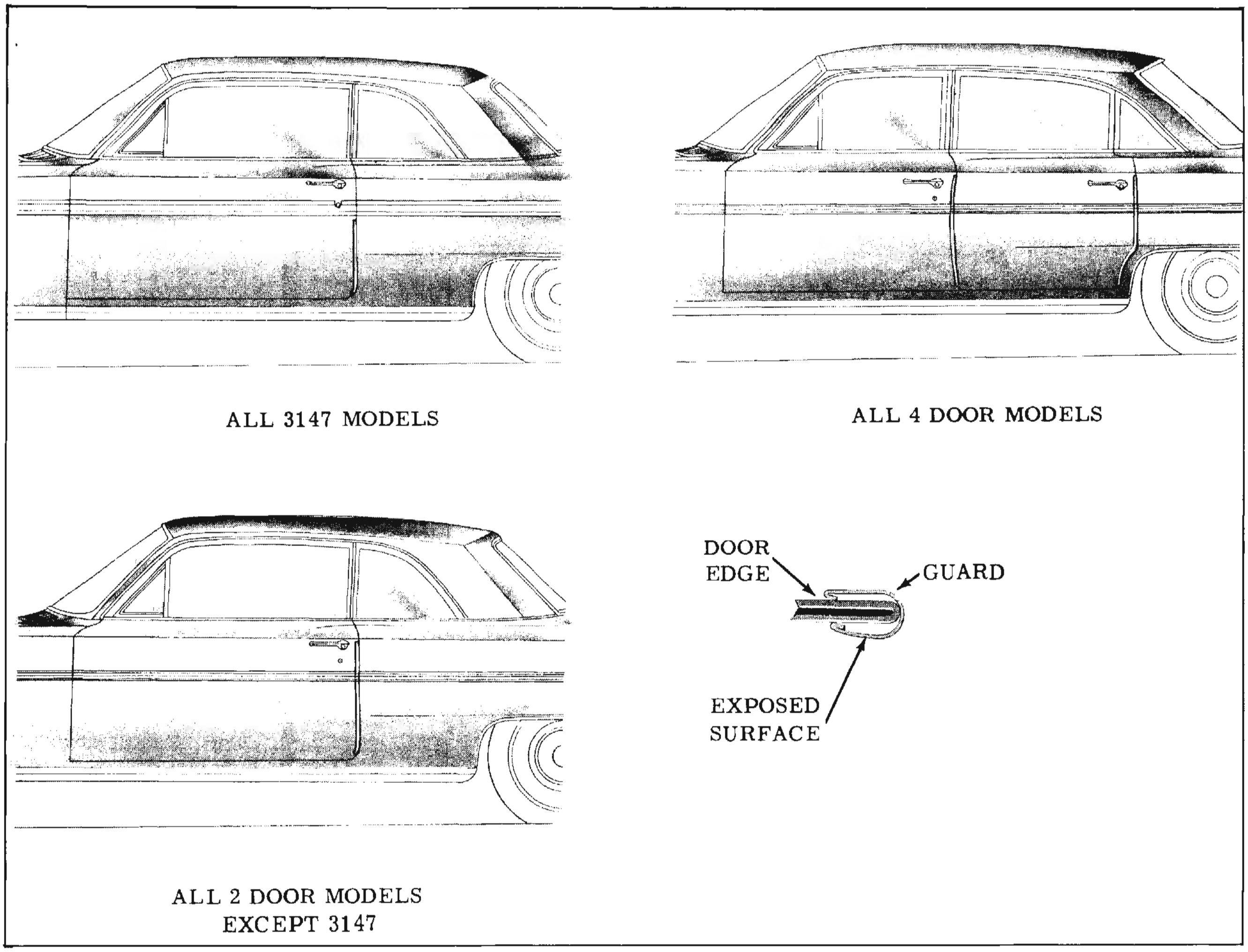


Fig. 13-127 Door Guards

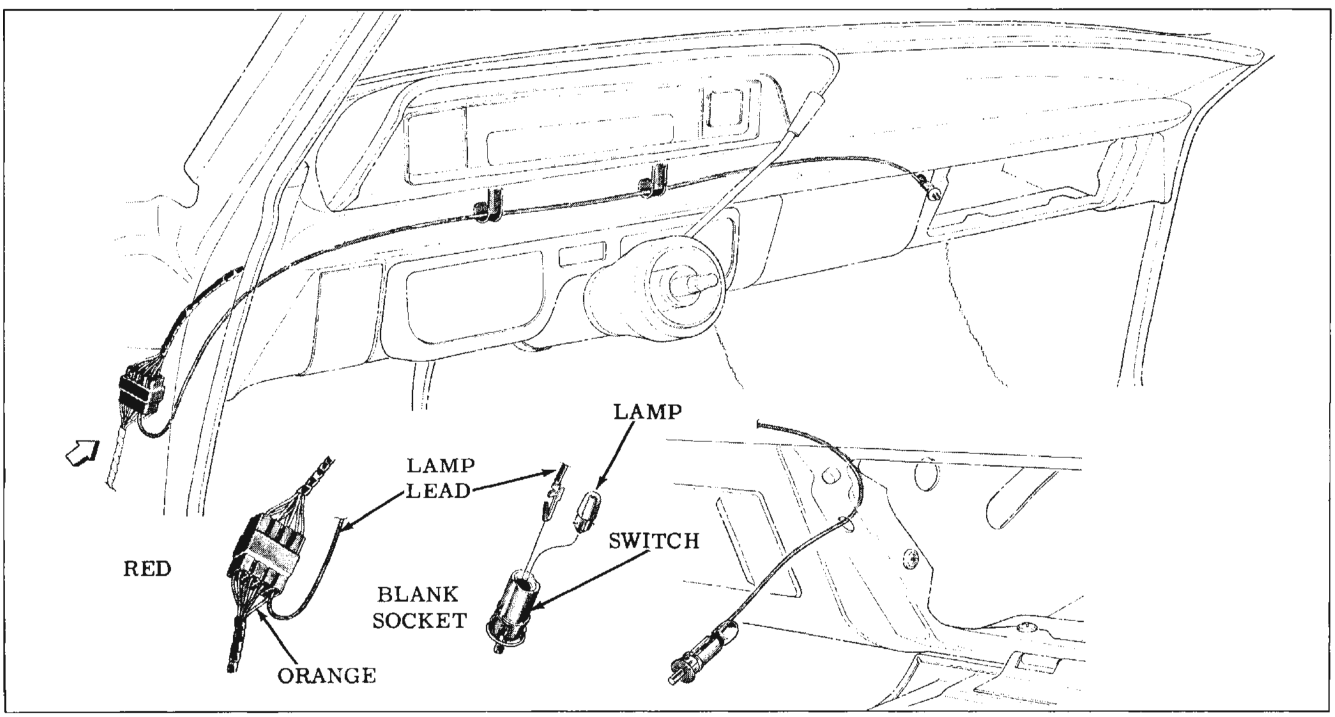


Fig. 13-128 Glove Box Lamp

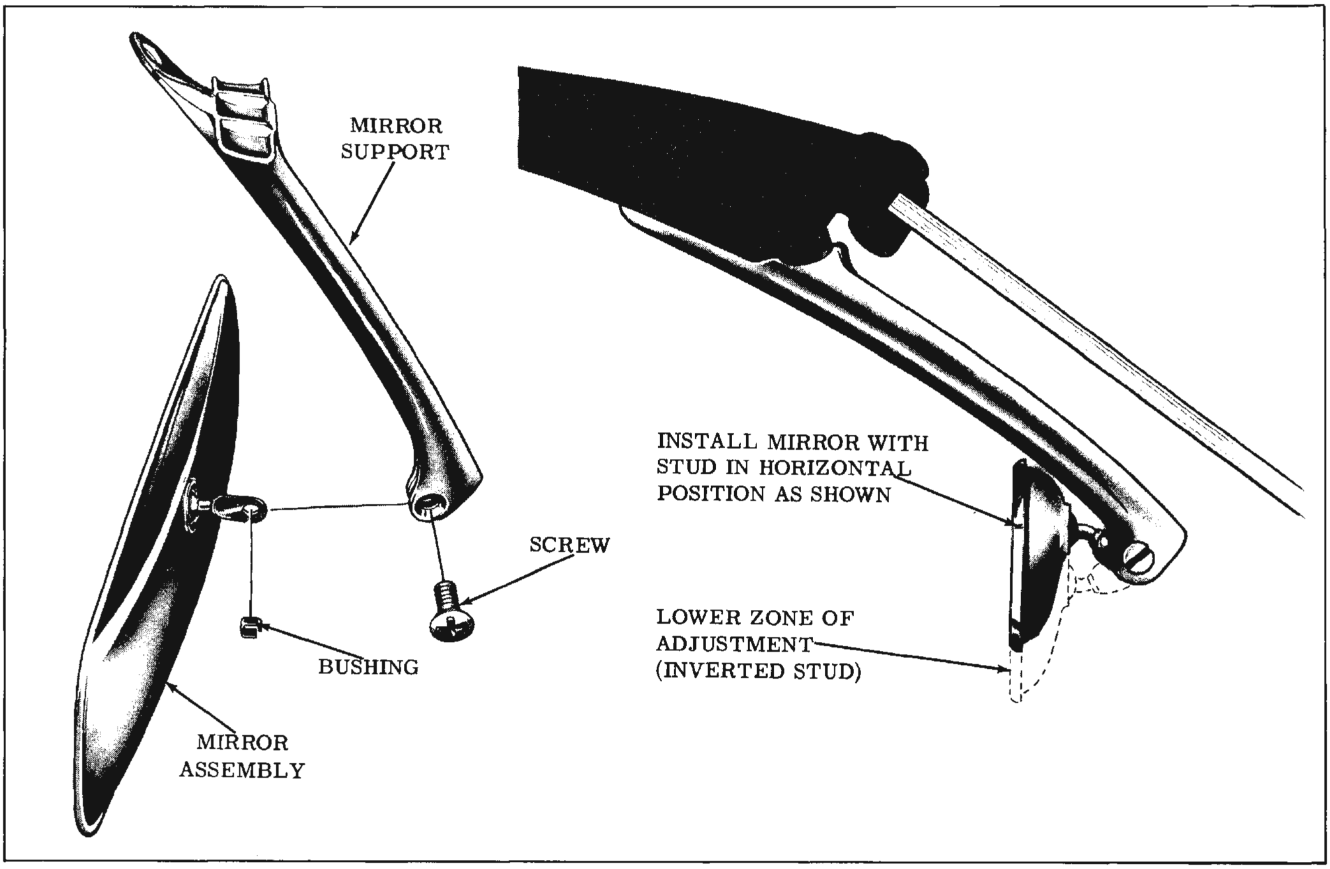


Fig. 13-129 Inside Rear View Mirror

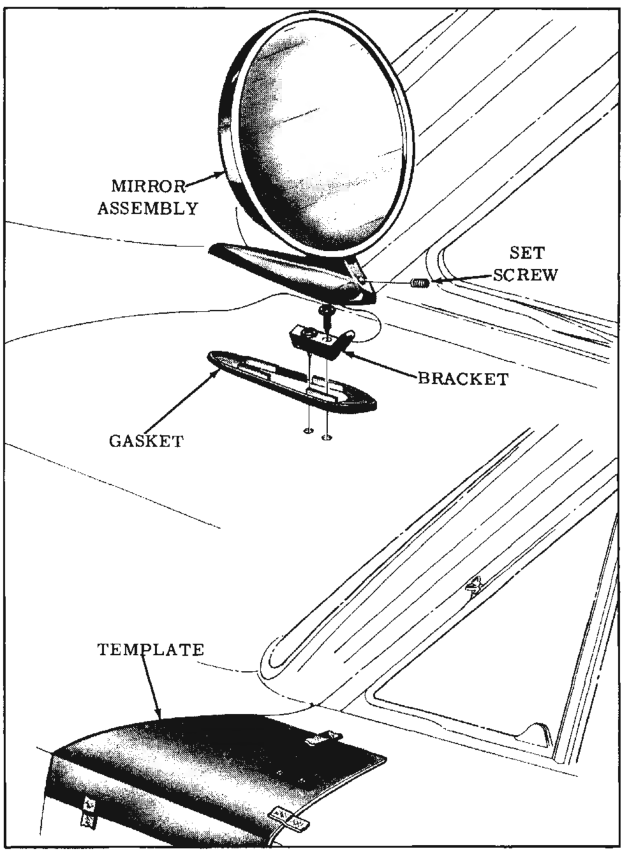


Fig. 13-130 Outside Rear View Mirror

3. Remove the side support to lower instrument panel attaching screw from beneath instrument panel.

4. Remove the side support to dash attaching bolt and remove side support through glove compartment opening.

5. Disconnect the electrical connector, antenna lead-in, and rear seat speaker wire, if so equipped.

6. Remove radio knobs and nuts and remove radio through glove compartment opening.

To install, reverse removal procedure.

Radio Dial Lamp

The receiver dial lamp may be removed after removing the receiver from the instrument panel and after removing the receiver top cover. The lamp number is 1893. (Fig. 13-135)

ANTENNA

Trimmer Adjustment

1. Remove the manual tuning knob and dummy knob or rear seat speaker control knob. The

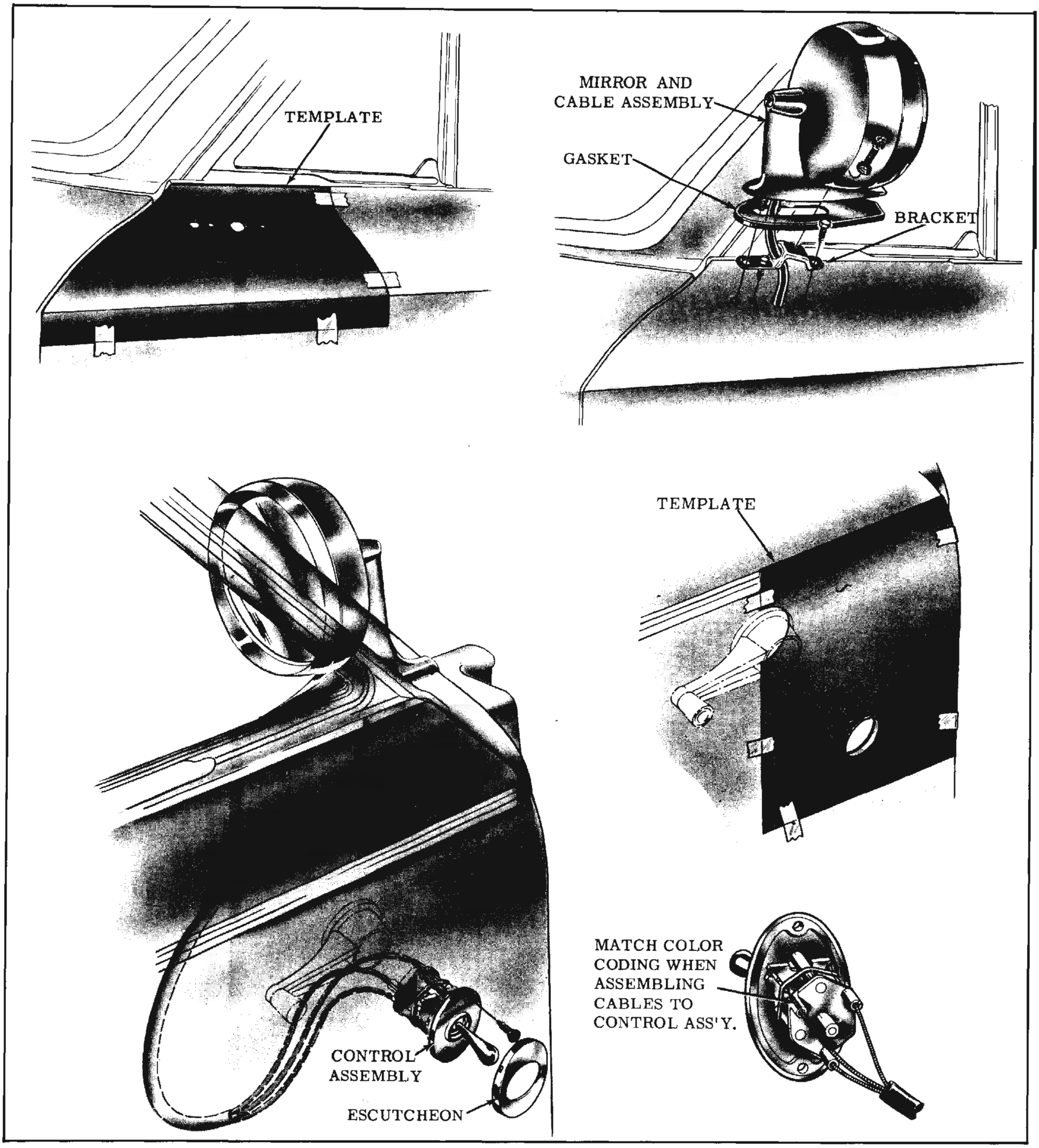


Fig. 13-131 Remote Control Outside Rear View Mirror

antenna trimmer screw is now accessible through the hole in the escutcheon. (Fig. 13-134)

2. With the antenna fully extended, turn the receiver on.

3. Tune the receiver to a weak station between 600 k.c. and 1000 k.c. Adjust trimmer screw until the best reception for this station is obtained.

4. Replace manual tuner knob and dummy knob or rear seat speaker control knob.

Checking Antenna

To check antenna for partial short, remove lead-in from side of receiver and check resistance from lead-in connector to a good ground using an ohmmeter. Resistance should be three megohms or more.

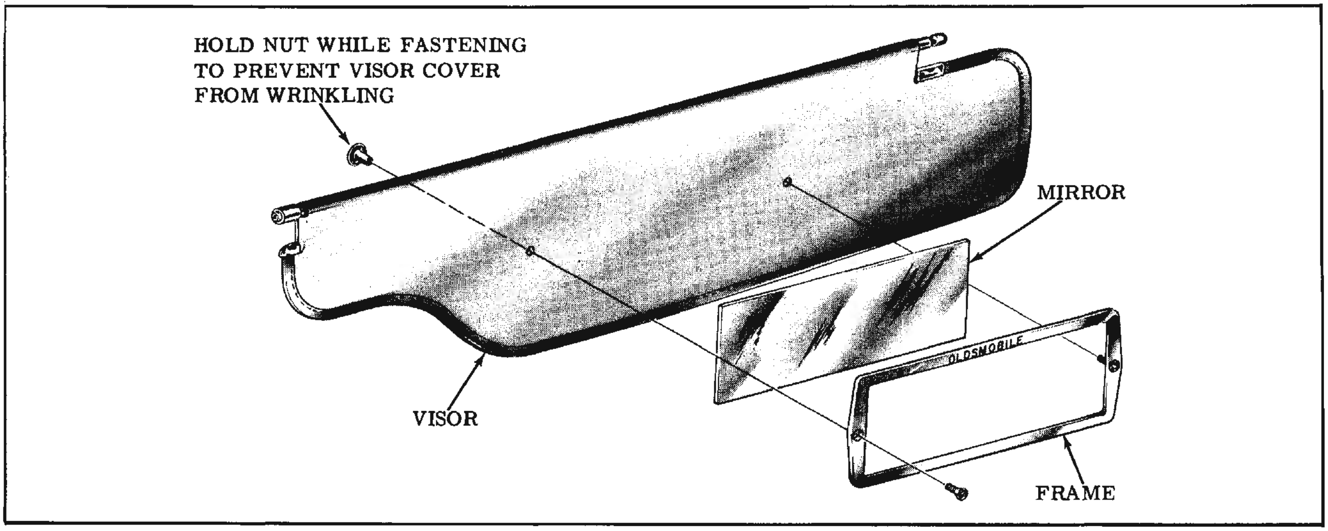


Fig. 13-132 Visor Vanity Mirror

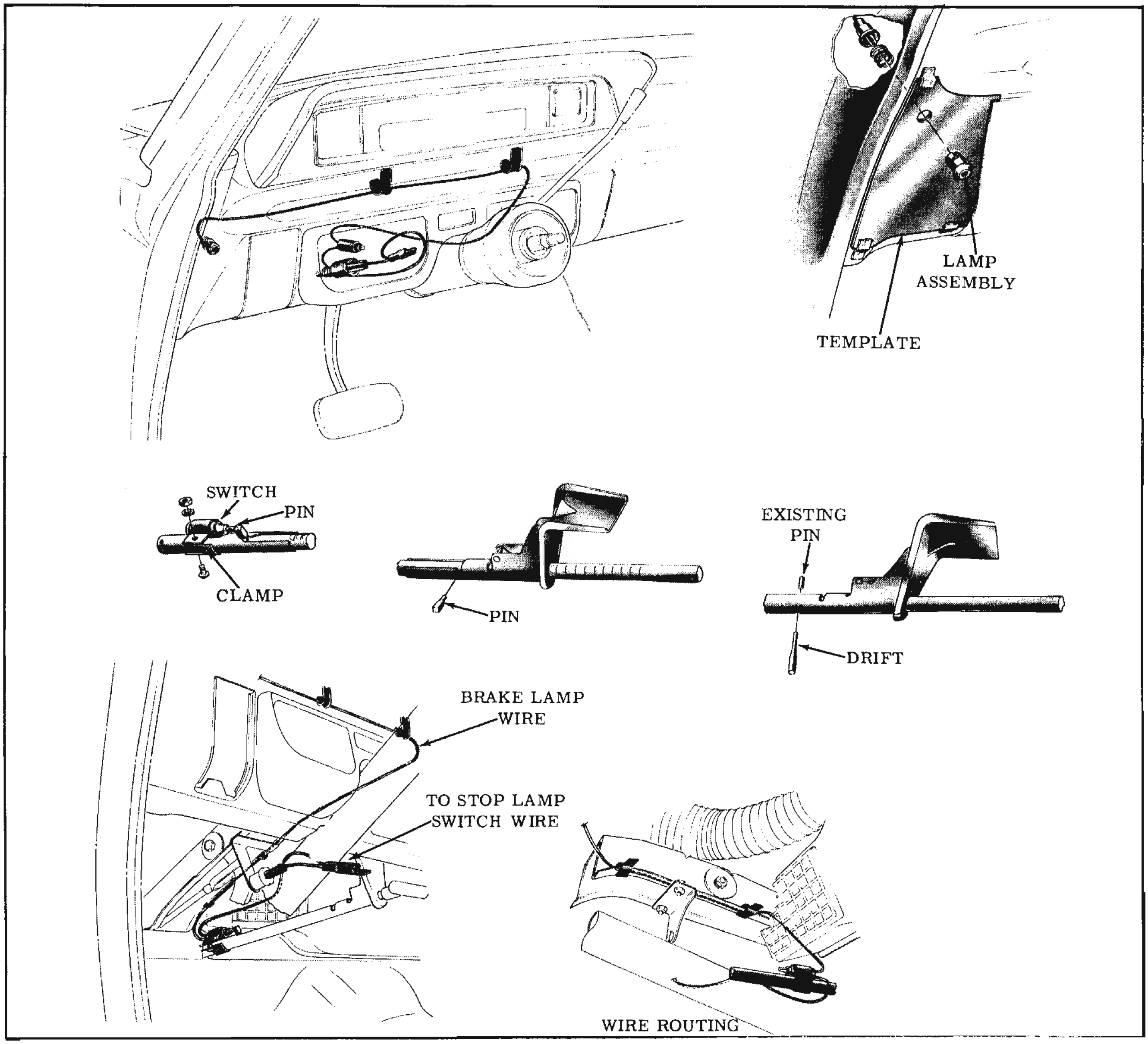


Fig. 13-133 Parking Brake Lamp

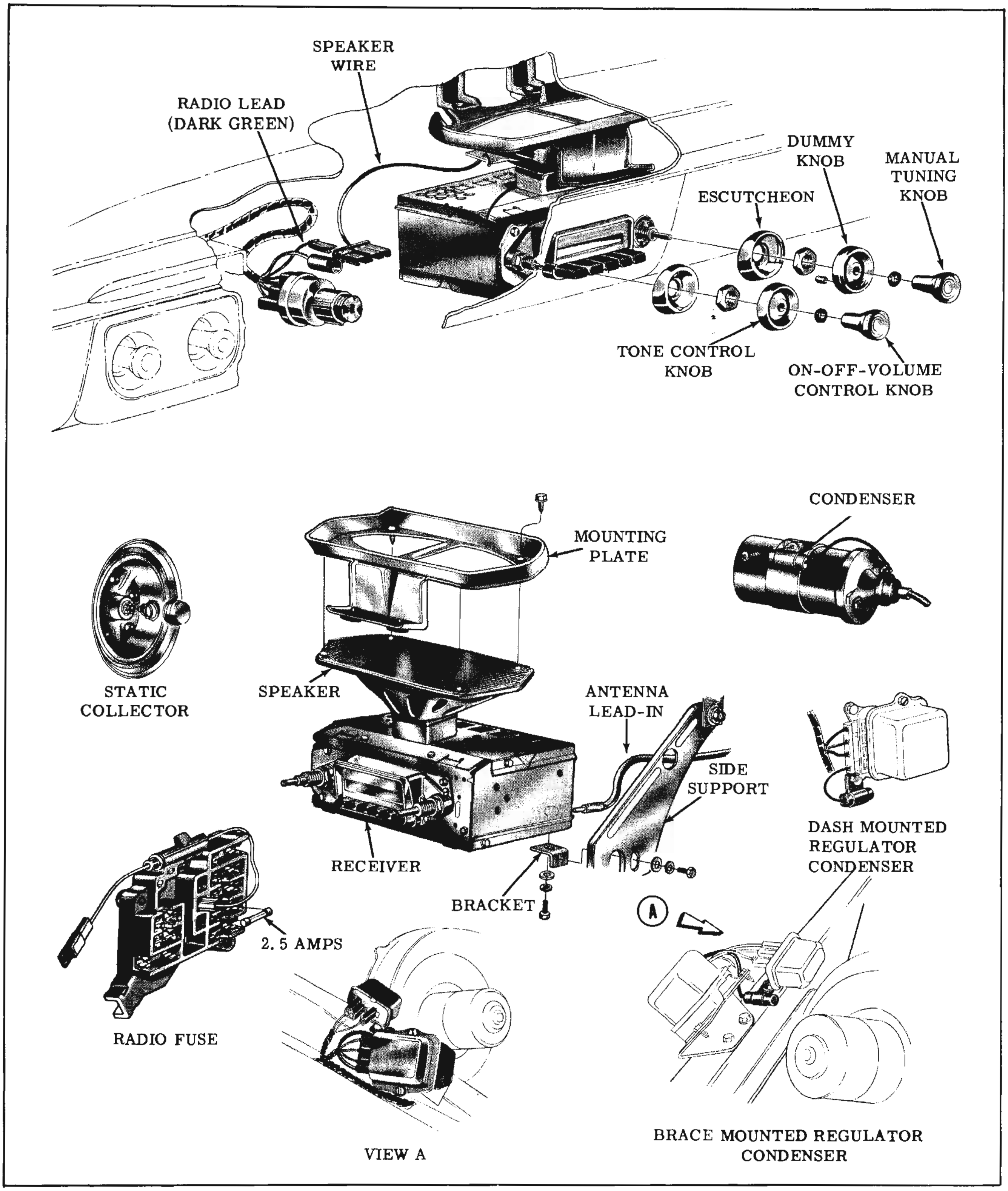


Fig. 13-134 Radio and Speaker Installation

Removal

To remove the antenna mast, loosen the antenna cap nut and lift the mast out of socket. To remove antenna socket and lead-in, proceed as follows:

1. Remove right cowl trim panel and insulation.
2. Remove lead-in plug from r.h. rear of radio receiver.
3. Remove antenna mast, then remove attaching nut, upper spacer, and gasket. (Fig. 13-136)
4. Remove bolt holding antenna lead-in brace in right cowl at air inlet.

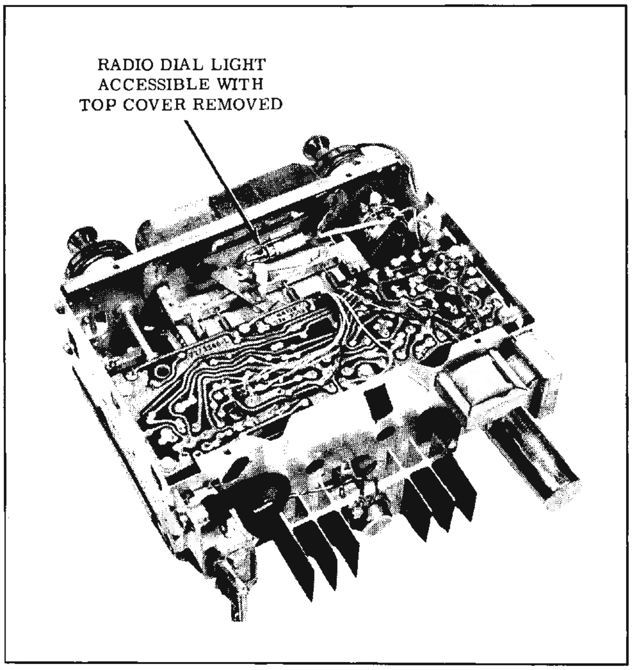


Fig. 13-135 Radio Dial Lamp

5. Remove lead-in assembly through cowl opening, being careful not to lose lower spacer, and pull lead-in cable out between end of plenum chamber and reinforcement.

SPEAKER

Removal

1. Remove radio receiver (Refer to "RECEIVER REMOVAL" in this section).
2. Remove the two speaker mounting plate to body mounting bracket nuts. (Fig. 13-137) Speaker will then pivot downward for removal.

Installation

Position the two rubber mounting bumpers at front edge of speaker mounting plate on instrument panel and pivot speaker assembly upward over studs at body mounting bracket and install two retaining nuts. (Fig. 13-137)

Rear Seat Speaker

The rear seat speaker is mounted under the parcel shelf and it is accessible through the rear compartment as shown in Fig. 13-138. There are two types of rear seat speaker installation; one for hardboard parcel shelves, and the other for models with the woven fabric cloth over the hardboard parcel shelf. Fig. 13-138 shows the two installations.

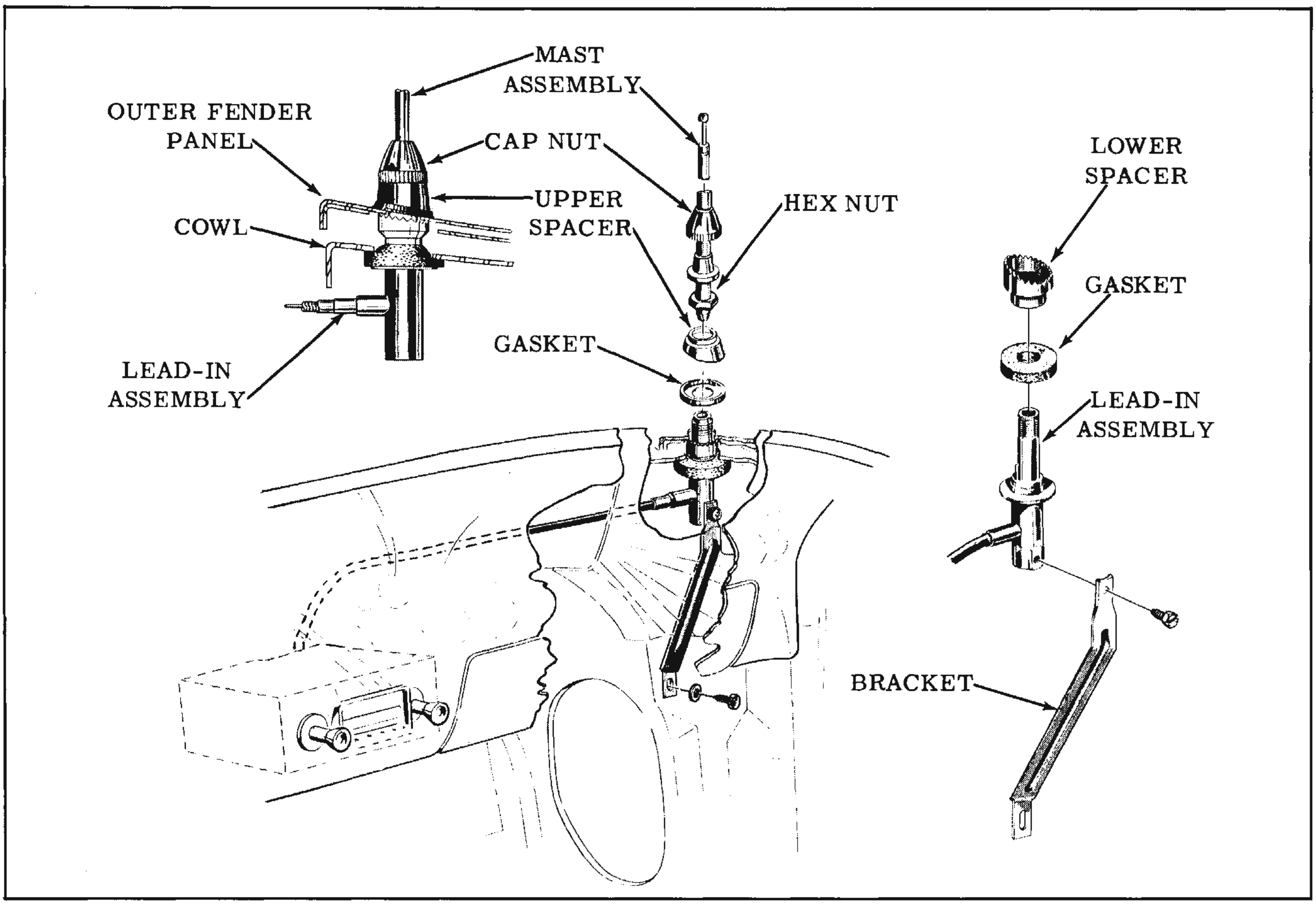


Fig. 13-136 Antenna Installation

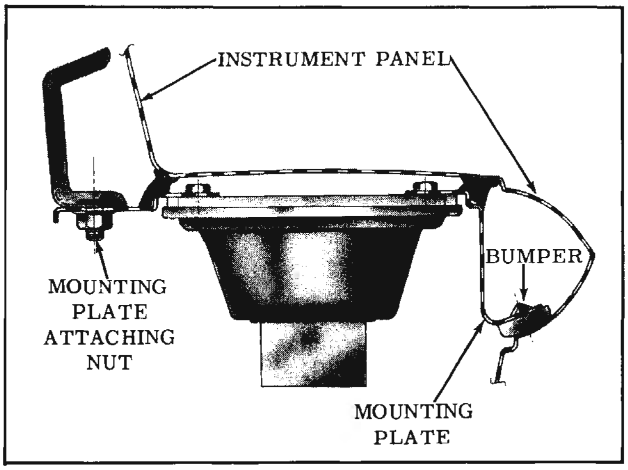


Fig. 13-137 Speaker Attachment

Removal

1. Disconnect speaker lead wire connector from speaker terminal.
2. Remove four attaching nuts while supporting speaker, then remove speaker.

To install, reverse removal procedure, exercising care to avoid damaging the speaker cone when aligning the speaker to the attaching bolts.

SEAT BELTS

The seat belts are anchored to the floor pan with eyebolts. The seat belts are attached to the eyebolt by hooks which are locked in place by means of a special locking type plastic rivet. (Fig. 13-139)

The front seat belt anchor bolt installation is shown in Fig. 13-139. The rear seat belt anchor bolt installation and the belt positions are shown in Fig. 13-140)

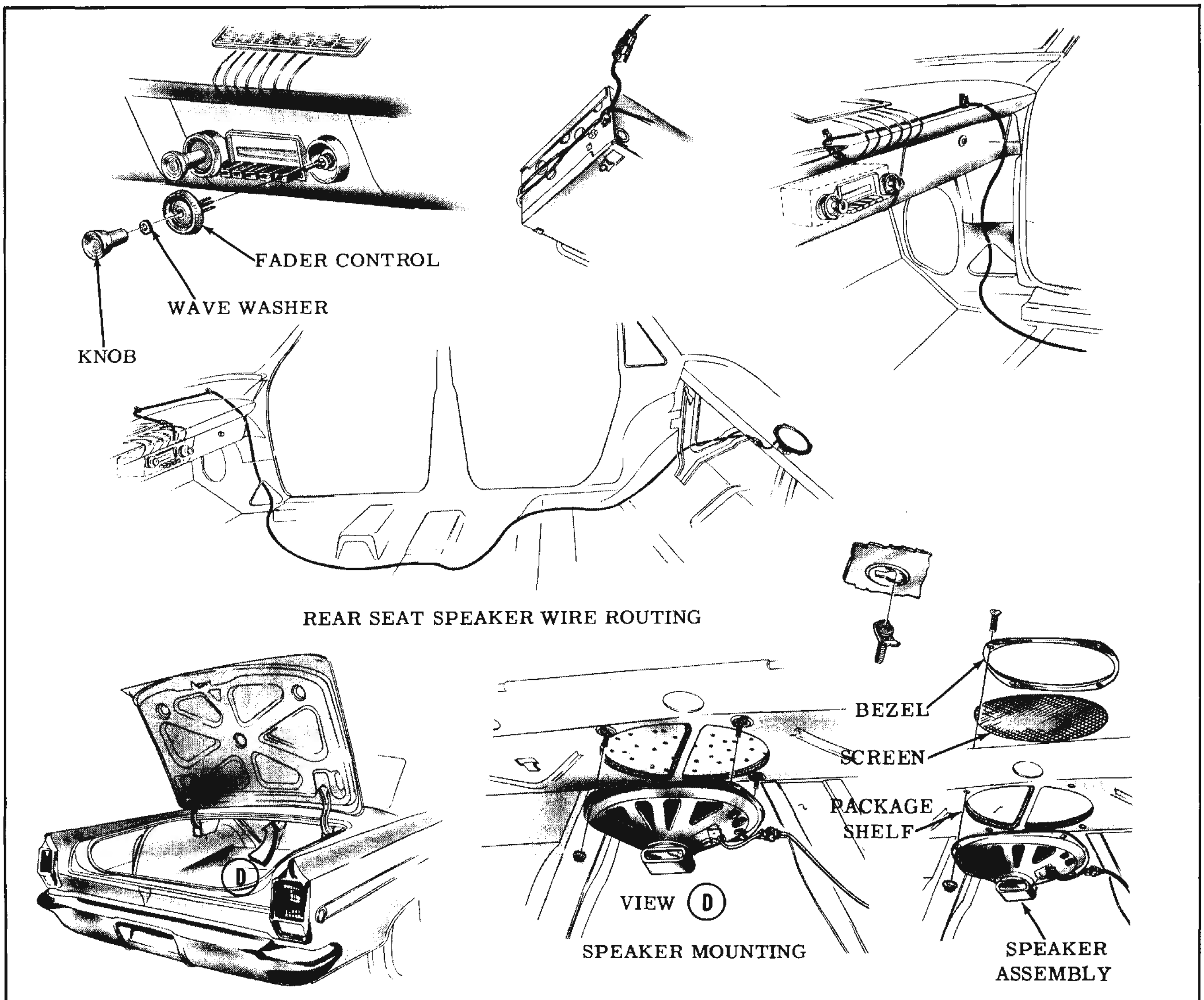


Fig. 13-138 Rear Seat Speaker

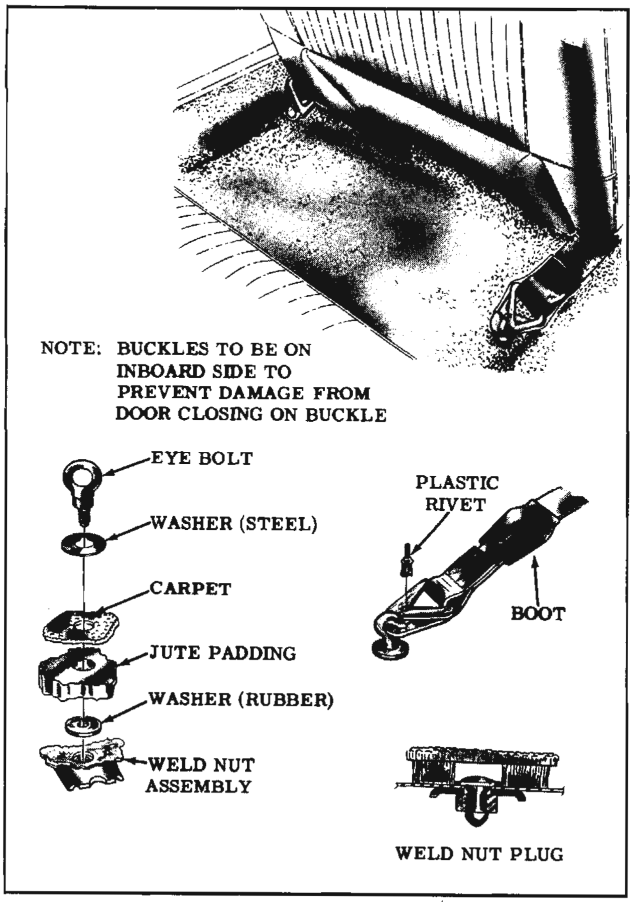


Fig. 13-139 Front Seat Belts

SPEEDOMETER CABLE

The speedometer cable installation and routing varies with the type of transmission the car is equipped with. The F-85 is available equipped with a three-speed synchromesh transmission, a four-speed synchromesh transmission, or a Hydra-Matic transmission.

The speedometer cable routing for three speed synchromesh transmission equipped cars is shown in Fig. 13-141. The speedometer cable routing for four-speed synchromesh transmission equipped cars is shown in Fig. 13-142. The speedometer cable routing for Hydra-Matic transmission equipped cars is shown in Fig. 13-143.

VACUUM TRUNK LID OR BACK DOOR LATCH

The vacuum operated trunk release is available is a factory and dealer installed option on all models except the station wagons. On station wagons, it is available as a factory installed option.

The control button is located at the lower left hand edge of the glove compartment and is accessible with the glove compartment door opened. Depressing the button allows vacuum to be pulled against the latch piston which actuates the trunk latch mechanism. If the vacuum operated latch fails to function, the trunk lid may be unlocked with the key in the conventional manner. A vacuum reservoir is provided to enable the trunk lid latch to operate when the car engine is not running.

Figs. 13-145, 13-146 and 13-147 show the installation of the vacuum trunk lid latch components.

The vacuum release used on station wagons is the same as used on sedans, with the exceptions of release cylinder and the hose routing from the control switch to the release cylinder. The release cylinder is shaped differently to operate properly in the back door. The hose is routed along the left side of the body.

To replace the control switch to release cylinder vacuum hose, it is necessary to remove the left cowl trim pad, the left sill plates, the left quarter trim and garnish moldings, the left plastic

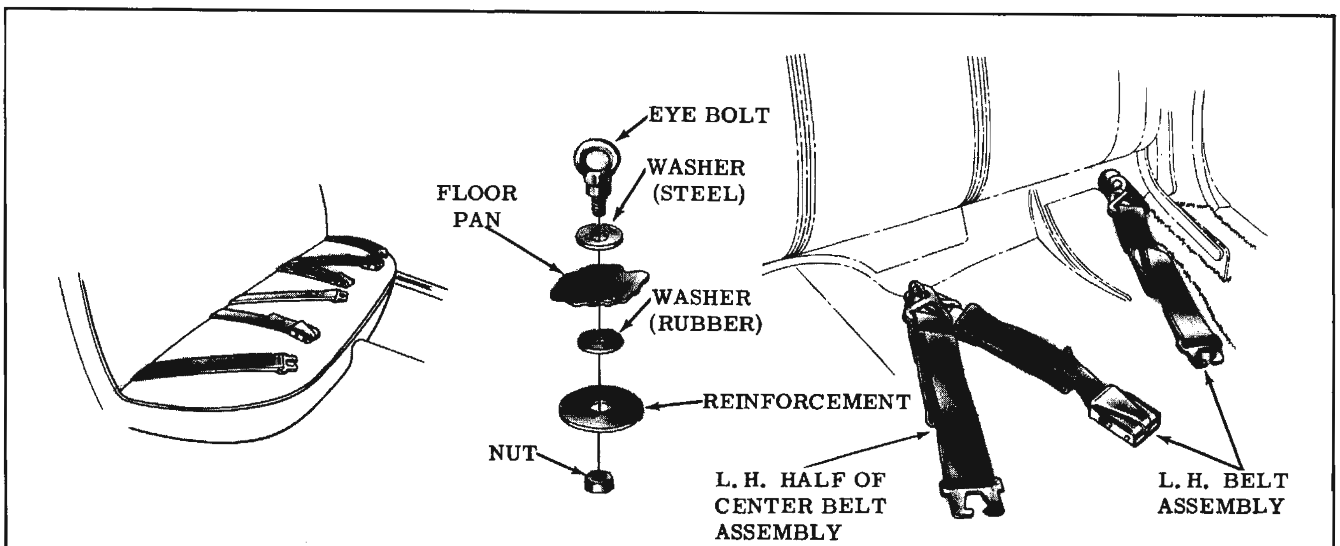


Fig. 13-140 Rear Seat Belts

hinge cover and the back door trim pad. It is suggested that small diameter wire or string be pulled through the back door, the pillar post, the rear door lock post and the rubber protector under the sill plates during removal to aid in installation of the new hose.

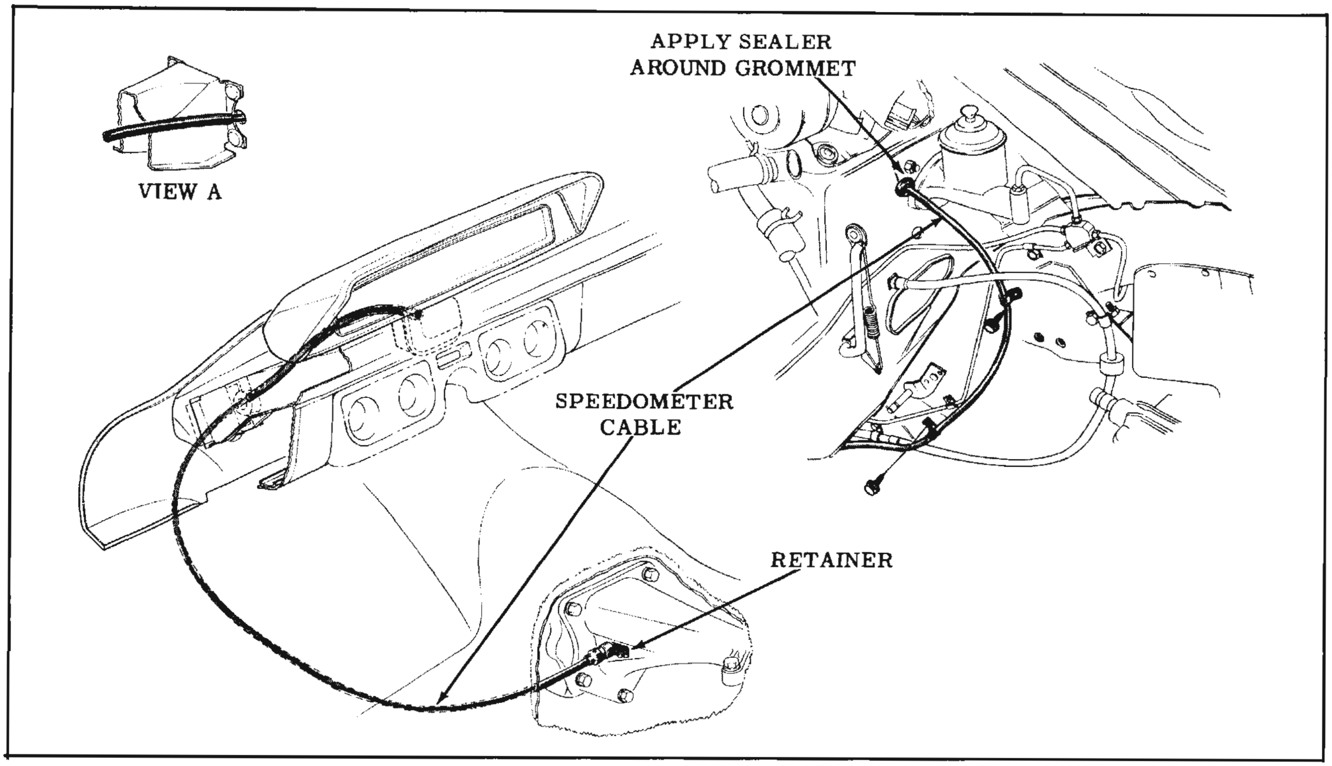


Fig. 13-141 Speedometer Cable Routing (3-Speed Synchromesh Transmission)

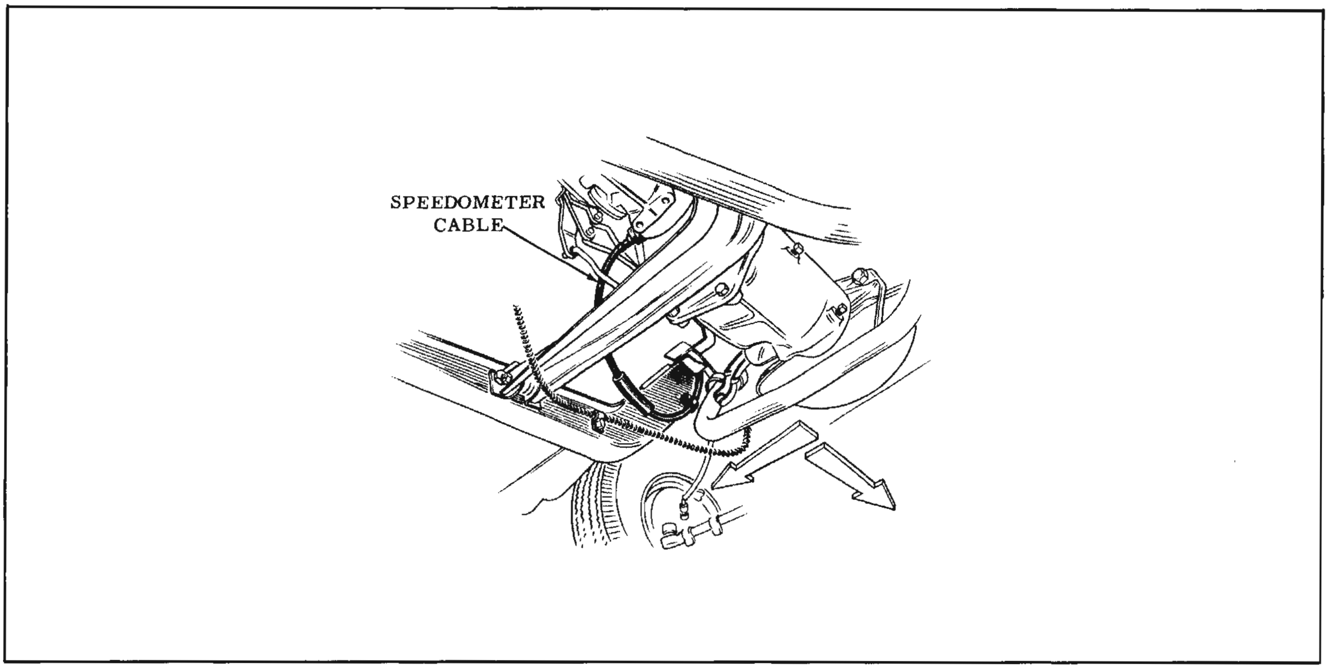


Fig. 13-142 Speedometer Cable Routing
(4-Speed Synchromesh Transmission)

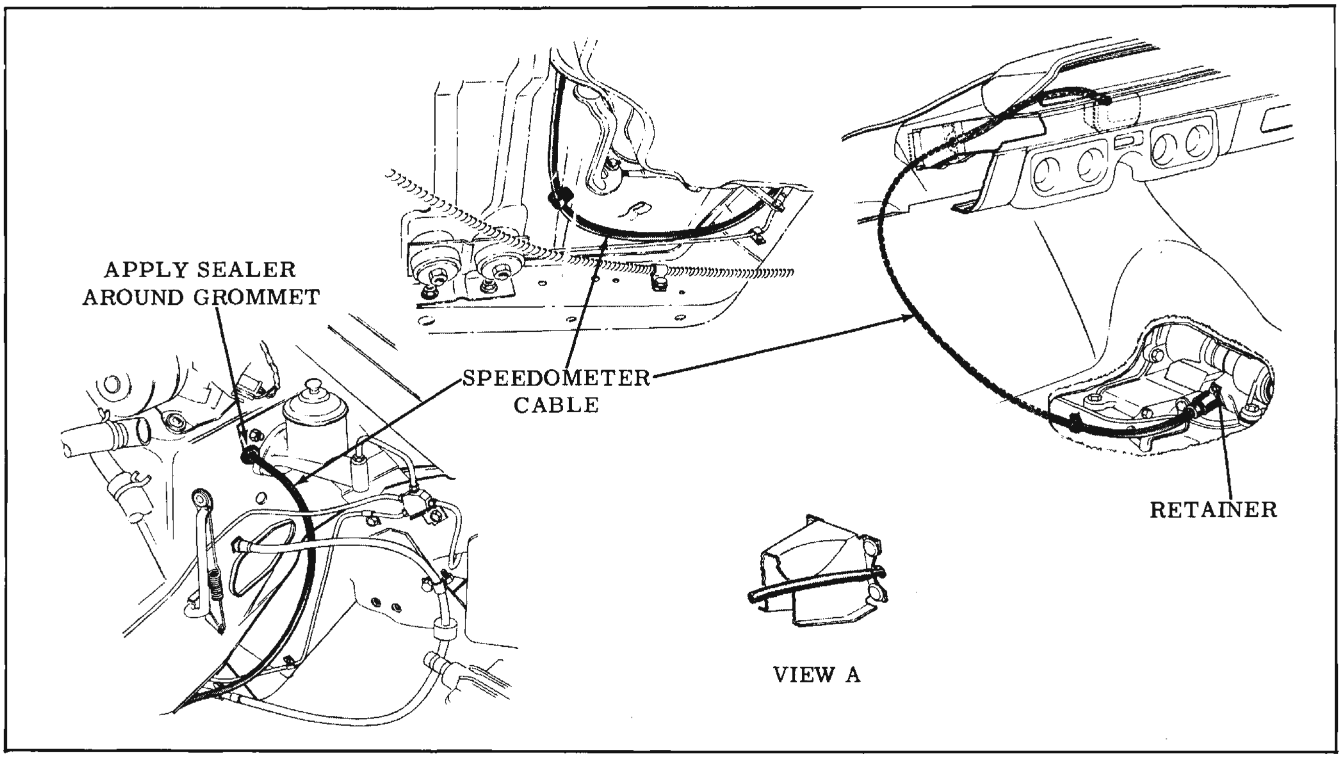


Fig. 13-143 Speedometer Cable Routing (Hydra-Matic)

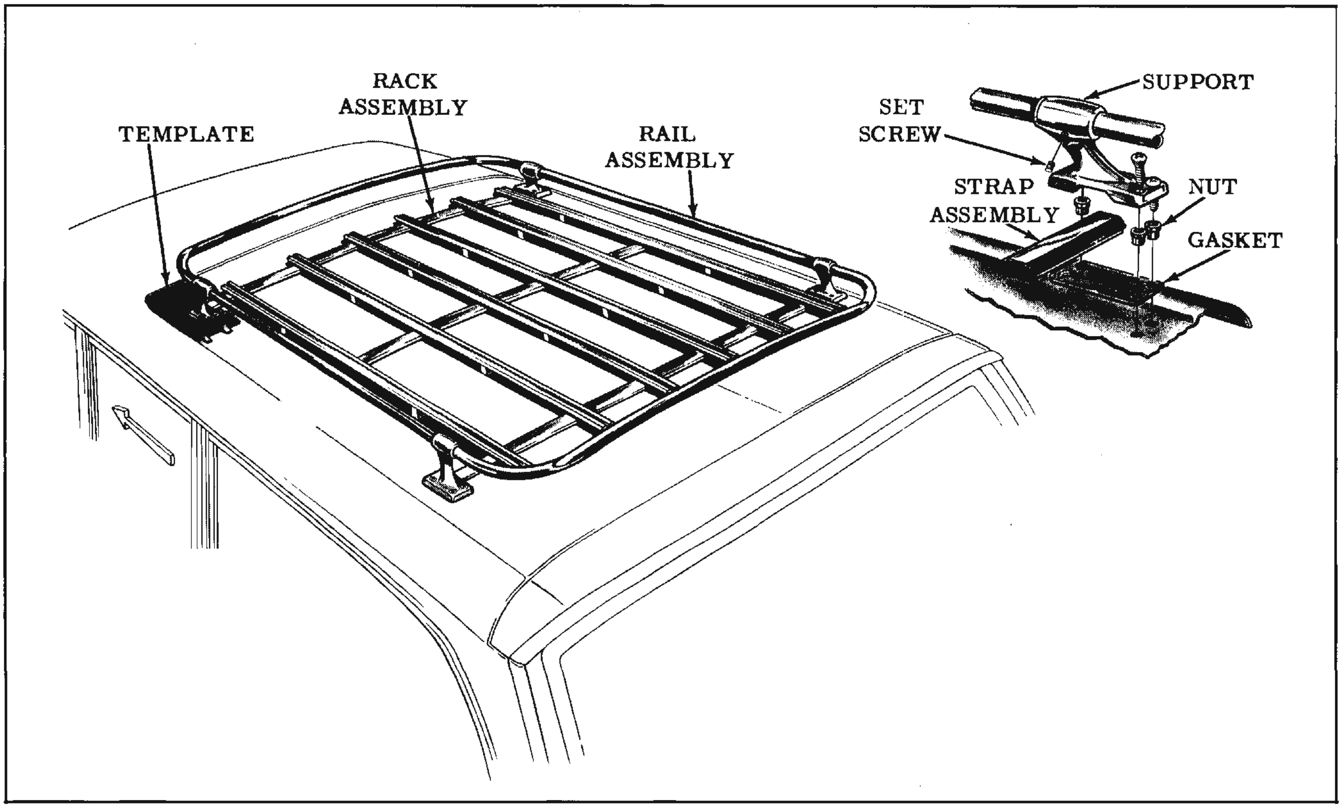


Fig. 13-144 Station Wagon Roof Top Carrier

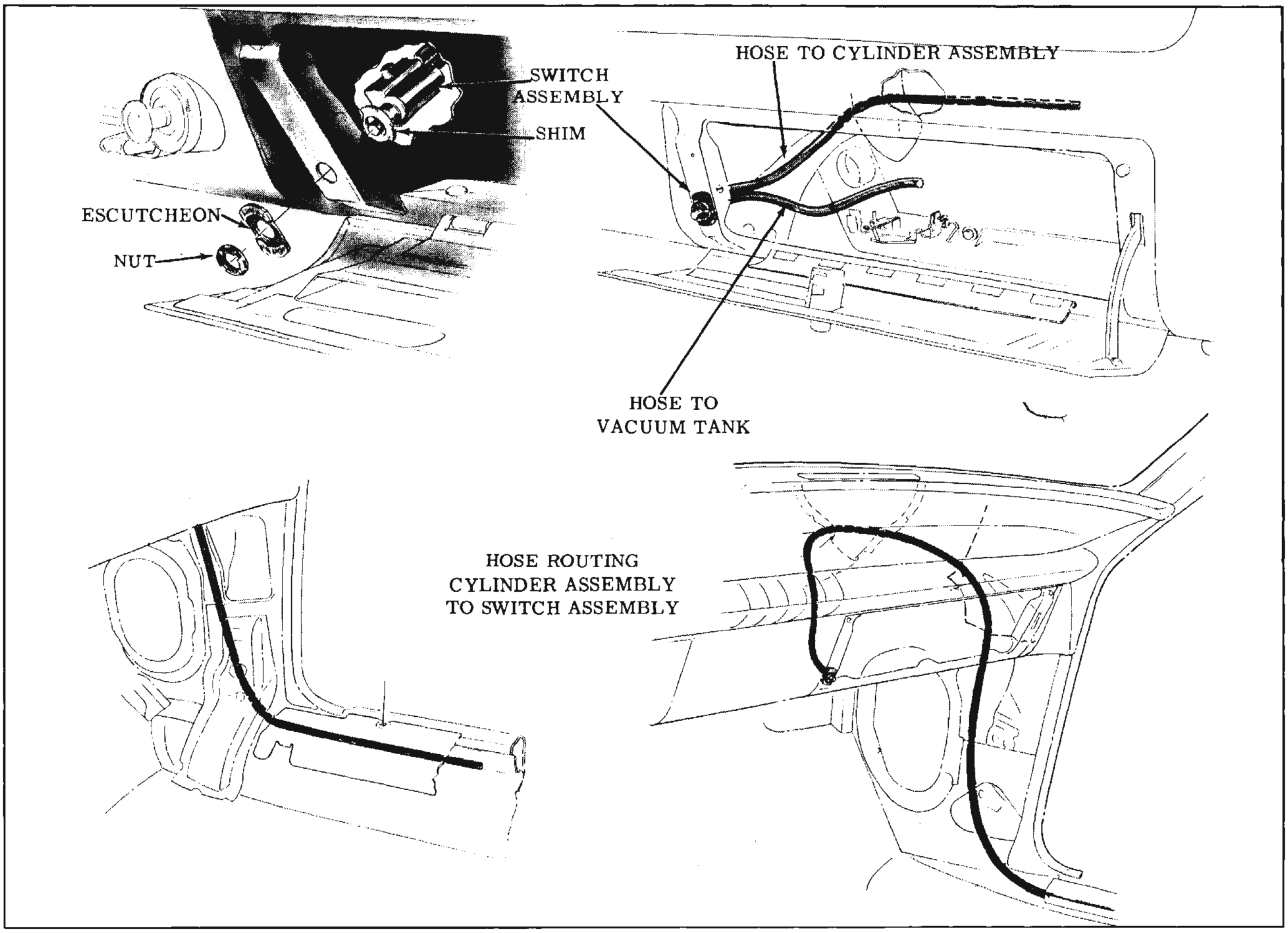


Fig. 13-145 Vacuum Trunk Lid Latch Control

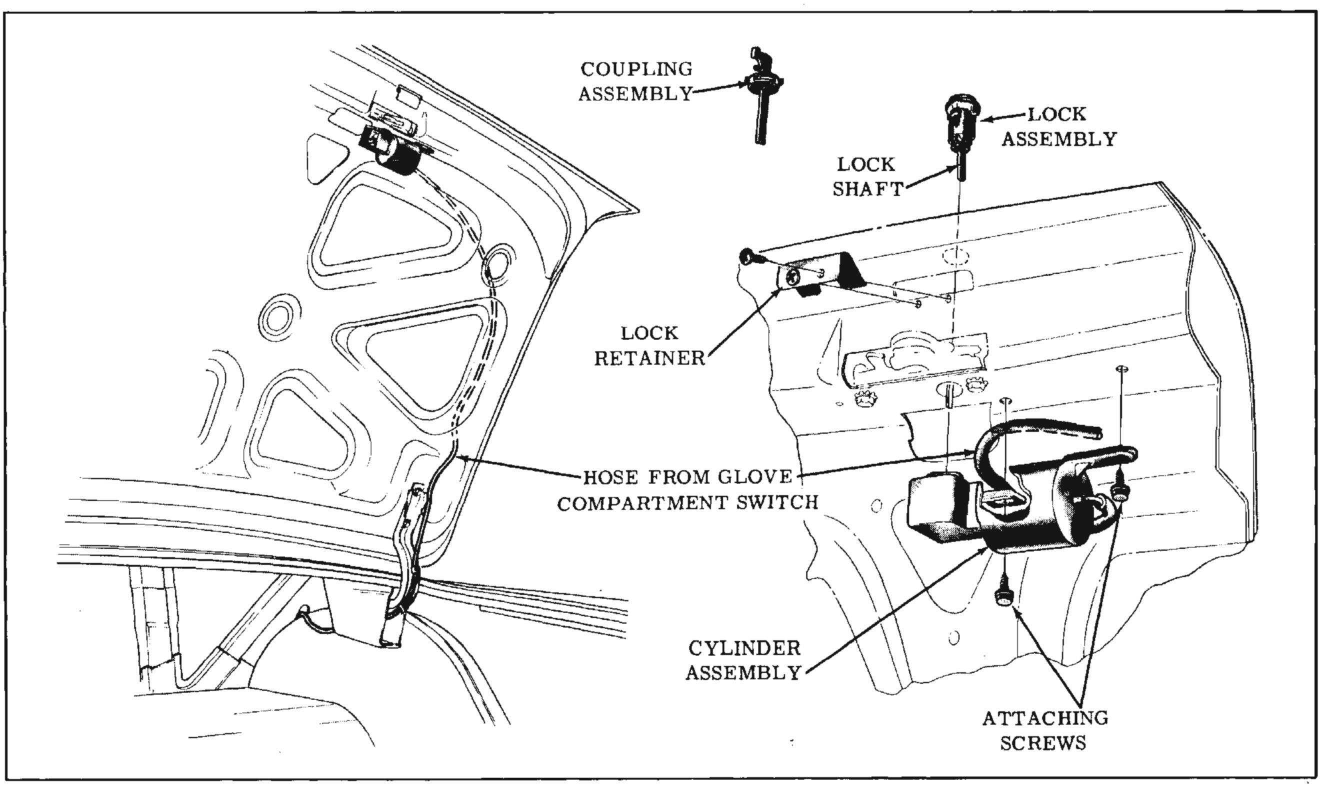


Fig. 13-146 Vacuum Trunk Lid Latch

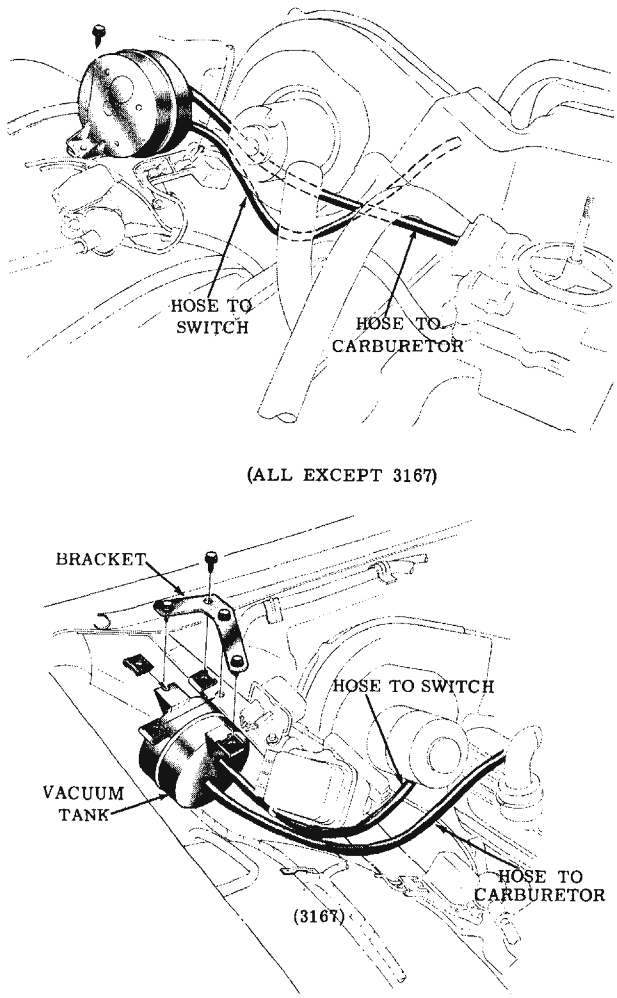


Fig. 13-147 Vacuum Reservoir

ELECTRICAL

(FULL SIZE CAR)

CONTENTS OF SECTION 14

PERIODIC MAINTENANCE

BATTERY

1. Check battery liquid level at each engine oil change, once a month or more often (when refueling) in hot weather. Level should reach the bottom of the vent well.

   CAUTION: DO NOT OVERFILL.

2. Clean top of battery and terminals every 12,000 miles and check tightness of battery hold-down bolt. To properly clean battery:

   a. Make sure vent plugs are installed tight.

   b. Remove battery cables from battery.

   c. Clean battery and battery cable clamps with a diluted ammonia or soda solution and a brush. When the solution stops foaming, rinse with clear water.

   d. Apply a thin coating of petrolatum to terminals and clamps after installing clamps.

DELCOTRON

The Delcotron belt tightness should be checked with Tool 33-70 and adjusted if necessary. No periodic lubrication is required on the Delcotron.

DISTRIBUTOR

The distributor requires periodic inspection of the cap, rotor, wiring, breaker points and timing.

When replacing the contact point assembly, apply a small amount of ball bearing lubricant or equivalent to the breaker cam. No other lubrication is required.

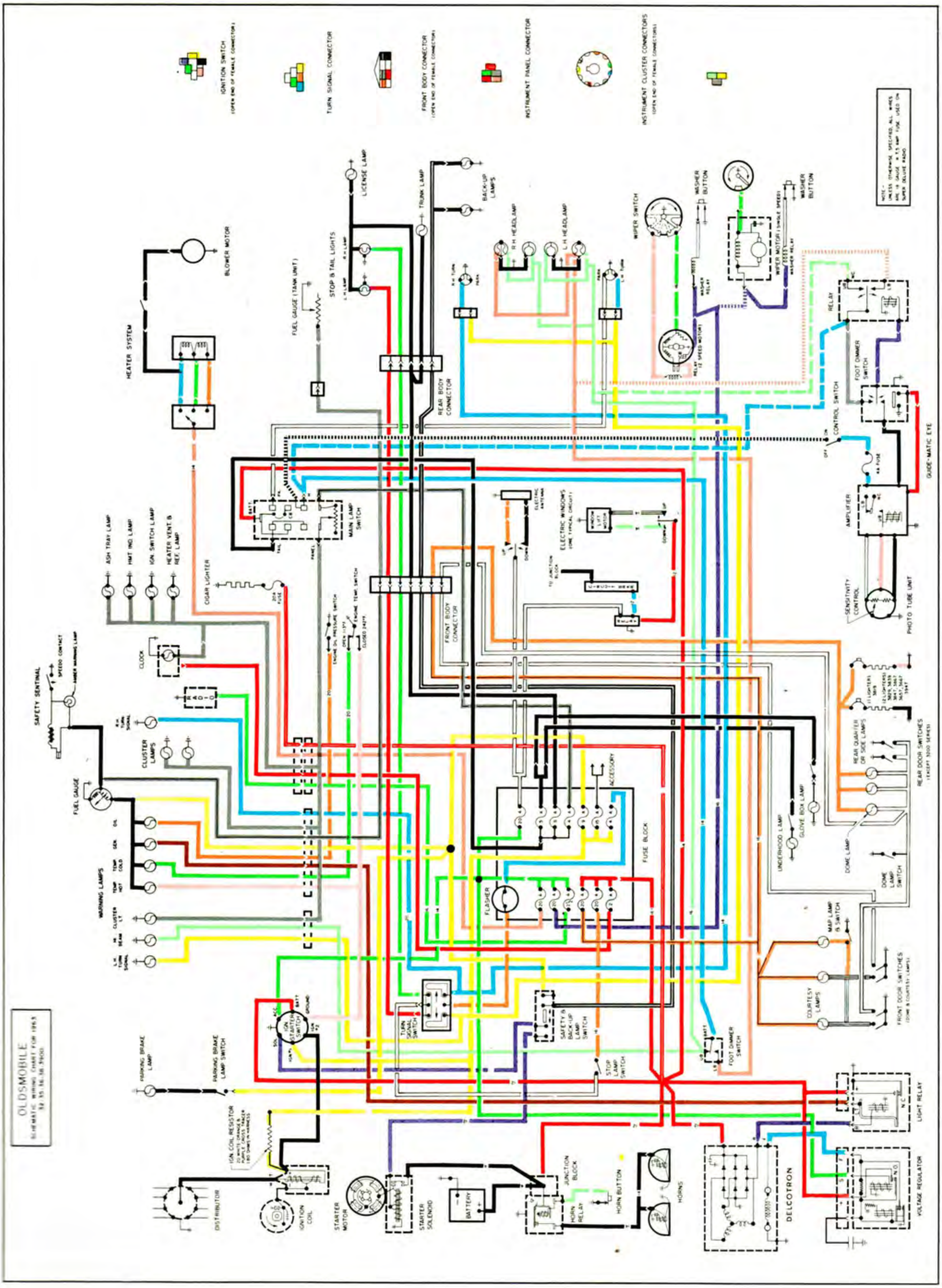


Fig. 14-1 Wiring Diagram

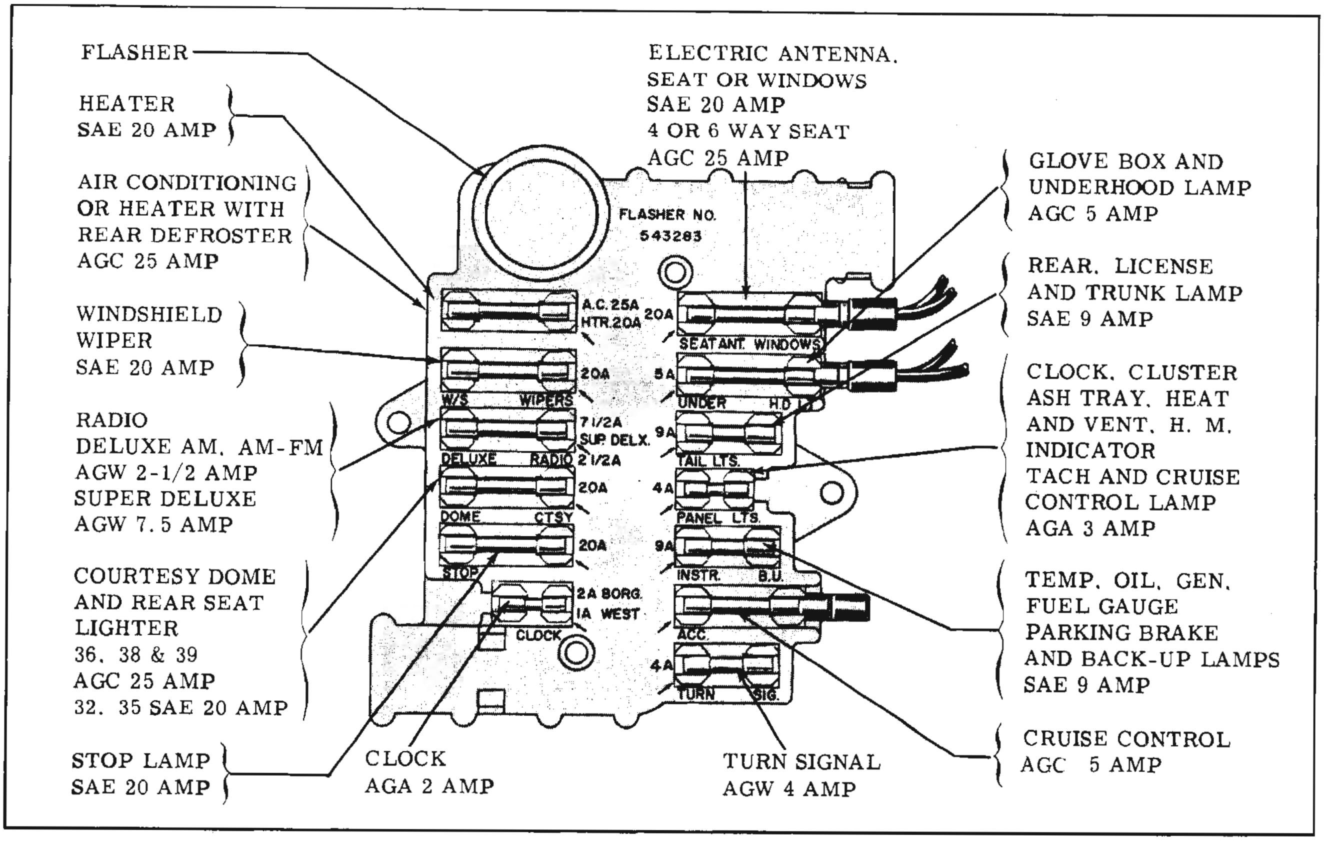


Fig. 14-2 Fuse Block

WIRING CIRCUIT (Fig. 14-1)

A combination junction and fuse block is mounted on the cowl under the instrument panel. Each wire from the fuse panel is color coded to simplify servicing. The turn signal flasher is mounted on the fuse block. (Fig. 14-2)

All electrical units in the instrument panel are connected to chassis wiring by multiple contact plugs, which are keyed to prevent improper assembly. There is no service other than replacement of the printed circuit panels. Body wiring is likewise connected to chassis wiring by a multiple contact plug which is located under the left side of the instrument panel.

IMPORTANT: Whenever it is necessary to disconnect the body wiring plug or whenever any electrical tests or repairs are made in the wiring harness, the wire to the fuel gauge unit in the gas tank must be disconnected to prevent damage to the tank unit resistance coil.

FUSE HOLDER REPLACEMENT

The fuse holders can be removed from the fuse block after the block has been disconnected from the cowl, by compressing the small tangs on both sides of the holder while applying pressure to the holder. A tool to compress the tangs can be made with a cotter pin.

CHARGING CIRCUIT (Fig. 14-3)

The charging circuit consists of the battery, Delcotron, regulator, warning light relay and the warning light. Cars without air conditioning are equipped with a 42 ampere Delcotron. Cars with factory installed air conditioning are equipped with a 52 ampere Delcotron.

BATTERY

The battery used on 88 Series engines, designed for regular fuel, is a 12 volt, 62 ampere-hour unit containing 9 plates per cell. The battery used on engines designed for premium fuel is a 12 volt, 70 ampere-hour unit containing 11 plates per cell. Both batteries are assembled in a hard rubber container with rubber separators, and are fitted with the "visual level fill" cell covers.

CAUTION: HYDROGEN GAS IS PRODUCED BY THE BATTERY. A FLAME OR A SPARK NEAR THE BATTERY MAY CAUSE AN EXPLOSION. BATTERY LIQUID IS HIGHLY ACIDIC. AVOID SPILLING ON FABRICS, PAINTED, PLATED OR BRIGHT SURFACES.

DELCOTRON

The Delcotron consists of a rotor, a stator, two brushes and slip rings and six diode rectifiers. (Fig. 14-4)

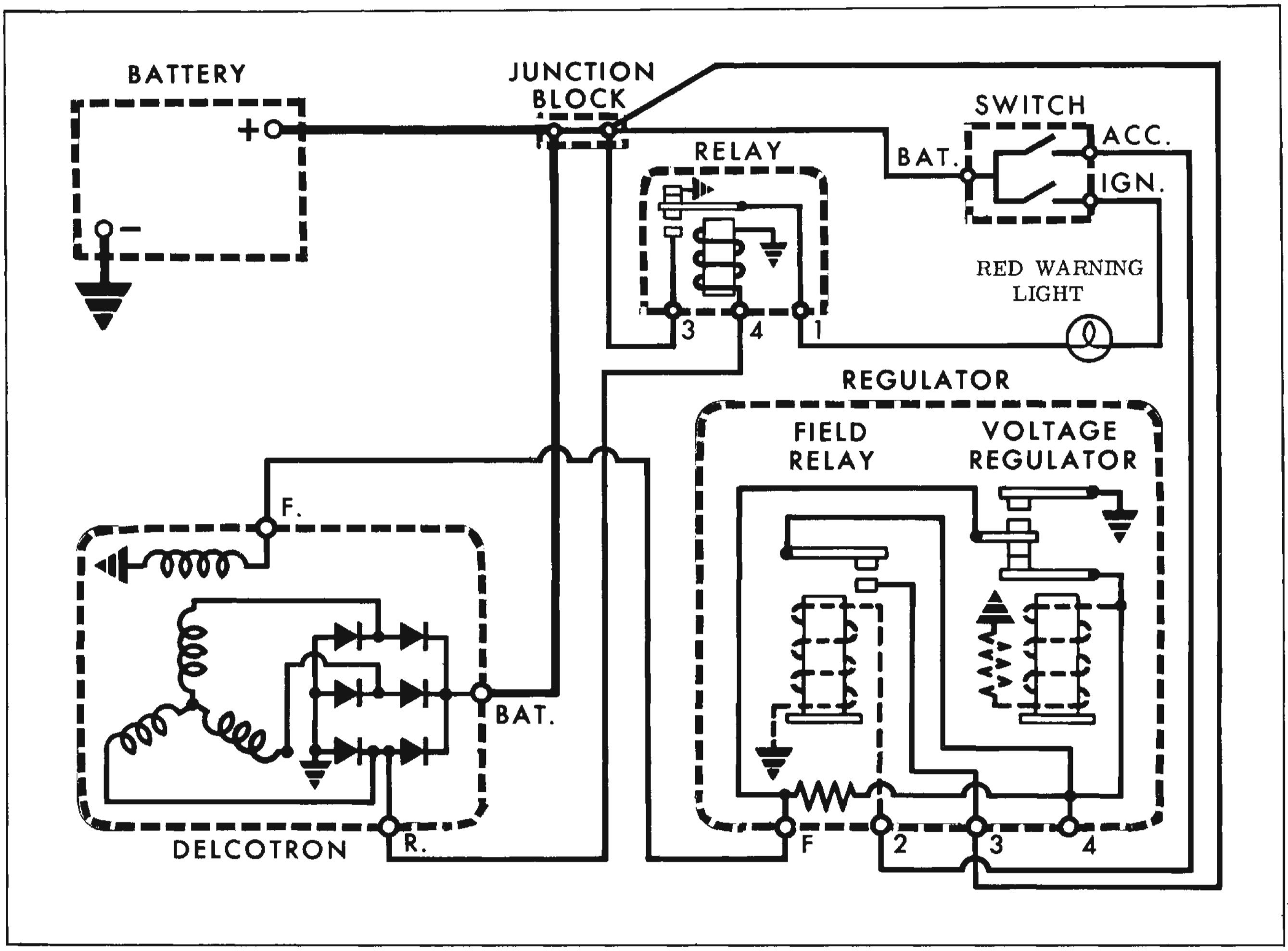


Fig. 14-3 Charging Circuit

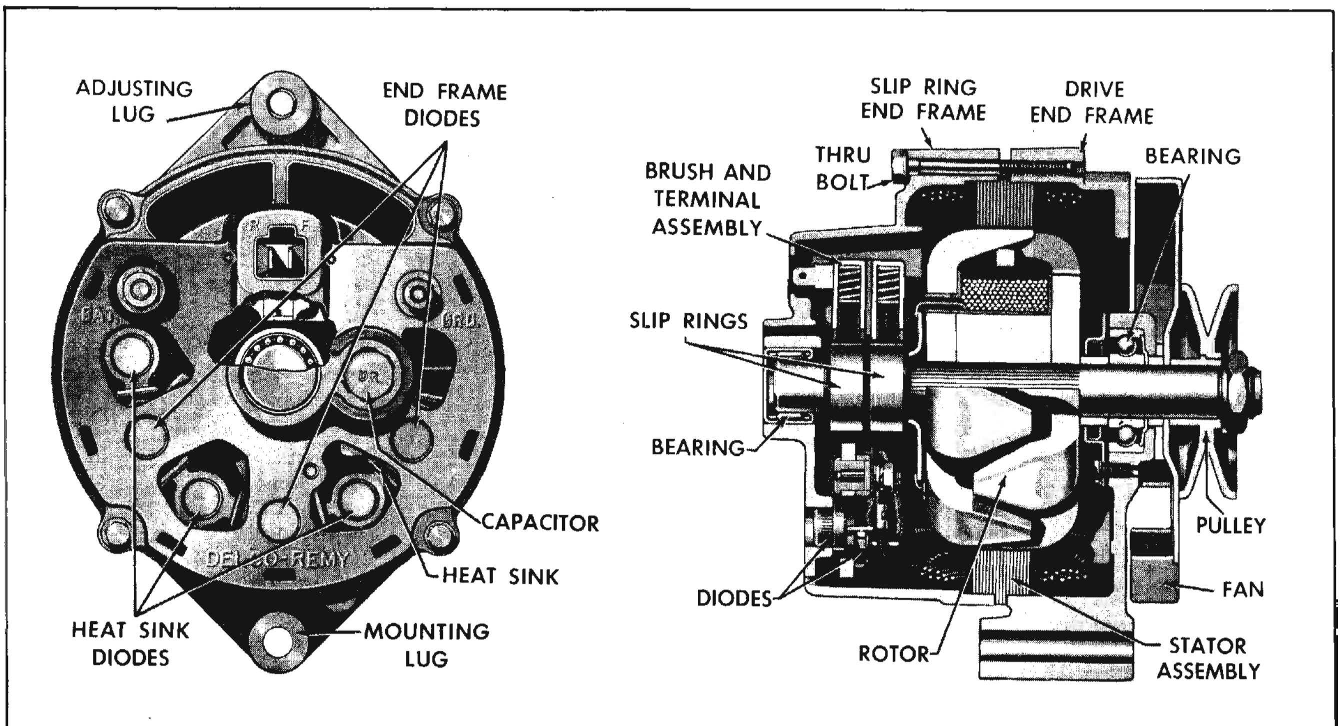


Fig. 14-4 Delcotron

The brushes and slip rings allow battery current to flow through the rotor creating a magnetic field. The stator consists of three sets of windings, each set containing seven coils, alternately spaced around the stator ring. The magnetic field produced by the rotor induces an A.C. voltage in the stator windings. This A.C. voltage is then directed to diode rectifiers.

A diode rectifier is an electrical device which resists current flow in one direction but allows it to flow in the other. Six diode rectifiers are used in the Delcotron. Three of the diode rectifiers are positive and three are negative and are arranged so that the A.C. voltage produced by the Delcotron is changed to a D.C. voltage. This D.C. voltage is used to charge the battery and operate electrical accessories.

REGULATOR

The regulator contains a voltage regulator and a field relay. (Fig. 14-5) A current regulator is not required because the Delcotron is capable of self regulating the current at a given speed and voltage. A cut-out relay is not required because the action of the diode rectifiers prevent battery voltage from discharging through the Delcotron.

VOLTAGE REGULATOR

The voltage regulator limits the voltage of the electrical system to a safe maximum. The contacts of the voltage regulator oscillate at a high speed, opening and closing the points. This action intermittently introduces resistance into the field circuit, thereby reducing voltage.

The voltage regulator has a double set of contacts to regulate voltage. The lower set of contacts limits voltage at low Delcotron r.p.m.

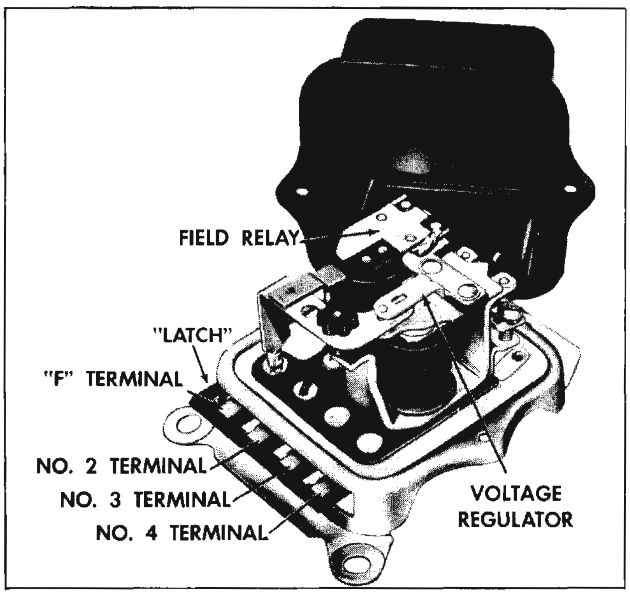


Fig. 14-5 Voltage Regulator

Vibration of the lower contacts intermittently inserts a resistance in the field circuit. This resistance is satisfactory at low r.p.m.; however, when the r.p.m. is increased the lower set of points can no longer control the voltage and the upper contacts close. A vibrating action takes place on the upper set of contacts which intermittently grounds the field to control voltage to a safe value.

FIELD RELAY

The field relay acts as an "on" "off" switch between the field winding and the battery.

When the ignition switch is closed, the field relay winding is connected to the battery. Current from the battery creates magnetism in the relay winding and closes the contact points. Current from the battery can now flow from the battery through the closed relay points, through the closed voltage regulator points, to the field windings in the Delcotron.

WARNING LIGHT RELAY

When the ignition switch is turned on, current flows from the battery, through the warning light and relay points to ground. The warning light will be on, indicating that the Delcotron is not operating. As the engine starts and the Delcotron begins operating, the voltage which appears at the relay terminal of the Delcotron, energizes the warning light relay winding. Magnetism created in the winding causes the relay points to be pulled away from the grounded points and against the battery points. This puts battery voltage on both sides of warning light, stopping current flow and causing the light to go out.

WARNING LIGHT

The red warning light located in the instrument panel should light when the ignition key is turned on and the engine is not running. When the engine is started, the light will go out indicating that the Delcotron is operating. If the light remains on with the ignition key in the "off" position, it indicates a shorted positive diode in the Delcotron.

SERVICE PRECAUTIONS

The following precautions must be observed when servicing the charging circuit to prevent serious damage to the electrical equipment:

1. When installing a battery, using jumper cables, a booster battery or connecting a charger, the negative terminals of the battery or charger must be connected to the ground side of the system and the positive terminals of the battery or charger, to the positive side of the system. Failure to observe polarity will result in the battery being directly shorted through the diodes and could result in a burned wiring harness or damaged diodes.

2. Never operate the Delcotron with any of the wires or connectors disconnected or loose. Operating the Delcotron with disconnected or loose connections could result in development of extremely high voltages.

3. Do not short across or ground any of the terminals on the Delcotron or regulator as damage to these units could result.

4. Do not attempt to polarize the Delcotron or regulator as these units could be damaged. Polarization is not required with this type of charging circuit.

5. When removing a Delcotron from the car or working in the engine compartment near the Delcotron, always disconnect the battery negative cable first; as the red wire connected to the "BAT" terminal on the Delcotron is connected to battery voltage.

CHECKS AND ADJUSTMENTS OF THE CHARGING CIRCUIT

Trouble in the charging circuit will usually show up as faulty warning light operation or by an undercharged or overcharged battery. Before attempting any checks and adjustments, be sure that all wiring connections are clean and tight and that the battery is in satisfactory condition.

WARNING LIGHT RELAY CHECK (Fig. 14-6)

If the warning light fails to light when the ignition switch is turned on, engine not running, check for a burned out bulb or fuse, then check the relay. If the light stays on with the ignition switch "off", check for a shorted positive diode in the Delcotron.

If the warning light fails to go out with the Delcotron in operation, the trouble is in either the warning light relay, field relay or the Delcotron. Check the warning light relay first, as follows:

1. Insert a cotter key into the "R" terminal on the Delcotron.

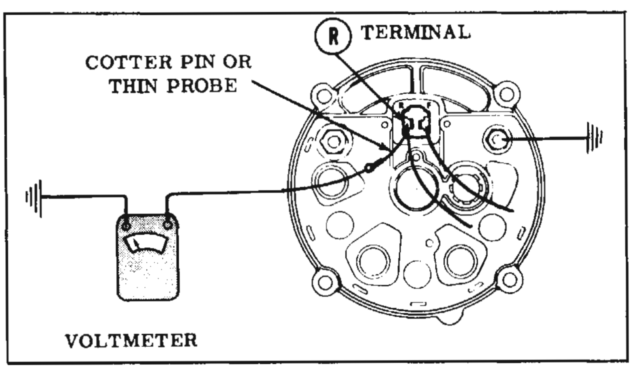


Fig. 14-6 Warning Light Relay Check

2. Connect the positive lead of a voltmeter to the cotter key and the other lead to ground.

3. Start the engine and run at fast idle. Observe the voltmeter reading.

4. If the voltmeter reading is 5 volts or above, and the warning light fails to go out, either the warning light relay is defective and must be replaced, or the wire from the "R" terminal on the Delcotron to the relay is open. The wire can be checked for continuity with an ohmmeter or test light.

5. If the voltmeter reading is below 5 volts, the trouble is in the field relay or the Delcotron. Proceed with the field relay and Delcotron output checks.

6. Shut off engine.

FIELD RELAY CHECK (Fig. 14-7)

1. Insert a cotter key into the "F" terminal, blue wire, on the Delcotron.

2. Connect the positive lead of a voltmeter to the cotter key and the other lead to ground.

3. Turn the ignition key to the "on" position and observe voltage reading. The voltmeter should read the same as battery voltage.

4. If the reading is zero, either the blue wire from Delcotron to "F" terminal on the regulator is open, the wire from the ignition switch to the regulator No. 2 terminal is open or the field relay is defective. The wires can be checked for continuity with an ohmmeter or test light. If the relay is defective, the regulator must be replaced.

DELCOTRON OUTPUT CHECK (Fig. 14-8)

1. Disconnect the battery.

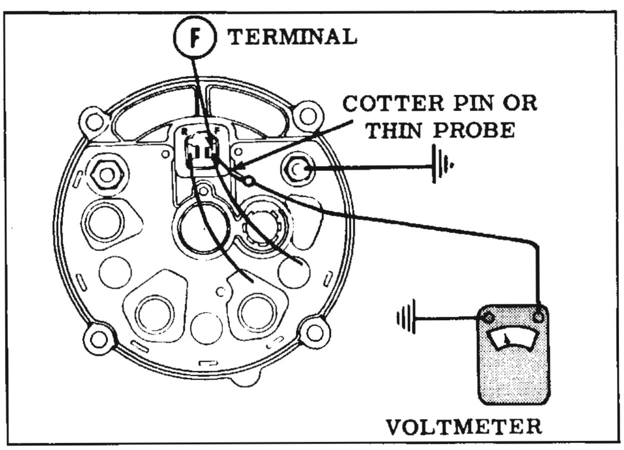


Fig. 14-7 Checking Field Relay

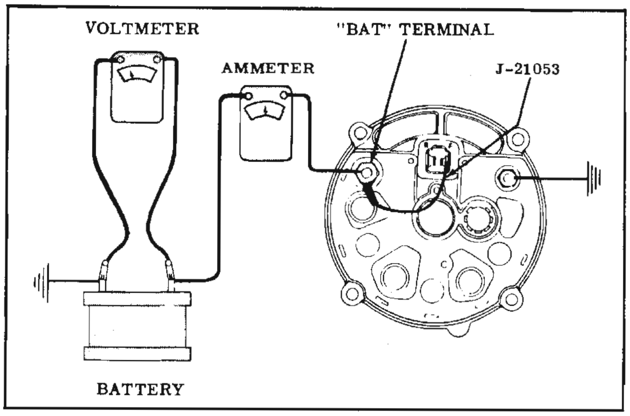


Fig. 14-8 Checking Delcotron Output

2. Remove the red wire from the "BAT" terminal on the Delcotron. Connect one lead of an ammeter to the red wire and the other lead to the "BAT" terminal on the Delcotron.

3. Connect a voltmeter across the battery terminals.

4. Remove the "F" and "R" terminal connector from the Delcotron.

5. Install the test adapter connector J-21053 on the "F" terminal of the Delcotron, attach the alligator clip to the "BAT" terminal.

6. Connect the negative battery cable. Load the battery with a carbon pile rheostat or by turning on the lights and accessories to prevent excessive voltage.

7. Start the engine and while observing the ammeter, gradually raise engine r.p.m. until output is reached. Do not run engine faster than the specified r.p.m., as the regulator is by-passed and excessive voltage could be built up.

   NOTE: Variations in engine r.p.m. are necessitated by differences in pulley ratios.

   CAUTION: Do not allow the output voltage to exceed the regulator setting.

8. If output is not within specifications, it will be necessary to disassemble and test the components within the Delcotron.

9. Stop engine and disconnect battery.

10. Disconnect the test adapter, ammeter and voltmeter.

11. Install the connector on the "F" and "R" terminals and the red wire to the "BAT" terminal of the Delcotron.

12. Install the battery cable.

OUTPUT CHART

Unit Tested	Engine R.P.M.	Amp. Output
(1100616 52 AMP)	700 1750	27 to 34 47 to 54
(1100624 42 AMP)	850 2150	23 to 30 37 to 44
(*1100624 42 AMP)	700 1750	23 to 30 37 to 44
(**1100624 42 AMP)	875 2200	23 to 30 37 to 44
(1100631 37 AMP)	875 2200	20 to 27 32 to 39

*Full Size Car Dealer Installed A/C
**F-85 Service Replacement

VOLTAGE REGULATOR ASSEMBLY

The voltage regulator contacts should not be cleaned unless the electrical performance indicates it is necessary. A sooty or discolored condition of the contacts is normal after a relatively short period of operation and is not an indication that cleaning is necessary. However, if the voltage fluctuates as evidenced by an unsteady voltmeter reading when checking the voltage setting, the contacts may have excessive resistance or be sticking and should be cleaned.

CAUTION: Before cleaning contacts, make sure the unsteady voltage is not being caused by loose connections or high resistance elsewhere in the system.

The contacts on the voltage regulator unit are of a soft material and must not be cleaned with a file. A strip of No. 400 silicon carbide paper or equivalent folded over and then pulled back and forth between the contacts is recommended as a satisfactory method of cleaning. After cleaning, the contacts should be washed with alcohol to remove any residue. If the voltage control has not improved, repeat the cleaning and washing process.

To clean the field relay contacts, use a thin, fine-cut, flat file. Remove only enough material to clean the points.

Never use emery cloth or sandpaper to clean contact points.

Voltage Regulator

Three checks and adjustments can be performed on the double contact voltage regulator. They are

Voltage Setting, Point Opening and Air Gap. The only time the point opening and air gap should be checked is when the correct voltage setting cannot be made.

Voltage Setting

Before making any voltage adjustments, position a mercury type glass thermometer within 1/4" of the regulator cover. This measures the surrounding temperature of the regulator. After the temperature is known, the voltage settings can be made in relation to the temperature.

1. Check battery and charge, if necessary, as the voltage setting must be made with a fully charged battery, to limit the Delcotron output to 10 amperes or less. Correct voltage settings cannot be made if the Delcotron output is greater than 10 amperes.

   If the battery is suspected of being defective, a LIGHT LOAD TEST should be performed to determine the condition of the battery.

2. Connect a voltmeter across the battery terminals.

3. Position the bulb of a glass mercury type thermometer, such as J-5421, within 1/4" of the regulator cover.

4. Start the engine and run for 15 minutes at approximately 1200 r.p.m. Leave the cover on the regulator to establish operating temperature. All accessories and lights must be turned off.

5. After the 15-minute warm-up, cycle the Delcotron by shutting off the engine, removing the regulator cover and restarting.

6. Raise engine speed to 2200 r.p.m. The regulator should be operating on the upper contacts. This can be visually observed in the regulator. Note the voltage reading on the voltmeter. The voltage reading should be within the voltage specifications as indicated by the temperature voltage chart. (Fig. 14-9)

7. If the voltage does not fall within the normal specification range, the voltage can be adjusted by turning the adjusting screw. (Fig. 14-10)

   CAUTION: Always make final setting by turning the screw clockwise. This insures that the spring holder will be against the head of the screw. If it is necessary to turn the screw head counterclockwise, turn it until the screw head is approximately 1/8" above the adjusting bracket, then pry holder up against screw head, then turn screw clockwise to make setting.

AMBIENT TEMPERATURE	VOLTAGE SETTING
65	13.9 to 15.0
85	13.8 to 14.8
105	13.7 to 14.6
125	13.5 to 14.4
145	13.4 to 14.2
165	13.2 to 14.0
185	13.1 to 13.9
205	13.0 to 13.8

Fig. 14-9 Temperature - Voltage Chart

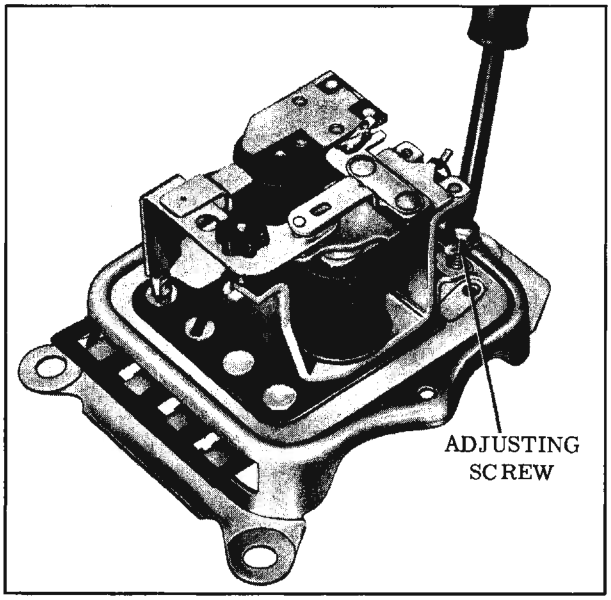


Fig. 14-10 Adjusting Voltage Setting

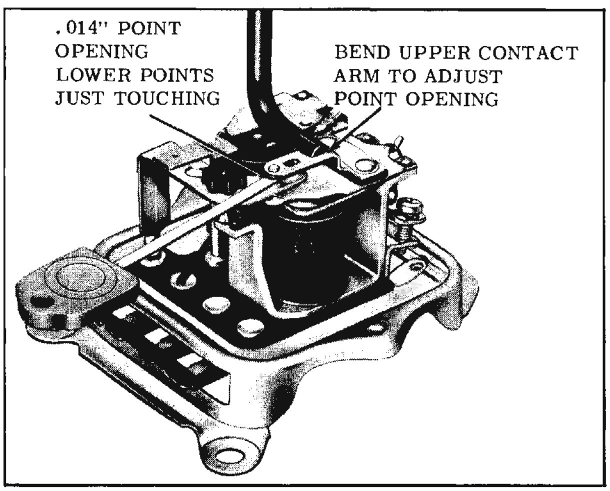


Fig. 14-11 Checking Point Opening

8. Cycle the Delcotron and recheck voltage reading. Readjust if necessary.

9. Turn on the lights and accessories to operate the voltage regulator on the lower set of contact points. Run the engine at 2200 r.p.m. and note the voltage reading. The voltage should be .1 to .3 volts lower than the reading obtained in Step 8.

10. If necessary to adjust, turn the nylon nut counterclockwise to increase the difference and clockwise to decrease the difference between the upper and lower points. After making the adjustments, it is necessary to recheck the voltage setting on both upper and lower contact points.

11. Install the regulator cover and remove the voltmeter. Avoid contact with the regulator units when installing the regulator cover.

Point Opening (Fig. 4-11)

1. Remove the electrical connector from the regulator.

2. With the lower contacts touching, measure the point opening between the upper contact points. Clearance should be .014".

3. If necessary to adjust, bend the upper contact arm, being careful not to bend the hinge.

Air Gap (Fig. 14-12)

1. With the electrical connector removed, measure the air gap between the armature and core with the lower contact points touching. Clearance should be .060".

2. If necessary to adjust, rotate the nylon nut on the contact support.

NOTE: The .060" air gap adjustment is only an initial setting. Final adjustment must be made with the engine running, so that the voltage reading, when operating on the lower contacts, is .1 to .3 volts less than the voltage reading when operating on the upper contacts.

FIELD RELAY

The two checks required on the field relay are air gap and point opening.

1. Disconnect the electrical connector from the regulator.

2. Remove the regulator cover.

3. Check clearance between the armature and core with the points just touching. Air gap should be .015". (Fig. 14-13)

4. If necessary to adjust, bend the contact support.

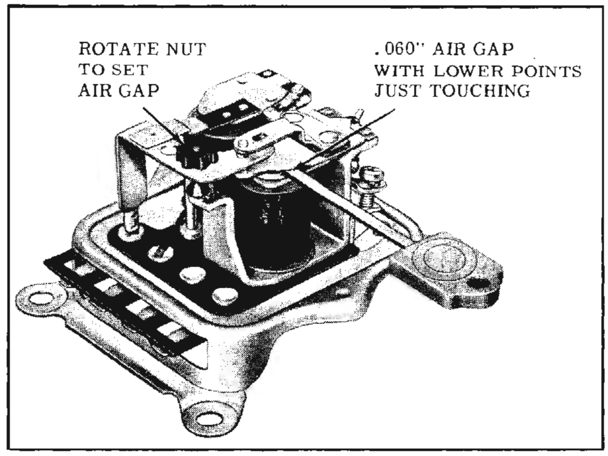


Fig. 14-12 Checking Air Gap

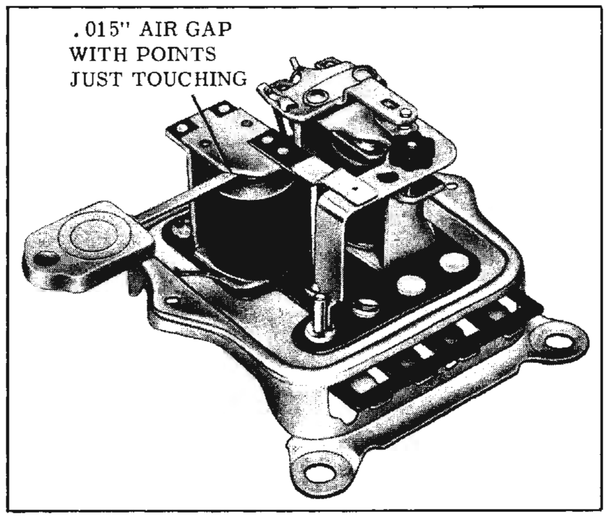


Fig. 14-13 Checking Field Relay Air Gap

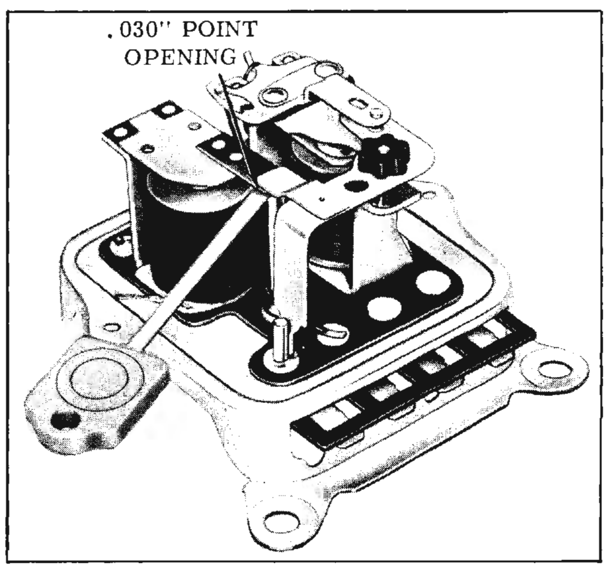


Fig. 14-14 Checking Field Relay Point Opening

5. To check point opening, insert a feeler gauge between the contact points. Clearance should be .030". (Fig. 14-14)

6. If necessary to adjust, bend the armature stop.

7. Install the regulator cover and electrical connector.

TAILORING THE VOLTAGE SETTING

The voltage setting for one type of operating condition may not be satisfactory for a different type of operating condition. Vehicle underhood temperatures, operating speeds, and the amount of night-time driving are factors which determine the proper voltage setting. The proper voltage setting is attained when the battery remains fully charged with a minimum use of water.

If no circuit defects are found, yet the battery remains undercharged, raise the voltage setting by .3 volt, and then check for an improved battery condition over a service period of reasonable length. If the battery remains overcharged, lower the setting by .3 volt, and then check for an improved battery condition.

BATTERY

A hydrometer test will indicate the state of charge of a battery unless water has recently been added to the battery or the battery has been recently fast charged. A good hydrometer reading does not necessarily indicate that the battery will perform its normal functions. (See LIGHT LOAD TEST IN SERVICING OF UNITS IN THE CHARGING CIRCUIT)

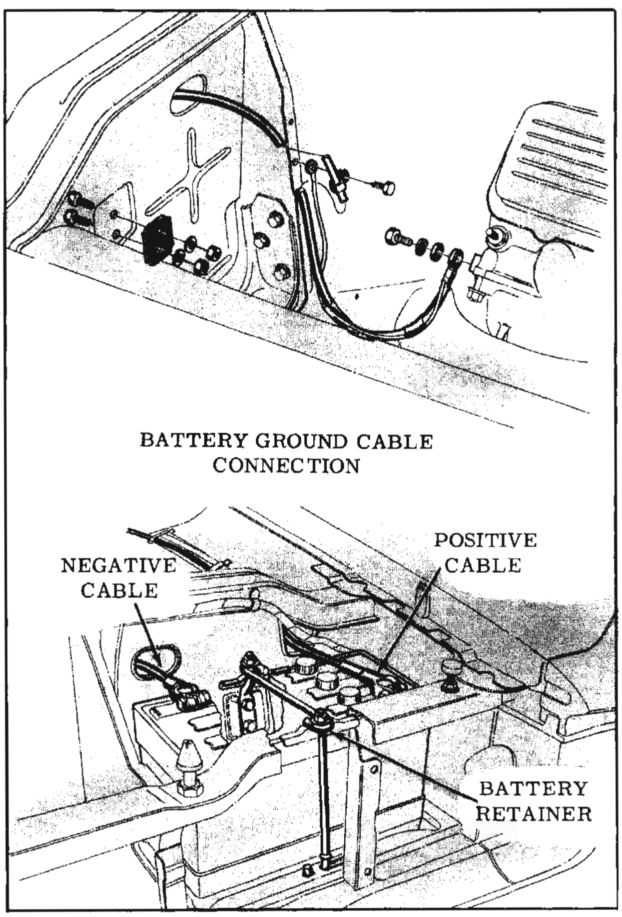


Fig. 14-15 Battery Installation

Specific gravity of the electrolyte varies .004 units for every 10° difference between the temperature of the electrolyte and 80°F. The hydrometer reading must be corrected to 80°F.

Examples:

a. Hydrometer gravity reading	1.235
Electrolyte temperature 110°F	
Correction (4x3)	+ .012
Corrected gravity reading	1.247
b. Hydrometer gravity reading	1.250
Electrolyte temperature 0°F	
Correction (4x8)	- .032
Corrected gravity reading	1.218

A battery with a corrected specific gravity reading 1.215 is half charged. A battery with a specific gravity reading of 1.270 $\pm$ .010 at 80°F is fully charged.

If the corrected specific gravity of the electrolyte is less than 1.215 or varies more than .025 between cells, the battery should be removed for a slow charge and a light load test.

SERVICING OF UNITS IN THE CHARGING CIRCUIT

BATTERY

Removal and Installation (Fig. 14-15)

1. Disconnect battery cables.

2. Remove the battery, rear retainer nut and washer, loosen the front nut then remove the battery retainer and bolt.

3. Remove the battery. To install, reverse the removal procedure. Tighten the battery retainer nuts 1.5 to 2.5 ft. lbs.

IN-THE-CAR BATTERY TEST AND CHARGING

INSPECTION

Check outside of battery for damage or signs of serious abuse such as broken case or covers. Check inside of battery by removing the vent caps and inspecting for signs of abuse such as electrolyte level too low to see, or bad or unusual odors. If electrolyte level is low, bring it up to the split ring by adding water.

If battery shows signs of serious damage or abuse, it should be replaced. If not, make a light load test.

LIGHT LOAD TEST

1. Place load on battery by holding starter switch "ON" for three seconds. It makes no difference whether starter turns engine or not. However, if engine starts, turn off ignition immediately.

2. Turn on headlights (Low beam) for one minute. With lights still "ON", read individual cell voltages of battery with voltmeter (.01 volt division). Compare readings with the following:

   A. Uniform Readings

   If any cell reads 1.95 volts or more and the difference between the highest and lowest cell is less than .05 volts, battery is good. If any cell reads less than 1.95 volts, battery should be fully recharged for good performance. See CHARGING AFTER LIGHT LOAD TEST.

   B. Non-uniform Readings

   If any cell reads 1.95 volts or more and there is a difference of .05 volts or more between the highest and lowest cell, the battery should be replaced.

   C. Low Readings

   If all cells read less than 1.95 volts, battery is too low to test properly. FAILURE OF THE METER TO REGISTER ON ALL CELLS DOES NOT INDICATE A DEFECTIVE BATTERY. Boost charge battery and repeat Light Load Test. (See BOOST CHARGING FOR LIGHT LOAD TEST.) If battery is found to be good after boosting, it should be fully recharged for good performance.

   If none of the cells come up to 1.95 volts after the first boost charge, the battery should be given a second boost. Batteries which do not come up after second boost charge should be replaced.

   NOTE: If any battery found to be good by the Light Load Test does not perform satisfactorily in subsequent service, it should again be tested by the Light Load Test and if it still tests "good", it should be removed from the car and tested as outlined under SLOW CHARGING.

BOOST CHARGING FOR LIGHT LOAD TEST

Boost 12-volt batteries at 50 amperes for 20 minutes (50 x 20 = 1000 ampere minutes). If charger will not give this rate, charge for an equal number of ampere minutes at best rate available. For purposes of light load test, do not boost battery more than the amount indicated.

CHARGING AFTER LIGHT LOAD TEST

1. For best performance, a good battery should be fully charged before being returned to service.

2. If batteries are to be fully charged by means of a quick charger, the charge rate must be "tapered" (reduced to a safe limit) when the electrolyte temperature reaches 125°F. or when gassing becomes excessive. Failure to do so may harm the battery.

SLOW CHARGING

Batteries removed from the car for charging should be charged continuously at a low rate. Batteries may be safely slow-charged at a rate in amperes equal to 7% of the battery's ampere-hour capacity. This is called the "Normal" charge rate.

Although the slow-charge method is recommended for charging all batteries, discharged batteries in otherwise good condition, may be given a "boost" with a fast charger if time does not permit complete slow-charging. When using a fast charger, it must be remembered that the battery is only receiving a partial charge and that the battery electrolyte temperature must not be allowed to exceed 125°F. If the battery heats excessively, quick charging must be discontinued.

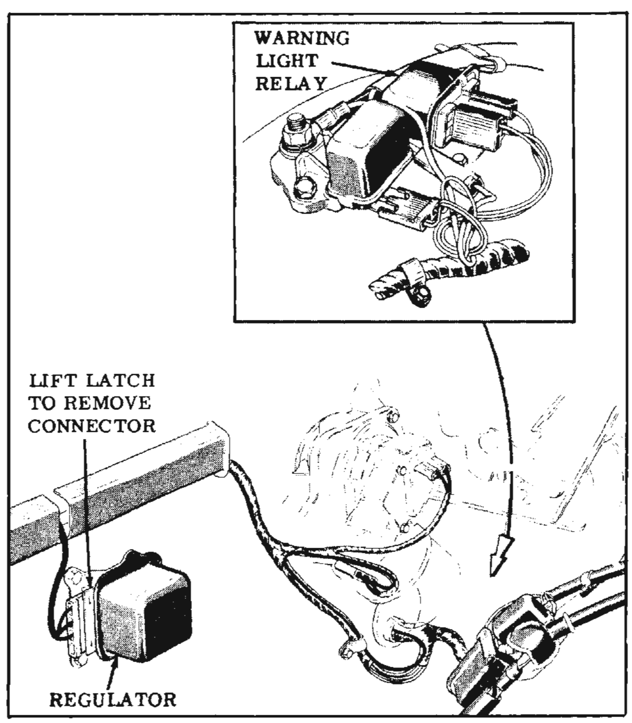


Fig. 14-16 Regulator and Warning Light Relay

Batteries removed from the car for further checking, in order to determine whether or not the unit should be replaced, should first be brought to a fully-charged condition by slow-charging. Badly sulfated batteries may require a continuous slow-charging for 48 hours or more before a rise in gravity reading occurs. If the specific gravity reading of any cell fails to reach 1.215 (corrected to 80°F.) or if there is a variation of more than 25 points between cells after thorough slow charging, replace the battery.

REGULATOR (Fig. 14-16)

Removal and Installation

1. Disconnect electrical connector from regulator by lifting the connector retainer.

2. Remove the regulator attaching screws and remove regulator. To install, reverse the removal procedure. DO NOT ATTEMPT TO POLARIZE THE DELCOTRON.

WARNING LIGHT RELAY (Fig. 14-16)

The warning light relay is located on the fender filler plate next to the junction block and horn relay. It is attached with sheet metal screws. Electrical connections are made by push-on type connectors. No internal adjustments are required. If the relay is defective, it must be replaced.

DELCOTRON

Disassembly (Fig. 14-17)

1. Scribe alignment marks on the end frames, then remove the four through-bolts.

2. Separate the drive end frame and rotor assembly from the stator assembly by prying at the stator slot.

3. Position the rotor in a vise and tighten only enough to permit loosening of the shaft nut. Avoid excessive tightening to prevent distortion of the rotor.

4. Remove the shaft nut, wave washer, pulley, fan and collar. Separate the drive end frame and spacer from the rotor shaft.

5. If necessary to remove the bearing from the drive end frame, proceed as follows:

   A. Remove bearing retainer and gasket.

   B. Back-up the bearing housing with Tool J-7584-1 (Front Cover Seal Installer).

   C. Drive out bearing with Tool J-5158-2 (Valve Guide Installer).

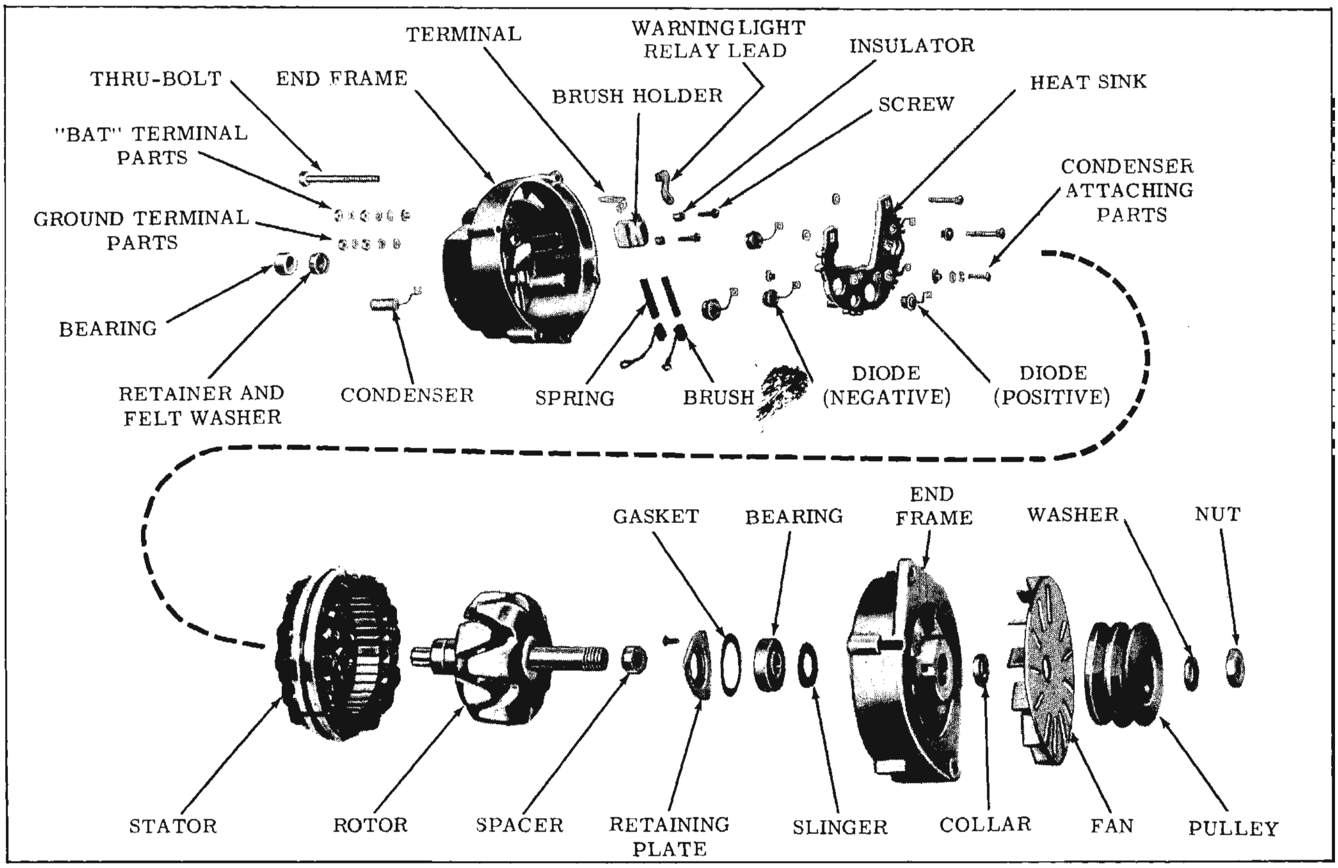


Fig. 14-17 Delcotron Assembly

6. Remove the three stator winding to diode attaching nuts and separate the stator from the slip ring end frame.

7. Remove the two brush holder attaching screws and remove the brush holder from the end frame.

8. Separate the brushes and warning light relay lead from the brush holder.

9. Remove the condenser to heat sink attaching screw and fiber washer.

10. Remove the "BAT" and "GRD" terminal nuts, bolts and washers; then remove the heat sink.

11. If necessary to remove the capacitor, it can be removed by pushing it out to the rear of the end frame.

Cleaning and Inspection

1. Check roller bearing in slip ring end frame. If bearing has sufficient lubricant and shows no sign of damage, protect the bearing opening with masking tape to prevent entrance of foreign material, and clean end frame with compressed air. If bearing shows roughness or lack of lubricant, the bearing should be replaced as follows:

   A. Position end frame on the open jaws of a vise so that the jaws support the area around the bearing.

   B. Using Valve Guide Installer J-5158-2, press bearing rearward out of end frame. Clean end frame in cleaning solvent.

   C. To install new bearing, back up the inside area of the end frame surrounding the bearing with Tool J-8810.

   D. Press on closed end of needle bearing until bearing is flush with the end frame housing.

   E. Install a new retainer and felt washer with J-5158-2 until retainer seats against bearing.

2. Wash metal parts except stator and rotor in cleaning solvent. Degreasing solvent will damage the rotor and stator insulation. The rotor and stator should be cleaned with compressed air.

3. Check the rotor as follows:

   A. To check rotor for grounds, connect a 12-volt test lamp or a ohmmeter from either slip ring to the rotor shaft or poles. If the lamp lights or the ohmmeter reading is low, the field winding is grounded and the rotor must be replaced. (Fig. 14-18)

   B. To check rotor for opens, connect the test lamp or an ohmmeter lead to each slip ring. If the test lamp does not light or no reading can be obtained on the ohmmeter, the field winding is open and the rotor must be replaced. (Fig. 14-18)

   C. To check rotor for short circuits, connect a 12 volt battery and an ammeter in series with the two slip rings. The ammeter should read 1.9 to 2.2 amps. If ammeter reading is higher than specified, the field windings are shorted and the rotor must be replaced.

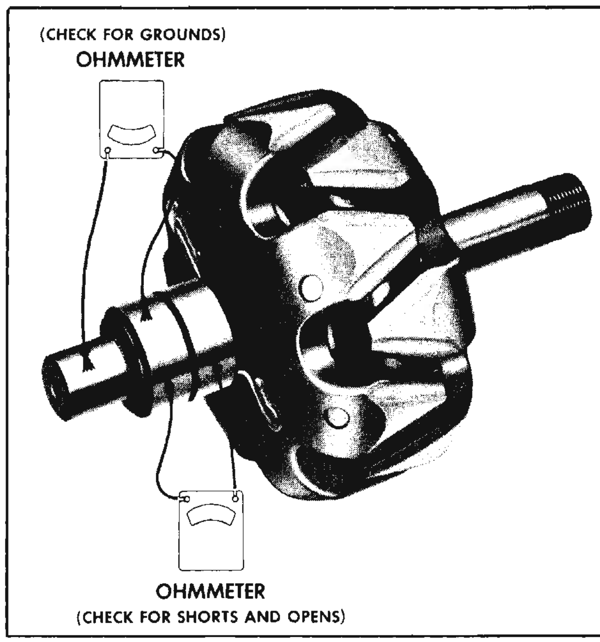


Fig. 14-18 Checking Rotor

   D. The slip rings on the rotor can be cleaned with 400 grain or finer polishing cloth. When cleaning slip rings, the rotor must be rotating to prevent flat spots on the slip rings which could cause brush noise.

   Slip rings which are rough or out-of-round should be trued in a lathe with a .002" maximum indicator reading. After turning slip rings in a lathe, polish with 400 grain or finer polishing cloth. Thoroughly clean away all dust particles.

4. The stator can be checked as follows:

   A. Connect a 12-volt test lamp or an ohmmeter from a stator lead to the stator frame. If the lamp lights or the ohmmeter reading is low, the winding is grounded and the stator must be replaced.

If lamp does not light or no ohmmeter reading can be obtained, repeat procedure on the other two stator leads. (Fig. 14-19)

B. Connect a 12-volt test lamp or an ohmmeter between each pair of stator leads. If the lamp fails to light or the ohmmeter reading is high between any pair of leads, the stator winding is open and the stator must be replaced. (Fig. 14-19)

C. A short circuit in the stator windings is difficult to locate without special test equipment due to the low resistance of the windings. However, if all other electrical checks are normal and the Delcotron fails to supply rated output, it is an indication that the stator windings are shorted.

5. Check each diode for a shorted or open condition. Refer to diode checking.

6. Inspect the drive end frame bearing for roughness.

7. Inspect brushes and brush springs.

8. Inspect drive end frame bearing retainer plate felt. If felt is hard or worn, the retainer plate should be discarded.

Diode Checking

The positive diodes, located in the heat sink, are checked as follows:

A. Attach the positive test lamp lead to a diode lead.

B. Attach the negative test lamp lead to the heat sink; the lamp should light indicating a good positive diode.

C. Check the other two positive diodes in the same manner.

D. Reverse the test lamp leads and again check the three positive diodes. The lamp should not light, indicating a good positive diode.

The negative diodes, located in the slip ring end frame are checked as follows:

A. Attach the negative test lamp lead to a diode lead.

B. Attach the positive test lamp lead to the slip ring end frame, the lamp should light, indicating a good negative diode.

C. Check the other two negative diodes in the same manner.

D. Reverse the test lamp leads and again check the three negative diodes. The lamp should not light, indicating a good negative diode.

If the lamp lights in both checks of each diode, or fails to light in both checks, the diode is shorted or open and must be replaced. This procedure can also be used to determine the polarity of a new diode. If necessary to replace a diode, refer to DIODE - Remove and Install.

Ohmmeter Method (Fig. 14-20)

The lowest range scale on the ohmmeter should

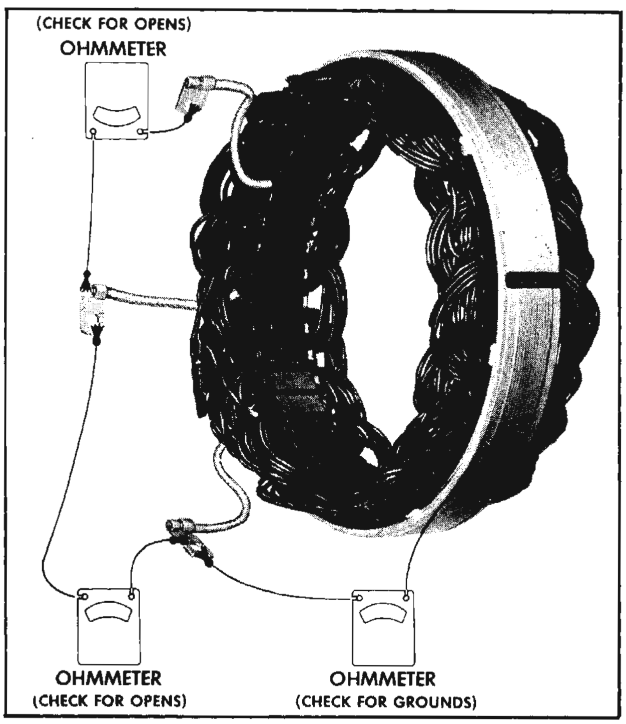


Fig. 14-19 Checking Stator

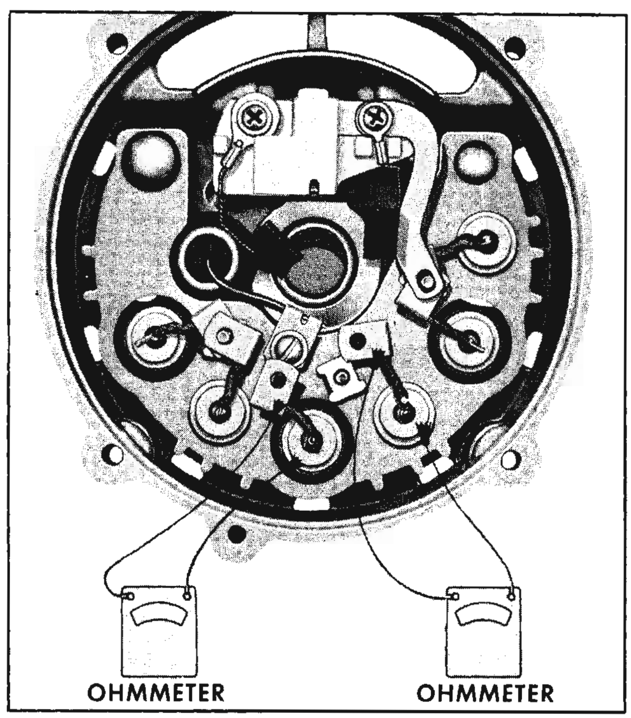


Fig. 14-20 Checking Diodes

be used, and the ohmmeter should have a 1-1/2 volt cell. To determine the cell voltage, turn the selector to the lowest scale, and then connect the ohmmeter leads to a voltmeter. The voltmeter will indicate the cell voltage.

Check the diode in the heat sink by connecting one of the ohmmeter leads to the heat sink, and the other ohmmeter lead to the diode lead and note the reading, then reverse the ohmmeter lead connections and note the reading. If both readings are very low, or if both readings are very high, the diode is defective. A good diode will give one low reading and one high reading. Check the other two diodes in the heat sink in the same manner.

To check a diode mounted in the end frame, connect one of the ohmmeter leads to the end frame, and the other ohmmeter lead to the diode lead and note the reading, then reverse the ohmmeter lead connections, and note the reading. If both readings are very low, or if both readings are very high, the diode is defective. A good diode will give one low reading and one high reading. Check the other two diodes in the end frame in the same manner.

Special Tester Method

Special testers are available for checking diodes. To use these testers, follow the tester manufacturer's recommendations.

DIODE

Remove

1. With the Delcotron disassembled and the stator removed, position Tool J-9617-1, J-9617-2 and the slip ring end frame in a vise as shown in Fig. 14-21.

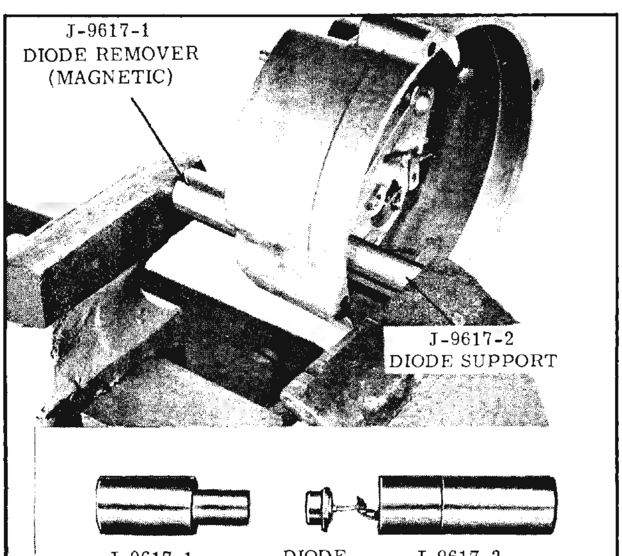


Fig. 14-21 Diode Removal

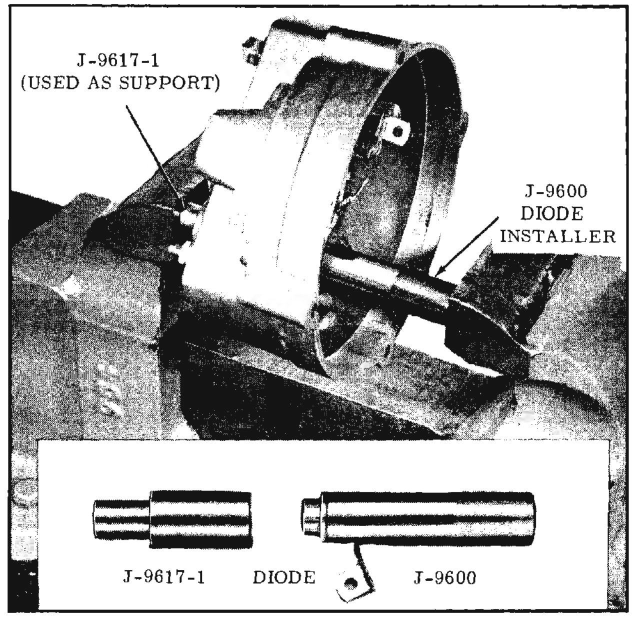


Fig. 14-22 Diode Installation

NOTE: Diodes can be removed from either the end frame or the heat sink without removing the heat sink.

2. Operate vise until the defective diode is removed from the end frame or heat sink.

3. Remove tools, diode and end frame from the vise.

Install

1. Insert a diode into Tool J-9600 as shown in Inset, Fig. 14-22.

NOTE: The positive diode rectifiers are located in the heat sink and the negative diode rectifiers are located in the end frame.

2. Position Tools J-9617-1, J-9600 (with diode) and end frame as shown in Fig. 14-22.

3. Operate vise until the diode shoulder bottoms against the end frame or heat sink.

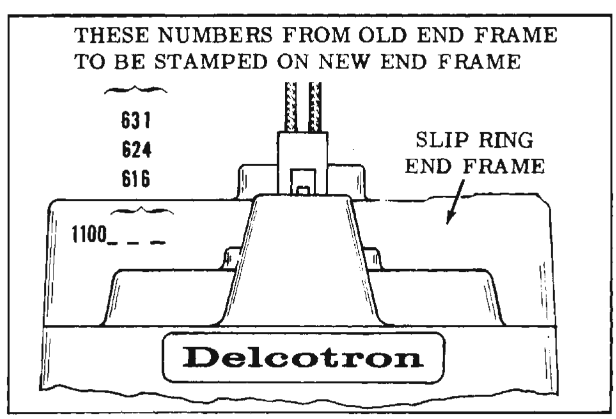


Fig. 14-23 Delcotron Part No. Location

4. Remove tools and end frame from vise.

Delcotron Assembly

NOTE: If a new slip ring end frame is to be installed, stamp the last three numbers of the old end frame on the new end frame as shown in Fig. 14-23.

1. If the capacitor was removed, install from the inside of the end frame until the capacitor is flush with capacitor housing.
2. Install the heat sink, making sure insulated washers are installed as shown in Fig. 14-24.
3. Install the capacitor to heat sink lead.
4. Assemble the brush holder as shown in Fig. 14-25. Install the brush springs and brushes into the brush holder and retain with a straight piece of wire inserted through the hole in the brush holder.
5. Install the brush holder assembly into the end frame and retain with the two attaching screws.
6. Position the stator into the slip ring end frame with the stator leads aligned with the stator and diode lead attaching studs. Before installing the attaching nuts, position the warning light relay lead over the diode lead attaching stud. Tighten all nuts. (Fig. 14-26)
7. If the bearing in the drive end frame is to be re-used, it should be re-packed one-quarter full of lubricant, Part No. 1948791. Install the bearing into the drive end frame as follows:

   A. Position drive end frame on a flat surface.

   B. Retain grease slinger to the bearing with grease.

   C. Using Tool J-6133 (Speedometer Gear Installer) press bearing into position.

   D. Install bearing retainer.
8. Position the rotor in a vise. Tighten vise only enough to permit tightening the shaft nut.
9. Install the spacer, drive end frame, collar, fan, pulley, wave washer and rotor nut. Tighten nut 50 to 60 ft. lbs.
10. Assemble the two end frames with scribe marks aligned and install the through-bolts.
11. Remove the brush retaining wire. The brushes will seat on the slip rings.

STARTING CIRCUIT (F.S.C. and F-85)

STARTING MOTOR ASSEMBLY (Fig. 14-27)

The starting motor is a 12-volt extruded frame type unit, having four poles and a compound field. The starting motor used on the 88 regular fuel engines and F-85 (Fig. 14-28) has three field coils connected in series from the field terminal to the insulated brushes, and one shunt coil connected from the field terminal to ground.

The starting motor used with premium fuel engines (Fig. 14-29) has heavier armature and field windings, and has two field coils in series with the armature circuit and in parallel to each other. The other two field coils are in parallel with each other and are connected from the field terminal to ground.

The armature rotates in bushings at both ends. An overrunning clutch drive is used to engage the

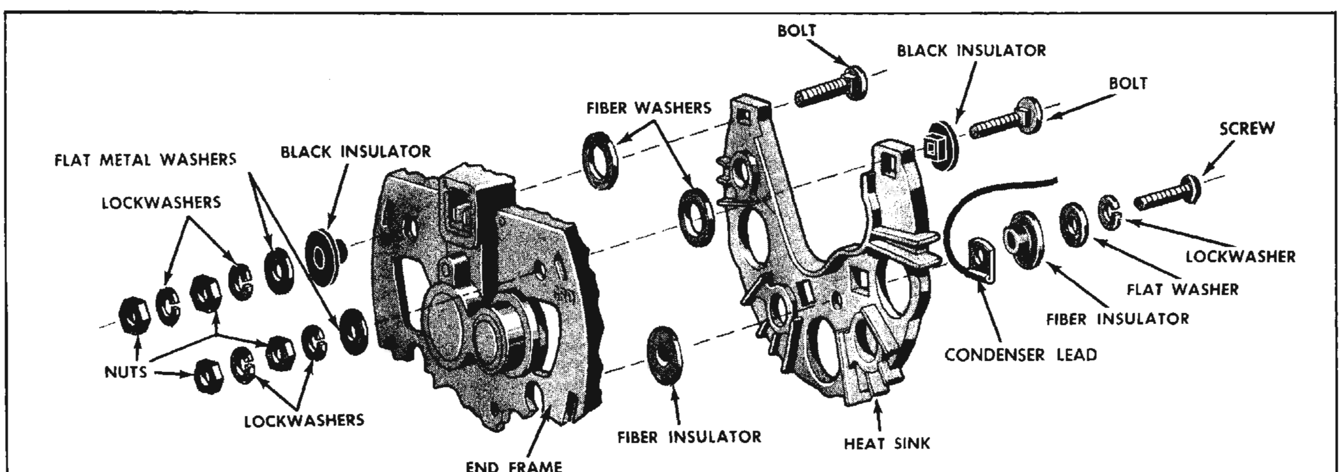


Fig. 14-24 Slip Ring End Frame Assembly

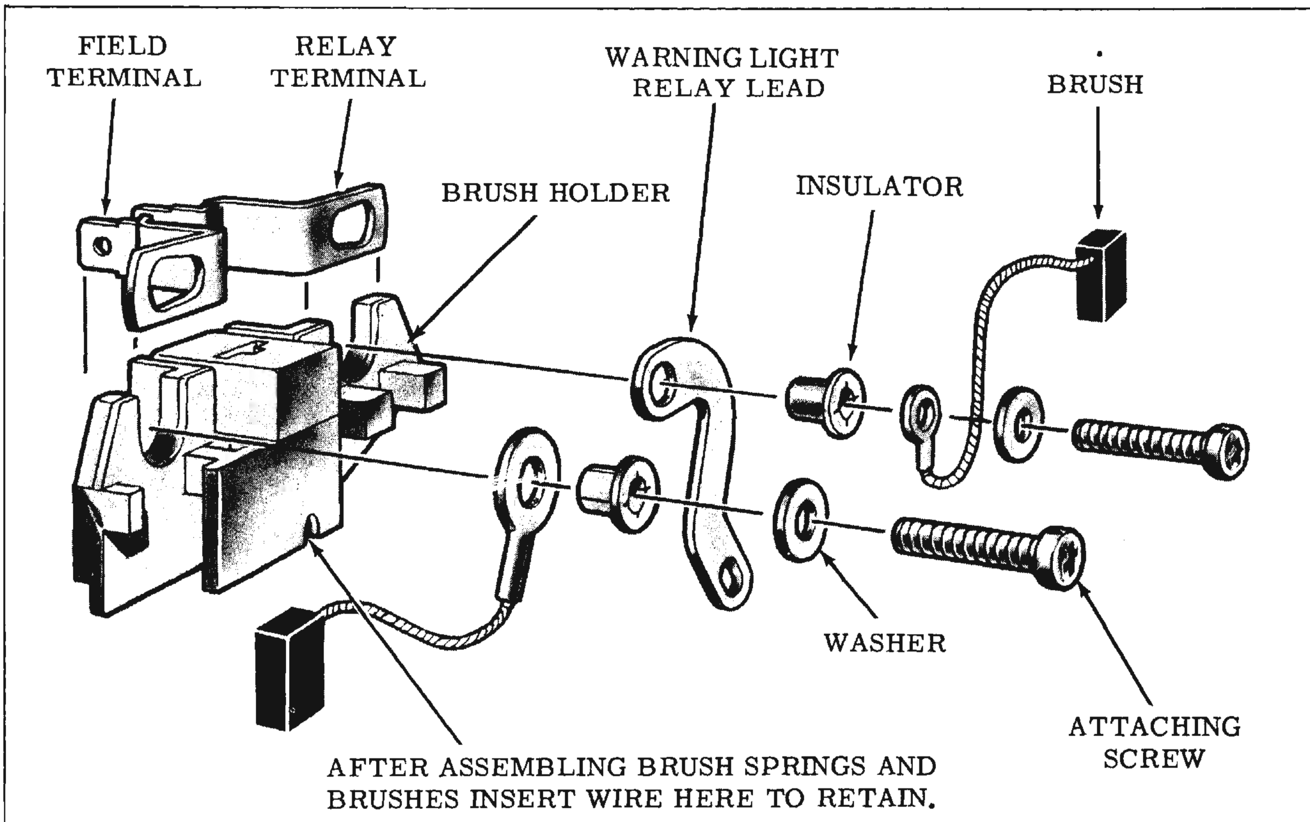


Fig. 14-25 Brush Holder Assembly

cranking motor pinion with the flywheel. The overrunning action of the clutch protects the cranking motor armature from excessive speed when the engine starts.

A solenoid switch, integral with the solenoid assembly, operates the overrunning clutch drive by means of a linkage to the shift lever. When the ignition switch is turned to the starting position, the solenoid is energized, moving the cranking motor pinion into mesh with the flywheel. The

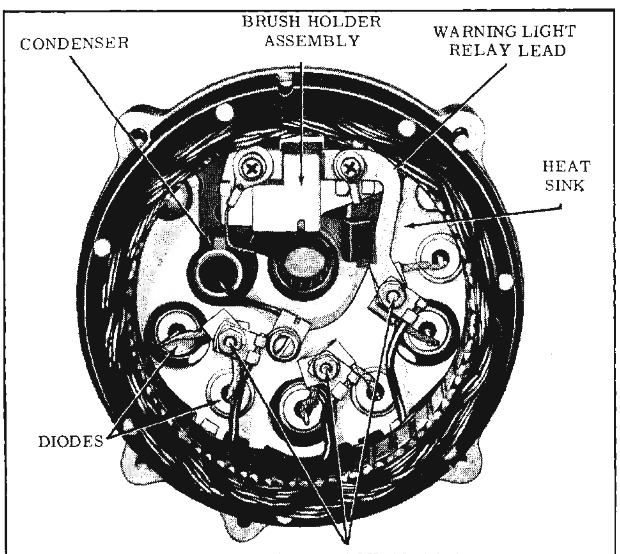


Fig. 14-26 Stator and Diode Leads

solenoid switch contacts are then closed so that battery current is delivered to the cranking motor.

The armature shaft and clutch have spiral splines which prevent full cranking power until the clutch pinion is fully engaged in the flywheel ring gear. An assist spring (88 regular fuel and all F-85 engines only) between the armature winding and the collar of the clutch drive aids the solenoid in overcoming the return spring force in the initial movement of the clutch. A pinion stop, consisting of a snap ring retainer and thrust collar assembled on the armature shaft, takes all the end thrust.

Removal

1. Disconnect battery, then disconnect the positive battery cable at junction block and disconnect the solenoid switch wire (purple) from the chassis wiring harness.

2. Hoist car.

3. If equipped with dual exhaust, disconnect exhaust pipe at manifold.

4. Disconnect starting motor from lower flywheel housing and remove motor while sliding battery cable loom through sleeve.

Disassembly

1. Disconnect the field coil connector from the motor solenoid terminal.

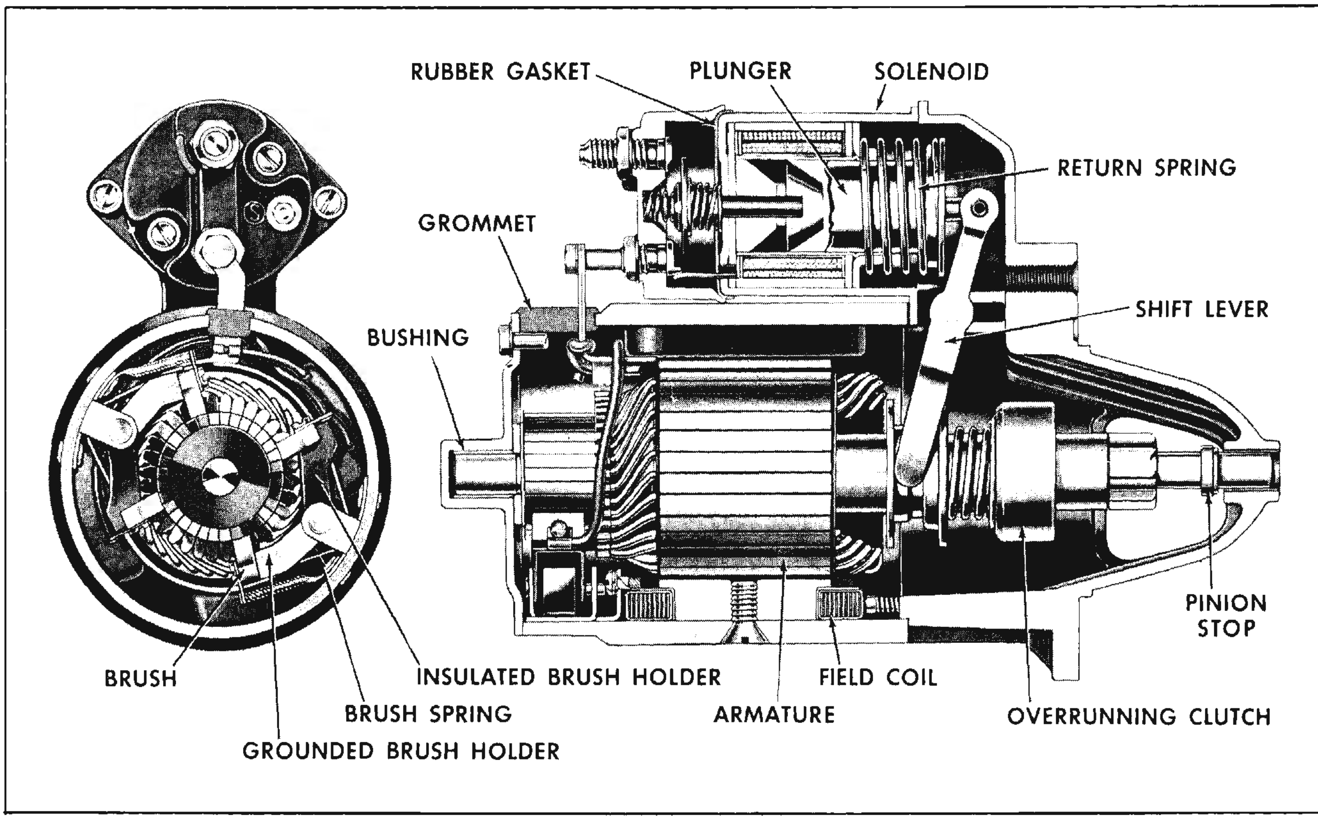


Fig. 14-27 Starter Motor Details

2. Remove through-bolts, then remove commutator end frame and leather washer.

3. Remove field frame assembly, armature, and clutch assembly from drive gear housing.

4. If necessary to remove overrunning clutch from armature shaft, proceed as follows:

   a. Remove thrust collar from armature shaft. (Fig. 14-30)

   b. Slide a standard half-inch pipe coupling or other metal cylinder of suitable size (an old pinion can be used if available) over shaft against retainer to be used as a driving tool. (Fig. 14-31) With armature shaft supported on wood block, tap end of driving tool until retainer clears snap ring.

   c. Remove snap ring from groove in shaft

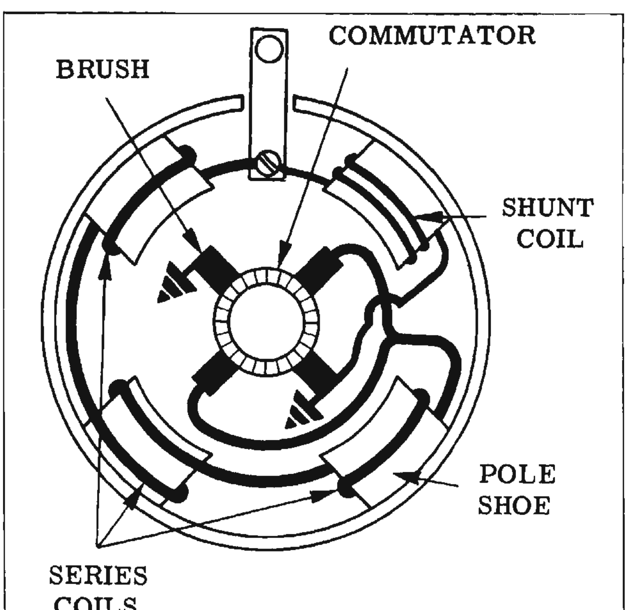


Fig. 14-28 Field Windings (88 Regular Fuel and F-85)

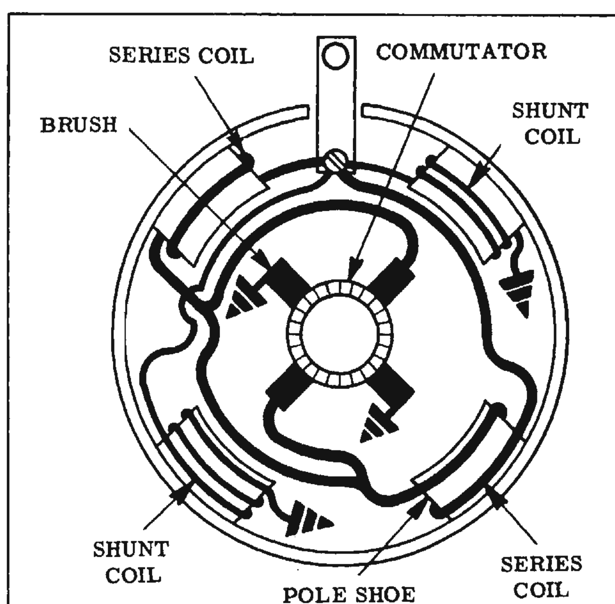


Fig. 14-29 Field Windings (Premium Fuel)

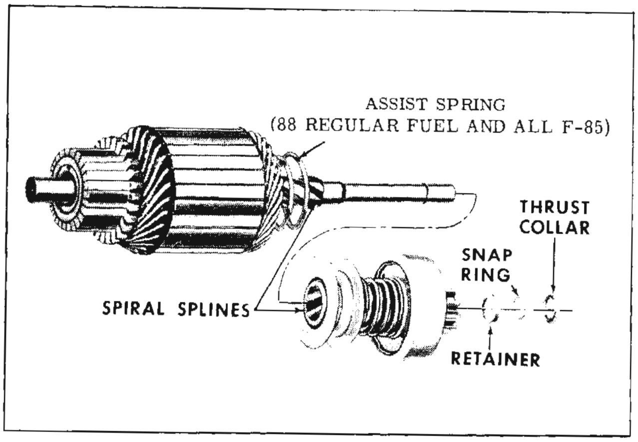


Fig. 14-30 Overrunning Clutch

using pliers or other suitable tool. If the snap ring is distorted during removal, it will be necessary to use a new one upon reassembly.

d. Remove retainer, clutch assembly, and assist spring from armature shaft.

5. If necessary to replace brush holding parts, proceed as follows:

a. Remove screws attaching leads and brushes to the holders.

b. Press down on the flat spring so that center of spring clears the retaining slot. Slide off the brush spring and two brush holders as an assembly.

c. Reassemble and install new brushes if necessary.

6. If necessary to remove solenoid assembly or shift lever, proceed as follows:

a. Remove solenoid to drive gear housing attaching screws, then remove solenoid assembly.

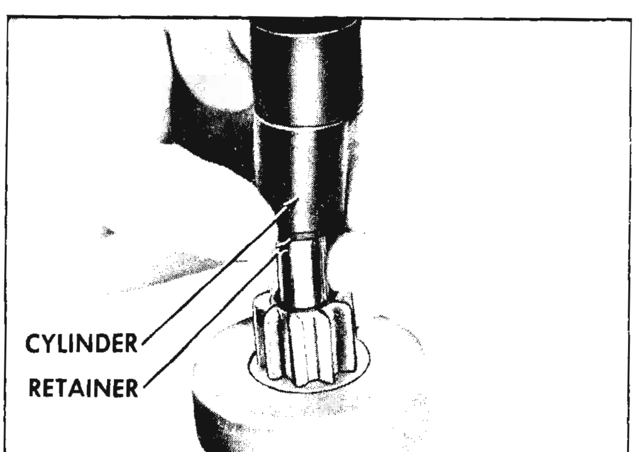


Fig. 14-31 Removing Pinion Retainer

b. To remove shift lever and/or plunger, remove shift lever pivot bolt.

c. Disassemble shift lever from plunger.

Cleaning, Inspection and Tests

1. Clean all starting motor parts, but DO NOT USE GREASE DISSOLVING SOLVENTS FOR CLEANING THE OVERRUNNING CLUTCH, ARMATURE, AND FIELD COILS, since such a solvent would dissolve the grease packed in the clutch mechanism and would damage armature and field coil insulation.

2. Test overrunning clutch action. The pinion should turn freely in the overrunning direction. Check pinion teeth to see that they have not been chipped, cracked, or excessively worn. Replace assembly if necessary.

3. Check brush holders to see that they are not deformed or bent, but will properly hold brushes against the commutator.

4. Check fit of armature shaft in bushing of drive housing. Shaft should fit snugly in the bushing. If the bushing is worn, it should be replaced.

5. Inspect armature commutator. If commutator is rough or out-of-round, it should be turned down and the mica undercut 1/32". Inspect the points where the armature conductors join the commutator bars to make sure they have a good connection. A burned commutator bar is usually evidence of a poor connection.

6. If test equipment is available:

a. Check the armature for short circuits by placing on growler and holding hack saw blade over armature core while armature is rotated. If saw blade vibrates, armature is shorted. Recheck after cleaning between the commutator bars. If saw blade still vibrates, replace the armature.

b. Using a 110-volt test lamp, place one lead on the armature shaft and the other on the commutator. If the lamp lights, the armature is grounded and must be replaced.

c. On starting motors used with regular fuel engines, using a 110-volt test lamp, place one lead on the connector bar and the other lead on one of the insulated brush terminals. (Fig. 14-32) If the lamp does not light, the series coils are open and will require repair or replacement.

d. On starting motors used with premium fuel engines, disconnect the field wires from connector bar. Using a 110-volt test lamp, place one lead on terminal of one series

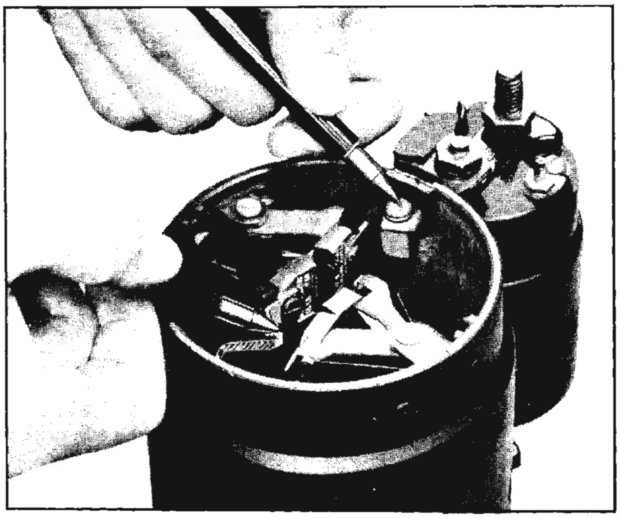


Fig. 14-32 Checking Field Coil for Open

coil and the other lead on one of the insulated brushes. If the lamp does not light, the coil has an open circuit. Test other series coil in the same manner.

e. Using a 110-volt test lamp, place one lead on the connector bar and the other on the field frame. (Fig. 14-33) Disconnect all shunt coil grounds before this check is made. If the lamp lights, the field coils are grounded and the defective coils will require repair or replacement.

f. Using a 110-volt test lamp, place one lead on each end of one shunt coil. (Fig. 14-34) If the lamp does not light, the shunt coil is open and will require replacement. On starting motors used with premium fuel engines, test the other shunt coil in the same manner.

g. Check the current draw of the solenoid winding. (See SOLENOID CURRENT CHECK)

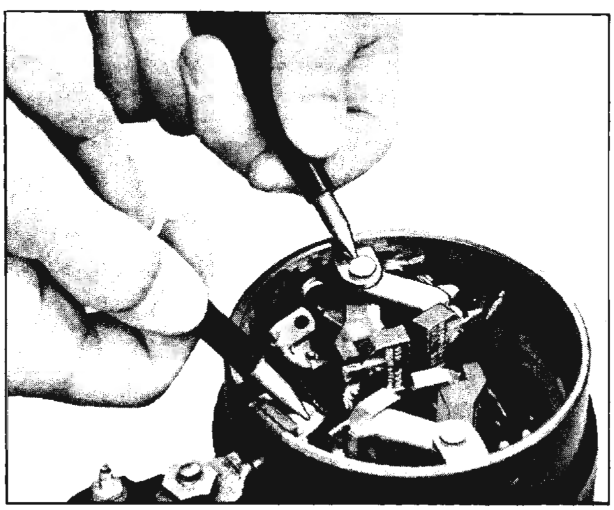


Fig. 14-33 Checking Field Coil for Ground

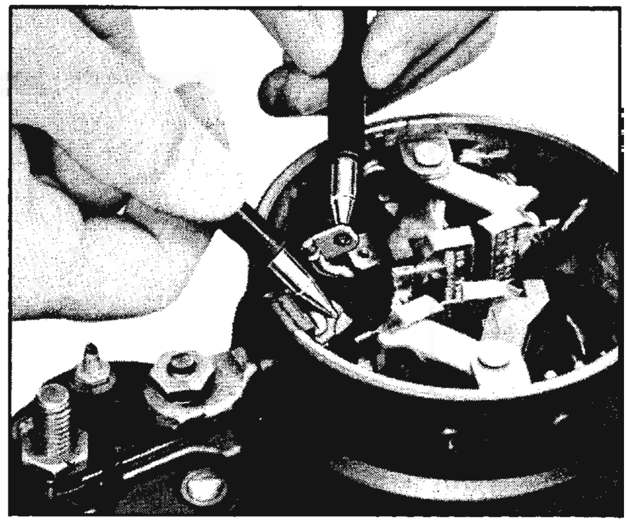


Fig. 14-34 Checking Shunt Coil for Open

Assembly

1. If the solenoid assembly or shift lever was removed, proceed as follows:

   a. Assemble shift lever and plunger.

   b. Position shift lever and plunger assembly in drive gear housing and install lever pivot bolt.

   c. Install solenoid assembly to drive gear housing.

2. If the overrunning clutch was removed from the armature shaft, assemble as follows:

   a. Lubricate drive end of armature shaft with SAE No. 10 oil, then install assist spring against armature.

   b. Slide clutch assembly onto armature shaft with pinion away from armature. (Fig. 14-35)

   c. Slide retainer onto shaft with cupped surface facing away from clutch assembly.

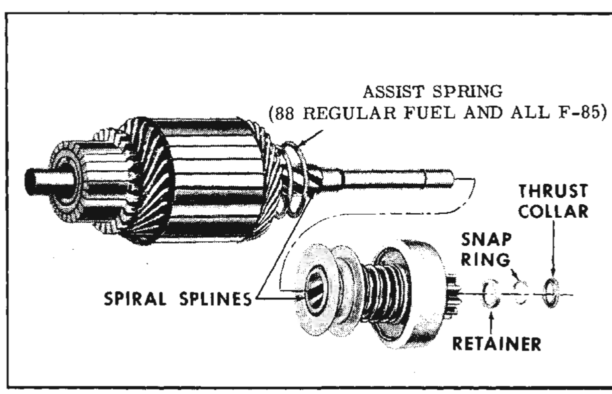


Fig. 14-35 Overrunning Clutch

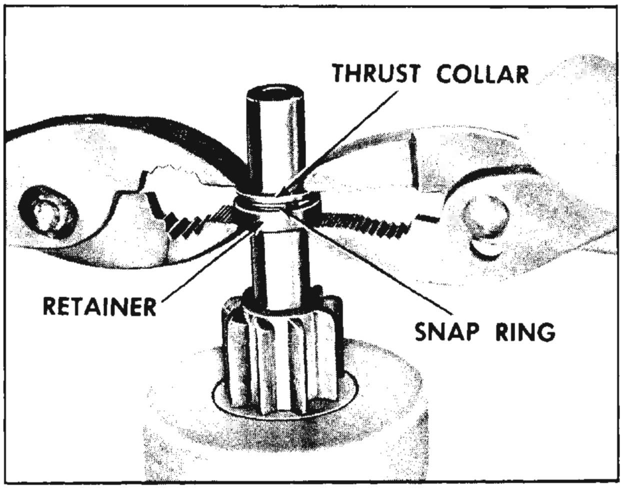


Fig. 14-36 Installing Retainer and Snap Ring

d. Install snap ring into groove on armature shaft.

e. Assemble thrust collar onto shaft with shoulder next to snap ring.

f. Position retainer and thrust collar next to snap ring. Using two pliers, grip retainer and thrust collar and squeeze until snap ring is forced into retainer and is held securely in groove in armature shaft. (Fig. 14-36)

3. Lubricate drive gear housing bushing with four or five drops of SAE 10W30.

4. With thrust collar in place against snap ring and retainer, slide armature and clutch assembly into drive gear housing and engage clutch with shift lever yoke.

5. Apply sealer, Part No. 557622 on solenoid flange as shown in Fig. 14-37.

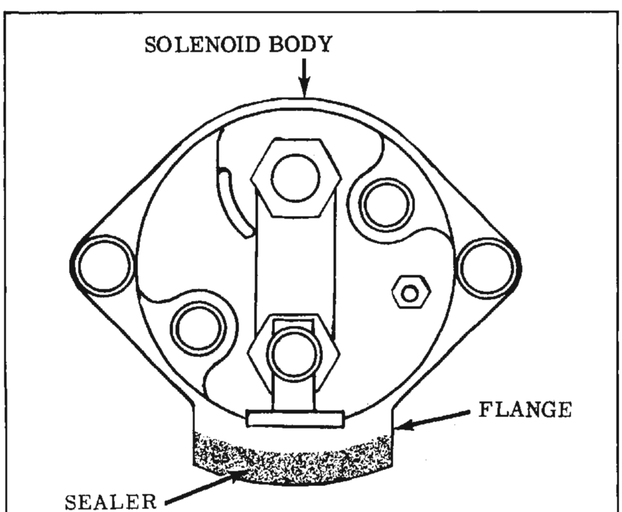


Fig. 14-37 Sealing Solenoid Housing

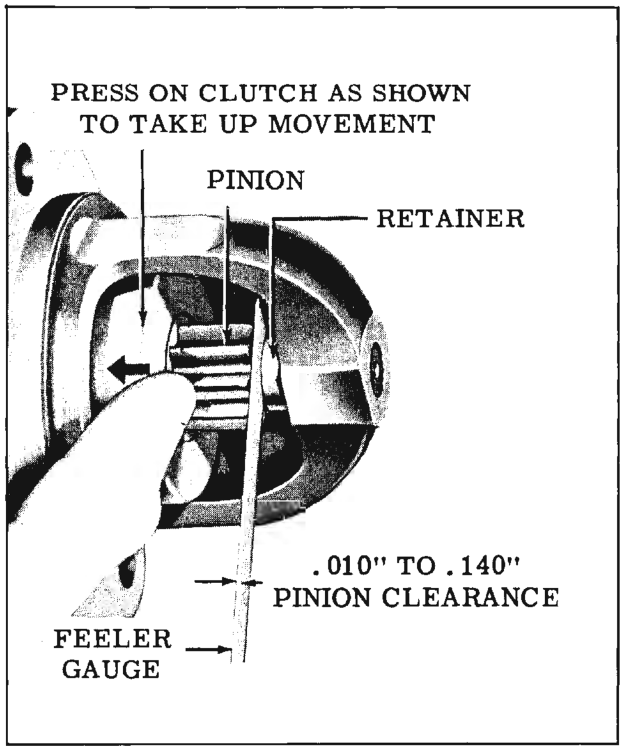


Fig. 14-38 Checking Pinion Clearance

6. Position field frame against drive gear housing using care to prevent damage to brushes.

7. Lubricate commutator end frame bushing with four or five drops of SAE 10W30.

8. Install leather washer on armature shaft and slide end frame onto shaft, then install and tighten through-bolts.

9. Connect the field coil connector to the motor solenoid terminal.

10. Check pinion clearance as outlined under PINION CLEARANCE.

Pinion Clearance

Whenever the cranking motor has been disassembled or the solenoid has been replaced, it is necessary to check the pinion clearance. Pinion clearance must be correct to prevent the buttons on the shift lever yoke from rubbing on the clutch collar during cranking.

To check, connect a voltage source of approximately 6 volts between the solenoid switch terminal and ground.

CAUTION: If a 6-volt battery is not available, a 12-volt battery may be used PROVIDING ONLY THREE CELLS ARE CONNECTED IN SERIES. TO PREVENT MOTORING, CONNECT A HEAVY JUMPER LEAD FROM THE SOLENOID MOTOR TERMINAL TO GROUND.

Energize the solenoid to shift the clutch, push the pinion back as far as possible to take up any movement, and check the clearance with a feeler gauge. (Fig. 14-38) The clearance should be .010" to .140".

Means for adjusting pinion clearance is not provided on the starter motor. If the clearance does not fall within limits, check for improper installation and replace all worn parts.

Solenoid Current Draw (Fig. 14-39)

If solenoid is not removed from starting motor, the connector strap must be removed from the terminal on the solenoid before making these tests. Complete tests in a minimum of time to prevent overheating of the solenoid.

To check hold-in winding, connect an ammeter and a variable resistance in series with a 12 volt battery and the "switch" terminal on the solenoid. Connect a voltmeter to the "switch" terminal and to ground. Adjust the voltage to 10 volts and note the ammeter reading. It should be 10.5 to 12.5 amperes for starting motors used with regular fuel and F-85 engines and 15.5 to 17.5 amperes for starting motors used with premium fuel engines.

To check both windings, connect the ammeter, variable resistance and voltmeter as for previous test. Ground the solenoid "motor" terminal. Adjust the voltage to 10 volts and note the ammeter reading. It should be 42 to 49 amperes for starting motors used with regular fuel and F-85 engines and 47 to 54 amperes for starting motors used with premium fuel engines.

Current draw readings that are over specifications indicate shorted turns or ground in the windings of the solenoid, and the solenoid should be replaced. Current draw readings that are under specifications indicate excessive resistance. Check connections, then replace solenoid if necessary.

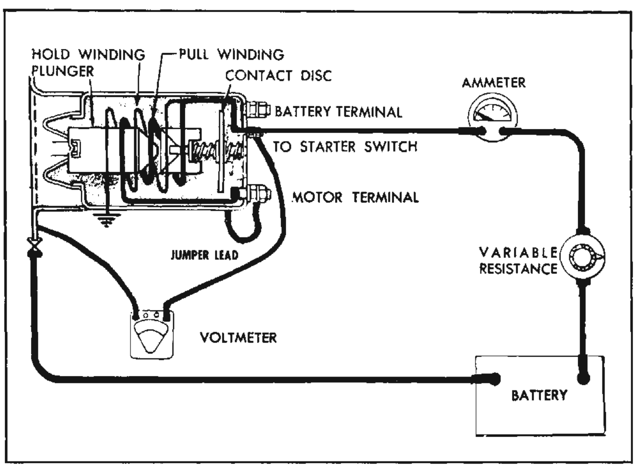


Fig. 14-39 Checking Solenoid Windings

NEUTRAL SAFETY SWITCH

A neutral safety switch, mounted on the mast jacket, or inside the console on the Starfire, is employed as a safety factor on Hydra-Matic models. The switch prevents starting of the engine with the transmission in gear. The engine may be started with the selector lever in "neutral" or "park" position.

CHECKING

1. Apply parking brake firmly.
2. Position selector lever into "D" range and turn ignition switch to "Start".
3. While holding ignition switch on "Start", slowly move selector lever toward "N" position until engine cranks and starts.
4. Without moving the selector lever after engine starts, depress accelerator pedal slightly to determine whether or not transmission is in gear. If neutral safety switch is properly adjusted, transmission will not be in gear.

   NOTE: If equipped with back-up lights, the lights should operate with the ignition on and the selector lever in reverse.

ADJUSTMENT

1. On Starfire series, remove the console control panel.
2. Loosen switch attaching screws.
3. With selector lever in "neutral," position the switch so that a .090" gauge pin can be inserted through the hole in the switch arm and into the hole in the face of the switch.
4. Tighten the switch attaching screws and remove the gauge pin.
5. Recheck adjustment.
6. On Starfire series, install console control panel.

CHECKING STARTING CIRCUIT RESISTANCE

Whenever the starter motor turns over slowly or not at all, or the solenoid fails to engage the starter with the flywheel, excessive resistance of the starter circuit may be the cause.

The following checks for excessive resistance can be performed with the starter motor on the car.

1. Test battery and charge if necessary.

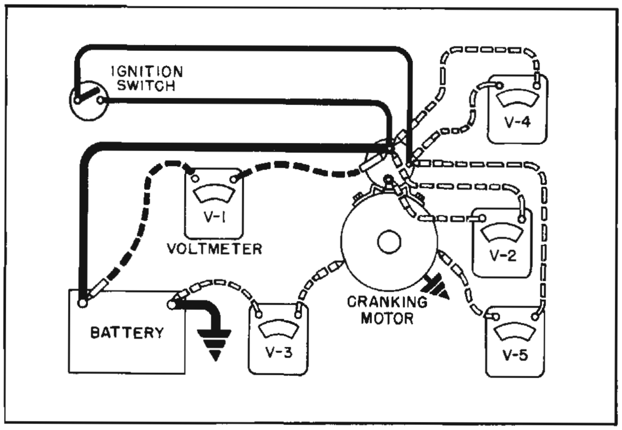


Fig. 14-40 Checking Starter Circuit Resistance

CAUTION: To prevent the engine from firing during the following checks, ground the distributor primary lead.

2. Measure the voltage drop (VI) during cranking between the positive battery post and the "battery" terminal of the solenoid. (Fig. 14-40)

3. Measure the voltage drop (V2) during cranking between the "battery" terminal of the solenoid and the "motor" terminal of the solenoid.

4. Measure the voltage drop (V3), during cranking between the negative battery post and the starter motor frame.

If the voltage drop for any one of the above three checks exceeds 0.2 volt, excessive resistance is indicated in that portion of the starting

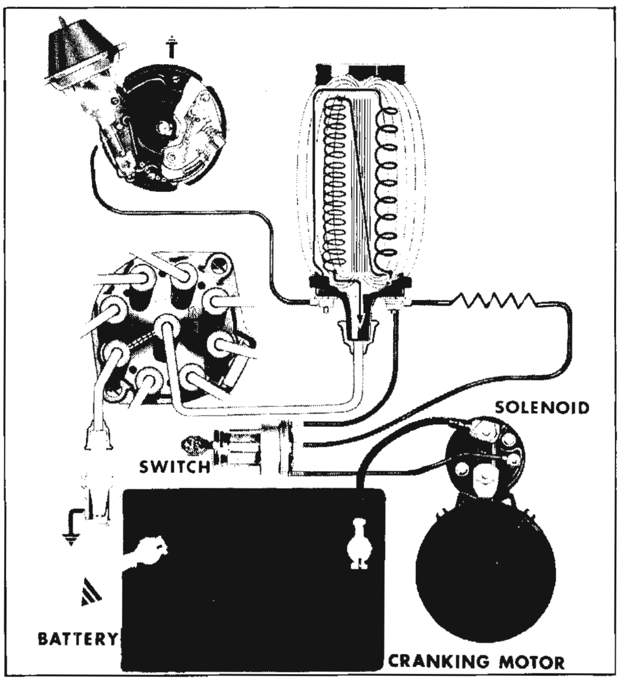


Fig. 14-41 Ignition System

circuit being checked. Locate and eliminate the cause for any excessive voltage drop in these circuits in order to obtain maximum efficiency of the starting system.

If the solenoid fails to pull in, the trouble may be due to excessive voltage drop in the solenoid circuit. To check for this condition, measure the voltage drop (V4) during cranking, between the "battery" terminal of the solenoid and the "switch" terminal of the solenoid. If the voltage drop exceeds 2.5 volts, the resistance is excessive in the solenoid circuit.

If the voltage drop does not exceed 2.5 volts and the solenoid does not pull in, measure the voltage (V5) available at the "switch" terminal of the solenoid. The solenoid should pull in with 8.0 volts at temperatures up to 200°F. If not, remove the starter motor and test the solenoid as outlined under SOLENOID CHECK.

IGNITION CIRCUIT (Fig. 14-41)

The ignition circuit includes the distributor, ignition coil, ignition resistor wire, ignition switch, spark plugs, and battery. For servicing of the battery, see CHARGING CIRCUIT.

DISTRIBUTOR (Fig. 14-42)

Description

The distributor cap has a window for adjusting point opening (dwell angle) while the cap is mounted and the engine is running. The contact point set is replaced as one complete assembly. The service replacement contact set has the BREAKER LEVER SPRING TENSION AND POINT ALIGNMENT pre-adjusted. Only the POINT OPENING requires adjusting after replacement.

Under part throttle operation, the intake manifold vacuum actuates the vacuum control diaphragm, thus advancing the spark and increasing fuel economy. During fast acceleration or when the engine is pulling heavily, the vacuum is not sufficient to actuate the diaphragm; therefore, the movable breaker plate is held so that the ignition timing is retarded.

The centrifugal advance mechanism consists of a cam actuated by two centrifugal weights controlled by springs. As the speed of the distributor shaft increases with engine speed, the centrifugal advance weights move outward which advances the cam, causing the contact points to open earlier, thus advancing the spark.

Adjustment of Distributor Dwell Angle (On Car)

1. Remove the distributor cap and inspect contact points; clean if necessary. Lubricate cam

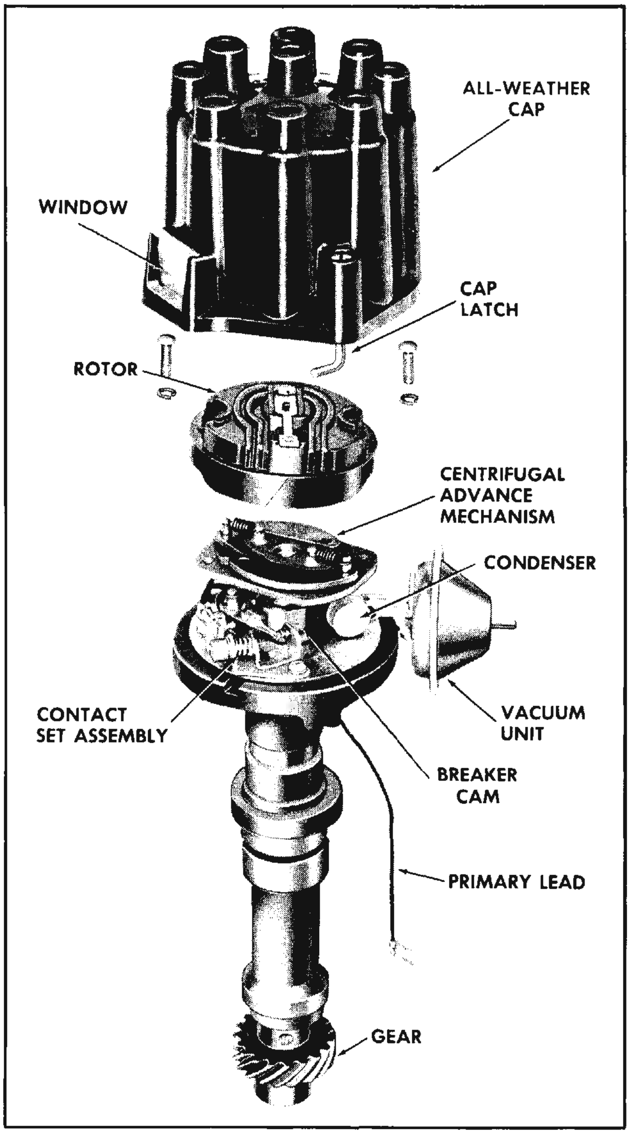


Fig. 14-42 Distributor

with cam and bearing lubricant. Install cap.

2. Connect a dwell meter to the primary distributor lead terminal on the coil and a suitable ground.

3. Raise window on side of distributor cap.

4. With the engine running at idle speed, insert Dwell Adjusting Tool BT-1501 into the head of the adjusting screw as shown in Fig. 14-43 and adjust dwell angle to 30^{o}.

   NOTE: If the dwell angle reading is erratic, check the primary circuit points and condenser.

The dwell angle variation should not exceed 3^{o} at engine speeds between idle and 1750 r.p.m. Excessive variation indicates distributor wear.

Removal

1. Disconnect the distributor wire from coil.

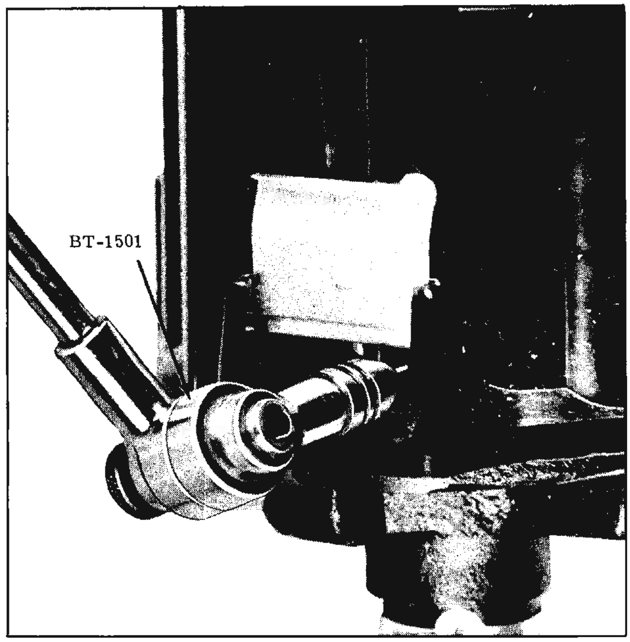


Fig. 14-43 Adjusting Dwell Angle

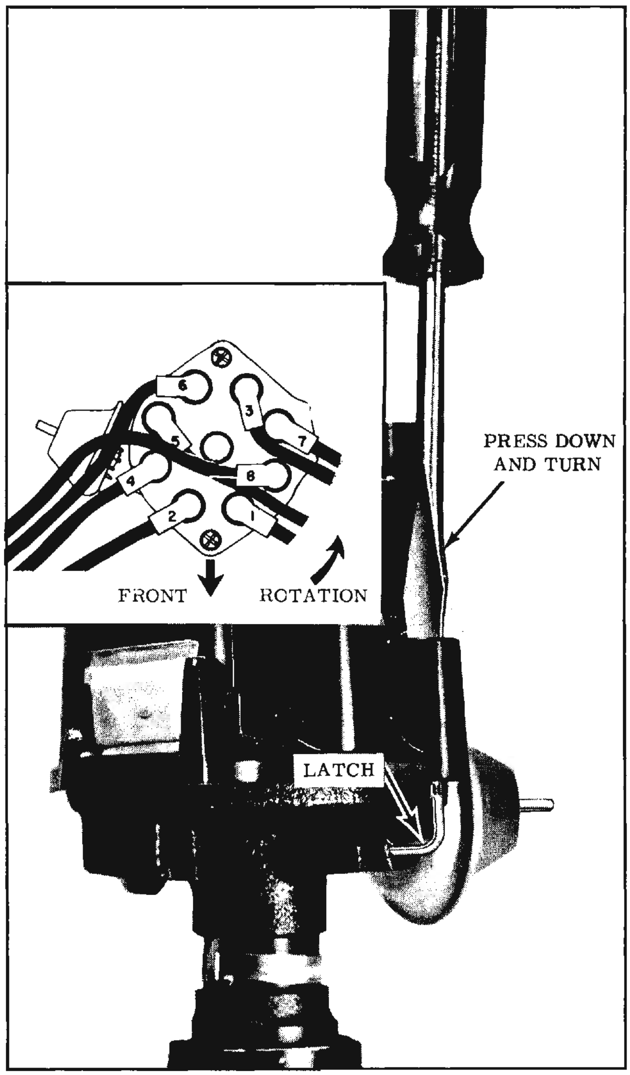


Fig. 14-44 Removing Distributor Cap

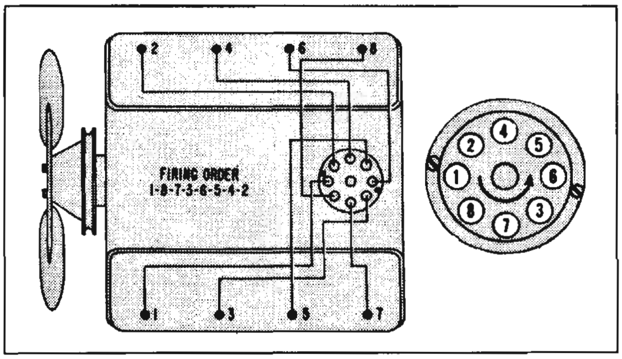


Fig. 14-45 Spark Plug Wiring

2. Remove distributor cap as shown in Fig. 14-44.

   NOTE: If necessary to remove secondary wires from cap, mark position on cap tower for lead to No. 1 cylinder. This will aid in reinstallation of leads. (Inset Fig. 14-44)

3. Remove vacuum hose line from vacuum advance unit.

4. Remove distributor clamp screw and hold-down clamp.

5. Note position of rotor, then pull distributor up until rotor just stops turning counterclockwise and again note position of rotor.

To install, reverse removal procedure.

IMPORTANT: To insure correct timing of the distributor, the distributor must BE INSTALLED with the rotor correctly positioned as noted in Step 5.

If the engine has been turned after the distributor was removed, it will be necessary to install a jumper wire and crank engine until the saw slot on the harmonic balancer indexes with the 0° timing mark on the engine front cover. If both valves of the No. 1 cylinder are closed, the piston will be on top dead center of the firing stroke and the distributor can be installed with the rotor pointing to the No. 1 spark plug terminal in the distributor cap. If not, crank engine one complete revolution, then install distributor.

Tests (Distributor Removed from Car)

With the distributor removed from the vehicle, place the distributor in a distributor testing machine. When mounting distributor in tester, first secure the gear in the drive mechanism, then push distributor housing down toward the gear to take up end play between the gear and housing, and finally secure the housing in the tester. Test the distributor for variation of spark, correct centrifugal and vacuum advance (See SPECIFICATIONS), and condition of contact points. This test will give valuable information on the distributor condition and indicates parts replacement which may be necessary.

Replacing Distributor Contact Set

1. Remove distributor cap. Remove condenser lead and primary lead from the contact set terminal by loosening the attaching screw.

2. Loosen the two attaching screws which hold the base of contact set, turn and lift out the assembly. (Fig. 14-46)

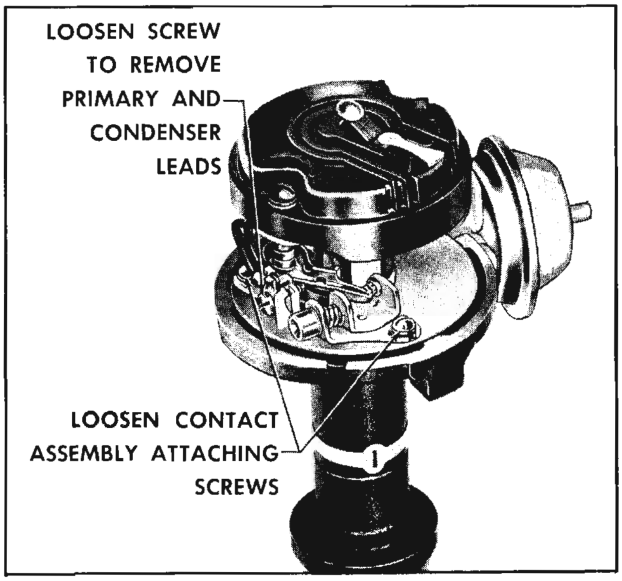


Fig. 14-46 Removing Contact Point Set

3. Upon reassembly, make sure that hole "A" in the contact set is centered over the dowel on the distributor plate and install the primary leads as shown in Fig. 14-47. Leads must be properly located to eliminate lead interference between cap, weight base, and breaker advance plate.

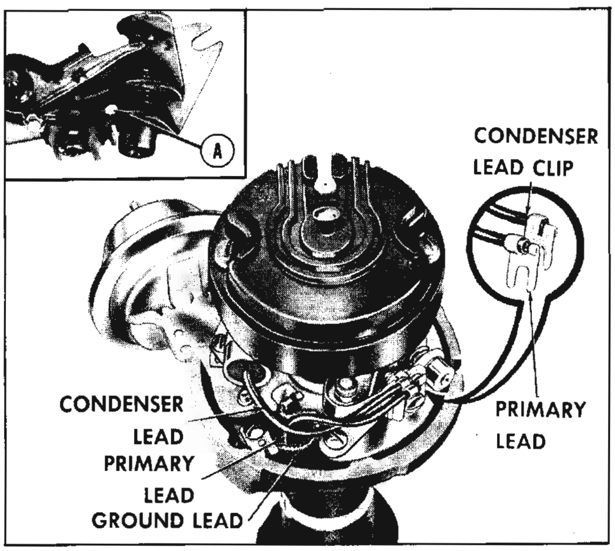


Fig. 14-47 Installing Contact Point Set

4. Apply a film of cam and ball bearing lubricant, or equivalent, to the breaker cam.

Adjusting Distributor Dwell Angle

1. With distributor mounted in distributor testing machine, connect the dwell meter to the distributor primary lead.

2. Turn the adjusting screw to set the dwell angle at 30°.

If a distributor tester is not available, the dwell angle may be adjusted as follows:

1. Mount distributor in a vise.

2. Connect a testing lamp between the primary lead and ground.

3. Rotate the shaft until one of the breaker cam lobes is under the center of the rubbing block on the moveable point.

4. Turn the adjusting screw clockwise until the lamp lights, then give the wrench one-half turn in the opposite direction.

When distributor has been installed in car, point opening must be reset by connecting a dwell meter to the primary distributor lead terminal on the coil and a suitable ground. The dwell angle must be set at 30° with the engine running at idle speed.

Rotor

The rotor is retained by two screws and is provided with round and square lugs which engage with the mechanical advance plate so that the rotor may be installed in only one position. (Fig. 14-48)

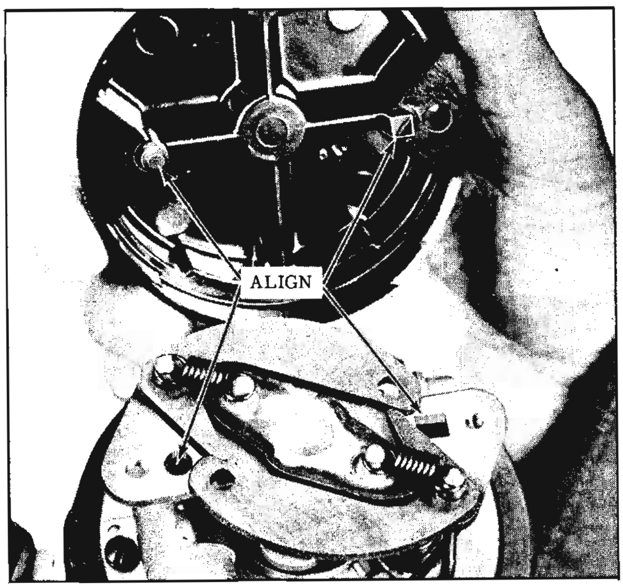


Fig. 14-48 Installing Rotor

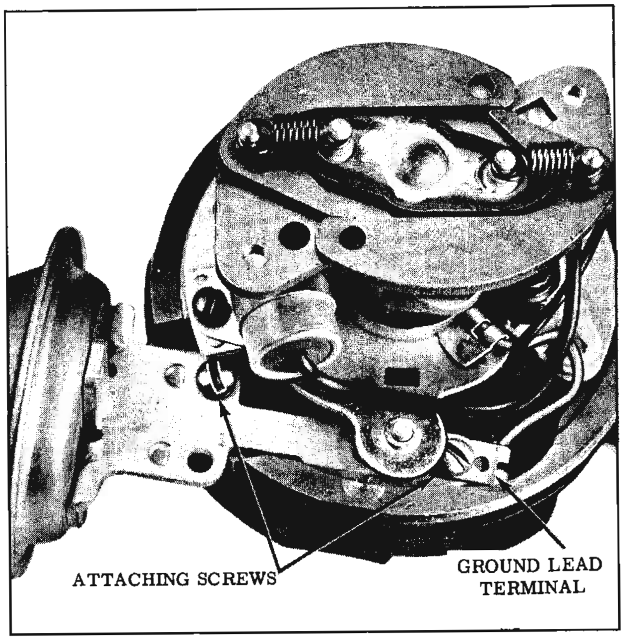


Fig. 14-49 Vacuum Advance Unit

Mechanical Advance

The mechanical advance weights and springs are accessible by removing the rotor. The mechanical advance plate is assembled to the breaker cam. In order to remove the breaker cam and advance plate, follow the procedure for DISTRIBUTOR-DISASSEMBLY AND ASSEMBLY.

VACUUM ADVANCE UNIT

Removal

1. Remove the two vacuum advance attaching screws. (Fig. 14-49)

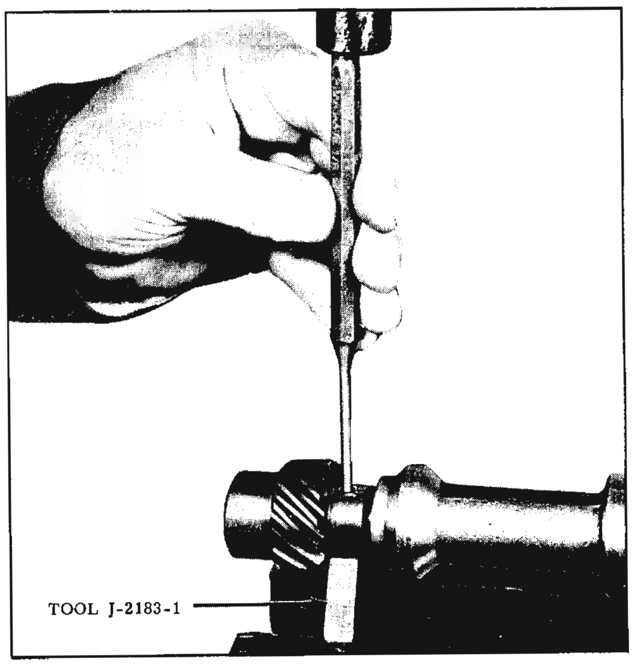


Fig. 14-50 Removing Roll Pin

2. Turn the breaker plate clockwise and push the rod end of the vacuum advance down so that it will disengage and clear the breaker plate. Remove vacuum advance unit.

Installation

1. Position the rubber sleeve over the rod end of the vacuum advance.

2. Insert the rod end of the unit between the housing and the breaker plate.

3. Turn the breaker plate clockwise so that the rod end can be inserted into the hole in the breaker plate.

4. Install the attaching screws with the ground lead terminal under the inner mounting screw. (Fig. 14-49)

DISTRIBUTOR

DISASSEMBLY

1. Mark distributor shaft and gear so that they may be reassembled in the same position.

2. Drive out the roll pin. (Fig. 14-50)

3. Pull the distributor assembly from the gear and pull the distributor shaft and breaker cam from the housing.

4. Remove the retaining ring from the upper bushing and lift the breaker plate and felt wick from the bushing. (Fig. 14-51)

5. Remove the two retaining screws and the vacuum advance.

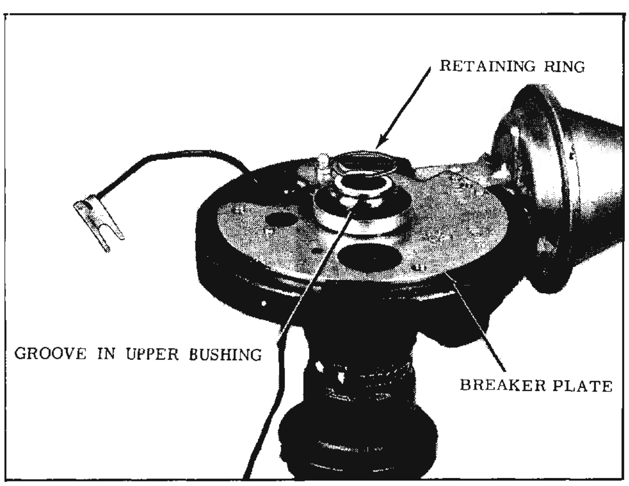


Fig. 14-51 Breaker Plate

ASSEMBLY

1. Install the vacuum advance with the ground lead terminal under the inner mounting screw. (Fig. 14-49)

2. Place the felt wick on the upper bushing, then place the breaker plate over the upper bushing and vacuum advance link.

3. Install the retaining ring on the upper bushing.

4. Slide the distributor shaft through housing bushings.

5. Push the driven gear onto the distributor shaft with the holes aligned.

6. Install the roll pin.

7. Check and adjust dwell angle, vacuum advance, and mechanical advance. Refer to ELECTRICAL SPECIFICATIONS (Distributor).

IGNITION COIL and IGNITION RESISTOR

The ignition resistor, connected in series with the primary circuit between the battery and coil, limits the primary current at low speeds and allows the coil to operate at maximum efficiency at road speeds. The resistor is by-passed during cranking, thereby connecting the ignition coil directly to the battery. This makes full battery voltage available at the coil and keeps ignition voltage as high as possible during cranking. The by-passing of the resistor during cranking is accomplished within the ignition switch.

IGNITION AND STARTING SWITCH

The ignition and starting switch is key-operated to close the ignition primary circuit and to energize the solenoid for cranking. The ignition key must be turned to the extreme clockwise position to energize the starter solenoid. Spring tension returns the key to the normal ignition position when it is released.

Accessories may be used when the engine is not running if the ignition key is turned counterclockwise.

SPARK PLUGS

Type 44 spark plugs are used on all engines using premium fuel. Type 45 spark plugs are used on all engines using regular fuel. Export engines use a type 46 spark plug. All spark plugs have 14mm threads and 13/16" hex body.

The proper gap setting .030". Satisfactory results can be assured only when plugs of the type recommended are used.

Whenever spark plugs are removed from the car and cleaned, the following precautionary steps should be followed:

1. The center electrode should be filed flat before the gap setting is made. (Fig. 14-52)

   NOTE: Do not file electrodes when setting gap on new plugs.

2. Any traces of paint or dirt should be cleaned from the spark plug porcelain.

3. All plugs should be checked for cracks in the porcelain. These cracks are not always visible because they may be hidden by the steel body. Use a spark plug tester to test plugs. If the spark plug porcelain is cracked, a new spark plug must be installed.

IGNITION SYSTEM DIAGNOSIS

If the engine does not run, the ignition system may be at fault if:

1. There is no spark during cranking when a spark plug wire is held 1/4" from the engine.

2. The engine starts but immediately stops when the ignition switch is released from the "START" position.

If the above checks indicate that the ignition system is at fault, the following checks may be made to help locate the difficulty, or locating trouble in the ignition system if the car runs, but not satisfactorily. (Fig. 14-53 and IGNITION SYSTEM CHECK CHART) All checks are to be made with the lights and accessories off and in the sequence shown.

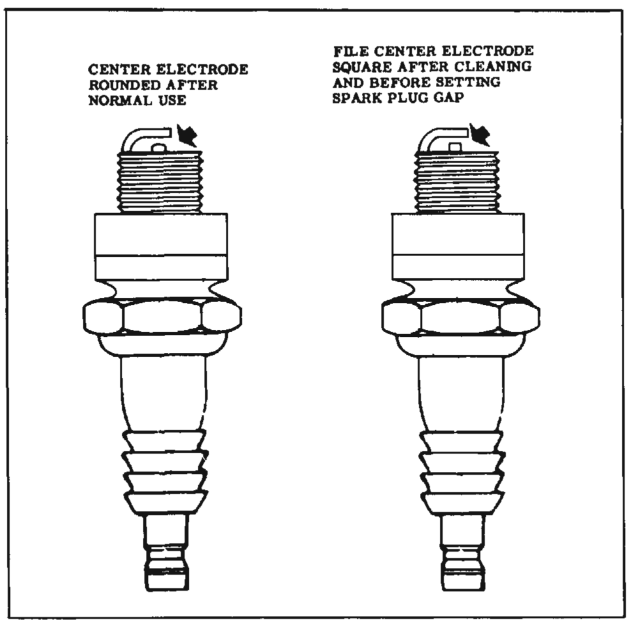


Fig. 14-52 Filing Center Electrode

MILLIAMP TEST

The milliamp test will indicate the presence of faulty ignition cables, cracked distributor cap, or burned rotor.

NOTE: When making a milliamp test, use the indicated reading values as furnished by the testing equipment manufacturers.

1. Connect tachometer, start engine, and set engine speed according to the directions on the test equipment.

2. Set meter knob to secondary efficiency position.

3. Ground positive lead.

4. Check each spark plug lead by connecting the the positive lead of the meter directly to the cable. A variation of five graduations between plugs is allowable.

5. A low reading indicates high resistance in the circuit. If a low reading is encountered, disconnect the cable from the spark plug and check the reading again. If the reading increases, the spark plug is partially shorted.

6. A low reading with the cable disconnected from the spark plug indicates:

   a. Poor connection on either end of the cable.

   b. Burned or corroded connector inside the distributor cap.

   c. Damaged or broken cable.

   Clean and inspect the distributor cap terminals on both ends. Check cable insulation for cracks, pinholes, or an oil-soaked condition. DO NOT attempt to shorten, rework, or repair cables.

   NOTE: If the milliamp reading is still unsatisfactory, carefully check the distributor cap and rotor for leakage or cracks. Test the coil, condenser, and primary circuit, including starter solenoid connections, ignition switch and terminals, as well as the coil and distributor terminals.

7. A low reading on all cables indicates:

   a. Burned or broken rotor.

   b. Faulty distributor cable.

   c. Weak coil.

   d. Cables not tight in distributor cap.

   e. Excessively burned rotor or distributor cap terminal electrodes.

IGNITION SYSTEM CHECK CHART

Step No.	Operation	Specification	Possible Trouble
1	Check all connections in Primary and Secondary circuit		
2	Remove secondary lead from distributor cap. Hold 1/4" from engine while cranking and observe if spark occurs.		IF SPARK OCCURS: Distributor cap Rotor Spark plug wiring
3	Check Voltage V1 while cranking	1 volt Max.	Open circuit from battery side of coil to IGN, on ignition switch. Ignition switch not closing ignition circuit in start position. Ground in circuit from coil terminal to IGN, on ignition switch. Ground in coil.
4	Check Voltage V2 ignition switch "On", points open	Normal Battery	Low battery Points not open Ground in circuit from coil to distributor Ground in distributor Ground in coil Ground in circuit from coil to ignition switch or to resistor
5	Check Voltage V2 ignition switch "On", points closed	5 to 7 Volts	IF UNDER 5 VOLTS: Loose connection from resistor through ignition switch circuit to battery. Loose connection between resistor and coil. Resistor is open or has too much resistance. IF OVER 7 VOLTS: Loose connection between coil and distributor. Resistor out of circuit due to shorted or incorrect wiring. Resistor has too little resistance Coil primary is open
6	Check Voltage V3 ignition switch "On", points closed	0.2 Volt Max.	Contacts not closed Loose connection in distributor Distributor not grounded to engine Faulty contacts
7	Check Voltage V4 ignition switch "On", points closed	0.7 Volt Max.	Loose connection from resistor through ignition switch circuit to battery
8	If these checks fail to find cause of trouble - remove distributor, coil and resistor from engine and check to specifications. Also check wiring harness.		

f. Spring button not contacting carbon brush in distributor cap.

g. Incorrect breaker point tension. (19 to 23 oz.)

HORNS

QUICK CHECKS FOR HORN TROUBLE

When horn trouble is encountered, the difficulty may be in the horn relay, wiring, or the horn itself. Quick checks to determine cause for trouble may be made as follows:

1. Ground the "S" terminal of the horn relay.

   a. If the horn operates satisfactorily, the trouble is in the horn contact or the wiring.

   b. Connect a jumper wire between the "H" terminal of the horn relay and the battery. If horn now operates satisfactorily, the trouble is in the horn relay. (See HORN RELAY CHECKS AND ADJUSTMENTS)

   c. If the above checks indicate that the horn wiring and relay are not defective, connect a voltmeter to the "H" terminal and ground. As the horn control circuit is closed, note the reading on the voltmeter. The horn should blow at any voltage above 7.0 volts, however, it may be weak or have poor tone at any voltage below 11.25 volts. If the voltmeter shows no reading, the wiring between the horn relay and horn is open or the horn is not grounded. If reading is less than 7.0 volts, the fault is high resistance in the wiring or a faulty horn.

After previous checks have been made, and it is established that the horn is at fault, the trouble may be that the contacts are held open by a foreign particle. To dislodge the particle, energize the horn and tap the horn lightly. If this is the trouble, the horn will start to blow and resume normal operation.

HORN CURRENT ADJUSTMENT

Connect an ammeter and a voltmeter as shown in Fig. 14-54. With horn operating, the current draw should be 8.0 to 10.0 amperes at 11.5 volts. To change the current adjustment, turn the adjusting screw on the horn clockwise to increase and counterclockwise to decrease the setting.

If horn fails to operate properly after the above adjustments have been made, the horn should be replaced.

HORN RELAY CHECKS AND ADJUSTMENTS

Closing Voltage

1. Disconnect positive battery cable from "B" terminal of horn relay.

2. Connect a variable resistance of at least 10 ohms in series between battery cable and "B" terminal. (Fig. 14-55)

3. Connect a voltmeter across the "S" terminal and the "B" terminal of the horn relay. Ground the "S" terminal.

4. Slowly decrease the resistance until horn relay points close. Closing voltage should be 1.50 to 9.5 volts. If voltage is outside this range, adjust to 6.5 volts by bending armature spring post down to increase the voltage or up to decrease the voltage. (Fig. 14-56)

Air Gap

NOTE: The closing voltage adjustment must be correct before making the following check.

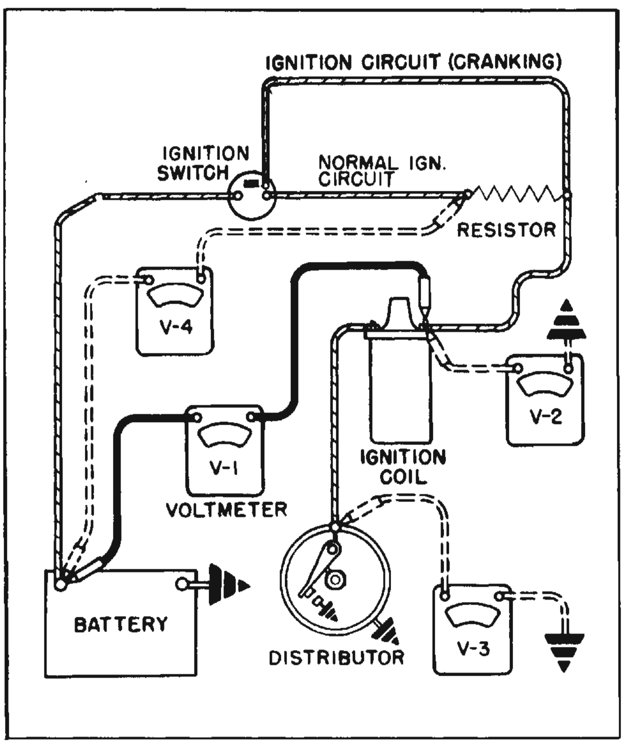


Fig. 14-53 Ignition System Tests

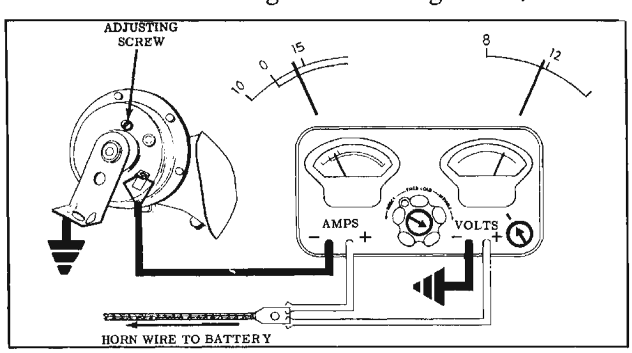


Fig. 14-54 Checking Current Draw

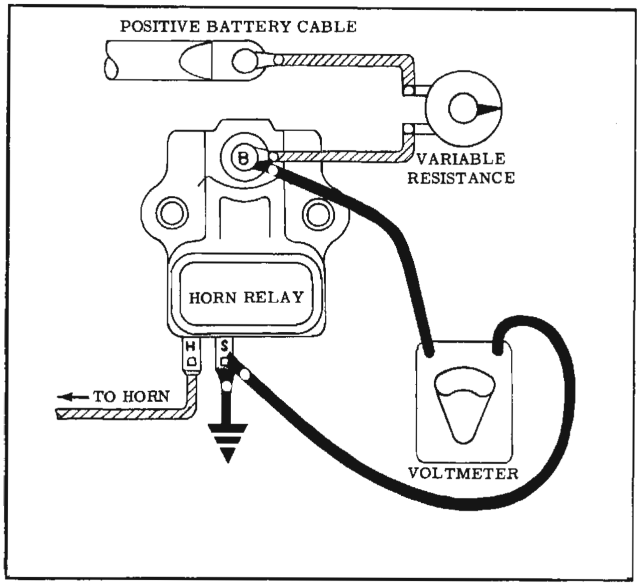


Fig. 14-55 Checking Horn Relay Closing Voltage

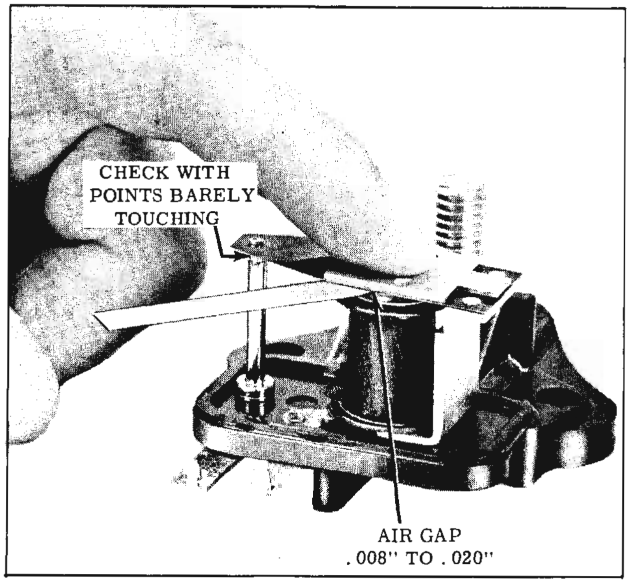


Fig. 14-57 Checking Horn Relay Air Gap

With the positive battery cable disconnected, check the air gap with the points barely touching. (Fig. 14-57) Air gap should be .008" to .020". No adjustment is provided.

Point Opening

NOTE: The closing voltage adjustment must be correct before making the following check.

With the positive battery cable disconnected, check the point opening. (Fig. 14-58) Point opening should be .020" (Minimum). No adjustment is provided.

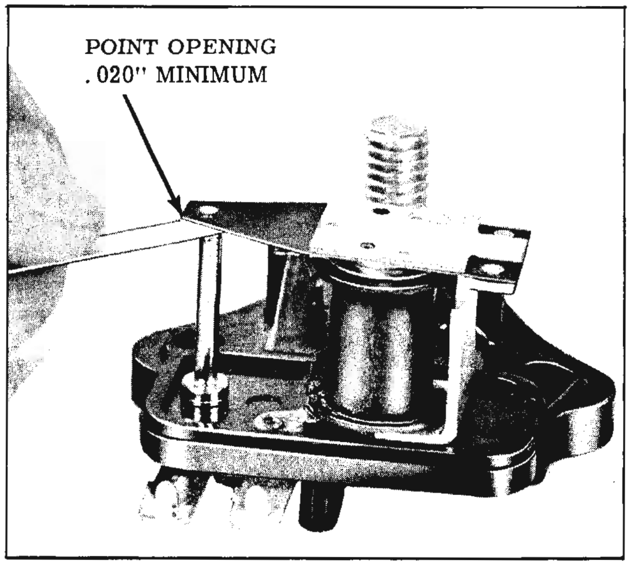


Fig. 14-58 Checking Horn Relay Point Opening

TURN SIGNAL

The turn signal circuit consists of the switch, flasher, two pilot lamps in the instrument panel, the stop lamp filaments in the rear lamps, and the turn signal filaments in the parking lamps. (Fig. 14-59)

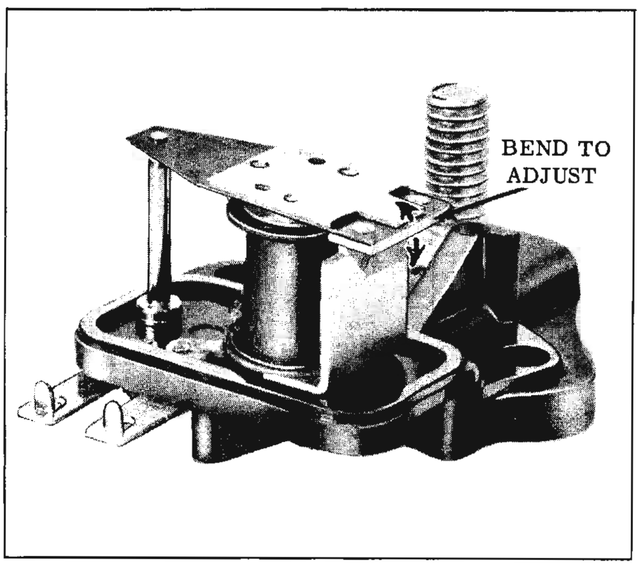


Fig. 14-56 Adjusting Horn Relay Closing Voltage

The turn signal switch is mounted on the steering column mast jacket just above the Hydra-Matic neutral safety switch and actuated by a rod extending down the mast jacket from the turn signal actuator assembly.

See SECTION 4 for servicing of turn signal switch.

TURN SIGNAL DIAGNOSIS (Fig. 14-60 and 14-61)

The turn signal wiring diagrams indicate the

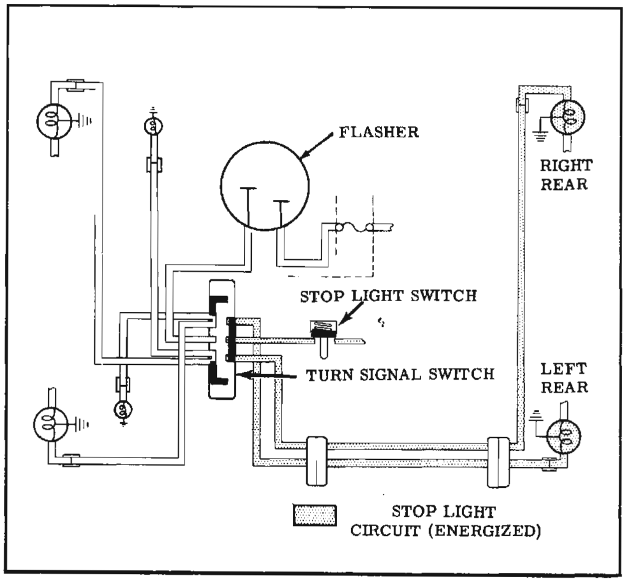


Fig. 14-59 Turn Signal Circuit (Off Position)

stop light circuit and the turn signal circuit energized at the same time in order to show how the stop light circuit is changed to a turn signal circuit when the turn signal switch is actuated.

1. PILOT LAMP REMAINS ON

   A. Right turn - right rear or right front turn signal filaments burned out, light bulb base not grounded or an open in the front or rear turn signal circuit.

   B. Left turn - left rear or left front turn signal filaments burned out, light bulb base not grounded or an open in the front or rear turn signal circuit.

   C. Flasher inoperative.

2. ONE PILOT LIGHT INOPERATIVE

   A. Pilot light filament burned out.

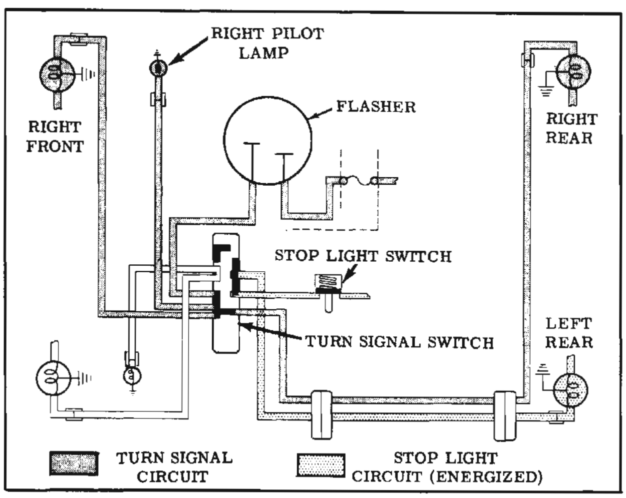


Fig. 14-60 Right Turn Position

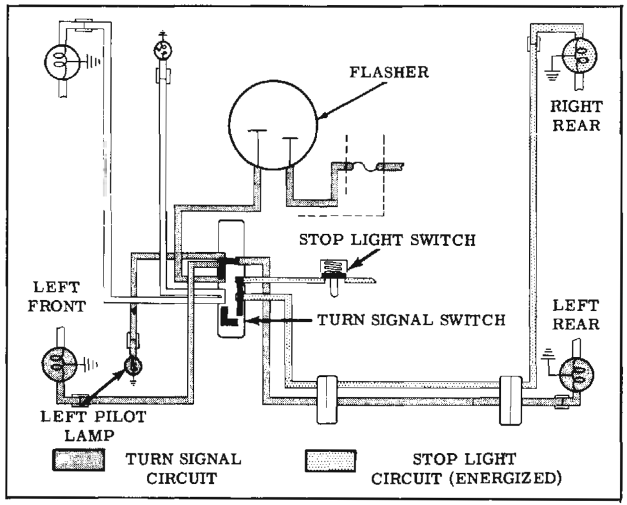


Fig. 14-61 Left Turn Position

   B. Poor connection or a defective printed circuit.

3. ALL TURN SIGNAL LIGHTS INOPERATIVE

   A. Fuse blown (If new fuse burns out, check for short circuit).

   B. Flasher inoperative.

   C. Defective turn signal switch.

   D. Open circuit in the dark blue wire from fuse block to flasher or in the orange wire from flasher to turn signal switch.

SWITCH ADJUSTMENT

Regular

To adjust the turn signal switch, loosen the switch attaching screws, and with the turn signal lever in the neutral position, shift the switch until the operating pin is in the center detent. (Fig. 14-62) Tighten attaching screws and check operation of turn signals.

Tilt Wheel

1. Check to see that the turn signal lever is in the neutral position.

2. Remove switch.

3. Loosen the control cable clamp.

4. Insert a .094" gauge pin in the switch carrier then tighten the control cable clamp. Remove the gauge pin.

5. Move the steering wheel to the full down position.

6. Position the switch on the column and secure with the two screws leaving a minimum

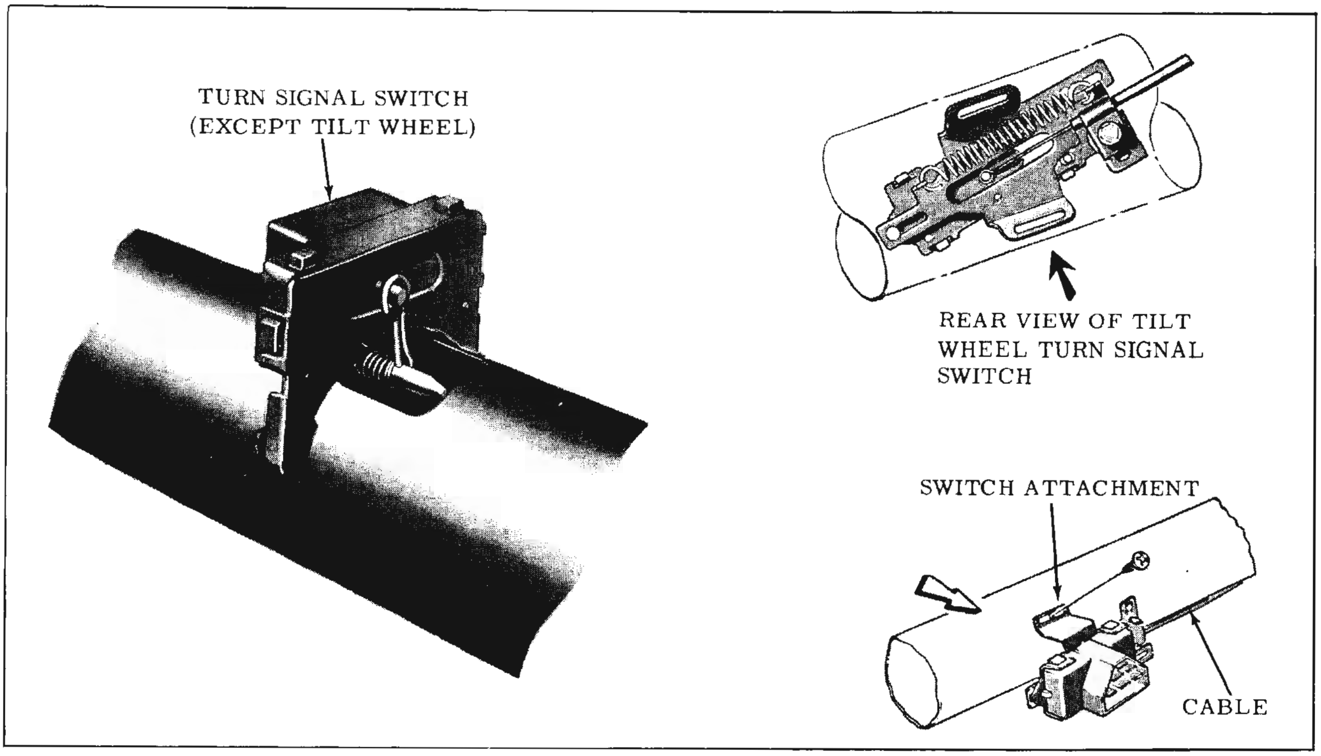


Fig. 14-62 Turn Signal Switch Adjustments

amount of slack in the control cable.

7. Check operation of turn signal switch.

TEMPERATURE INDICATOR

The engine temperature indicator lights are controlled by a thermal switch in the right front of the intake manifold.

When the ignition switch is turned to the "START" position, A TEST CIRCUIT IS CLOSED TO INDICATE WHETHER THE RED LIGHT IS FUNCTIONING PROPERLY. (Fig. 14-63) When the engine is started cold, the green light comes on to indicate that the engine has not reached normal operating temperature ($113^{\circ}F \pm 2^{\circ}F$). When the engine reaches normal temperature, the green light will be turned off by the thermal switch.

If the engine cooling system is not functioning properly, the thermal switch will close the circuit to the red light when the engine temperature reaches $243^{\circ}F \pm 2^{\circ}F$. The thermal switch does not require servicing. If it is defective, it should be replaced.

OIL PRESSURE INDICATOR

The engine oil pressure indicator light is controlled by a pressure operated switch located in

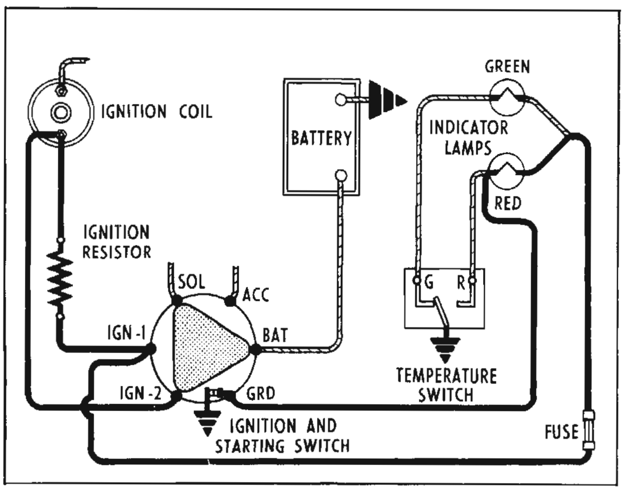


Fig. 14-63 Temperature Indicator Circuit

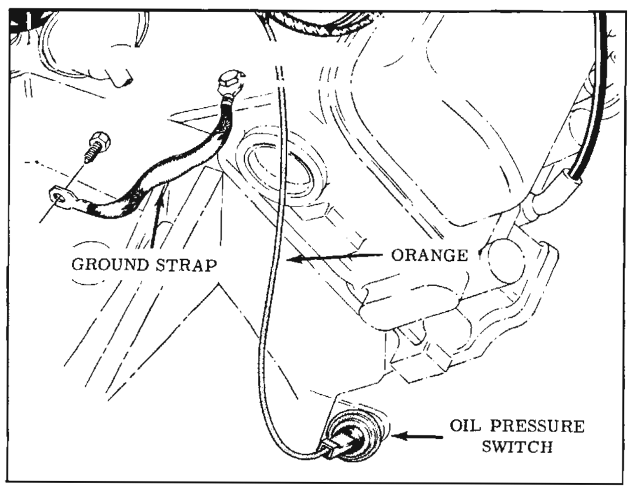


Fig. 14-64 Oil Pressure Switch

the oil filter pad. (Fig. 14-64) When the engine is running, the light operates only when the oil pressure is not satisfactory. This light should come on when the ignition is turned on and the engine is not running.

FUEL GAUGE

The gasoline fuel gauge circuit consists of an electrical indicator in the instrument panel and a float-controlled rheostat in the tank.

CHECKING GAS GAUGE

Testing Fuel Gauge Circuit

IMPORTANT: Engine must be running when testing the gasoline gauge to insure adequate operating voltage (14.5 volts) at the gauge.

When checking either at the trunk compartment or the instrument cluster, be sure that the correct sequence is followed to insure accurate readings. The checking procedure must be started with Tester BT-11-13 on the "F" position, then moved to the "1/2" and "E" positions in that order. If checks are made in any other sequence, it will be necessary to stop the engine and restart it before taking each fuel gauge reading.

Fuel Gauge Check At Trunk Compartment

1. Set Tester BT-11-13 on "F" position.
2. Disconnect the tank unit connector. Connect one lead of the tester to the gray wire from the instrument panel gauge and the other lead to ground.
3. Start the engine and run at idle. Gauge should read on the "F" graduation or above.

   NOTE: Most gauges will read above the "F" graduation.

4. Set the tester on "1/2" position. Gauge should read on the "1/2" graduation or 1/8" above or below the "1/2" graduation.
5. Set tester on "E" position. Gauge should read on "E" graduation or below. If gauge reads above "E" position, replace gauge.

If the gauge registers correctly during this test, the trouble is in the tank unit or the wire from the trunk compartment connector, to the tank unit. If the gauge registers full, regardless of the position of the tester, there is an open circuit in the wire from the instrument panel gauge to the trunk compartment connector.

When removing the tank unit for inspection, if it appears to be defective, check as follows:

1. Remove the fuel tank and the tank unit. Clean all dirt from around the tank unit terminal.
2. Connect an ohmmeter to the tank unit and check the resistance at top, bottom and mid-point of float arm travel.
3. Resistance at empty should be between 0 and .5 ohms. At mid-point, resistance should be 15 ohms plus or minus .1 ohm. At full, the resistance should be between 29.4 and 31.5 ohms. If ohmmeter check indicates that tank unit gauge reads within specifications, check for poor connections between tank gauge and body. Resistance between tank gauge and body should be less than .1 ohm.
4. If the tank unit is replaced, always check the new unit in the same manner before installing it in the tank.

Fuel Gauge Check At Cluster

To determine whether the instrument panel gauge or wiring to the trunk compartment connector is at fault, proceed as follows:

NOTE: With the instrument cluster printed circuit, it is not possible to disconnect the tank unit wire at the dash gauge. Disconnect tank unit in trunk. To check the dash gauge alone, disconnect the tank gauge in the trunk compartment.

1. Unscrew the plastic caps on both terminals of the dash gauge.
2. Connect one lead of tester to the upper terminal of the gauge, (as viewed from the rear of the instrument cluster) and the other lead to ground.
3. Repeat Steps 3, 4 and 5 of Fuel Gauge Check At Trunk Compartment.

If the dash gauge does not register correctly, make a visual inspection of the printed circuit. Defects will show up in the form of blisters or breaks in the circuit. Shorts or breaks in the wiring can be isolated by making a continuity check of the wiring. If printed circuit is not defective, replace dash gauge.

HEADLIGHTS

The dual headlight system consists of four headlights paired horizontally. Each pair of lights consists of a sealed beam unit (inner unit with No. 1 embossed on the lens) with one filament which provides an upper beam only, and a sealed beam unit (outer unit, with No. 2 embossed on the lens) with two filaments which provides both an upper and lower beam. The sub-body is also identified.

Since the No. 2 headlight lens is designed to provide maximum illumination on lower beam and the upper beam filament is not at the focal point of the No. 2 light, the major portion of the upper beam illumination is supplied by the No. 1 unit. Thus, the upper beam is supplied by all four headlights.

When the lower beam is desired, the No. 1 lights are turned off, the upper filament of the No. 2 lights are turned off and the lower filaments of the No. 2 lights are turned on.

SEALED BEAM UNIT

Remove and Install (Fig. 14-65)

1. Remove headlight rim.
2. Disengage the coil spring from the retaining ring, then pull the assembly out of the body and disconnect plug from rear of sealed beam unit.
3. Remove the two retaining ring attaching screws, then remove retaining ring and sealed beam unit and sub-body.

To install unit, reverse the removal procedure.

NOTE: The locating bosses on the back of the sealed beam units are designed so that the No. 1 and No. 2 units are not interchangeable.

HEADLIGHT AIMING

Aimers J-6663 meet the SAE specifications for mechanical headlight aimers.

1. Before proceeding with headlight aiming, the following items should be performed:
   a. Locate car on a known level surface or recalibrate aimers for a selected unlevel area. (Refer to AIMING AREA)

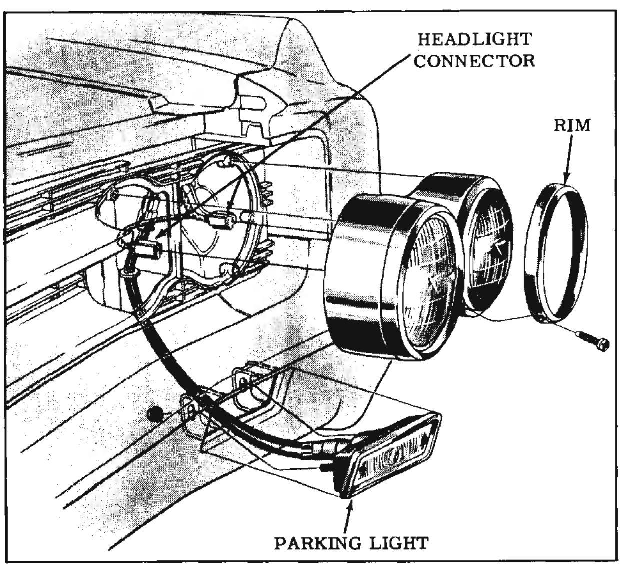


Fig. 14-65 Headlights and Parking Lamp

   b. Check and equalize tires to recommended pressures.
   c. Car should not be loaded with passengers or have excess weight in rear compartment.
   d. Rock car sideways to stabilize springs.
   e. Turn on headlights, replace any units burned out.
2. Remove all the headlight rims.
3. Mount Aimers J-6663 on either the two outer or two inner headlights so that the cross arm of each aimer is horizontal and pointing inward.

   IMPORTANT: Guide points on sealed beam unit must contact inner ring of aimer.
4. Fasten string to R.H. aimer. Rotate aimers until string just clears "F" and "G". (Fig. 14-66)
5. Horizontal Aim
   a. Loosen horizontal adjusting screw "A" of R.H. headlight and tighten until string is positioned directly over the center line of the R.H. aiming dial and point "G".
   b. Repeat adjustment on horizontal screw "A" of L.H. headlight until string is positioned directly over center line of the L.H. aiming dial at point "F".
   c. Recheck points "F" and "G" and readjust if necessary.
6. Vertical Aim
   a. Loosen knob "0" on both aimers and move slide until numeral "2" appears in "down" view window. Tighten knobs. (Fig. 14-67)
   b. Loosen vertical adjusting screws "B" and tighten until bubbles are centered in level.
   c. Recheck horizontal string alignment at points "F" and "G" and readjust horizontal aim if necessary.
7. Remove aimers and repeat Steps 3 through 6 on other set of headlight units.
8. After headlight aiming is completed, install the headlight rims.

AIMING AREA

In order to obtain accurate headlight aim, the car must be either located on a known level surface, or the Aimers J-6663 must be calibrated to compensate for an unlevel surface.

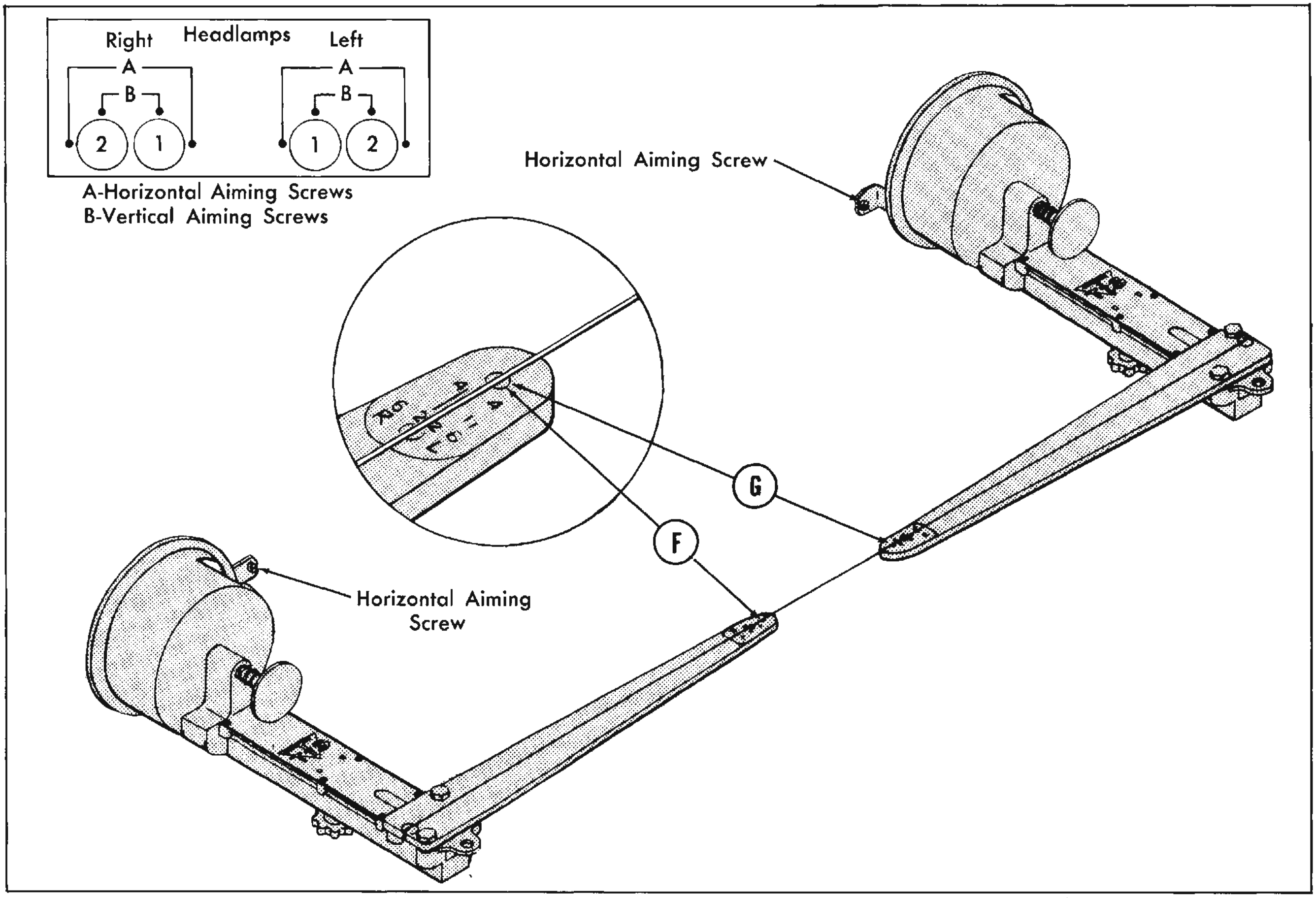


Fig. 14-66 Horizontal Aim

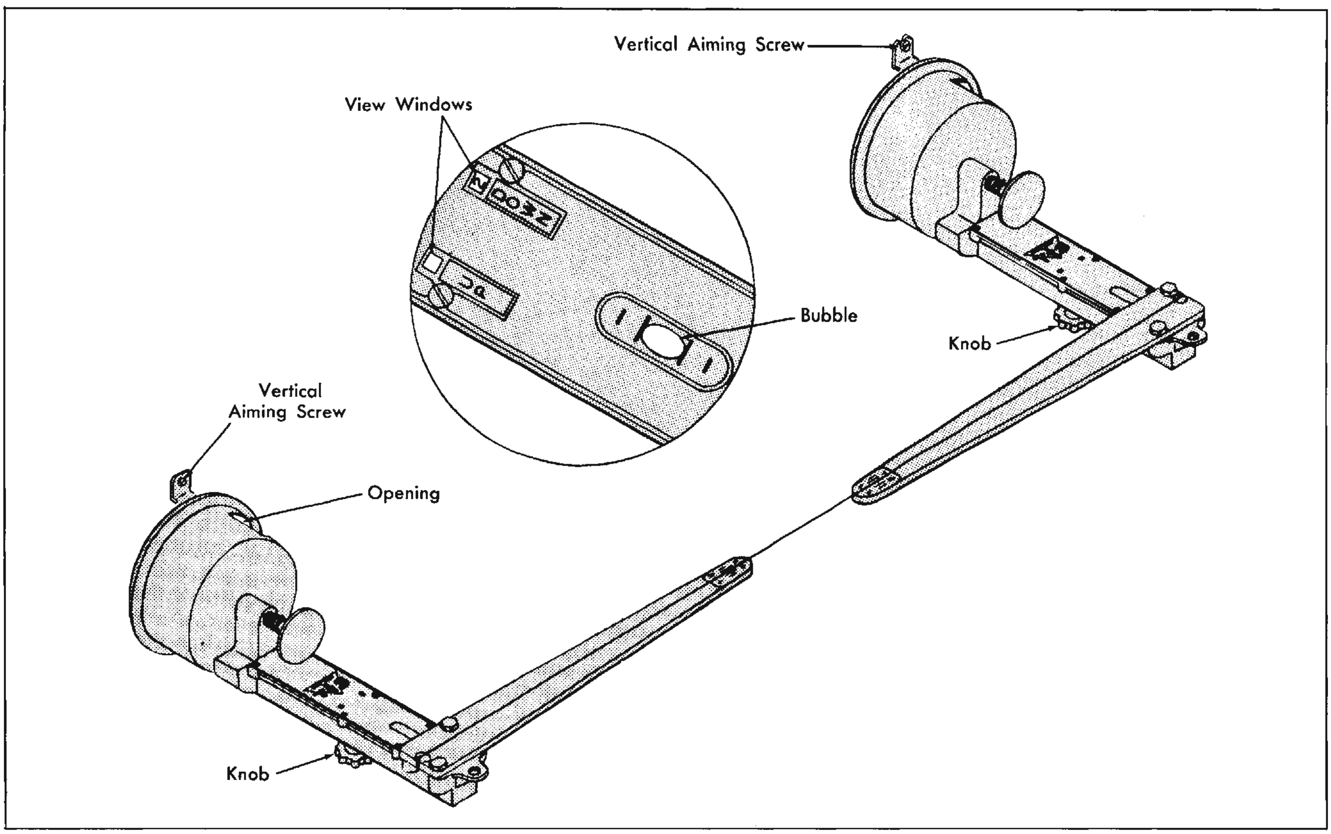


Fig. 14-67 Vertical Aim

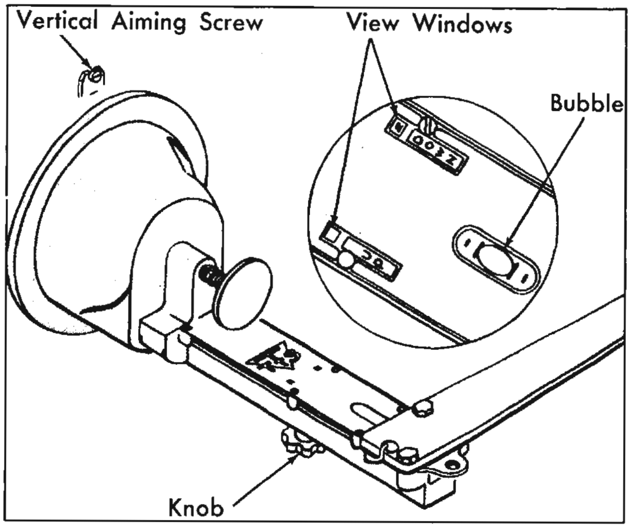


Fig. 14-68 Vertical Alignment

Select an area which appears to be level. Drive car into that area and install aimers on either the two outer or the two inner lights so that both cross arms point toward the center of the car. Loosen knob on bottom of aimer and move slider until numeral 2 appears in "down" view window. (Fig. 14-68) Turn headlight vertical aiming screws to center the level bubbles. Mark the wheel positions on the floor, then turn car end for end making sure that all four wheels are positioned within the marks located on the floor. If the bubbles are still centered, (Fig. 14-69) the aiming area is level and the Aimers J-6663 can be used without further adjustments with the car in this area and position.

If the bubbles are not centered after turning car end for end, (Fig. 14-70) the aimers must be recalibrated as follows:

1. Loosen knob on bottom of aimer and move slider until bubble is centered. Record numeral that now appears in the view window.

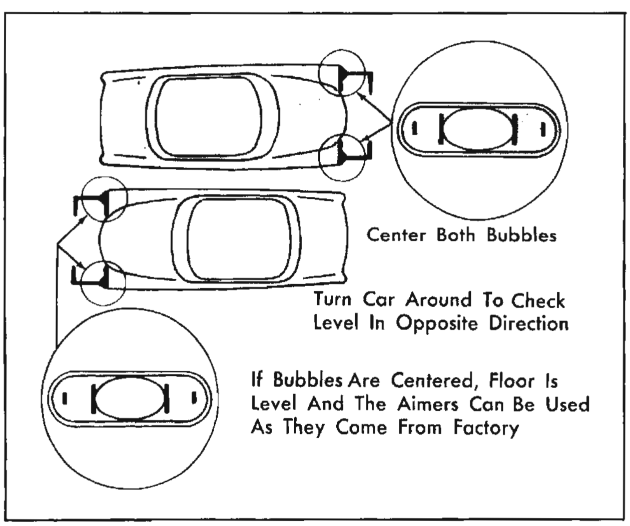


Fig. 14-69 Selection of Aiming Area

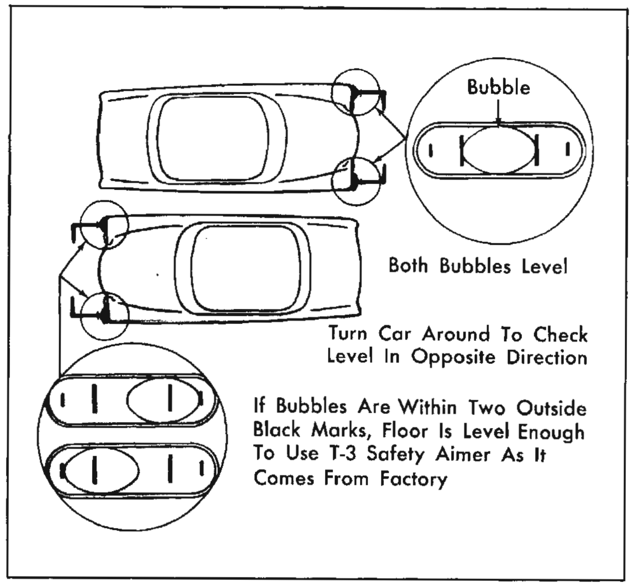


Fig. 14-70 Floor Level Limits

2. Move slider to a position half-way between the recorded number in Step 1 and the numeral 2 in the "down" view window.

3. Without moving the car, recalibrate aimers by turning the adjusting screw until bubble is centered. (Fig. 14-71)

The aimer is now calibrated for this specific area. Tire locations should be permanently marked so that all future headlight adjustments are performed with the car facing in the same direction and tires located in the same position.

AIMING FIXTURE

An easily constructed checking fixture can be made to correct aimer alignment according to

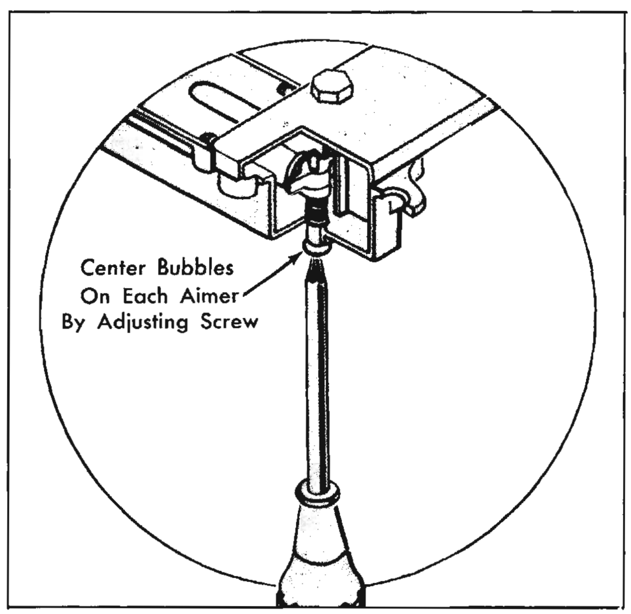


Fig. 14-71 Adjusting Aimer

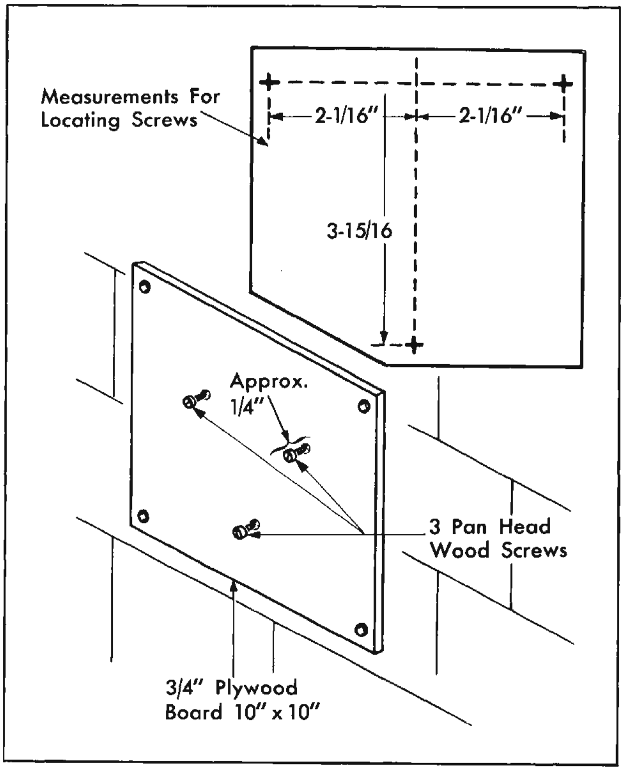


Fig. 14-72 Aiming Fixture

original manufacturers specifications, after the aimers have been dropped or damaged. Since the manufacturers calibration is required in making this fixture, care must be taken to use only an aimer that is known to be properly aligned.

1. Mount a 10" x 10" square of 3/4" plywood in a vertical position on a wall.

2. Install three 1/2" No. 6 pan head wood screws on the board as shown in Fig. 14-72. The screw heads should be approximately 1/4" from board.

3. Place the aimer against the screws with the horizontal arm parallel to the floor and the numeral 2 in the "down" view window. Be certain the screw heads provide adequate clearance between the flange of the aimer and the board.

4. Adjust the three screws until the bubble in the aimer is centered. Screws should be left in this position.

5. After the checking fixture has been constructed and adjusted as outlined above, any aimer can be quickly and easily checked periodically and especially if it should be dropped or damaged in any way.

AIMER CALIBRATION

When an aimer has been dropped or damaged, the alignment should be checked as follows:

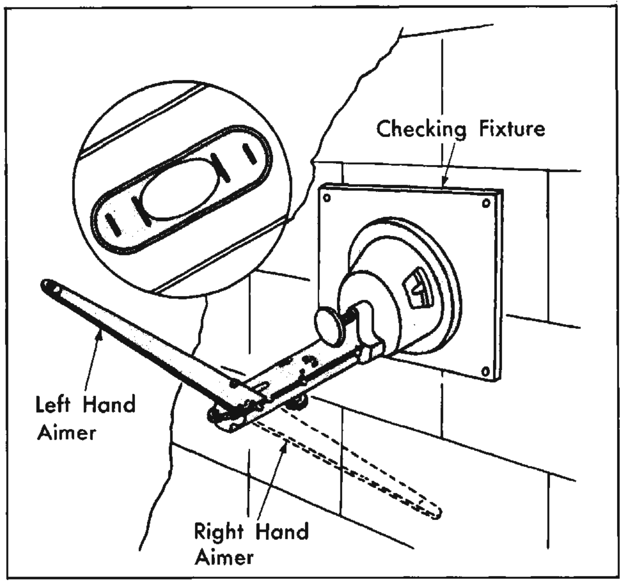


Fig. 14-73 Checking Vertical Calibration

1. With the numeral 2 in the "down" window of the aimer, hold the aimer retaining ring against the three screws in the checking fixture and with the horizontal arm parallel to the floor as shown in Fig. 14-73. If the bubble is centered, the aimer is vertically calibrated.

2. If the bubble is not centered, adjust the screw on the bottom of the aimer, Fig. 14-71, until the bubble is centered. The aimer is now calibrated vertically.

3. The horizontal check of the aimer is made by placing the aimer on the board as in the vertical check, except that the horizontal arm is pointing toward the floor as shown in Fig. 14-74. With a small weight or plumb bob on one end of a three-foot string, connect the opposite end of the string to the slot in the aimer

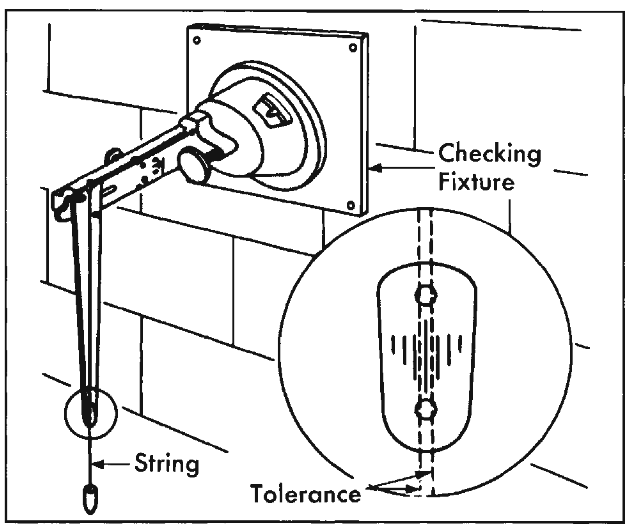


Fig. 14-74 Checking Horizontal Calibration

arm. The string should fall as shown, inset, Fig. 14-74. If it falls outside the tolerances shown, the aimer should be replaced.

TAIL LIGHT

The tail light bulb is a double element bulb which acts as a stop light, tail light and turn signal light.

The tail light bulb on all models, except station wagons, can be replaced from within the rear compartment by removing the socket from the tail light housing. When installing the socket, align the tang of the socket with the slot in the housing and push until socket snaps into place.

The tail light bulb on station wagons can be replaced by removing the tail light lens.

BACK-UP LIGHT SWITCH (Fig. 14-75)

On cars equipped with Hydra-Matic, the back-up light switch is incorporated with the neutral safety switch. (See STARTING CIRCUIT, Neutral Safety Switch, for adjustment.) On cars equipped with synchromesh transmission, the back-up lamp switch is mounted on the steering column.

To adjust switch, place shift lever in reverse. Loosen attaching screw and move switch clockwise until distance between switch arm and stop is 3/8". Tighten attaching screw.

HEADLIGHT SWITCH

The headlight switch controls the headlights, parking lights, tail lights, and instrument panel lights. These circuits are protected by a circuit breaker incorporated in the headlight switch. In addition, the tail lights and instrument panel lights are protected by fuses located in the fuse block. The brightness of the instrument panel lights is adjustable by means of a rheostat built into the headlight switch. Turning the knob of the switch operates the rheostat.

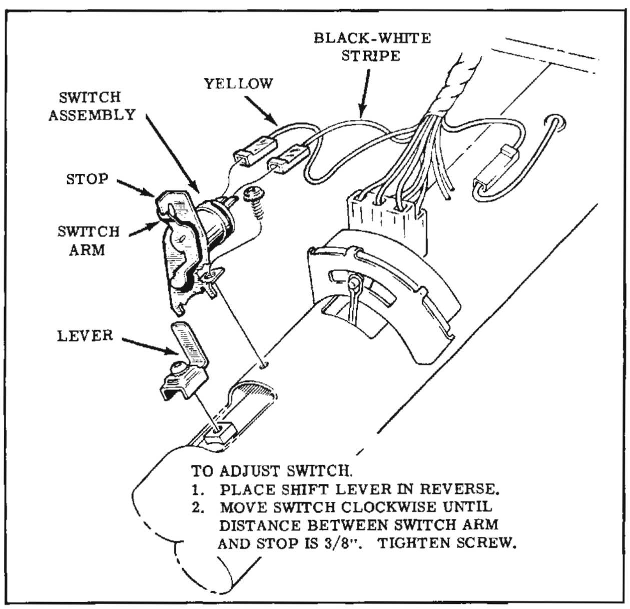


Fig. 14-75 Back-Up Light Switch (Synchromesh)

The light switch used on cars with Guide-Matic has a separate ON-OFF switch for Guide-Matic actuation, and also incorporates a 4-amp fuse to protect the circuit.

HEADLIGHT CIRCUIT BREAKER

The normal lighting load is not sufficient to cause the circuit breaker (located on the headlight switch) to open. If a short occurs, the circuit breaker will cause the lights to flicker. This flickering will continue until the cause of the short is corrected. The circuit breaker is not adjustable.

DIMMER SWITCH

The foot dimmer switch is used to select high or low beam of the headlights as desired. Cars equipped with Guide-Matic have a combination override and dimmer switch. The override position of the switch is obtained by depressing the switch half-way, and is used to signal oncoming cars by switching momentarily to upper beam. The headlights return to automatic operation when the switch is released. The foot dimmer switch must be in the upper beam position before the Guide-Matic will operate.

WINDSHIELD WIPER

Two types of electric windshield wipers are used. Usage and identification is as follows:

88 Series - The standard wiper motor used with this series is a single speed motor operating wipers with a tandem wiping action. This unit is identified by the rectangular shaped motor housing.

A washer pump is available for installation by dealer.

A two-speed wiper motor with washer pump is available as an option on the 88 Series, also operating the tandem wipers. This unit has a round motor housing.

S88, 98 and Starfire Series - The wiper consists of a two-speed wiper motor operating wipers which overlap. This unit also has a round motor housing, 1/2" longer than the 88 series two-speed motor.

An integral type windshield washer pump (standard on 98 and Starfire Series) is available as optional equipment with the S88 Series either as factory or dealer installed option.

CONTROLS (Fig. 14-76)

Two types of wiper controls are used and consist of electrical switches that start and stop the wiper motor. The controls consist of a knob for actuating the wiper motor and a push button for operating the windshield washer pump if the car is so equipped. When the push button is depressed to actuate the washer pump, the wipers are also actuated. Manual operation of the wiper speed knob is required to turn the wipers off.

TRANSMISSION—REPLACEMENT (Fig. 14-77)

1. Remove cowl vent grille. (Refer to SECTION 12)
2. Detach transmission drive linkage retainer from wiper motor crank arm.
3. Remove the transmission attaching screws and remove transmission.
4. Remove transmission and linkage arms from cowl.

To install, reverse removal procedure. Lubricate pivot points with SAE 10W30.

WIPER MOTOR—REPLACEMENT (Fig. 14-77)

1. Make certain wiper motor is in parked position.
2. Disconnect electrical connector(s) from motor. If equipped with windshield washers, remove washer hoses. Remove three motor mount screws holding motor in position.
3. While slowly moving arms and blades across windshield, feed motor crank and transmission drive link through cowl opening.
4. Remove motor crank to transmission drive link retainer.

To install, reverse the removal procedure.

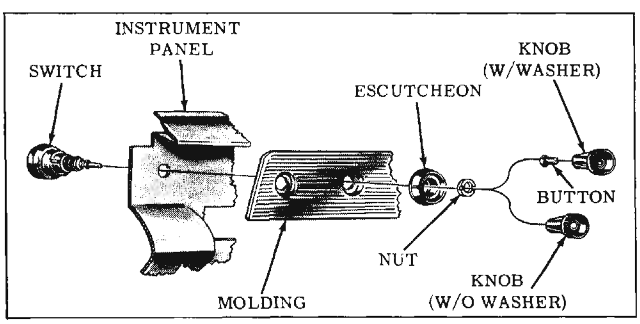


Fig. 14-76 Windshield Wiper Controls

SINGLE SPEED WIPER MOTOR

For description, disassembly, assembly and diagnosis of the single speed washer and wiper, refer to the F-85 Electrical Section.

TWO-SPEED WIPER MOTOR (Fig. 14-78)

The two-speed wiper motor consists of a compound 12-volt DC motor and a gear box section containing the gear mechanism and relay control. The motor armature has a worm shaft which drives the main gear assembly and related parts. The two wiper transmission link arms attach to an external crank arm which is attached to the main drive gear assembly. During normal operation, the crank arm rotates continuously through 360°. Oscillation is accomplished at the wiper transmissions.

Two relay controls, consisting of a relay coil, relay armature and switch assembly are located in the gear housing and controls the starting and stopping of the wiper through a latching mechanism.

A washer pump mounts on the gear housing section of the wiper and is driven by the wiper motor.

MOTOR CASE AND/OR ARMATURE

Remove

1. Remove the two through-bolts and the armature end play adjusting screw and locknut.
2. Tap the brush end of the motor case with a mallet to free it from the gear housing, then insert a brass drift into the armature end play adjusting screw opening in the gear housing to push the armature and motor case from the housing.
3. Remove the armature from the motor case.

   NOTE: The steel thrust ball is retained in the commutator end of the armature shaft by grease. The ball can be removed by dissolving the grease with solvent.

4. Remove the felt washer, thrust disc and rubber disc from the bore of the armature bearing in the motor case.

Assembly

1. Install the rubber disc, steel thrust disc, and felt washer into the bore of the armature bearing.
2. Install brush springs and brushes in holder.

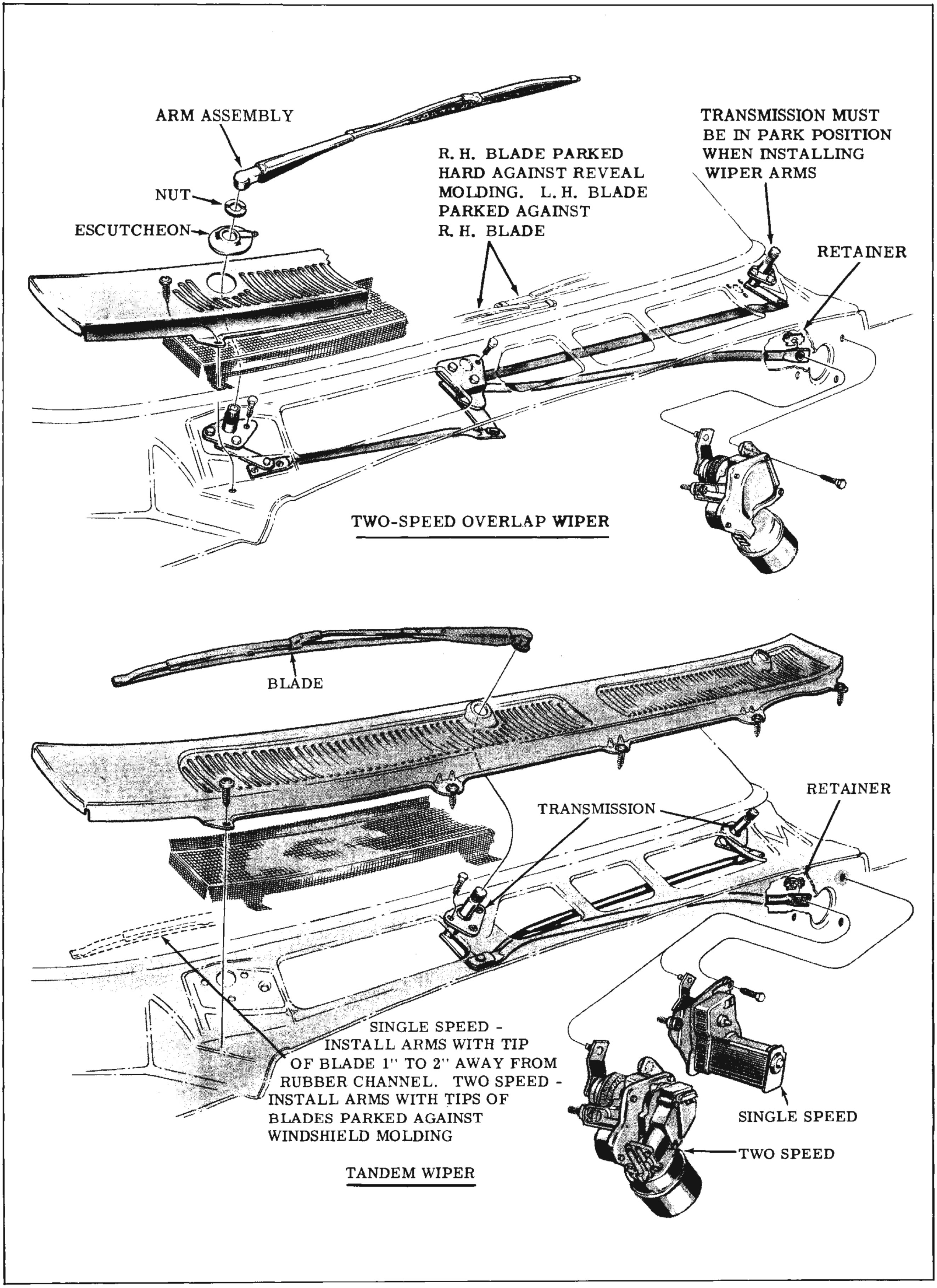


Fig. 14-77 Windshield Wiper Assemblies

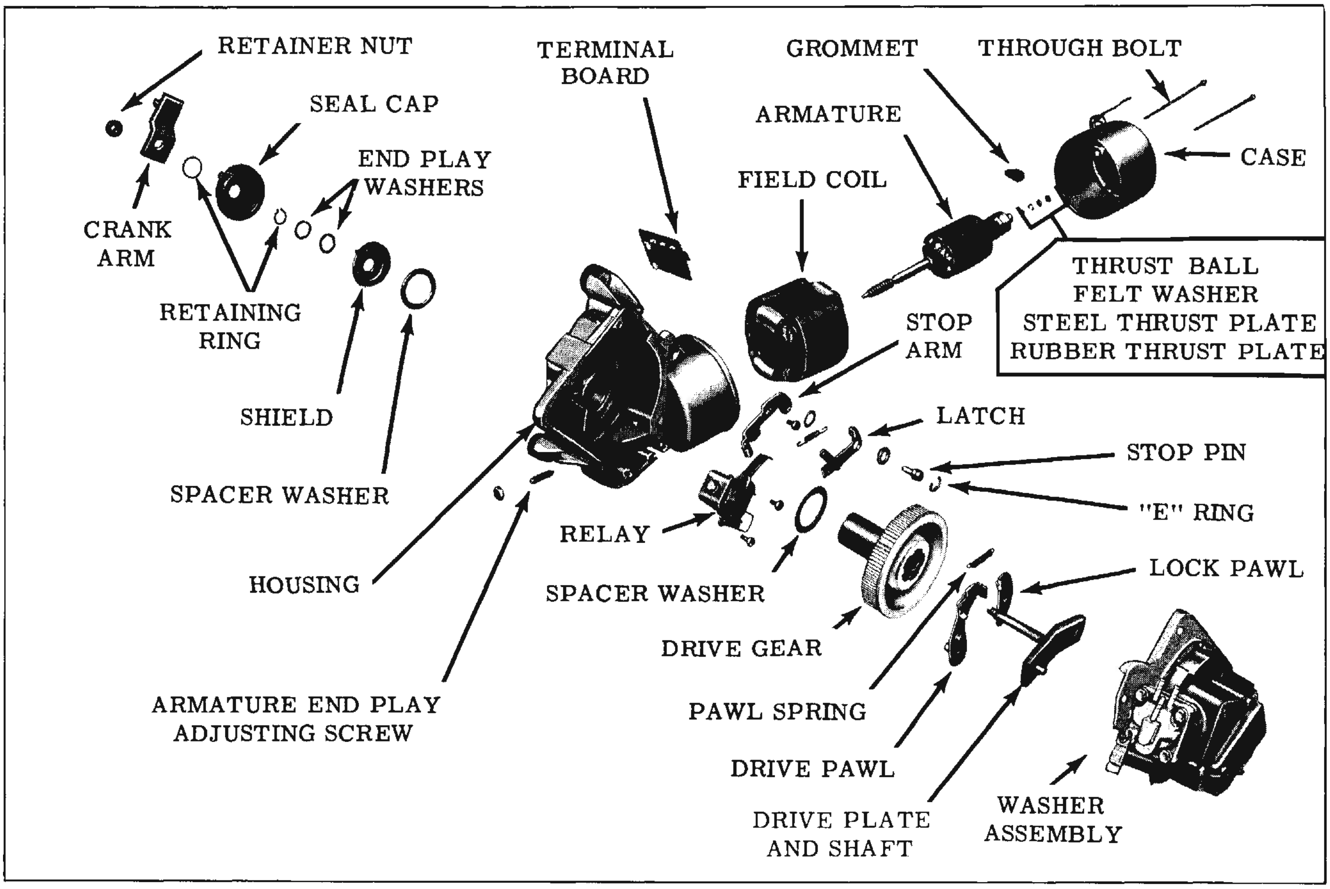


Fig. 14-78 Wiper and Washer Assembly (Two Speed)

Retain brushes in holders with a brush retainer as shown in Fig. 14-79.

3. Lubricate the steel thrust ball, the bearing and worm surface of the armature shaft with cam and ball bearing lubricant.

4. Install the armature in the motor case, then remove the brush retainers.

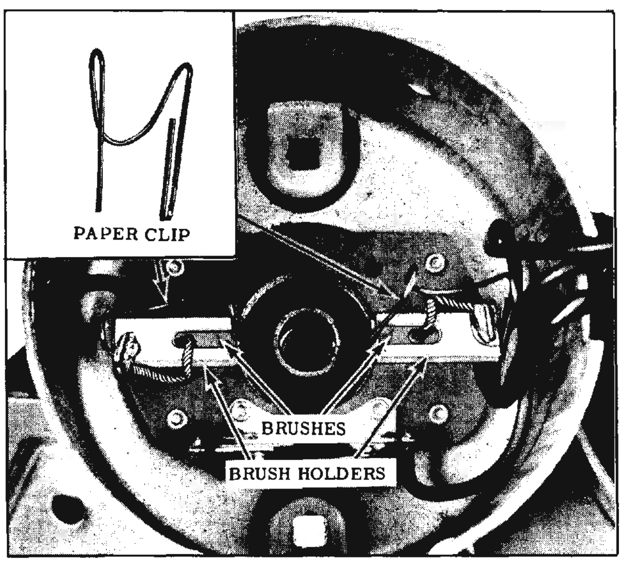


Fig. 14-79 Retaining Brushes

5. While holding the armature in the motor case, start the armature shaft through the bearing in the gear housing. Guide motor wire grommet into notch in motor case.

6. Rotate motor case until the through-bolt holes in the case are aligned with those in the gear housing, then install the two through-bolts and tighten.

7. Install the armature end play adjusting screw.

8. Adjust the armature end play with either of the following two methods:

   a. Stand motor on end with motor running. Loosen locknut and turn end play adjusting screw out 1/4 turn. Turn screw in until a light pressure is felt between the armature and the screw. Tighten locknut.

   b. With motor running and an ammeter connected, loosen locknut and turn adjusting screw out until a minimum current reading is obtained. Tighten adjusting screw until current reading increases 0.1 ampere. Tighten locknut.

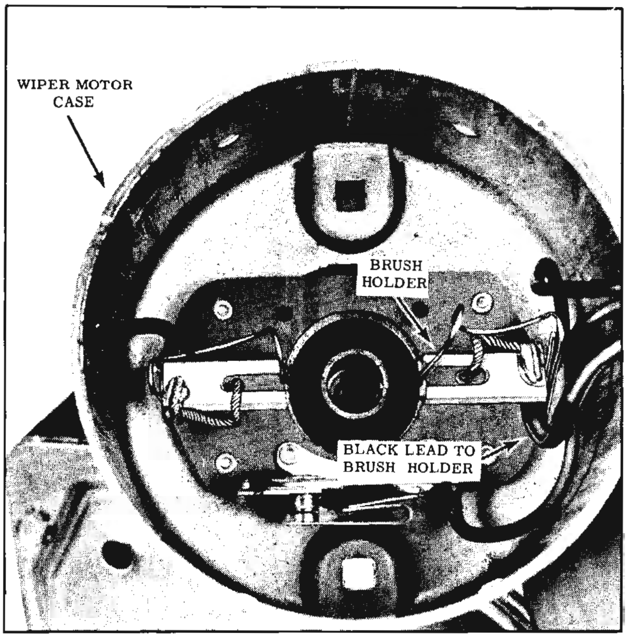


Fig. 14-80 Field Coil Connections in Case

FIELD COIL

Remove (Armature Removed)

1. Scribe an alignment mark on the field coil and housing for reference when installing new field coil. This mark can be transferred to the new coil for proper installation in housing.

2. Remove wiper gear cover or washer.

3. Remove two relay attaching screws, remove relay and unsolder yellow wire at relay connection.

4. Slide connector block from housing and unsolder black wire from connection.

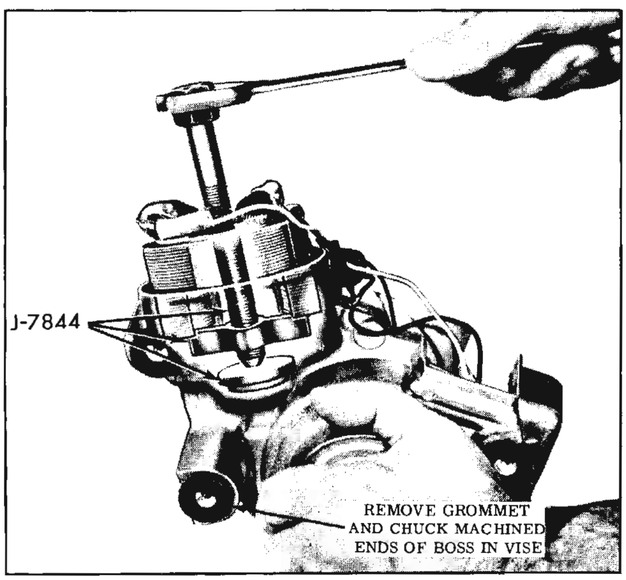


Fig. 14-81 Removing Field Coil

5. Unsolder black solid wire from brush holder in case as shown in Fig. 14-80.

6. Remove field coil with Tool J-7844 as shown in Fig. 14-81.

Install

1. Position a new field coil in the housing in proper alignment.

2. Temporarily install the through bolts to act as guides while installing the field coil.

3. Using a small brass drift, tap the field coil lightly and evenly into housing. Use caution not to damage field wiring.

   NOTE: If field coil requires excessive force to install, remove and file outer diameter of field laminations at point of interference.

4. Route yellow wire to relay control assembly and solder to relay terminal.

5. Solder black wire to connector block terminal.

6. Thread black solid wire through hole in brush holder. Loop end of black wire over armature brush wire and solder both wires to brush holder.

GEAR BOX

The gear box is divided into two areas; the relay control and latching mechanism and the drive gear mechanism.

RELAY CONTROL AND LATCHING MECHANISM

Disassembly

NOTE: Before unsoldering any wires, mark the color code of the wires to their respective terminals.

1. Remove the four screws which secure the gear box cover or washer pump assembly to the gear box.

2. Disconnect coil spring, remove "E" ring and lift the latch and follower assembly off the pivot pin.

3. Remove the stop assembly retaining screw. This will permit the stop assembly to be moved as necessary to allow clearance for removing the relay control assembly.

4. Remove the two screws that secure the relay control assembly.

5. Lift the relay control assembly out of the gear box and unsolder leads as required.

6. If terminal board is to be replaced, it can be removed at this time.

Assembly

Solder existing green and yellow wiper leads to relay control switch and solder the relay coil lead to the wiper unit terminal board and reverse disassembly procedure.

DRIVE GEAR MECHANISM

Disassembly

1. Mark the crank arm, drive shaft and the motor housing, then remove the crank arm retaining nut.

   NOTE: The alignment marks are necessary in order to assemble the parts in their original location. If the parts are not installed in their original location, the wiper blades will be mispositioned in the "Park" position.

2. Remove crank arm, snap ring, and rubber seal.

3. Remove the retaining ring, end play washers, and spacer washer.

4. Repeat Step 1 through 3 under "Relay Control and Latch Mechanism Disassembly".

5. Remove gear mechanism from the gear box and slide spacer washer off the gear assembly eccentric shaft.

6. Slide the drive plate and shaft assembly out of the gear assembly, remove the lock and drive pawls, and remove the coil spring.

7. Remove the stop assembly pivot pin and the stop assembly.

   NOTE: It may be necessary to use vise grip pliers to remove the stop assembly pivot pin. A new pivot pin is included in the stop assembly parts package.

8. Clean and inspect all parts, replace as necessary.

Assembly

1. Position stop assembly and pivot pin into the housing. Tap lightly with a brass drift to seat the pivot pin.

2. Assemble lock and drive pawls to the shaft and drive plate assembly.

3. Install the assembled parts in the gear and eccentric shaft.

4. Hold the gear and drive plate assembly in this relative position until installed in housing since no retainer is used and accidental disassembly can easily occur.

5. Connect the coil tension spring between the lock and drive pawls.

6. Install spacer washer on the eccentric shaft of the gear.

7. Install gear mechanism in the housing.

8. Reassemble parts removed in Steps 1 through 4 under drive gear disassembly. Install a tablespoonful of lubricant around the worm drive gear. Be sure the rubber seal is fully seated on the housing.

NOTE: When installing washer pump, align cam slot with drive pin. (Fig. 14-82)

DIAGNOSIS TWO-SPEED WIPER MOTOR

WIPER INOPERATIVE (On Car)

1. Check for blown fuse. If a new fuse blows, check for mechanical "lock-up" or short in circuit. If equipped with washer, check purple wire from wiper terminal board to washer connection for a short.

2. Connect a jumper wire from the wiper motor to ground. If the wiper motor will operate

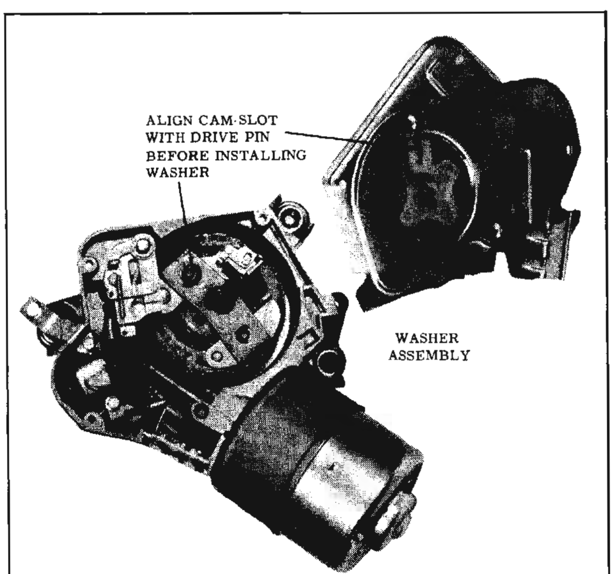


Fig. 14-82 Washer Installation

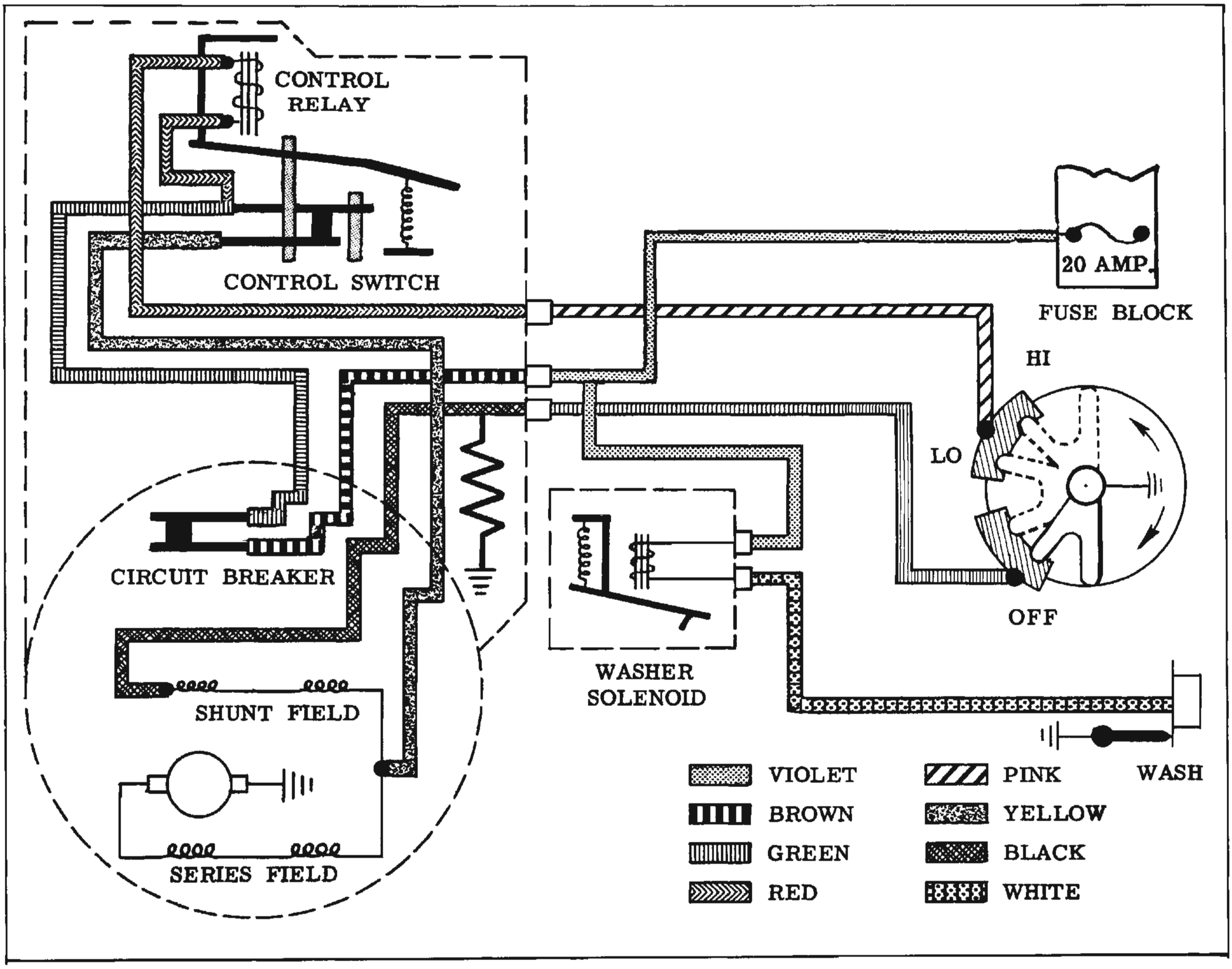


Fig. 14-83 Wiring Diagram (Two Speed Wiper)

with ignition switch in "accessory" position and wiper control switch in low or high speed position, a defective wiper ground strap or connection is indicated.

3. With the ignition in the "accessory" or "on" position, check for 12 volts at the center terminal of wiper terminal board (purple wire connected). If there is no voltage at this point, but there is voltage at the fuse clips, the purple wire from the fuse block to the wiper connector is open.

4. To determine if the wiper control switch or wiper is inoperative, disconnect wires at the wiper terminal board and operate the wiper motor independently of the wiper control switch as follows:

   a. Connect a 12 volt supply to the center terminal (purple) of the wiper terminal board and connect a jumper wire from the control relay terminal (pink) of the wiper terminal board to ground. The wiper should operate at high speed.

   b. With the wires connected as in Step a, check the low speed operation by connecting another jumper wire from the shunt field terminal (light green) of the wiper terminal board to ground.

   c. If the wiper operates when making either test a or b, it indicates that the wires from the motor to the wiper control switch, the wiper control switch, or the connectors are at fault.

5. If the wipers fail to operate after making tests a, b, and c, disconnect the transmission link arm from the motor. If the wiper motor will operate with the transmission disconnected, the trouble is in the transmission(s). If wiper fails to operate, remove the wiper motor for checking off the car.

WIPER INOPERATIVE (Off Car) (Fig. 14-84)

1. Remove gear box cover or washer pump assembly. Visually inspect for loose connections or burned wires at terminal connector board and relay control switch.

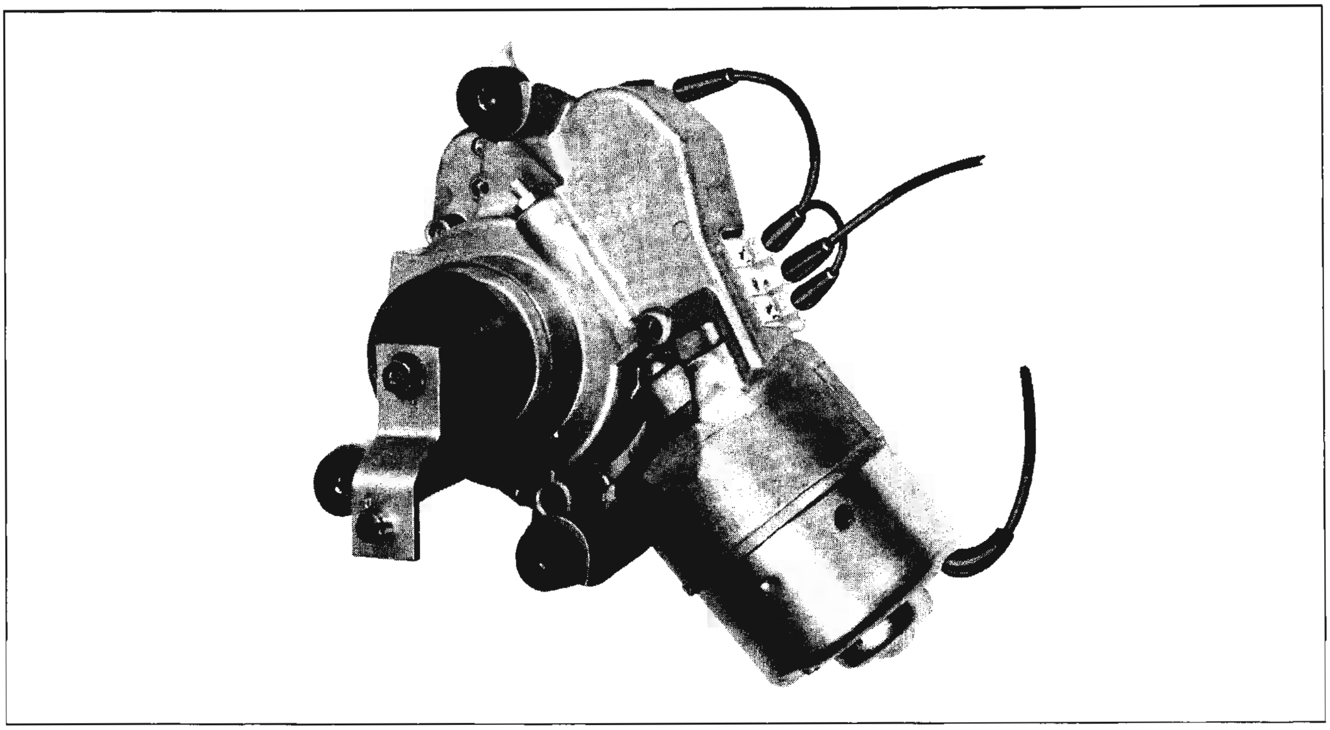


Fig. 14-84 Checking Motor (Off Car)

2. Visually inspect latch arm, spring and relay control switch tabs for damage or binding.

3. Connect 12 volts (+) to center terminal on terminal board and the negative (-) terminal to motor housing, also connect the wiper ground strap to motor housing. Connect a jumper wire from the red wire on terminal board to the motor housing. With these wires connected, control relay coil should be energized. If coil does not energize, it indicates an open in the brown wire circuit breaker, green wire, control relay, or red wire. If the control relay energizes and its armature pulls in but the motor does not operate, make the following checks with a test light.

   a. Connect test light between the yellow wire on the relay control switch and ground. If test light does not light, relay control switch is defective.

   b. If test light does light, trouble is in the yellow wire to the field coils, field coils, or armature.

WIPERS WILL NOT PARK— JUMPS IN AND OUT OF PARK POSITION

1. Remove wiper motor from car.

2. Remove gear box cover or washer pump from wiper housing.

3. Check for binding or broken parts at:

   a. Drive pawl lever.

   b. Relay control switch tabs.

   c. Stop tab on drive pawl and spring.

   d. Check the relay control switch points as follows:

      (1) If the drive pawl is in the park position, disconnect the drive pawl spring and move the stop tab away from the relay control switch tab.

      (2) Connect 12 volts (+) to the red wire on the terminal board. Connect the negative lead to one side of test light. Connect other side of test light to yellow wire. Switch should be closed and test light should be on.

      (3) Push the insulated tab (one not connected to relay armature), if the test light does not go out, the switch is defective.

MOTOR CONTINUES TO OPERATE WITH WIPER CONTROL SWITCH OFF

1. Check for mechanical bind or broken parts at the control relay armature, latch arm, and drive pawl.

2. Check for grounded red wire from relay to terminal board.

Motor Checks

For the Motor Checks, disassemble the motor but leave the field assembly in the housing.

1. Check armature to detect an open or short circuit.
2. Inspect the case and brush assembly for the following items.

   a. Worn brushes.

   b. Brushes binding in their respective holders.

   c. Defective brush springs.

   d. Loose solder joints.

   e. Dirty or defective circuit breaker contacts.

Field Checks

1. Disconnect yellow lead from relay control switch and connect an ohmmeter between the yellow lead and the brush holder to which the internal field lead connects. No reading indicates an open series field.

   Connect the ohmmeter between the yellow lead and the terminal to which the black motor lead attaches. No reading indicates an open shunt field.

2. Disconnect yellow lead from relay control switch. Be sure steel case and brass ground strap are not touching the housing. Check between the yellow lead and field lamina with an ohmmeter or 110 volt test lamp. If continuity exists, it indicates a grounded field.

WINDSHIELD WASHER PUMP

The windshield washer pump consists of a relay, pump assembly, valve assembly and related parts assembled in a casting which attaches directly to the wiper gear box.

OPERATION

Washer Off (Fig. 14-85)

When the wiper is operated, the rotor cam is always turning with the wiper gear. As the rotor cam rotates it actuates a spring loaded lever (1) and pin (4) assembly to which a ratchet pawl (2) is attached.

The lever arm pin extends into the slot (5) of a spring loaded plunger arm (6). The spring loaded plunger arm which is attached to the pumping bellows (9), is held in a retracted position (spring compressed) by an eccentric (7) on the ratchet wheel (8) when the pump is idling.

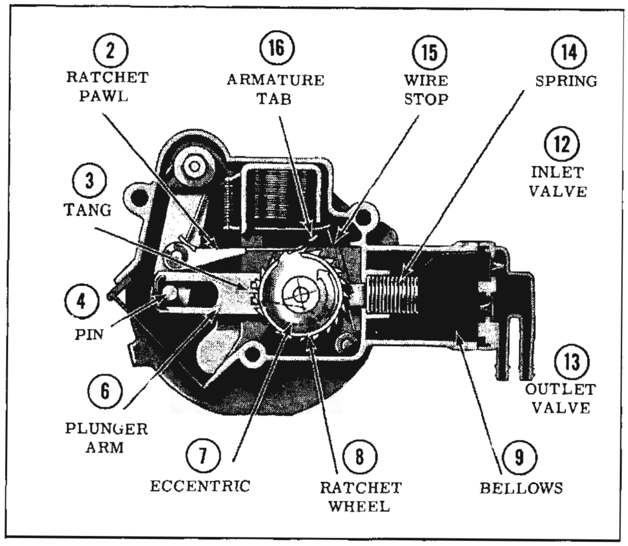


Fig. 14-85 Washer - Off Position

While the pumping mechanism is idling, the lever arm pin can move freely back and forth in the plunger arm slot and no pumping action occurs.

The ratchet pawl, which extends through an opening in the relay armature (10), is prevented from rotating the ratchet wheel by the relay armature.

Wiper On (Fig. 14-86)

When the washer button on the instrument panel is depressed, the circuit to the washer pump relay coil (11) is closed to ground. The relay is held in the energized position by a wire stop (15). The ratchet pawl (2), which previously was moving freely back and forth through the armature opening now drops out of the opening and engages the ratchet wheel (8).

As the ratchet wheel is rotated, the eccentric (7)

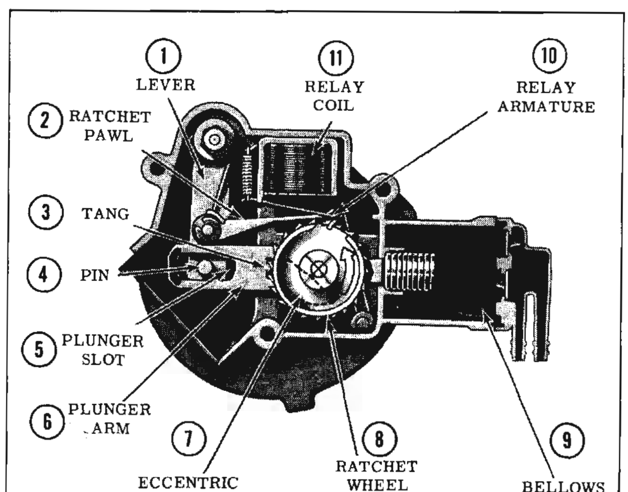


Fig. 14-86 Washer - On Position

moves away from the plunger arm tang (3) releasing the plunger arm (6) for pumping action.

The plunger arm being spring loaded, now moves toward the bellows (9) and collapses the bellows forcing the water in the bellows out through the outlet valves (13) to the nozzles (exhaust stroke). At the same time the edge of the plunger arm slot moves up tight against the lever arm pin (4). As the rotor cam is turned, each of the four lobes actuate the lever arm which in turn pulls the plunger arm back compressing the spring (14). While the plunger arm is being pulled back (suction stroke) water is drawn in through the inlet valve (12). As the high point of each lobe is passed, the plunger arm spring pulls the plunger arm toward the bellows. This collapses the bellows and forces water out through the outlet valve (exhaust stroke).

For each revolution of the wiper gear and/or rotor cam, there are four pumping strokes. For each pumping stroke, the ratchet wheel is actuated or turned one tooth by the ratchet pawl. As the ratchet wheel turns, the eccentric pushes the wire stop out of the way of the relay armature. This allows the armature to partially drop so that the armature tab (16) rests against the edge of the ratchet wheel. After the ratchet wheel has been rotated about 12 teeth, the ratchet wheel eccentric starts to interfere with the plunger arm tang (3), resulting in shorter pumping strokes.

When the ratchet wheel has been turned through 360° or 21 teeth, two simultaneous functions occur as the wash cycle is completed:

A. The relay armature tab drops into the ratchet wheel slot allowing the ratchet pawl to enter the armature opening preventing further ratchet wheel rotation.

B. The ratchet wheel eccentric moves into a position which holds the plunger arm in a retracted position preventing further pumping action.

DISASSEMBLY AND ASSEMBLY

Relay Terminal Board Assembly (Fig. 14-87)

1. Remove relay terminal board cover.
2. Slide spring clip off relay mounting stud.
3. Rotate nylon rotor cam to free ratchet pawl from relay armature and lift out relay terminal board.
4. To reinstall relay assembly, hold relay arm-

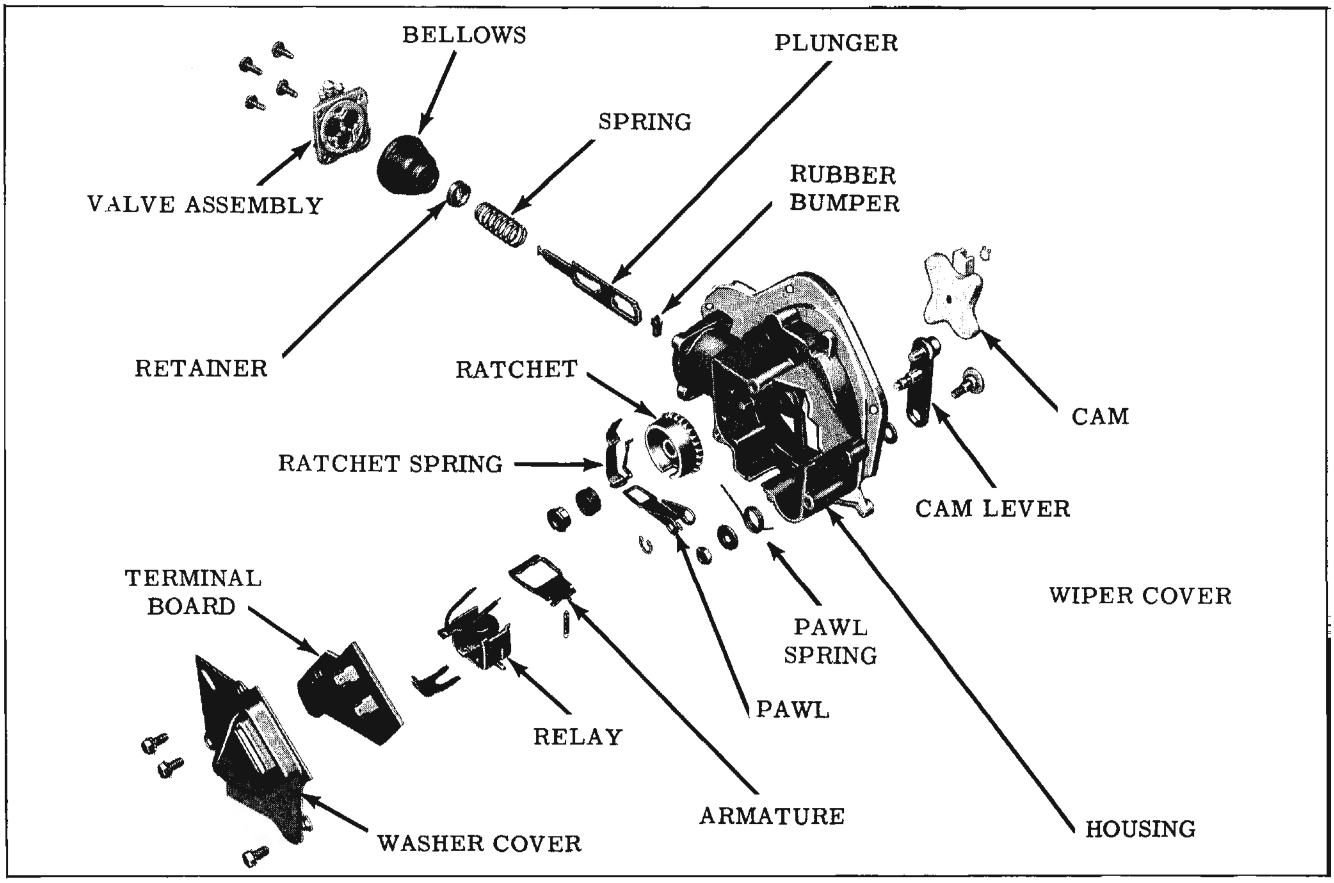


Fig. 14-87 Washer Assembly

ature against the coil pole and position the coil mounting stud in the casting slot.

5. Reinstall spring clip on mounting stud.

6. Position terminal board in slot.

7. Manually rotate washer pump nylon cam through a cycle (ratchet rotated 21 teeth) to check if pump is operating correctly as explained under pump operation.

Valve Assembly

1. Remove the four screws that secure the valve assembly to the housing and gently pry the bellows lip out of the valve body.

To install valve assembly, reverse the procedure.

Bellows

1. Remove valve assembly.

2. If pump is in idling position, release it as follows: Push relay armature toward relay coil so that wire stop spring engages it; then manually rotate nylon rotor cam until pumping action can be felt. The bellows should now extend partially out of the housing.

3. Place an obstruction (small block of wood) between cam lever arm and housing. (Fig. 14-88)

4. Push in against bottom of bellows and turn bellows approximately 90°. This will release bellows from pumping arm. To install, reverse the procedure.

WASHER DIAGNOSIS (ON CAR)

Washer Pump Inoperative

1. Inspect all washer hoses and hose connections. Inspect screen at end of jar cover tube for being plugged and for adequate supply of liquid in jar.

2. Start wiper motor first, then push washer button and listen for "click" as washer relay pulls in. If no "click" is heard, check power supply (12V) at washer pump wiring connector. No voltage indicates defective car wiring.

3. If correct voltage reading was obtained in Step 2, start wiper first, then connect 12 volt supply to one of washer terminals and ground the other. If washer relay "click" is heard, a defective instrument panel switch is indicated.

4. If washer relay click is not heard in Step 3, a defective washer pump relay coil is indicated.

5. If relay click is heard in Step 3, and pump still does not pump water, a defective valve assembly is indicated. (Note: Listen for soft clicking as washer pump ratchet wheel is rotated through a cycle.)

Washer Pump Will Not Shut Off When Wiper Is "On"

1. Disconnect wiring from washer pump. If pump shuts off, trouble is located in the wiring or switch.

2. If pump fails to shut off in Step 1, remove pump assembly from car for further checking (See WASHER DIAGNOSIS-OFF CAR).

WASHER DIAGNOSIS—OFF CAR

1. Connect 12 volt supply to one of washer terminals and ground the other. Manually rotate the rotor cam and observe if relay armature pulls in. Failure of relay to pull in indicates an open relay coil or poor solder connections.

2. If relay pulled in in Step 1, manually rotate the rotor cam (CCW looking at rotor) through a complete cycle (Ratchet wheel rotated 360° or 21 teeth) carefully observing if performance matches that as explained under washer operation. Binds or any other type of malfunction can usually be located in this manner.

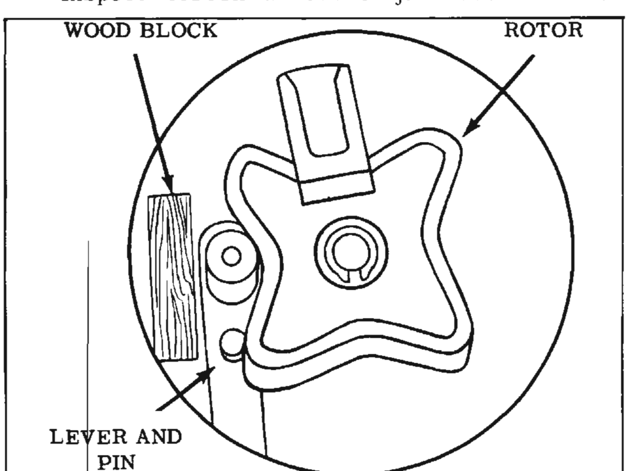


Fig. 14-88 Removing Bellows

ELECTRICAL CIRCUIT DIAGNOSIS PROCEDURE

CAUTION: The gasoline tank gauge unit can be partially or completely damaged by a momentary surge of 12 volt current across the resistance coil in the tank gauge. To prevent damaging the tank unit resistance coil, it is recommended that the tank wires be disconnected before any electrical tests or repairs are made in the wiring harness. The above precaution should also be exercised whenever the chassis to body wiring connector plug has to be disconnected.

Failures in a circuit are usually caused by short or open circuits. Open circuits are usually caused by breaks in the wiring, faulty connections or mechanical failure in a component such as a switch or circuit breaker. Short circuits are usually caused by wires from different components of the circuit contacting one another or by a wire or component grounding to the metal of the body due to a screw driven through the wire, insulation cut through by sharp metal edge, etc.

If a failure is encountered in one of the body circuits, the circuit diagrams should be thoroughly reviewed to become familiar with the circuit before performing an intensive checking procedure to determine the cause and location of the failure. The body circuit diagrams are located in the BODY SECTION. The following information may aid in locating and correcting a failure in the body wiring electrical system.

1. If a major portion of the electrical circuit becomes inoperative simultaneously, the failure may be due to improper connections between the front and rear harness, or between the front harness and the chassis wiring connector.

2. If only one of the circuits is inoperative, the failure is due to an open circuit or short in the affected circuit. Short circuits usually result in blown fuses or in the case of power equipment circuits, in the circuit breaker opening the circuit. If the fuse is not blown and the circuit affected is a lamp circuit, check the bulb before proceeding with any checking procedures.

3. The dome lamp and courtesy lamp circuits are designed so that the switches are in the "ground" side of the circuit. If a condition is encountered where the lamps remain "on" even though the jamb or courtesy lamp switches are not actuated, the failure is probably due to defective switches, or to the wire leading to the switches being grounded to the metal body.

TESTING WITH BT 11-20

If the preliminary checks have not located the cause of failure, Tester BT 11-20 can be used to isolate the defective circuit without unnecessary removal of trim or hardware. (Fig. 14-89)

TESTING FOR SHORT CIRCUIT

CAUTION: If the turn signal fuse is blown, remove the flasher and install a jumper wire in its place before connecting test leads. Do not use BT 11-20 in the clock, radio or fuel gauge circuits.

1. Move detector switch to TEST.
2. Remove blown fuse and connect a test lead to each fuse clip. Move detector switch to SHORT.
3. Turn on all switches in the blown fuse circuit.
4. Observe each unit or light in shorted circuit. Units or lights that operate momentarily (when tester light is out) are not shorted.
5. Position meter over the shorted circuit, at the fuse block, with the base of the meter or arrows directly above the wiring. The meter needle will deflect AWAY from the direction of the short each time the tester completes the circuit. Note the amount of needle deflection.
6. Move meter progressively from the fuse block toward the unit that is not operating. The location of the short will be indicated by a reduction in needle deflection. If the needle ceases to deflect, the short circuit has been passed, the wrong circuit has been followed or the meter is not above the circuit.
7. After the short is located and repaired, remove the test leads and replace the fuse.

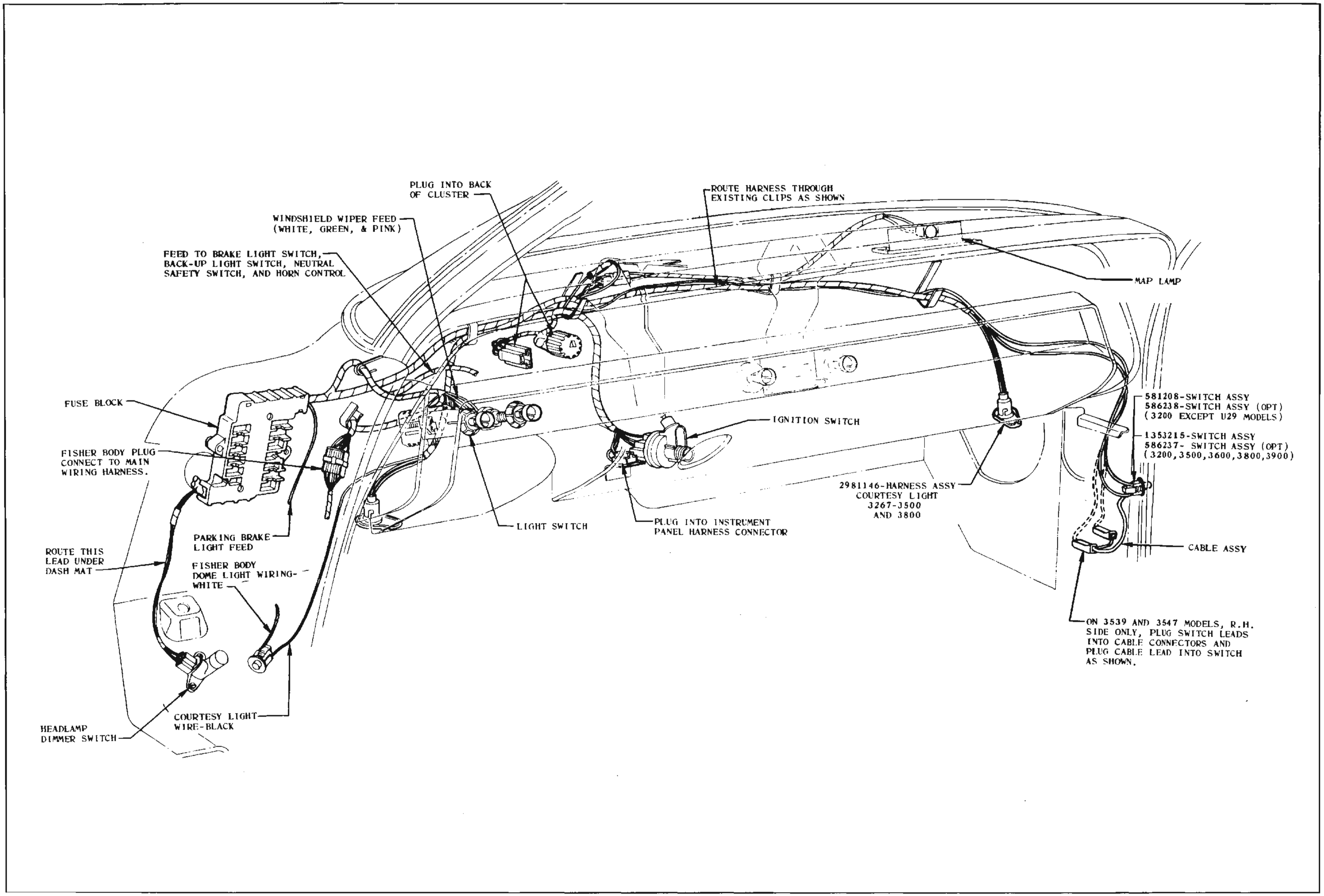


Fig. 14-89 Instrument Panel Wiring

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specifications.

APPLICATION	Ft. Lbs.
1. Battery Hold Down Nuts	1.5 to 2.5
2. Connector Strap to Starting Motor Bolt	6 to 8
3. Distributor Clamp to Cylinder Block Bolt	11 to 14
4. Delcotron to Bracket Bolt	22 to 34
5. Delcotron Bracket to Cylinder Head Bolt	28 to 38
6. Delcotron Link to Front Cover Bolt Nut	22 to 34
7. Delcotron Link Clamp Bolt	14 to 17
8. Ignition Coil to Intake Manifold Stud Nuts	9 to 11
9. Spark Plugs	18 to 34
10. Starter Motor to Flywheel Lower Housing Nut & Bolt	45 to 50
11. Delcotron "BAT" Terminal Nut	2 to 4
12. Ignition Coil Terminal Nuts	1 to 2
13. Starter Terminals (Solenoid)	1 to 2
14. Junction Block Nut	8 to 10

DISTRIBUTOR TEST SPECIFICATIONS

Distr. No.	Rotor Rot.	Spring Tension	Vacuum Advance		Mechanical Advance			
1111033	L.H.	19 to 23 oz.	6" to 8"	17"	Distr. r.p.m.	400	1200	2000
	(Counter-clockwise)		Start	12° to 14°	Degrees	0° to 2°	9° to 11°	12° to 14°

GENERAL SPECIFICATIONS

STARTING MOTOR
- a. Make . . . . . Delco-Remy
- b. Brush Spring Tension . . . . . 35 oz. min.
- c. No. of Brushes Used 4
- d. No. of Fields 4
- e. No. of Teeth on Starter Pinion 9
- f. No. of Teeth on Flywheel 176
- g. Ratio Between Starter Pinion and Ring Gear . . . . . 19.5 to 1
- h. Rotation, Viewed from Drive End . . . . . Clockwise
- i. Pinion Clearance . . . . . .010" to .140"
- j. Free Speed (Model 1107665): 3600 to 5100 r.p.m. at 10.6 volts, 65 to 100 amps.
- k. Free Speed (Model 1107776): 3900 to 5400 r.p.m. at 10.6 volts, 80 to 120 amps.

SOLENOID SWITCH
- a. Current Consumption (Model 1119798) Both Windings at 10 Volts @ 80°F. 42 to 49 Amps.
- b. Current Consumption (Model 1114257) Both Windings at 10 Volts @ 80°F. 47 to 54 Amps.
- c. Current Consumption (Model 1119798) Hold-In Winding at 10 Volts @ 80°F. 10.5 to 12.5 Amps.
- d. Current Consumption (Model 1114257) Hold-In Winding at 10 Volts @ 80°F. 15.5 to 17.5 Amps.

DELCOTRON
- a. Charging Rate - at 14.0 Volts, 1750 r.p.m. (Model 1100616) . . . . . 47 to 54 Amps.
- b. Charging Rate - at 14.0 Volts, 2150 r.p.m. (Model 1100624) . . . . . 37 to 44 Amps.
- c. Charging Rate - at 14.0 Volts, 2200 r.p.m. (Model 1100631) . . . . . 32 to 39 Amps.
- d. Field Current Draw at 12 Volts, 80°F. . . . . . 1.9 to 2.2 Amps.

GENERAL SPECIFICATIONS (Cont'd)

REGULATOR

Field Relay
- a. Air Gap . . . . .015"
- b. Point Opening . . . . .030"

Voltage Regulator
- c. Air Gap . . . . .060"
- d. Point Opening . . . . .014"
- e. Voltage Setting . . . . Refer to Fig. 14-9

BATTERY--12 VOLT

Regular Fuel Engine
- a. Make . . . . Delco-Remy
- b. Model 3KMR62
- c. Plates . . . . 9 Per Cell
- d. Capacity at 20 Hr. Rate . . . . 62 Ampere Hour
- e. Specific Gravity for fully Charged Battery . . . . 1.270 ± .010 at 80°F.

Premium Fuel Engine
- a. Make . . . . Delco-Remy
- b. Model 3KRM70
- c. Plates . . . . 11 Per Cell
- d. Capacity at 20 Hr. Rate . . . . 70 Ampere Hour
- e. Specific Gravity for fully Charged Battery . . . . 1.270 ± .010 at 80°F.

COIL
- a. Primary Resistance . . . . 1.28 to 1.42 Ohms
- b. Secondary Resistance . . . . 7200 to 9500 Ohms

RESISTOR, IGNITION COIL (IN WIRING HARNESS)
- a. Resistance 80°F . . . . 1.75 to 1.85 Ohms

DISTRIBUTOR
- a. Cam Angle Range . . . . 28° to 32° (Adjust to 30°)
- b. Contact Point Opening . . . . .016"
- c. Contact Arm Spring Tension . . . . 19 to 23 oz.
- d. Condenser Capacity . . . . .18 to .23 Mfd.

SPARK PLUGS
- a. Make . . . . AC
- b. Type:
  - Regular Fuel Engine 45
  - Premium Fuel Engine 44
  - Export Engine 46
- c. Thread . . . . Metric 14MM
- d. Body . . . . 13/16" Hex.
- e. Spark Gap . . . . .030"

HORNS
- a. Current Draw at 12 Volts . . . . 7 to 11 Amps.

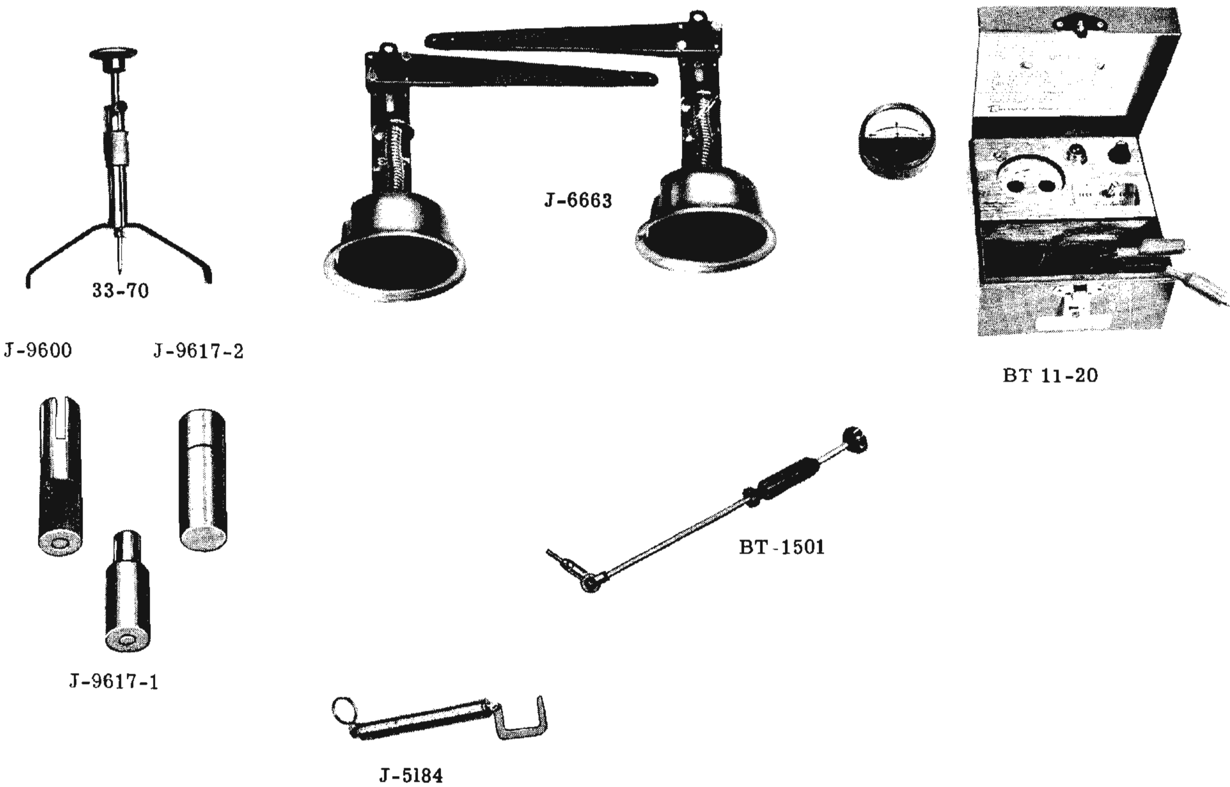
HORN RELAY
- a. Point Opening . . . . .020" Min.
- b. Closing Voltage . . . . 1.5 to 9.5 Volts (Adjust to 6.5 Volts)
- c. Air Gap - Points Closed . . . . .008" to .020"

LIGHT BULB NUMBERS

Headlamps (inner) (#1) (Upper beam only)	4001
Headlamps (outer) (#2) (Lower & Upper Beam)	4002
Stop Lights and Tail Lights Parking Lights and Turn Signal Front	1034
Dome Light	1004
License Light	67
Courtesy Light (Including Console Side) Side Roof or Rear Quarter Light Arm Rest Map Light	90
Ignition Switch Console Shift Indicator Light Ash Tray Light Cruise Control Light	53
Shift Indicator Light Heater, Ventilation and A/C Control Light Glove Compartment Light Map Case Light Console Tachometer Light	57
Parking Brake Warning Light	57X
Oil Pressure Warning Light Speedometer and Odometer Light Fuel Gauge Generator Warning Light Safety Sentinel Temperature Indicator Lights Turn Signal Indicator Lights High Beam Indicator Instrument Cluster Lights	158
Underhood Light Rear Compartment Light	89
Back-Up Lights	1073
Electric Clock	1816
Radio Dial Light (Super Deluxe, AM & FM)	1893
Radio Dial Light (Deluxe)	1895

FUSE SPECIFICATIONS AND LOCATION

APPLICATION	FUSE TYPE AND AMPERES	FUSE LOCATION
Heater	SAE 20	Located in Fuse Block For exact location Refer to Fig. 14-2
Air Conditioning or Heater with Rear Defroster	AGC 25	
Windshield Wiper	SAE 20	
Radio - Deluxe AM, AM & FM	AGW 2.5	
Radio - Super Deluxe	AGW 7.5	
Courtesy, Dome and Rear Seat Lighter		
36, 38 & 39 Series	AGC 25	
32, 35 Series	SAE 20	
Stop Lamp	SAE 20	
Clock	AGA 2	
Electric Seat or Windows	SAE 20	
4 or 6-way Seat	AGC 25	
Glove Compartment Light Underhood Light	AGC 5	
Rear, License and Trunk Light	SAE 9	
Clock, Cluster, Ash Tray, Heat, Vent A/C Control, HM Indicator, Tach. and Cruise Control Lights	AGA 3	
Temp, Oil, Gen, Fuel, Parking Brake and Back-Up Lights	SAE 9	
Cruise Control	SAE 5	
Turn Signal	AGW 4	
Headlights	Circuit Breaker	On Headlight Switch
Electric Seat, Window and/or Convertible Top	Circuit Breaker	L.H. Side of Cowl (in engine compartment)
Guide-Matic Headlight Control	AGC 4	In line connector near Headlight Switch



BT-11-20	SHORT DETECTOR	J-6663	HEADLIGHT AIMERS
BT-33-70	BELT TENSIONER GAUGE	J-9600	DIODE INSTALLER
BT-1501	DISTRIBUTOR DWELL ANGLE ADJUSTING TOOL	J-9617-1	DIODE REMOVER
J-5184	ELECTRICAL TENSION CHECKING SCALE	J-9617-2	DIODE SUPPORT

Fig. 14-90 Tools

ELECTRICAL
(F-85)

CONTENTS OF SECTION 14

MAINTENANCE RECOMMENDATIONS

DELCOTRON

The Delcotron is lubricated at the time of manufacture and does not require periodic maintenance.

DISTRIBUTOR

The distributor shaft requires no external lubrication. The upper bushing is lubricated by a special lubricant which never needs addition or replacement. The lower bushing is lubricated by splash from distributor drive gear.

Every 12,000 miles:

1. Apply one drop of oil to the breaker lever pivot.
2. Apply a thin film of ball bearing lubricant or equivalent to the breaker cam.

Periodically clean and tighten connections.

SPARK PLUGS

Every 12,000 miles:

1. Remove, clean, inspect and regap.
2. Replace defective plugs.

BATTERY

Every 12,000 miles:

1. Adjust electrolyte level.
2. Oil positive terminal felt washer with S.A.E. 20W oil.

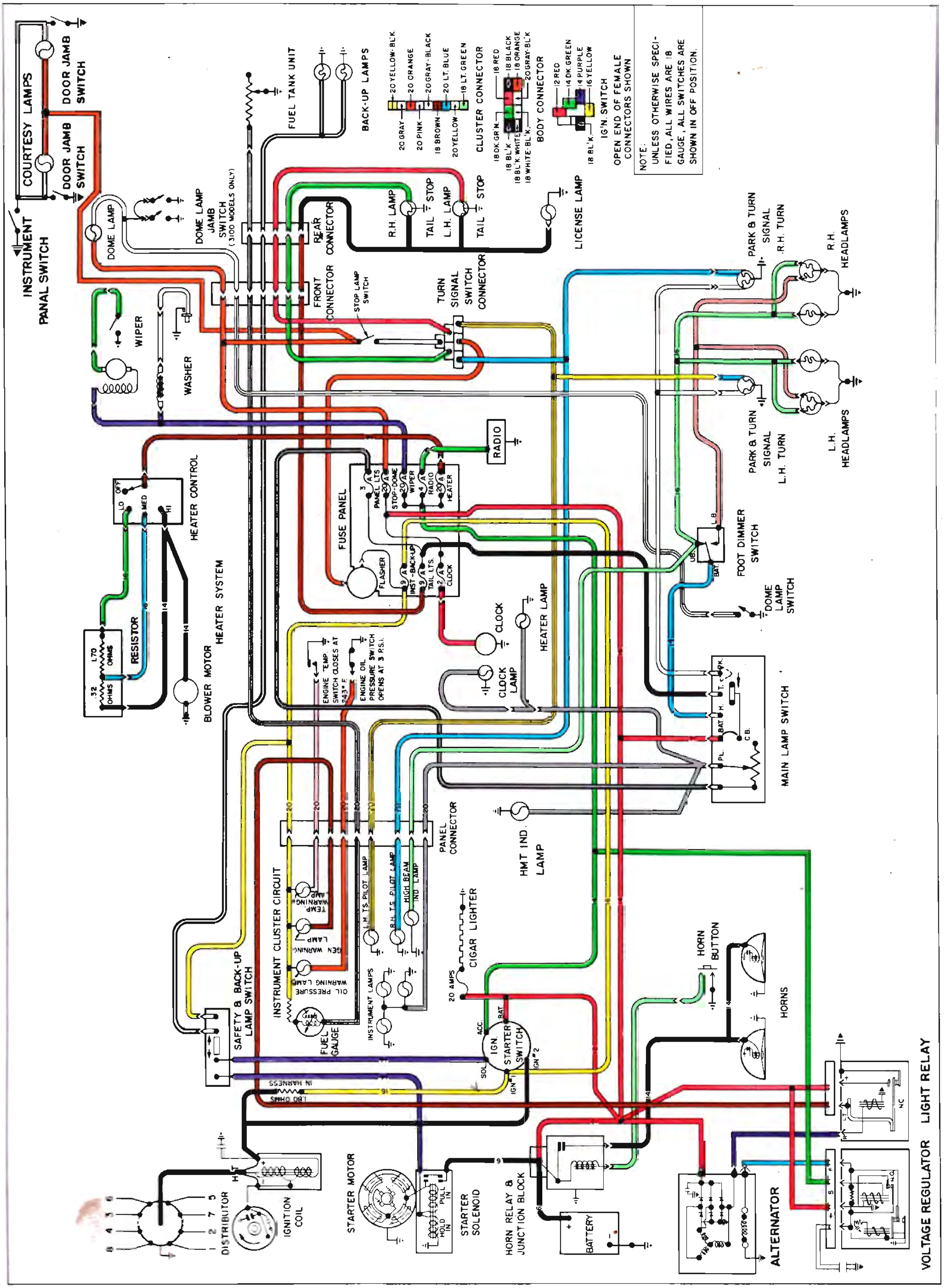


Fig. 14-101 Wiring Diagram

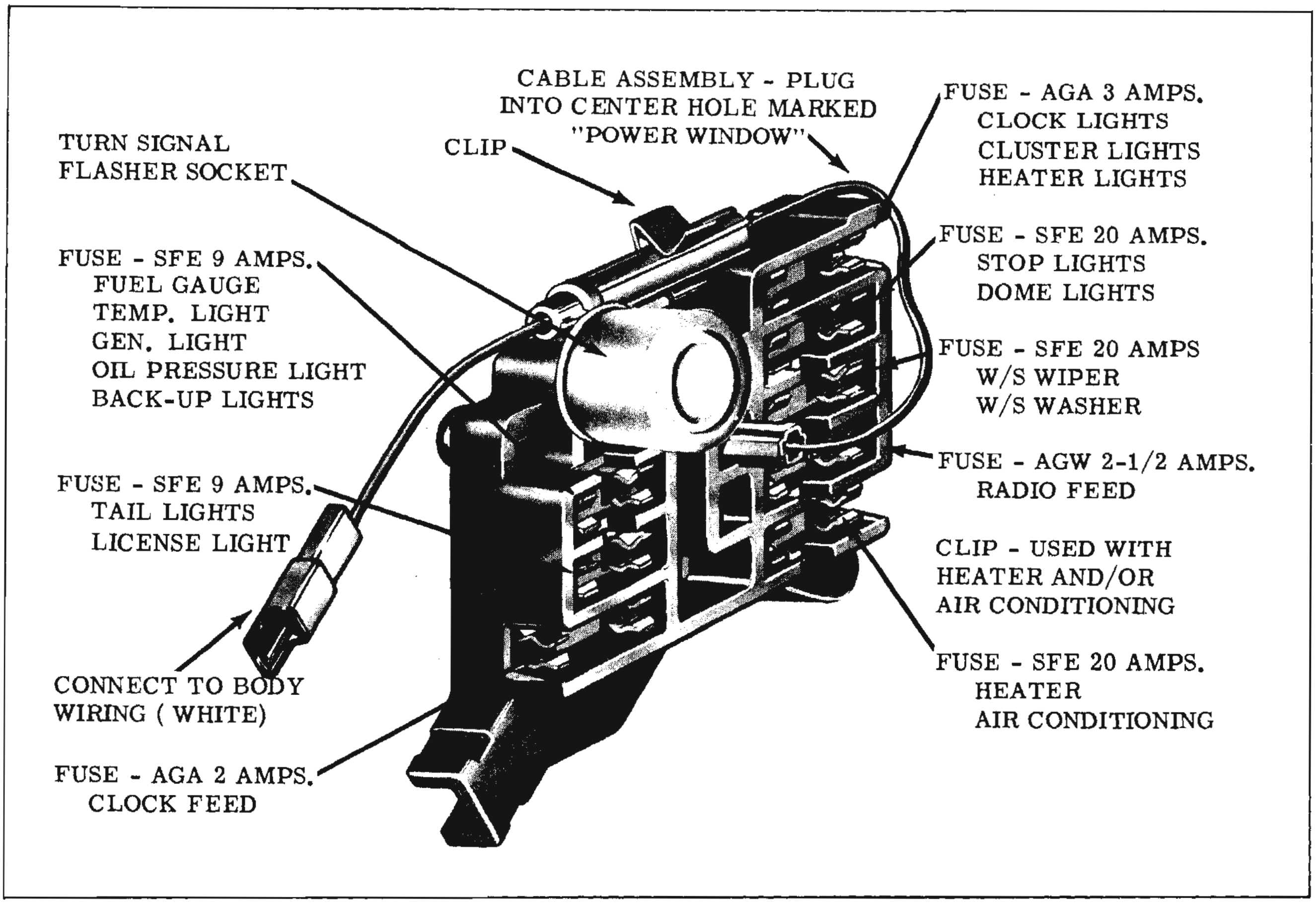


Fig. 14-102 Fuse Panel

Periodic

1. Inspect external condition of battery.
2. Clean top of battery.
3. Check hold-down clamp for proper tightness.

STARTER MOTOR AND SOLENOID

No periodic lubrication required.

IGNITION COIL

Inspect periodically for dirt, oil leakage, cracks and loose terminals.

WIRING SYSTEM

The wiring system incorporates a wiring harness designed such that several conductors are wound into a single loom or cable with branches along the harness to connect the various electrical components. The wiring circuit is broken down into two sections, they are: the chassis wiring harness and the body wiring harness. The chassis wiring harness connects those components located in the instrument panel and directly ahead of the instrument panel. The body wiring harness, with few exceptions, connects all electrical components in the body shell from the instrument panel on back to the rear of the car.

A combination junction block and fuse panel is mounted with two hex head sheet metal screws, on the cowl under the instrument panel and just to the left of the steering column. The fuse panel is color coded to correspond to the wiring color code. The turn signal flasher unit socket is at the upper left hand corner of the fuse panel. All instrument panel units are connected to the chassis wiring harness by a multiple contact connector that is designed to prevent improper assembly. The body wiring harness is connected to the chassis wiring harness by a keyed multiple contact connector. This chassis-body wiring harness connector is located under the left side of the instrument panel. A wiring diagram of the complete electrical system is illustrated in Fig 14-101.

FUSE PANEL

Removal

1. Disconnect the battery positive cable.
2. Disconnect the clock feed wire at the fuse panel.
3. Remove the two sheet metal mounting screws. (Fig. 14-102)

4. Remove fuses from panel.

5. Disconnect the wiring from the back of the panel by removing the fuse holder clips. To remove the fuse clip, insert a cotter pin over the center of the fuse clip and push in to disengage locking ears on both sides of the clip. When the locking ears are disengaged, the fuse clip can be pushed on out the back of the fuse panel.

Installation

1. Insert fuse clips into back of panel until locking ears snap, locking the clip in place.

2. Mount the panel on the cowl using two sheet metal screws. (Fig. 14-102)

3. Replace fuses.

4. Connect clock feed wire if car is so equipped.

5. Connect battery positive lead.

CHASSIS WIRING HARNESS

Removal

Whenever a failure in the main wiring harness makes it necessary to replace the harness, it is suggested that all harness leads be cut off within about an inch of the connectors. This will leave the correct color coded wire at the connector and will make correct identification of connections possible.

IMPORTANT: WHENEVER IT IS NECESSARY TO DISCONNECT THE BODY WIRING HARNESS FROM THE CHASSIS WIRING HARNESS OR WHENEVER ANY ELECTRICAL TESTS OR REPAIRS ARE MADE IN THE HARNESS, THE WIRE TO THE FUEL GAUGE TANK UNIT MUST BE DISCONNECTED TO PREVENT DAMAGE TO THE TANK UNIT RESISTANCE COIL.

1. Disconnect the battery positive cable.

2. Cut all harness to component leads near the connector.

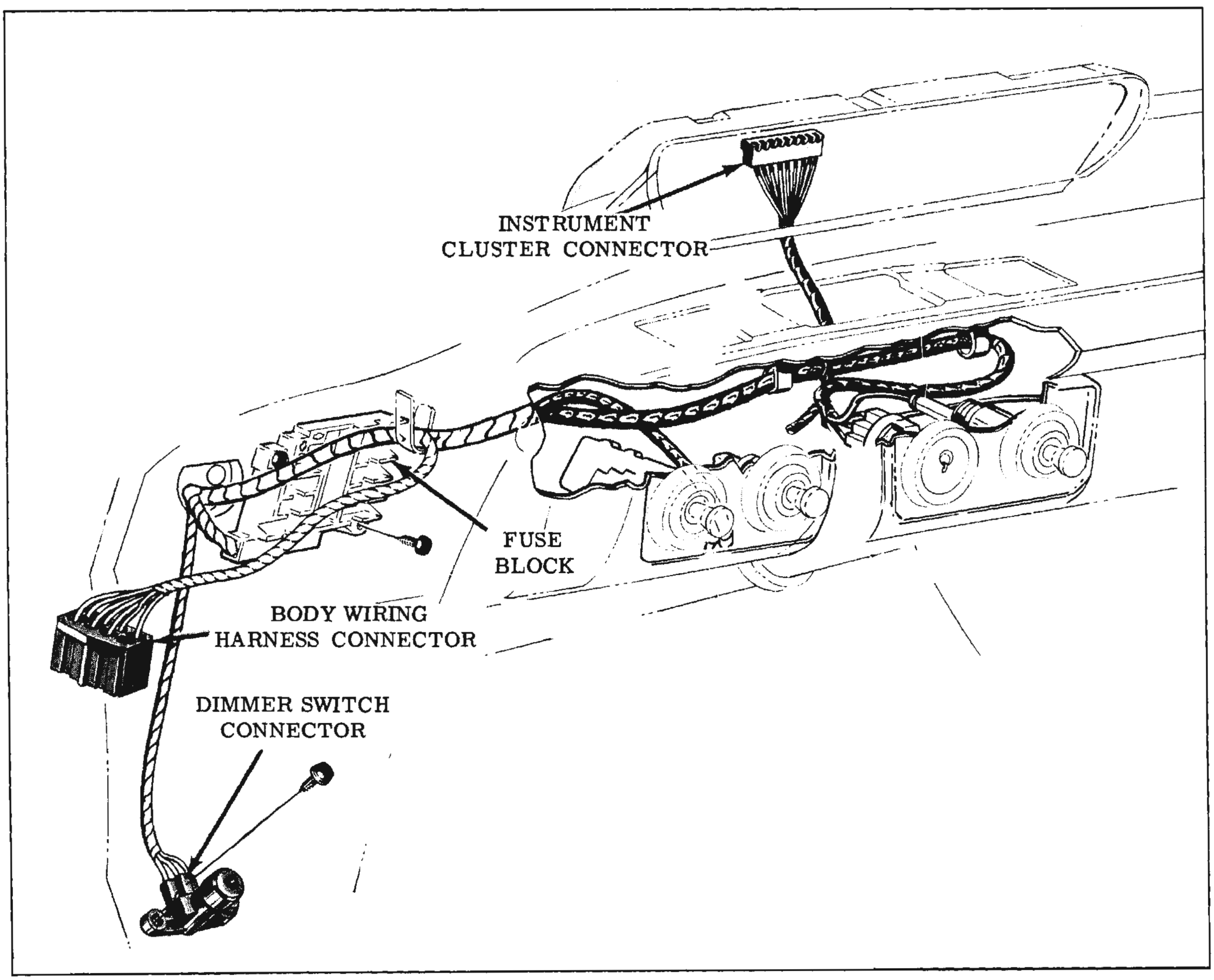


Fig. 14-103 Instrument Panel Wiring

(Delete all reference to existing Chassis Wiring Harness Removal and Installation. Insert new copy between pages 14-104 & 14-105).

CHASSIS WIRING HARNESS

Removal

IMPORTANT: WHENEVER IT IS NECESSARY TO DISCONNECT THE BODY WIRING HARNESS FROM THE CHASSIS WIRING HARNESS OR WHENEVER ANY ELECTRICAL TESTS OR REPAIRS ARE MADE IN THE HARNESS, THE WIRE TO THE FUEL GAUGE TANK UNIT MUST BE DISCONNECTED TO PREVENT DAMAGE TO THE TANK UNIT RESISTANCE COIL.

1. Disconnect battery.

   NOTE: If car is equipped with air conditioning, remove battery.

2. To save time when removing the old harness, cut the harness close to the cowl grommet on the engine side.

   CAUTION: Do not cut the heater wire harness, the red air conditioning wire or the pink two-speed wiper wire.

3. Disconnect left headlamps and remove headlamp ground screw.

   NOTE: For 3147 models, it is necessary to remove the windshield washer jar, turbo-rocket fluid tank, horn and turbo-rocket fluid bottle bracket.

4. Loosen harness from cowl clips, cut the branch of the harness routed along right side of engine just above the heater at the junction where the harness goes behind the heater, loosen the harness from the valve cover clips and disconnect the connections on the end of the harness section and remove section of harness.

5. Disconnect the right headlamp wiring.

   NOTE: If car is equipped with power brakes, remove the outboard vacuum tank attaching screw.

6. Loosen the wheelhouse harness clips, disconnect all connections on the right wheelhouse section of the harness and remove remaining portion of harness.

   NOTE: At this point, all of the original harness from the cowl forward has been removed.

7. Remove instrument cluster cover and light switch escutcheon. If car is equipped with air conditioning, remove ignition switch.

   NOTE: Do not disconnect wiring harness from the light switch at this time. If car is equipped with air conditioning, remove the inner and outer A/C ducts. It is not necessary to remove evaporator or loosen the air outlet nozzle.

8. Remove left air outlet grille and cowl trim pad. Fold back floor covering to disconnect wire dimmer switch terminal.

9. Remove fuse block retaining screws, disconnect body harness connector and all accessory connectors.

   NOTE: Disconnect speedometer cable to gain access to printed circuit multiple connector.

10. Cut the harness tape to extract the pink windshield washer wire and remove the fuse block with harness attached, from the car.

11. On the bench, transfer the fuses, clips and flasher to new fuse block and the light switch to the new harness.

Installation

From inside the car, thread harness through cowl, install retaining clips and connect all terminals and plugs in engine compartment.

Install the fuse block to cowl retaining screws and connect all terminals disconnected during removal procedure.

NOTE: It is not necessary to remove the radio, evaporator or console, if so equipped, to connect the terminals. Replace all previously removed parts and check the operation of instruments and switches.

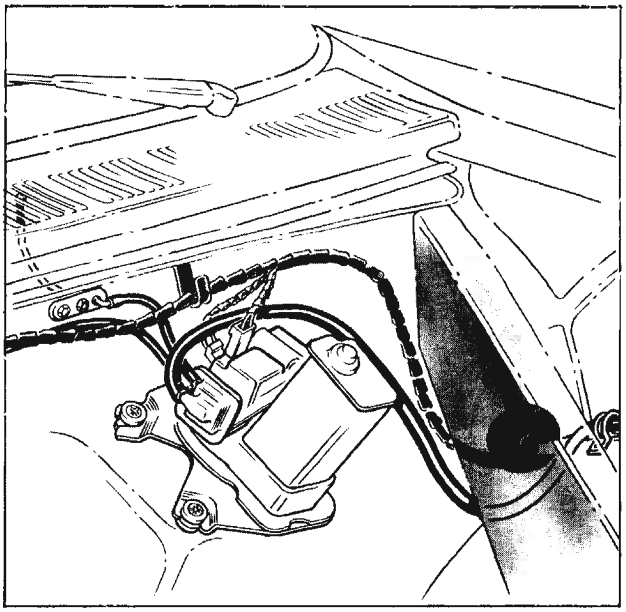


Fig. 14-104 Wiring Harness Routing

3. Remove fuse panel.

4. Remove damaged harness.

Installation

1. Mount fuse panel on cowl. (Fig. 14-102)

2. Route harness branches to components under instrument panel. (Fig. 14-103)

3. Route under-hood branches through rubber grommet in cowl panel. (Fig. 14-104)

4. Connect each connector of new harness as the trimmed off connector of old harness is removed by following color of old wire.

5. Reconnect battery cable to positive terminal of battery.

CHARGING CIRCUIT

Description

The charging circuit consists of a battery, Delcotron, voltage regulator and an indicator lamp relay which controls the instrument panel warning lamp.

The battery is a six cell, fifty-four plate, twelve volt, 44 ampere hour storage battery. It is mounted as shown in Fig. 14-105.

Refer to the full size car section of this Service Manual for the description and servicing of the Delcotron, battery, voltage regulator, indicator lamp relay and starter.

SERVICING UNITS

BATTERY

Removal

1. Disconnect the battery cables from the battery terminals using a suitable tool to spread cable spring clamp.

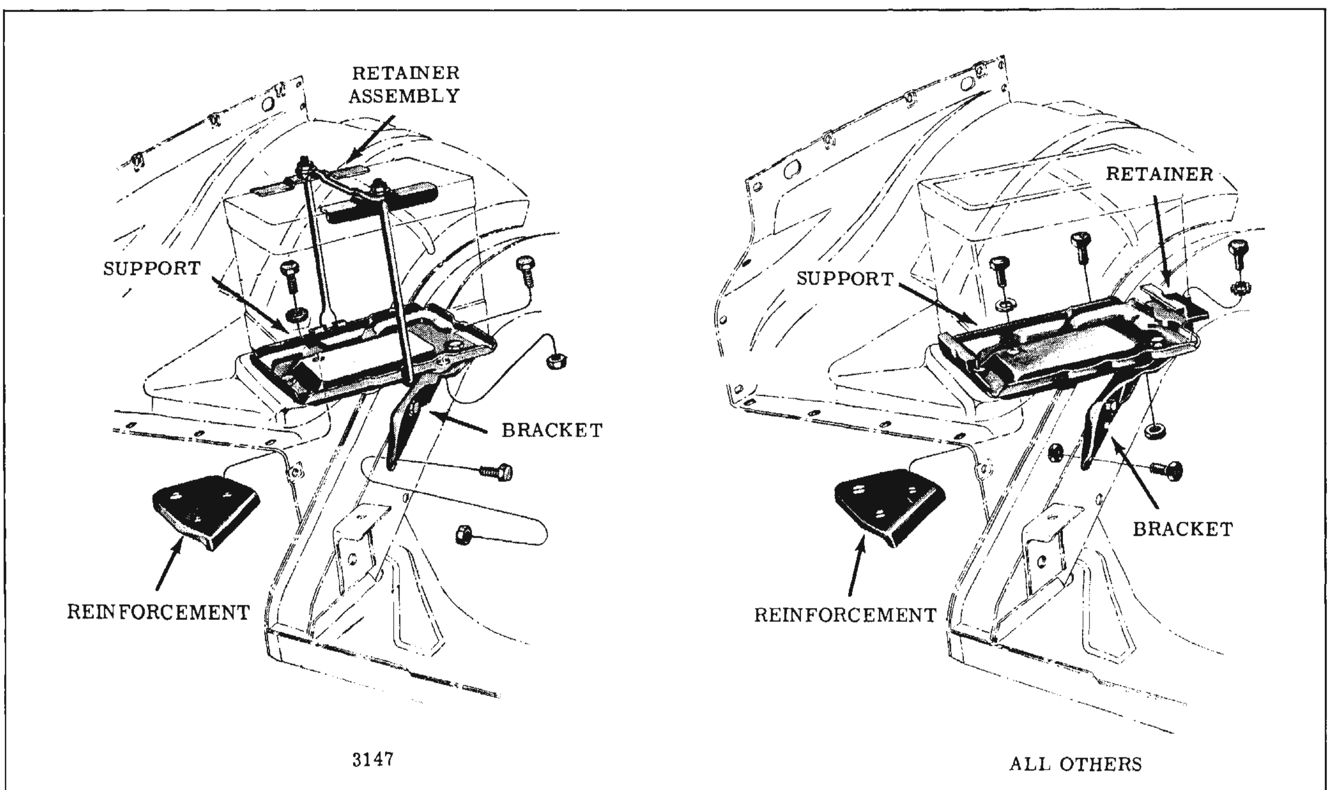


Fig. 14-105 Battery Mounting

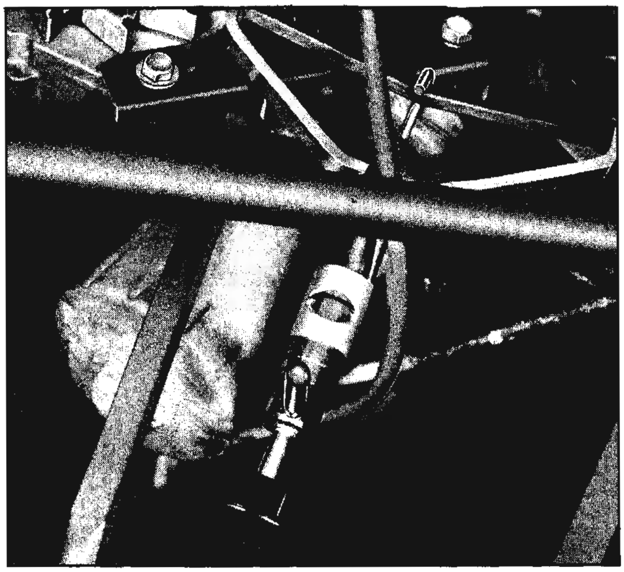


Fig. 14-106 Belt Tension Adjustment

2. On 3147 Models, remove battery hold-down clamp. For other models remove bolt retaining bracket to support.

3. Lift battery from battery tray and note position of positive and negative terminals with respect to the tray.

Installation

1. Position battery in tray with negative terminal closest to the engine.

2. On 3147 Models install battery hold-down clamp and tighten sufficient to hold battery firmly. Do not tighten battery clamp too tight since too much pressure may crack the battery case. Torque 1-1/2 to 2-1/2 ft. lbs. On all other models, install bracket and retain with bolt and washer.

3. Apply a few drops of oil to positive terminal felt washer.

4. Connect the spring clamps of the battery cables to their respective terminals.

DELCOTRON

Removal

1. Disconnect battery positive cable.

2. Disconnect wiring at rear of Delcotron.

3. Remove belt adjusting link bolt.

4. Remove bracket to Delcotron attaching bolt, disengage belt and remove Delcotron from underside of car.

   NOTE: It will be necessary to remove the oil filter element to obtain clearance to remove the Delcotron. Keep filter in upright position.

Delcotron Bracket

If necessary to remove the Delcotron bracket, it will be necessary to first remove the Delcotron on all models.

Installation

1. Position the Delcotron on the mounting bracket and install bracket to Delcotron attaching bolt.

2. Position Delcotron belt on the pulleys.

3. Start belt adjusting link bolt.

4. Adjust belt using Tool BT-33-70 and tighten belt adjustment link bolt. (Fig. 14-106)

5. Install oil filter element, using new gasket.

6. Install wiring and wiring clip at rear of Delcotron.

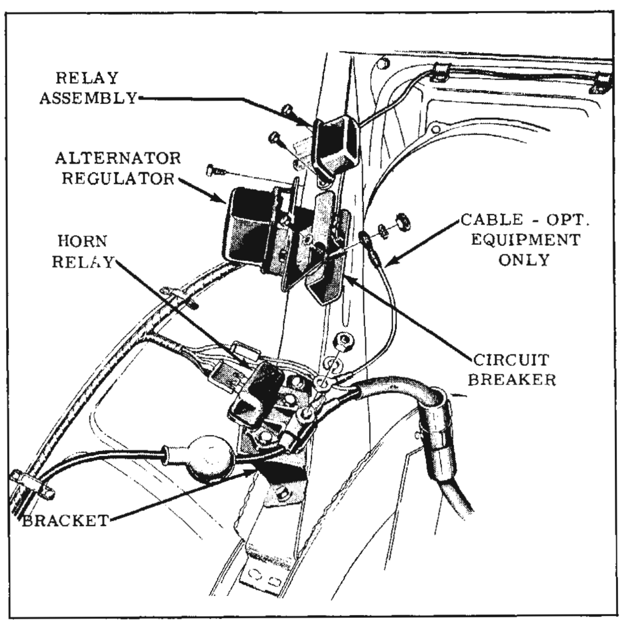


Fig. 14-107 Voltage Regulator and Indicator Lamp Relay Mounting

Voltage Regulator and Indicator Lamp Relay

Before removing the voltage regulator or indicator lamp relay, the battery must be disconnected. The voltage regulator and the indicator lamp relay are mounted as shown in Fig. 14-107.

STARTING CIRCUIT

The starting circuit consists of the battery, the ignition switch, the starting motor, the starting motor solenoid and the ignition resistor bypass to the primary of the ignition coil. The description and servicing of the starting circuit is covered in the full size car section of the service manual.

STARTER

Removal

1. Disconnect the positive battery cable.

2. Disconnect the positive battery cable from the junction block, remove the starter positive cable from the junction block, and disconnect the purple solenoid switch wire from the chassis wiring harness.

3. Hoist car.

4. Disconnect the starting motor from the engine cylinder block and remove starting motor while sliding battery cable loom through cable support tube.

Installation

1. Position starting motor on the cylinder block and install attaching bolts. Torque bolts 30-35 ft. lbs.

2. Slide starting motor cable loom through support tube.

3. Reconnect cables to junction block and solenoid wire to harness.

4. Connect positive battery cable.

IGNITION SYSTEM

DESCRIPTION

The ignition circuit is made up of the battery, junction block, ignition switch, ignition resistor, ignition coil, ignition distributor, and the spark plugs. The ignition circuit is shown in Fig. 14-108.

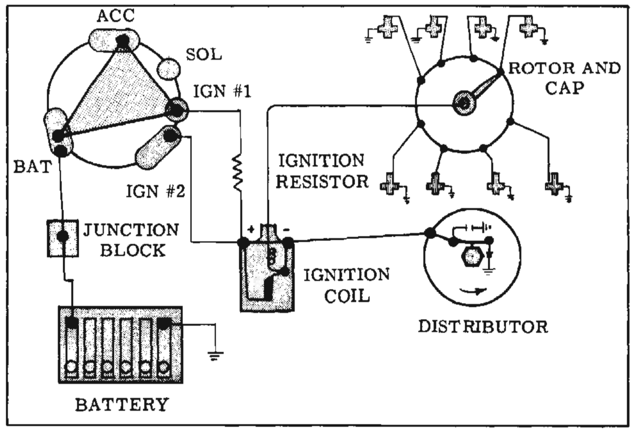


Fig. 14-108 Ignition System

The ignition and starting switch is key-operated to close the ignition primary circuit and to energize the solenoid for engine cranking. Accessories may be used when the engine is not running if the ignition switch key is turned counterclockwise, to the accessory position.

The ignition coil is a pulse transformer that steps up the low voltage from the battery or generator to a voltage high enough to jump a spark gap at the spark plug. The coil is oil filled for effective electrical insulation and cooling, (Fig. 14-109) The ignition resistor is a stainless steel wire that is built into the chassis wiring harness. The resistor, connected in series with the primary circuit between the ignition switch and the coil, limits the primary current at low speeds and allows the coil to operate at maximum efficiency at road speeds. The resistor is by-passed during cranking, thereby connecting the ignition coil primary directly to the battery through the ignition switch.

This makes full battery voltage available in the coil and keeps the ignition voltage as high as possible during engine cranking.

The distributor cap has a window for adjusting point opening (dwell angle) while the cap is

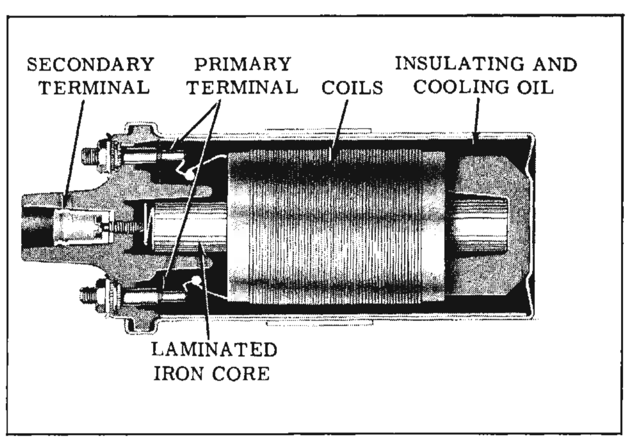


Fig. 14-109 Ignition Coil

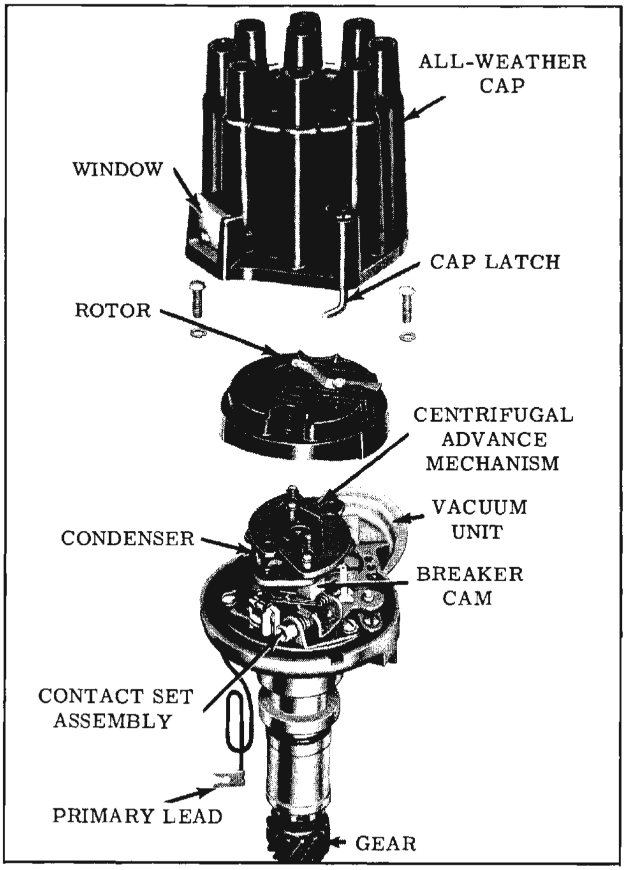


Fig. 14-110 Ignition Distributor

mounted and the engine is running. (Fig. 14-110) The contact point set is replaced as one complete assembly. The service replacement contact set has the BREAKER LEVER SPRING TENSION and POINT ALIGNMENT pre-adjusted. Only the POINT OPENING requires adjusting after replacement.

Under part throttle operation the intake manifold vacuum is sufficient to actuate the vacuum control diaphragm, thus advancing the spark and increasing fuel economy. During fast acceleration or when the engine is pulling heavily, the vacuum is not sufficient to actuate the diaphragm; therefore, the movable breaker plate is held so that the ignition timing is retarded.

The centrifugal advance mechanism consists of a cam actuated by two centrifugal weights controlled by spring. As the speed of the distributor shaft increases with engine speed, the centrifugal advance weights move outward which advances the cam, causing the contact points to open earlier, thus advancing the spark.

The spark plugs have 14mm threads and a 13/16" hex body. Satisfactory results can be assured only when genuine AC plugs of the type recommended are used.

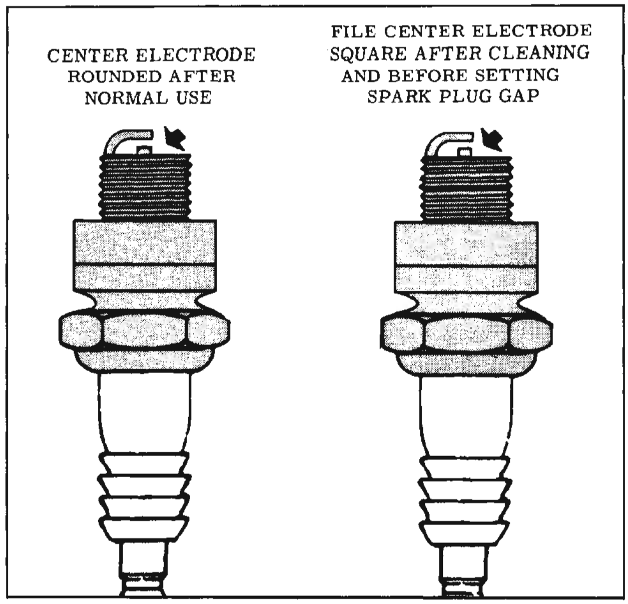


Fig. 14-111 Spark Plug Electrodes

MAINTENANCE

Distributor

When replacing contact point assembly, apply a small amount of Delco-Remy Cam and Ball Bearing lubricant or equivalent to the breaker cam. No other lubricant is required.

In addition to lubrication, the distributor requires periodic inspection of the cap, rotor, wiring, breaker points, and timing.

Ignition Coil

The ignition coil should be cleaned of all oil and dust periodically to insure the prevention of spark leakage. All connections should be cleaned and tightened to insure good contact and minimize resistance.

Spark Plugs

Whenever spark plugs are removed from the car and cleaned, the following precautionary steps should be followed to insure against voltage leakage:

1. The center electrode should be filed flat before setting the gap. (Fig. 14-111)

   NOTE: Do not file electrodes when setting gap on new plugs.

2. Any traces of paint or dirt should be cleaned from the spark plug porcelain.

3. All plugs should be checked for cracks in the porcelain. These cracks are not always visible because they may be hidden by the steel body. (Fig. 14-112) Use a spark plug tester to test plugs.

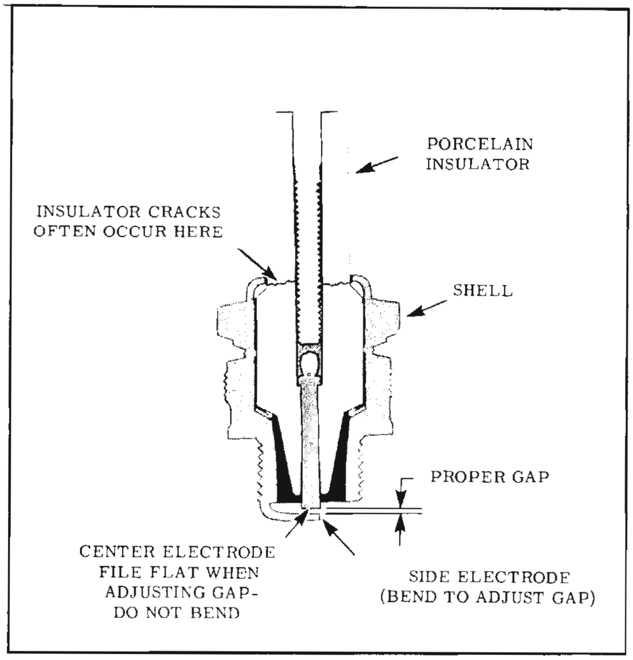


Fig. 14-112 Spark Plug Construction

If the spark plug porcelain is cracked a new spark plug must be installed.

The spark plug gap should not be measured with flat feeler gauge stock but should be measured with a wire gauge as shown in Fig. 14-113.

CHECKS AND ADJUSTMENTS

DISTRIBUTOR

ADJUSTMENT OF DISTRIBUTOR DWELL ANGLE (ON CAR)

1. Connect a dwell meter to the primary distributor lead terminal on the coil and a suitable ground.

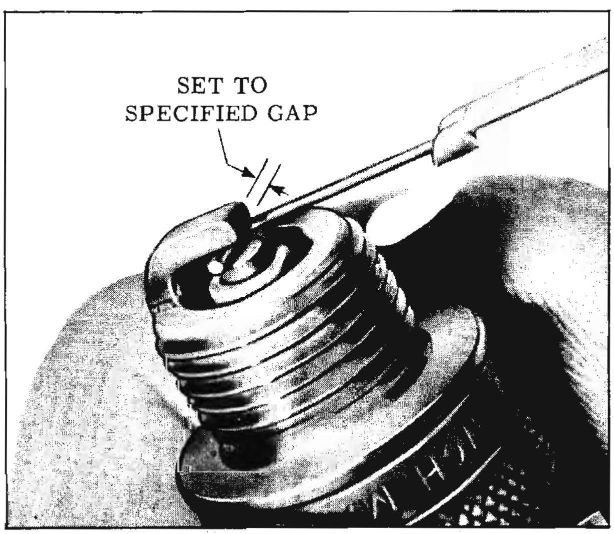


Fig. 14-113 Adjusting Spark Plug Gap

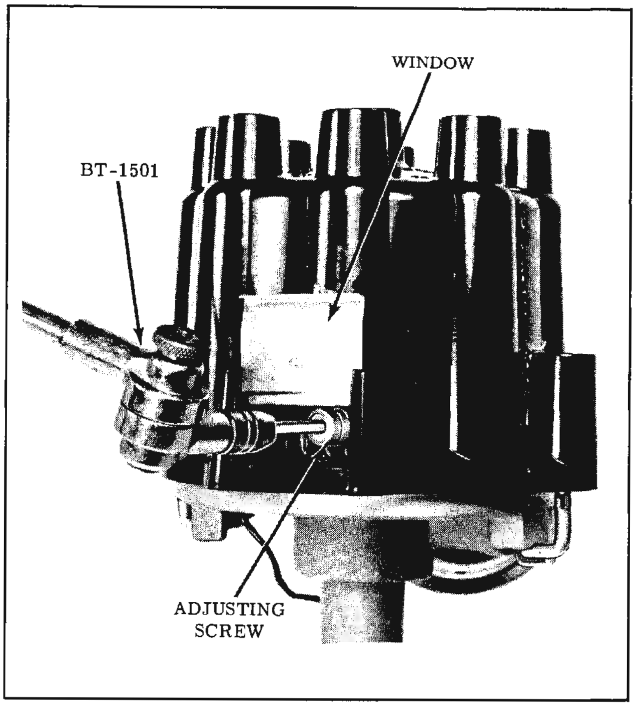


Fig. 14-114 Adjusting Dwell

2. Raise window on side of distributor cap.

3. With the engine running at idle speed, insert Dwell Adjusting Tool BT-1501 into the head of the adjusting screw as shown in Fig. 14-114 and adjust dwell angle to 30°.

   NOTE: If the dwell angle reading is erratic, check the primary circuit, points, and condenser.

The dwell angle variation should not exceed 3° at engine speeds between idle and 1,750 r.p.m. Excessive variation indicates distributor wear.

ADJUSTING DISTRIBUTOR DWELL ANGLE (OFF CAR)

1. With distributor mounted in distributor testing machine, connect the dwell meter to the distributor primary lead.

2. Turn the adjusting screw to set the dwell angle at 30°.

IGNITION SYSTEM DIAGNOSIS

If the engine does not run, the ignition system may be at fault if:

1. There is no spark during cranking when a spark plug wire is held 1/4" from the engine.

2. The engine starts but immediately stops when the ignition switch is released from the "START" position.

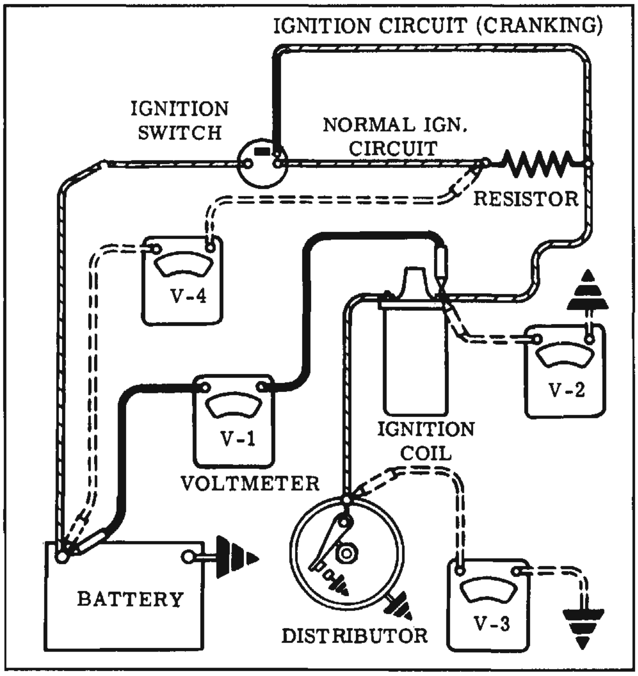


Fig. 14-115 Ignition System Tests

If the above checks indicate that the ignition system is at fault, the following checks may be made to help locate the difficulty, or locating trouble in the ignition system if the car runs, but not satisfactorily, (Fig. 14-115 and IGNITION SYSTEM CHECK CHART). All checks are to be made with the lights and accessories off and in the sequence shown.

IGNITION SYSTEM CHECK CHART

Operation	Specification	Possible Trouble
Check all connections in Primary and Secondary circuit:		
Remove secondary lead from distributor cap. Hold 1/4'' from engine while cranking and observe if spark occurs:		Distributor cap. Rotor. Spark plug wiring.
Check Voltage V1 while cranking:	1 Volt Max.	Open circuit from battery side of coil to IGN, on ignition switch. Ignition switch not closing ignition circuit in start position. Ground in circuit from coil terminal to IGN, on ignition switch. Ground in coil.
Check Voltage V2 ignition switch "On", points open:	Normal Battery	Low battery. Points not open. Ground in circuit from coil to distributor. Ground in distributor. Ground in coil. Ground in circuit from coil to ignition switch or to resistor.
Check Voltage V2 ignition switch "On", points closed:	5 to 7 Volts	If under 5 volts: Loose connection from resistor through ignition switch circuit to battery. Loose connection between resistor and coil. Resistor is open or has too much resistance. If over 7 volts: Loose connection between coil and distributor. Resistor out of circuit due to shorted or incorrect wiring. Resistor has too little resistance. Coil primary is open.
Check Voltage V3 ignition switch "On", points closed:	0.2 Volt Max.	Contacts not closed. Loose connection in distributor. Distributor not grounded to engine. Faulty contacts.
Check Voltage V4 ignition switch "On", points closed:	0.7 Volt Max.	Loose connection from resistor through ignition switch circuit to battery.
If these checks fail to find cause of trouble - remove distributor, coil and resistor from engine and check to specifications. Also check wiring harness.		

SERVICING UNITS

SPARK PLUGS

Removal

1. Disconnect the spark plug secondary wires from the spark plugs.

2. Remove dirt from around the base of the spark plugs by blowing out with compressed air.

3. Using a 13/16" spark plug socket, remove the spark plug from the cylinder head.

Inspection

Spark plugs should be removed from the car, cleaned, and regapped periodically. This will insure top performance and maximum life of the spark plug.

Worn or dirty plugs may function satisfactorily at idle and low speeds, whereas at high speeds they may fail noticeably. Faulty plugs may show up with a noticeable drop in fuel economy, power, and performance, and they may also cause high speed miss and hard starting. Spark plugs fail because of fouling, excessive gap or broken insulators.

Dirty or leaded plugs may be evident by black carbon deposits, or red, brown, yellow or blistered oxide deposits on the plugs. The black deposits are usually the result of low speed driving and short runs where sufficient engine operating temperature is seldom reached. Worn pistons, rings, faulty ignition, over-rich carburetion and spark plugs which are too "cold" will also result in carbon deposits. Red, brown, etc., oxide deposits, a consequence of the use of leaded fuel, usually result in spark plug failure under severe operating conditions. The oxides have no adverse effect on plug operation as long as they remain in a powdery state. But, under high speed or hard pull, the powder oxide deposits melt and form a heavy glaze coating on the insulator which, when hot, acts as a good electrical conductor, allowing current to follow. the deposits and short out the plug.

Excessive gap wear on plugs of low mileage usually indicates the engine is operating at high speeds or loads that are consistently greater than normal or that a plug which is too "hot" is being used. In addition, electrode wear may be the result of plug overheating, caused by combustion gases leaking past the threads and gasket, due to insufficient compression of the spark plug gasket, dirt under the gasket seat, or the use of old gaskets. Too "lean" carburetion will also result in excessive electrode wear.

Broken insulators are usually the result of improper installation or carelessness when regapping the plug. Broken upper insulators usually result from a poor fitting wrench or an outside blow. The cracked insulator may not make itself evident immediately, but will as soon as oil or moisture penetrates the fracture. The fracture is usually just below the crimped part of the shell and may not be visible.

Broken lower insulators usually result from carelessness when regapping and generally are visible. In fairly rare instances, this type of a break may result from the plug operating too "hot" such as encountered in sustained periods of high speed operation or under extremely heavy loads. When regapping a spark plug, to avoid lower insulator breakage, always make the gap adjustment by bending the ground (side) electrode.

Never bend the center wire. Spark plugs with broken insulators should always be replaced.

Cleaning and Adjusting

1. Clean the spark plugs using an abrasive type cleaner.

2. File the center electrode square as shown in Fig. 14-111.

3. Set the spark plug electrode gap at 0.040" using a wire gauge as shown in Fig. 14-113.

4. Clean the upper porcelain removing all dirt, grease, or paint.

5. Since cracked insulators are not always visible, the spark plug should be given a performance check in a spark plug tester. Any cracked porcelain insulators will show up in the form of a spark shorting across the insulator through the crack.

6. Replace faulty plugs.

Installation

1. Always use new spark plug gaskets when installing spark plugs.

2. Place a coating of 980131 lubricant on the spark plug threads before installing.

3. Using a 13/16" spark plug socket, install the spark plug, and torque to 12-17 ft. lbs.

4. Connect the secondary lead to the spark plug.

CONTACT POINTS

Removal

1. Remove distributor cap.

DIAGNOSIS

PLUG CONDITIONS	FACTORS CAUSING THIS CONDITION	CORRECTIVE ACTION
Plug "Flash Over" (Firing from upper terminal to base of plug):	Dirty insulator tops—oil, dirt and moisture on insulator will shunt current to base of plug. The above condition can be caused by failure of spark plug boot.	Keep plugs wiped clean with cloth moistened with cleaning solvent. Check spark plug boot and replace if necessary.
Oil or Carbon Fouling:	Wet, black deposits on firing end of plug indicate oil pumping condition. This is usually caused by worn piston rings, pistons, cylinders or sticky valves. Soft, fluffy, dry black carbon deposits usually indicate a rich mixture operation, excessive idling, improper operation of automatic choke or faulty adjustment of carburetor. Hard baked-on, black carbon deposits result from use of too cold a plug.	Correct engine condition. In most cases plugs in this condition will be serviceable after proper cleaning and regapping. If troubles are not eliminated, use "hotter" type plug. Use "hotter" type plug.
Lead Fouling (Light & powdery or shiny glazed coating on firing end):	By-products of combustion and fuel additives, deposited as a powder which may later melt and glaze on insulator tip.	Remove deposits by blast cleaning. If this is not possible, plugs should be replaced.
Normal Electrode Wear:	Due to intense heat, pressure and corrosive gases together with spark discharge, the electrode wears and gap widens.	Plugs should be regapped every 10,000 miles.
Rapid Electrode Wear:	Condition may be caused by (1) burned valves, (2) gas leakage past threads and seat gaskets, due to insufficient installation torque or damaged gasket, (3) too lean a mixture or (4) plug too "hot" for operating speeds and loads.	Correct engine condition. Install plugs to specified torque. Use a new spark plug seat gasket each time a new or cleaned spark plug is installed. Use "colder" type plug if condition continues to exist.
Broken Upper Insulator (Firing around shell crimp under load conditions):	Careless removal or installation of spark plug.	Replace with a new spark plug.
Broken Lower Insulator (Firing Tip):	The cause is usually carelessness in regapping by either bending of center wire to adjust the gap or permitting the gapping tool to exert pressure against the tip of the center electrode or insulator when bending the side electrode to adjust the gap. Fracture or breakage of lower insulator may also occasionally occur if the engine has been operated under conditions causing severe and prolonged detonation or pre-ignition.	Replace with a new spark plug. Use "colder" type plug for the particular type of operation.
Damaged Shell:	Very seldom occurs but cause is almost always due to mishandling by applying excessive torque during installation. This failure is usually in the form of a crack in the Vee of the thread next to the seat gasket or at the groove below the hex.	Replace with a new spark plug.

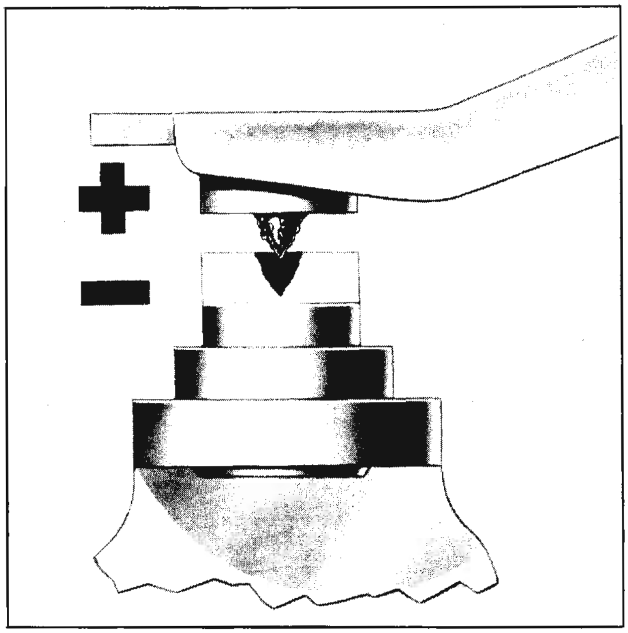


Fig. 14-116 Effects of High Capacitance

2. Remove the rotor.

3. Disconnect the distributor primary lead and condenser lead from the contact set terminal by loosening the attaching screw.

4. Loosen the 2 attaching screws which hold the base of the contact set to the breaker plate. Lift up and rotate the contact set counterclockwise sufficient to clear the 2 mounting screws and lift the contact assembly from the breaker plate.

Inspection, Cleaning, and Alignment

Examine the contact points for presence of dirt, abnormal wear, burning, or pitting. Dirty points should be dressed with a few strokes of a clean fine-cut contact point file. NEVER USE EMERY CLOTH TO CLEAN CONTACT POINTS. Contact point surfaces may not appear bright and shiny after prolonged use, but this does not necessarily indicate that they are not functioning satisfactorily. Do not attempt to remove all of the roughness to make the points smooth. Simply remove excess scale and dirt.

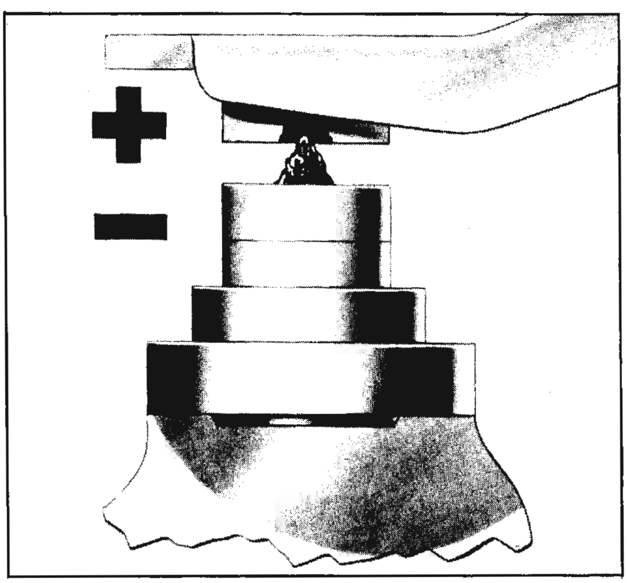


Fig. 14-117 Effects of Low Capacitance

Contact point burning may result from high voltage, presence of oil and dirt, improper adjustment or alignment and/or a defective condenser. An improperly adjusted voltage regulator could be the cause of point burning from excess voltage.

Contact point pitting results from improper ignition circuit capacitance. If the material transfer is from negative to positive, as shown in Fig. 14-116, the capacitance is too high. If the material transfer is from positive to negative as shown in Fig. 14-117, the capacitance is too low. Capacitance can be increased by replacing condenser with a higher value capacitance, by shortening the condenser lead, by separating the distributor to coil low tension and high tension leads, and/or by moving these leads closer to ground. To reduce circuit capacitance, move distributor to coil leads closer together, or move these leads away from ground, or lengthen the condenser lead.

The point opening on new points can be set using a feeler gauge; however, a feeler gauge should not be used on rough or uncleaned points since the gauge would touch only the high points resulting in an inaccurate gauging as is shown in Fig. 14-118.

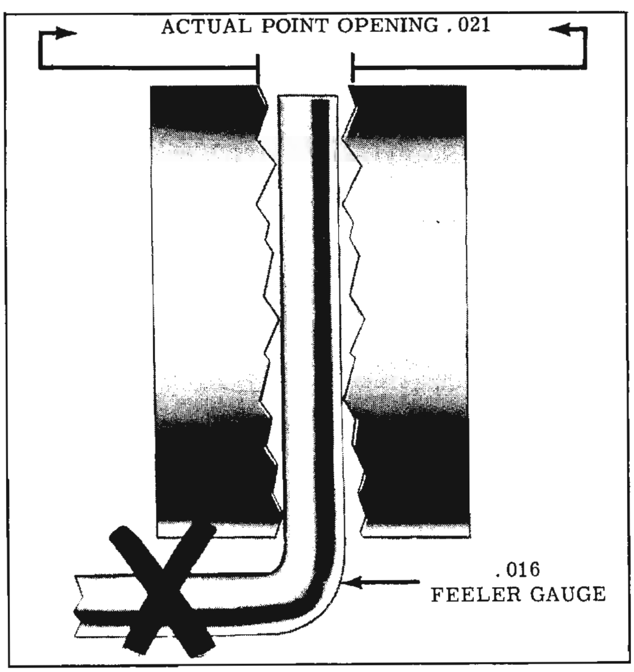


Fig. 14-118 Inaccurate Point Setting

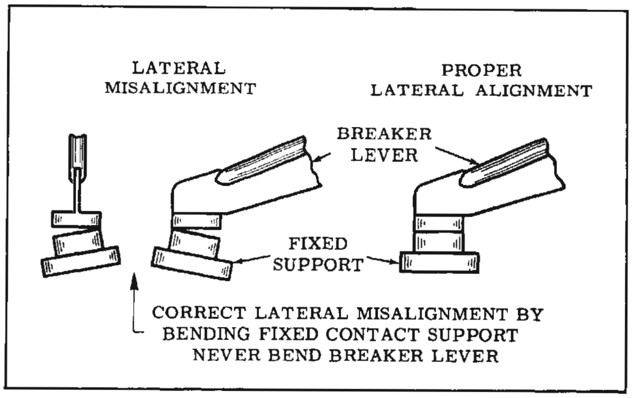


Fig. 14-119 Aligning Points

Only misaligned new points should be corrected. If serious misalignment of used points is encountered, the points should be replaced rather than attempting to align the contacts. Align new points by bending the fixed contact support. See Fig. 14-119. DO NOT ATTEMPT TO BEND THE BREAKER LEVER. BENDING OF THE BREAKER LEVER WILL RESULT IN IMPROPER SPRING TENSION AND WILL AFFECT THE PROPER OPERATION OF THE CONTACT SET.

Installation

1. When installing the contact set, be sure the dowel pin hole in the contact set base is centered over the dowel pin on the distributor breaker plate. Apply a thin film of Delco-Remy Cam and Ball Bearing lubricant, or equivalent, to breaker cam.
2. Insert the right end of the contact set under its mounting screw and pivot the contact set clockwise until contact set will drop onto alignment dowel. (Fig. 14-120)

Adjustment

1. Turn engine over until the breaker arm rubbing block is on a high point of the breaker cam to open points.

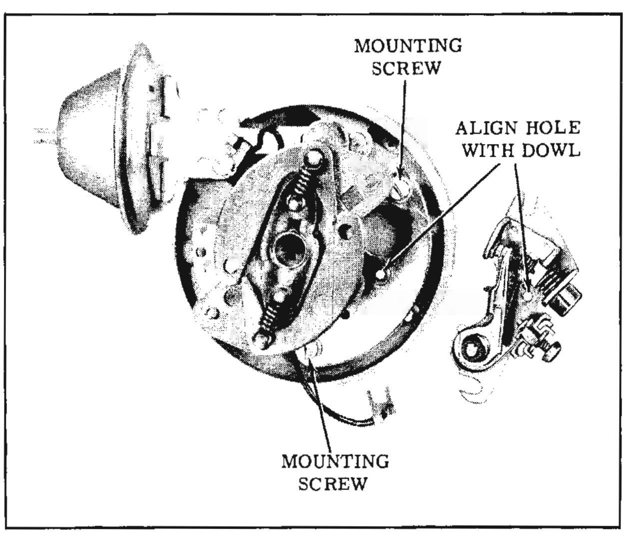


Fig. 14-120 Contact Point Position

2. Measure point gap with a .016" feeler gauge.
3. Adjust the gap by turning adjusting screw using a 1/8" Allen wrench. To decrease the point gap rotate adjusting screw clockwise. To increase gap rotate adjusting screw counterclockwise.

   The gap can also be measured by using a dwell meter. If this method is preferred proceed to:

   a. Install distributor rotor and distributor cap.

   b. Connect dwell meter positive (red) lead to the distributor primary terminal at the ignition coil. Connect dwell meter negative (black) lead to ground.

   c. Check the dwell angle with engine at idle.

   d. Adjust dwell to 30^{o} using Tool BT-1501 as shown in Fig. 14-114.

CONDENSER

Removal

1. Remove distributor cap.
2. Loosen condenser lead screw at contact set terminal and remove condenser lead.
3. Remove condenser mounting screw.
4. Lift condenser from breaker plate.

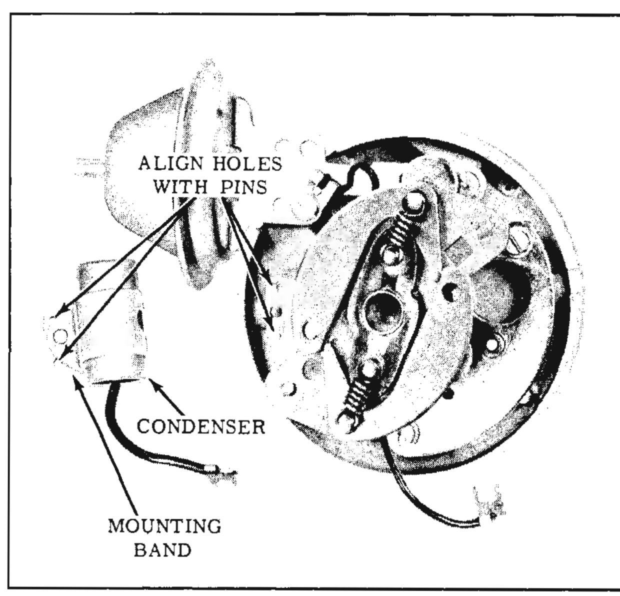


Fig. 14-121 Condenser Installation

Installation

1. Place condenser and mounting band in position on the breaker plate alignment pin and install mounting screw. (Fig. 14-121)

2. Insert condenser lead into contact set terminal and tighten terminal screw.

Testing

The following four factors affect condenser operation. They should be checked with a suitable tester following the test equipment manufacturer's instructions.

1. Breakdown of insulation or direct short.

2. High leak-down rate preventing condenser from holding charge.

3. High series resistance caused by broken strands in condenser lead.

4. Capacitance should be 0.18-0.23 Microfarad.

ROTOR

Removal

1. Remove distributor cap by pressing down on and turning latch as shown in Fig. 14-122.

2. Remove 2 rotor mounting screws and lift rotor from distributor mechanical advance mechanism.

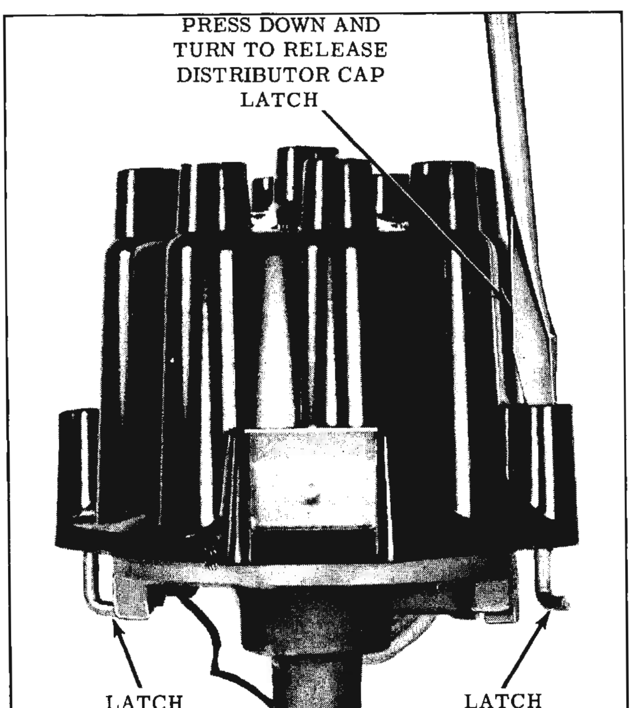


Fig. 14-122 Distributor Cap Removal

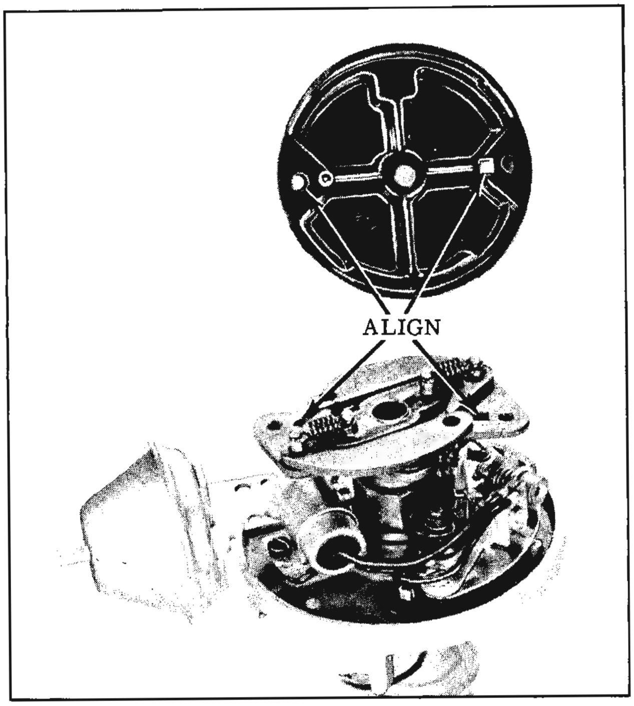


Fig. 14-123 Rotor Installation

Installation

1. Install rotor, aligning round and square lugs shown in Fig. 14-123.

2. Install mounting screws.

VACUUM ADVANCE UNIT

Removal

1. Disconnect the vacuum hose from unit.

2. Remove distributor cap.

3. Remove rotor.

4. Rotate breaker plate to provide access to unit mounting screws and remove mounting screws.

5. Pull the vacuum advance unit out from the distributor so that the breaker plate is rotated approximately 30° counterclockwise. Holding the breaker plate in this position, disengage the vacuum advance unit rod from the breaker plate and remove vacuum advance unit. (Fig. 14-124)

Installation

1. Engage vacuum advance unit rod with breaker plate.

2. Install mounting screws attaching the ground wire to the outer mounting screw as shown in Fig. 14-125.

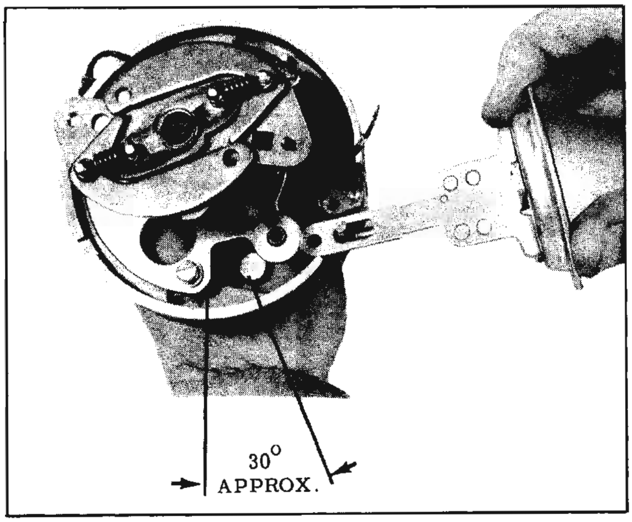


Fig. 14-124 Vacuum Advance Removal

3. Install rotor and distributor cap.

4. Connect vacuum hose to vacuum advance unit.

IGNITION COIL

Removal

1. Remove coil secondary wire from coil tower. Do not jerk the wire out, but remove by pulling with a steady pressure to prevent damage to wire connector.

2. Disconnect the coil primary wires by removing the 2 hex nuts at the coil terminals.

3. Remove the hex mounting bolt and lift coil from engine.

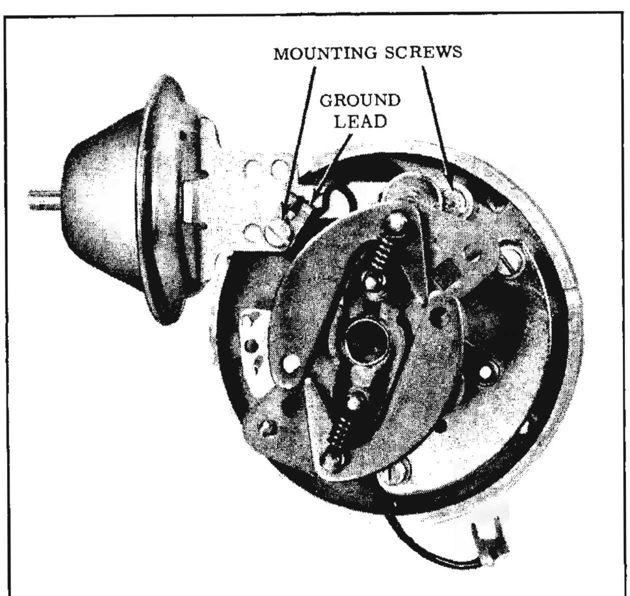


Fig. 14-125 Vacuum Advance Installation

Installation

1. Before mounting coil, place a small amount of thread lubricant on threads of coil mounting bolt.

2. Position coil on intake manifold, install mounting bolt, and torque to not more than 20-25 ft. lbs.

3. Connect the ignition primary lead and radio condenser lead if so equipped to the coil positive terminal and tighten hex nut to 15-20 in. oz. of torque.

4. Connect the coil to distributor primary lead to the negative terminal and tighten the hex nut to 15-20 in. oz. torque.

5. Insert the coil secondary lead into the coil tower and slide boot over tower.

Testing

The voltage output can be checked with any suitable test equipment following the manufacturer's test instructions.

The primary coil resistance on all models except 3147, should be from 1.28 ohms to 1.42 ohms at 80°F. The secondary coil resistance should be from 7200 ohms to 9500 ohms at 80°F. On all 3147 models, the primary coil resistance should be 7.5 ohms to 8.60 ohms at 80°F. The secondary coil resistance should be 7500 ohms to 10,000 ohms at 80°F.

IGNITION SWITCH

Removal

1. Disconnect harness connector from ignition switch.

   NOTE: The ignition switch wiring connector is locked to the back of the ignition switch by means of a special terminal tang which fits in a hole in the terminal for the accessory wire. The connector plastic insulation has a slot in it to gain access to the tang. To remove the connector, insert a small punch or awl through the slot to depress the terminal tang and disengage it from the terminal, then pull the connector from the ignition switch. The tang automatically engages the terminal when the connector is reinstalled.

2. Remove ignition switch nut.

3. Remove switch escutcheon.

4. Slide switch through instrument panel opening from the back side of the instrument panel. (See Fig. 14-126)

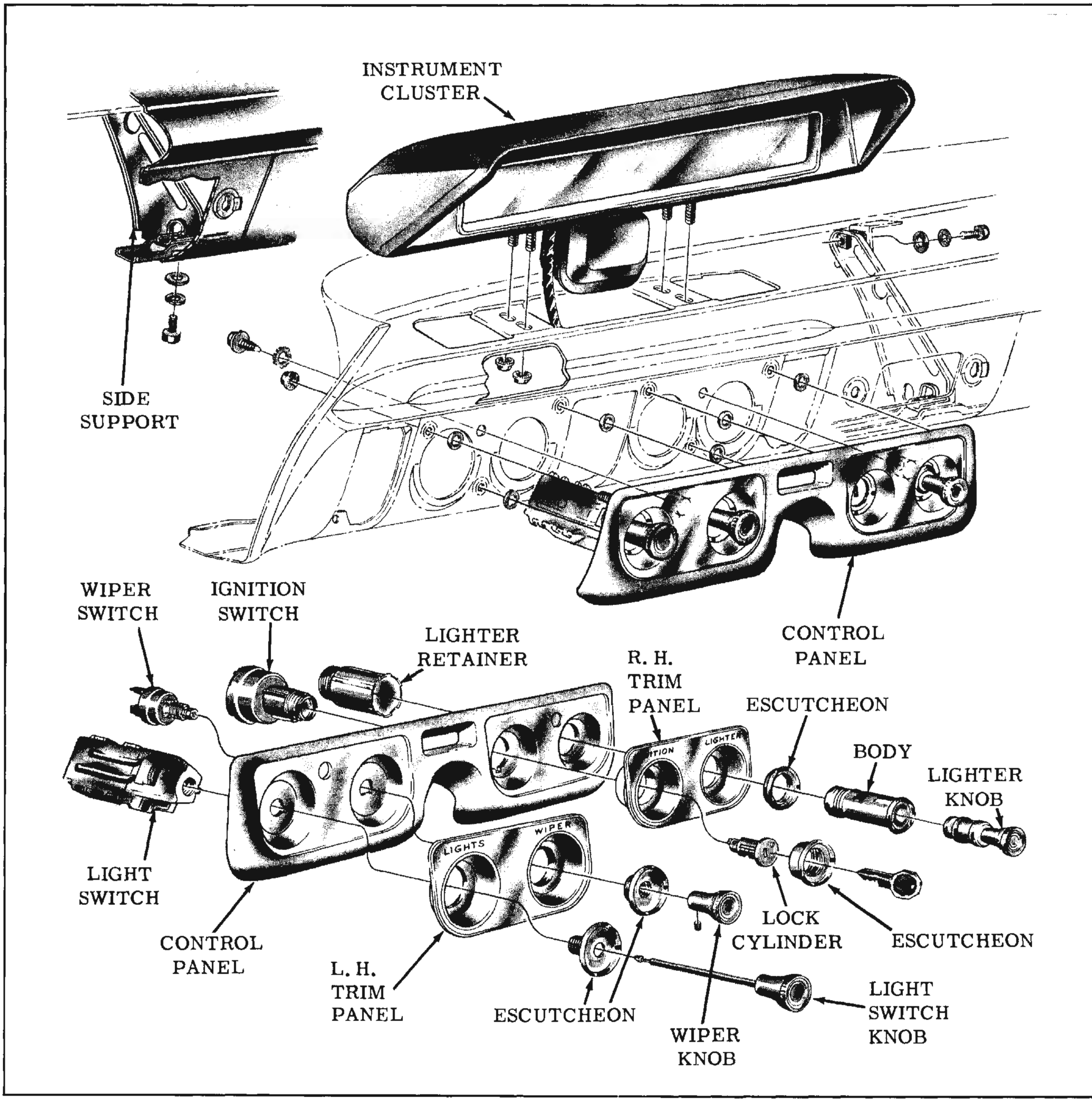


Fig. 14-126 Instrument Panel Assembly

To remove lock cylinder:

1. Insert key and turn to the left.
2. Push a wire in hole in face of lock cylinder.
3. Turn cylinder to left as far as it will go and withdraw cylinder.

Installation

1. From back side of instrument panel, slide switch into mounting hole and align lug with slot.
2. Position escutcheon over switch.
3. Install ignition switch nut.
4. Connect harness connector to ignition switch.

DISTRIBUTOR

Removal

1. Disconnect the distributor primary wire from the coil.
2. Remove the distributor cap as shown in Fig. 14-122.

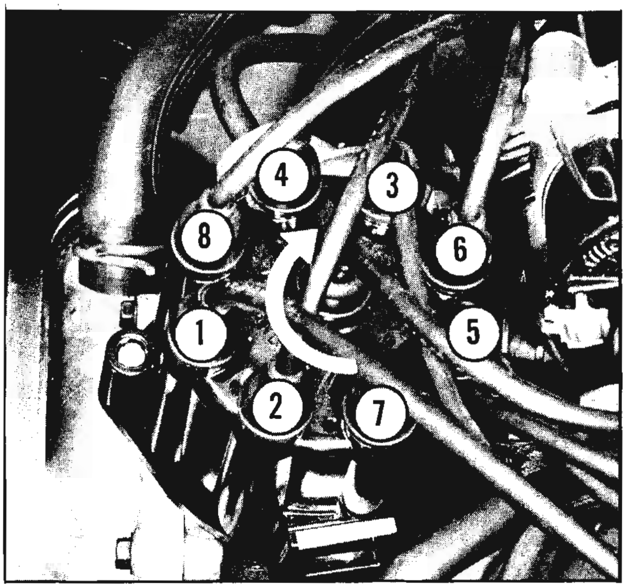


Fig. 14-127 Plug Wire Locations in Cap

NOTE: If necessary to remove the secondary wires from the cap, mark the position for the number one cylinder on the distributor cap tower and reassemble as shown in Fig. 14-127. This will make it possible to correctly replace the secondary leads.

3. Remove the vacuum hose line from the distributor vacuum advance unit.

4. Remove the hex head bolt and hold-down clamp.

5. Mark the position of the rotor, then pull the distributor up until the rotor just stops turning clockwise and note the position of the rotor at this point.

6. Remove distributor from front cover.

Installation (Engine Not Disturbed)

1. Rotate rotor to the same position as that at removal.

2. Install distributor into engine block and align distributor drive gear with oil pump drive shaft and camshaft gear. This can be done by rotating distributor drive shaft to first pick up oil pump drive shaft and secondly engage cam gear and distributor drive gear so that rotor is positioned as it was before removal after the gear is engaged.

3. Position hold-down clamp and install clamp bolt finger tight using a drop of SAE 10W30 oil on bolt threads.

4. Cover distributor vacuum advance hose with tape.

5. Connect the positive (red) lead of the dwell meter to the distributor primary lead terminal at the ignition coil and the negative (black) lead of the dwell meter to ground.

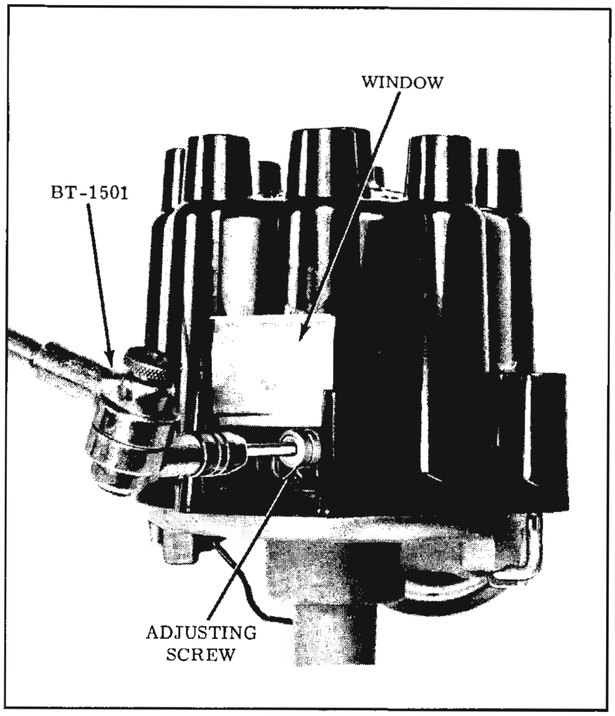


Fig. 14-128 Adjusting Dwell

6. Start the engine and with the engine running at idle speed, insert dwell adjusting Tool J-6296 or BT-1501 through the distributor window into the Allen head of the adjusting screw as shown in Fig. 14-128. Adjust the dwell angle to 30°.

7. Connect timing light spark plug high tension lead to the number one cylinder spark plug line by inserting a probe lead between the spark plug rubber boot insulator and the high tension lead.

8. Connect the positive (red) timing light lead to the battery positive terminal and the negative (black) timing light lead to the battery negative terminal.

9. Adjust the engine speed to 850 r.p.m.

10. Set the timing to 5° before top-dead-center by rotating the distributor and tighten the distributor hold-down clamp bolt.

11. Torque the distributor hold-down clamp bolt to 25-30 ft. lbs.

12. Remove the tape from the distributor vacuum line and connect vacuum line to vacuum advance unit.

Installation (Engine Disturbed)

If the engine is turned over after the distributor is removed or if the engine has been disassembled

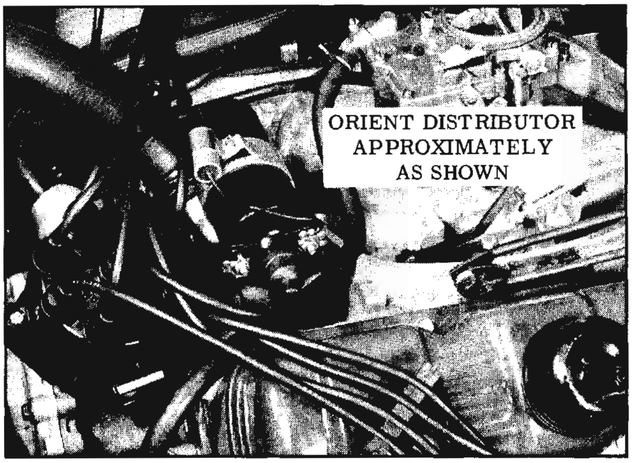


Fig. 14-129 Distributor Installation

for some reason, it will be necessary to perform the following steps:

1. Position the number one cylinder piston in firing position by either of the two following methods:

   a. Remove the number one cylinder spark plug. Using an auxiliary starter switch and a compression gauge, crank the engine until compression is indicated on gauge. Continue to crank engine intermittently to align timing mark on crankshaft balancer with the zero line on the front cover. This will place the piston at top-dead-center for initial timing.

   b. Remove the left bank rocker cover. Crank engine until the number one cylinder intake valve closes and the zero timing mark on front cover is aligned with the notch on the crankshaft balancer rim. The piston will be at top-dead-center when the intake valve rocker-arm is at its upper extreme on the valve stem end.

2. Install the distributor with the vacuum advance positioned to the right of the engine as shown in Fig. 14-129.

3. Rotate rotor to engage oil pump drive shaft.

4. Position the rotor so that it points toward the distributor cap number one cylinder tower. This will be positioned just slightly to the left of center and towards the front of the engine. (Fig. 14-130)

5. Rotate the rotor about 1/8 turn clockwise and push down to engage camshaft gear.

6. Install hold-down clamp and bolt finger tight using SAE 10W30 oil on bolt threads.

7. Cover distributor vacuum advance vacuum hose with tape.

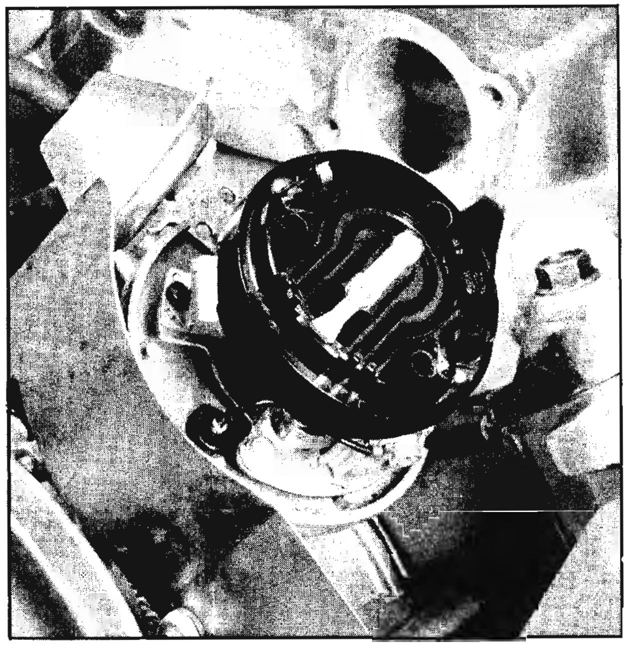


Fig. 14-130 Distributor Installation

8. Connect the positive (red) lead of the dwell meter to the distributor primary lead terminal at the ignition coil and the negative (black) lead of the dwell meter to ground.

9. Start the engine and with the engine running at idle speed, insert dwell adjusting Tool J-6296 or BT-1501 through the distributor window into the Allen head of the adjusting screw as shown in Fig. 14-128. Adjust the dwell angle to 30^{o}.

10. Connect timing light spark plug high tension lead to the number one cylinder spark plug line by inserting a probe lead between the spark plug rubber boot insulator and the high tension lead.

11. Connect the positive (red) timing light lead to the battery positive terminal and the negative (black) timing light lead to the battery negative terminal.

12. Adjust the engine speed to 850 r.p.m.

13. Set the timing to 5^{o} before top-dead-center by rotating the distributor and tighten the distributor hold-down clamp bolt.

14. Torque the distributor hold-down clamp bolt to 25-30 ft. lbs.

15. Remove the tape from the distributor vacuum line and connect vacuum line to vacuum advance unit.

Disassembly

1. With distributor cap and rotor removed, mark the distributor gear and the distributor shaft

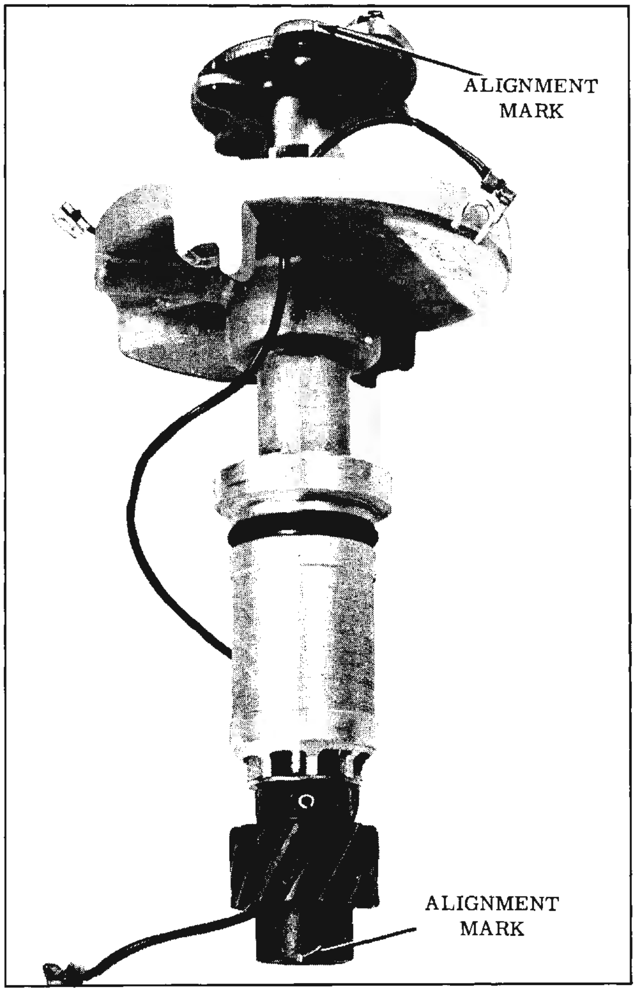


Fig. 14-131 Distributor Shaft and Gear

at the centrifugal advance mechanism so that they may be reassembled in the same position. (Fig. 14-131)

2. Using a suitable drift, drive out the gear retaining roll pin.

3. Slide drive gear from distributor shaft and remove the shaft thrust washer.

4. Loosen the ground lead terminal screw and disconnect the ground lead terminal from the vacuum advance unit. (Fig. 14-132)

5. Disconnect the primary lead from the contact set.

6. Remove the shaft retaining ring from the upper bushing and lift the breaker plate and felt wick from the bushing. (Fig. 14-133)

7. Remove the two vacuum advance unit retaining screws and the vacuum advance unit.

Assembly

1. Install the vacuum advance unit and be sure the locating lug is seated in the hole in the housing. Just start the ground lead terminal screw.

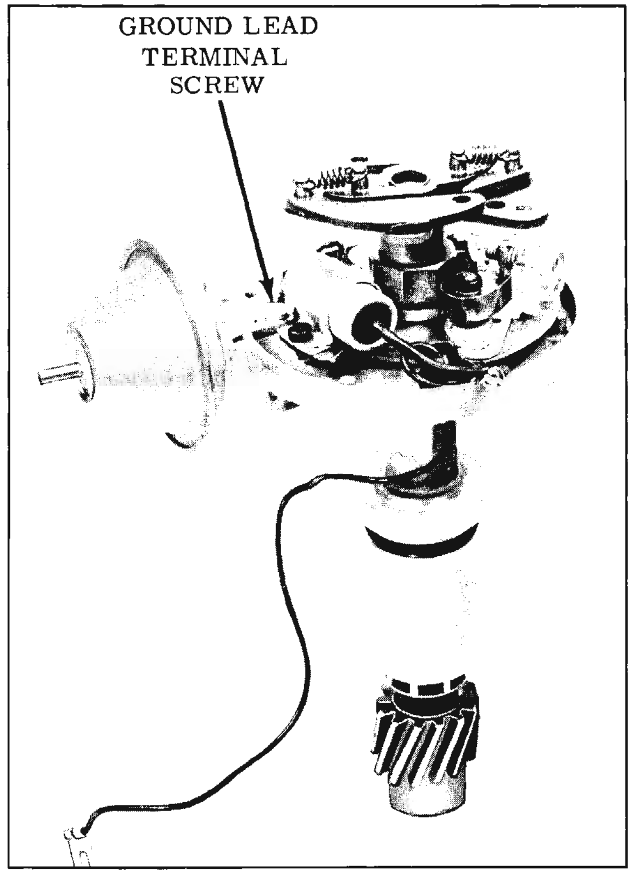


Fig. 14-132 Distributor Ground Lead

2. Place the felt wick on the upper bushing, then place the breaker plate over the upper bushing and vacuum advance link. (Fig. 14-133)

3. Install the retaining ring on the upper bushing.

4. Insert the ground lead under the retaining screw and tighten.

5. Connect the primary wire to the contact set terminal. (Fig. 14-134)

6. Slide the distributor shaft through the housing bushings.

7. Slide a new thrust washer onto the shaft.

8. Slide the drive gear onto the shaft aligning pin hole and the alignment marks.

9. Install the gear retaining roll pin.

10. Apply a small amount of cam and ball bearing lubricant or equivalent to the breaker cam.

11. Check and adjust dwell, vacuum advance and mechanical advance.

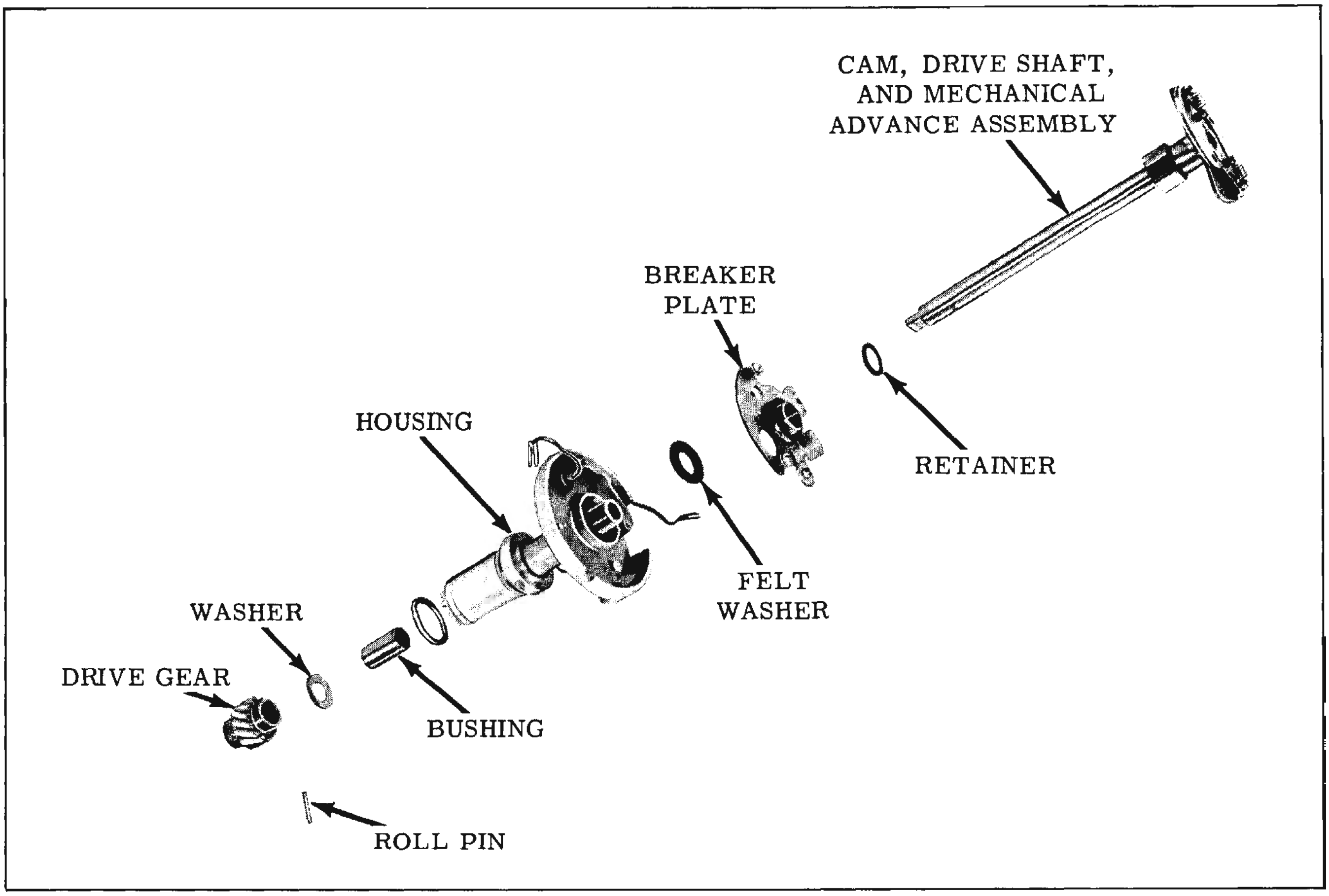


Fig. 14-133 Distributor Assembly

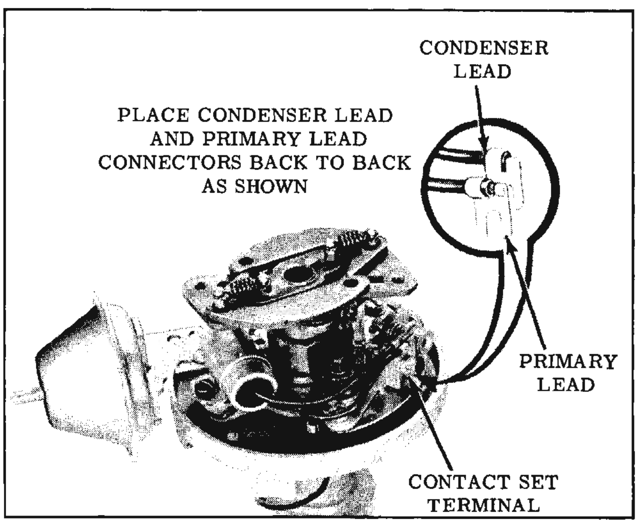


Fig. 14-134 Condenser and Primary Lead

LIGHTING SYSTEM

HEADLAMP SWITCH

The headlamp switch controls the headlamps, parking lamps, tail lamps, and instrument panel lamps. Turning the knob counterclockwise against the stop turns on the dome lamp. These circuits are protected by a circuit breaker incorporated in the headlamp switch. In addition, the tail lamps and instrument panel lamps are protected by fuses located in the fuse block. The brightness of the instrument panel lamps is adjustable by means of a rheostat built into the headlamp switch. Turning the knob of the switch operates the rheostat.

The normal lighting load is not sufficient to cause the circuit breaker (located on the headlamp switch) to open. If a short circuit or overload occurs, the circuit breaker will cause the lamps to flicker on and off rapidly. This flickering will continue until the cause of the malfunction is corrected. The circuit breaker is not adjustable.

HEADLAMPS

The dual headlamp system consists of four headlamps paired horizontally. Each pair of lamps consists of a sealed beam unit (inner unit with number one embossed on the lens) with 1 filament which provides an upper beam only, and a sealed beam unit (outer unit, with number two embossed on the lens) with 2 filaments which provides both an upper and lower beam. The subbody is also identified.

Since the number two headlamp lens is designed to provide maximum illumination on lower beam and the upper beam filament is not at the focal point of the number two lamp, the major portion of the upper beam illumination is supplied by the number one unit. Thus, the upper beam is supplied by all 4 headlamps.

When the lower beam is desired, the number one lamps are turned off, the upper filament of the number two lamps are turned off and the lower filaments of the number two lamps are turned on.

DIMMER SWITCH

The foot dimmer switch is used to select high or low beam of the headlamps as desired.

TAIL LAMP

The tail lamp bulb is a double filament bulb which acts as a stop lamp, tail lamp and turn signal lamp.

LICENSE LAMP

The rear license plate is illuminated by a lamp that is mounted in the bumper above the license plate.

STOP LAMP SWITCH

The stop lamp switch is a mechanically operated electrical switch. It is mounted through a bracket to the instrument panel brace. When the brake pedal is applied, the switch plunger is allowed to move outward. This outward movement of the switch plunger energizes the brake lamp circuit lighting the rear stop lamps.

TURN SIGNAL CIRCUIT

The turn signal circuit consists of the switch, flasher, 2 pilot lamps in the instrument cluster, the stop lamp filaments in the rear lamps, the turn signal filaments in the parking lamps.

The turn signal switch is mounted on the steering column jacket just above the Hydra-Matic neutral safety switch and actuated by a rod extending down the mast jacket from the turn signal actuator assembly.

FLASHER

The flasher is mounted on the fuse panel, and is a bi-metal unit.

The front turn signal lamp, rear turn signal lamp and pilot lamp are all connected in parallel and light simultaneously when the flasher makes contact.

If either the front or the rear turn signal lamp burns out, the pilot lamp on that side of the instrument panel will be lit all the time.

TURN SIGNAL DIAGNOSIS

1. PILOT LAMP REMAINS ON

   A. Right turn - right rear or right front turn signal filaments burned out, light bulb base not grounded or an open in the front or rear turn signal circuit.

   B. Left turn - left rear or left front turn signal filaments burned out, light bulb base not grounded or an open in the front or rear turn signal circuit.

   C. Flasher inoperative.

2. ONE PILOT LIGHT INOPERATIVE

   A. Pilot light filament burned out.

   B. Poor connection or a defective printed circuit.

3. ALL TURN SIGNAL LIGHTS INOPERATIVE

   A. Fuse blown. If new fuse burns out, check for short circuit.

   B. Flasher inoperative.

   C. Defective turn signal switch.

   D. Open circuit in the dark blue wire from fuse block to flasher or in the orange wire from flasher to turn signal switch.

BACK-UP LAMP SWITCH

On cars equipped with Hydra-Matic, the back-up lamp switch is incorporated with the neutral safety switch. The neutral safety switch, mounted on the steering column mast jacket, is employed as a safety factor on Hydra-Matic models. The switch prevents unintentional starting of the engine with the transmission in gear. When the switch is properly adjusted, the engine can only be started with the selector lever in "NEUTRAL" or "PARK" position.

The back-up lamp switch on Synchromesh equipped cars is mounted on the steering column mast jacket adjacent to the lower hole.

This switch is actuated by a lever attached to the shift tube. Placing the shift lever in reverse actuates this switch, turning the back-up lamps on.

DOME LAMP

The dome lamp is located in the center of the interior roof area. Turning the headlamp switch knob counterclockwise against the stop causes the dome lamp to operate. (3100 models are also

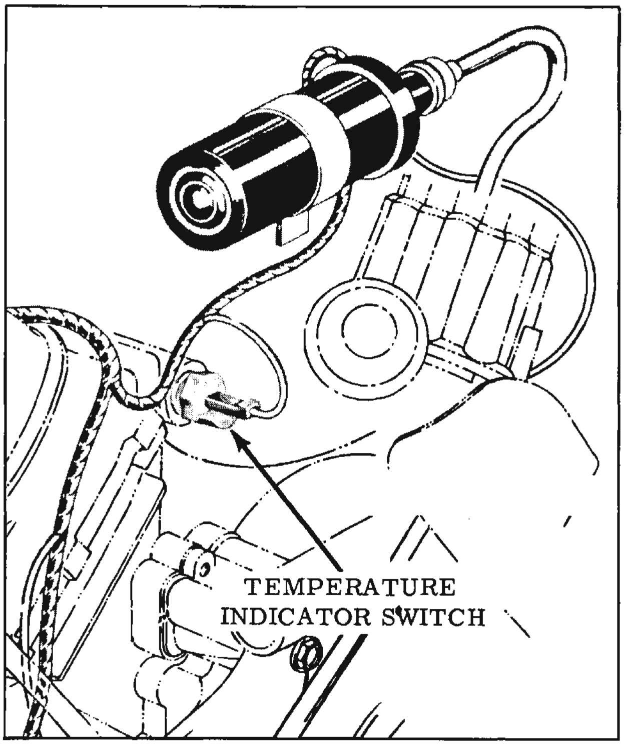


Fig. 14-135 Temperature Indicator Switch

equipped with 2 door lamp switches. Opening either of the front doors causes the dome lamp to operate).

INSTRUMENT LIGHTING

The instrument cluster is equipped with 3 lamps to light the speedometer dial and fuel gauge. The clock, located in the cluster, is illuminated with 1 lamp bulb. The cluster also houses a high beam indicator, 2 turn signal indicators, a temperature warning lamp, a generator warning lamp and an oil pressure warning lamp. All lamp bulbs, except the clock lamp, are in sockets in the printed circuit.

The engine temperature indicator lamp is controlled by a thermal switch in the right front of the intake manifold. (Fig. 14-135) If the engine cooling system is not functioning properly, the thermal switch will close the circuit to the red light when the temperature reaches 238°F ± 2°F, (cars without air· conditioning). The thermal switch does not require servicing. If it is defective, it should be replaced.

The engine oil pressure indicator lamp is controlled by a pressure operated switch located in the oil filter pad. (Fig. 14-136) With the engine running, the light operates only when the oil pressure is not satisfactory. This lamp should come on when the ignition is turned on and the engine is not running.

The heater control and radio dial are also illuminated.

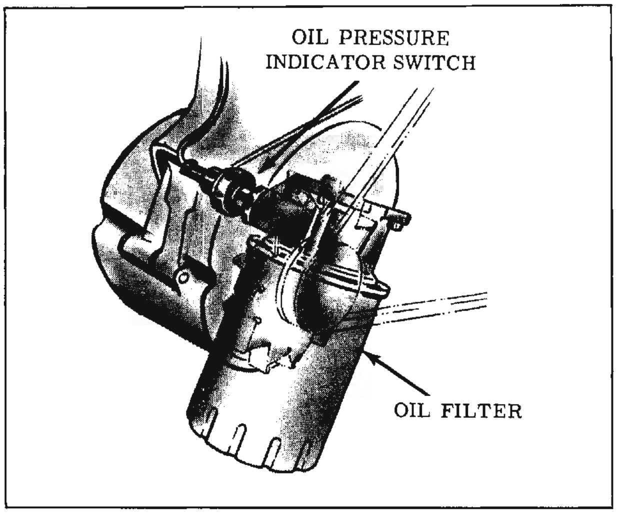


Fig. 14-136 Oil Pressure Switch

SERVICING UNITS

HEADLAMP SWITCH

Removal

1. Disconnect wiring from lamp switch. (Fig. 14-138)
2. Remove knob and rod by first pulling knob out to the headlamp "ON" position, then depress pull rod release button on the side of the switch assembly and pull the rod out. (Fig. 14-137)
3. Remove sleeve nut with a screwdriver.
4. Remove escutcheon.
5. Remove headlamp switch from rear of instrument panel.

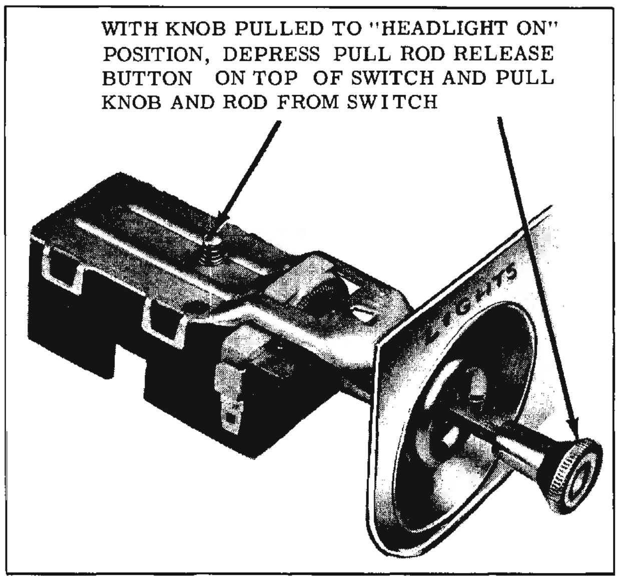


Fig. 14-137 Headlamp Switch Removal

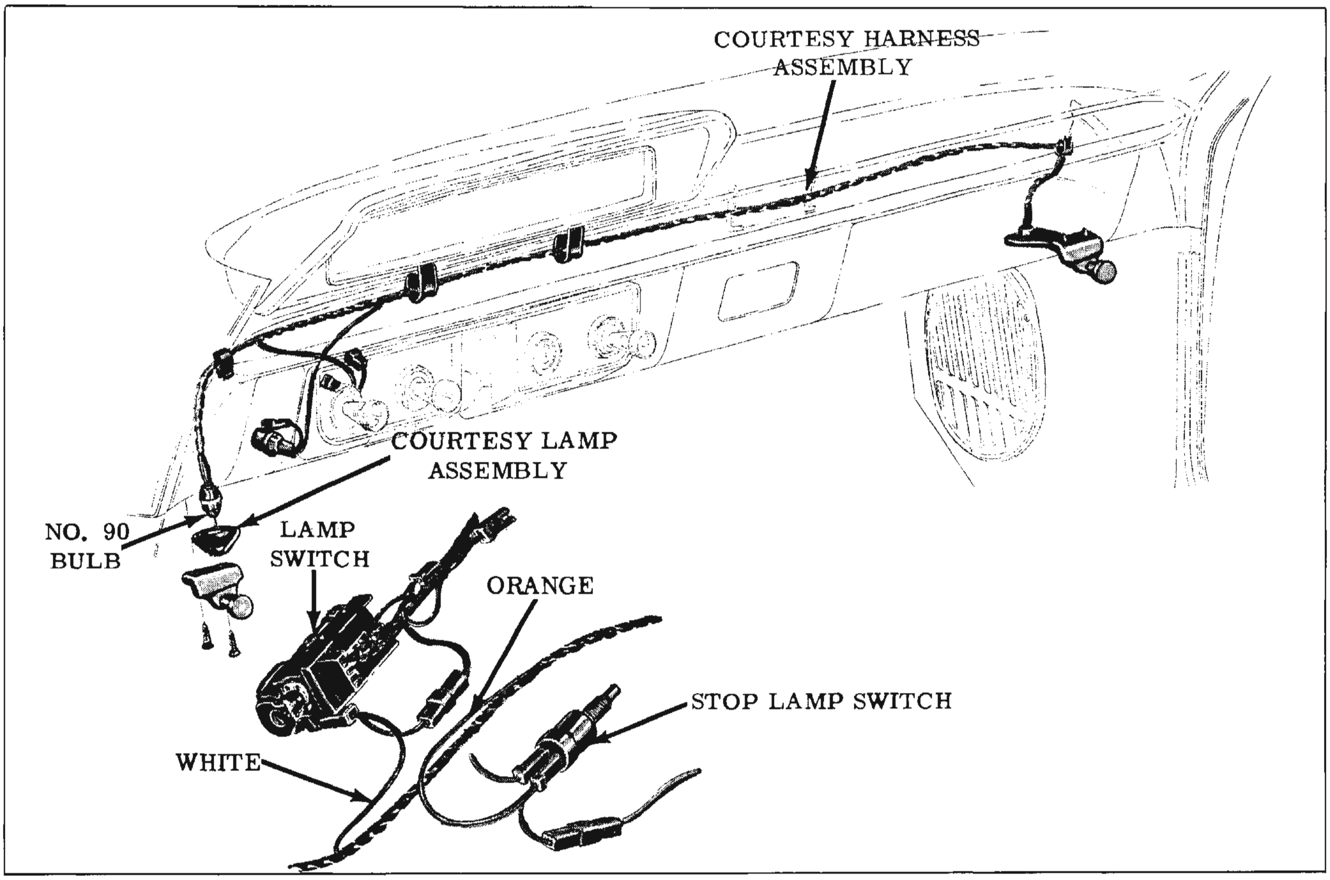


Fig. 14-138 Headlamp Switch and Courtesy Lamp Wiring

Installation

1. Install headlamp switch through mounting hole of instrument panel.
2. Install escutcheon.
3. Install sleeve nut.
4. Insert pull rod into switch and push in until the release button snaps into the lock position to retain pull rod.
5. Connect the harness connector to the switch assembly.

HEADLAMP (SEALED BEAM)

Removal

1. Remove headlamp door. (Fig. 14-139)
2. Using needle nosed pliers, disconnect the retaining ring spring.
3. Remove 2 retaining ring attaching screws, but DO NOT DISTURB THE ADJUSTING SCREWS. (Fig. 14-139)
4. Remove retaining ring and pull headlamp sealed beam out to gain access to wiring connector.
5. Disconnect wiring connector from sealed beam unit and remove unit.

Installation

1. Attach connector to new sealed beam unit.
2. Position unit in mounting ring so that the alignment lugs are seated in slots provided in mounting ring and the sealed beam unit is right side up.

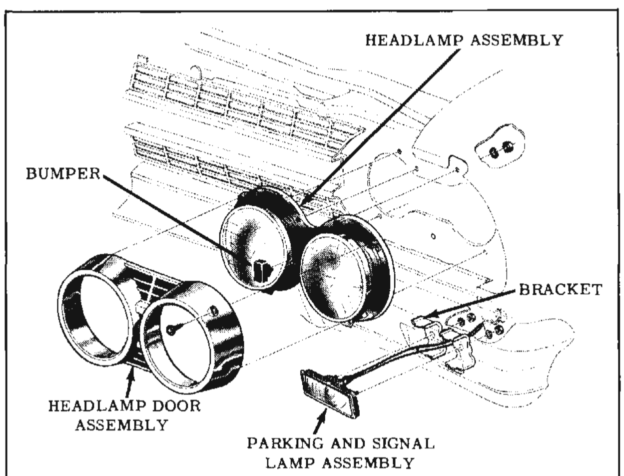


Fig. 14-139 Headlamp Door Removal

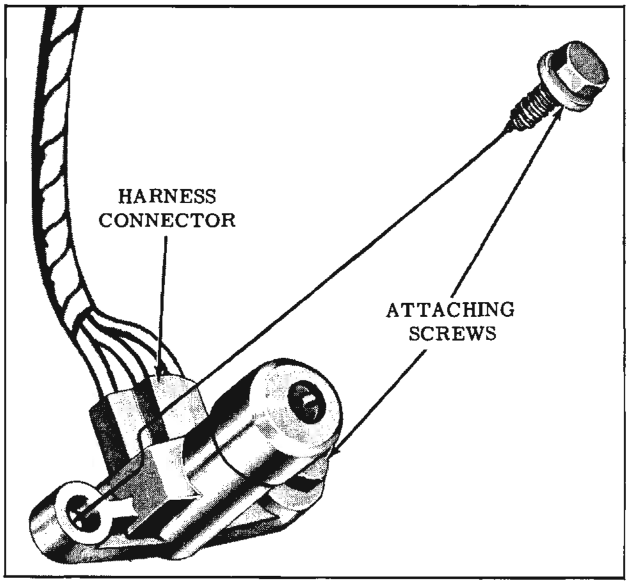


Fig. 14-140 Dimmer Switch

3. Install retaining ring and 2 retaining ring attaching screws.

4. Attach retainer spring to retaining ring using needle nosed pliers.

5. Replace headlamp door.

Adjustment

Refer to full size car electrical section.

DIMMER SWITCH

Removal

1. Remove retaining screws and roll front floor mat carpet down at left front corner.

2. Disconnect wire connector from dimmer switch. (Fig. 14-140)

3. Remove switch by removing 2 hex head sheet metal screws.

Installation

1. Position switch on toe pan and install 2 hex head screws.

2. Connect wire plug connector to dimmer switch.

3. Replace floor carpet in correct position.

STOP LAMP SWITCH

Removal

1. Disconnect harness connector from switch terminals.

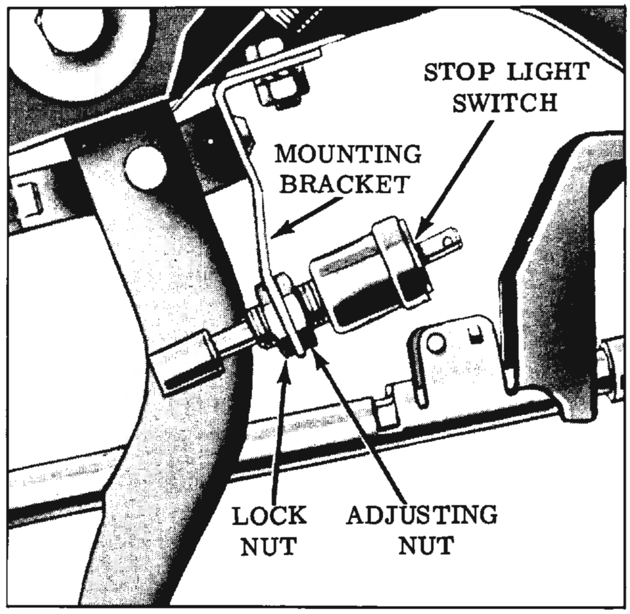


Fig. 14-141 Stop Lamp Switch

2. Loosen and remove lower locknut and slip switch out of mounting bracket hole.

Installation

1. Position switch on mounting bracket and install and tighten locknut.

2. Connect harness connector to switch terminals.

3. Adjust switch.

Adjustment

The stop lamp switch must be checked whenever brake pedal height has been changed. Adjustment is made by moving the switch in its mounting bracket. (Fig. 14-141)

The brake stop lamp switch is adjusted by means of 2 locknuts. The switch can be positioned back and forth in its mounting bracket and it can be locked in place on the bracket through a range of positions allowing for adjustment. To adjust, merely loosen locknuts and thread them on or off the switch to move switch either closer to or farther away from the brake pedal switch actuating lever. (Fig. 14-141)

TURN SIGNAL SWITCH

Removal

1. Disconnect the harness plug connector from the switch. (Fig. 14-142)

2. Remove the 2 mounting screws.

3. Slide switch actuator pin from actuator rod lever and remove switch from mast jacket.

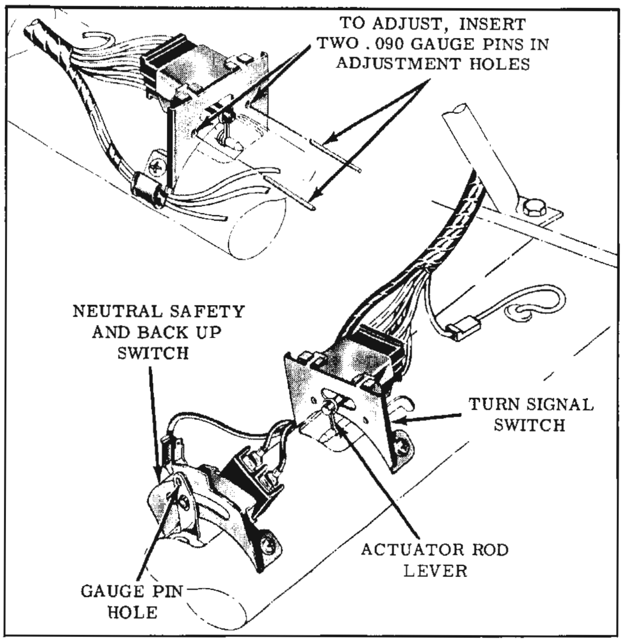


Fig. 14-142 Turn Signal Switch

Installation

1. Position switch on mast jacket with the actuator pin inserted into the actuator rod lever as shown in Fig. 14-142.

2. Install the 2 mounting screws, but do not tighten.

3. With the turn signal lever in the neutral position, shift the switch back and forth on the mast jacket until two .090" pins can be inserted into the holes in the face of switch. (Fig. 14-142)

4. Tighten mounting screws and remove alignment pins.

5. Connect harness plug connector to the switch.

Adjustment

1. Loosen switch mounting screws.

2. Place the turn signal lever in the neutral position.

3. Shift switch back and forth on mast jacket until two .090" pins can be inserted into the holes in the face of the switch. (Fig, 14-142)

4. Tighten mounting screws and remove alignment pins.

BACK-UP LAMP SWITCH

Hydra-Matic (Neutral Safety)

Removal

1. With ignition switch in the "OFF" position, disconnect the neutral safety switch and back-up lamp switch wires, noting wire positions.

2. Remove 2 attaching screws and remove switch from mast jacket.

Installation

1. Position the selector lever in the "N" position.

2. Position the switch on the mast jacket so that a .090" pin can be inserted through the hole in the switch arm and into the hole in the face of the switch. (Fig. 14-142)

3. Tighten mounting screws and reconnect wires to switch.

4. Apply the parking brake firmly.

5. Place the selector lever in the "D" position and turn the ignition switch full clockwise to the "START" position.

6. While holding the ignition switch in the "START" position, slowly move the selector lever toward the "N" position until engine cranks and starts.

7. Without moving the selector lever after the engine starts, depress the accelerator pedal slightly to determine whether or not the transmission is in gear. If neutral safety switch is properly adjusted, the transmission will not be in gear.

8. Check operation of back-up lights. With neutral safety switch properly adjusted, the back-up lights should come on when the selector lever is in the "R" position.

Syncromesh

Refer to Section 13 Instrument Panel and Accessories.

STOP, TURN SIGNAL, TAIL AND PARKING LAMP BULB

Removal and Installation

The bulb can be replaced by rémoving or snapping the socket out of the tail light assembly from inside the trunk.

REAR LICENSE LAMP BULB

Removal and Installation

The rear license lamp may be replaced by removing the lens from the rear license lamp assembly.

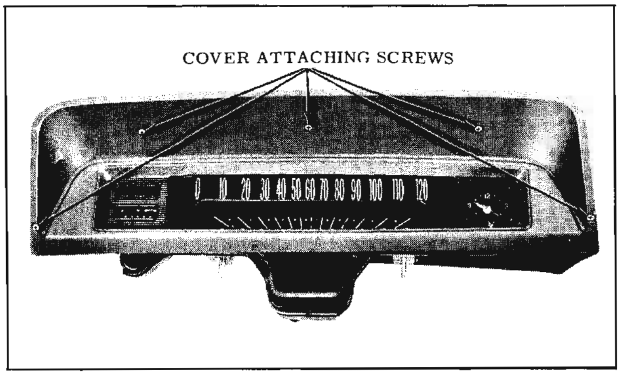


Fig. 14-143 Instrument Cluster Cover

INSTRUMENT PANEL LAMPS

Removal

1. Remove the 5 instrument cluster cover attaching screws. (Fig. 14-143)

2. The instrument panel lamps, except the clock and heater control lamp, are mounted on a printed circuit panel. Fig. 14-144 identifies the position of the indicator lamps and the cluster lighting lamps. These lamps may be removed by turning the socket counterclockwise (looking at the back of the instrument cluster), to disengage the locking lugs. The electric clock lamp socket and the heater control lamp socket are the push-in type lamp sockets and they can be removed by pulling straight out from the back of the instrument panel.

DOME LAMP

Removal

1. Remove lamp lens by pinching sides together to release tangs from base.

2. Pry tube type lamp from terminal clips.

Installation

1. Install lamp bulb in contact holder.

2. Snap the lens into position on lamp base.

FUEL GAUGE

The gasoline fuel gauge circuit consists of an electrical indicator in the cluster and a float-controlled rheostat in the tank. The circuit can be checked for accuracy with Tester BT-11-13.

TESTING FUEL GAUGE CIRCUIT

IMPORTANT: Engine must be running when testing the gasoline gauge to insure adequate operating voltage (14.5 volts) at the gauge.

When checking either at the trunk compartment or the instrument cluster, be sure that the correct sequence is followed to insure accurate readings. The checking procedure must be started with Tester BT-11-13 on the "F" position, then moved to the "1/2" and "E" positions in that

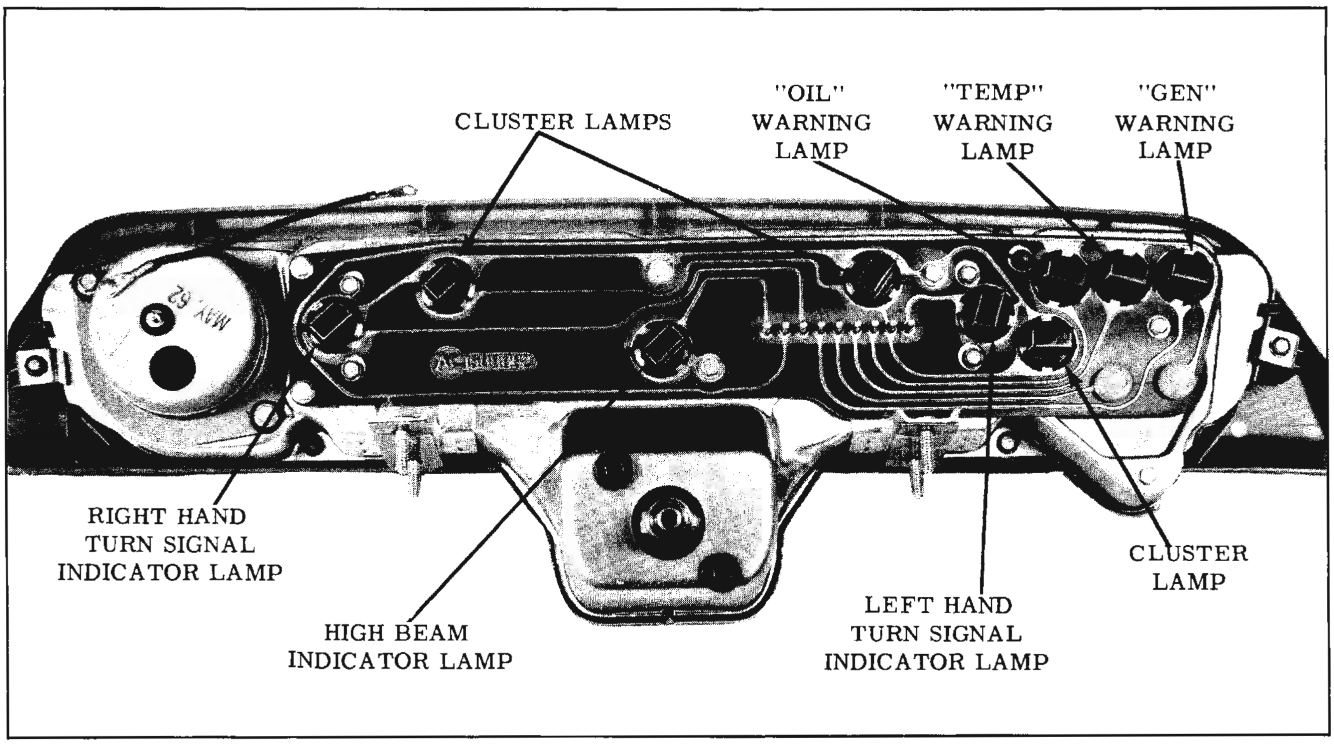


Fig. 14-144 Instrument Panel Lamps

order. If checks are made in any other sequence, it will be necessary to stop the engine and restart it, before taking each fuel gauge reading.

FUEL GAUGE CHECK AT TRUNK COMPARTMENT

1. Set Tester BT-11-13 on "F" position.

2. Disconnect the tank unit connector. Connect one lead of the tester to the gray wire from the instrument panel gauge and the other lead to ground.

3. Start the engine and run at idle. Gauge should read on the "F" graduation or above.

   NOTE: Most gauges will read above the "F" graduation.

4. Set the tester on "1/2" position. Gauge should read on the "1/2" graduation or "1/8" above or below the "1/2" graduation.

5. Set tester on "E" position. Gauge should read on "E" graduation or below. If gauge reads above "E" position, replace gauge.

If the gauge registers correctly during this test, the trouble is in the tank unit or the wire from the trunk compartment connector, to the tank unit. If the gauge registers full, regardless of the position of the tester, there is an open circuit in the wire from the instrument panel gauge to the trunk compartment connector.

When removing the tank unit for inspection, if it appears to be defective, check as follows:

1. Remove the fuel tank and the tank unit. Clean all dirt from around the tank unit terminal.

2. Connect an ohmmeter to the tank unit and check the resistance at top, bottom and mid-point of float arm travel.

3. Resistance at empty should be between 0 and .5 ohms. At mid-point, resistance should be 15 ohms plus or minus .1 ohm. At full, the resistance should be between 29.4 and 31.5 ohms. If ohmmeter check indicates that tank unit gauge reads within specifications, check for poor connections between tank gauge and body. Resistance between tank gauge and body should be less than .1 ohm.

4. If the tank unit is replaced, always check the new unit in the same manner before installing it in the tank.

FUEL GAUGE CHECK AT CLUSTER

To determine whether the dash gauge or wiring to the trunk compartment connector is at fault, proceed as follows:

NOTE: With the instrument cluster printed circuit, it is not possible to disconnect the tank unit wire at the dash gauge. Disconnect tank unit in trunk. To check the dash gauge alone, disconnect the tank gauge in the trunk compartment.

1. Unscrew the plastic caps on both terminals of the dash gauge.

2. Connect one lead of tester to the L.H. terminal of the gauge (as viewed from the rear of the instrument cluster) and the other lead to ground.

3. Repeat Steps 3, 4 and 5 of Fuel Gauge Check At Trunk Compartment.

If both dash and tank units register correctly, make a visual inspection of the printed circuit. Defects will show up in the form of blisters or breaks in the circuit. Shorts or breaks in the wiring can be isolated by making a continuity check of the wiring.

HORNS

DESCRIPTION

The horns are mounted one on each inner front fender baffle. (Fig. 14-145)
The horn relay is part of the main wiring harness junction block as shown in Fig. 14-146.

When the horn button on the steering wheel is pressed, a circuit is closed energizing the horn relay which in turn closes, supplying electricity to the horns.

SERVICING UNITS

HORNS

Removal

1. Disconnect horn lead wire from horn terminal. (Fig. 14-145)

2. Remove 2 hex head sheet metal screws.

Installation

1. Position horn and install attaching screws.

2. Connect horn lead wire to horn terminal.

HORN RELAY

Removal

1. Disconnect battery ground cable from negative terminal.

2. Remove hex nut from junction post and disconnect battery positive cable and starter

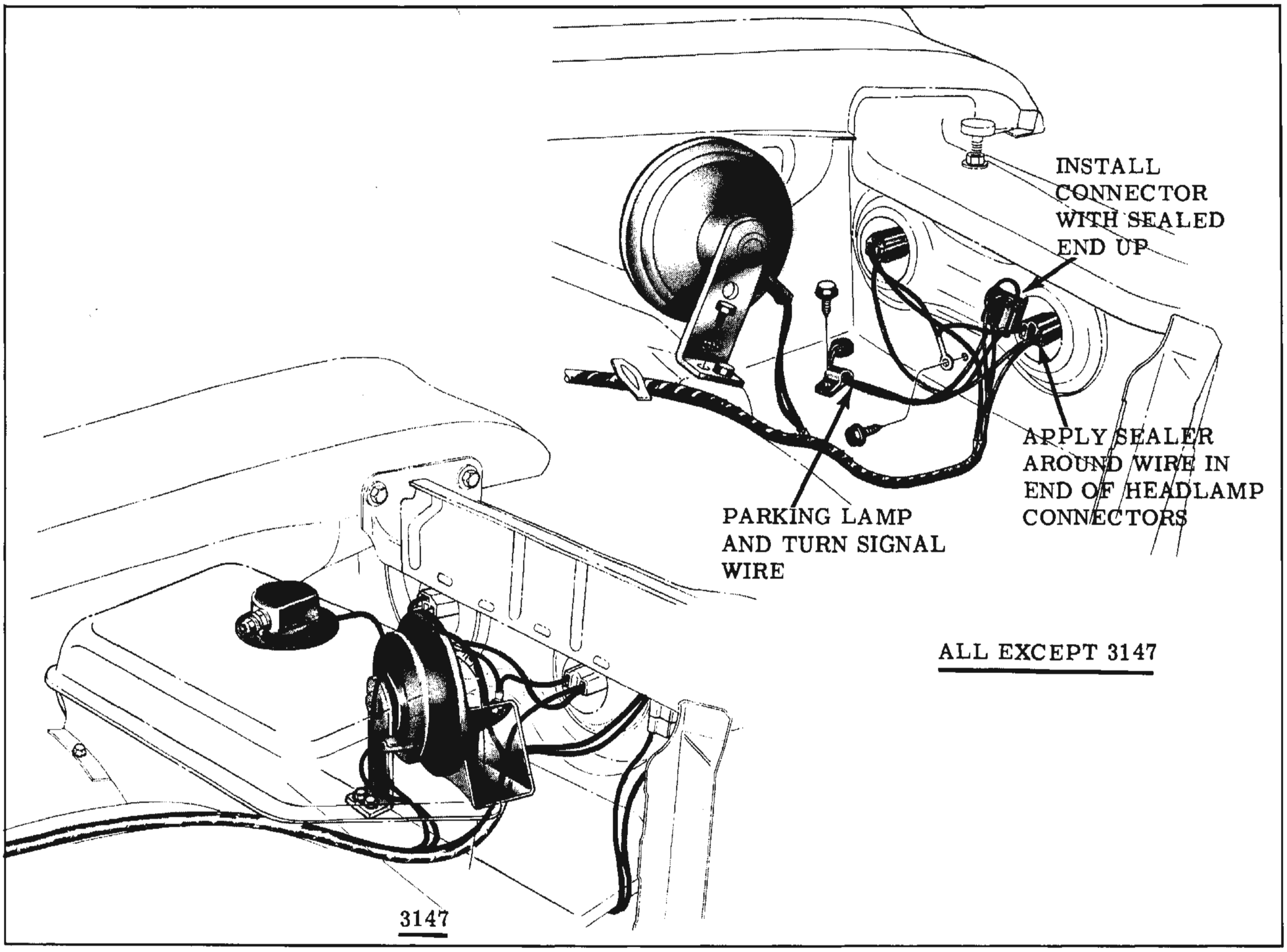


Fig. 14-145 Horns

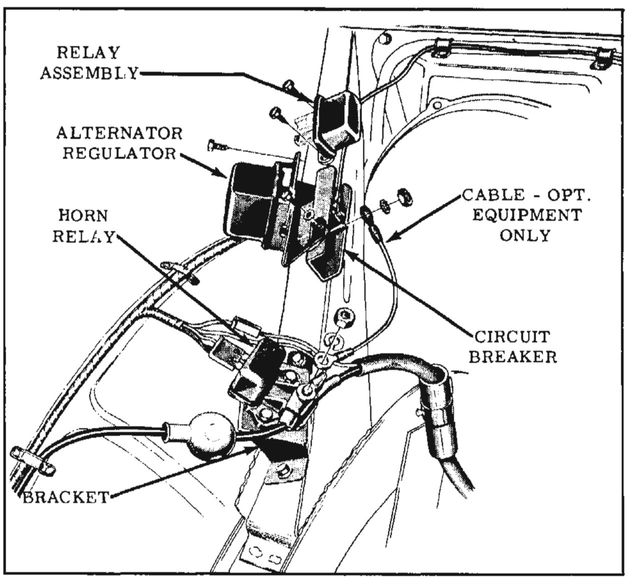


Fig. 14-146 Horn Relay

lead cable from post. (Fig. 14-146)

3. Disconnect horn relay wire connector from horn relay.

4. Remove 2 hex head sheet metal screws and lift relay and junction block assembly from fender inner baffle.

Installation

1. Place relay and junction block assembly in position on the inner fender baffle and install attaching screws.

2. Connect horn relay wire connector to horn relay terminals.

3. Replace battery positive cable and starter lead cable on junction block post and install terminal nut.

4. Replace battery ground cable on battery negative terminal.

Checks and Adjustments

When horn trouble is encountered, the difficulty may be in the horn relay, wiring, or the horn itself. Quick checks to determine cause of trouble may be made as follows:

1. Ground the "S" terminal of the horn relay.

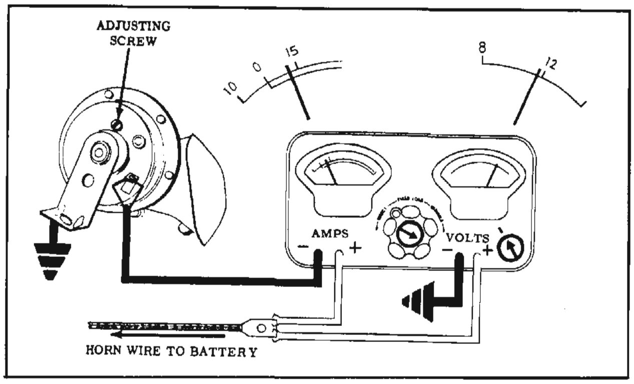


Fig. 14-147 Horn Current Adjustment

a. If the horn operates satisfactorily the trouble is in the horn contact or the wiring.

b. Connect a jumper wire between the "H" terminal of the horn relay and the battery. If horn now operates satisfactorily, the trouble is in the horn relay. (See HORN RELAY CHECKS AND ADJUSTMENTS.)

c. If the above checks indicate that the horn wiring and relay are not defective, connect a voltmeter to the "H" terminal and ground. As the horn control circuit is closed, note the reading on the voltmeter. The horn should blow at any voltage above 7.0 volts, however, it may be weak or have poor tone at any voltage below 11.25 volts. If the voltmeter shows no reading, the wiring between the horn relay and horn is open or the horn is not grounded. If reading is less than 7.0 volts, the fault is high resistance in the wiring or a faulty horn.

After previous checks have been made and it is established that the horn is at fault, the trouble may be that the contacts are held open by a foreign particle. To dislodge the particle, energize the horn and tap the horn lightly. If this is the trouble, the horn will start to blow and resume normal operation.

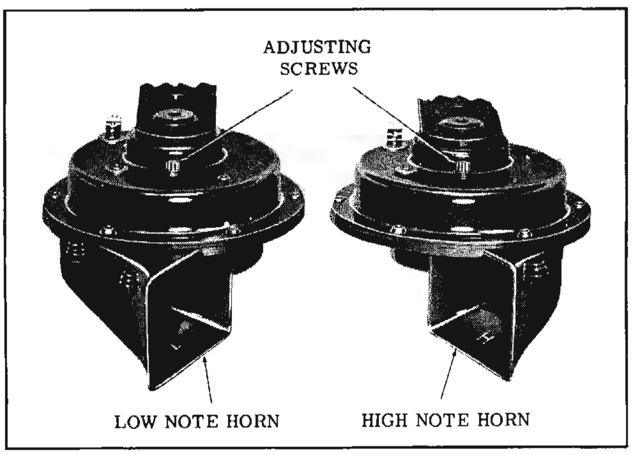


Fig. 14-148 Horn Adjusting Screws

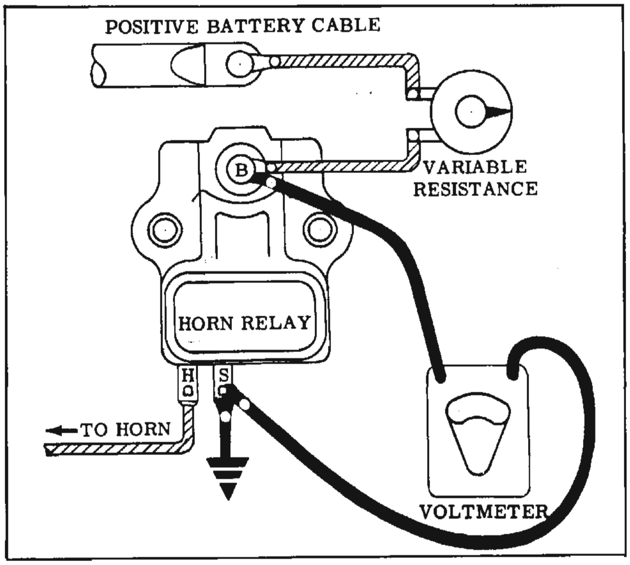


Fig. 14-149 Checking Horn Relay

Horn Current Adjustment

Connect an ammeter and a voltmeter as shown in Fig. 14-147. With horn operating, the current draw should be 7.0 to 11.0 amperes at 12.0 volts. To change the current adjustment, turn the adjusting screw on the horn clockwise to increase and counterclockwise to decrease the setting. (Fig. 14-148)

If horn fails to operate properly after the above adjustments have been made, the horn should be replaced.

HORN RELAY CHECKS AND ADJUSTMENTS

Closing Voltage

1. Disconnect positive battery cable from "B" terminal of horn relay.

2. Connect a variable resistance of at least 10 ohms in series between battery cable and "B" terminal. (Fig. 14-149)

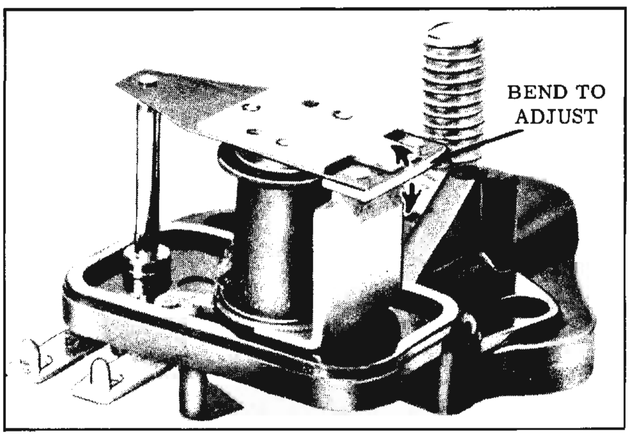


Fig. 14-150 Adjusting Relay

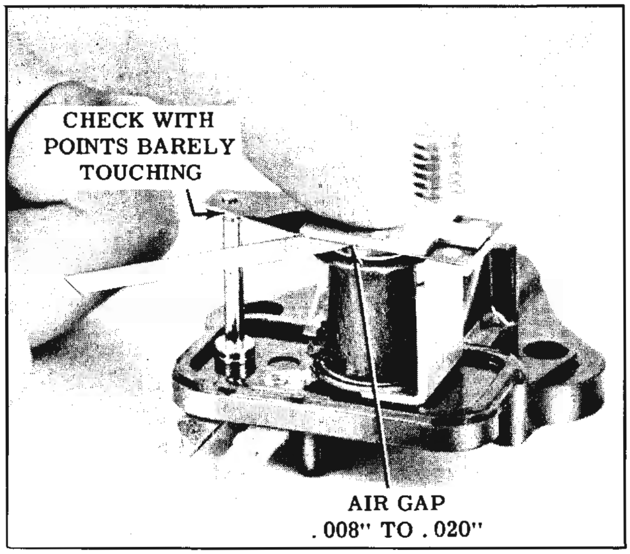


Fig. 14-151 Air Gap Adjustment

3. Connect a voltmeter across the "S" terminal and "B" terminal of the horn relay. Ground the "S" terminal.

4. Slowly decrease the resistance until horn relay points close. Closing voltage should be 1.5 to 9.5 volts. If voltage is outside this range, adjust to 6.5 volts by bending armature spring post down to increase the voltage or up to decrease the voltage. (Fig. 14-150)

Air Gap

NOTE: The closing voltage adjustment must be correct before making the following check.

With the positive battery cable disconnected, check the air gap with the points barely touching. (Fig. 14-151) Air gap should be .008" to .020". No adjustment is provided.

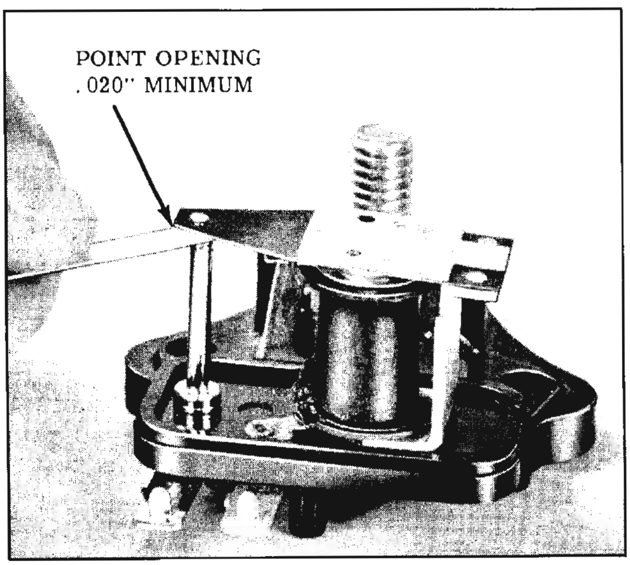


Fig. 14-152 Point Adjustment

Point Opening

NOTE: The closing voltage adjustment must be correct before making the following check.

With the positive battery cable disconnected, check the point opening. (Fig. 14-152) Point opening should be .020" (minimum). No adjustment is provided.

WINDSHIELD WIPER SYSTEM

DESCRIPTION

SINGLE SPEED (Typical of 88 Series)

The single speed wiper system consists of a shunt wound motor and a gear train. The gear train consists of a helical gear which drives an intermediate gear and pinion, the pinion of which drives an output gear and shaft assembly. (Fig. 14-153) The gear train ratio is 33:1. (Fig. 14-154) The single speed wiper is not available from the factory with a washer system, however, an accessory package is available. The single speed wiper has two motor leads.

TWO-SPEED (Except 3147)

The two-speed wiper consists of a rectangular shaped compound wound motor (series and shunt field) adapted to the same gear train as used with the single speed motor. (Fig. 14-153) The two-speed wiper has a gear train ratio of 36:1. The two-speed wiper is equipped with a washer system and has three motor leads.

TWO-SPEED (3147)

The two-speed wiper system consists of a round

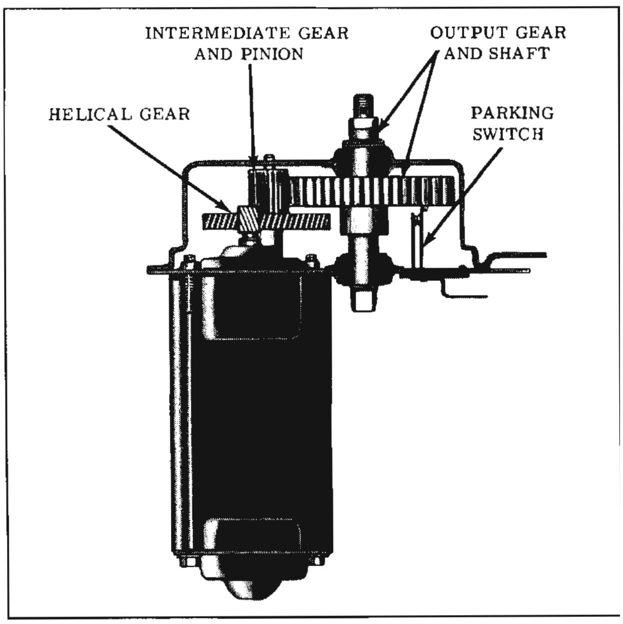


Fig. 14-153 Gear Train-Single Speed

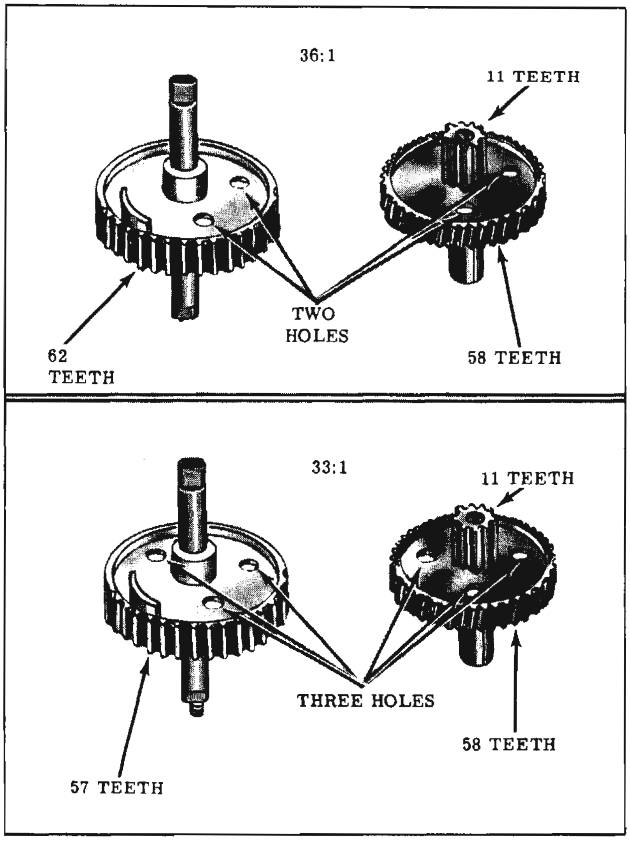


Fig. 14-154 Gear Train Ratios

compound wound motor equipped with a washer system.

OPERATION

SINGLE SPEED (Typical of 88 Series)

Two switches, dash and parking are connected in parallel and control the starting and stopping of the wiper. The park switch contacts located in the wiper gear box (Fig. 14-153), are normally closed. The purpose of the parking switch is explained in the following paragraph.

When the car owner shuts the wiper "off" at the dash switch, the motor circuit to ground is opened at the dash. However, the parking switch contacts, which are normally closed, maintain the motor circuit to ground at the wiper. This allows the wiper to keep operating until the blades or wiper crank arm can reach the park position. (blades approximately 2" above windshield molding). At the same time the blades reach the park position, a cam on the output gear opens the park switch contacts. This opens the motor circuit to ground, stopping the motor. Thus, the parking switch actually controls wiper operation only during that short period of time, between the owner turning the wiper "off" at the dash switch and when the wiper has completely stopped.

Turning the wiper "on" at the dash switch overrides the open park switch contacts and closes the wiper motor circuit to ground starting the wiper. NOTE: Although the park switch contacts are opened once during each revolution of the output gear, the park switch has no control over the wiper until the dash switch is turned off.

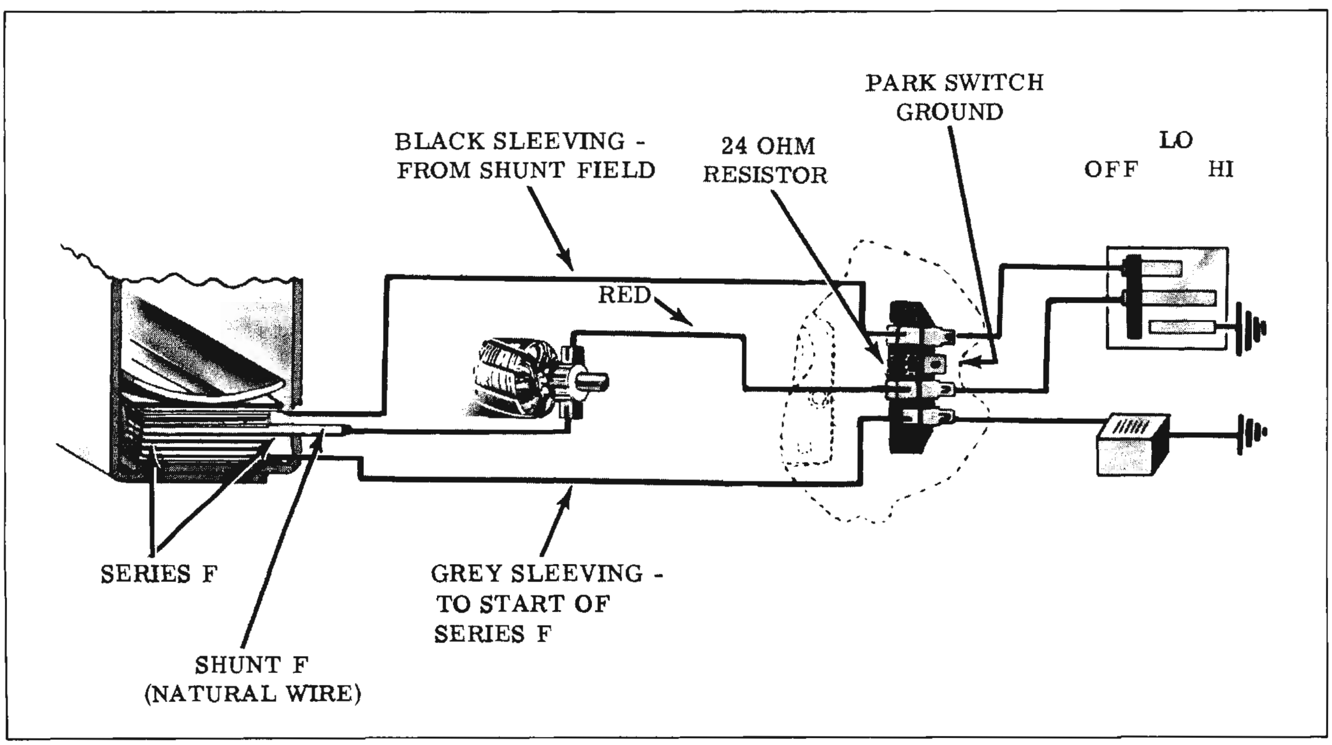


Fig. 14-155 Wiring Circuit

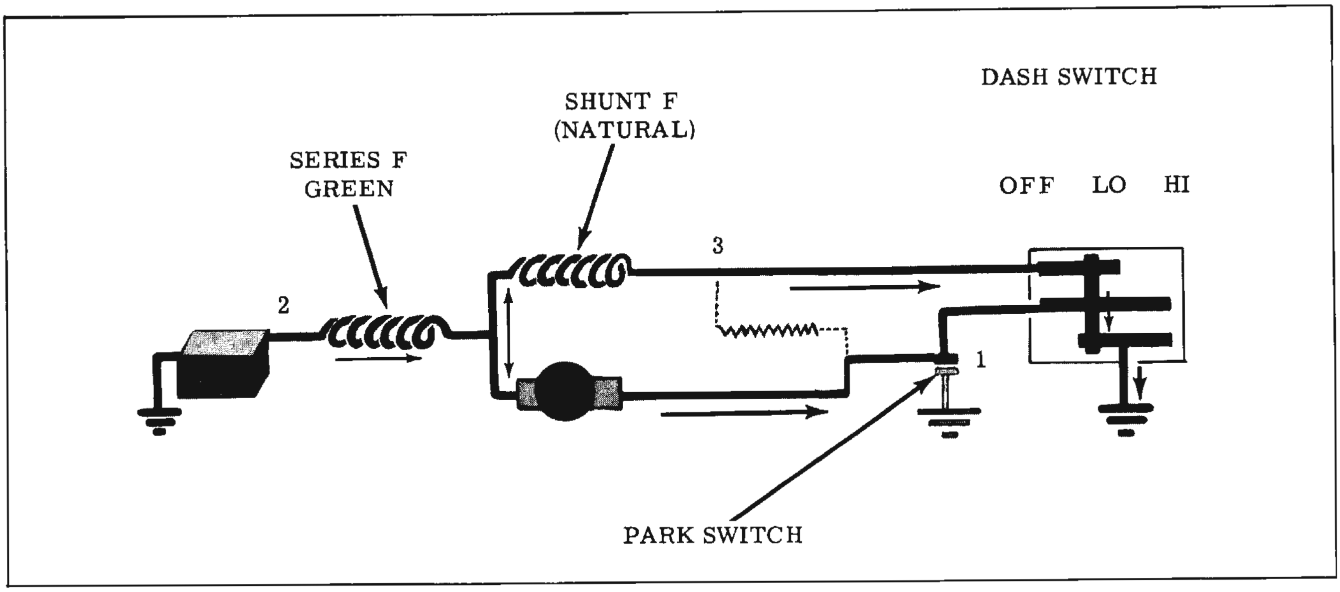


Fig. 14-156 Lo-Speed (Two-Speed Except 3147 Model)

TWO-SPEED (Except 3147)

The principle of operation is very similar to that of the single speed wiper. (Fig. 14-155)

LO SPEED (Fig. 14-156)

When the dash switch is moved to the "LO" speed position (Ignition Switch On) current from the battery flows through the series field coil and divides; part passing through the shunt field coil to ground at the dash switch, the other part passing through the armature to ground at the dash switch.

HI SPEED (Fig. 14-157)

Moving the dash switch to the "HI" speed position opens the shunt field circuit to ground at the dash switch and keeps the armature circuit closed to ground. The shunt field current must then pass through a 24 ohm resistor located on the back of the wiper terminal board, and then through the same lead that connects the armature circuit to ground through the dash switch.

PARKING CIRCUIT (Fig. 14-158)

Moving the dash switch to the "off" position opens both the armature and shunt field circuits to ground at the dash switch. However, both of these circuits are still closed to ground through the parking switch.

NOTE: The shunt field circuit actually flows via the dash switch back to the wiper parking switch direct to ground which means that wiper is actually operating in "LO" speed during parking cycle.

When the cam on the wiper output gear opens the park switch contacts, the wiper is off and the blades and/or wiper crank arm should be in the park position.

TWO-SPEED (3147)

When the wiper is first turned off, the wiper motor circuit to ground is opened at the dash switch control. However, the wiper motor continues in the cycle it is in and stops at the extreme end of the downward stroke. This is accomplished through the parking switch contacts as

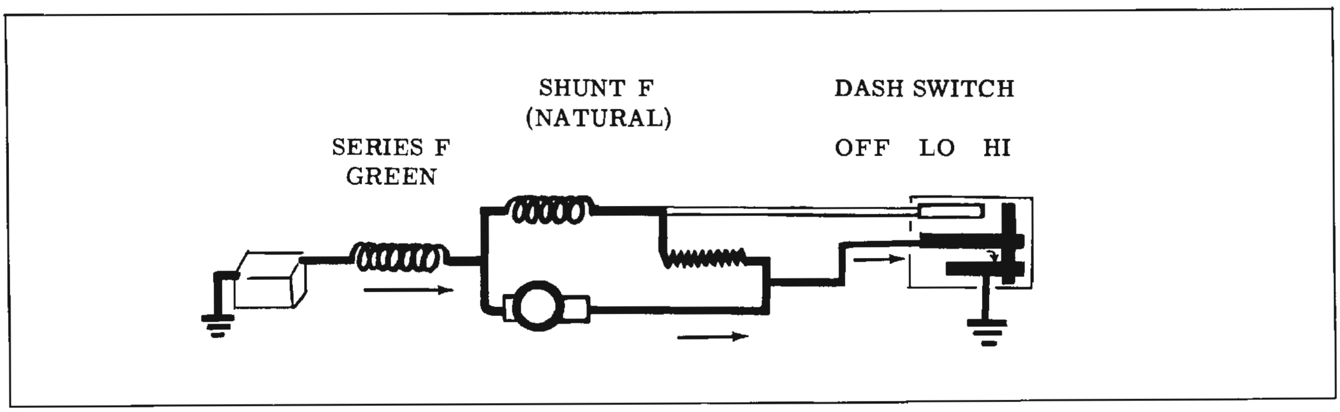


Fig. 14-157 Hi-Speed (Two-Speed Except 3147 Models)

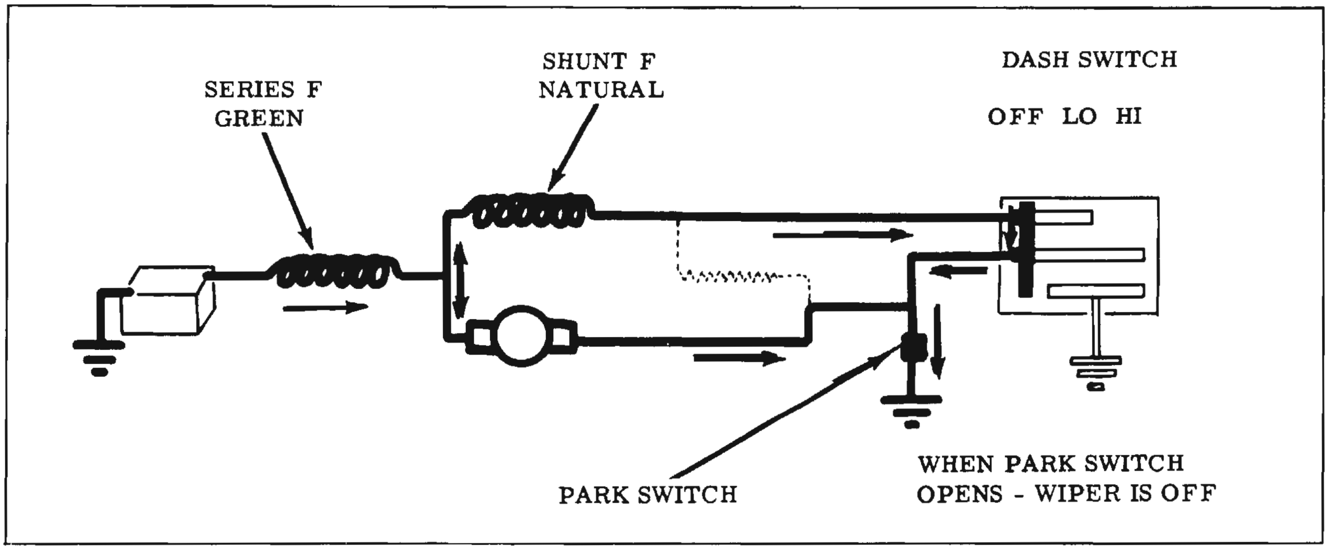


Fig. 14-158 Parking Cycle (Two Speed)

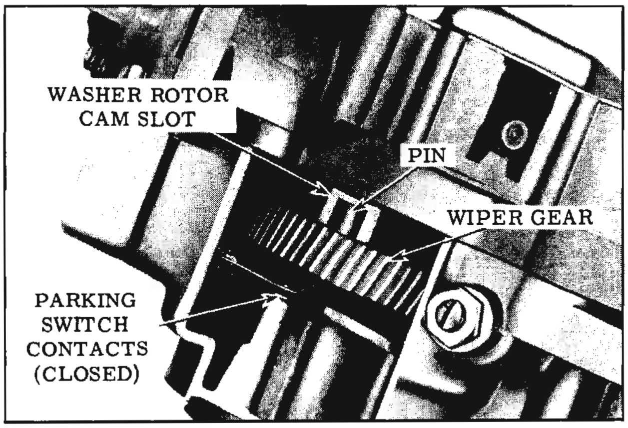


Fig. 14-159 Parking Switch (Two Speed 3147 Model)

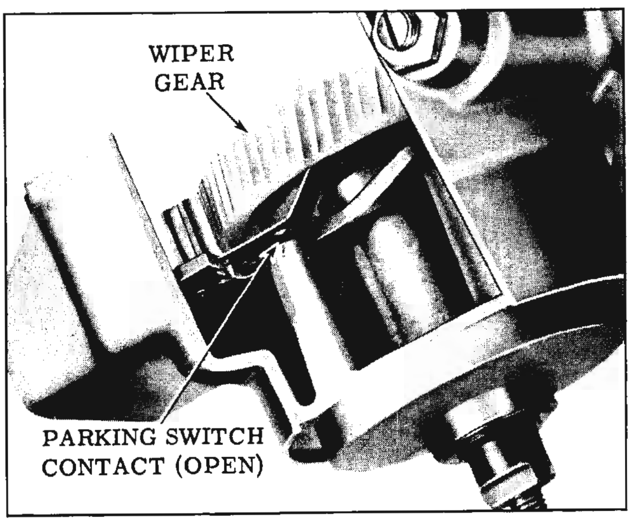


Fig. 14-160 Parking Switch Open (Two Speed 3147 Model)

shown in Fig. 14-159. When the control is turned off, the parking switch contacts continue to maintain a ground, energizing the motor circuits until

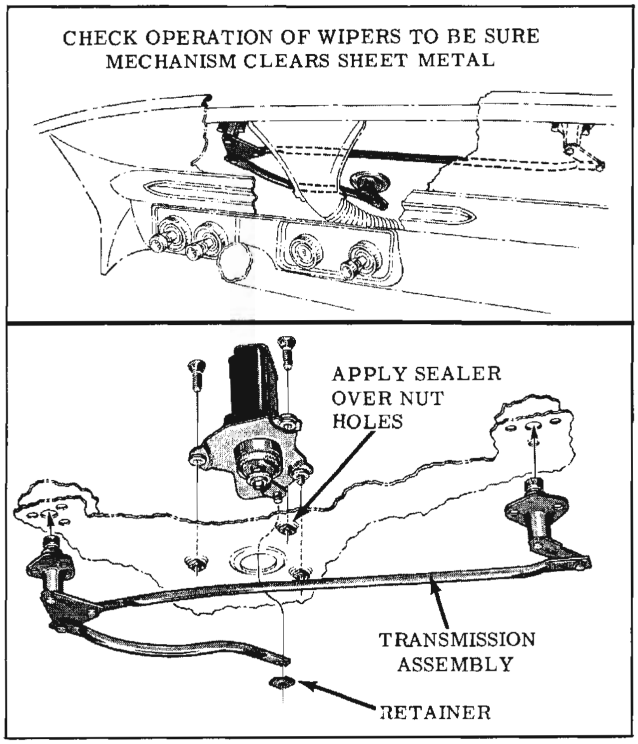


Fig. 14-161 Motor and Transmission Installation

the extreme downward position is reached. When the downward position is reached, the motor circuit to ground is broken by the parking switch contacts. (Fig. 14-160)

SERVICING UNITS

SINGLE SPEED WIPER

Removal (All Series)

1. Disconnect drive link from crank arm under instrument panel by removing retaining clip. (Fig. 14-161)

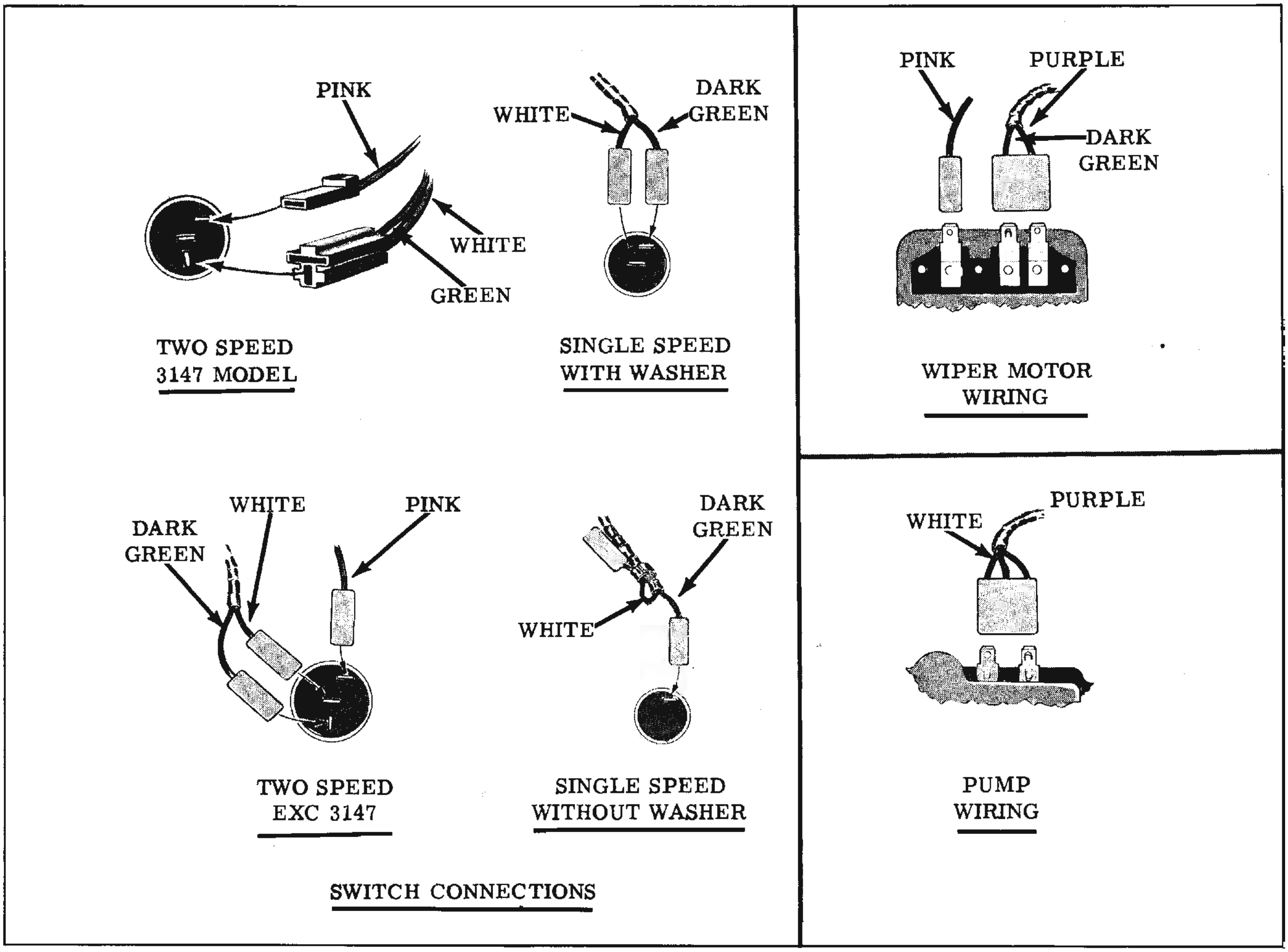


Fig. 14-162 Wiring Connections

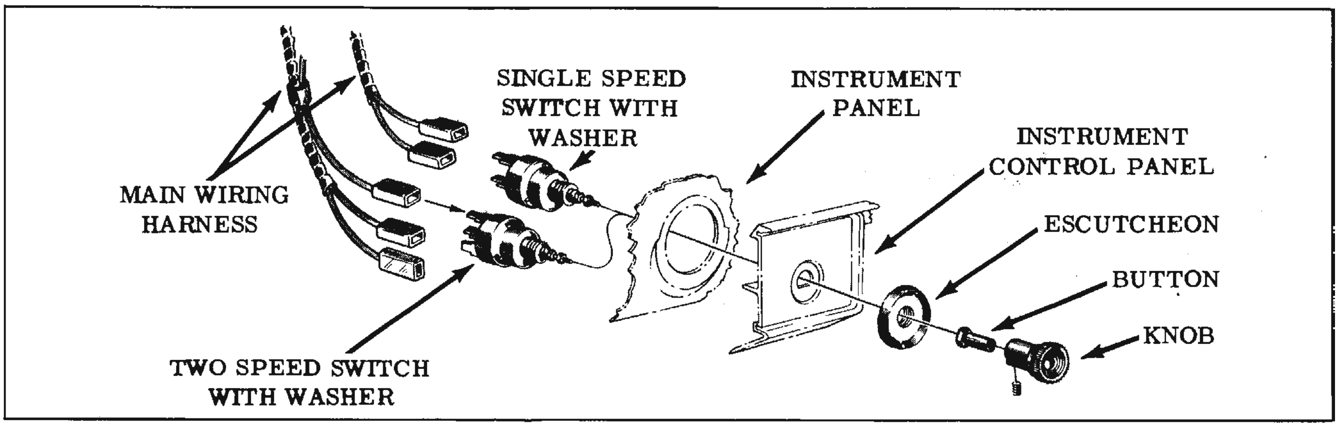


Fig. 14-163 Switch Installation

2. Disconnect harness connector from motor terminals. (Fig. 14-162)

3. If car is equipped with windshield washers, note the location of washer hoses, then remove hoses from washer pump.

4. Remove 3 attaching screws.

5. Lift wiper motor assembly from cowl, guiding crank arm out of hole in cowl panel.

NOTE: For switch removal see Fig. 14-163.

Installation (All Series)

1. With wiper motor crank arm in the park position, as shown in Fig. 14-164, place the motor assembly on the cowl panel and install

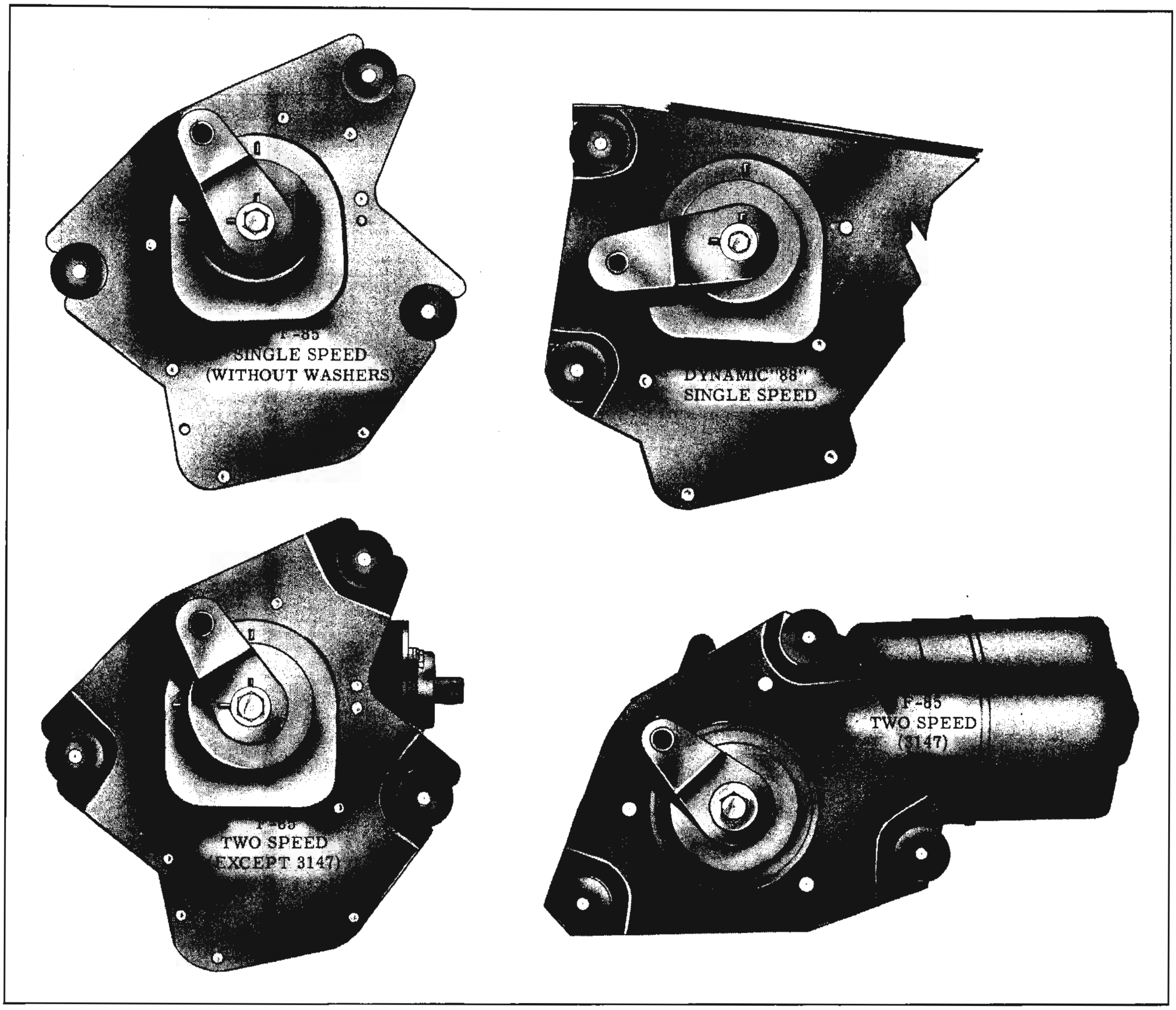


Fig. 14-164 Crank Arm in Park Position

the 3 attaching screws. Be sure the attaching screws are fully tightened so that the sleeves surrounding the screws bottom to prevent "floating of the motor".

2. If car is equipped with windshield washers, attach the washer hoses to the washer pump.
3. Attach the harness connector to the motor terminals.
4. Connect the drive link to the crank arm and install the retaining clip.

SINGLE SPEED WIPER GEAR BOX

Disassembly

1. For wipers equipped with a washer pump remove the two washer pump mounting screws (Fig. 14-165) and lift washer pump off wiper.
2. Remove 4 lobe cam as required. (Fig. 14-166) The cam is pressed on the shaft but can be wedged off by using two screwdrivers between cam and plate.
3. Clamp crank arm in a vise and loosen crank arm retaining nut.
4. Remove seal cap, retaining ring and end-play washers. NOTE: Seal cap should be cleaned and re-packed with a waterproof type grease before reassembly.

NOTE: Seal cap used only on wipers without washer pump.

5. Drill out the gear box cover retaining rivets and remove cover from gear train. Mark ground strap location for reassembly purposes.

NOTE: Screws, nuts and lock washers for reassembling cover to wiper are contained in a service repair package, Part No. 4910591.

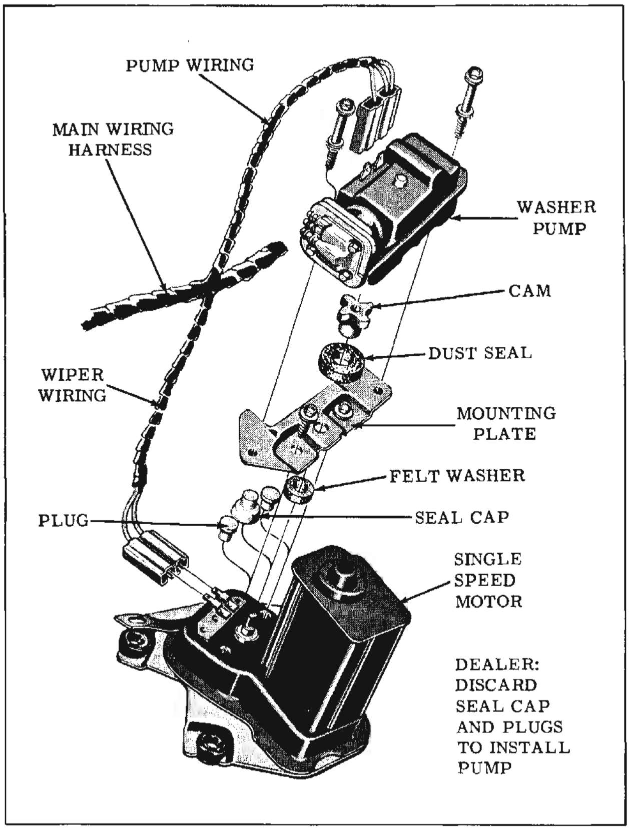


Fig. 14-165 Single Speed Wiper With Washer

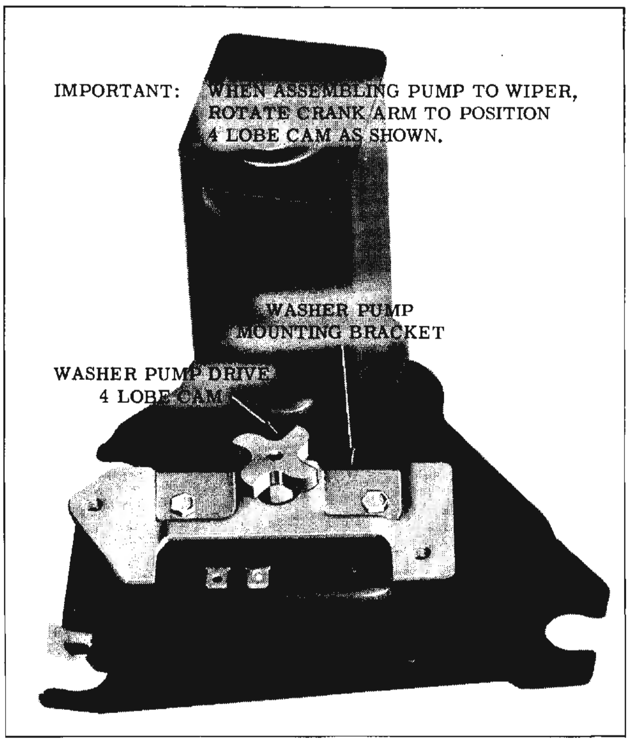


Fig. 14-166 Four Lobe Cam

6. Remove output gear and shaft assembly, then slide intermediate gear and pinion assembly off shaft. (Fig. 14-167)

7. Remove terminal board and park switch assembly as follows:

   a. Unsolder motor leads from terminals, coding of these leads on single speed, type "E" wipers is not necessary.

   b. Drill out rivets that secure terminal board and park switch ground strap to plate.

   NOTE: Screws, nuts and washers for attaching a replacement terminal board-park switch assembly are included with the replacement assembly.

Assembly

Reverse Steps 1 thru 7 except as noted:

1. REASSEMBLY OF GEAR BOX COVER - Cover must be located properly over locating dowel pins and reinstall ground strap.

2. Reassembly of Crank Arm - Operate wiper to park position and install crank arm on output shaft so that identification marks line up with those in the cover. (Fig. 14-164) Clamp crank in vise before securing the retaining nut.

   NOTE: Use cam and ball bearing lubricant on all gear teeth and light oil on shafts and bearings.

MOTOR SECTION

1. Follow Steps 1 thru 7(a) under gear box disassembly.

2. Release brush spring pressure against brushes as shown in Fig. 14-168.

3. Move brushes away from armature and slide armature out of frame and field assembly. Pull end cap assembly off armature.

4. Remove end play adjusting washers.

   To reassemble motor, reverse Steps 1 thru 4 as required.

ADJUSTMENTS

Armature end play is automatically adjusted by the proper assembly of end play washers. (Fig. 14-169)

DIAGNOSIS (ON CAR)

WIPER INOPERATIVE

NOTE: Ignition switch must be on to make electrical tests.

1. Check the following:

   a. Car wiring harness is properly attached to wiper terminals and dash switch.

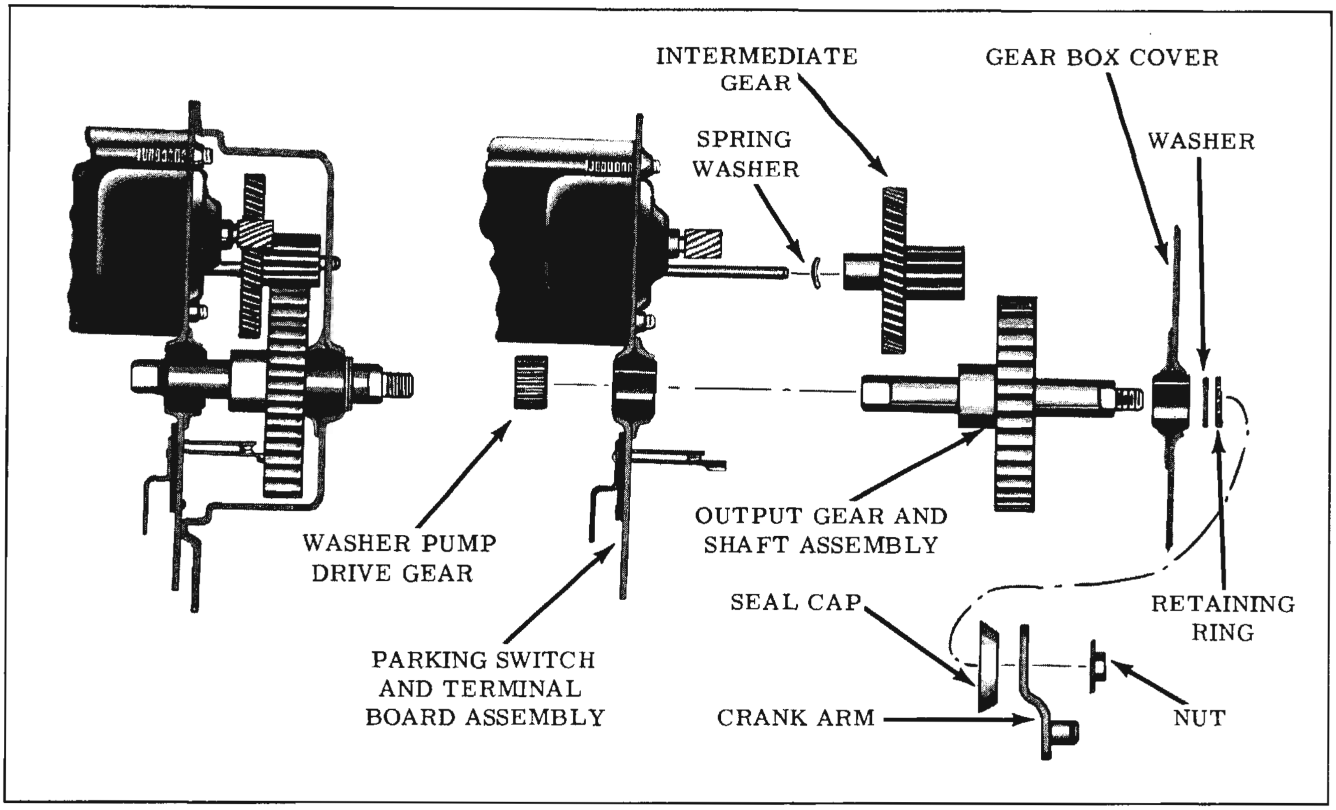


Fig. 14-167 Single Speed Gear Box

b. Wiper ground strap properly connected to wiper and car body.

c. Dash switch is mounted securely in dash.

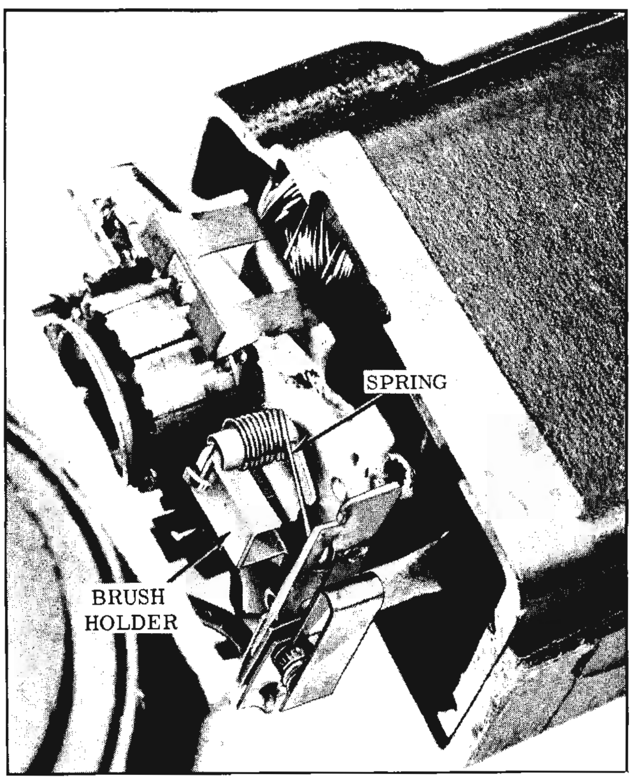


Fig. 14-168 Removing Armature

d. Check fuse.

2. If everything checks out in Step 1 and wiper fails to operate, disconnect wiring harness from wiper and check for 12 volts at harness terminal that connects to wiper terminal No. 2. (Fig. 14-170) No voltage indicates defective car wiring.

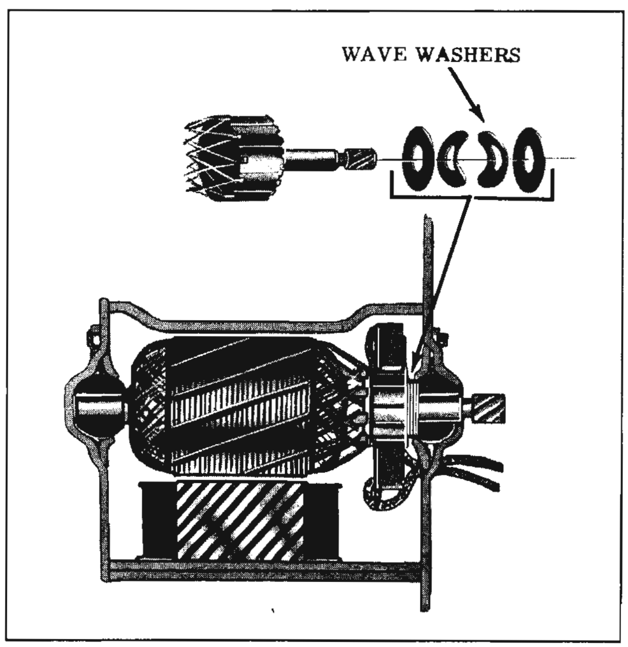


Fig. 14-169 Armature End Play Washers

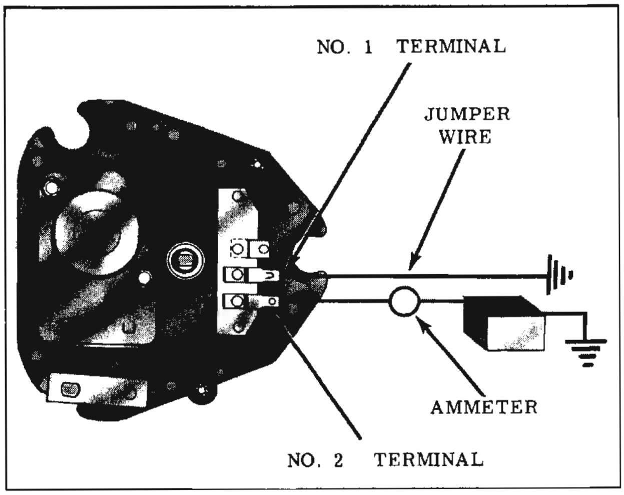


Fig. 14-170 Terminal Board Connections

CAUTION: DO NOT connect hot line to No. 1 Terminal.

3. Connect 12 volt supply to No. 2 wiper terminal and connect a jumper wire from terminal No. 1 to ground. (Fig. 14-170) If wiper operates, the dash switch or wiring between dash switch and wiper is defective.

4. If wiper fails to operate in Step 3, disconnect wiper transmission from wiper crank arm. Recheck wiper operation as explained in Step 3. If wiper operates correctly, a defective transmission or binding condition exists. If wiper still fails to operate, remove wiper from car and follow instructions under Trouble-Shooting, Wiper Detached.

WIPER WILL NOT SHUT OFF

1. Disconnect wiring from dash switch. If wiper shuts off, a defective dash switch is indicated.

2. If wiper still operates in Step 1, disconnect wiring from wiper and connect 12 volt supply direct to wiper terminal No. 2 (Fig. 14-170) DO NOT connect any jumper wire to terminal No. 1.

   -- Wiper shuts off correctly - check for grounded lead that extends between wiper terminal No. 1 and dash switch.

   -- Wiper fails to shut off - remove wiper from car and follow instructions under "Diagnosis - Off Car".

INTERMITTENT OPERATION

1. Check the following: Loose ground strap, loose dash switch mounting, or loose connection.

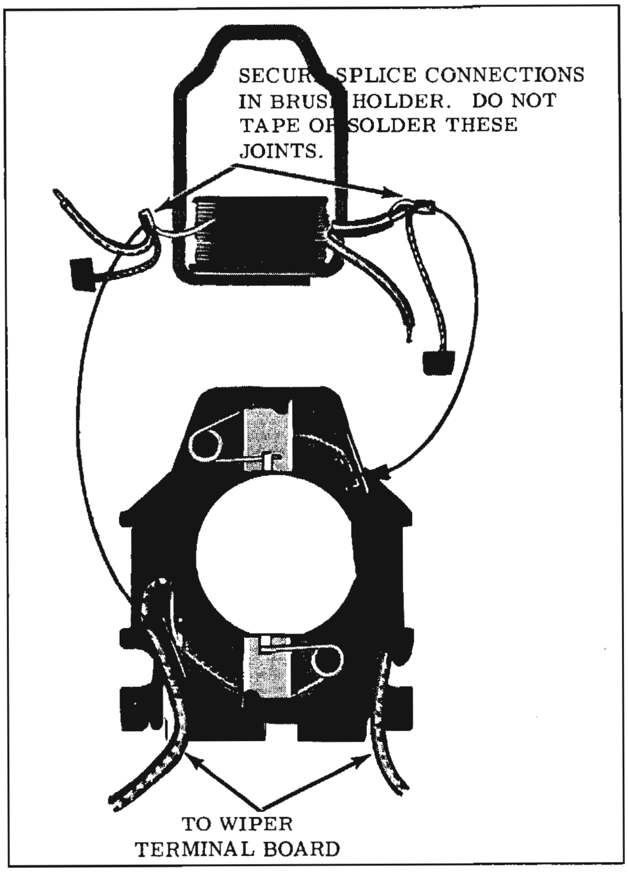


Fig. 14-171 Splice Connections (Single Speed)

BLADES DO NOT RETURN TO PARK POSITION WHEN WIPER IS TURNED OFF

Remove wiper from car and check for a dirty or broken park switch.

DIAGNOSIS (OFF CAR)

Connect 12 Volt DC power source and ammeter to wiper as shown in Fig. 14-170 and observe current draw and wiper operation. NOTE: Identify wiper part number from wiper motor end cap and select proper current draw from specification table.

WIPER INOPERATIVE

Current Draw, 0 Amps.

1. Check solder connection at terminal board.

2. Disassemble motor section and check all splice connections.

Current Draw, 1-1.5 Amps.

1. Disassemble motor and check for the following items:

   a. Open armature.

b. Brushes sticking.

c. Brush springs improperly positioned. (Fig. 14-168)

d. Poor solder joints at brush pigtail connections. (Fig. 14-171)

Current Draw, 10-12 Amps.

1. Check for open shunt field circuit.
2. Check for broken gear.

WIPER RUNS SLOW, VIBRATES AND CURRENT DRAW APPROXIMATELY 7-9 AMPS

1. Check for binds in gear train.
2. Check for shorted armature. (Armature may by checked on a growler).

WIPER SHUTS OFF BEFORE CRANK ARM REACHES PARK POSITION

Wiper crank arm stops rotating immediately when jumper wire is disconnected from wiper terminal No. 1. (Fig. 14-170) NOTE: When crank arm has reached park position, the crank arm index grooves will line up approximately with the ridges on the gear box cover. (Fig. 14-164)

1. Check for dirty, broken or bent park switch contacts.

WIPER WILL NOT SHUT OFF

Wiper crank arm fails to stop in park position when jumper wire is removed from wiper terminal No. 1. (Fig. 14-170)

1. Check that park switch contacts are opening.
2. Check for grounded condition in the internal motor lead that connects to terminal No. 1. (Fig. 14-170)

SPECIFICATIONS

Operating Test Voltage	12 Volt DC
Crank Arm Rotation (looking at arm)	CCW
Current Draw (Amps)	
No Load	3 Max.
Dry Windshield	3.5 Max.
Stall	11.0 Max.

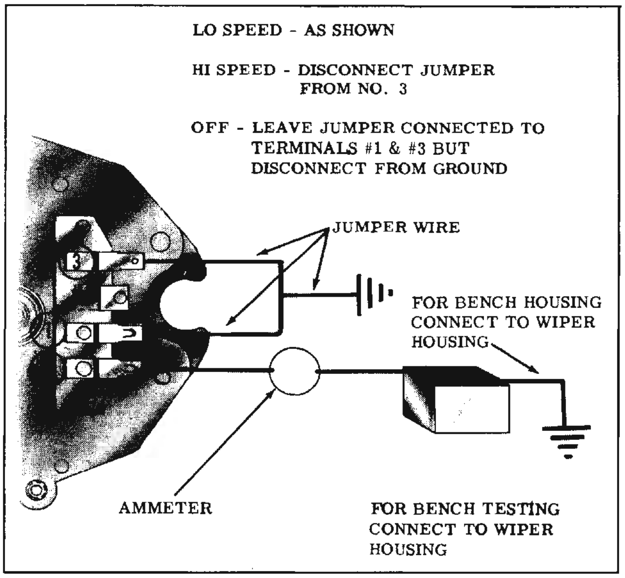


Fig. 14-172 Trouble Shooting Connections

TWO SPEED WIPER (ALL EXCEPT 3147 MODEL)

Removal and Installation

Refer to "REMOVAL AND INSTALLATION" Single Speed.

Disassembly and Assembly

Except for the internal wiring to the wiper terminal board, the disassembly and assembly procedures are the same as the single speed wiper.

DIAGNOSIS (ON CAR) (Fig. 14-172)

WIPER INOPERATIVE

1. Check that wiring harness is properly connected to wiper and dash switch; wiper ground strap is connected securely to car body; and dash switch is securely mounted.
2. With ignition switch on, check for 12 volts at harness terminal that connects to number (2) terminal. (Fig. 14-172)
3. To determine if dash switch or car wiring are at fault, disconnect harness from wiper motor and try operating wiper as shown in Fig. 14-172. If wiper fails to operate, disconnect transmissions from wiper crank arm and recheck wiper operation. If wiper still fails to perform, correctly, remove wiper from car and check wiper according to procedure under TROUBLE SHOOTING WIPER DETACHED.

WIPER WILL NOT SHUT OFF

1. Determine if wiper has both "LO" and "HI" speeds; "LO" speed only; or "HI" speed only. (IMPORTANT: Wiper must operate in "LO" speed during parking cycle.)

2. Disconnect wiring harness from wiper motor and try operating wiper independently of dash switch as shown in Fig. 14-157.

   If wiper operates correctly, independently of the dash switch and shuts off correctly with crank arm in park position, refer to the following:

WIPER WILL NOT SHUT OFF HAS BOTH SPEEDS

1. Lead between wiper terminal No. 1 and dash switch grounded.

2. Defective dash switch.

WIPER WILL NOT SHUT OFF HAS "LO" SPEED ONLY

1. Lead between terminal No. 3 and dash switch grounded.

2. Defective dash switch.

WIPER WILL NOT SHUT OFF HAS "HI" SPEED ONLY

1. Lead between wiper terminal No. 3 and dash switch open.

2. Defective dash switch.

If wiper still fails to operate correctly in Step 2, remove it from car and check it per instructions under DIAGNOSIS (OFF CAR).

WIPER HAS ONE SPEED "FAST"

1. Check for a defective dash switch or open lead between terminal No. 3 and dash switch.

WIPER HAS ONE SPEED SLOW AND SHUTS OFF WITH DASH SWITCH IN "HI" SPEED POSITION

1. Reverse harness leads that connect to wiper terminals 1 and 3.

BLADES DO NOT RETURN TO PARK POSITION WHEN WIPER IS TURNED OFF

1. Check wiper ground strap connection to car body.

2. Remove wiper from car and check for dirty, bent or broken park switch contacts.

WIPER SPEED NORMAL IN "LO" BUT TOO FAST IN "HI"

1. Remove wiper from car and check for an open terminal board resistor.

INTERMITTENT OPERATION

1. Check for loose wiper ground strap connections and/or loose dash switch mounting.

DIAGNOSIS (OFF CAR)

It is assumed that in many cases there is no information available to the repairman about the original wiper complaint. It is necessary, therefore, that wiper operation be checked according to the instructions shown in Fig. 14-172. IMPORTANT: Be sure to use an ammeter capable of reading at least 30 amperes in the feed wire circuit.

WIPER INOPERATIVE

Connect wiper to operate in "LO" speed and observe current draw. Current draw ratings shown below will provide a hint as to the possible source of trouble.

AMMETER READING (Amps)	POSSIBLE TROUBLE
0	(1) Loose solder connection at wiper terminal No. 2. (Fig. 14-172) (2) Loose splice joints. (Fig. 14-173)
1-1.5	(1) Open armature. (2) Brushes sticking. (3) Loose splice joint at brush leads.
11.0	(1) Broken gear or some other condition that will stall the wiper.

TWO SPEED WIPER (3147 MODEL)

Removal and Installation

Two speed wiper motor removal and installation is the same as Single Speed Wiper Motor Removal and Installation procedure.

DISASSEMBLY

Gear Box

Follow Steps 1 to 7 under Single Speed Wiper Gear Box Disassembly.

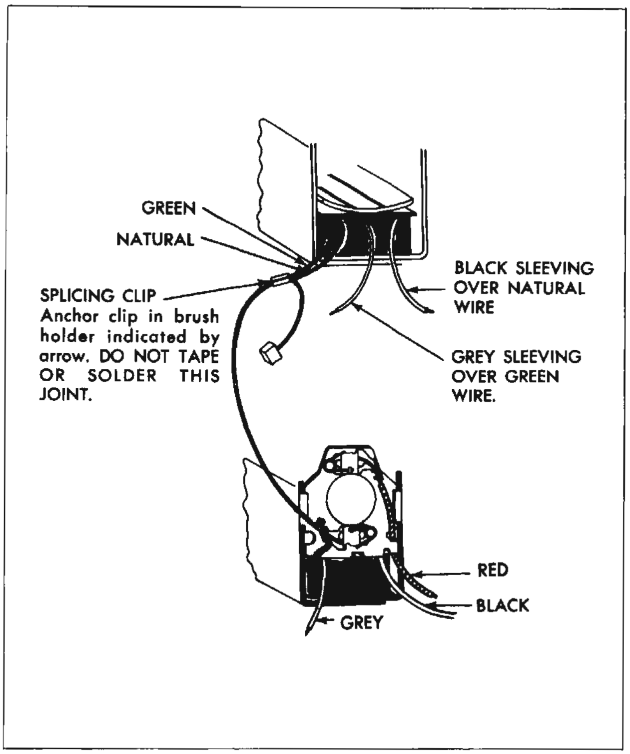


Fig. 14-173 Splice Connections (Two Speed Except 3147 Model)

Wiper Motor

1. Disassemble gear box.
2. Remove 2 motor frame through-bolts and loosen the armature end play adjusting screw and locknut.
3. Tap the brush end of the motor case with a mallet to free it from the gear housing.
4. Remove the armature from the motor field frame.

NOTE: The steel thrust ball is retained in the commutator end of the armature shaft by grease. The ball can be removed by dissolving the grease with solvent.

Field Coil Removal (Armature Removed)

1. Scribe an alignment mark on the field coil and housing to facilitate assembly. This mark can then be transferred from the old field coil to the new field coil for proper assembly.
2. Remove wiper gear cover or washer.
3. Slide terminal shield from housing.
4. Remove 2 terminal board attaching screws and lift terminal board from gear housing. Unsolder the black wire from connection at terminal board. (Fig. 14-174)

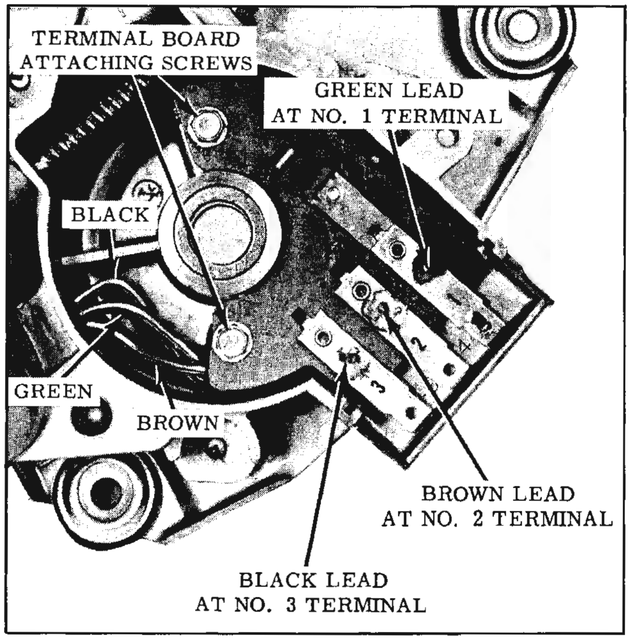


Fig. 14-174 Removing Terminal Board

5. Unsolder black wire from brush holder and unsolder wire from circuit breaker in motor case.
6. Remove field coil from housing using Tool J-7844 as shown in Fig. 14-175.

Field Coil Installation

1. Position a new field coil in the housing in proper alignment.
2. Temporarily install through-bolts to act as guide while installing field coil.
3. Lightly tap the field coil evenly into gear housing using a brass drift. Use caution not to damage field wiring.

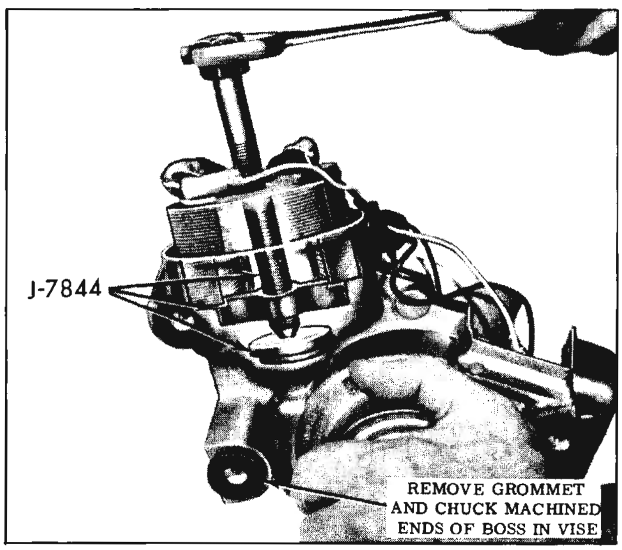


Fig. 14-175 Removing Field Coils

NOTE: If field coil requires excessive foıce to install, remove and file outer diameter of field laminations at point of interference.

4. Solder black wire to proper terminal of the terminal board. (Fig. 14-174) Solder the yellow lead on opposite end of same field coil to the circuit breaker contacts on the brush plate.

5. Solder other field coil orange lead to brush.

ASSEMBLY

Wiper Motor

1. Lubricate the steel thrust ball, the bearing and worm surface of the armature shaft with cam and ball bearing lubricant.

2. Install brush springs and brushes in holder. Retain brushes in holders and install the armature in the motor case.

3. While holding the armature in the motor case, start the armature shaft through the bearing in the gear housing.

4. Rotate motor case until the through-bolt holes in the case are aligned with those in the gear housing, then install the 2 through-bolts and tighten.

5. Tighten end play adjusting screw finger tight, then loosen 1/4 turn.

6. Tighten the adjusting screw lock nut being careful not to change the adjustment.

Gear Box

Follow steps 1 to 9 of Single Speed Gear Box Assembly.

DIAGNOSIS (ON CAR)

WIPER INOPERATIVE (ON CAR)

1. Check for blown fuse. If a new fuse blows, check for mechanical "lock-up" or short in circuit. If equipped with washer, check purple wire from wiper terminal board to washer connection for a short.

2. Connect a jumper wire from the wiper motor to ground. If the wiper motor will operate with ignition switch in "accessory" position and wiper control switch in low or high speed position, a defective wiper ground strap or connection is indicated.

3. With the ignition in the "accessory" or "on" position, check for 12 volts at the center terminal of wiper terminal board. If there is no voltage at this point, but there is voltage at the fuse clips, the purple wire from the fuse block to the wiper connector is open.

4. To determine if dash switch or vehicle wiring is the source of trouble, disconnect wires at the wiper terminal board and operate the wiper motor independently of the wiper control switch as follows:

   a. Connect a 12 volt supply to the center or number two terminal of the terminal board. (Fig. 14-176)

      Connect a jumper between the 2 outer terminals. (No. 1 and No. 3)

      Connect another jumper between the number one terminal and ground. The wiper should operate at "LO" speed.

   b. To check the "HI" speed operation, remove the jumper wire from between the number (1) and number (3) terminals of the terminal board. The wiper should then operate at "HI" speed.

   c. If the wiper operates when making either test a or b, it indicates that the wires from the motor to the wiper control switch, the wiper control switch, or the connectors are at fault.

5. If the wipers fail to operate after making tests a, b, or c, disconnect the transmission link arm from the motor. If the wiper motor will operate with the transmission disconnected, the trouble is in the transmission(s). If wiper still fails to operate, remove it from car and check it according to procedure outlined under WIPER INOPERATIVE (OFF CAR).

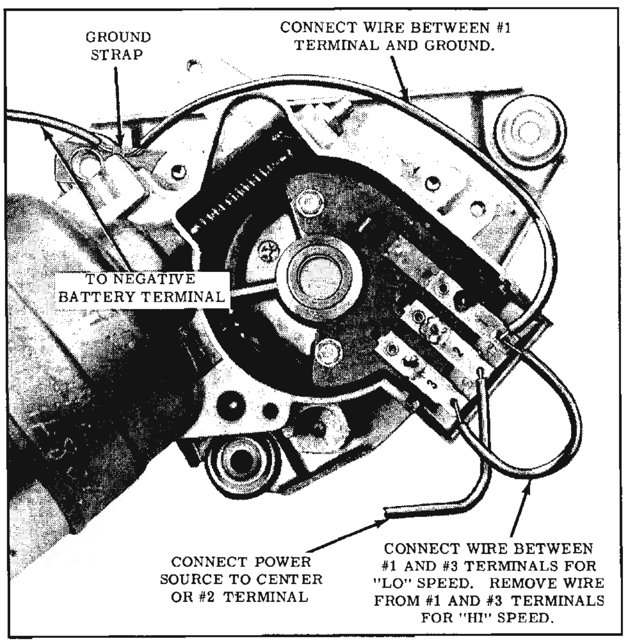


Fig. 14-176 Checking Circuit Wiring

DIAGNOSIS (OFF CAR)

WIPER INOPERATIVE (OFF CAR)

1. Remove gear box cover or washer pump assembly. Visually inspect for loose connections or burned wires at terminal connector board and relay control switch.

2. Connect 12 volts to center terminal on terminal board and ground the motor housing, also connect the wiper ground strap to motor housing. Connect an ammeter in the supply line and connect jumpers as shown in Fig. 14-177.

   If a current reading of approximately 2 amperes is obtained, check for an open armature, hung brushes, poor solder connections, or a broken green lead.

   If a current reading of approximately 13 amperes is obtained, check for a broken gear or some similar condition that would stall the wiper.

   If a current reading of zero amperes is obtained, check for dirty or defective circuit breaker contacts, or poor solder connections at circuit breaker terminals.

WIPER WILL NOT SHUT OFF

1. Check wiper for both "LO" and "HI" speeds.

   a. If wiper has only "LO" speed, follow procedure under WIPER HAS ONE SPEED, "SLOW".

   b. If wiper has only "HI" speed, follow procedure under WIPER HAS ONE SPEED, "FAST".

   c. If wiper has both speeds, proceed with next step.

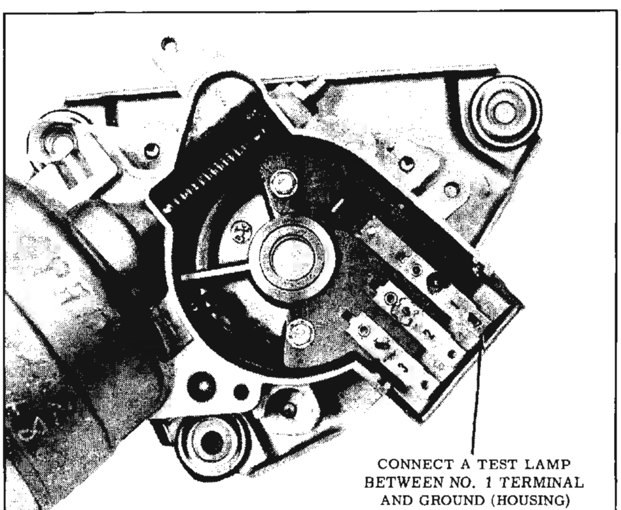


Fig. 14-177 Checking Wiper for Ground

2. By-pass car wiring and dash switch and operate wiper as shown in Fig. 14-176.

3. Disconnect jumper wire number (2). Wiper should shut off when blades reach park position.

   If wiper still fails to shut off, the parking switch contacts probably are not opening. Repair or replace parking switch contacts.

   If wiper shuts off correctly, check for a grounded condition in car wiring leads that connect to the number (1) wiper terminal.

WIPER HAS ONE SPEED "FAST"

1. By-pass car wiring and dash switch and connect wiper as shown in Fig. 14-176. This should operate wiper in "LO" speed (approximately 35-45 wipes per minute).

   If wiper operates correctly, check to see that lead from terminal number (3) to dash switch is not open. If lead is not open, switch is at fault.

   If wiper still has one speed "FAST", remove wiper from car and follow procedures outlined under TROUBLE SHOOTING, WIPER DETACHED.

WIPER HAS ONE SPEED "SLOW"

1. By-pass car wiring and dash switch and connect wiper as shown in Fig. 14-176. This should operate wiper in "LO" speed. Next, disconnect jumper wire number (1). This should operate wiper in "HI".

   If wiper operated correctly and has both speeds, look for a grounded condition in the wire between wiper terminal number (3) and dash switch.

   If wiper still has one speed "slow", remove wiper from car and check for a ground in the wiper motor black wire that connects to number (3) terminal.

WIPER WILL NOT PARK BLADES CORRECTLY

When dash switch is turned to "OFF" position, blade movement stops immediately regardless of blade position on windshield.

1. Remove wiper from car and check to see that parking switch contacts are not bent, dirty or broken.

WIPER SPEED NORMAL IN "LO" BUT TOO FAST IN "HI"

1. Remove wiper from car and check for an open terminal board resistor.

INTERMITTENT OPERATION

Wiper cycles on and off automatically.

1. Remove wiper from car and follow Intermittent Operation checking procedures outlined under TROUBLE SHOOTING, WIPER DETACHED FROM CAR.

TROUBLE SHOOTING, WIPER DETACHED FROM CAR

Check wiper operation as follows:

"LO" Speed - Using an ammeter in the feed wire circuit from battery connect wiper as shown in Fig. 14-176.

"HI" Speed - Disconnect jumper lead number (1) from number (3) terminal.

To Park Wiper - Leave jumber lead number (1) connected and disconnect jumper lead number (2) from ground.

WIPER INOPERATIVE

The following ammeter readings will provide a hint as to where trouble might be located.

Approximately 2 amperes indicates an open armature, hung brushes, poor solder connections, or broken green lead.

Zero amperes indicates dirty or defective circuit breaker contacts, or solder connections at circuit breaker terminals.

Approximately 13 amperes indicates a broken gear or some similar condition that would stall the wiper.

WIPER WILL NOT SHUT OFF

1. Check that wiper has "LO" speed. If wiper has only one speed (fast), look for an open shunt field circuit.

2. Check that parking switch contacts are opening as follows:

   a. Remove wiper gear from housing and check that parking switch contacts are not stuck or bent together.

   b. To double check operation of park switch, slide gear and shaft out of housing far enough to disengage gear teeth from worm shaft. Turn gear so that gap in ring can be positioned over the raised part of the parking switch and slide gear back in housing.

   Connect a test light as shown in Fig. 14-177. Test lamp should not light.

3. If the checks in Step 1 fail to locate the trouble, look for a grounded condition in the green lead.

SPECIFICATIONS

Operating Volts	12 Volts DC
Gear Ratio	36:1
Crank Arm Rotation (looking at Crank Arm)	CCW
Crank Arm Speed: (r.p.m.) (No Load)	
Lo	34-45 Min.
Hi	65-80 Min.
Current Draw: (Amps)	
No Load (Lo Speed)	3.0-3.5 Max.
Installed in Car - (Dry Glass)	4.5-5.0 Max.
Stall	13 Max.

WIPER HAS ONE SPEED "FAST"

Check for an open shunt field circuit.

WIPER HAS ONE SPEED "SLOW"

Look for a grounded condition in the shunt field circuit.

WIPER CRANK ARM STOPS ROTATING IMMEDIATELY WHEN JUMPER NUMBER (2) IS DISCONNECTED FROM GROUND (Stops in any position).

Check that parking switch contacts are not dirty, bent or broken.

WIPER SPEED NORMAL IN "LO" BUT TOO FAST IN "HI"

Check for an open resistor on wiper terminal board.

INTERMITTENT OPERATION (WIPER CYCLES ON AND OFF AUTOMATICALLY)

Operate wiper in "LO" speed and observe current draw. If current draw exceeds 3.5 amperes when operating with no load on bench, check the following items:

a. Armature end play too tight.

b. Armature shorted or grounded.

c. Field assembly shorted.

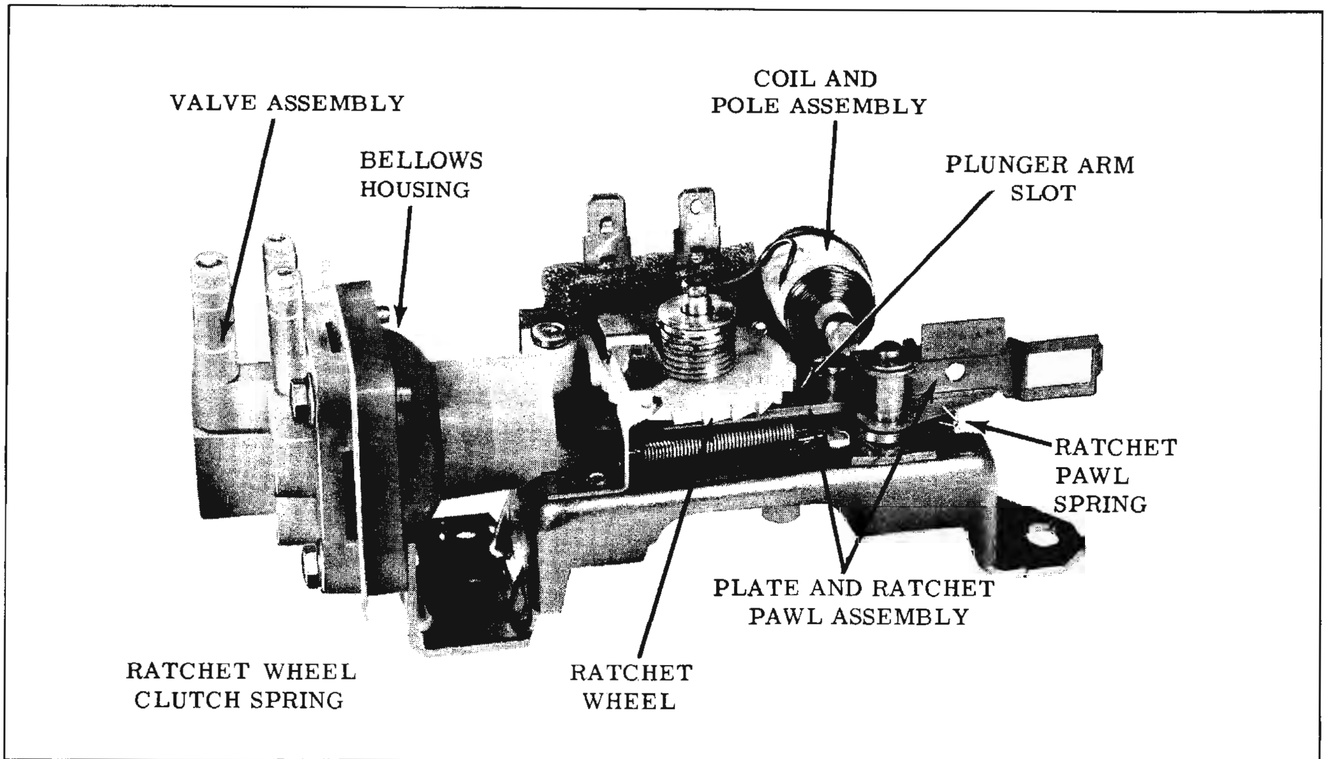


Fig. 14-178 Pump Assembly

d. Gear Assembly end play tight.

If current draw is normal, a defective circuit breaker is indicated and it should be replaced.

WASHER SYSTEM (Typical of 88 Series)

DESCRIPTION

The washer pump is a positive displacement type pump employing a small bellows, bellows spring and valve arrangement. The pumping mechanism is actuated by a 4 lobe cam driven by the wiper.

OPERATION

The starting and completion of a wash cycle is accomplished electrically and mechanically by a relay assembly and ratchet wheel arrangement. (Fig. 14-178)

WIPER "ON"—WASHER "OFF"

With the washer pump mounted on the wiper, the 4 lobe cam actuates a spring loaded plate and ratchet pawl assembly. Thus, with the wiper running, the 4 lobe cam rotates continuously actuating the plate and ratchet pawl assembly back and forth in a horizontal plane. A pin, attached to the plate and ratchet pawl assembly, extends through a slot in the bellows plunger arm. This pin moves freely back and forth in the slot while the pumping mechanism is in the "locked-out" position and no pump action develops. (Fig. 14-179)

The pump is in the "lock-out" position when the relay holding contacts are open and a tang on the plunger arm rests against the widest part of an eccentric ramp on the bottom of the ratchet wheel. The tang holds the bellows plunger arm in a retracted position (bellows spring compressed) allowing the plunger arm pin to move back and forth in the plunger arm slot preventing pumping action. (Fig. 14-180)

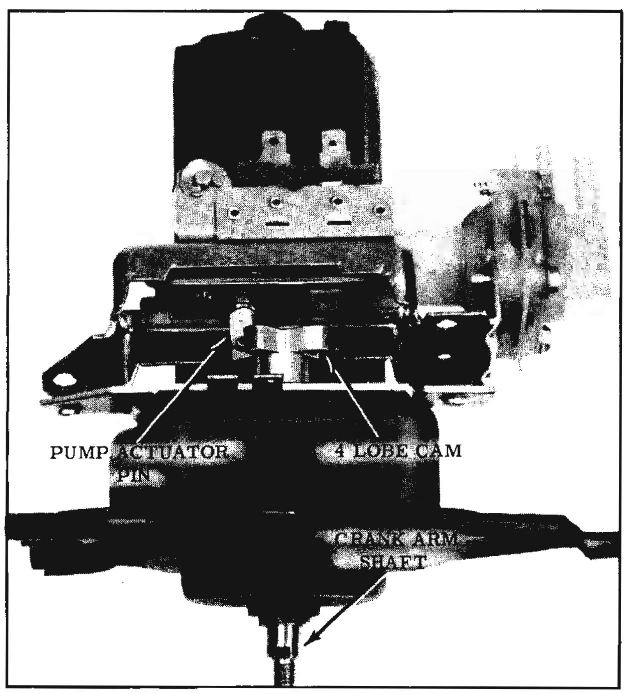


Fig. 14-179 Pump Actuator

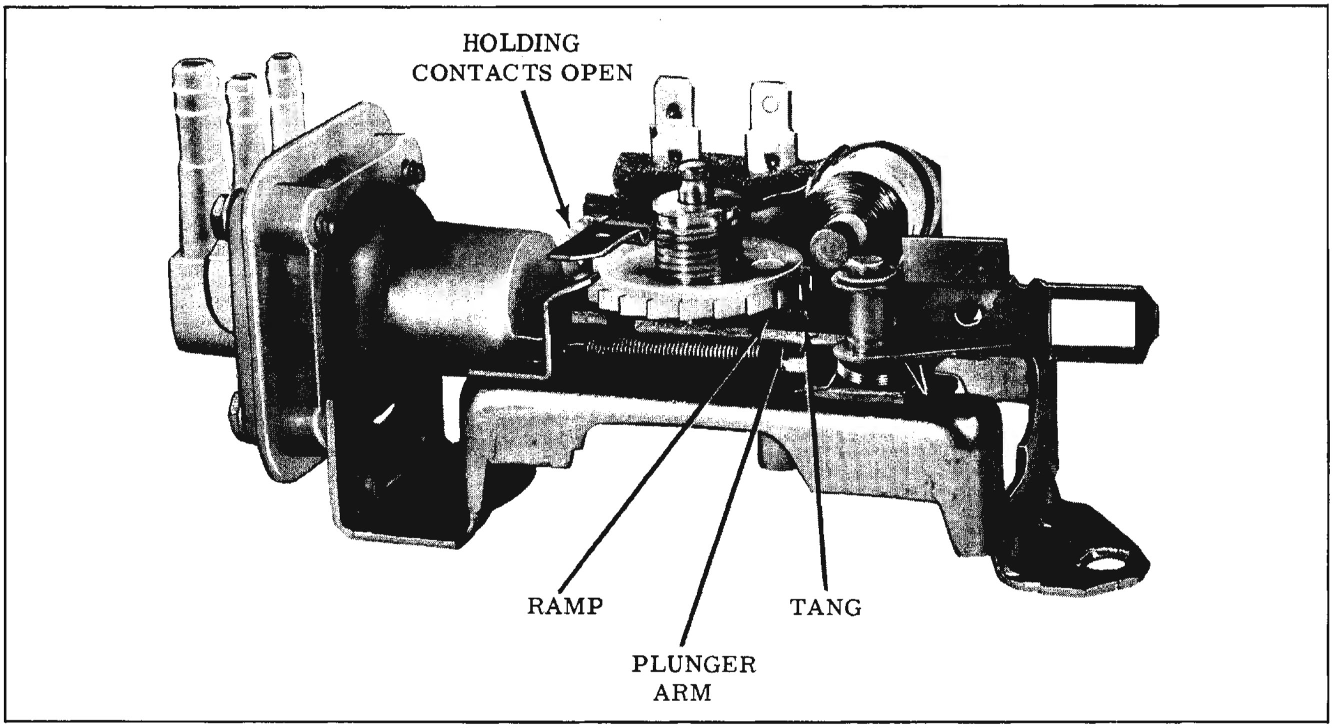


Fig. 14-180 Pump Lock-Out Position

The ratchet pawl is spring loaded to keep it from engaging the ratchet wheel until the pump relay is energized by the dash switch washer button.

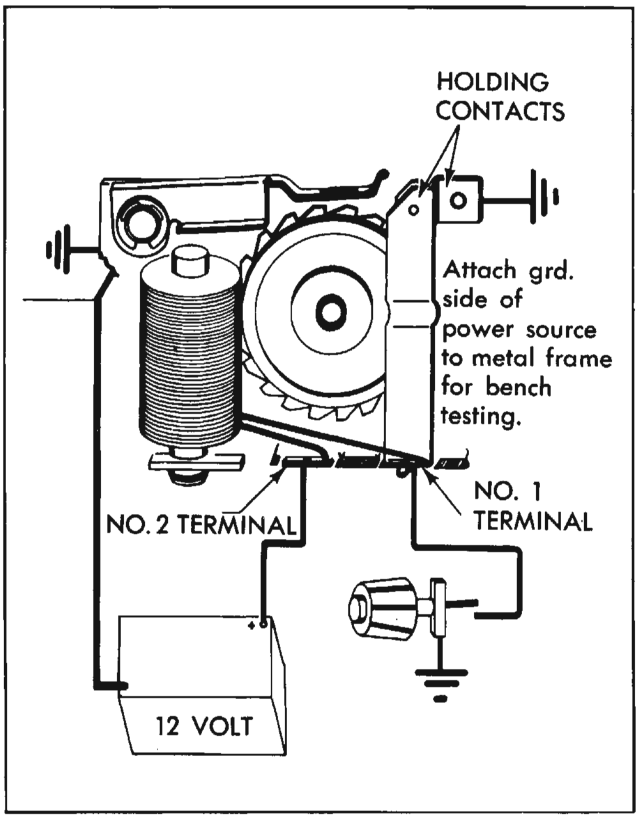


Fig. 14-181 Pump Wiring Circuit

WASHER "ON"

Depressing the dash washer button, closes the washer pump relay circuit to ground (if the wiper was off, the wiper switch is mechanically turned on by the washer button). (Fig. 14-181).

With the washer coil energized, the pawl, normally held away from the ratchet by spring force, is pulled towards the coil pole and engages the ratchet wheel. The ratchet pawl and plate assembly, which moves back and forth any time the wiper is on, now starts to rotate the ratchet wheel. (Fig. 14-182)

When the ratchet wheel has been rotated one tooth, two functions occur, the eccentric ramp on the ratchet wheel is moved away from the plunger arm releasing the pump mechanism from its locked-out position, a set of holding contacts close, maintaining the coil circuit to ground. The contacts remain closed until the ratchet wheel is turned through 360°, at which time the ratchet wheel again opens the contacts.

PUMPING CYCLE

Exhaust Half of Pump Stroke

With the pumping mechanism released from the "lock-out" position, the bellows spring expands collapsing the bellows forcing the water out through the two outlet valves. (Fig. 14-183) The plunger arm, attached to the bellows, is pulled forward with the bellows and the back edge of the plunger arm slot moves up tight against

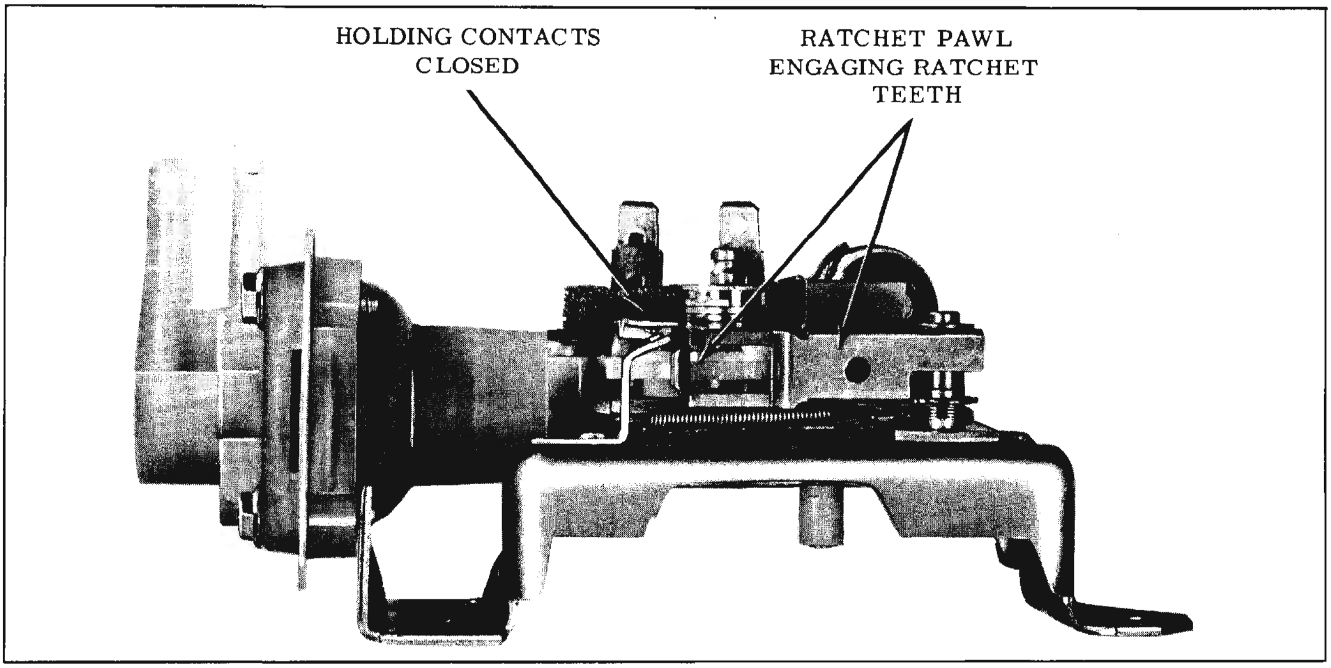


Fig. 14-182 Relay Coil Energized

the plunger arm actuator pin. The actuator pin, which was previously moving back and forth freely in the plunger arm slot, pulls the plunger arm back and compresses the bellows spring each time a lobe of the cam actuates the plate and ratchet assembly.

Intake Half of Pump Stroke

Pulling the plunger arm back compresses the bellows spring and water is drawn into the bellows through the intake valve. (Fig. 14-184) During the intake of water, the exhaust or outlet valves are drawn tight against their seats. During each intake stroke of the pumping mechanism, the ratchet wheel is rotated one tooth.

The wash cycle is completed when the electrical circuit to the relay coil is opened and the pumping mechanism reaches its "lock-out" position. This is accomplished as follows:

When the ratchet wheel has been rotated through 360° or 21 teeth, the relay coil holding contacts are pushed open by a "hump" on the ratchet wheel. This opens the coil circuit and the spring loaded ratchet pawl moves away from the ratchet wheel preventing further rotation of the ratchet wheel.

As the ratchet wheel rotates, the tang on the bellows plunger arm starts to ride up the eccentric ramp on the lower surface of the ratchet

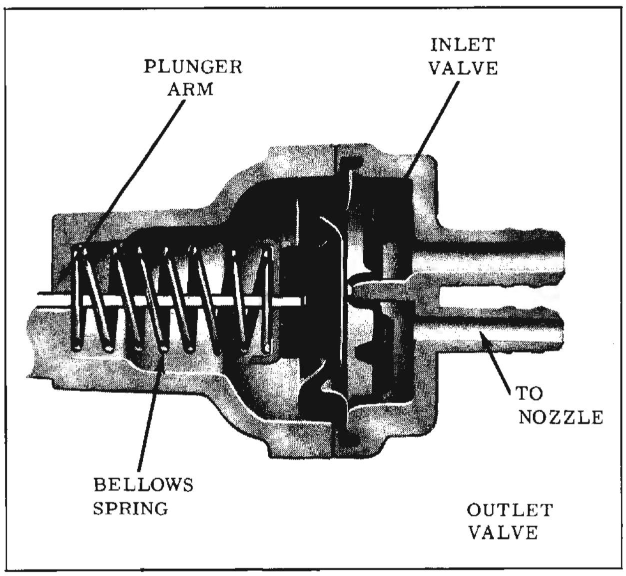


Fig. 14-183 Exhaust Half of Pump Stroke

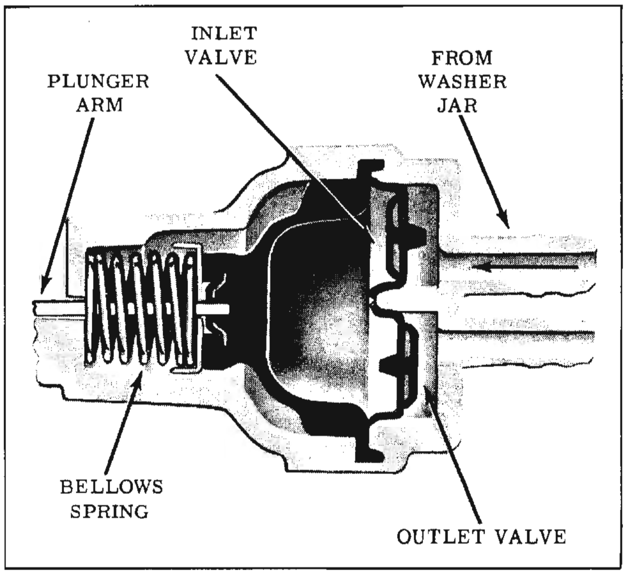


Fig. 14-184 Intake Half of Pump Stroke

wheel. The full "lock-out" position of the pumping mechanism is reached when the tang is up on the widest part of the ramp. (Fig. 14-180) The tang reaches the "lock-out" position at the same time the relay coil holding contacts open.

DIAGNOSIS (ON CAR)

WASHER INOPERATIVE

1. Check the following items:

   a. Jar had adequate quantity of water solution.

   b. Hoses are not damaged and hose connections are tight.

   c. Screen at end of jar cover hose is not plugged.

   d. Electrical connections to washer pump and dash switch.

   e. Nozzles are not plugged.

2. If all items in Step 1 check out, start wiper motor only, then push washer button and listen for "click" as washer relay pulls in. If no "click" is heard, check for 12 volts at terminal No. 2 Fig. 14-185. No voltage indicates defective wiring. If "click" is heard, proceed to Step 4.

3. If correct voltage was found in Step No. 2, connect a jumper wire from terminal No. 1 to ground (Fig. 14-185) and operate wiper. If washer relay "click" is heard and pump functions correctly, a defective dash switch or an open circuit between washer pump and dash switch is indicated - "No Click" indicates an open relay coil.

4. If relay "click" is heard in Step 2, listen for the soft clicking as the pump ratchet wheel is rotated. If "soft clicking" is not heard, the pump mechanism is faulty and should be removed from the wiper motor and checked.

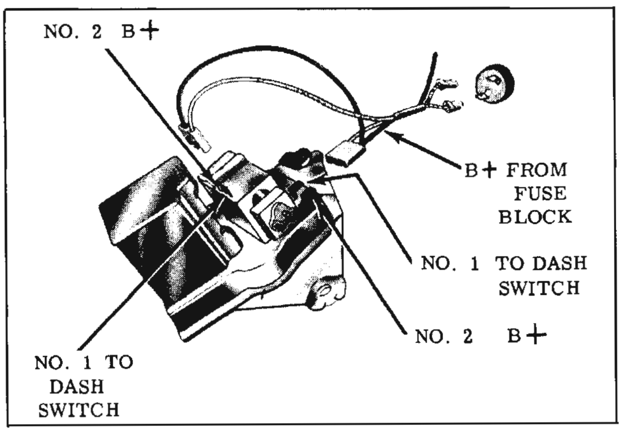


Fig. 14-185 Checking Connections

If soft clicking is heard but no pumping action occurs, replace the valve assembly and recheck pump.

DIAGNOSIS (OFF CAR)

1. Remove washer pump cover and connect 12 volt power supply to washer pump as shown in Fig. 14-181. Connect jumper wire from terminal No. 1 to ground. Turn ratchet pawl to position shown in Fig. 14-181.

   Ratchet pawl should be pulled toward relay pole and engage ratchet teeth. Failure to do as described indicates an open relay coil.

2. If relay and ratchet pawl perform correctly in Step 1, manually actuate the washer pump to rotate the ratchet wheel one tooth. Observe if relay holding contacts close (Fig. 14-181) and the pump plunger arm is released from its lock-out position. Figure 14-180 shows plunger arm in lock-out position.

3. Disconnect jumper wire from terminal Number 1. Relay coil should remain energized and hold ratchet pawl against ratchet wheel. Failure to do so indicates open or dirty holding contacts.

4. If pump performs correctly in Step 3, continue to manually actuate the slide and ratchet pawl assembly until the ratchet wheel has been turned through 360° or 21 teeth. After the ratchet wheel has been rotated 21 teeth, the holding contacts should be opened by a "hump" on the wheel and the pump plunger arm should be in the "lock-out" position. (Fig. 14-180)

Check Valve Assembly as Follows:

1. Attach a hose to the large or intake pipe. You should be able to blow through it but not draw through it.

2. Attach a hose individually to each of the small or exhaust pipes. You should be able to draw through them but not blow through them.

   If any of three valves allow air to pass in both directions, the valve assembly is defective.

PUMP DISASSEMBLY—Refer to Fig. 14-178

Relay

1. Remove washer pump cover.

2. Unsolder coil leads from terminals. (NOTE: No coil polarity is necessary when resoldering coil leads.)

3. Remove coil retainer clip and slip coil assembly out of mounting bracket.

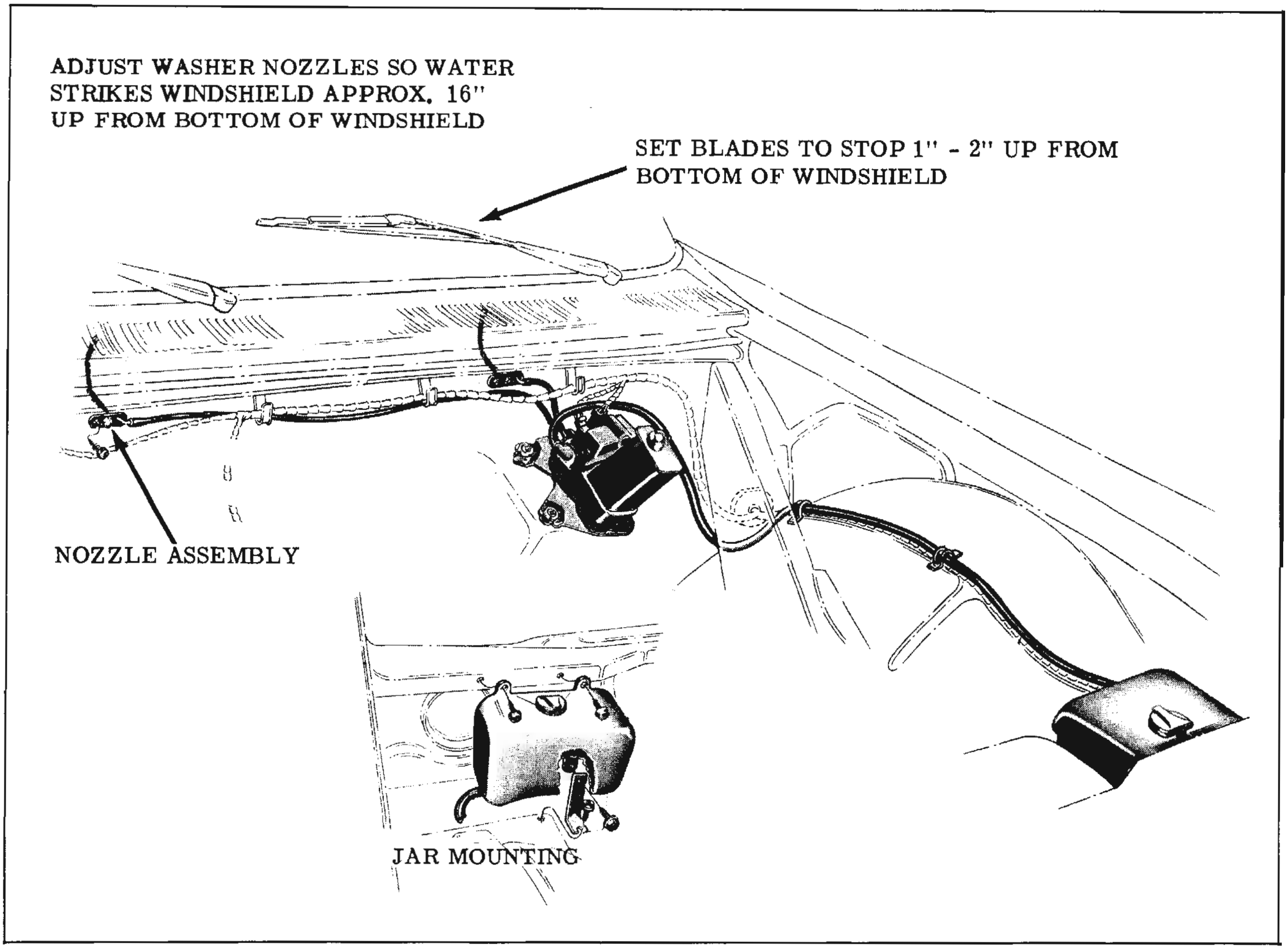


Fig. 14-186 Washer Adjustment

Ratchet Pawl

1. Remove washer pump cover.
2. Disengage spring from ratchet pawl. (CAUTION: Be sure spring is properly assembled before replacing washer pump cover.)
3. Remove "E" ring and slide ratchet pawl off shaft.

Valve Assembly

1. Remove the four screws that secure the valve assembly to the bellows housing.

CAUTION: It is sometimes necessary to carefully pry the bellows lip out of the valve body groove.

Bellows

1. Remove valve body.
2. Manually operate pump to release pump from "lock-out" position (See "Checking Washer Pump Detached").
3. Hold bellows plunger arm from moving, then push in against bottom of bellows with thumb and twist bellows 90°. This should release bellows and bellows spring.

ASSEMBLY

To assemble the relay, ratchet pawl, valve assembly or bellows, reverse the disassembly procedure. For washer adjustment see Fig. 14-186.

SPECIFICATIONS

Number of "squirts" at full pressure	12
Pressure (PSI)	11-15
Coil Resistance (ohms)	20

DISTRIBUTOR TEST SPECIFICATIONS

Refer to ENGINE TUNE-UP, Section 10.

ELECTRICAL SPECIFICATIONS

STARTING MOTOR (1108303)	
Make	Delco-Remy
Brush Spring Tension	35 oz. min.
Number of Brushes Used	4
Number of Fields	4
Number of Teeth on Starter Pinion	9
SOLENOID SWITCH (1114266)	
Current Consumption of Both Windings @ 10 Volts @ 80°F	42-49 amps.
Current Consumption of Hold-In Windings @ 10 Volts @ 80°F	10.5-12.5 amps.
"DELCOTRON" (1100631)	
Output at 875 Engine r.p.m.	20-27 amps.
Output at 2200 Engine r.p.m.	32-39 amps.
Field Current Draw	1.9-2.3 amps.
Weight	Approx. 10 lbs.
REGULATOR (1119507)	
Field Relay	
Air Gap	0.015"
Point Opening	0.030"
Closing Voltage	6.3-8.3 Volts
Voltage Regulator	
Air Gap	0.060"
Point Opening	0.014"
Indicator Light Relay	
Air Gap	0.011"
Point Opening	0.015"
Closing Voltage	3.8-5.2 Volts
BATTERY	
Make	Delco-Remy
Model Number	555
Catalogue Number	594
Number of Cells	6
Number of Plates	9 per cell or 54
Voltage Rating	12 Volts
Capacity @ 20 hr. Rate	44 amp-hr.
Specific Gravity @ Full Charge	1.270±.010 @ 80°F.
Ground	Negative
IGNITION COIL (1115168) (ALL EXCEPT 3147 MODELS)	
Primary Resistance @ 80°F.	1.28-1.42 ohms
Secondary Resistance @ 80°F.	7200-9500 ohms
IGNITION COIL (1115170) (3147 MODEL ONLY)	
Primary Resistance @ 80°F.	7.5-8.6 ohms
Secondary Resistance @ 80°F.	7500-10,000 ohms
IGNITION RESISTOR (IN HARNESS)	
Resistance @ 80°F.	1.75-1.85 ohms
DISTRIBUTOR	
Cam Angle Range	28°-32° (Adjust to 30°)
Contact Point Opening	0.016"
Contact Arm Spring Tension	19-23 oz.
Condenser Capacity	0.18-0.23 mfd.

ELECTRICAL SPECIFICATIONS (Cont'd)

SPARK PLUGS	
Make	AC
Type	
All 2BBL	46 FFX
All 4BBL SMT & 3147	45 FF
All 4BBL HMT	44 FF
Body	13/16"
Spark Gap	
All 2BBL	0.030"
All 4BBL HMT	0.030"
All 4BBL SMT & 3147	0.025"
Thread Size	14 MM
HORNS	
Current Draw @ 12 Volts	7-11 amps
HORN RELAY	
Point Opening	0.020"
Closing Voltage	1.5-9.5 volts (Adjust to 6.5 Volts)
Air Gap - Points Closed	0.008"-0.020"

LIGHT BULB NUMBERS

Glove Box Lamp	1816
Parking Brake Signal Lamp	1816
Headlamps (Inner, #1, upper beam only)	4001
Headlamps (Outer, #2, lower and upper beam)	4002
Stop, Tail and Turn Signal	1034
Parking and Turn Signal (Front)	1034
Dome Light (Tubular)	211
Console Courtesy Lamp	68
Electric Clock Lamp	57
Heater Control Lamp	53
Delcotron Warning Lamp	158
High Beam Indicator Lamp	161
Instrument Cluster Lamps	158
Oil Pressure Warning Lamp	158
Temperature Indicator Lamp	158
Turn Signal Indicator Lamps	158
Shift Indicator Lamp	53
License Lamp	67
Back-Up Lamps	1073
Radio Dial Lamp	1892
Courtesy Lamp	90
Turbo-Rocket Fluid Warning Light	53
Performance Gauge	57

FUSE SPECIFICATIONS AND LOCATIONS

APPLICATION	FUSE TYPE AND AMPERES	FUSE LOCATION
Electric Clock	AGA 2	Located in Fuse Block
Dome Lights Courtesy Lights Stop Lights	SAE 20	Located in Fuse Block
Temperature Indicator Light Fuel Gauge Oil Pressure Warning Light Parking Brake Indicator Lamp Delcotron Warning Light Turbo-Rocket Fluid Warning Light Back-Up Light Turn Signal License Light Tail Lights	SAE 9	Located in Fuse Block
Radio	AGW 2.5	Located in Fuse Block
Heater and/or Air Conditioning Electric Windshield Wipers & Washer	SAE 20	Located in Fuse Block
Instrument Cluster Light Clock Light Performance Gauge Light Shift Indicator Light Heater Ventilator & Air Conditioning Lights	AGA 3	Located in Fuse Block
Headlights	Circuit Breaker	On Headlight Switch
Cigar Lighter (Instrument Panel)	SAE 20	On Back of Lighter
Flasher		Upper L.H. Corner of Fuse Block
Power Seat & Power Windows	Circuit Breaker	On Junction Block

HEATER AND AIR CONDITIONER

(FULL SIZE CAR)

CONTENTS OF SECTION 15

HEATER

GENERAL DESCRIPTION

Air enters the ventilation and heater system at the cowl vent grille, travels through the plenum chamber and into the cowl air chamber. Air can now be directed into the passenger compartment by opening the right and left side cowl valves or by opening the heater inlet valve. The valves are opened by vacuum operated diaphragms, actuated by push buttons, and closed by spring force.

The ventilation and heater control push buttons are in a single control unit located on the instrument panel on the right side of the steering column. The control also contains the blower speed switch and the temperature control slide lever.

The blower motor is started whenever the heater inlet air valve is opened. Movement of the inlet valve actuates a master "ON", "OFF" switch which controls operation of the blower motor.

The water control valve assembly consists of a water valve located on the rear of the right cylinder head, and a thermostat located inside the heater case in the passenger compartment. A temperature control slide lever on the heater control panel is connected to a lever on the thermostat by a cable. Moving the slide lever to the right allows vacuum to pass through the thermostat and open the water valve which is opened and closed by a vacuum diaphragm. The thermostat will regulate the amount of water flowing through the water valve through changes in temperature in the heater case or by movement of the sliding lever, only when the heater is in operation. With the ventilation system in operation, the water valve is closed regardless of the temperature sliding lever position.

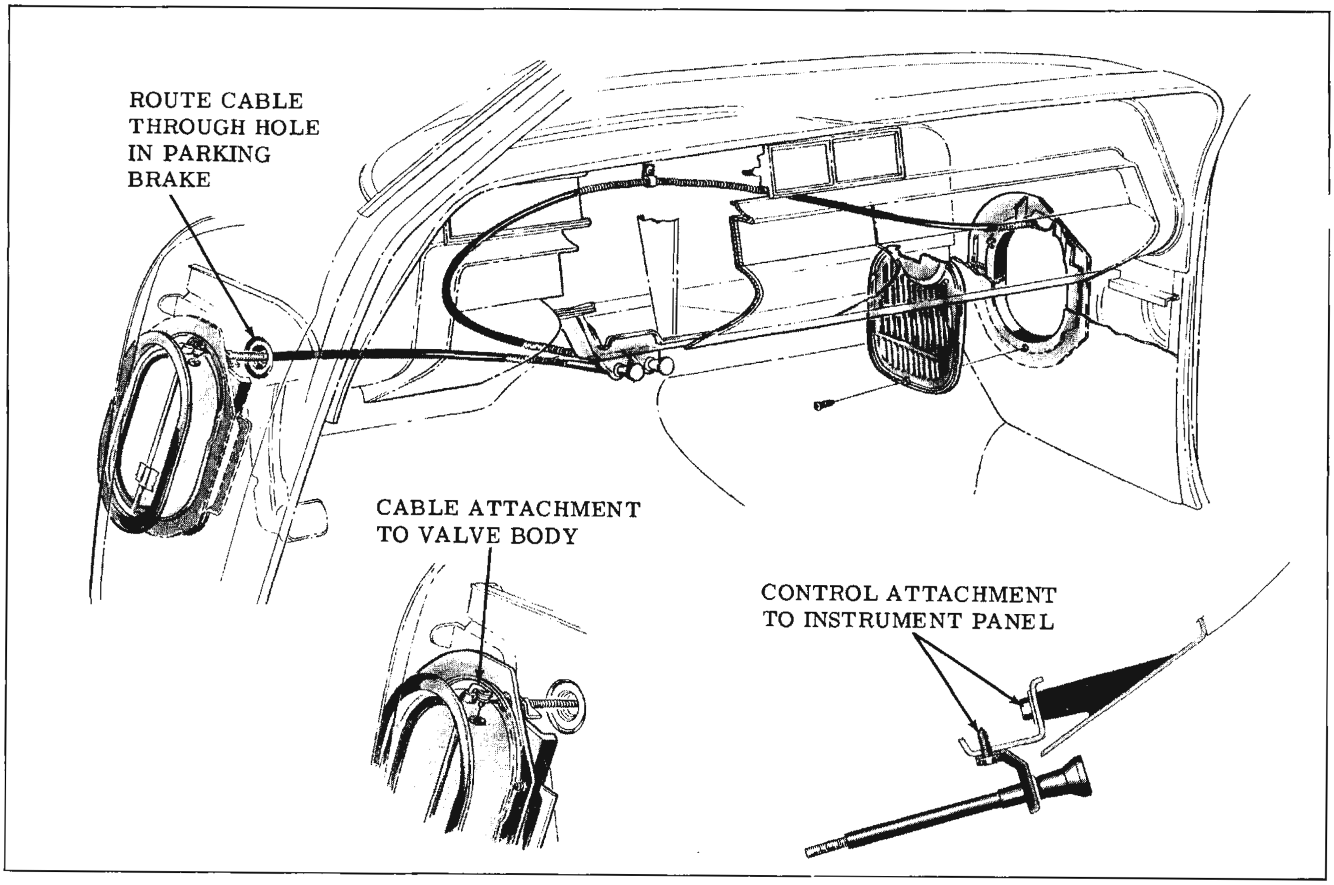


Fig. 15-1 Ventilation Without Heater

Cars without heaters are equipped with hand operated cowl outlet valves for right and left side ventilation. (Fig. 15-1)

VENTILATION SYSTEM (Fig. 15-2)

When the "LOW" button is depressed, the heater inlet valve is opened and the blower motor is started. Since the cowl outlet valves are closed, air flows through the heater core, into the heater case and into the passenger compartment. Rate of air flow can be controlled by the blower speed switch on the heater control.

When the "MEDIUM" button is depressed, the left hand cowl outlet valve opens in addition to the heater air inlet valve and air flows into the car through both the heater and the left hand cowl outlet valve.

When the "MAXIMUM" button is depressed, the heater inlet valve is closed, shutting off the blower motor, and the right and left cowl outlet valves are opened. Air now flows from the cowl air chamber directly into the passenger compartment.

HEATER SYSTEM (Fig. 15-2))

For heating, the temperature control lever must be moved to the right, depending on the amount of heat desired.

Depressing the "HEAT" button opens the heater inlet air valve which starts the blower motor. With the water valve open, air is heated as it passes through the heater core and into the passenger compartment.

Depressing the "DEF" button operates a vacuum operated diaphragm which closes the defroster valve and air flows into the right and left defroster nozzles, diverting the air flow onto the

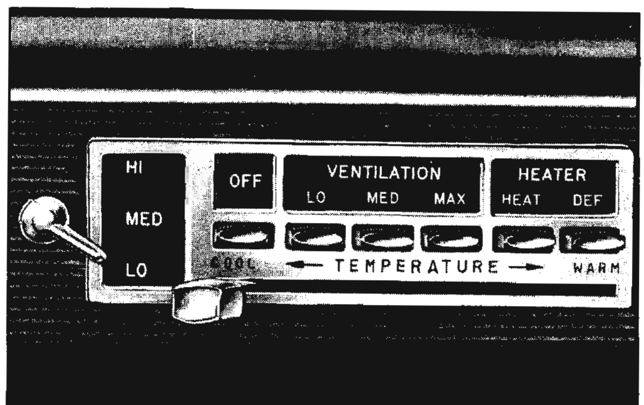


Fig. 15-2 Heater and Ventilation Control

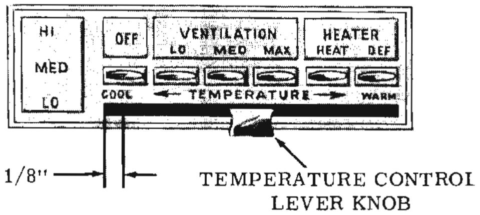


Fig. 15-3 Temperature Control Adjustment

windshield.

Rate of air flow on "HEAT" and "DEF" can be controlled by the blower speed switch.

ADJUSTMENTS

TEMPERATURE CONTROL

With the THERMOSTAT lever on the heater case in the closed position (fully to the right), the temperature control lever at the instrument panel should be 1/8" from the left end of the slot in the control assembly on the instrument panel. To adjust, proceed as follows:

1. Check to insure that the cable is not kinked and operates freely.

2. Loosen the control cable clamp at the thermostat.

3. Move the THERMOSTAT lever to the closed position (fully to the right). Position the cable conduit until the temperature control lever is 1/8" from the left end of the slot in the control assembly on the instrument panel. (Fig. 15-3)

4. Tighten the control cable clamp.

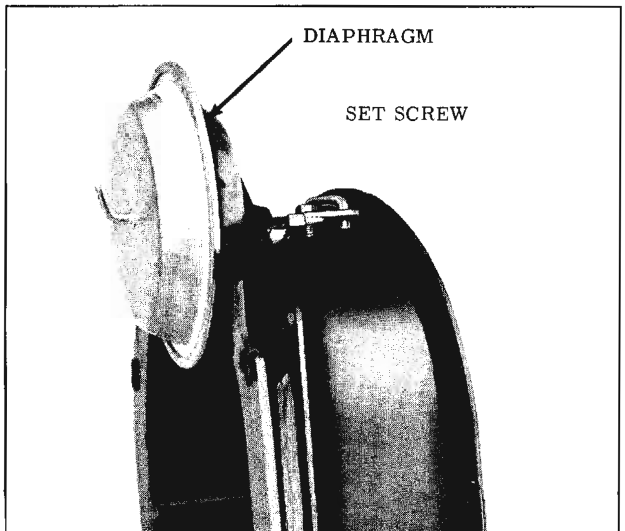


Fig. 15-4 Cowl Outlet Diaphragm Adjustment

COWL OUTLET DIAPHRAGM

Adjustment of the cowl outlet valve and diaphragm linkage is provided at the diaphragm. (Fig. 15-4)

1. With cowl vent valve body removed, loosen set screw.

2. Pull diaphragm lever to its extreme stop, then push back 1/16".

3. While holding valve closed, tighten set screw.

HEATER INLET DIAPHRAGM (Fig. 15-5)

To adjust the heater inlet valve linkage, loosen valve link to diaphragm lever lock screw. Pull diaphragm lever to its extreme stop, then push back 1/16". Tighten lock screw with valve in closed position.

COWL VENT VALVE BODY

Remove and Install (Fig. 15-6)

1. Remove cowl vent grille and trim pad.

2. Disconnect vacuum line from diaphragm.

3. Remove valve body assembly to cowl attaching screws and remove valve body.

On installation, apply a 3/8" bead of caulking compound between the valve body and cowl, make sure water seal tape is installed over actuating wire rod hole in valve body, then reverse removal procedure.

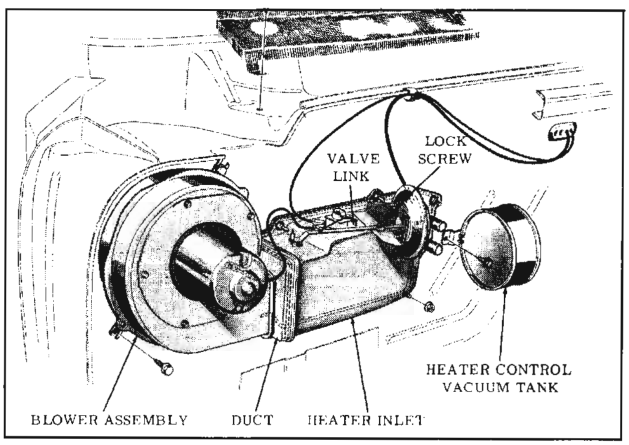


Fig. 15-5 Heater Inlet Diaphragm Adjustment

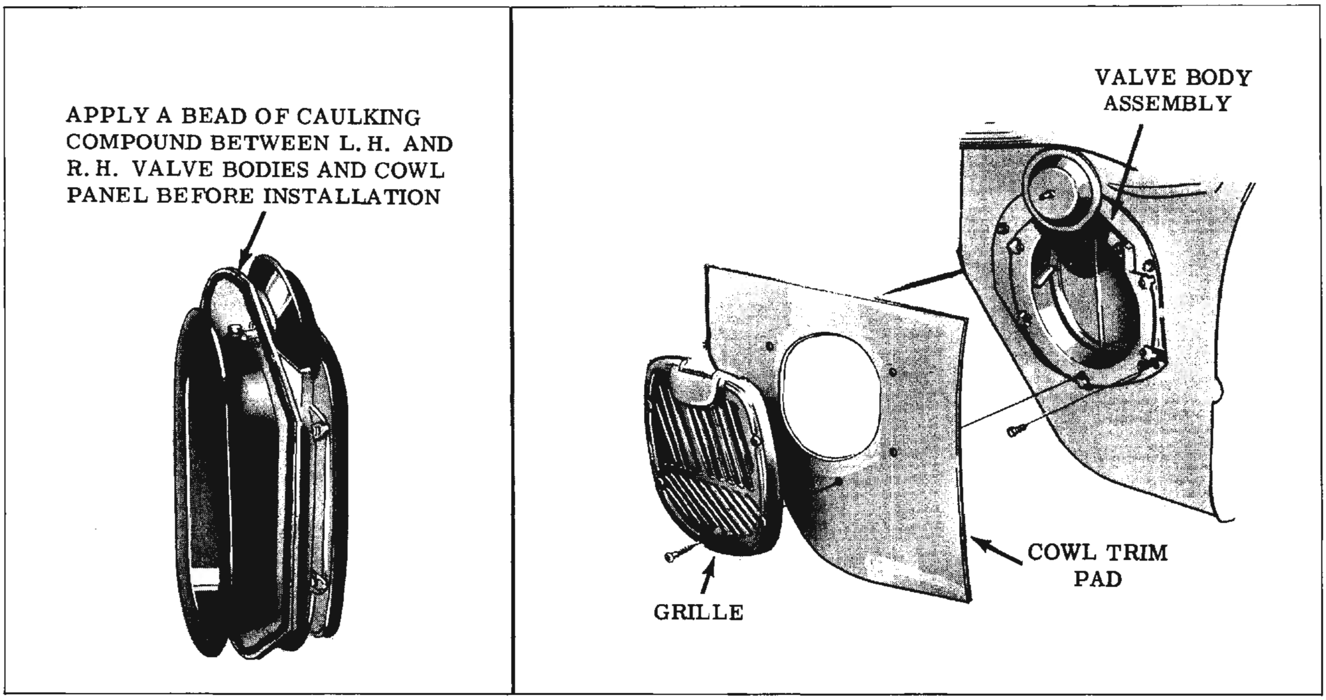


Fig. 15-6 Cowl Vent Valve Body

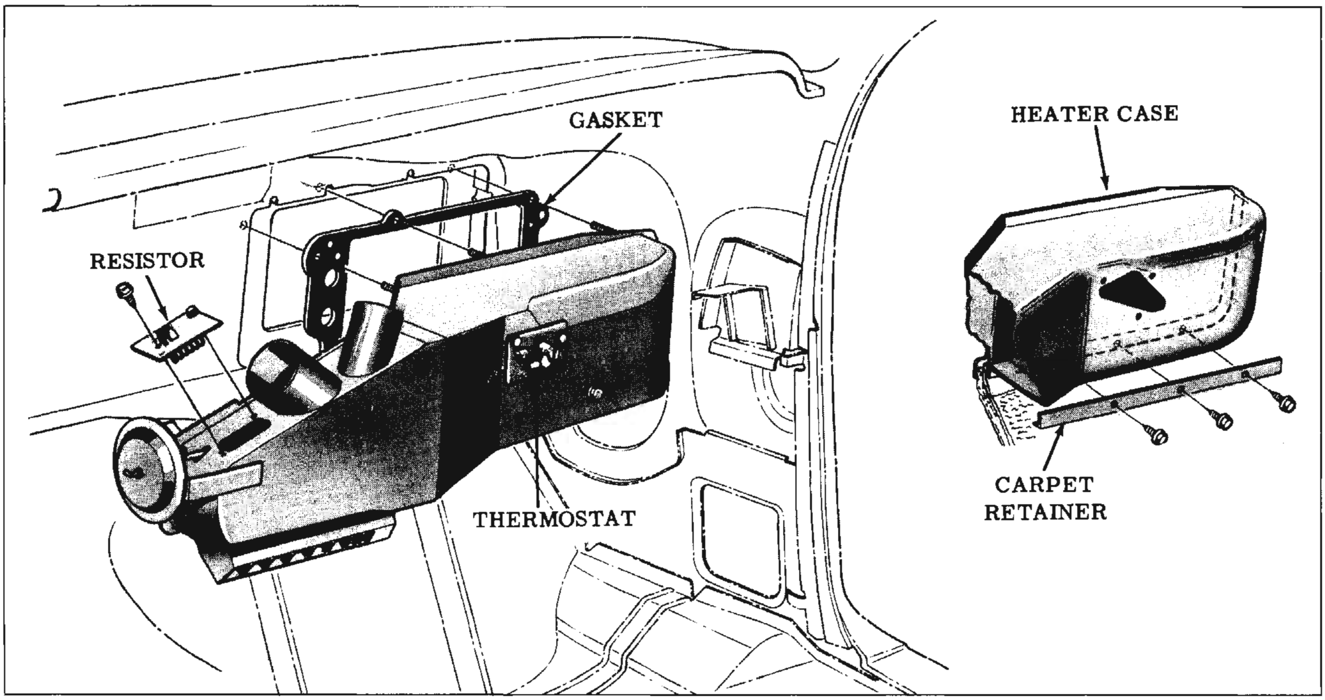


Fig. 15-7 Heater Attachment

HEATER BLOWER ASSEMBLY

Remove and Install (Fig. 15-5)

1. Scribe hood hinge location on right side of hood and cowl.
2. Remove hood hinge spring.
3. While firmly supporting hood, remove the right hood hinge from cowl and hood.
4. Disconnect heater motor wiring.
5. Remove the five blower motor attaching screws.
6. Remove fan from motor shaft.
7. Remove blower motor.

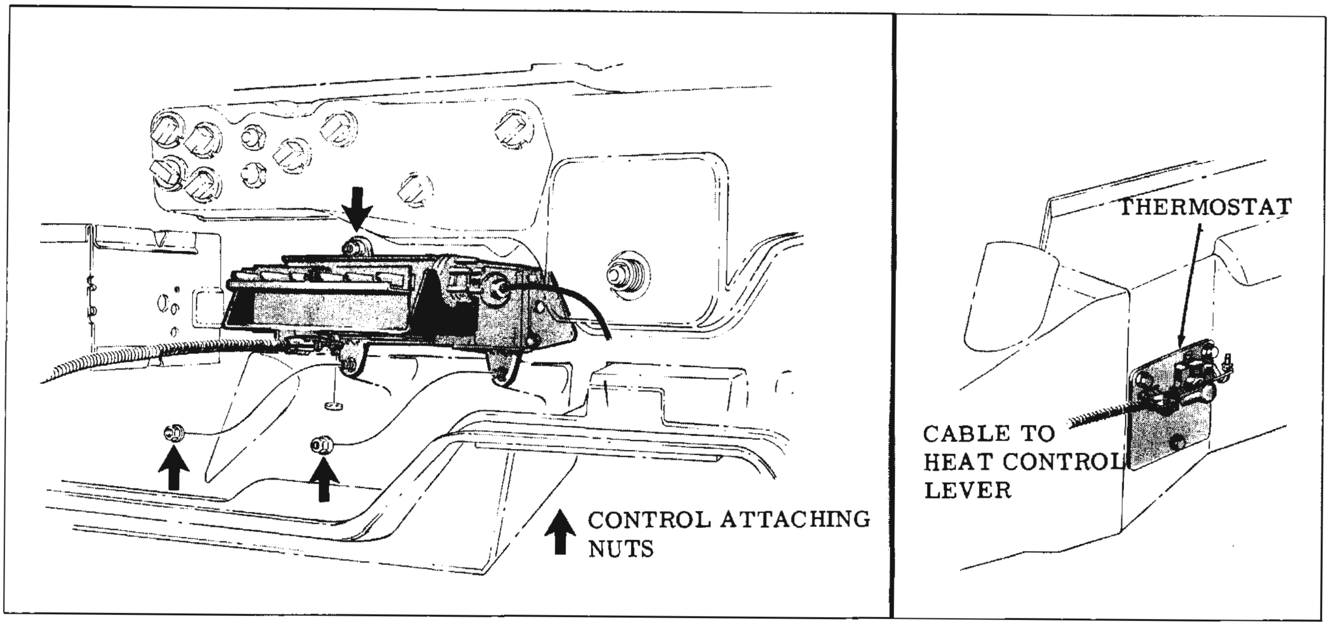


Fig. 15-8 Control Attachment

To install, reverse removal procedure and align hood.

HEATER CASE AND CORE

Remove and Install

1. Remove glove box.
2. Disconnect wiring, vacuum lines, and defroster hoses from heater case.
3. Remove the nine case to cowl attaching screws and remove heater case.
4. To remove heater core, proceed as follows:
   a. Drain radiator.
   b. Disconnect water hoses from heater core and vacuum line from heater inlet valve diaphragm.
   c. Remove the six heater inlet to cowl attaching nuts and washers and remove heater inlet assembly. (Fig. 15-7)
   d. Remove heater core from inside the passenger compartment.

To install reverse the removal procedure. Apply sealer as indicated in Fig. 15-7.

VENTILATION AND HEATING CONTROL

Remove and Install (Fig. 15-8)

1. Disconnect all vacuum lines and wiring.
2. Remove blower speed control lever.
3. Remove the attaching nuts and remove control from the rear of instrument panel.

To install, reverse removal procedure. Refer to schematic diagrams (Fig. 15-9) and (Fig. 15-10) for proper installation of hoses. Wiring and hoses must be properly routed and retained.

HEATER THERMOSTAT AND RESISTOR

Remove and Install (Fig. 15-8)

The heater thermostat attaches to the heater case with three sheet metal screws. To remove, disconnect vacuum hose and temperature control cable from thermostat and remove attaching screws.

The heater resistor is mounted on top of the heater case with two sheet metal screws. To remove, disconnect wiring connector and remove attaching screws.

To install heater thermostat and resistor, reverse removal procedure.

VACUUM TANK

A vacuum tank, located next to the heater inlet in the engine compartment, provides a constant supply of vacuum to operate the vacuum diaphragms. (Fig. 15-7) The vacuum tank is retained with two sheet metal screws.

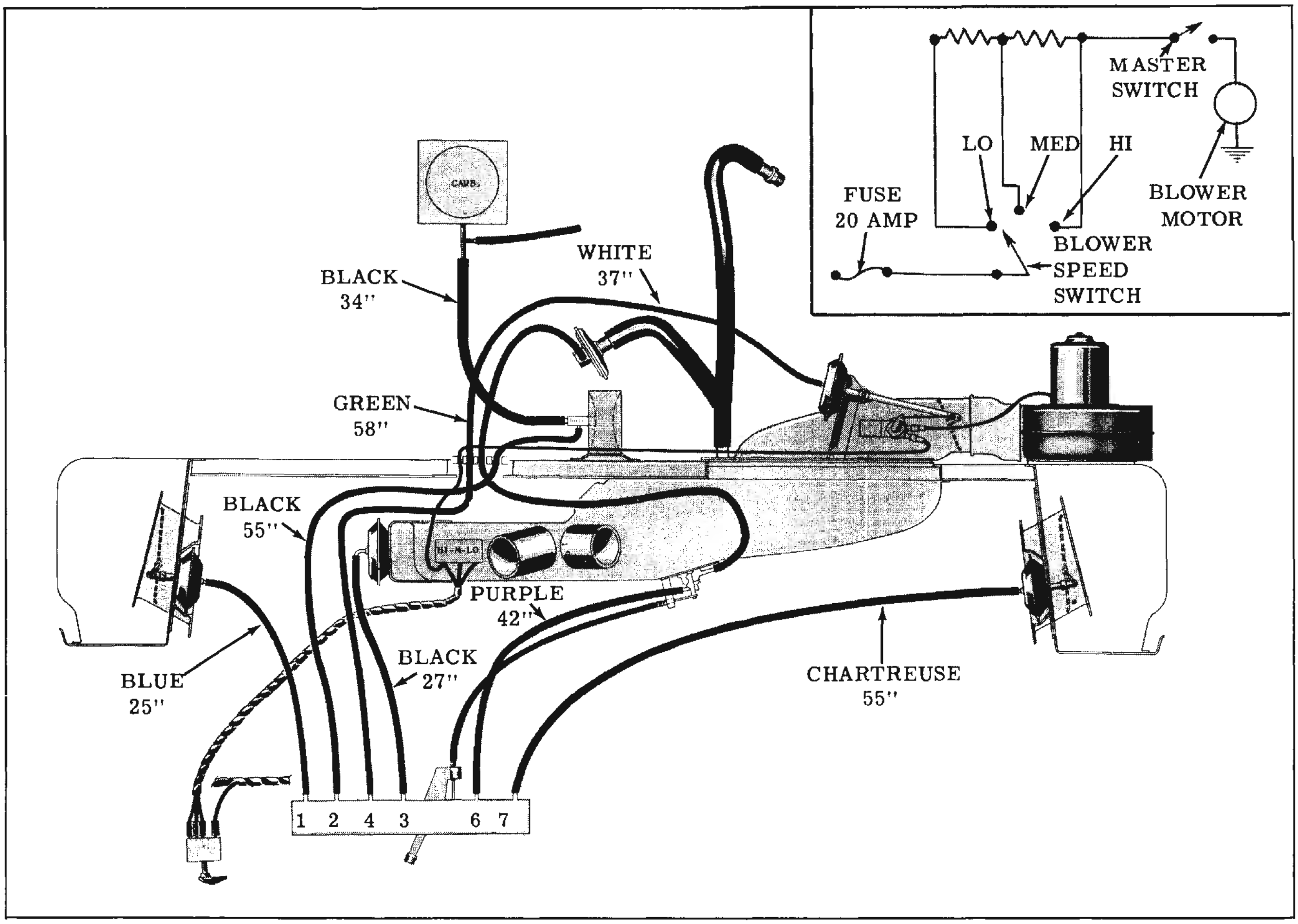


Fig. 15-9 Schematic Diagram of Heater and Ventilation

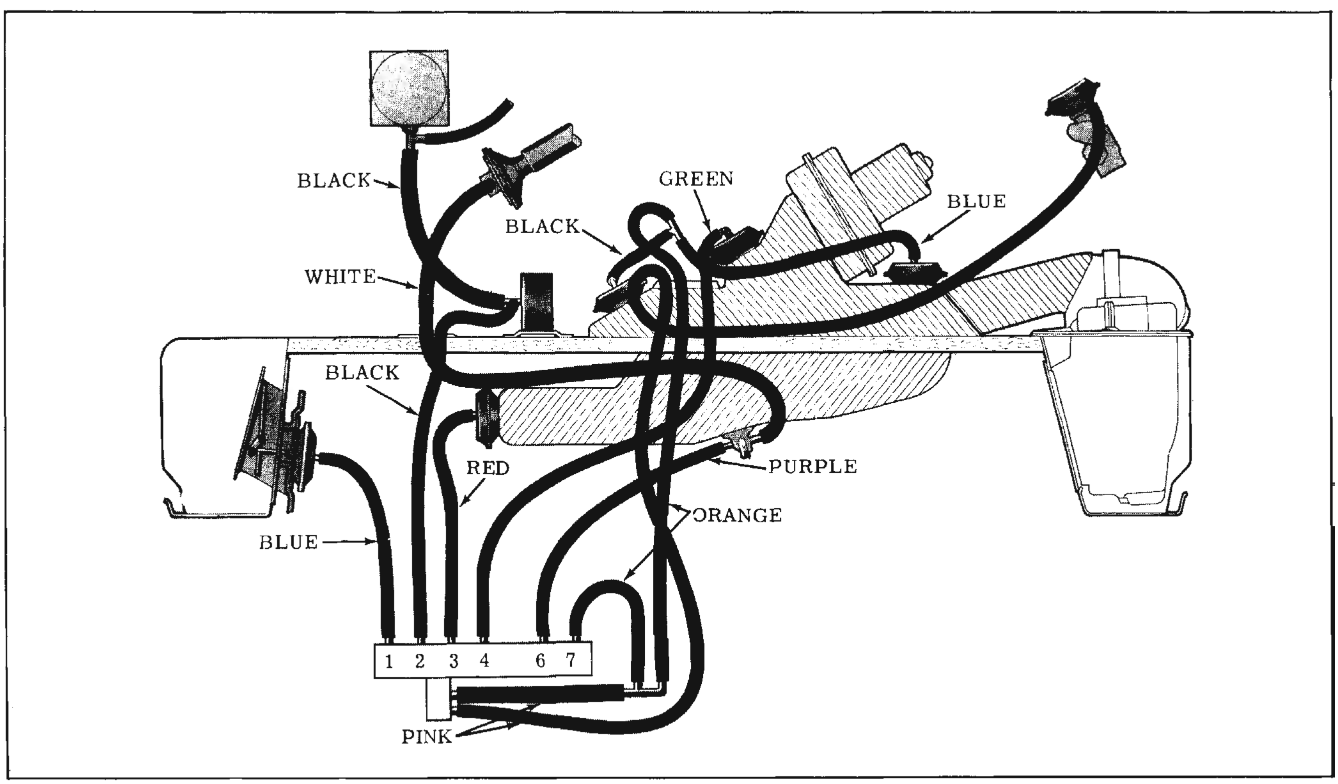


Fig. 15-10 Schematic Diagram of Heater and Air Conditioning Vacuum Hoses

VACUUM CONTROL CHART

Button Depressed	DIAPHRAGM OPERATED				
	L. H. Cowl Vent Valve	R. H. Cowl Vent Valve	Heater Inlet Valve	Water Valve	Defroster Valve
OFF					
LO			X		
MED	X		X		
MAX	X	X			
HEAT			X	X	
DEF			X	X	X

AIR CONDITIONER

PERIODIC MAINTENANCE

Remove road accumulation from condenser at every engine oil change interval or as necessary.

Check and adjust compressor belt tension at each engine oil change interval.

The system should be operated for at least five minutes every two weeks.

GENERAL DESCRIPTION

The air conditioning system provides refrigerated and dehumidified air to cool the car interior. The system uses both outside and recirculated air.

For normal cooling, "NORMAL" button depressed, 100% outside air passes through the evaporator core. For maximum cooling, "RECIR" button depressed, approximately 75% recirculated air and 25% outside air is directed through the evaporator core.

Air Outlets (Fig. 15-25)

Adjustable air outlets are located on either side of the instrument panel. The left and right air outlets may be adjusted to direct the air as desired. In addition, auxiliary side and center outlets are provided to allow additional upper level cooling. These outlets are equipped with shut-off valves. Floor cooling is provided by discharging air directly to the floor from fixed openings in the air manifold located under the instrument panel.

The air condition control assembly is mounted in the instrument panel. A three speed blower switch is located in the control assembly. (Fig. 15-26)

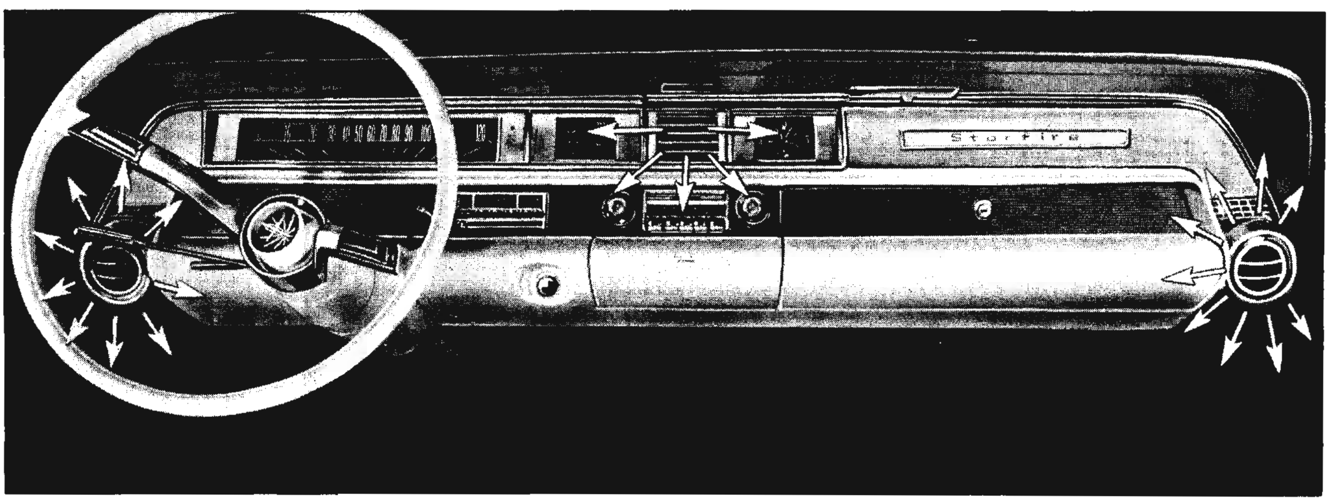


Fig. 15-25 Air Outlets

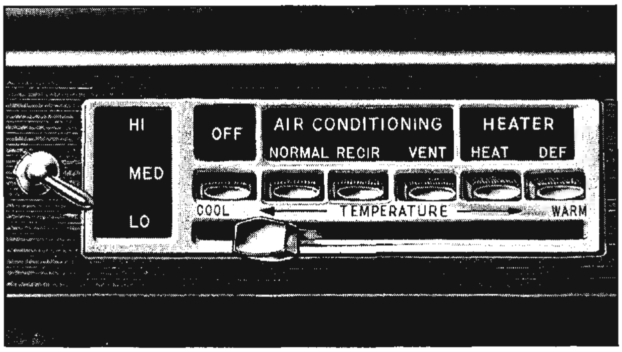


Fig. 15-26 Air Conditioner Controls

FAST COOL DOWN

To rapidly cool a car which has been standing for a period of time in the sun, open the center outlet, depress "NORMAL" button, slide temperature lever to the extreme left position and turn blower speed switch on "HI". Open car windows just long enough to expel hot air. After car has cooled, adjust temperature control lever position to suit individual comfort. Air flow can be directed by adjusting the side outlets. The recommended position of the air outlets, for best over-all front and rear seat cooling, is when the side outlets are adjusted to direct the air flow along the inside roof line, and the auxiliary side and center outlets are open.

DRIVING CONDITIONS

For normal driving conditions, the driver may adjust the temperature of cool air by moving the control lever to suit individual comfort. Selection of blower speeds should be regulated according to the amount of air forced into the passenger compartment by the forward motion of the car.

When driving in heavy traffic, it may be desirable to set the blower speed switch on "HI". At higher car speeds, air will be forced by the forward motion of the car into the passenger compartment in greater volume, lessening the speed requirements of the blower motor. It then may be deisrable to set the blower speed switch on "MED" or "LO". (Fig. 15-26).

OPERATION OF SYSTEM

COMPRESSOR

The refrigeration system uses a recirculating axial type six cylinder compressor, with intake and discharge valve reeds for each cylinder. These valve reeds cause the compressor to have a definite separation between the discharge (high) side and the suction (low) side. Oil is picked up by the refrigerant in the compressor and is pumped through the refrigeration system. A magnetic operated clutch pulley permits the compressor to run only when refrigeration is desired. The compressor is completely serviceable.

A serial number plate is attached to the top side of the compressor and includes the Serial Number and Model Number.

IMPORTANT: ALWAYS INCLUDE BOTH SERIAL NO. AND MODEL NO. ON REPORTS.

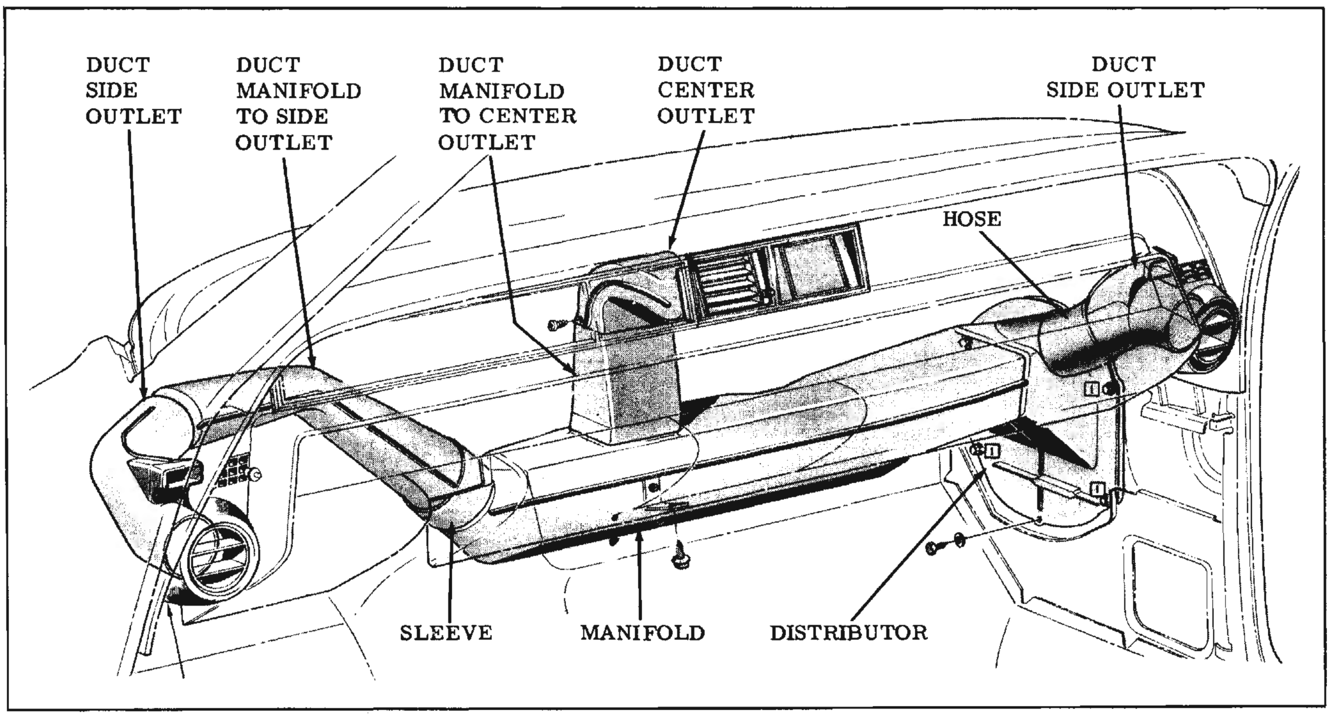


Fig. 15-27 Air Outlets

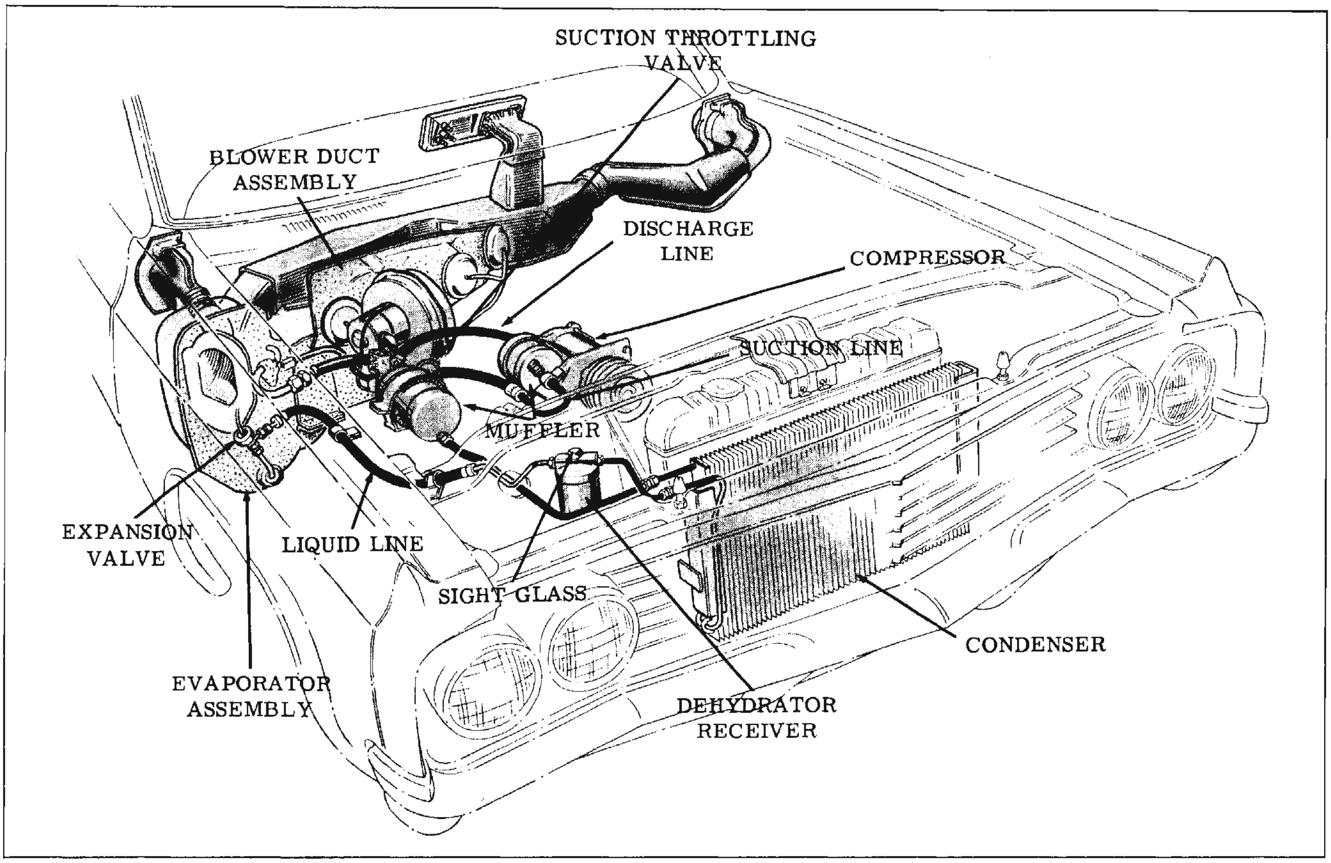


Fig. 15-28 Refrigerant System

PRESSURE RELIEF VALVE

The compressor is equipped with a pressure relief valve which is placed in the system as a safety factor. Under certain conditions, the refrigerant on the discharge side may exceed a safe operating pressure. To prevent damage, the valve is designed to open automatically at approximately 440 p.s.i. Any condition that causes this valve to open should be corrected, and the refrigerant oil and refrigerant should be replenished as necessary.

MUFFLER

Two mufflers are used in the refrigerant system to reduce compressor noises and high pressure line vibrations. No repairs are to be made on the mufflers. If muffler is defective, it should be replaced. Always install the mufflers with the outlet side down.

CONDENSER

The condenser assembly is made up of coils which carry the refrigerant, and cooling fins which provide rapid transfer of heat. The condenser is located in front of the engine cooling system radiator so that it receives a high volume of air from the movement of the car and from the engine fan. The air passing through the condenser cools the high pressure refrigerant vapor, causing it to condense into a liquid.

SIGHT GLASS

The sight glass (at the top of the dehydrator receiver) is provided to aid in diagnosis, by permitting the refrigerant to be observed. The appearance of a steady flow of bubbles or foam, after the compressor has run long enough to stabilize, indicates a shortage of refrigerant, when checking in temperatures above 75° F.

The sight glass can be serviced without removing the dehydrator receiver assembly. After removal of the retaining screw, the sight glass can be lifted out with caulking compound and the "O" ring can be removed with a wire hook.

CAUTION: When performing this operation, the system should not be left open longer than absolutely necessary as the dehydrator will absorb an excess of moisture. Refer to SERVICING OF THE REFRIGERANT SYSTEM.

DEHYDRATOR RECEIVER ASSEMBLY

The functions of this unit are to absorb moisture and foreign material that may be present in the system after assembly, and to insure a solid charge of liquid refrigerant in the line feeding the

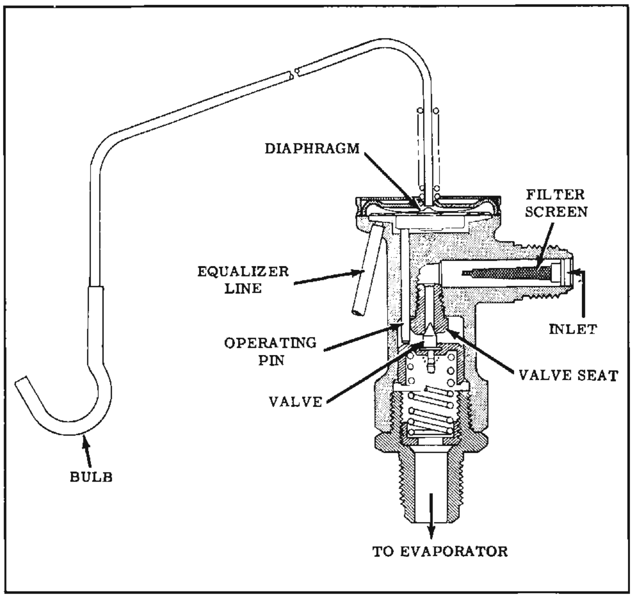


Fig. 15-29 Expansion Valve

expansion valve, providing the system is properly charged. This unit is not serviceable, and should be replaced when there has been a leak in the suction side of the system which permitted air and moisture to be drawn into the system.

EXPANSION VALVE (Fig. 15-29)

The expansion valve, mounted outside the evaporator, is an externally equalized valve, controlling the flow of refrigerant into the evaporator.

Spring force moves the valve toward the seat restricting refrigerant flow into the evaporator. A capillary tube filled with carbon dioxide provides the temperature regulation of the expansion valve. Carbon dioxide in the tube increases the pressure on the diaphragm when it senses an increase in temperature on the evaporator suction line. Movement of the diaphragm downward forces the operating pins to move the valve away from the seat allowing liquid refrigerant to enter the evaporator to maintain the desired temperature.

Equalizing pressure from the suction line is directed to the bottom side of the diaphragm and assists the spring in opposing pressure on the top of the diaphragm, and acts as a further control on the flow of refrigerant into the evaporator.

NOTE: It is important that the expansion valve capillary tube be tightly clamped to the suction line at the evaporator. Both the suction line and the capillary tube should be clean at the points of contact.

EVAPORATOR

The evaporator is a device which cools and dehumidifies the air before it enters the car. High pressure liquid refrigerant flows through the expansion valve into the low pressure area of the evaporator. This regulated flow of refrigerant boils immediately. Heat from the evaporator core surface is lost to the boiling and vaporizing refrigerant, which is cooler than the core, thereby cooling the core. The heat in the air passing through the evaporator core loses its heat to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water.

SUCTION THROTTLING VALVE (Fig. 15-30)

The suction throttling valve performs two functions in the refrigeration circuit. First, it limits the evaporator minimum pressure to prevent "freeze-up" of the evaporator coils, and second, it provides a means for controlling evaporator discharge air temperature.

The valve controls minimum evaporator pressure by throttling the flow of refrigerant through the suction line. The evaporator pressure is maintained by a balance of spring force, above the diaphragm, and evaporator pressure below the diaphragm. The valve is used as a temperature control, through the use of a vacuum diaphragm and vacuum modulator. The temperature lever actuates the vacuum modulator which in turn is connected to the suction throttling valve vacuum diaphragm by means of a vacuum hose. With the "NORMAL" or "RECIR", button depressed and the temperature lever to the right, 7" of vacuum is applied to the diaphragm and the diaphragm plus the spring in the suction throttling valve is used to maintain high evaporator pressure.

As the temperature lever is moved to the left, the vacuum is gradually reduced. This lowers the evaporator pressure. When the temperature lever is at the extreme left position, vacuum is completely shut off from the diaphragm and spring force only controls the evaporator pressure. This results in maximum cooling ability of the evaporator and consequently maximum cooling of the discharge air. The suction throttling valve should be adjusted to maintain a minimum evaporator pressure of 29.5 p.s.i.

To insure return of oil to the compressor, under partially depleted refrigerant charge conditions, an oil bleed line connects the bottom of the evaporator and the suction line at the suction throttling valve. A valve core, located in the equalizer line fitting, opens at 5 to 12 psi pressure difference allowing oil to return to the compressor.

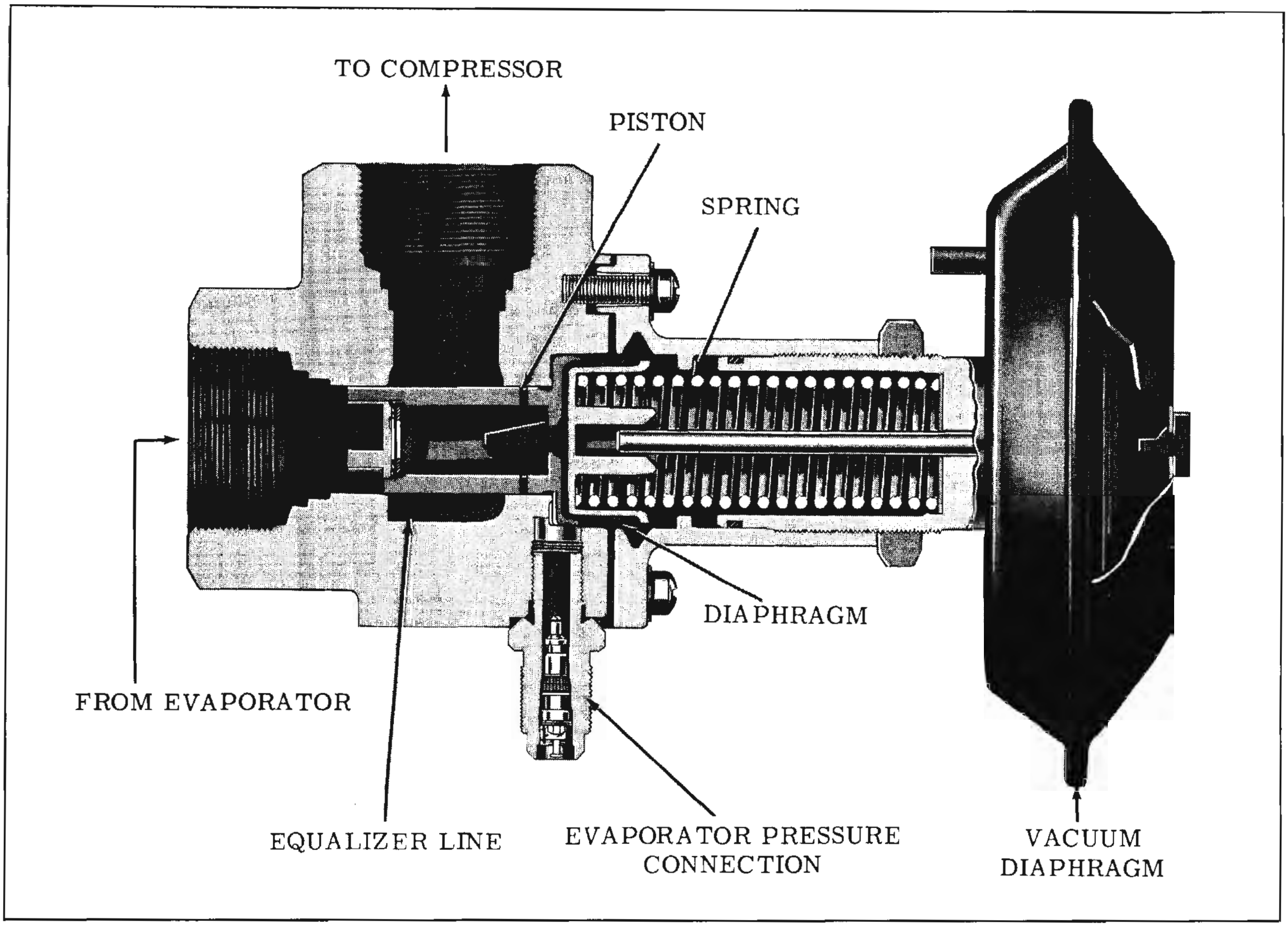


Fig. 15-30 Suction Throttling Valve

REFRIGERATION CIRCUIT (Fig. 15-31)

Heat laden, low pressure vapor refrigerant is drawn into the compressor and pumped from the compressor through the muffler to the condenser under high pressure. The vapor is heated as a result of the compression process. As it passes through the condenser, the high pressure - high temperature vapor is cooled, which causes the vapor to condense into liquid. The liquid refrigerant passes from the condenser into the dehydrator receiver which acts as a reservoir. The liquid in the receiver is still under high pressure.

Liquid refrigerant from the receiver now passes on to the expansion valve. The expansion valve meters refrigerant into the evaporator core. When the pressure in the evaporator is reduced, the liquid refrigerant immediately begins to boil at low temperature as it enters the evaporator. As the refrigerant passes through the evaporator, it continues to boil, absorbing heat from (and thereby cooling) the air passing through the evaporator core. By the time the refrigerant leaves the evaporator, it has completely vaporized and has warmed approximately 6° F.

Refrigerant returns from the evaporator through the suction pressure line to the compressor. When the evaporator pressure drops below 29.5 p.s.i. the suction throttling valve restricts the flow of refrigerant to the compressor, thereby raising the evaporator pressure to prevent freezing of the core. It is this same action that regulates the amount of cooling when the temperature lever on the instrument panel is gradually moved to the right.

PRECAUTIONS IN HANDLING REFRIGERANT 12 (TYPICAL OF F-85)

Do Not Leave Refrigerant Drum Uncapped

All refrigerant drums have a metal screw cap. This cap protects the valve and safety plug from damage; therefore, the protective cap should always be replaced when the drum is not in use.

Do Not Subject Drum to High Temperature

The drum should not be exposed to the radiant heat of the sun, for the resulting increase in

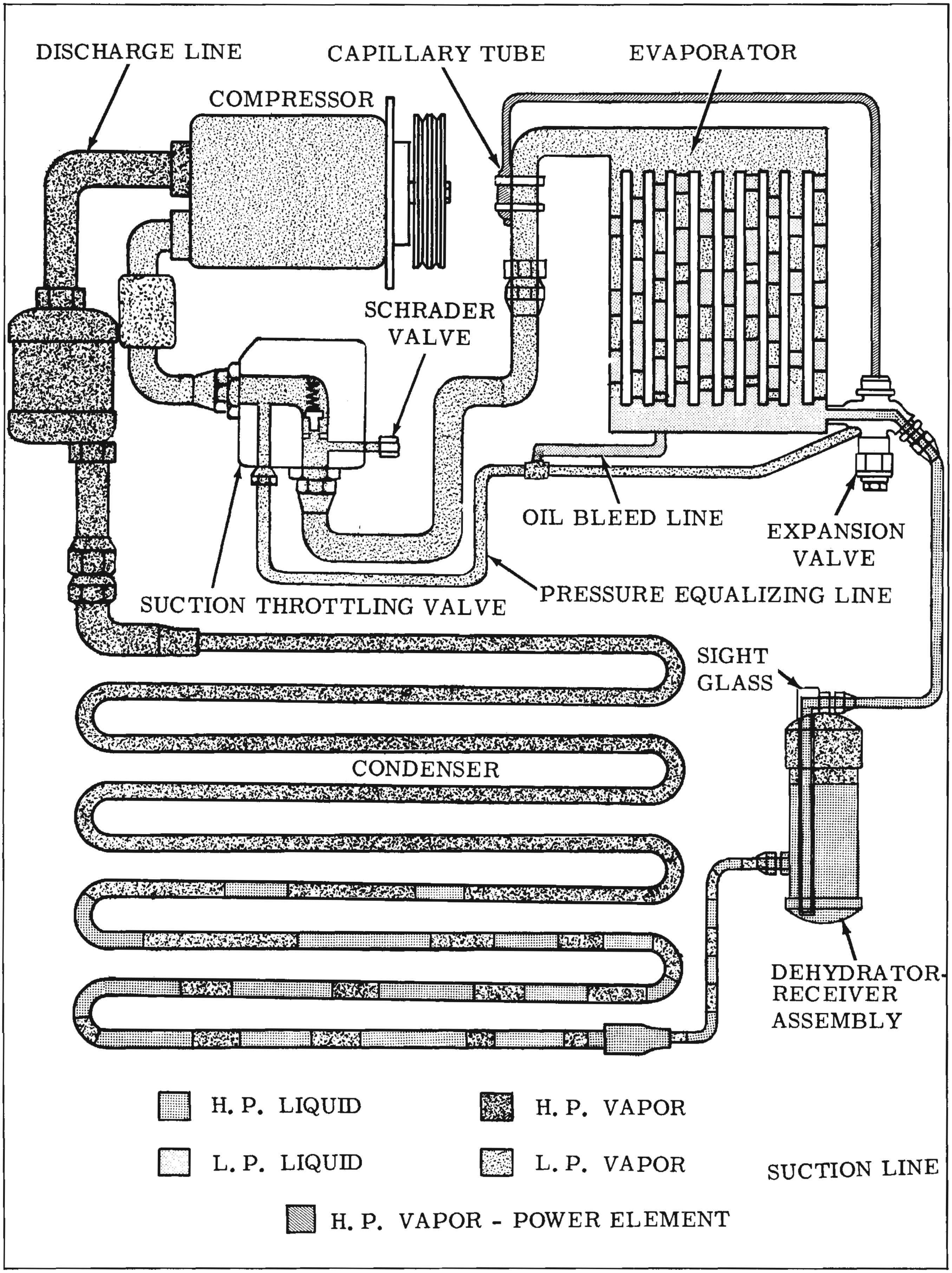


Fig. 15-31 Refrigeration Circuit

pressure may cause the safety plug on the drum to burst.

The refrigerant drum should never be subjected to excessive temperature when charging a system. The drum should be heated for charging purposes by placing in 125°F. water. Never heat above 125°F. or use a blow torch, radiator, or stove to heat the drum.

Do Not Weld or Steam Clean On or Near the System

Welding or steam cleaning of, or near, any of the refrigerant lines or components of the refrigerant system can build up dangerous pressures in the system.

Do Not Fill the Drum Completely

When filling a small drum from a larger one, always allow space above the liquid for expansion. If the drum were completely filled and the temperature increased, tremendous hydraulic force would develop.

Do Not Discharge Vapor Into Area Having Exposed Flame

Large quantities of refrigerant 12 should not be discharged into a closed room. The refrigerant may displace the oxygen in the air. Also, heavy concentrations of refrigerant 12 in contact with a live flame, such as a gas heater, or drawn into the intake of a running engine will produce a poisonous gas. This gas will also tarnish all bright metal surfaces.

Do Not Expose Eyes to Refrigerant

One of the most important precautions is protection of the eyes when handling refrigerant. Any liquid refrigerant which may accidentally escape is approximately 21.7° F. below zero. If any refrigerant comes in contact with the eyes, serious injury could result. Always wear goggles to protect the eyes when handling refrigerant.

If refrigerant should come in contact with the eyes:

1. DO NOT rub the eyes. Splash the eyes with cold water to gradually get the temperature above the freezing point.
2. Apply a protective film of an antiseptic oil over the eye ball to reduce the possibility of infection.
3. Consult a doctor or an eye specialist immediately.

Should liquid refrigerant come in contact with the skin, the injury should be treated the same as though the skin had been frostbitten or frozen.

MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM

The efficient operation of the air conditioning refrigeration system is dependent on the pressure-temperature relationship of pure refrigerant. As long as the system contains only pure refrigerant (plus a certain amount of compressor oil which mixes with the refrigerant), it is considered to be chemically stable.

When foreign materials, such as dirt, air or moisture are allowed to get into the system, they will affect chemical stability, resulting in acids or sludge which could cause the expansion valve to freeze up, and change the pressure-temperature relationship of the refrigerant. Thus, the system will no longer operate at the proper pressures and temperatures, and the efficiency will decrease and parts deteriorate.

The following general practices should be observed to insure chemical stability in the system:

Keep Lines Sealed

When disconnecting refrigerant lines, the lines should be at, near or above surrounding room temperature to prevent formation of condensation inside the lines. The lines should also be immediately capped to prevent entrance of dirt or foreign material.

Keep Tools Clean

Tools should be kept clean and dry. This includes the gauge set and replacement parts. Keep gauge lines plugged.

Use Clean Dry Oil Container

When adding oil to compressor, the container should be exceptionally clean and dry due to the fact that refrigeration oil is as moisture-free as possible; therefore, it will quickly absorb any moisture with which it comes in contact.

Keep Oil Container Capped

The oil container should not be opened until ready for use and should be capped immediately after use to reduce the possibility of the oil absorbing moisture.

Do Not Keep System Open Longer Than Five Minutes

PRECAUTION IN HANDLING LINES

All line connections use "O" rings for sealing. Replacement lines must be checked to see if they are completely sealed and dehydrated. Refrigerant lines must be free of kinks which would restrict the flow of refrigerant and cause noise.

Insulated clamps are used to reduce vibration and it is important to reinstall all the clamps when a line is replaced. Tightening connections is very important and the proper size wrenches should be used. The opposing fitting should always be held with a wrench to prevent distortion of connecting lines or components. This is especially important in tightening a hose connection as twisting a hose stiffens it and permits it to transmit more vibration. ALWAYS USE TWO WRENCHES WHEN TIGHTENING OR LOOSENING LINE FITTINGS. "O" rings should be coated with refrigeration oil and installed on the line before the line is inserted into the fitting, to insure proper sealing. Torque "O" ring fittings as follows:

TORQUE IN FT. LBS.

TUBE O.D.	SWIVEL NUT ON STEEL TUBE	SWIVEL NUT ON ALUMINUM TUBE
1/4"	10 to 15	5 to 7
3/8"	30 to 35	11 to 13
1/2"	30 to 35	11 to 13
5/8"	30 to 35	18 to 21
3/4"	30 to 35	23 to 28
For steel and aluminum connections, use aluminum torque specifications.		

CAUTION: ALWAYS WEAR SAFETY GOGGLES WHEN OPENING REFRIGERANT LINES.

In the event any line is opened to atmosphere, it should be IMMEDIATELY capped to prevent entrance of moisture and dirt.

SPECIAL EQUIPMENT (TYPICAL OF F-85)

REFRIGERATION GAUGE SET (Fig. 15-32)

The gauge set is used when discharging, evacuating, charging, or diagnosing trouble in the system. The low pressure gauge is graduated into pounds of pressure from 0 to 100 and in the opposite direction in inches of vacuum from 0 to 30. The high pressure gauge is graduated from 0 to 300 pounds pressure. The center connection

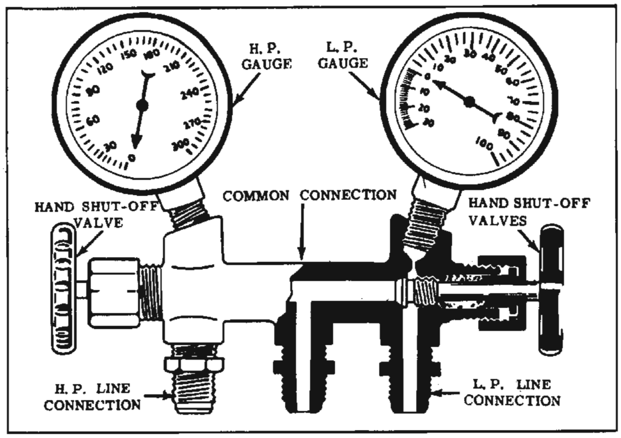


Fig. 15-32 Gauge Set

is common to both and is for the purpose of attaching a line for adding refrigerant or evacuating the system. When this connection is not required, it should be capped with a flare nut and cap.

The shut-off valves close each opening to the connector and to each other. They DO NOT open or close off pressure to the gauges.

LEAK DETECTOR (TORCH)

The leak detector (torch) is used to locate a leak in any part of the refrigerant system. To operate, the detector is ignited and the sampling tube is held close to all possible points of leakage (fittings, connections, etc.). If the flame changes color, particularly green, brilliant blue, or purple, refrigerant is being drawn into the sample tube, indicating a leak.

CAUTION: DO NOT BREATHE THE FUMES THAT ARE PRODUCED BY THE LEAK DETECTOR AS THEY ARE POISONOUS.

CAUTION: The valve should never be closed tightly when the needle is hot because the needle will "freeze" when the burner cools and the valve seat will be damaged.

For confined areas, such as sections of the evaporator and condenser, the alcohol torch or a Bernz-O-Matic torch is the only method which can be used.

LEAK DETECTOR (LIQUID)

There are a number of fittings and places throughout the air conditioning unit where leak detector solution (Part No. 564255) may be used to pinpoint leaks.

Apply the solution to the suspected area with a swab that is attached to the bottle cap. Bubbles will form within seconds if there is a large leak.

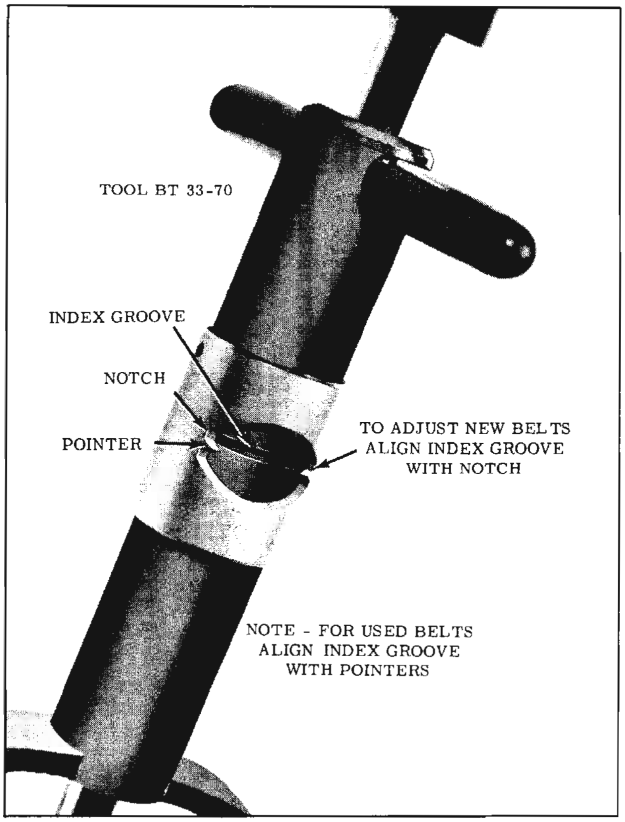


Fig. 15-33 Belt Adjustment

VACUUM PUMP

If a leaking system has been operated in a discharged condition, the receiver dehydrator assembly should be replaced and a vacuum pump should be used to thoroughly evacuate the system.

SERVICING OF INDIVIDUAL UNITS (NOT IN REFRIGERANT SYSTEM)

The following services and repairs concern parts of the air conditioning system which can be serviced without opening the refrigerant system.

COMPRESSOR BELT ADJUSTMENT

Tool 33-70 is used to check the compressor belt tension.

If belts require adjustment:

1. Loosen the Delcotron bracket bolt and link.

2. Pivot the Delcotron until the belt tension indicated in Figure 15-33 is obtained.

3. Tighten the Delcotron bracket bolt and adjusting link.

4. Check the other belt, if it is outside the gauge limits, replace both belts as a matched set.

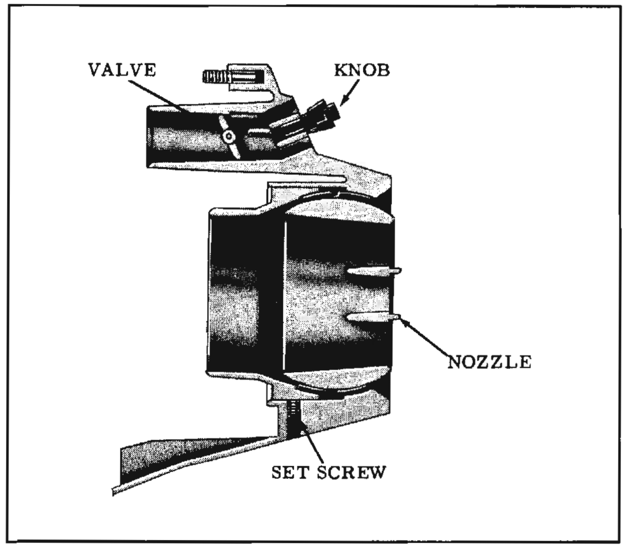


Fig. 15-34 Side Air Outlet

SIDE OUTLETS

Adjustment (Fig. 15-34)

Nozzles should be free to rotate but tight enough to remain in a set position. If the tension is insufficient:

1. Loosen set screw at bottom through opening in housing.

2. From behind instrument panel, push in retainer to tighten or pull out to loosen ball adjustment.

3. Tighten set screw.

AIR OUTLETS (Fig. 15-35)

SIDE OUTLET

Remove and Install

1. Remove the instrument panel side molding. NOTE: For L.H. molding, loosen instrument cluster. For R.H. molding, loosen center outlet and clock bezel.

2. Remove the side outlet duct.

3. Remove the side outlet attaching screws and remove outlet.

To install, reverse the removal procedure.

CENTER OUTLET OR DUCT

Remove

1. Remove the manifold to instrument lower

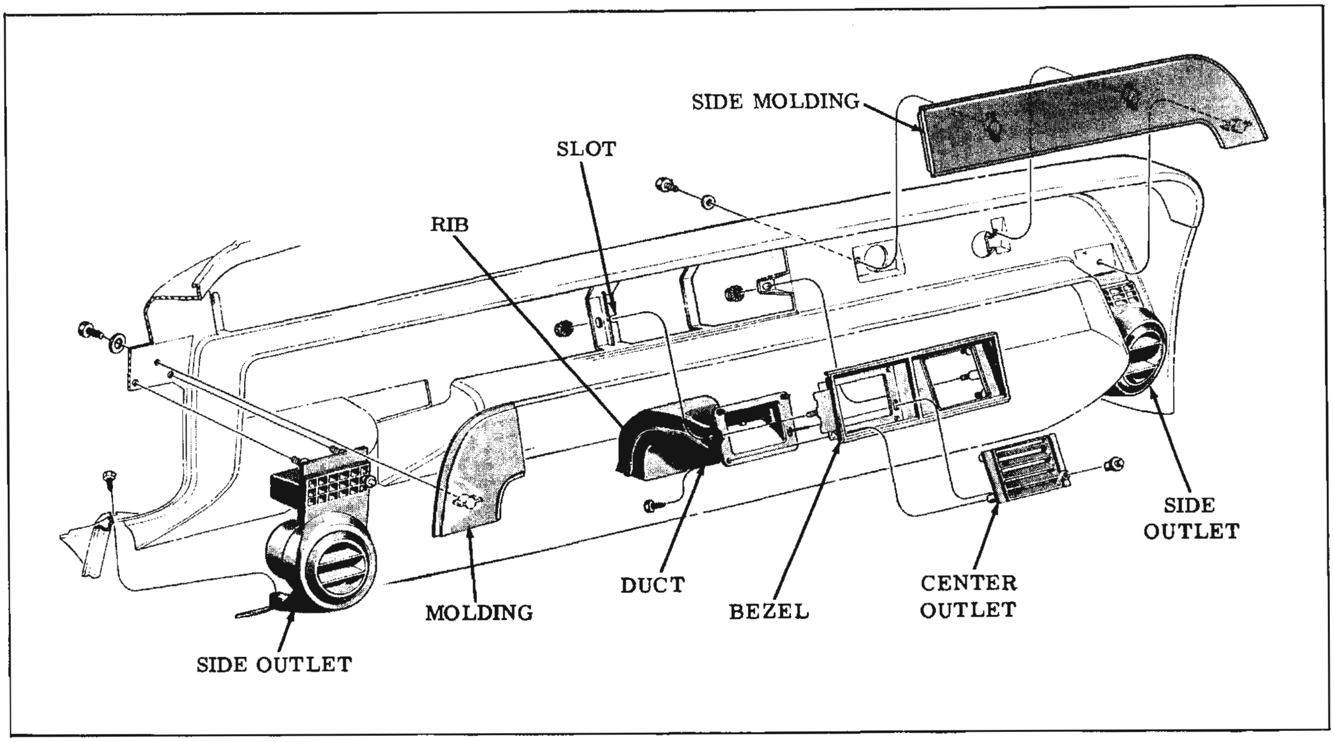


Fig. 15-35 Air Outlets and Controls

panel attaching screw.

2. Remove the center outlet duct to manifold duct attaching screw. If equipped with clock, disconnect clock wire and bulb.

3. Remove the center outlet and clock bezel to instrument panel attaching screws.

4. Push clock side of bezel out slightly to prevent tang on bezel from interfering with instrument cluster bezel.

5. Tip bezel downward and withdraw complete assembly from instrument panel.

NOTE: When withdrawing bezel assembly, rib on side of duct must be in the bezel attaching bolt slot.

6. Remove duct and center outlet from bezel.

Install

1. Install the duct and center outlet on the bezel.

2. Position the rib on the side of the duct in the bezel attaching bolt slot.

3. Position the bezel assembly into the instrument panel.

4. While holding clock end of bezel away from the instrument panel, position the tang of the bezel under the instrument cluster bezel.

5. Install all attaching nuts and screws and clock wire and bulb, if so equipped.

COMPRESSOR CLUTCH SWITCH

Adjustment (Fig. 15-36)

The compressor clutch switch is actuated by the sliding lever in the control assembly. The switch should close when the lever is moved 3/16" from the extreme right position. If necessary to adjust, loosen the two attaching screws and rotate

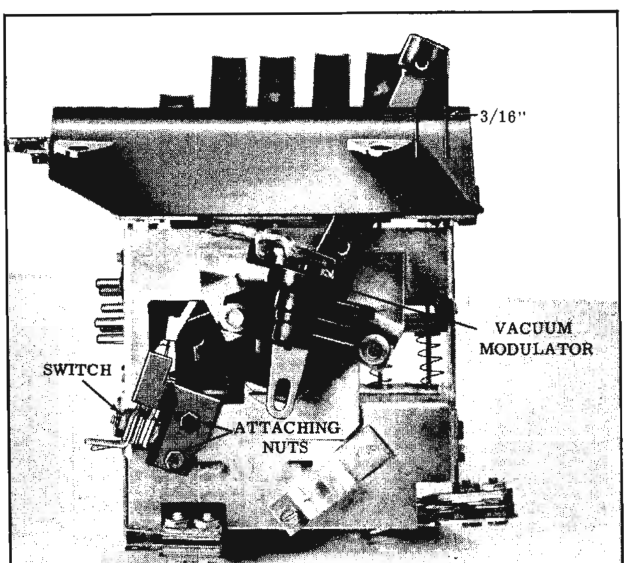


Fig. 15-36 Compressor Clutch Switch Adjustment

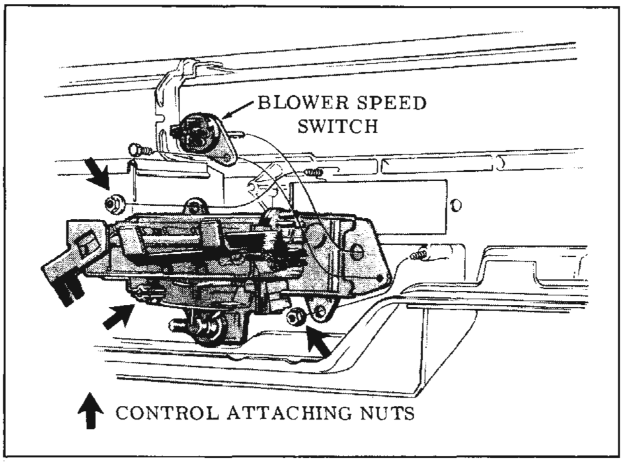


Fig. 15-37 Control Assembly Installation

switch into correct position. Tighten screws.

CONTROL ASSEMBLY

Removal and Installation (Fig. 15-37)

1. Remove the two control attaching nuts from behind the instrument panel.

2. Remove control assembly from instrument panel.

3. Remove vacuum hoses, wires and light socket from control assembly.

4. To install, reverse removal procedure. Refer to Fig. 15-83, for proper installation of hoses.

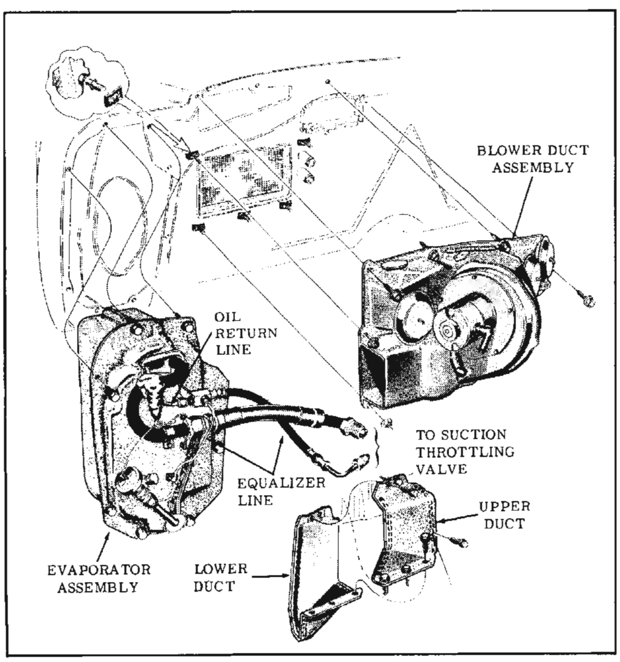


Fig. 15-38 Blower Duct Assembly

BLOWER MOTOR

The blower motor assembly is mounted on the blower duct at the right side of the cowl in the engine compartment. To remove the motor and blower, remove the five motor to case attaching screws, disconnect the motor lead at the connector and remove the motor ground wire screw.

BLOWER DUCT ASSEMBLY

Removal and Installation (Fig. 15-38)

1. Disconnect battery ground cable.

2. Remove air cleaner.

3. Remove vacuum hoses from three diaphragms on duct, and disconnect wiring at resistor.

4. Disconnect motor lead at connector and remove motor ground wire screw.

5. Disconnect heater hoses at heater core. Wire the upper hose above coolant level. Drain coolant from heater core into a small container.

6. Remove wires and windshield washer hoses from clips at top of duct.

7. Remove six screws from upper to lower duct, then remove upper duct.

8. Remove nuts and screws holding duct assembly to cowl, then remove duct assembly.

9. Remove the lower duct from blower duct assembly.

When installing, reverse removal procedure. Be sure rubber gasket is in place on blower duct, and reseal upper and lower duct.

DIAPHRAGM ADJUSTMENTS (Blower Duct Assembly Removed)

The three vacuum diaphragms mounted on the blower duct are pre-set prior to assembly and no adjustment is possible until the blower duct assembly is removed.

Diverter Valve (Fig. 15-39)

With the diverter valve held closed by spring tension, loosen set screw and pull diverter valve diaphragm link out until it is not quite fully extended, then tighten set screw.

Outside Air Valve (Fig. 15-40)

With the outside air valve closed by spring

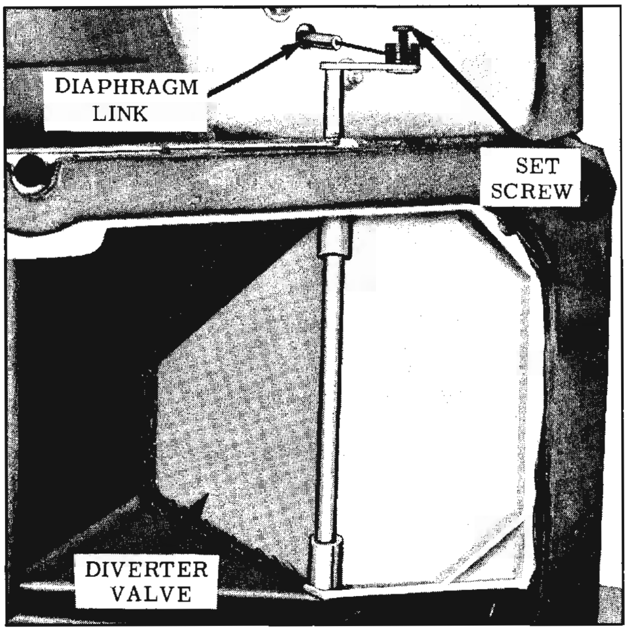


Fig. 15-39 Diverter Valve Adjustment

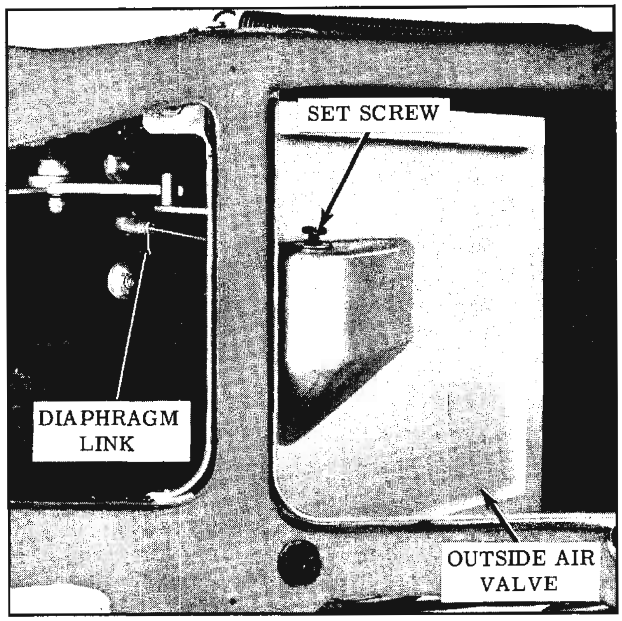


Fig. 15-41 Recirculating Air Valve Adjustment

tension, loosen the set screw and pull outside air valve diaphragm link out until it is not quite fully extended, then tighten set screw.

Recirculating Air Valve (Fig. 15-41)

With set screw loosened, position outside air valve open 1-3/32" from edge of door opening. A wood block 1-3/32" wide can be used as a gauge for this dimension. Push recirculating diaphragm link all the way in and tighten set screw. With outside air valve open 1-3/32" and the diaphragm link pushed all the way into the diaphragm, the lever should just contact the pin.

CLUTCH, PULLEY, AND COIL (TYPICAL OF F-85)

The following procedures can be performed with the compressor either on or off the car. When working with the compressor on the car, the compressor should be disconnected from the mounting bracket and tipped upward to provide adequate working clearance.

DRIVEN PLATE

Removal

1. Using a thin wall socket, remove the locknut from the compressor shaft. Use Tool J-972-A to hold driven plate.
2. Install Puller J-9401 into hub of driven plate. Hold main body of tool and turn forcing screw clockwise to remove driven plate. (Fig. 15-42)
3. Remove tool from hub of driven plate.

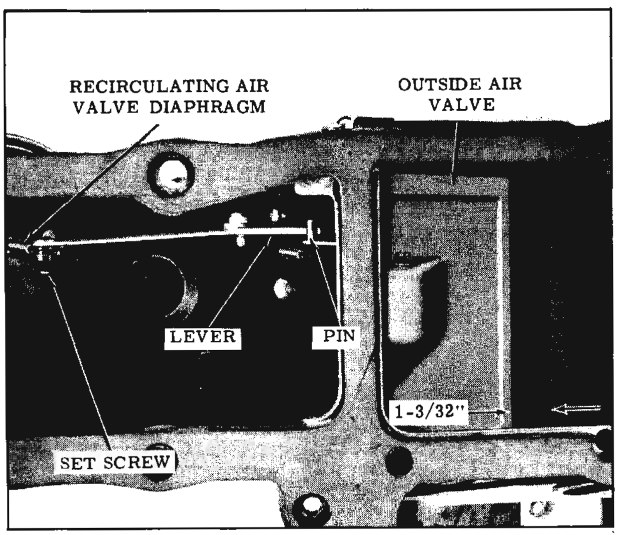


Fig. 15-40 Outside Air Valve Adjustment

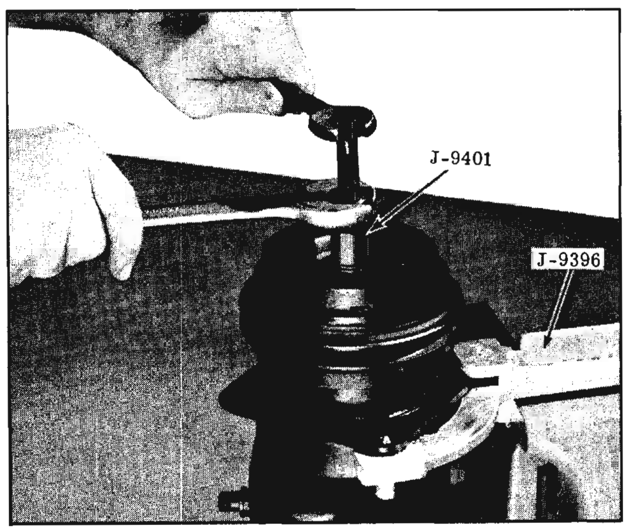


Fig. 15-42 Removing Driven Plate

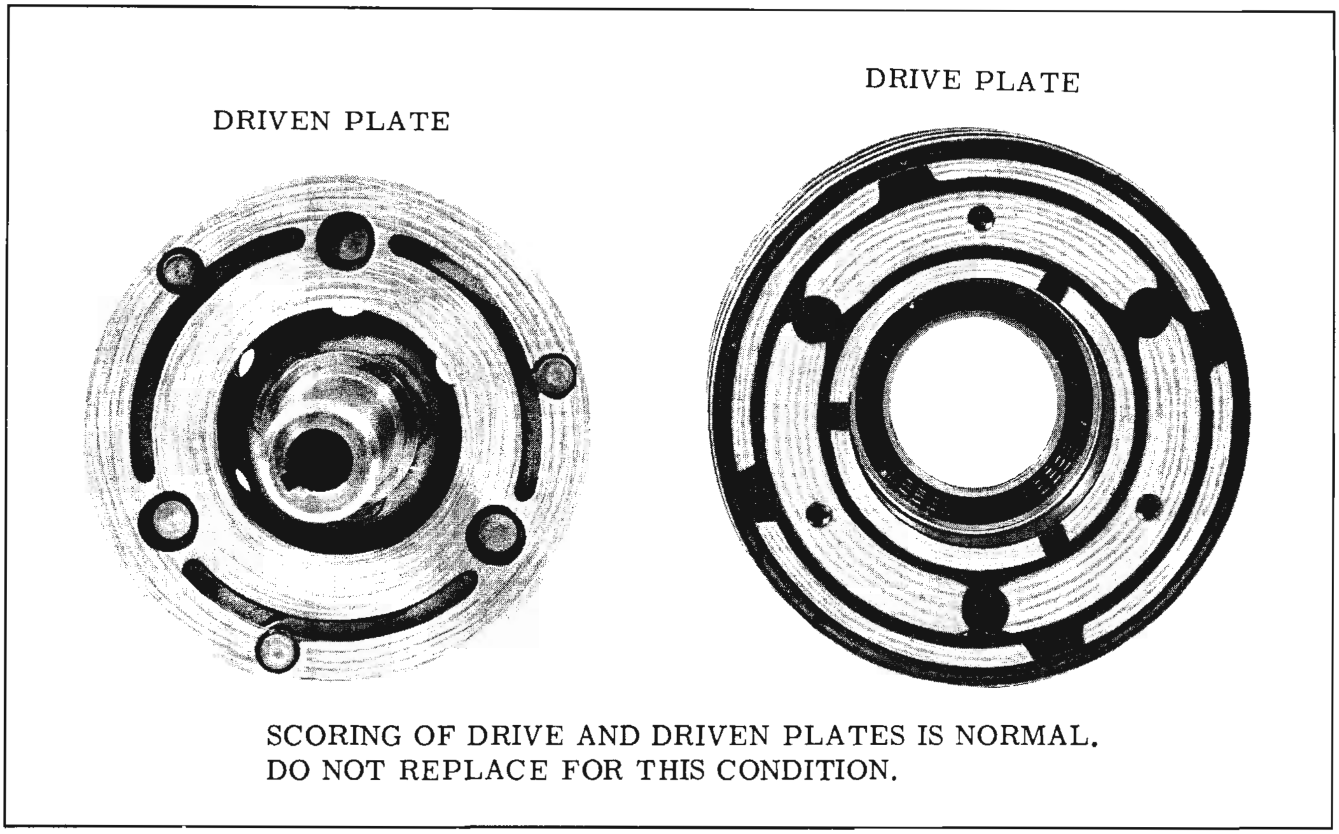


Fig. 15-43 Normal Clutch Plate Wear

4. Remove the retaining ring and spacer washer from inside the driven plate.
5. Remove key from either the compressor shaft or the driven plate.
6. Inspect driven plate for cracks or stresses in the resilient drive. Do not replace driven plate for a scoring condition. (Fig. 15-43).

Installation

1. Insert the square drive key into the hub of driven plate, allow it to project approximately 3/16" out of the keyway.
2. Line up the key in the hub with keyway in the shaft. (Fig. 15-44)
3. Position the Driven Plate Installing Tool J-9480 on the threaded end of the shaft. The "Free" Washer, J-9480-2, should be in place under the hex nut on the tool. This tool has a lefthand thread on the body. (Fig. 15-45).
4. Press the driven plate onto the shaft until there is approximately 3/32" space between the frictional faces of the clutch plates.
5. Remove installing tools.
6. Install hub spacer washer and snap ring.
7. Install the locknut, using a thin wall socket. Tighten 14 to 16 ft. lbs. torque. The air gap between the friction faces should now be between .022" to .057" clearance. (Fig. 15-46)

DRIVE PLATE AND PULLEY ASSEMBLY

Removal

1. With the driven plate removed, remove the

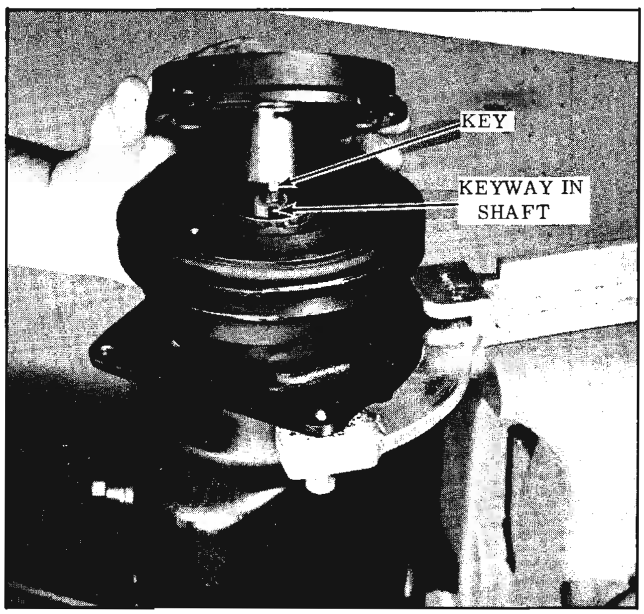


Fig. 15-44 Aligning Driven Plate Key

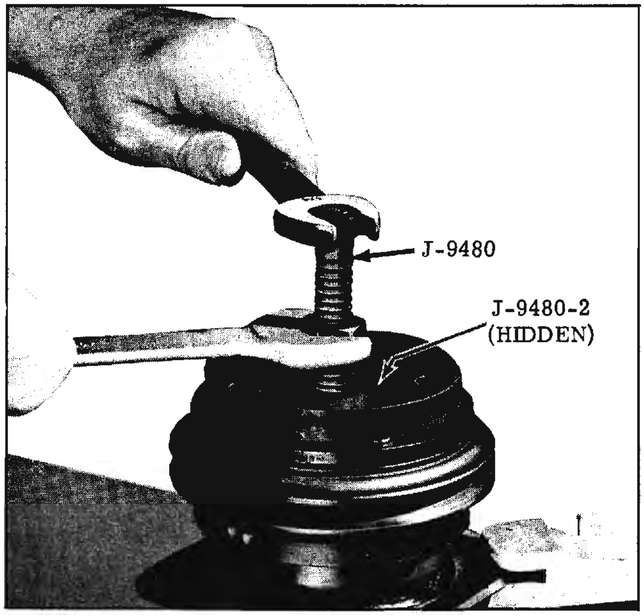


Fig. 15-45 Installing Driven Plate

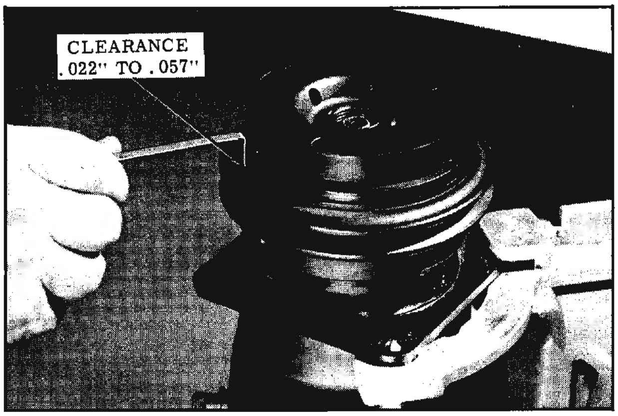


Fig. 15-46 Checking Air Gap

Fig. 15-47 Removing Pulley Retaining Ring

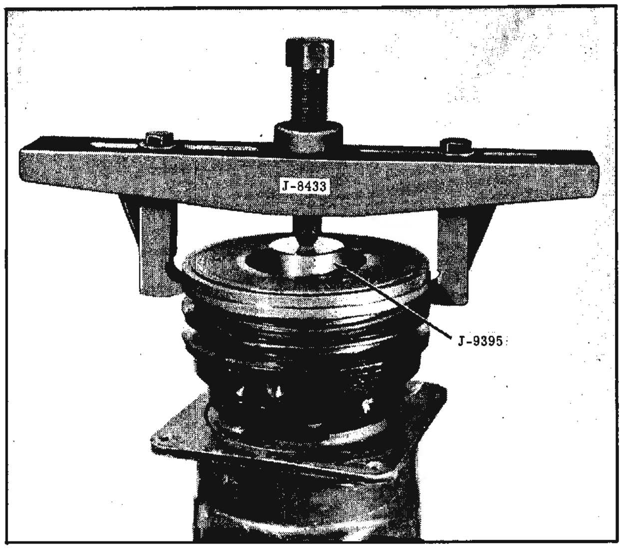


Fig. 15-48 Removing Pulley and Drive Plate

pulley retaining ring with Tool J-6435. (Fig. 15-47)

2. Insert Pilot J-9395 over shaft then remove pulley with Puller J-8433. (Fig. 15-48)

3. If necessary to remove the pulley bearing, proceed as follows:

   a. Remove the bearing retaining ring.

   b. Drive out bearing with brass drift.

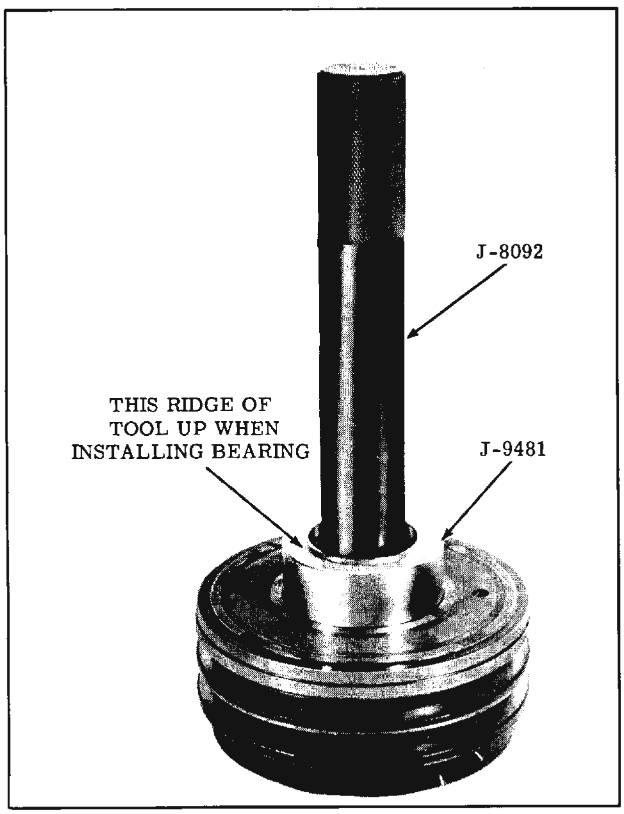


Fig. 15-49 Installing Pulley and Drive Plate Bearing

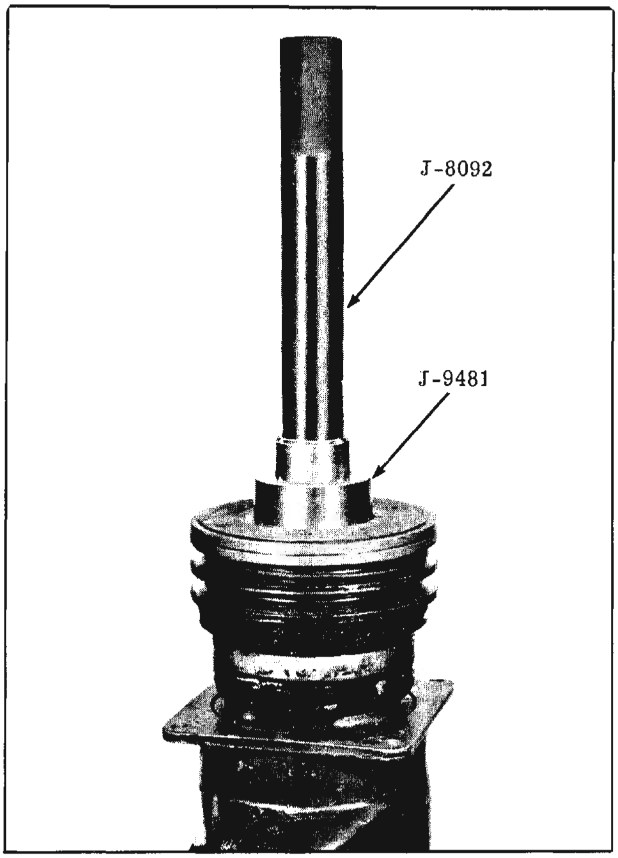


Fig. 15-50 Installing Pulley and Drive Plate on Compressor

c. Install new bearing as shown in Fig. 15-49, then install retaining ring.

Installation

1. Install the pulley and bearing assembly on the end of the compressor, with Tool J-9481. (Fig. 15-50) The pulley should rotate freely.
2. Install the pulley retaining ring with Tool J-6435.

CLUTCH COIL AND HOUSING

Removal

1. With the driven and drive plates removed, scribe the clutch coil housing and compressor housing.
2. Remove the clutch coil housing retaining ring with Tool J-6435. (Fig. 15-51)
3. Remove coil housing assembly.

Installation

1. With the scribe marks aligned, locate the extrusions on the coil housing with the holes in the front head.

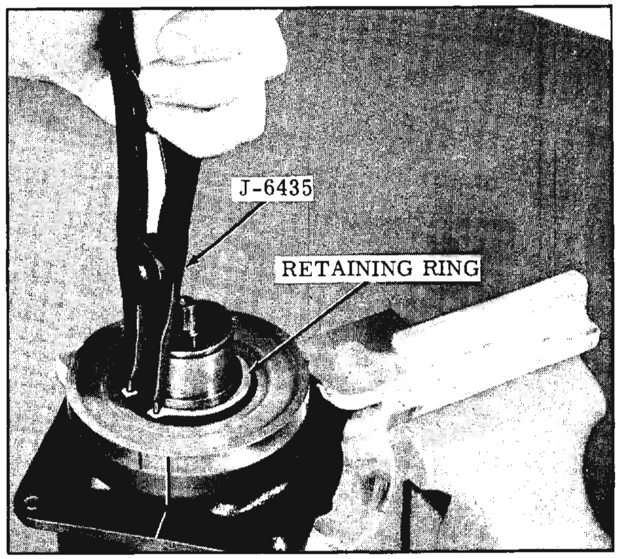


Fig. 15-51 Removing Coil Housing Retaining Ring

2. Install the coil retainer ring with Tool J-6435.

SERVICING OF THE REFRIGERANT SYSTEM (TYPICAL OF F-85)

In removing and replacing any part of the refrigerant system, the following operation must be performed.

1. Discharge the system by releasing the refrigerant to atmosphere.
2. Remove and replace the defective part.
3. Evacuate the system of air and moisture.
4. Charge the system with refrigerant 12.
5. Leak test connections which were disconnected.

DISCHARGING THE SYSTEM (TYPICAL OF F-85)

1. With the engine stopped, remove protective caps from compressor discharge and suction Schrader valves. (Fig. 15-52)
2. Connect gauge set J-5725 with Schrader valve adapters J-5420 to the suction and discharge Schrader valve fittings at the compressor.

   CAUTION: When connecting the gauge set to the Schrader valve adapters, use a cloth as a guard to divert escaping refrigerant.

3. Crack open both high and low pressure gauge valves and allow refrigerant to escape through the center outlet of the gauge set.

to charge to drum pressure.

4. With transmission in "neutral" ("park" if car has Hydra-Matic) and the parking brake applied, start engine and set speed at 1600 r.p.m.

5. Depress the "NORMAL" button, slide the temperature control fully to the left and turn blower speed switch to the high position.

6. Close low pressure valve in gauge set at frequent intervals to be certain pressure in low side of system is always maintained above 5 p.s.i.

7. When 4-1/4 lbs. of refrigerant has entered the system, close the refrigerant drum valve and the low pressure gauge valve.

8. Remove the gauge set, install the protective caps on the Schrader valve and gauge fittings.

   CAUTION: When disconnecting Schrader valve adapters from system use a cloth as a guard to divert escaping refrigerant.

9. After the system is charged, a performance check should be made. Observe particularly for excessive head pressures.

SUCTION THROTTLING VALVE (Fig. 15-54)

Disassembly

1. Discharge refrigerant system.

2. Remove the valve assembly from the car.

3. Loosen vacuum diaphragm locknut, then remove vacuum diaphragm from valve assembly.

   NOTE: Diaphragm assembly is under spring tension. Apply pressure to diaphragm when removing.

4. Remove and discard "O" ring from diaphragm.

5. Remove spring and washer.

6. Remove diaphragm cover attaching screws, then remove cover, retainer cup, diaphragm and piston.

7. Remove Schrader valve from fitting.

8. Thoroughly clean valve body and piston with cleaning solvent and blow out all passages and screen with compressed air.

ASSEMBLY

1. Insert piston and diaphragm into valve body.

2. Position retainer cup into diaphragm, open end out, then install the diaphragm cover and retain loosely with the attaching screws.

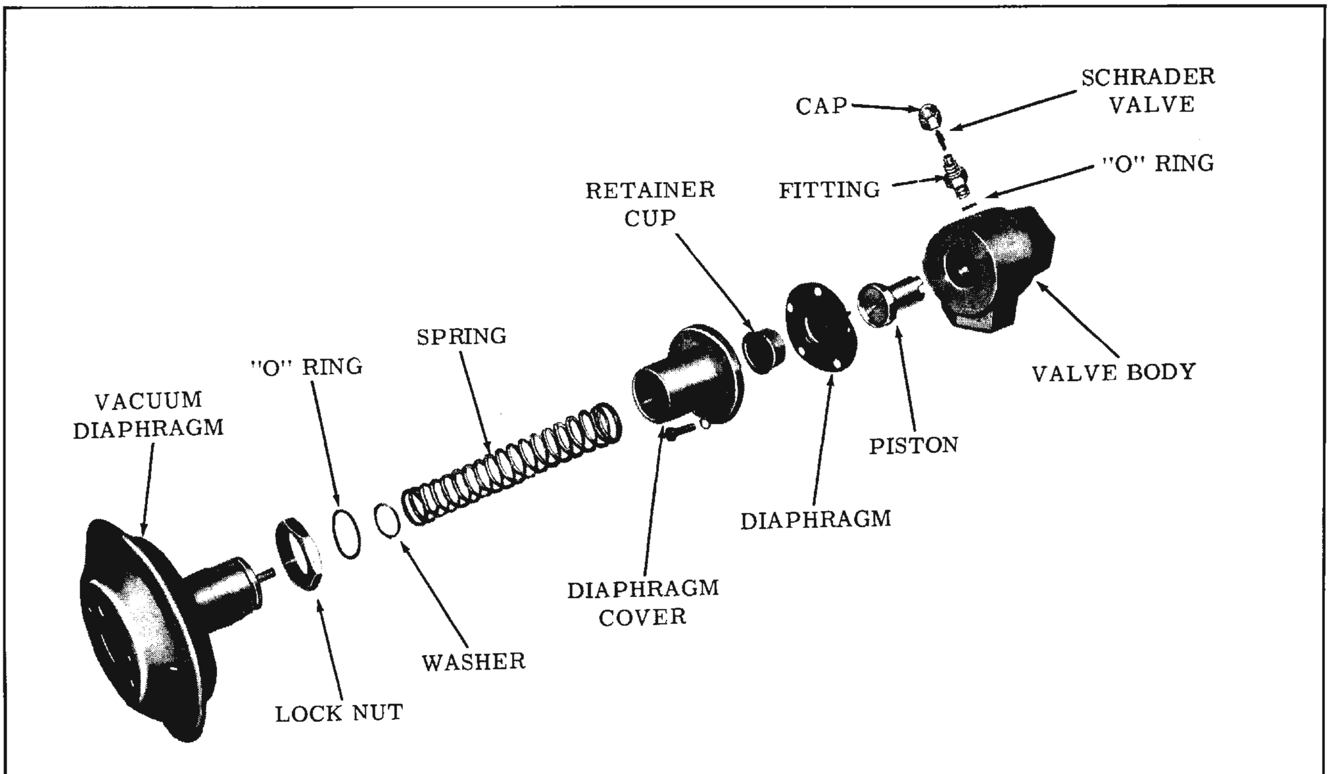


Fig. 15-54 Suction Throttling Valve

3. Move piston back and forth several times to properly seat diaphragm, then tighten the attaching screws.

4. Install a new "O" ring on the vacuum diaphragm.

5. Position washer and spring into the vacuum diaphragm cavity.

6. Insert the vacuum diaphragm and spring into the diaphragm cover. Apply pressure to vacuum diaphragm and thread vacuum diaphragm into diaphragm cover.

7. Install the Schrader valve into the test fitting.

8. Install the valve, then evacuate and charge the system.

9. Adjust suction throttling valve as outlined under SUCTION THROTTLING VALVE ADJUSTMENT.

SUCTION THROTTLING VALVE ADJUSTMENT (Fig. 15-55)

The suction throttling valve is adjusted to regulate evaporator pressure so that it will not fall below 29 to 30 psi. If it controls below 29 psi, the evaporator will "ice-up" and refrigeration capacity will be reduced. If the valve controls higher than this pressure, an undesirable loss of refrigeration will occur which will be especially noticeable in extremely hot weather. This is because for each pound in pressure higher than 30 psi, the discharge air temperature will be raised one degree. The controlling pressure of the valve can be checked and adjusted as follows:

1. Remove Schrader valve fitting cap at the suction throttling valve.

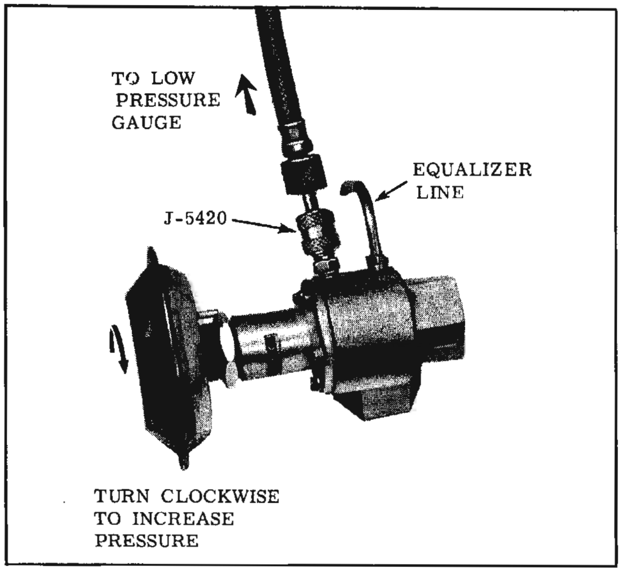


Fig. 15-55 Suction Throttling Valve Adjustment

2. Install Adapter J-5420 on the low pressure gauge hose, and connect the adaptor to the Schrader valve fitting on the suction throttling valve.

3. Purge the gauge and hose by opening the low pressure gauge valve for a few seconds.

4. Start engine and run at fast idle. Move temperature control lever to the extreme left position, turn blower speed on "HIGH" and depress "RECIRCULATION" button.

NOTE: When adjusting the suction throttle valve after the system has been discharged, the temperature control lever must be moved back and forth 10 to 15 times to normalize the suction throttling valve diaphragm.

5. Allow system to operate a few minutes, then observe evaporator pressure on gauge. Continue to increase engine r.p.m. until evaporator pressure no longer changes. If the stabilized evaporator pressure is not 29 to 30 psi, adjust valve as follows:

a. Disconnect vacuum hose from suction throttling valve diaphragm.

b. Loosen locknut on diaphragm and rotate diaphragm clockwise to raise evaporator pressure or counterclockwise to lower evaporator pressure.

c. After pressure has been adjusted to specifications, tighten locknut and install vacuum hose on diaphragm.

7. Shut off engine and remove gauge assembly.

8. Install Schrader valve fitting cap.

EVAPORATOR ASSEMBLY

Removal

1. Discharge the system as outlined under DISCHARGING THE SYSTEM.

2. Disconnect all parts that attach to the right fender filler plate, then remove the filler plate.

3. Disconnect the liquid line at the expansion valve, and the low pressure and equalizer lines at the suction throttling valve. Tape fittings to prevent entrance of dirt and moisture.

4. Remove six screws from evaporator to blower connecting duct, then remove upper section of duct. (Fig.15-56)

5. Loosen two screws on inside of lower section

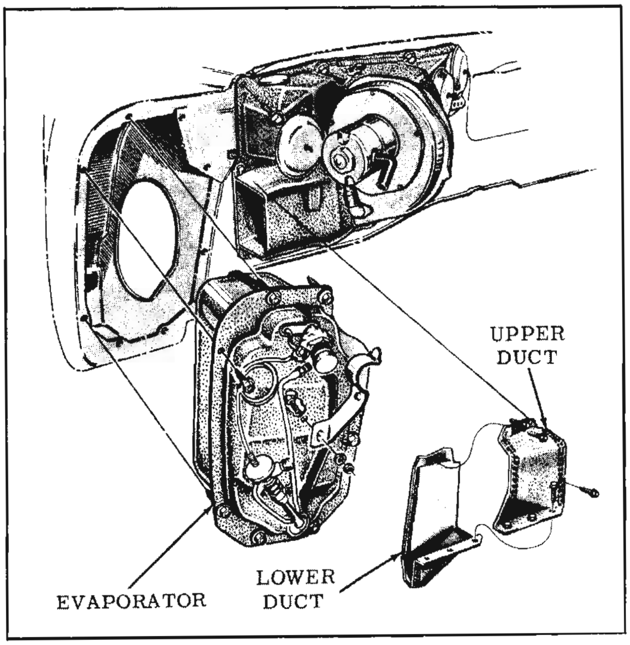


Fig. 15-56 Evaporator Removal

of connecting duct, then slide from blower duct.

6. Remove evaporator attaching screws and remove evaporator.

Disassembly

1. On bench, remove expansion valve from evaporator by loosening the line fittings and removing the capillary bulb.

2. Remove evaporator housing bolts, nuts and washers, then remove evaporator from housing.

To assemble, reverse disassembly procedure.

Installation

1. With rubber gasket cemented to evaporator housing, position the evaporator assembly in cowl opening and install attaching screws.

2. Install lower section of connecting duct in blower duct. Then install the two screws on inside of duct.

3. Place upper section of connecting duct in position, then install attaching screws.

4. Remove caps and tape from lines, oil the fittings with Frigidaire 525 Viscosity Oil, then connect the lines.

5. Install the fender filler plate, reinstall all

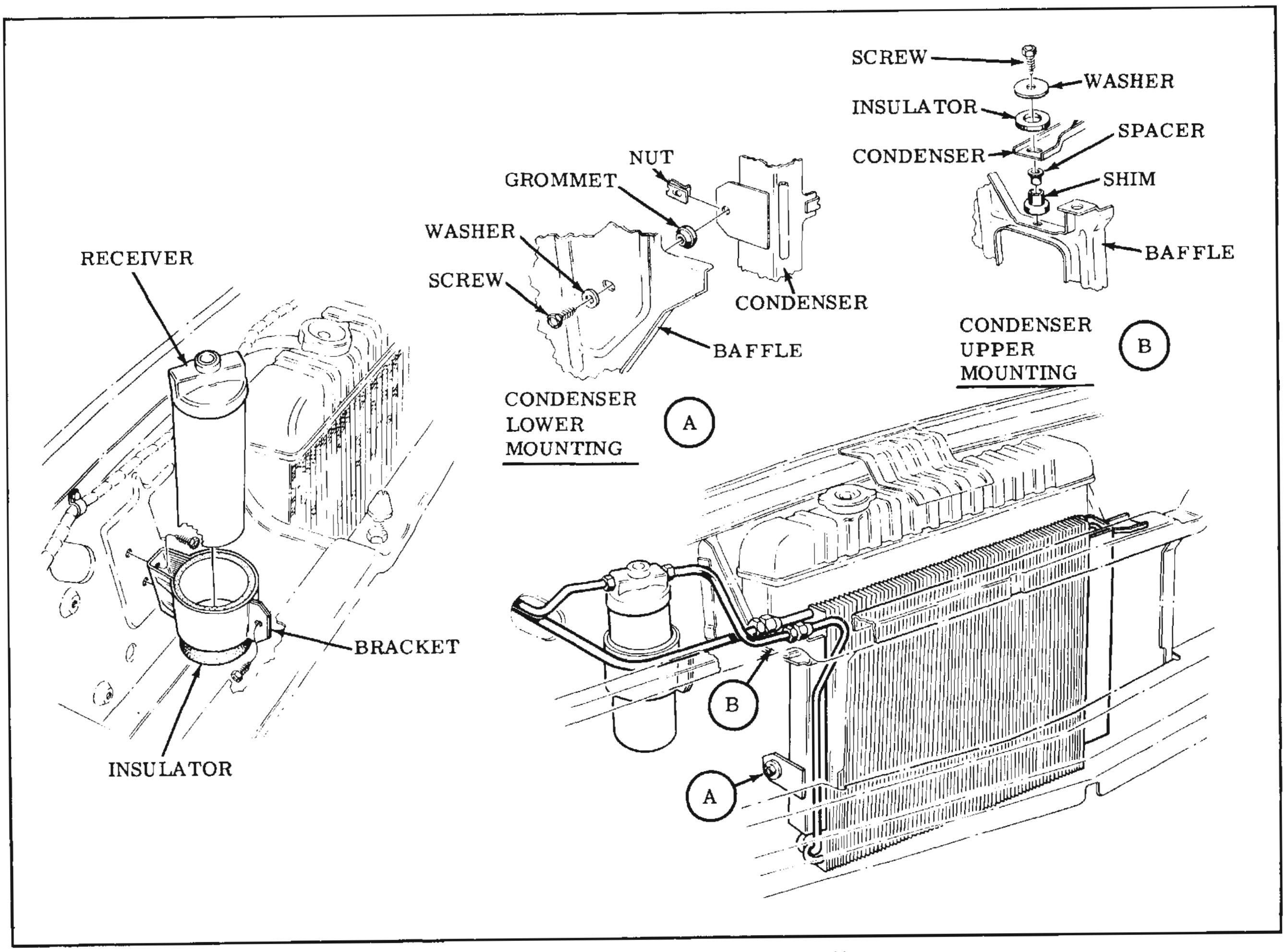


Fig. 15-57 Condenser and Receiver Installation

removed parts.

6. Evacuate the system as outlined under EVACUATING THE SYSTEM.

7. Charge the system as outlined under CHARGING THE SYSTEM.

8. Leak test all line fittings that were disconnected. Refer to LEAK DETECTOR.

CONDENSER AND RECEIVER

The condenser and receiver are mounted in front of the radiator. After discharging the system, the condenser or receiver can be removed as illustrated in Fig. 15-57.

COMPRESSOR (Fig. 15-58)

Removal

1. Discharge the refrigerant system.

2. Disconnect clutch coil wire at compressor connector.

3. Remove the belts from the compressor pulley.

4. Remove the bolt holding the fittings connector to the compressor, then remove the assembly from the compressor. Install Tool J-9527, with fittings capped, on the compressor to prevent loss of oil.

5. Disconnect Delcotron from compressor.

6. Remove the compressor to bracket bolts, then remove the compressor assembly.

INSTALLATION

1. Position the compressor on the mounting bracket, then install and tighten the compressor to bracket bolts.

2. Install Delcotron and tighten the attaching bolt. (Fig. 15-57)

3. Install compressor clutch coil wire.

4. Remove Tool J-9527 and install two new "O" rings on the valve port openings and position the fittings connector on the compressor. Install the mounting bolt and tighten to 15 ft. lbs. torque.

5. Install belts and adjust tension using Tool 33-70.

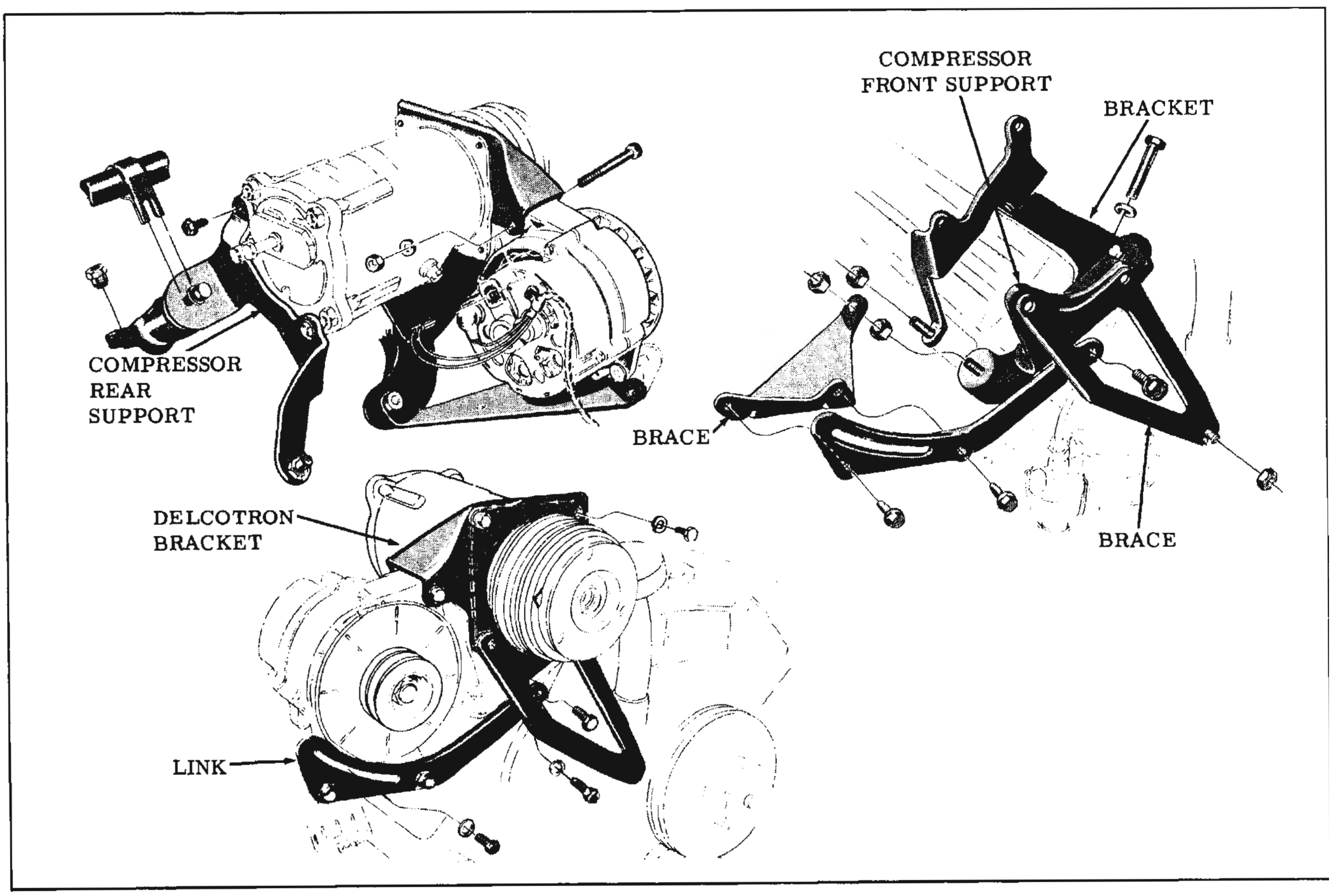


Fig. 15-58 Compressor and Bracket Attachment

6. If compressor was removed for some internal malfunction and foreign material has circulated throughout the system, proceed as follows:

   a. Install a charging line to the compressor discharge Schrader valve and to a drum of refrigerant 12.

   b. Disconnect the liquid line from the dehydrator receiver assembly on the inlet side, and cap the dehydrator receiver immediately.

   c. Open the refrigerant drum valve and turn the drum upside down to allow liquid refrigerant to flush through the condenser and out the line. Use approximately 2 lbs. of refrigerant for this operation.

   d. Close the drum valve and connect the dehydrator receiver assembly.

   e. Remove the expansion valve screen and clean or replace as necessary.

   f. Remove the charging line from the compressor, install the gauge set, and evacuate the entire system as outlined under EVACUATING THE SYSTEM.

   g. Recharge the system as outlined under CHARGING THE SYSTEM.

COMPRESSOR SHAFT SEAL (Fig. 15-59) (TYPICAL OF F-85)

Removal

1. Remove compressor from the car. Refer to COMPRESSOR - Removal.

2. Remove driven plate from compressor. Refer to DRIVEN PLATE - Removal.

3. Remove seal seat retaining ring with Tool J-5403.

4. Remove the seal seat with Tool J-9393 as shown in Fig. 15-60.

5. Remove the seal seat "O" ring from inside the housing.

6. Insert Tool J-9392 on top of seal. Rotate clockwise and force tool downward until tool engages tangs of seal. Remove seal by lifting tool out of housing. (Fig. 15-61)

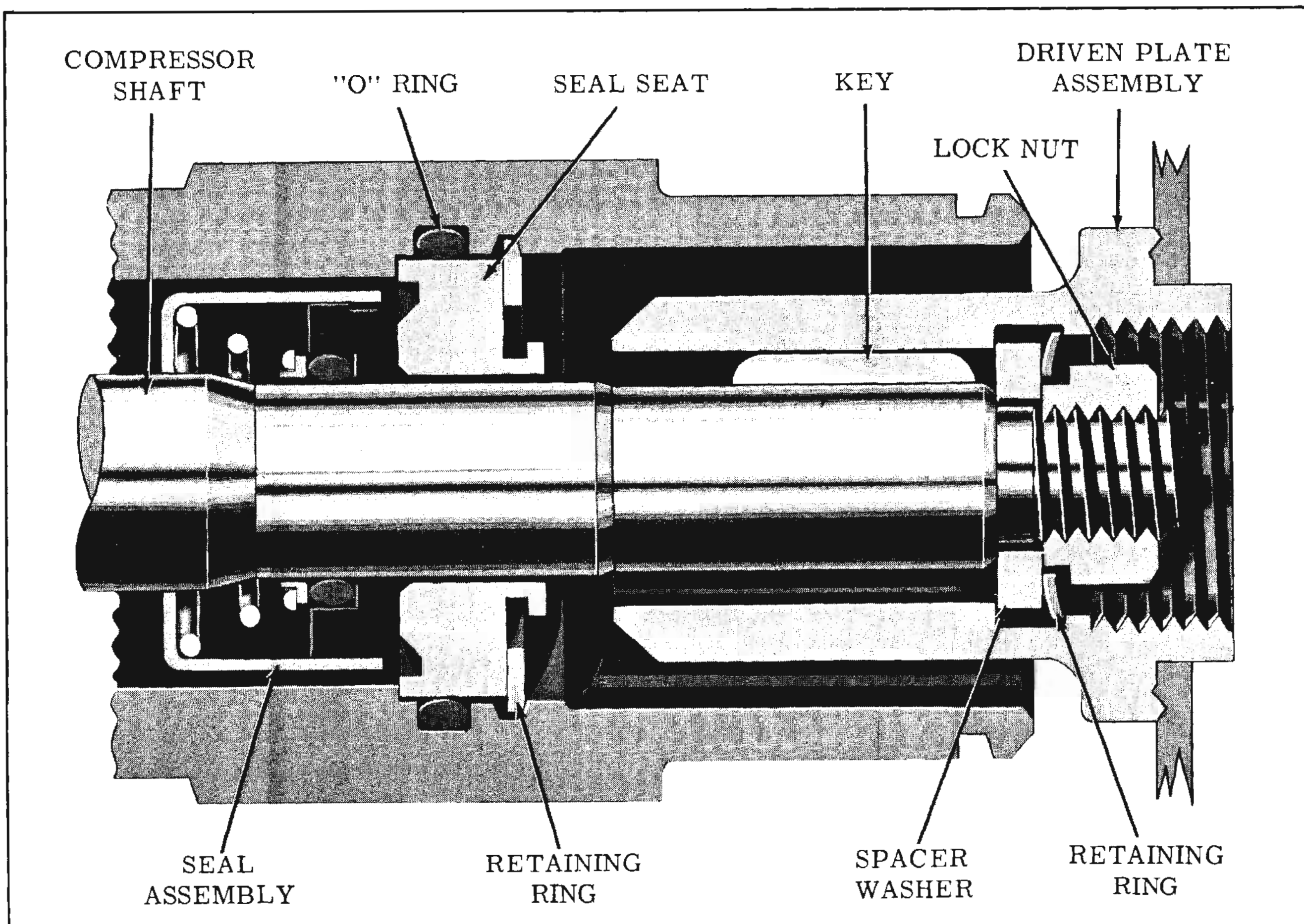


Fig. 15-59 Compressor Shaft and Seal

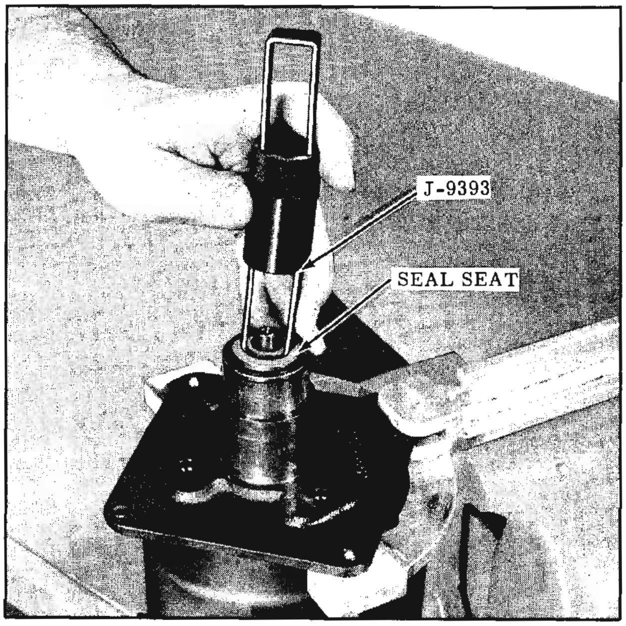


Fig. 15-60 Removing Seal Seat

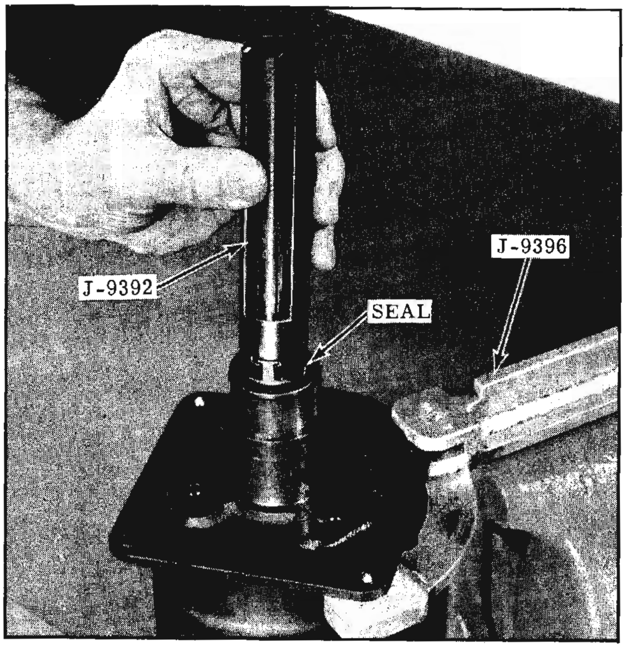


Fig. 15-61 Removing Seal

Installation

1. Place the new seal seat "O" ring in the groove inside the neck of the compressor front head.

2. With Tool J-9392, install seal by rotating tool while applying a light pressure, until seal locks in place. Rotate tool counterclockwise slightly to release from seal, and remove tool.

3. Oil the interior of the seal cavity, shaft and seal, using clean Frigidaire 525 Viscosity Oil.

4. Grip the seal seat with Tool J-9393. Push it into place so as not to disturb the "O" ring in the groove and to also effect a seal with this "O" ring.

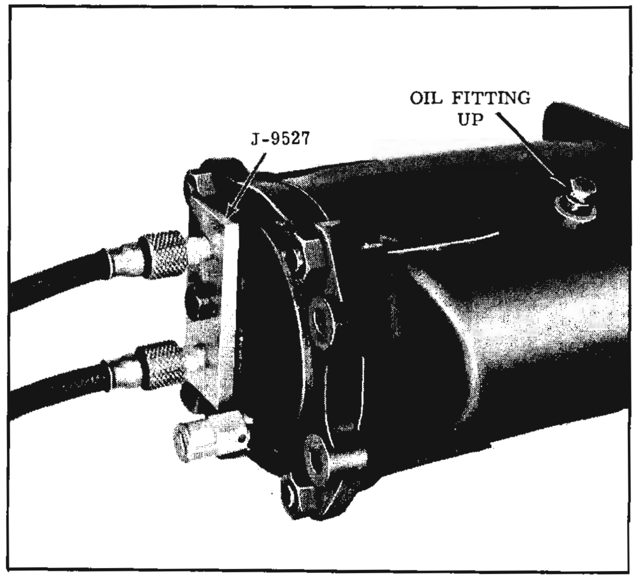


Fig. 15-62 Leak Testing Compressor

5. Install the seal seat retainer with J-5403.

6. With Tool J-9527 installed on compressor (Fig. 15-62), leak test the compressor as follows:

   a. Using the J-5725 Gauge Set, connect the center hose to the refrigerant drum and the high and low pressure hoses to the compressor.

   b. With the high pressure valve and the low pressure valve open, allow refrigerant to flow into the compressor.

   c. Open the oil plug fitting in the compressor housing and allow the air to exhaust until refrigerant starts to flow from the fitting.

   d. Close the oil plug fitting and allow the drum pressure to stabilize in the compressor.

   e. Check and correct any leaks that may exist.

   f. Remove gauge set, cap fittings on Tool J-9527 then add oil as outlined under CHECKING AND ADDING OIL.

7. Install driven plate on compressor.

8. Install compressor on car.

COMPRESSOR DISASSEMBLY (Fig. 15-63) (TYPICAL OF F-85)

Before disassembling the compressor, remove

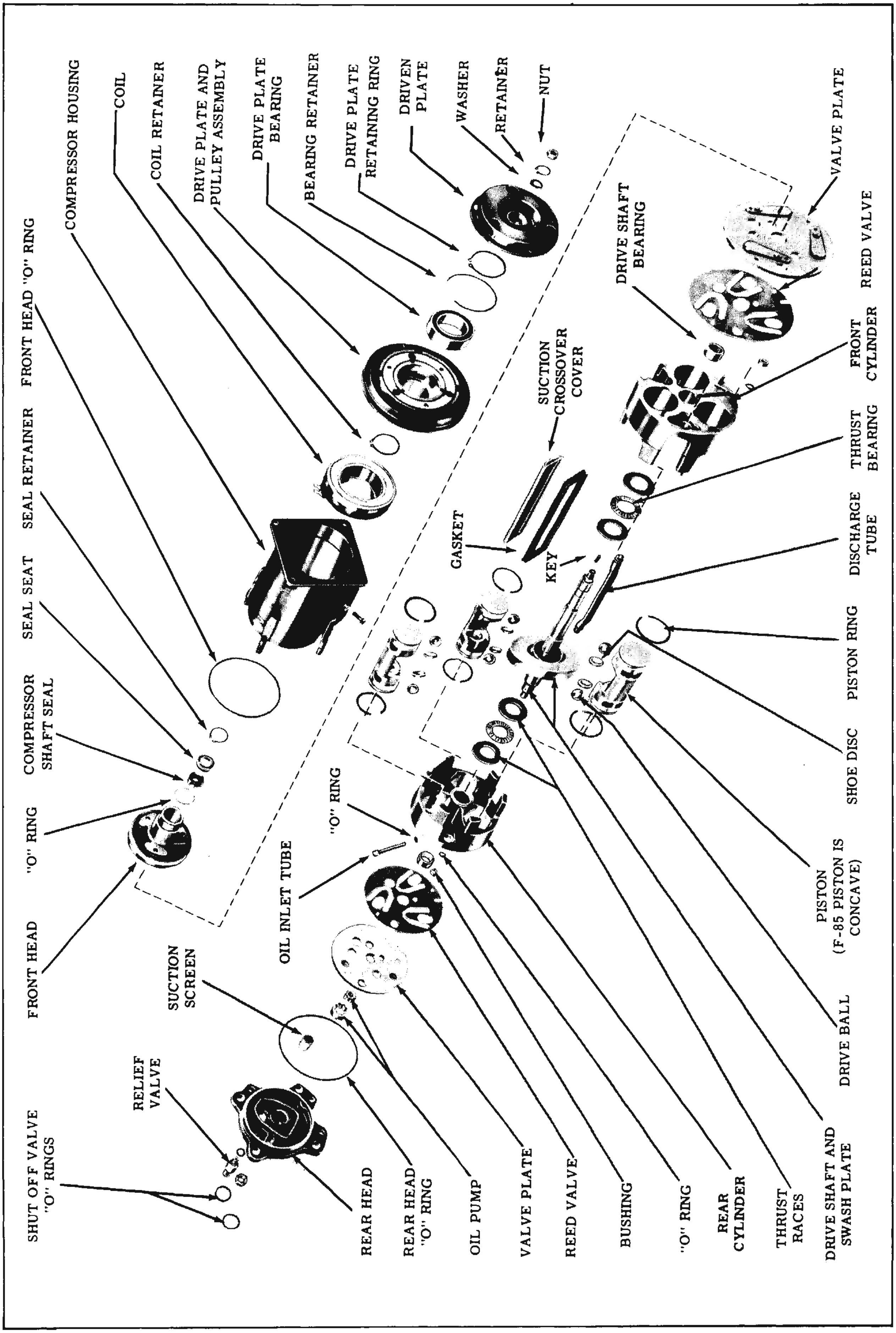


Fig. 15-63 Air Conditioning Compressor

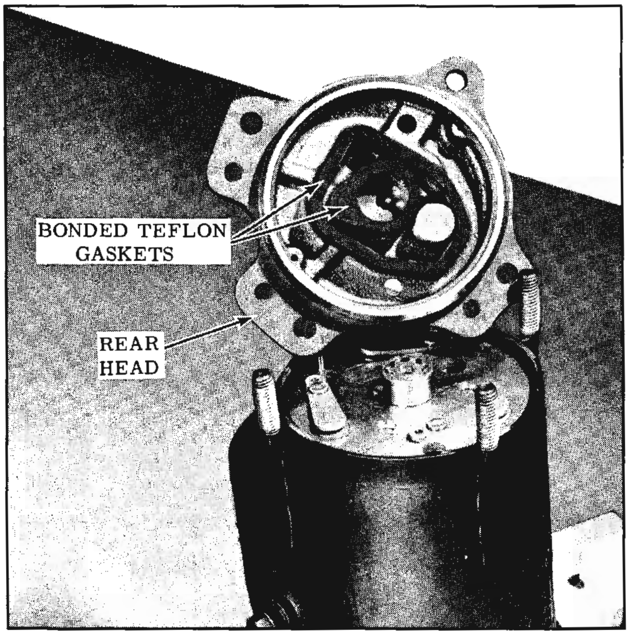


Fig. 15-64 Rear Head Removal

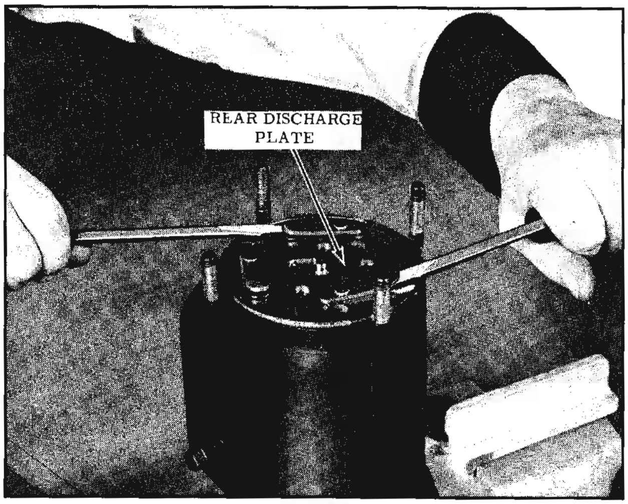


Fig. 15-65 Removing Rear Discharge Plate

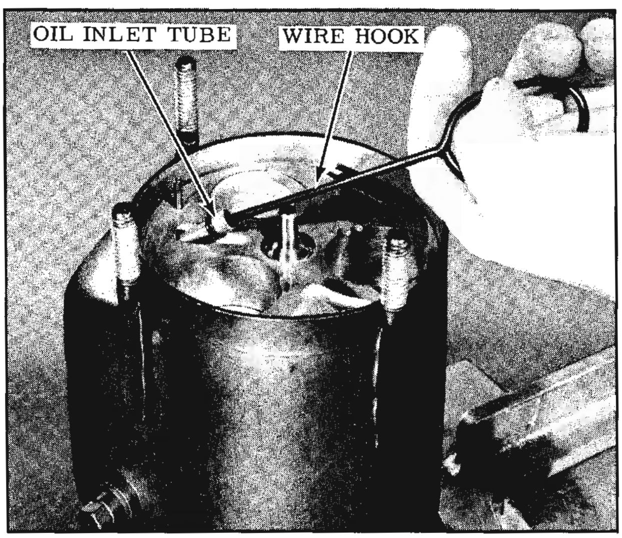


Fig. 15-66 Removing Oil Inlet Tube

the oil drain screw and allow all of the oil to drain from the compressor into a clean container. This is to determine the amount and condition of the oil.

REAR HEAD

1. With compressor mounted in a vise or in Holding Fixture J-9396, rear head up, scribe rear head and compressor housing.
2. Remove the four rear head to housing attaching nuts.
3. Remove the rear head, inspect teflon gaskets on the casting. If teflon gaskets are damaged, replace the rear head. (Fig. 15-64)
4. Remove the suction screen from the rear head.
5. Remove the oil pump gears. If gears are damaged, gears should be replaced.
6. Remove the rear head "O" ring and discard.
7. Remove the rear discharge valve plate and reed valve assembly. Separate the discharge valve plate and reed valve and inspect. (Fig. 15-65)
8. Remove the oil inlet tube and "O" ring. Discard "O" ring. (Fig. 15-66)

FRONT HEAD

1. Remove the cylinder assembly from the rear of the compressor housing by pushing on the compressor shaft. (Fig. 15-67)

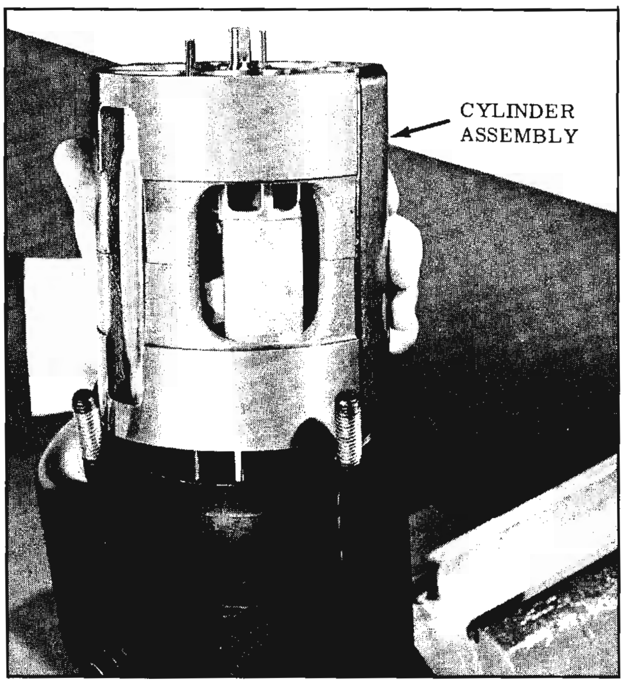


Fig. 15-67 Removing Cylinder from Housing

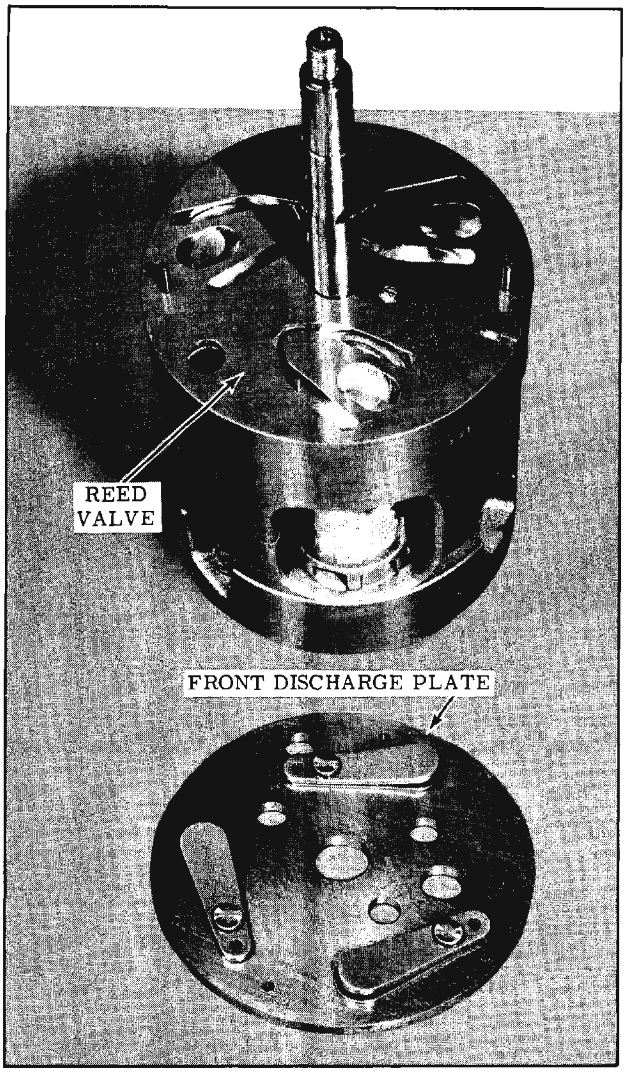


Fig. 15-68 Front Head Discharge Plate and Reed Valve

2. Remove the front head by tapping it to the rear with a wood block. Discard "O" ring. Check teflon sealing surfaces of head.

3. Remove the front discharge valve plate and reed valve assembly. Separate discharge plate from reed valve and inspect. (Fig. 15-68)

CYLINDER

1. Remove the suction crossover cover and seal. (Fig. 15-69)

2. Drive the cylinder halves apart using a wood block and hammer. (Fig. 15-70)

3. Remove the rear half of the cylinder from the pistons.

4. Remove and discard the discharge tube. (Fig. 15-71)

5. If necessary to remove the drive shaft bearing from the rear cylinder half, remove the bearing with a brass drift, then install a new bearing, with manufacturers name towards tool, as shown in Fig. 15-72.

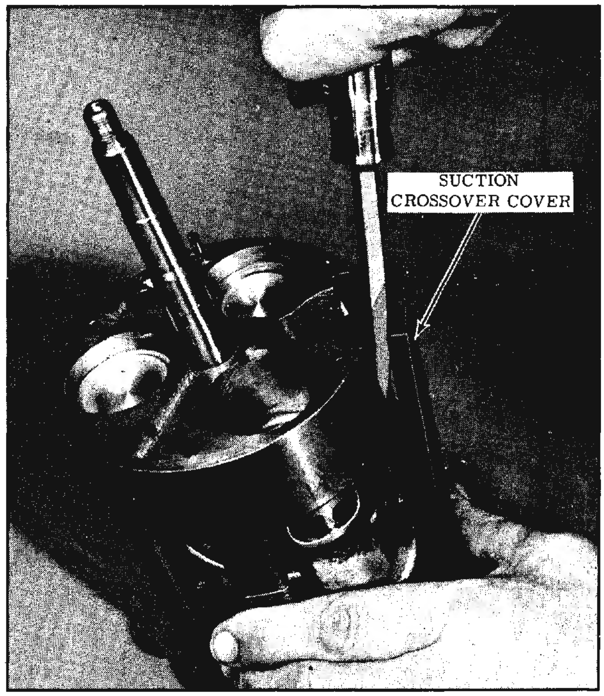


Fig. 15-69 Removing Suction Crossover Cover

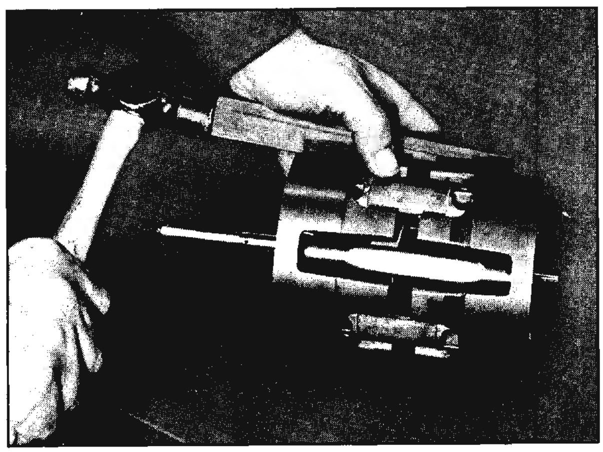


Fig. 15-70 Separating Cylinder Halves

6. Mark pistons with their respective cylinders, so that pistons can be reinstalled in their original position and location.

7. Rotate shaft until a piston is at its highest point. Push shaft away from head until the piston assembly can be removed. Separate the piston, piston drive balls, and piston rings and place in Tray J-9402, in compartments associated with proper end of piston. Discard all piston shoe discs.

8. Repeat procedure until all pistons are removed. (Fig. 15-73)

9. Remove shaft and swash plate assembly.

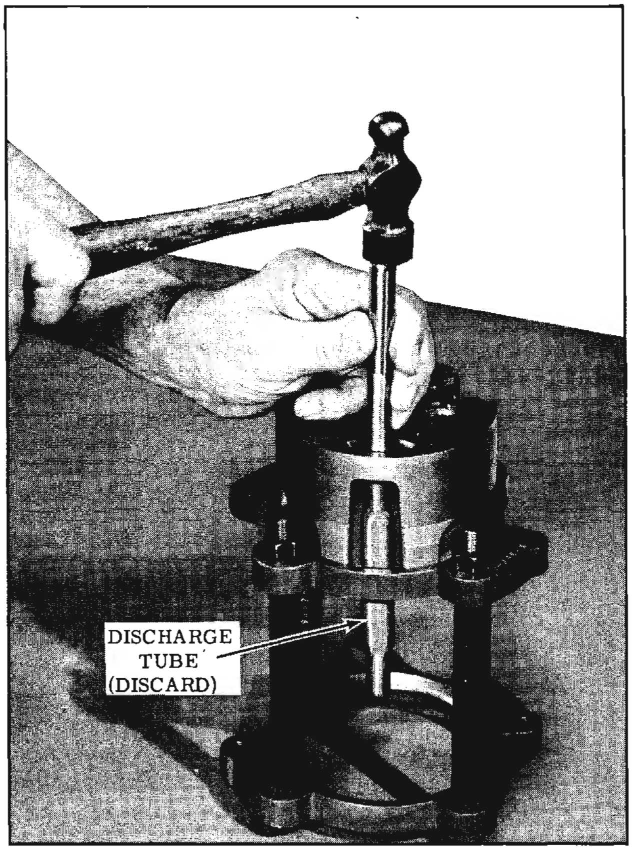


Fig. 15-71 Removing Discharge Tube

Separate thrust bearings and races and discard. Inspect bearing surfaces of shaft and swash plate assembly.

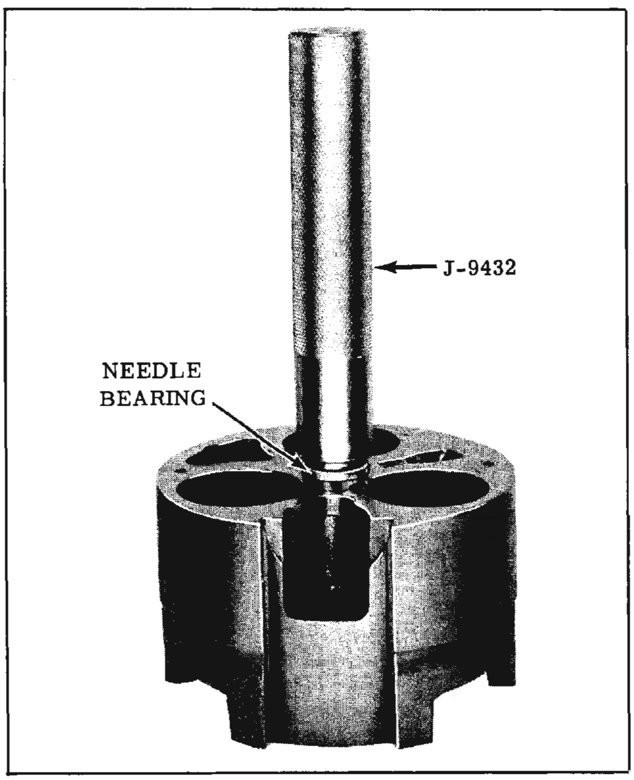


Fig. 15-72 Installing Drive Shaft Bearing

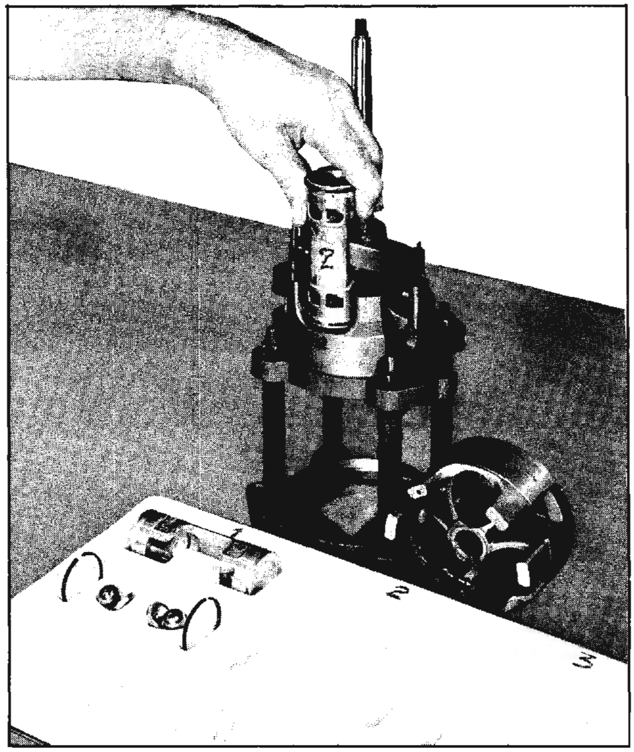


Fig. 15-73 Removing Piston

10. If necessary to replace the front cylinder half drive shaft bearing, repeat Step 5.

11. Wash all parts to be reused in clean solvent (oleum). Dry with compressed air.

COMPRESSOR ASSEMBLY

CYLINDER

1. Position front half of cylinder on the Cylinder Assembly Fixture J-9558.

THRUST BEARING RACE CHART

Service *Part Number	Thickness Dimension	Identification No. Stamped on Race
6556000	.0920	0
6556060	.0970	6
6556070	.0980	7
6556080	.0990	8
6556090	.1000	9
6556100	.1010	10
6556110	.1020	11
6556120	.1030	12

* The last three digits indicate identification number on race.

2. Position a zero thrust race, a thrust bearing

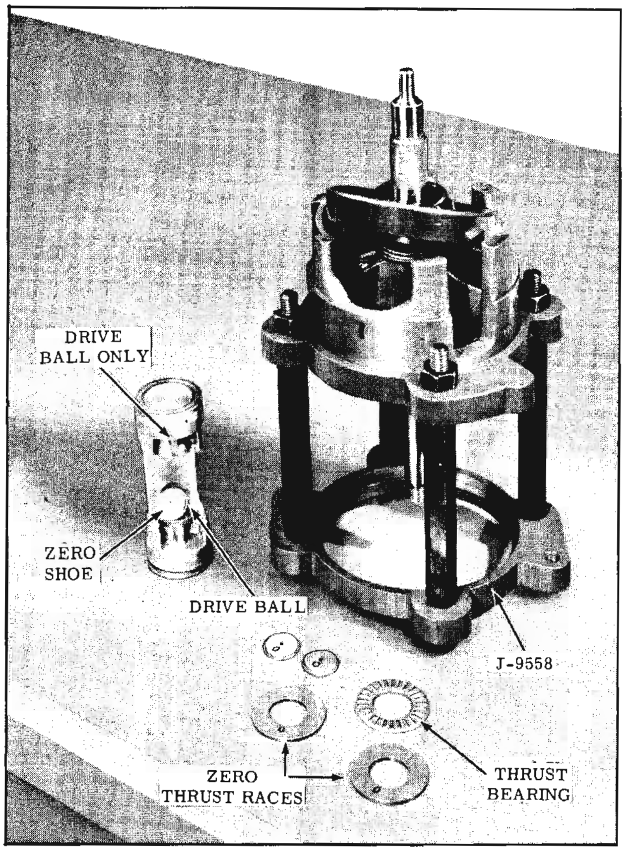


Fig. 15-74 Assembling Parts for Clearance Check

and another zero thrust race over the front and rear ends of the compressor shaft. Retain bearings and thrust washers with clean petrolatum. Install shaft into front cylinder, threaded end of shaft down. (Fig. 15-74)

3. Apply a light smear of clean petrolatum to the ball pockets of each of the three pistons.

4. Place the balls in the piston pockets.

5. Apply a light smear of clean petrolatum to the cavity of three new zero shoe discs.

6. Place a zero shoe over each ball in the front end of the piston. The front end of the piston has an identifying notch in the casting web. (Fig. 15-75)

7. Place a ball only in the rear ball pocket of each of the three pistons.

   NOTE: Do not assemble any of the piston rings at this time.

8. Rotate the shaft and swash plate until the high point of the swash plate is over the piston cylinder bore, which has been identified as No. 1. Raise the shaft until the front end of the piston can be inserted in the cylinder bore, at the same time place the front ball and shoe and the rear ball only over the swash plate.

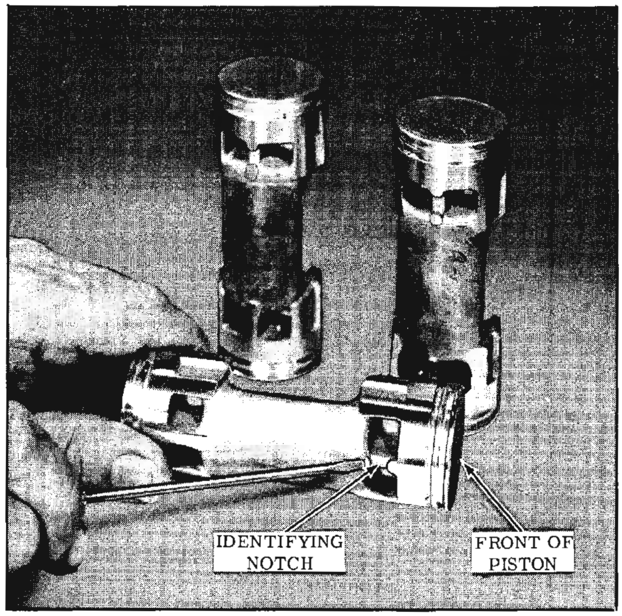


Fig. 15-75 Piston Identification

9. Repeat this operation for pistons No. 2 and No. 3.

   NOTE: The balls and shoes must adhere to the piston during this assembly.

10. Align the rear cylinder with the front cylinder. Tap into place, using a wood block and mallet.

11. Assemble the head ring of Tool J-9558 and nuts to the fixture, tighten the nuts to approximately 15 ft. lbs. torque.

12. Use a leaf type feeler gauge to check between the rear ball and swash plate. (Fig. 15-76)

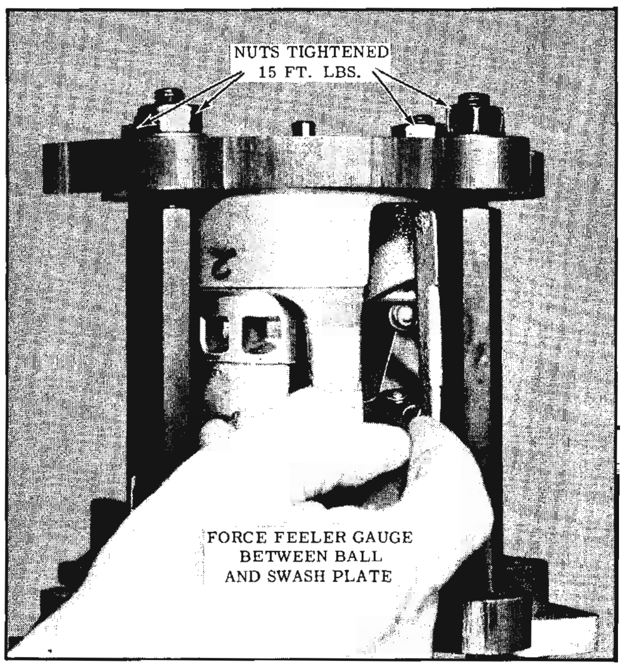


Fig. 15-76 Checking Drive Ball to Swash Plate Clearance

Use a suitable combination of feeler gauge leafs until the combination will result in a FORCED FIT between the ball and swash plate. Rotate the shaft approximately 120°, and make a second check with feeler gauge between the ball and plate. Rotate the shaft again approximately 120° and again check with a feeler gauge between the parts. Record the three readings. From the three checks, select a numbered shoe to correspond to the minimum feeler gauge reading for No. 1 piston (refer to SHOE CHART). Mark piston number on the shoe package. The shoe may be put in the assembly tray in the compartment corresponding to the piston number and rear ball pocket position. Repeat procedure for the remaining pistons.

EXAMPLE

	Position 1	Position 2	Position 3	Select and Use Shoe No.
Piston #1	.019"	.0195"	.019"	19
Piston #2	.020"	.020"	.020"	20
Piston #3	.021"	.021"	.022"	21

SHOE CHART

SERVICE *PART NUMBER	IDENTIFICATION NO. STAMPED ON SHOE
6557000	0
6556180	18
6556190	19
6556200	20
6556210	21
6556220	22

* The last three digits indicate identification number on shoes.

13. To determine the clearance between the rear thrust bearing and the upper or outer-rear thrust race, use a combination of feeler gauge leafs to get a FORCED FIT between these two parts. (Fig. 15-77)

14. Select from stock a numbered thrust race that corresponds to the feeler gauge reading. Mark the package "REAR" place it in the assembly tray corresponding to this position.

15. Loosen and remove the nuts and ring from the checking fixture. Remove the rear cylinder, pistons and rear outer thrust race.

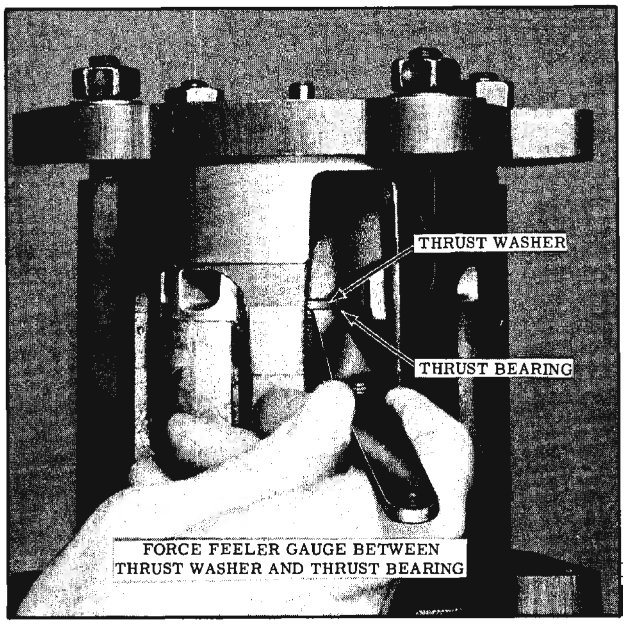


Fig. 15-77 Checking Drive Shaft End Play Clearance

16. Install the correct thrust race, determined in Step 14, over the compressor shaft. Apply a light smear of petrolatum to the thrust races to aid in holding them in place during assembly.

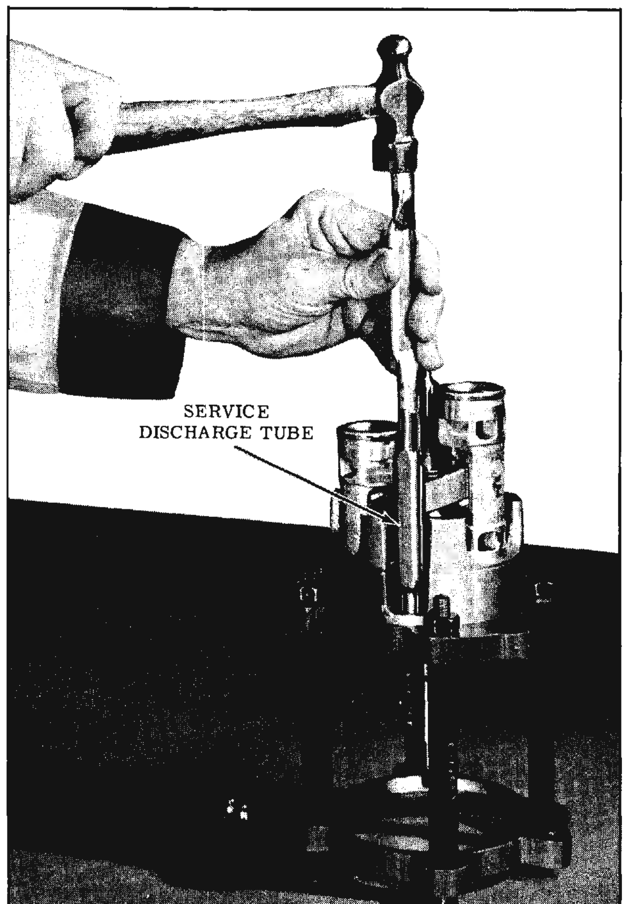


Fig. 15-78 Installing Discharge Tube

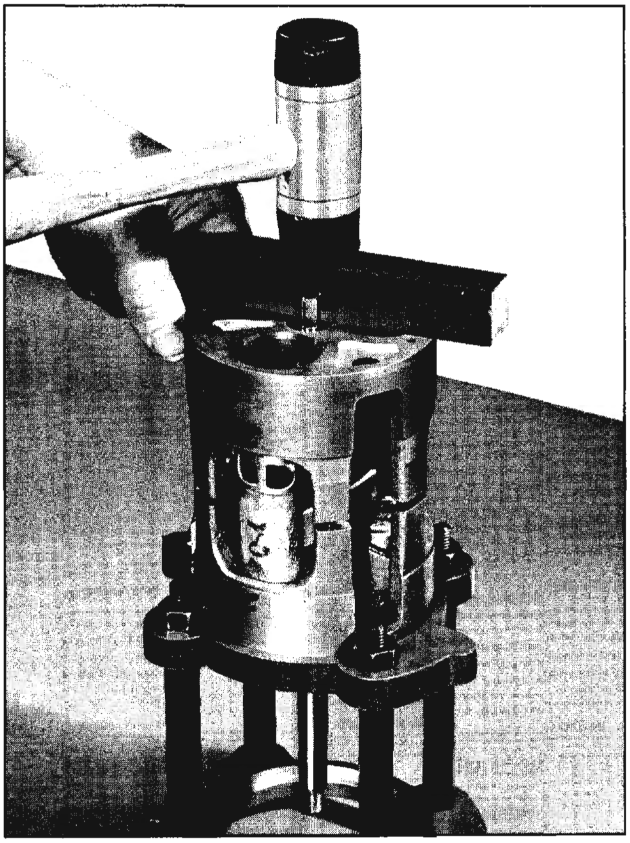


Fig. 15-79 Assembling Cylinder Halves

17. Assemble a piston ring, scraper groove toward the piston ball socket, to each end of the three pistons.

18. Apply a light smear of petrolatum to the numbered shoes and place them over the correct ball in the rear of the piston.

19. Rotate the swash plate so the high point is above cylinder bore No. 1. Carefully assemble piston No. 1, complete with ball and a zero shoe on the front end and ball and numbered shoe on the rear end, over the swash plate. Compress and enter the front piston ring into the front cylinder half. Repeat this operation for pistons No. 2 and No. 3.

20. Assemble one end of the service discharge crossover tube into the hole in the front cylinder. (Fig. 15-78)

21. Rotate the shaft to position the pistons in a "stair step" arrangement. Place the rear half of the cylinder over the shaft and start the pistons and rings into the cylinder bores. When all parts are in proper alignment, tap rear cylinder with a wood block and mallet to seat the rear cylinder over the locating dowel pins. (Fig. 15-79)

22. Generously lubricate all moving parts with Frigidaire 525 Viscosity Oil. Check for the free rotation of the mechanism.

23. Remove cylinder assembly from fixture.

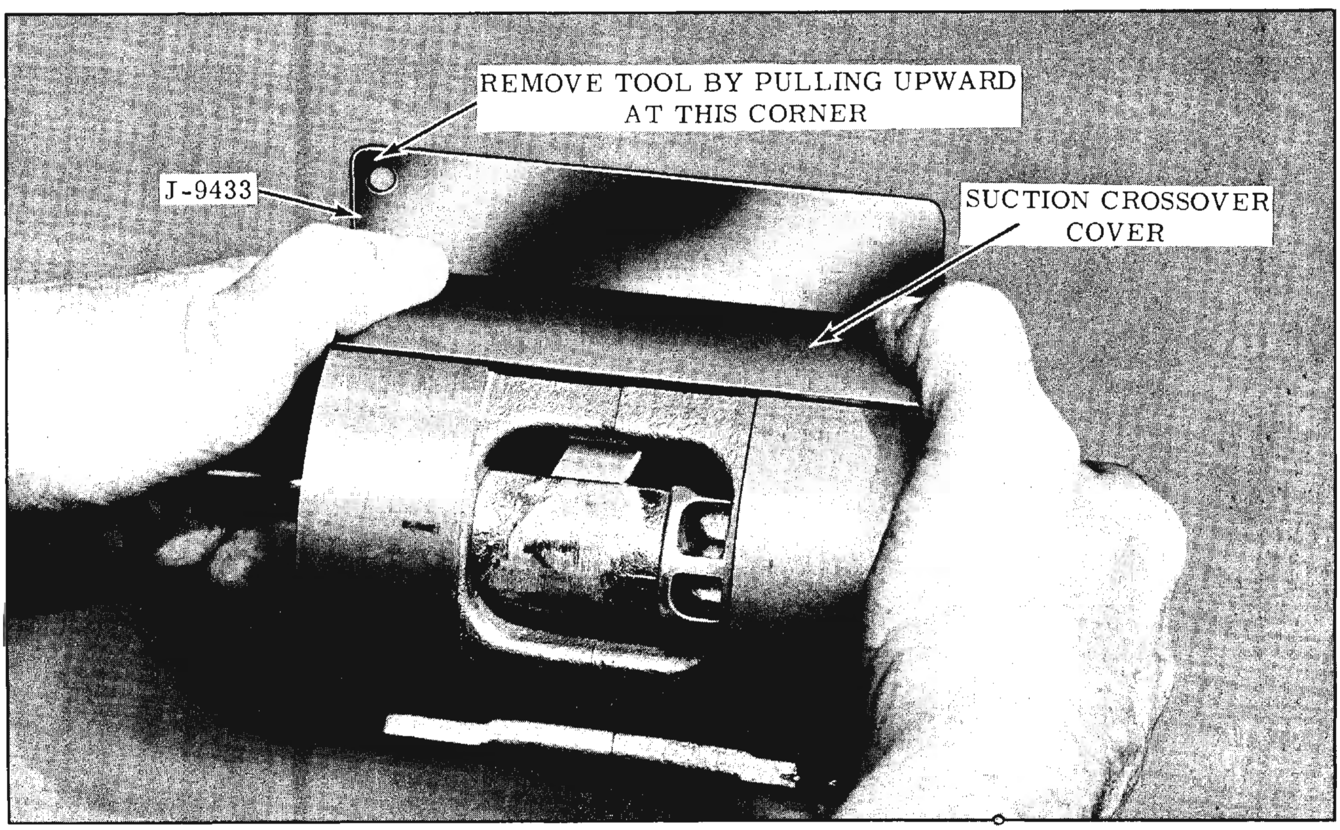


Fig. 15-80 Installing Suction Crossover Cover and Seal

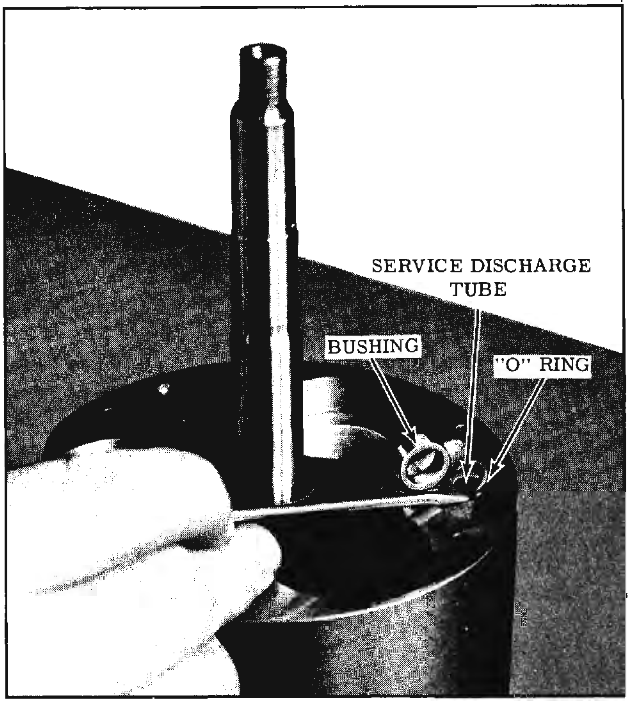


Fig. 15-81 Installing "O" Ring and Bushing

24. Assemble a new rectangular gasket to the suction crossover cover. Coat the gasket with Frigidaire 525 Viscosity Oil. Start one side of the gasket and cover into the "dove tail" slot in the cylinder. Position Tool J-9433 between the gasket and the "dove tail" slot. Center the cover and gasket with the ends of the cylinder faces. Press down on the cover to snap it into place and remove tool. (Fig. 15-80)

25. Install "O" ring and bushing over discharge tube. (Fig. 15-81)

26. Assemble the suction reed valve and the front discharge valve plate to the front end of the cylinder. Align the dowel pin holes, suction ports and oil return slot.

    NOTE: The front discharge valve plate has a large diameter hole in the center.

27. Coat the teflon gasket surfaces on the webs of the front head with Frigidaire 525 Viscosity Oil. Examine the location of the dowel pins and contour of the webs. Rotate so as to position it properly over discharge reed retainers. Use care to avoid damaging the teflon gasket surfaces. When in proper alignment, seat with light mallet taps.

28. Apply an ample amount of Frigidaire 525 Viscosity Oil around the angle groove at the lower edge of the head and to the "O" ring. Assemble the "O" ring in the groove.

29. Mount the compressor housing on the holding fixture, attaching bolts up.

30. Coat the inside machined surfaces of the housing with Frigidaire 525 Viscosity Oil. Install the cylinder assembly into the housing. Line up the oil sump with the oil intake tube hole.

31. Position a new "O" ring on the oil intake tube, apply oil to the cavity and "O" ring. Insert the tube and "O" ring, rotating the cylinder assembly to align the tube with the hole in the housing baffle.

32. Install "O" ring and bushing over discharge tube.

33. Position the rear suction reed valve and discharge valve assembly to align with the dowel pins, then slide it into place over pins.

34. Assemble the inner oil pump gear over the "D" shaped flat on the shaft. Place the outer oil pump gear into oil pump gear cavity in the head. Retain with petrolatum.

35. Generously oil the valve plate around the outer ends where the large "O" ring will be placed. Oil the valve reeds, oil pump gears, and the area where the teflon gasket will contact the valve plate.

36. Coat the rear head to housing "O" ring with Frigidaire 525 Viscosity Oil and place it on the valve plate in contact with the housing.

37. Place the suction screen in the rear head.

38. Assemble the rear head to the compressor housing, using care not to damage the teflon gasket.

    NOTE: If oil pump gears do not mesh, a slight movement of the rear head or drive shaft will aid in meshing of the gears.

39. Assemble the nuts to the threaded housing studs. Tighten 19 to 23 ft. lbs. torque.

40. Position two "O" rings in the cavity at the rear of the compressor.

41. Install Tool J-9527 on compressor (Fig. 15-62), then leak test the compressor as follows:

    a. Using the J-5725 Gauge Set, connect the center hose to the refrigerant drum and the high and low pressure hoses to the compressor.

    b. With the high pressure valve and the low pressure valve open, allow refrigerant to flow into the compressor.

    c. Open the oil plug fitting in the compressor housing and allow the air to exhaust until refrigerant starts to flow from the fitting.

d. Close the oil plug fitting and allow the drum pressure to stabilize in the compressor.

e. Check and correct any leaks that may exist.

f. Release the pressure and remove gauge set.

g. Install caps on fittings of Tool J-9527.

42. Add oil to compressor as outlined under CHECKING AND ADDING OIL.

ADDING REFRIGERANT—PARTIAL CHARGE

The proper charge of refrigerant to insure a clear sight glass under operating conditions at various ambient temperatures is 4 lbs. 4 ozs. Since less than 4 lbs. 4 ozs. will result in a clear sight glass under some load conditions, it is necessary to consider load effects when checking and adding refrigerant to the system. The load can be varied by changing the blower speed as listed in the following chart. Be sure to operate the system for at least five minutes before checking sight glass:

Ambient Temp. (Outside of Car)	Blower Switch Position	Temperature Control Setting	Push Button Setting	Eng. RPM
70° to 80°	High	Fully to Left	Normal	1600
80° to 90°	Medium	Fully to Left	Normal	1600
90° or above	Low	Fully to Left	Normal	1600

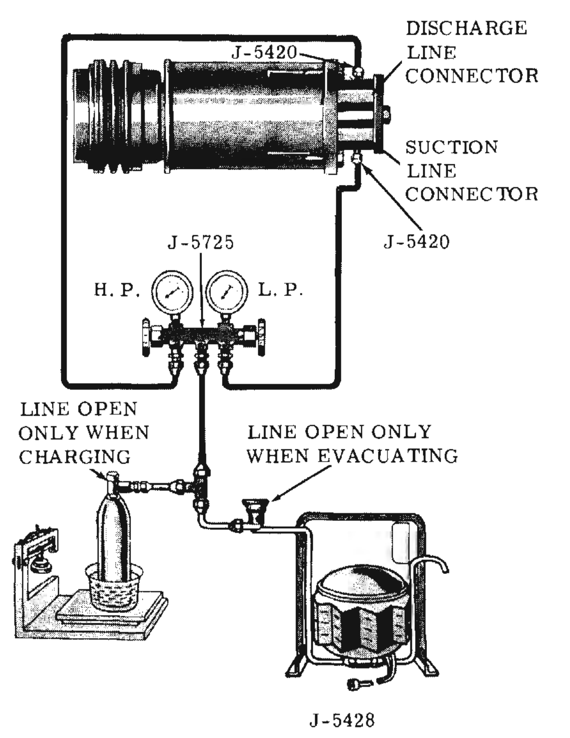


Fig. 15-82 Adding Refrigerant Partial Charge

If the system is low on refrigerant, proceed as follows:

1. Turn off the ignition.
2. Remove protective caps from Schrader valve adapters.
3. Install gauge set as shown in Fig. 15-82.
4. Crack open both gauge valves to purge the gauge hoses through the center hose, and crack open the valve on the refrigerant drum or the "Fits-All" valve on a 15 oz. refrigerant can. While refrigerant is escaping from the center hose of the gauge set and the valve fitting on the refrigerant container, connect the center hose to the refrigerant container.
5. Close the refrigerant container valve and both gauge valves.
6. Start the engine and set at 1600 r.p.m. Make sure the temperature control lever is fully to the left, the "NORMAL" button is depressed, and the blower switch is set according to the preceeding chart.
7. Open valve on refrigerant container and the low pressure gauge valve to allow refrigerant to enter the system. When sight glass clears, close refrigerant container valve.
8. Wait two minutes, then check the sight glass. If vapor is still visible, open the refrigerant container valve and again allow refrigerant to enter the system. Add 1/4 lb. of refrigerant after sight glass clears.
9. Shut off engine, remove gauge set, and install all protective caps.

CHECKING AND ADDING OIL (TYPICAL OF F-85)

The compressor was originally charged with 10.5 ounces of Frigidaire 525 Viscosity Oil. During normal operation, because of an affinity of refrigerant 12 for oil, a certain amount of oil will circulate throughout the system along with the liquid and vapor. If any major loss of oil has occurred, such as a severe compressor seal leak, line breakage, damaged condenser, etc., proceed as follows after making the necessary repairs.

1. Remove belts and coil electrical lead.
2. Remove compressor.
3. Transfer compressor to bench and loosen the oil drain screw.
4. Allow all of the oil to drain from the compressor into a clean container. This is to determine the amount and condition of oil.

NOTE: If the examination of the oil shows any foreign material; sludge, water, etc., flush the system as outlined under COMPRESSOR - Installation Step 6, and fill compressor with 10.5 ounces of oil.

5. If the condition of the oil indicates that the compressor is free of any contamination, position the compressor so that the oil test valve flange is on the top side and pour from a graduated bottle, new Frigidaire 525 Viscosity Oil into the compressor in the amount required as follows:

   a. If oil drained in Step 4 was more than 1-1/2 ounces, add to the compressor the amount drained in Step 4.

   b. If oil drained in Step 4 was less than 1-1/2 ounces and a major oil loss has occurred, add 6 ounces of oil to the compressor.

   c. If the compressor is overhauled, add 1 ounce in addition to the oil added in Steps 5a or 5b.

   d. If a new service compressor is to be installed, drain service compressor and fill with oil as indicated in Steps 5a or 5b.

   e. If refrigeration components are replaced, add oil as follows, in addition to the oil added in Steps 5a, 5b or 5c:

Evaporator	3 Fluid Ounces
Condenser	1 Fluid Ounce
Dehydrator Receiver	1 Fluid Ounce

6. Tighten the oil drain screw.

7. Install compressor.

8. Evacuate the system to remove air and moisture, then charge the system with refrigerant.

PERFORMANCE TEST

The Performance Test should be made with the car doors open, the temperature control lever fully to the left, "NORMAL" button depressed, blower speed switch on "HI", an auxiliary fan in front of the radiator, and the car hood up.

1. Remove Schrader valve fitting cap at the suction throttling valve.

2. Install Adapter J-5420 on the low pressure gauge hose, and connect the adapter to the Schrader valve fitting on the suction throttling valve, then momentarily open low pressure gauge valve to purge gauge hose.

3. Remove the compressor high pressure Schrader valve protective cap and install high pressure gauge hose with adapter J-5420. Be sure high pressure gauge valve is closed.

4. Momentarily open high pressure gauge to purge the gauge and hose.

5. With transmission in "park" or "neutral" and parking brake applied, adjust engine speed to 2000 r.p.m.

6. After temperature and humidity have been determined, compare test results with the PERFORMANCE CHART.

7. When test is completed, disconnect gauge hoses, and install protective caps.

8. Install Schrader valve fitting cap on suction throttling valve.

DIAGNOSIS OF PERFORMANCE TEST RESULTS

CONDITION AND CAUSE	CORRECTION
EVAPORATOR PRESSURE TOO HIGH	
A. Defective or improperly adjusted suction throttling valve.	A. Adjust or repair as necessary.
B. Restriction in suction line.	B. Remove, inspect, and clean or replace.
C. Loose compressor drive belts.	C. Adjust as outlined.
D. Defective clutch or coil.	D. Check or replace as necessary.
E. Defective expansion valve.	E. Replace as necessary.
F. Expansion valve capillary tube not tight to evaporator suction line.	F. Check clamp for tightness.
G. Clutch slipping.	G. Refer to CLUTCH SLIPPAGE.
HIGH PRESSURE SIDE OF SYSTEM TOO HIGH	
A. Engine overheated.	A. Check engine cooling system.
B. Restricted air flow through condenser.	B. Remove foreign material from engine radiator and condenser.
C. Air in system or overcharge of refrigerant.	C. Momentarily discharge system on discharge side with engine not running; then, operate system and recheck pressure. Repeat as necessary. Check sight glass with system under load.
D. Restriction in condenser, dehydrator receiver assembly, or any discharge or liquid line.	D. Remove parts, inspect for restricted passage, and clean or replace.
E. Too much oil in compressor.	E. Drain oil and add correct amount.
NOZZLE DISCHARGE AIR TOO WARM (With Other Readings OK)	
A. Air hoses not properly connected.	A. Inspect air hoses and manifolds.
B. Defective or mispositioned evaporator drain hoses.	B. Replace or align as necessary.
C. Poor Seal - Evaporator to cowl.	C. Correct sealing.
CLUTCH SLIPPAGE	
A. Head pressure too high.	A. Discharge system until bubbles appear in sight glass and then add one pound of refrigerant.
B. Pulley wobbles.	B. Check and replace, if necessary, the pulley bearing. If pulley has been worn by bearing, replace pulley.

DIAGNOSIS OF PERFORMANCE TEST RESULTS (Cont'd.)

CONDITION AND CAUSE	CORRECTION
VELOCITY OF AIR AT DISCHARGE NOZZLES TOO LOW	
A. Restricted evaporator core in evaporator assembly.	A. Wash evaporator core. Remove air distributor from cowl trim pad and spray water through evaporator with hose.
B. Restricted air hoses.	B. Inspect and replace if necessary.
C. Defective blower motor.	C. Check and replace if necessary.
D. Defective switches.	D. Check and replace if necessary.
E. Poor wiring connection (Low voltage at blower.)	E. Correct wiring.
EVAPORATOR PRESSURE TOO LOW	
A. Insufficient Refrigerant charge.	A. Add refrigerant.
B. Restricted air flow through evaporator.	B. Check air flow.
SWEATING OF AIR DISCHARGE NOZZLES	
A. Heater valve not completely closed or leaking.	A. Check air valve for proper closing.
B. Air leak at cowl or floor pan.	B. Properly seal all holes in cowl and floor pan.
WATER BLOWING OUT AIR DISCHARGE NOZZLE	
A. Plugged or kinked evaporator drain hose.	A. Clean or align as necessary.
INOPERATIVE CONTROLS	
A. Inadequate vacuum.	A. Check vacuum. All controls should move with 10° Hg. Check hoses.
B. Defective vacuum modulator.	B. Replace vacuum modulator on air conditioning and heater control.

PRESSURE—TEMPERATURE RELATIONSHIP OF REFRIGERANT-12

Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure
-8	5.4	22	22.4	52	49.0	82	87.0	112	140.1
-6	6.3	24	23.9	54	51.0	84	90.1	114	144.2
-4	7.2	26	25.4	56	53.0	86	93.2	116	148.4
-2	8.2	28	27.0	58	55.4	88	96.4	118	153.0

PRESSURE—TEMPERATURE RELATIONSHIP OF REFRIGERANT-12 (Cont'd.)

Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure
0	9.2	30	28.5	60	58.0	90	99.6	120	157.1
2	10.2	32	30.1	62	60.0	92	103.0	122	161.5
4	11.3	34	32.0	64	62.5	94	106.3	124	166.1
6	12.3	36	33.4	66	65.0	96	110.0	126	171.0
8	13.5	38	35.2	68	67.5	98	113.3	128	175.4
10	14.6	40	37.0	70	70.0	100	117.0	130	180.2
12	15.9	42	39.0	72	73.0	102	121.0	132	185.1
14	17.1	44	41.0	74	75.5	104	124.0	134	190.1
16	18.4	46	43.0	76	78.3	106	128.1	136	195.2
18	19.7	48	45.0	78	81.1	108	132.1	138	200.3
20	21.0	50	47.0	80	84.1	110	136.0	140	205.5

GENERAL SPECIFICATIONS

Engine Idle Speed	(Refer to Engine Tune-Up and/or Carburetion Section)
Cooling System Capacity (With Air Conditioning)	22 qts.
Fuse (at Fuse Block)	AGC 25 Amps.
Amount of Refrigerant 12 in System:	4 Lbs. 4 Oz.
Total Amount of Oil in Refrigerant System	10.5 Fluid Oz.
Type of Oil	Frigidaire 525 Viscosity

TORQUE SPECIFICATIONS

Application	Ft. Lbs.
Compressor Rear Support to Compressor Bolt	22 to 26
Compressor Bracket and Rear Support to Cylinder Head Bolt Nut	45 to 55
Compressor Front Support to Compressor Bolt	14 to 17
Compressor Bracket Brace to Bracket and Front Cover Bolt and Nut	22 to 26
Compressor Support to Compressor Bracket Bolt	35 to 50
Schrader Valve Adapter Fittings to Compressor Bolt	10 to 15
Driven Plate to Compressor Shaft Nut	14 to 16
Rear Head to Compressor Housing Nuts	19 to 23
Delcotron Bracket to Compressor Housing Nuts	14 to 17
Delcotron Bracket to Delcotron Bolt	25 to 35
Adjusting Link to Bracket	22 to 26

PERFORMANCE CHART

TAKEN AT FRONT OF CONDENSER		EVAPORATOR PRESSURE		DISCHARGE AIR R.H. NOZZLE	HIGH PRESSURE (DISCHARGE)
RELATIVE HUMIDITY	AIR TEMP. °F.	(AT SUCTION THROTTLING VALVE)	ENGINE R.P.M.	TEM. ±1°F.	±10 p.s.i.
20	60	27-1/2	2000	34-1/2	155
	70	27-1/2		37	182
	80	27-1/2		39-1/2	213
	90	27-1/2		42-1/2	245
	100	28-1/2		45-1/2	280
	110	35-1/2		54	330
30	60	27-1/2	2000	35	155
	70	27-1/2		37-1/2	184
	80	27-1/2		40	218
	90	27-1/2		43-1/2	250
	100	31		49-1/2	287
	110	39		58-1/2	343
40	60	27-1/2	2000	35	157
	70	27-1/2		38	185
	80	27-1/2		41	220
	90	27-1/2		44-1/2	252
	100	33		53-1/2	287
	110	42		62-1/2	357
50	60	27-1/2	2000	35	158
	70	27-1/2		38	187
	80	27-1/2		42	223
	90	28		46-1/2	257
	100	35		57-1/2	300
	110	45-1/2		66-1/2	370
60	60	27-1/2	2000	35-1/2	159
	70	27-1/2		38-1/2	188
	80	27-1/2		43-1/2	226
	90	30-1/2		49-1/2	265
	100	37-1/2		62	307
	110	49		70	382
70	60	27-1/2	2000	35-1/2	160
	70	27-1/2		39-1/2	191
	80	27-1/2		45	228
	90	32-1/2		53-1/2	270
	100	39-1/2		65	314
80	60	27-1/2	2000	35-1/2	162
	70	27-1/2		42	193
	80	27-1/2		45	232
	90	34-1/2		57	275
	100	41-1/2		69	320
90	60	27-1/2	2000	36	163
	70	27-1/2		44	194
	80	30		49-1/2	234
	90	36-1/2		60-1/2	269
	100	44		73	327

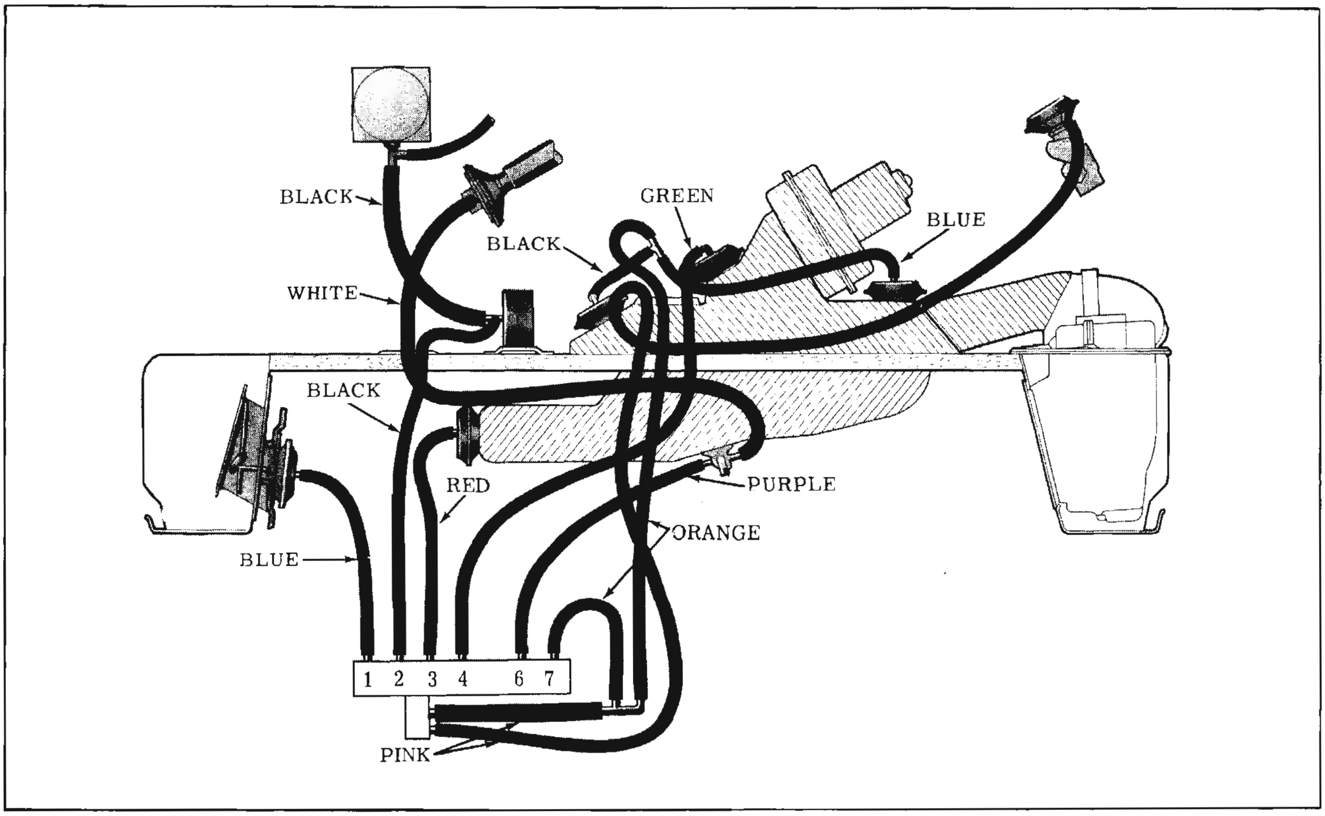


Fig. 15-83 Schematic Diagram of Air Conditioning and Heater Vacuum Hoses

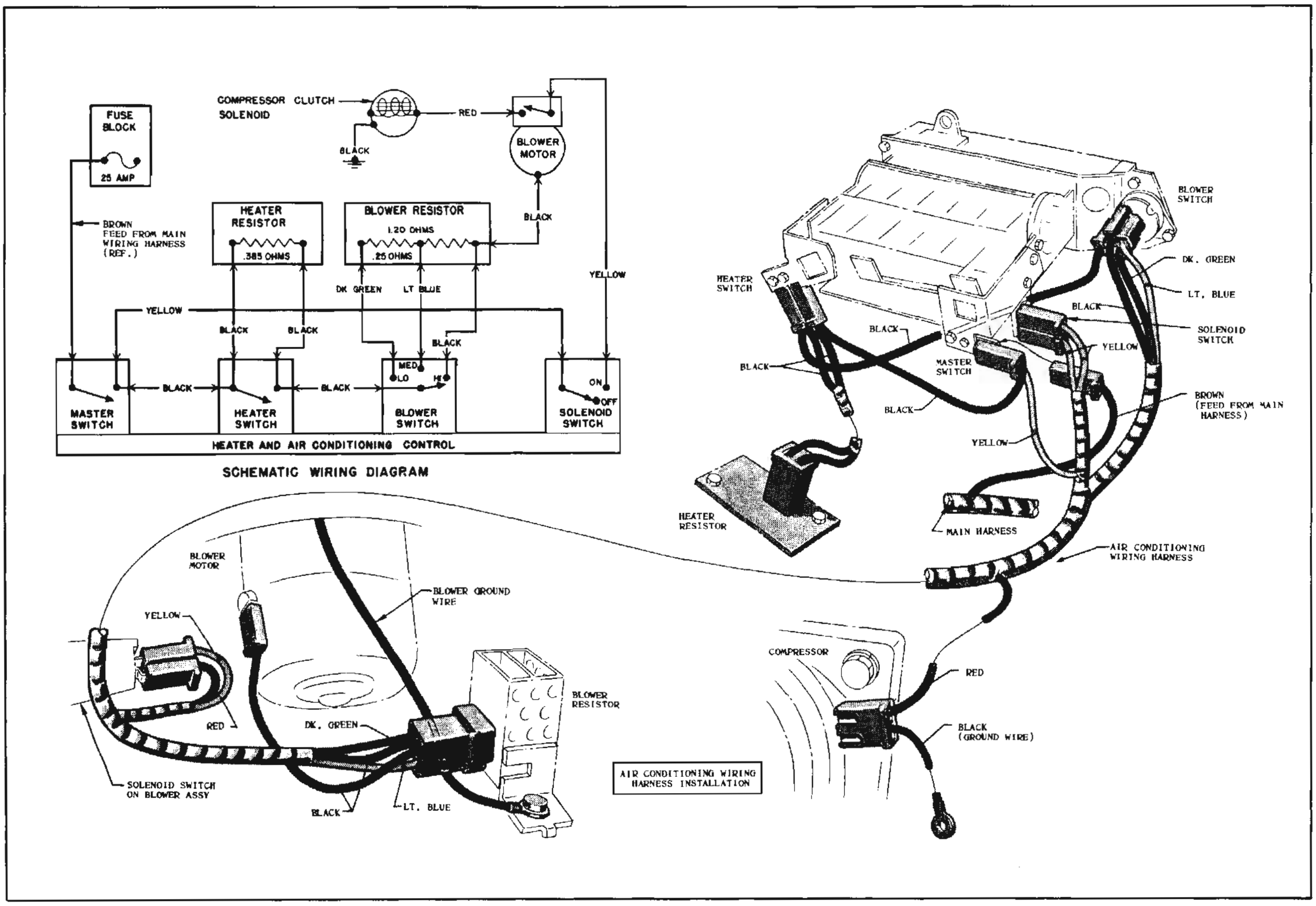
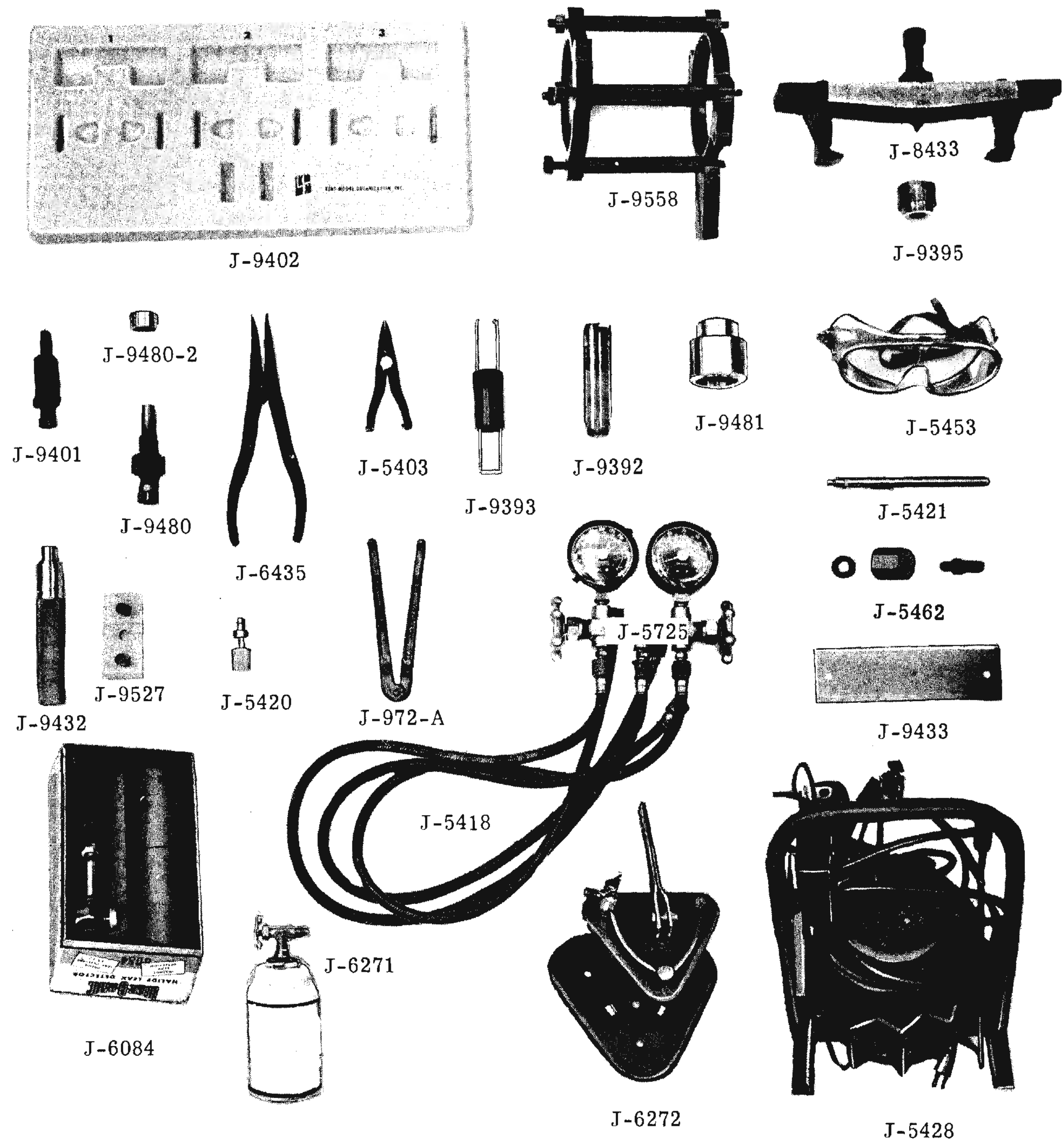


Fig. 15-84 Wiring Connections



J-972-A	Spanner Wrench (Used for Holding Driven Plate)	J-8433	Compressor Pulley Puller
J-5403	Snap Ring Pliers	J-9392	Seal Remover & Installer
J-5418	Gauge Charging Line	J-9393	Seal Seat Remover & Installer
J-5420	Gauge Adapter	J-9395	Puller Pilot
J-5421	Pocket Thermometer	J-9401	Hub & Drive Plate Assembly Remover
J-5428	Vacuum Pump	J-9402	Cylinder Assembly Tray
J-5453	Goggles	J-9432	Needle Bearing Remover & Installer
J-5462	Refrigerant Drum Hook-Up Set	J-9433	Suction Crossover Seal Installer
J-5725	Gauge Manifold Test Unit	J-9480	Driven Plate Installer
J-6084	Leak Detector Kit	J-9481	Pulley Bearing & Drive Plate Assembly Installer
J-6271	Fits-All Valve	J-9527	Leak Test Adapter
J-6272	#3 Multi-Opener	J-9558	Checking Fixture
J-6435	Snap Ring Pliers		

Fig. 15-85 Tools

HEATER AND AIR CONDITIONER

(F-85)

CONTENTS OF SECTION 15

VENTILATION

DESCRIPTION

The body ventilation system used on the F-85 consists of an air inlet in each cowl foundation panel which allows outside air to pass into the passenger compartment when the car is moving forward. The vent valves are manually controlled by a push-pull bowden cable control located at the lower edge of each end of the instrument panel. The air enters the air inlet below the windshield and is directed through the cowl plenum chambers to the foundation panel inlet valves.

CONTROL ADJUSTMENT

The cowl air inlet valve can be adjusted to operate properly, as follows:

1. Remove outlet grille, foundation panel and insulation.
2. Push control knob to fully forward position.
3. Move cable assembly through cable clamp until air valve closes and tighten clamp.
4. Check operation of cable and reinstall foundation panel and cowl vent grille.

VENTILATION CONTROL

Removal (Fig. 15-101)

1. Remove cowl vent grille and foundation panel.

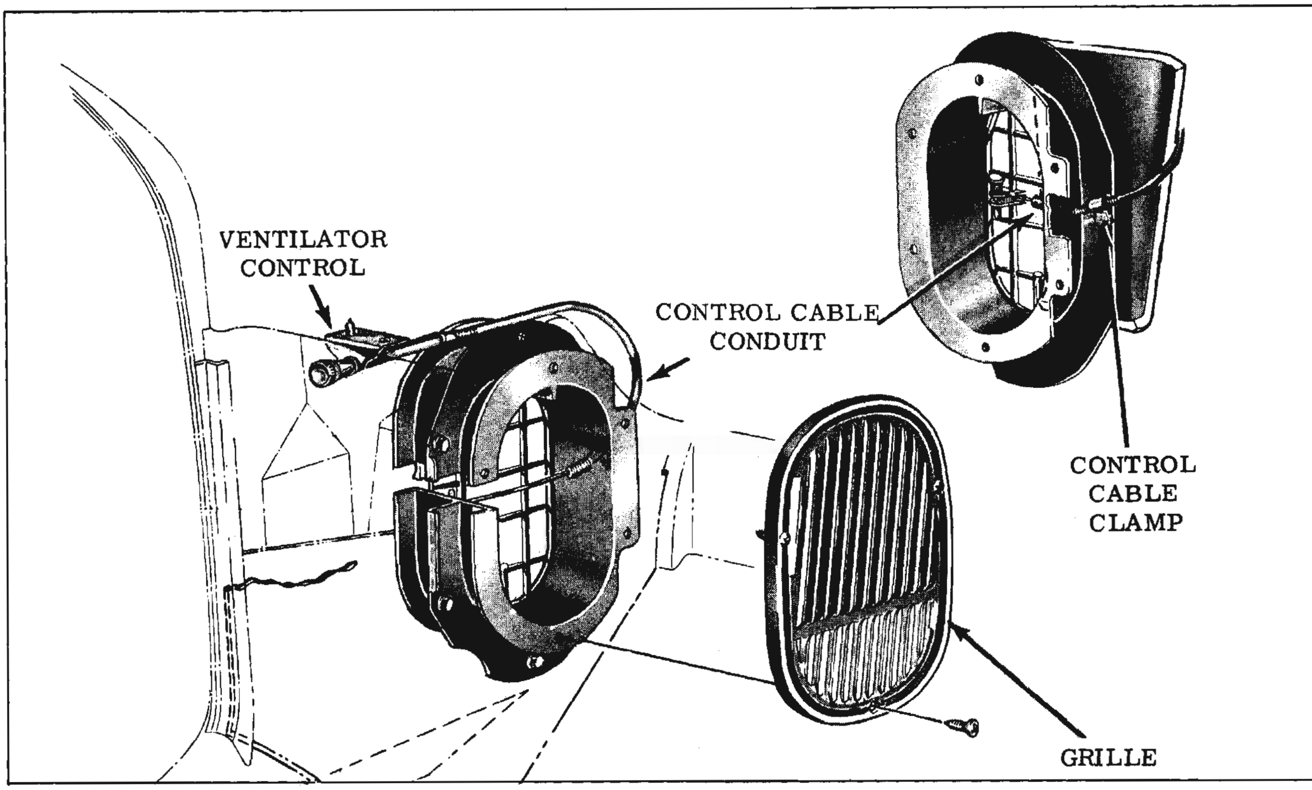


Fig. 15-101 Cowl Ventilator

2. Disconnect cable from valve by removing "springrip" washer and pivot pin.

3. Remove cable clamp at valve assembly.

4. Disconnect control from instrument panel by removing attaching screws.

Installation

1. Mount control on instrument panel.

2. Connect cable to air valve using pivot pin and "springrip" washer.

3. Position cable clamp on cable loosely. Push control knob to fully forward position. Move cable assembly through cable to clamp until air valve closes, then tighten cable clamp.

4. Check operation of control and re-install foundation panel and cowl vent grille.

AIR INLET VALVE BODY

Removal (Fig. 15-101)

1. Remove cowl vent grille, foundation panel and insulation.

2. Disconnect cable from air valve by removing "springrip" washer and pivot pin.

3. Remove cable clamp and pull cable out of valve body.

4. Remove valve body to cowl attaching screws and pry air valve from cowl.

Installation

1. Reseal valve body mounting flange, position valve body to cowl and install attaching screws.

2. Position cable through valve body assembly and connect cable to valve using pivot pin and "springrip" washer.

3. Adjust control cable and tighten cable clamp.

4. Install insulator, foundation panel and cowl vent grille.

AIR INTAKE GRILLE

Removal

1. Raise hood and place protective covering over fenders.

2. Remove windshield wiper arms.

3. Remove grille attaching screws from forward flange of grille. (Fig. 15-102)

4. Carefully raise front edge of grille and slide grille forward to disengage tabs along rear edge of grille from slots in the shroud.

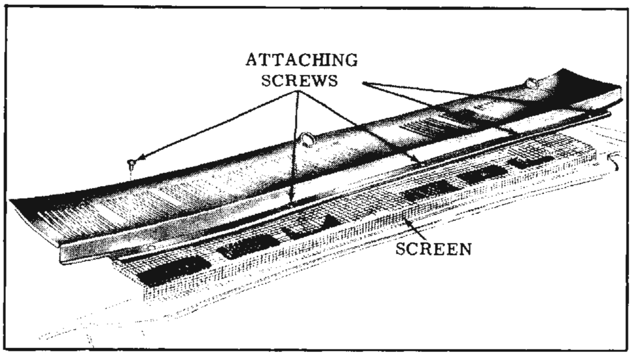


Fig. 15-102 Air Intake Grille

Installation

1. Apply medium bodied sealer around attaching screw holes and grille retaining slots.
2. Insert grille retaining tabs along rear edge of grille into slots in the shroud panel.
3. Position grille to provide clearance for the hood in the closed position and install attaching screws.

HEATER

DESCRIPTION

Outside air is drawn into the air intake grille by the heater blower. The air is blown through the heater core into the passenger compartment air distributor where it is directed either onto the floor or through the defroster outlets. (Fig. 15-103)

The blower is controlled by a three speed switch which is energized by the left hand lever in the control assembly. (Fig. 15-104) The center lever in the control assembly controls the temperature of the heater core by regulating the water flow through the core. The right hand control lever controls air flow through the heater system. In the "OFF" position, air is prevented from flowing through the system. In the "ON" position, air is directed into the passenger compartment through the air distributor when the lever opens the valve in the air inlet assembly. In the "DEFROST" position, air is directed onto the windshield through the defroster outlets when the lever closes two valves, one at each end of the heater air distributor, allowing the air to exit through the defroster outlets.

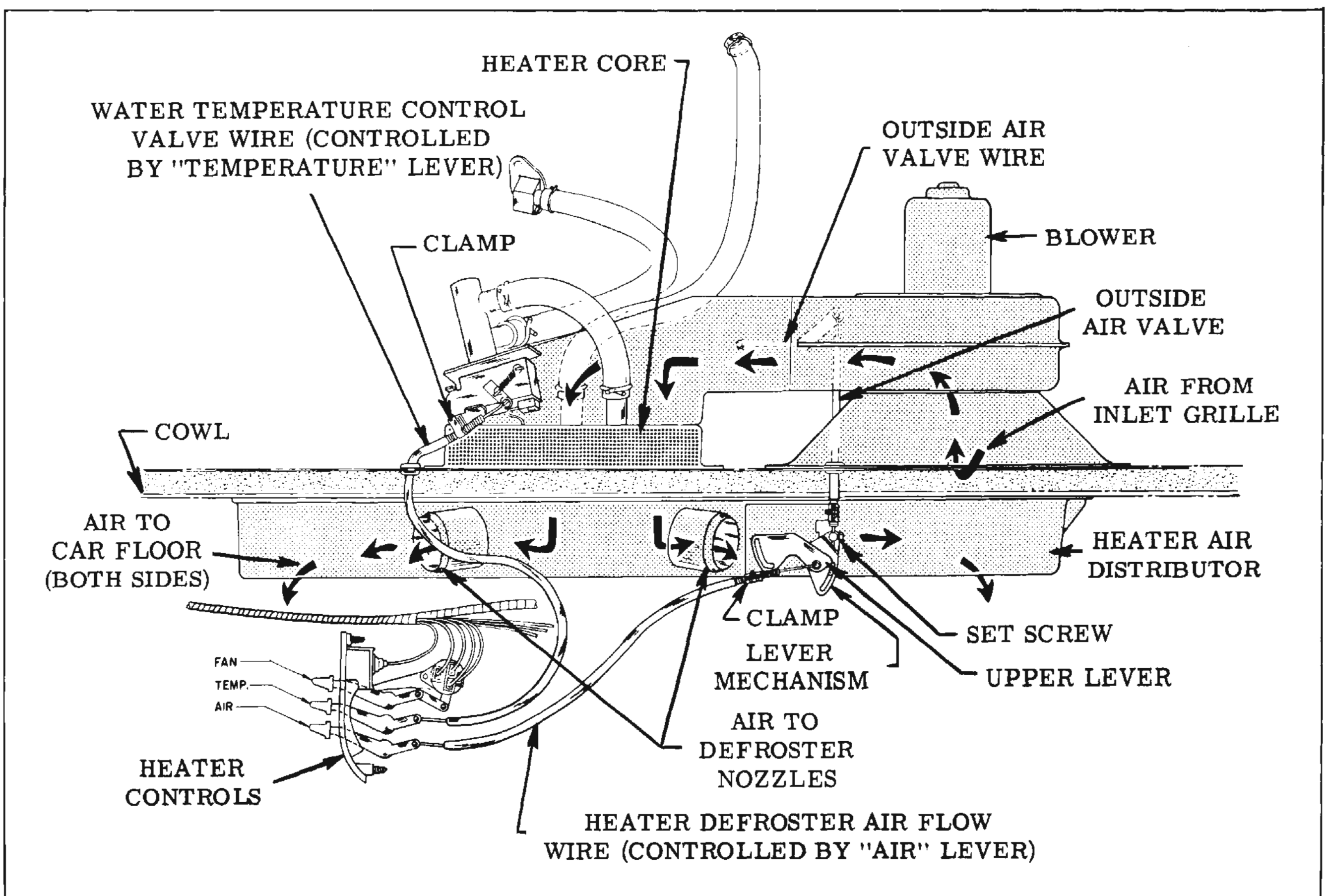


Fig. 15-103 Heater Air Distribution

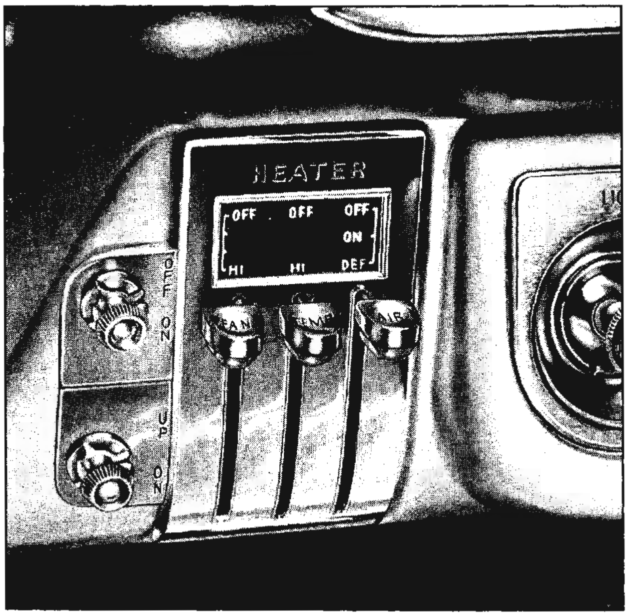


Fig. 15-104 Heater Controls

CONTROL ADJUSTMENTS

FAN SWITCH

Adjust switch so detents in switch and detents in heater control coincide. The elongated hole in the control body is provided to allow for adjustment.

TEMPERATURE CONTROL

The temperature control cable should be positioned in the clamp so the water valve is closed when the control lever is in the "OFF" position.

AIR CONTROL

1. Loosen heater-defroster cable clamp at lever assembly on air distributor. (Fig. 15-105)
2. Using a .30" spacer above the air control lever, set and hold lever against spacer. (Fig. 15-105)
3. Attach a spring to the air valve crank and to the choke tube to hold the air valve in the closed position.
4. Move the lower lever assembly (at air distributor) to the right until tight against stop. Tighten clamp holding heater-defroster cable, then tighten set screw against wire in the air inlet valve cable.
5. Remove spring and .30" spacer.

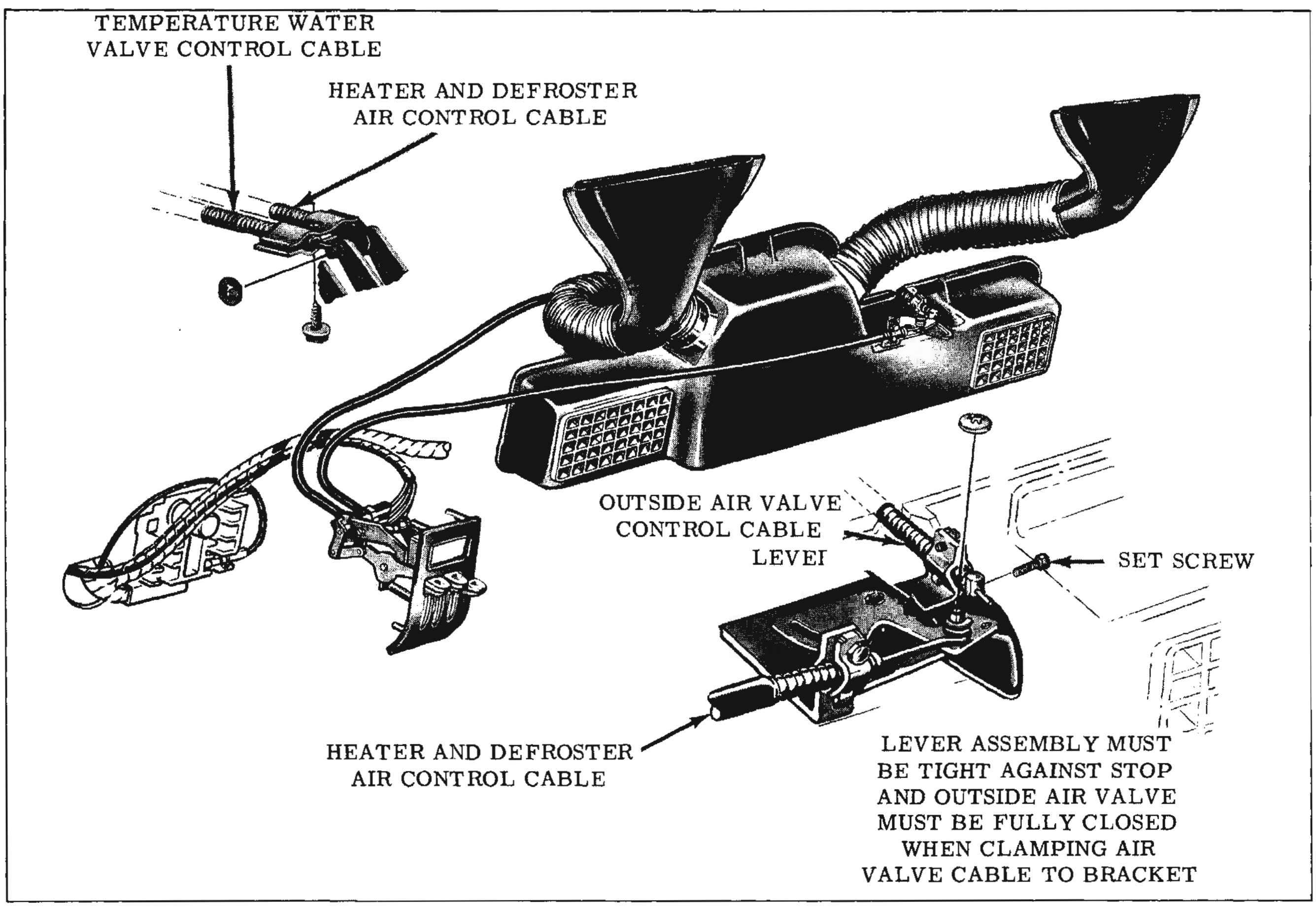


Fig. 15-105 Heater Control Cable Adjustments

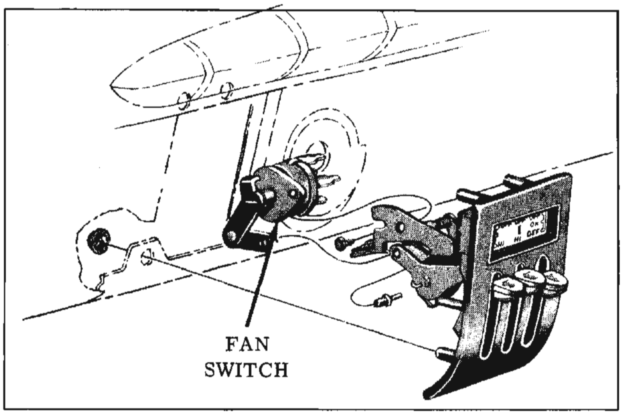


Fig. 15-106 Heater Control and Fan Switch

HEATER CONTROL

Removal

1. With control levers in "OFF" position, disconnect cables from air and temperature levers by removing "springrip" washers.

2. Disconnect switch wiring connector from switch and pull lamp from socket in control assembly.

3. Remove three control to instrument panel nuts and remove control assembly. (Fig. 15-106)

Installation

1. Position control to instrument panel and retain with three attaching nuts.

2. Insert lamp in socket and connect switch wiring.

3. Connect cables to levers and retain with "springrip" washers.

4. Check and, if necessary, adjust cables.

FAN SWITCH

Removal

1. With control assembly removed, remove nylon rivet which retains switch link to control lever. (Fig. 15-106)

2. Remove switch to control attaching screw and remove fan switch.

Installation

1. With switch control lever in "OFF" position, place switch on control, retain with attaching screw and install link-to-lever nylon rivet. (Fig. 15-106)

2. Adjust switch position, relative to control bracket, so switch detents coincide with control lever detents.

3. Install control assembly on instrument panel.

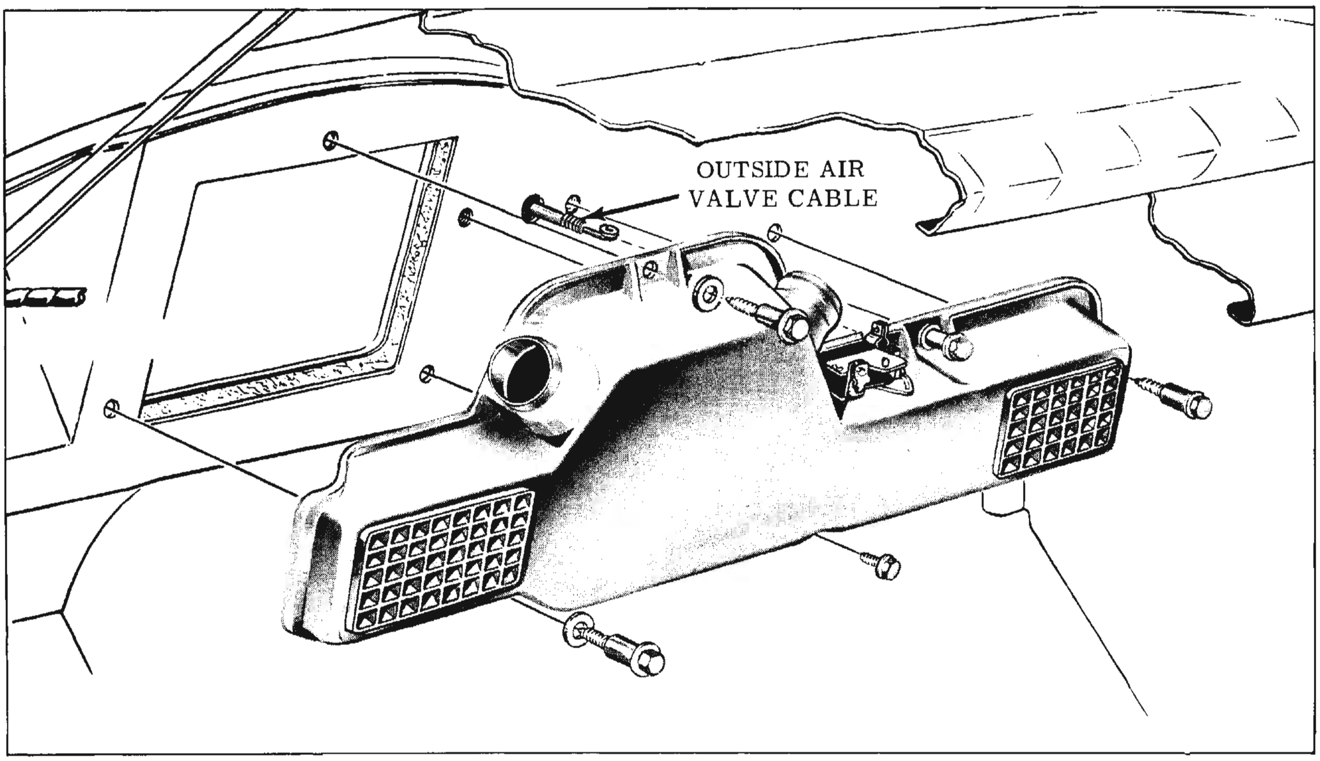


Fig. 15-107 Heater Distributor Case

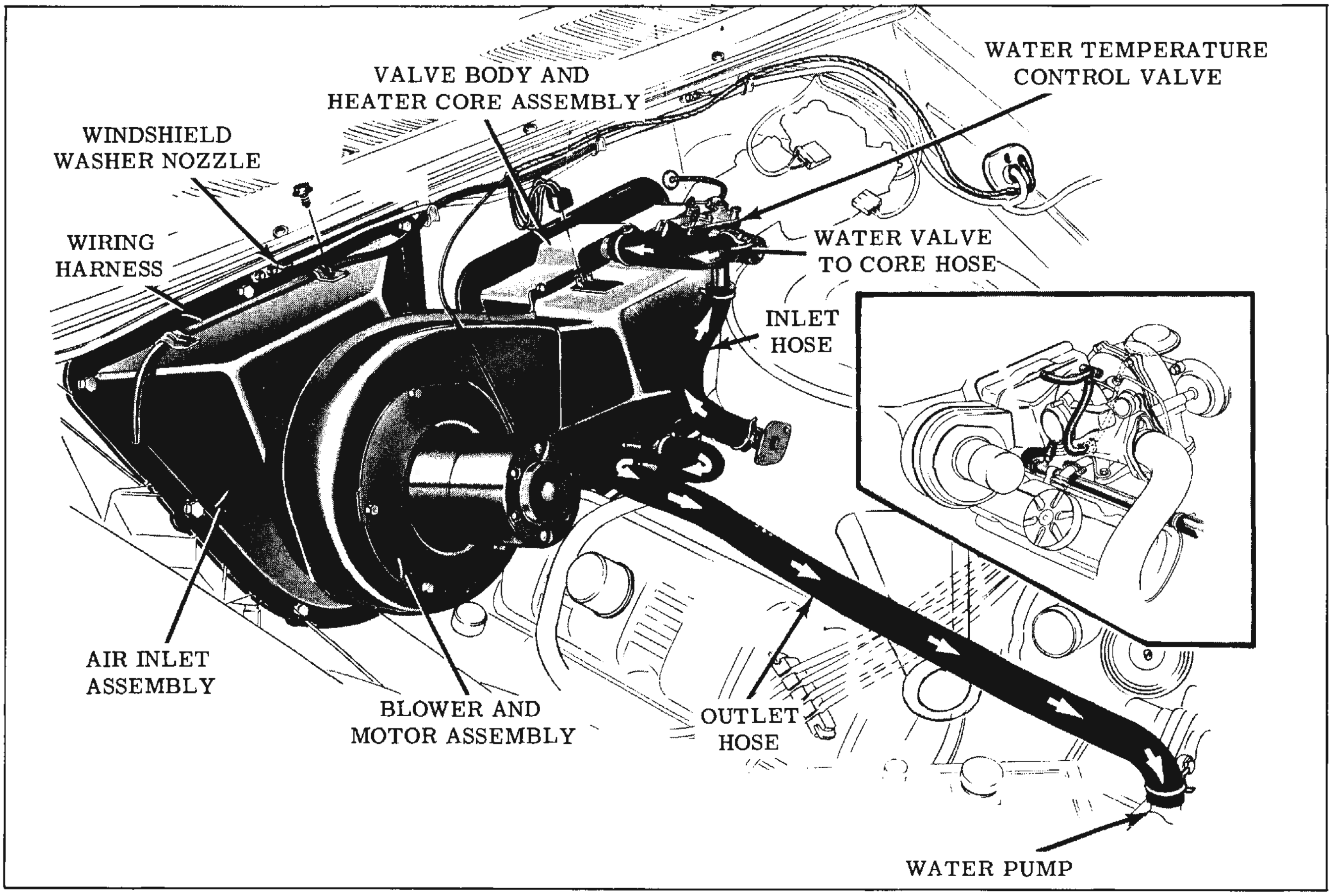


Fig. 15-108 Heater Hose Routing

HEATER DISTRIBUTOR CASE

Removal

1. Disconnect heater control cables and defroster hoses from the distributor.

2. Remove the distributor case to cowl screws and remove distributor assembly. (Fig. 15-107)

   NOTE: On air conditioned cars, it will be necessary to disconnect the evaporator assembly from the instrument panel and pivot evaporator assembly toward the R.H. side of the car to provide access to the heater distributor case.

Installation

1. Position distributor assembly to cowl and install attaching screws. Be sure all wiring and cables are properly positioned before tightening attaching screws.

2. Connect defroster hoses.

3. Connect and adjust control cables.

VALVE BODY AND HEATER CORE ASSEMBLY

Removal

NOTE: On Jetfire cars, it will be necessary to remove the turbo-charger assembly to provide access for valve body and heater core assembly removal.

1. Drain radiator.

2. Disconnect lower heater core water hose. (Fig. 15-108)

3. Disconnect hose (water valve to engine) from water valve.

4. Disconnect heater wiring harness from resistor. Disconnect water valve control cable from valve. (Fig. 15-109)

5. Disconnect outside air valve control cable.

6. Remove valve body to cowl attaching screws.

7. Pry valve body and heater core assembly from cowl.

8. The heater core can be removed from the valve body assembly by removing four core

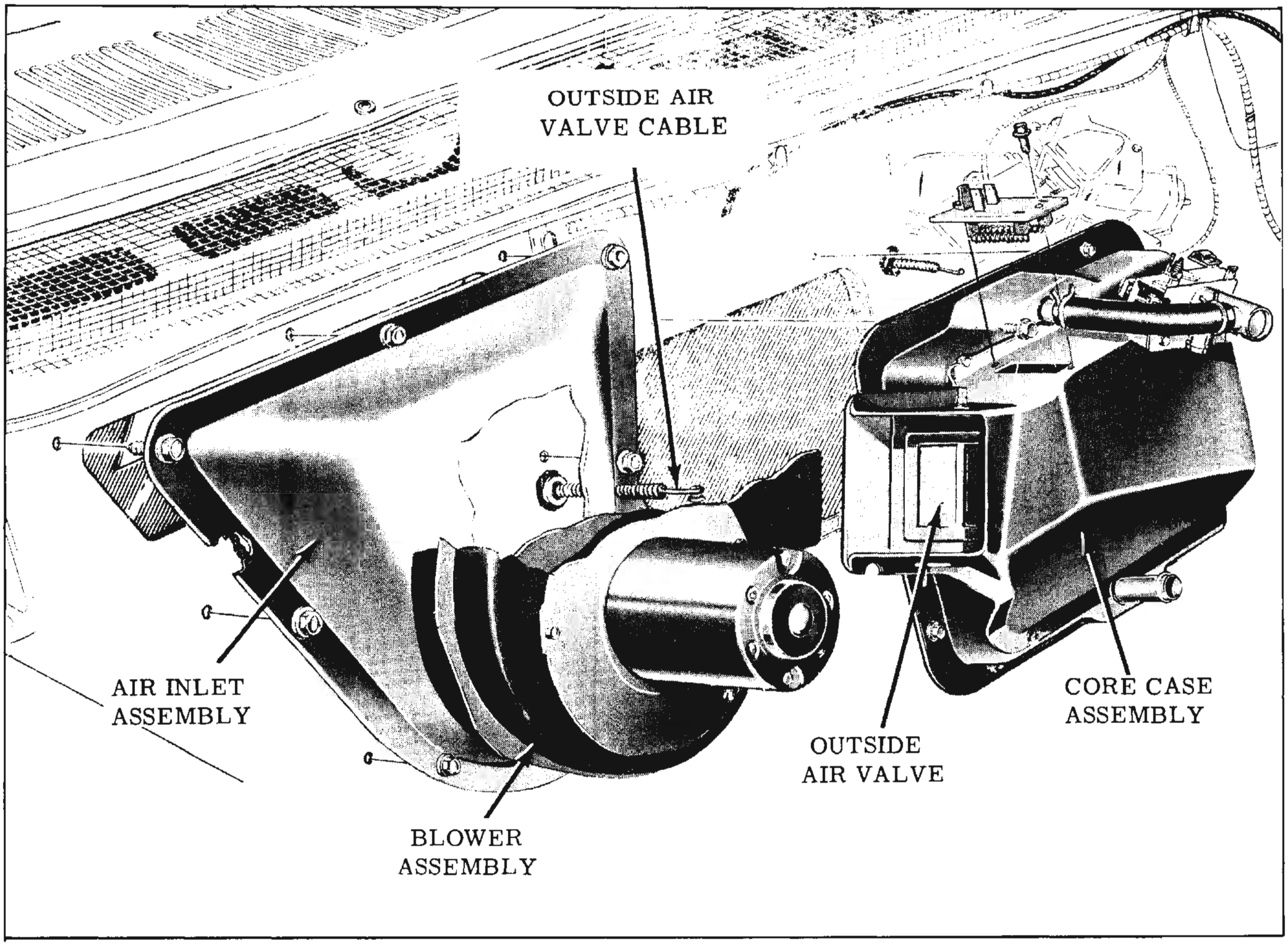


Fig. 15-109 Blower, Air Inlet Assembly, Valve Body and Heater Core Assembly

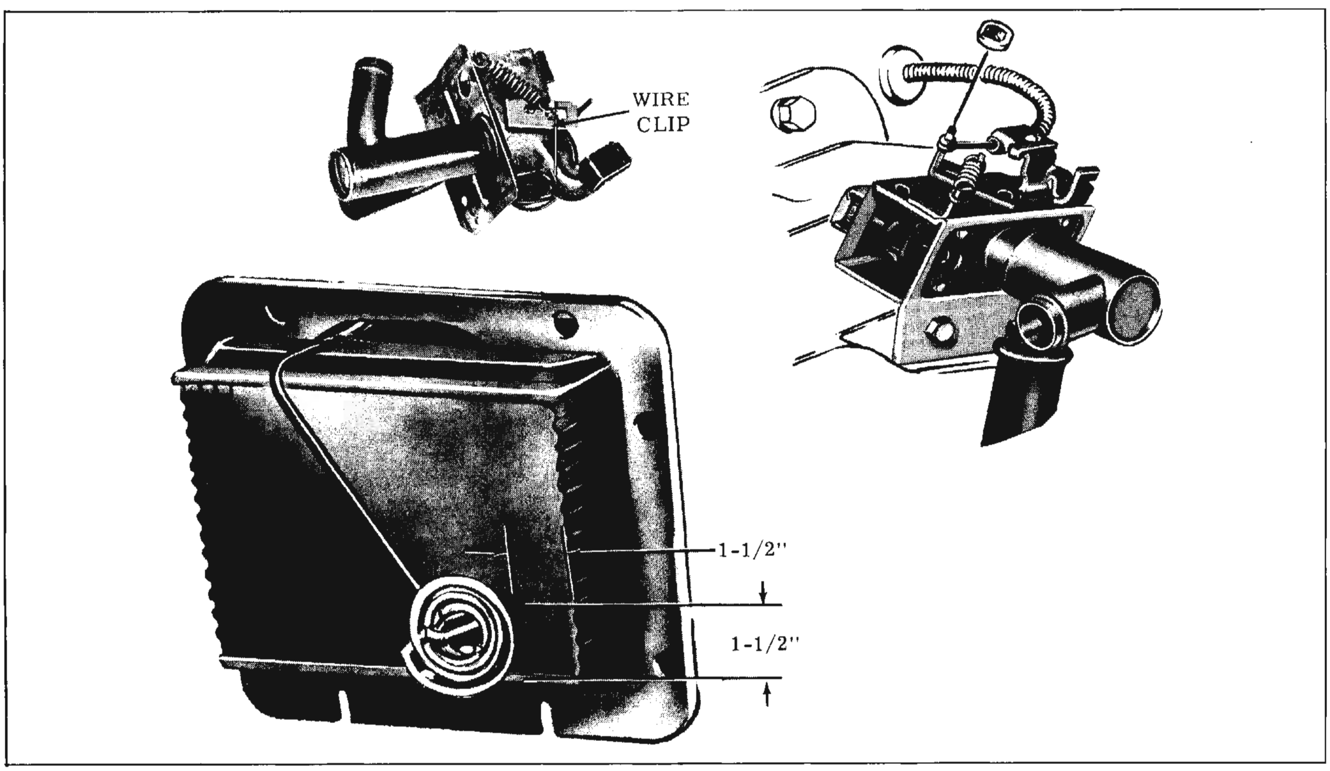


Fig. 15-110 Water Control Valve

retaining strap screws, disconnecting core inlet hose (core to water valve hose), removing temperature sensing tube core retainer from core and guiding the temperature sensing tube coil through the slot in the core flange.

NOTE: Do not attempt to uncoil and recoil the temperature sensing tube since this will cause the calibration of the unit to vary.

Installation

1. Reseal the valve body and core flanges. Position core to valve body assembly and reposition temperature sensing tube coil through slot in the core flange. Position two core to valve body assembly retaining straps and retain with four screws. Position temperature sensing tube coil on core and retain with nylon retainer as shown in Fig. 15-110.
2. Reseal cowl opening, position air valve and core assembly to cowl and install attaching screws.
3. Connect outside air valve cable to valve crank. Check operation and adjust cable as required.
4. Connect water valve control cable, check operation, and adjust the cable as required.
5. Connect heater wiring harness to resistor.
6. Connect water hoses, replenish radiator coolant and check system for leaks.

BLOWER AND MOTOR ASSEMBLY

Removal

1. Disconnect blower wiring.
2. Remove five blower to air inlet assembly attaching screws from blower mounting flange. (Fig. 15-108)
3. Pull blower and motor assembly from air inlet assembly.
4. The blower impeller can be removed from the motor after the impeller to shaft retaining nut has been removed.

Installation

1. Install the blower and motor assembly on the air inlet assembly and retain with five attaching screws.
2. Reconnect blower wiring and check operation.

WATER VALVE

Removal

1. Remove the valve body and heater core assembly as outlined under "VALVE BODY AND HEATER CORE ASSEMBLY, Removal".

   On "Jetfire" cars, it will be necessary to remove the turbo-charger in order to remove the heater core and valve body assembly since the valve body assembly attaching screws are not readily accessible without removing the turbo-charger.

2. Disconnect hose (water valve to core) from water valve.
3. Remove temperature sensing tube coil retainer from core.
4. Remove four core retaining strap attaching screws and remove core from valve body assembly, guiding temperature sensing tube coil through the slot in flange of core.
5. Remove the two water valve attaching screws and remove water valve from valve body assembly.

Installation

NOTE: Replacement water valves are packaged with a wire clip in place on the valve crank which holds the valve fully closed. (Fig. 15-110) This clip should not be removed until the temperature control cable has been adjusted after installation is completed.

1. Reseal the valve body and core flanges. Position core to valve body assembly and position two core to valve body assembly retaining straps on core. Install four retaining strap attaching screws.
2. Position water valve on valve body assembly and retain with two attaching screws.
3. Guide temperature sensing tube coil through the access slot in the flange of the heater core. Retain coil to heater core as shown in Fig. 15-110.

   NOTE: Do not attempt to uncoil and recoil the temperature sensing tube since this will cause the calibration of the unit to vary.

4. Connect hose from water valve to core.
5. Install the heater core and valve body assembly on cowl as outlined under "VALVE BODY AND HEATER CORE ASSEMBLY, Installation".

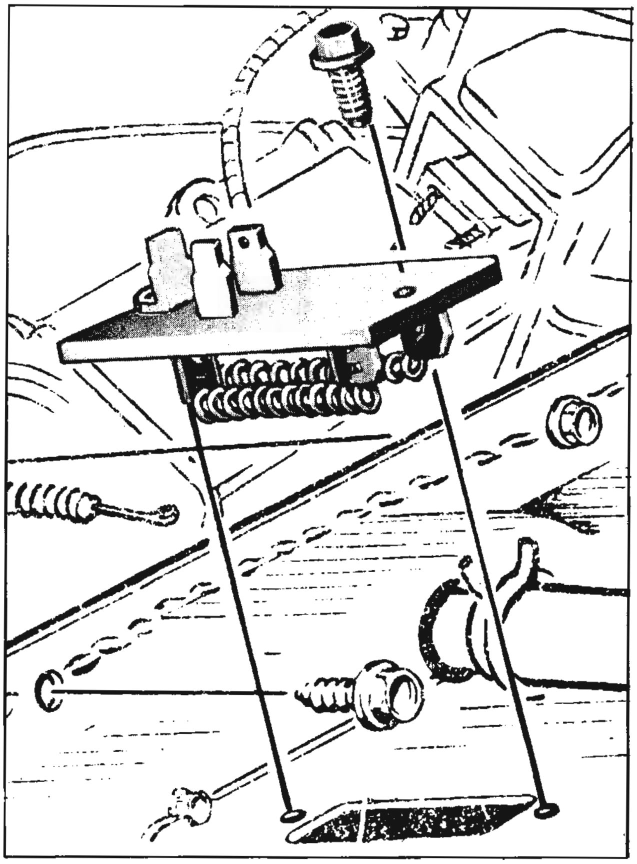


Fig. 15-111 Heater Resistor Installation

RESISTOR

Removal

1. Disconnect harness from resistor. Remove two attaching screws, and remove resistor from air valve assembly.

Installation

1. Position resistor on air valve assembly as shown in Fig. 15-111 and retain with two attaching screws. Connect harness.

AIR CONDITIONER

MAINTENANCE RECOMMENDATIONS

The air conditioning system should be operated for five minutes during each month that the system is not in regular use. A thorough service inspection should be performed at the beginning of the cooling season or as otherwise indicated below:

1. Check refrigerant and oil at least twice a year and replenish as necessary.

2. Periodically check and adjust compressor belt tension.

3. Periodically remove road accumulation from condenser (bugs, etc.).

DESCRIPTION

The Oldsmobile F-85 Air Conditioning System can be operated any time the engine is running, to provide refrigerated and dehumidified air to cool the car interior. The system uses both outside air and recirculated inside air. Outside air enters the car at the cowl inlet grille below the windshield. The outside air passes through the cowl plenum chamber and enters the passenger compartment air inlet duct at the right hand side cowl panel. The air then passes through the inlet duct into the passenger compartment in front of the air conditioning blower intake screen. The outside air enters the blower, passes into the evaporator case and through the evaporator. (Fig. 15-112)

The recirculating inside air joins the outside air at the blower inlet screen, passes into the evaporator case and through the evaporator. From the evaporator the air is then directed to the passenger compartment outlets.

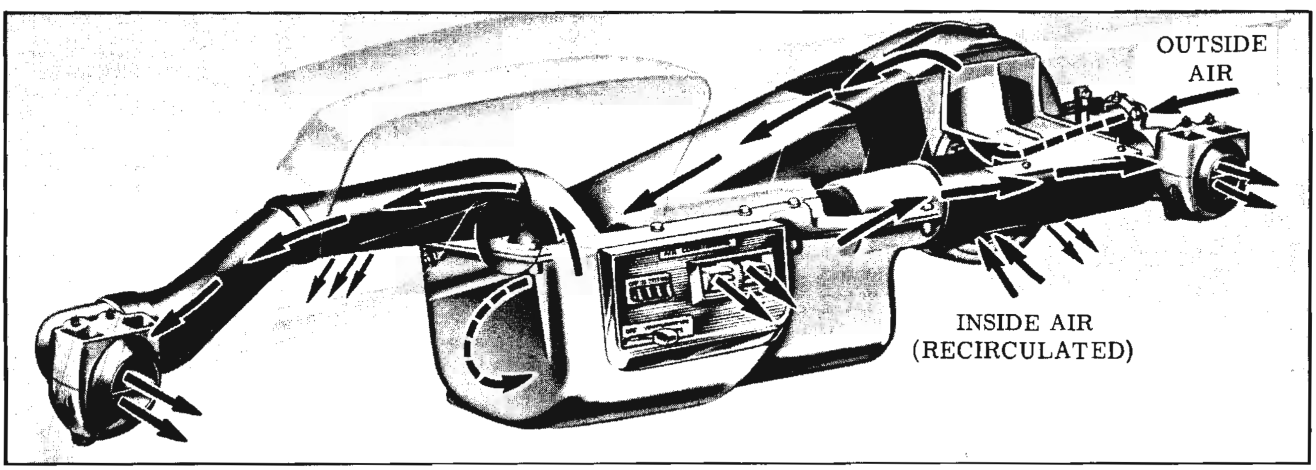


Figure 15-112 Air Conditioning Air Distribution

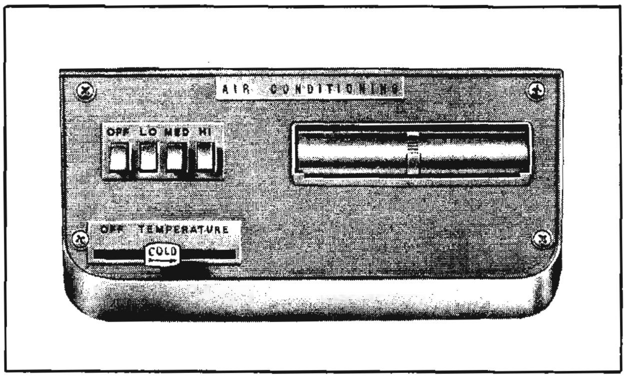


Fig. 15-113 Air Conditioning Controls

The temperature of the air leaving the air conditioning outlets is regulated by a single control lever. The outside air inlet valve is opened completely when the temperature lever is moved approximately 1/4" to the right. In addition, outside air will be admitted to the passenger compartment, even though the blower is off and the air conditioning is apparently not functioning, if the temperature control lever is not placed in its warmest setting. Therefore, in winter driving it will be necessary to have the temperature control in the extreme left hand position in order to prevent a cold air draft since the outside air inlet valve is closed only in the extreme left hand position.

The amount of air moved through the evaporator is controlled by the blower speed. Four buttons ("OFF", "LOW", "MED" and "HIGH") on the evaporator case, control the blower speed. (Fig. 15-113)

Refrigerated air enters the passenger compartment through three air outlets. (Fig. 15-114) Two revolvable nozzles, one at each lower side of the instrument panel, can be moved as desired to direct cooling air in any direction away from the instrument panel.

An air outlet on the evaporator case at the center of the instrument panel can be adjusted from an opened to closed position. For maximum cooling, this door should be wide open.

The blower button also controls the operation of the air conditioning compressor. With the "OFF" button depressed, the compressor clutch is disengaged. With any blower speed button depressed, the compressor clutch is engaged providing cooling.

FAST COOL DOWN

To rapidly cool a car which has been standing for a period of time in the sun, open center outlet. Depress "HI" button and slide temperature lever to the extreme right position. Open car windows just long enough to expel hot air and then close windows. After car has cooled, adjust temperature control lever position and blower speed to suit individual comfort. Air flow can be directed by adjusting the side and center outlets. THE RECOMMENDED POSITION OF THESE OUTLETS, FOR BEST OVERALL FRONT AND REAR SEAT COOLING, IS WHEN THE OUTLETS ARE ADJUSTED TO DIRECT THE AIR FLOW ALONG THE INSIDE ROOF LINE.

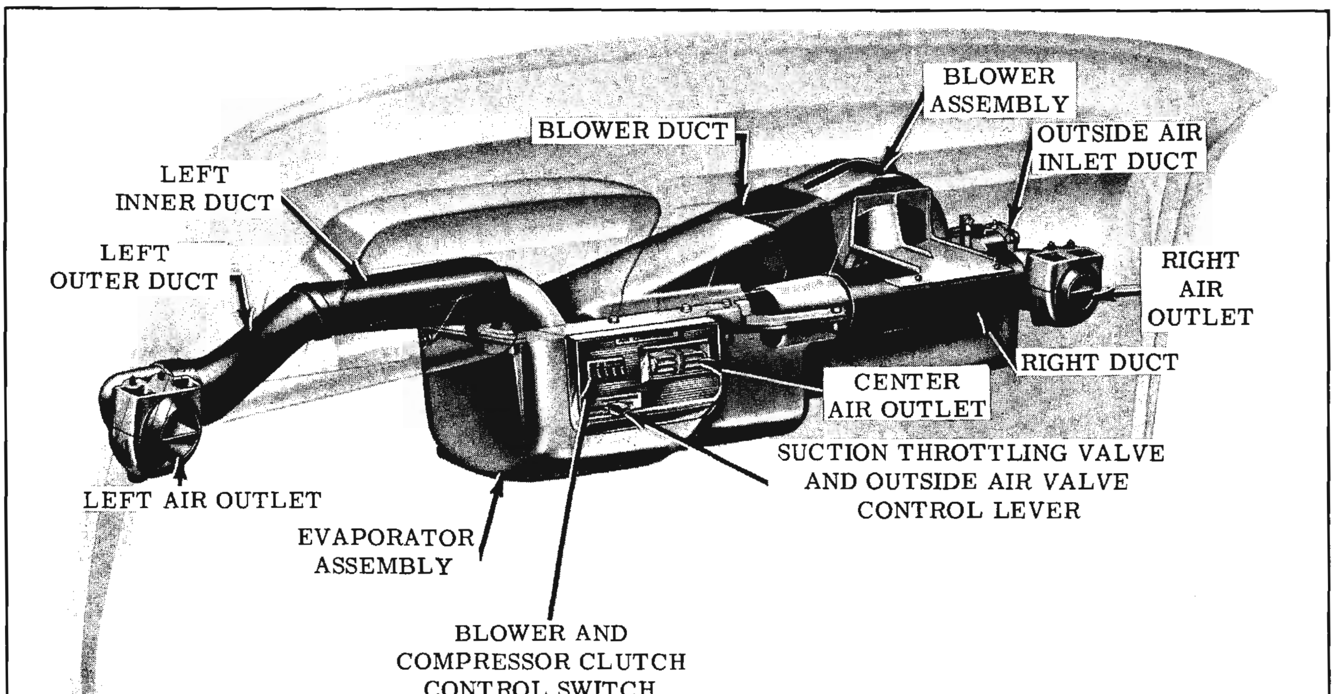


Fig. 15-114 Evaporator Case and Distributor Assembly

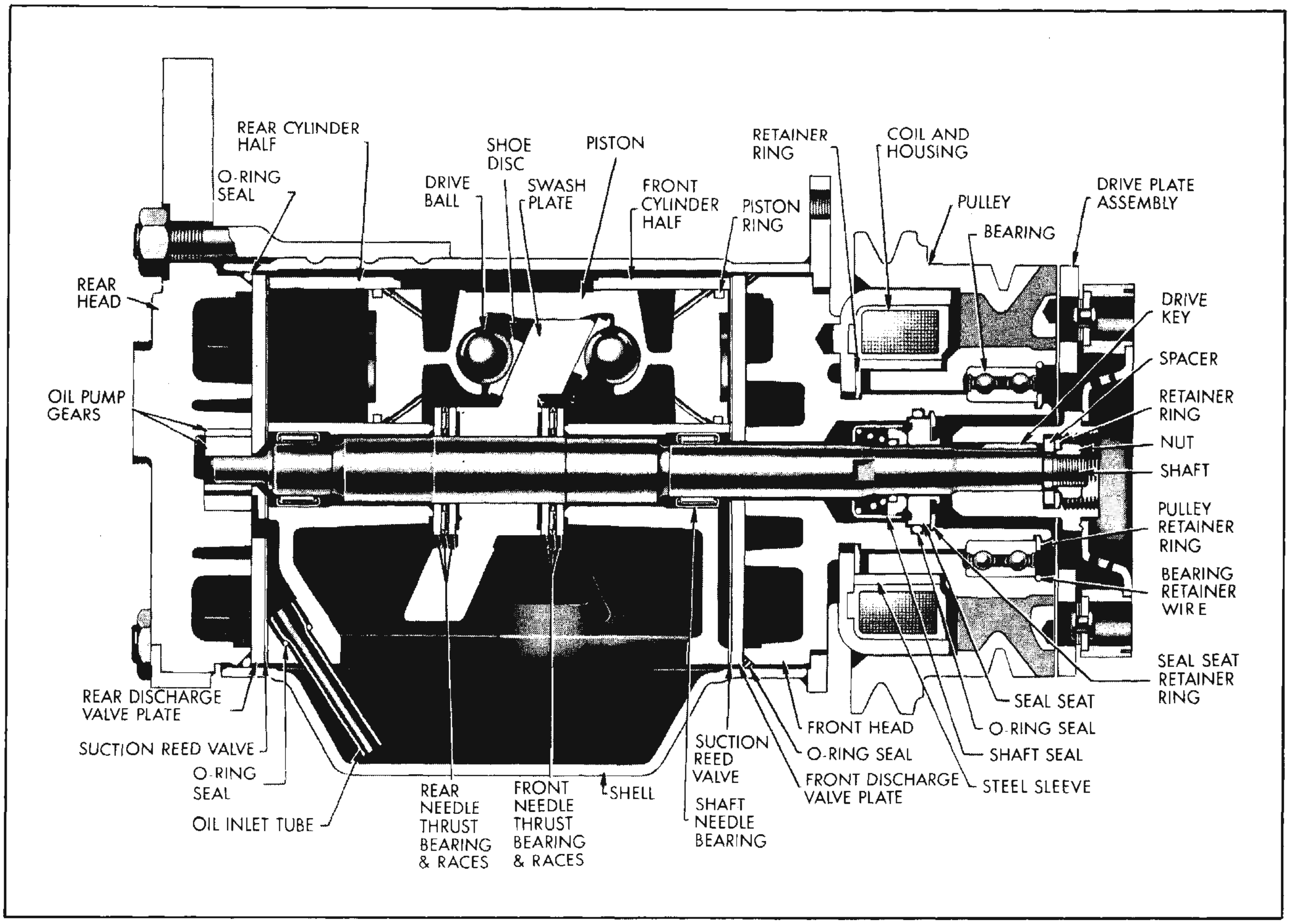


Fig. 15-115 Compressor Cross Section

SERIAL NUMBERS

The serial number plate is attached to the top side of the compressor. The plate includes the Serial Number and Model Number.

IMPORTANT: ALWAYS INCLUDE BOTH SERIAL NUMBER AND MODEL NUMBER ON ALL REPORTS.

OPERATION OF SYSTEM

CONTROLS

The air conditioning control assembly is mounted in the front of the evaporator case at the lower center of the instrument panel. Four blower speed control buttons, ("OFF", "LOW", "MED" and "HIGH") are located at the upper left of the control assembly. Whenever the blower circuit is energized, the compressor clutch is energized also. The temperature control lever is located at the lower left of the control assembly and it controls the amount of cooling.

COMPRESSOR

The refrigeration system uses an axial type compressor. (Fig. 15-115) It is a reciprocating compressor having 6 cylinders, with intake and discharge valve reeds for each cylinder. These valve reeds cause the compressor to have a definite separation between the discharge (high) side and the intake (low) side. Oil is picked up by the refrigerant in the compressor and is pumped through the refrigeration system. An oil drain fitting is on the lower side of the compressor. The solenoid-operated clutch pulley permits the compressor to run only when refrigeration is desired. The compressor is completely serviceable.

COMPRESSOR PRESSURE RELIEF VALVE

The compressor pressure relief valve is located on the high pressure service valve at the muffler. The relief valve is placed in the system as a safety factor. Under certain conditions, the refrigerant on the high side may exceed a safe operating pressure; therefore, to prevent damage, the valve is designed to open automatically at approximately 430 p.s.i. Any condition that causes this valve to open should be corrected, and the refrigerant oil and refrigerant should be replenished as necessary.

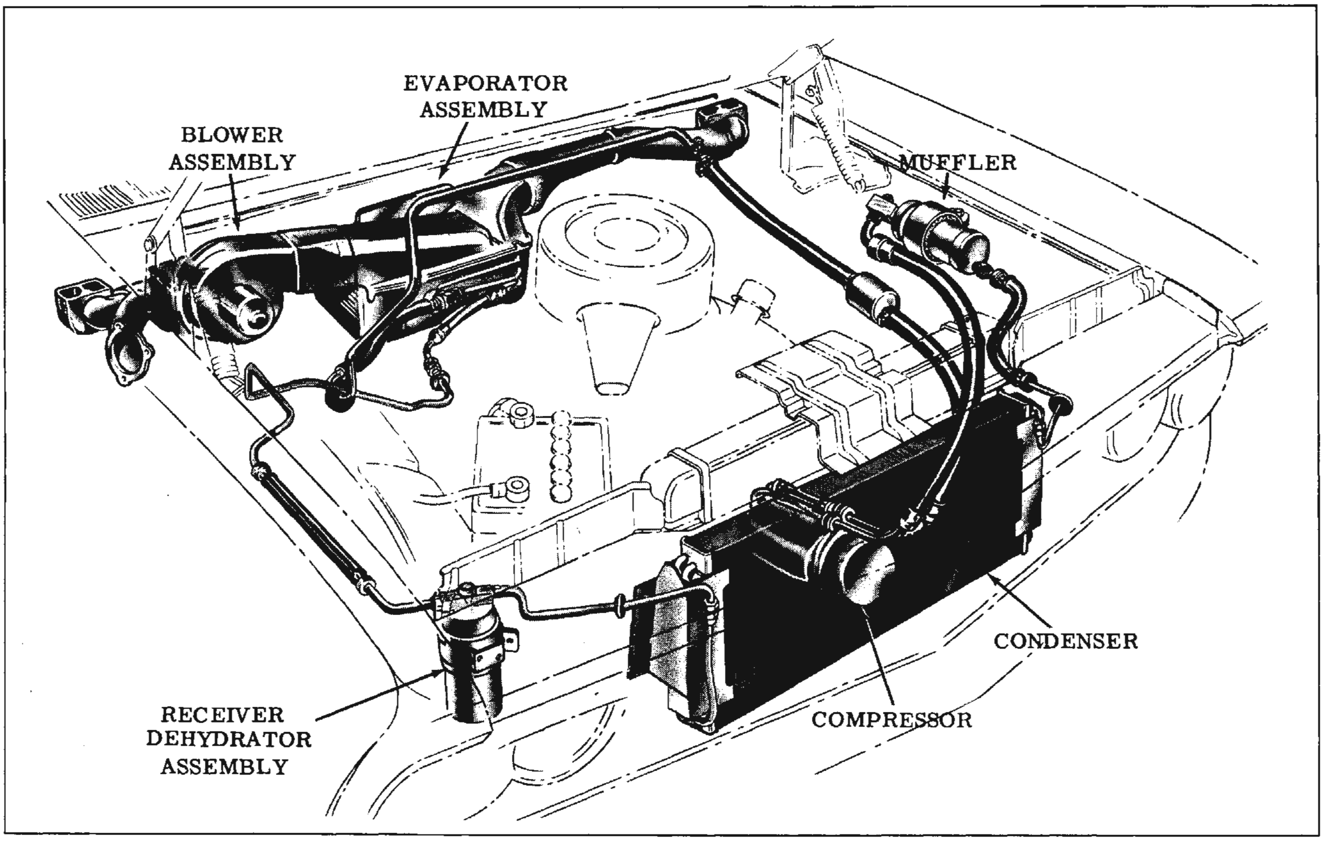


Fig. 15-116 Air Conditioning System

SCHRADER SERVICE VALVES (Fig. 15-116)

The compressor service valves are necessary to permit pressure checks and servicing of the refrigerant system.

The compressor high pressure service valve is located at the discharge muffler. It is an integral part of the muffler and the two units are serviced as an assembly.

The compressor low pressure service valve is located in the low pressure compressor return line between the evaporator and the compressor.

COMPRESSOR DISCHARGE MUFFLER

A muffler has been placed in the high pressure discharge side of the system to reduce compressor noises and high pressure line vibrations. The muffler tank absorbs the surges from the compressor in a manner similar to the action of a hydraulic accumulator. No repairs are to be made on the muffler. If it is defective, it should be replaced. Always install the muffler with the outlet side down.

CONDENSER

The condenser is similar to the ordinary car radiator. It is made up of coils which carry the refrigerant and cooling fins which provides rapid transfer of heat. The condenser is located in front of the engine cooling system radiator so that it receives a high volume of air from the movement of the car and from the engine fan. The air passing through the condenser cools the high pressure refrigerant vapor, causing it to condense into liquid refrigerant.

SIGHT GLASS

The refrigerant sight glass (at top of receiver-dehydrator) is provided to aid in diagnosis, by permitting the refrigerant to be observed. The appearance of a steady flow of bubbles or foam, after the compressor has run long enough to stabilize, indicates a shortage of refrigerant.

The sight glass can be serviced without removing the receiver-dehydrator assembly. After removal of the retaining screw, the sight glass can be lifted out with caulking compound and the "0" ring can be removed with a wire hook.

CAUTION: When performing this operation, the system should not be left open longer than absolutely necessary as the dehydrator will soak up moisture like a sponge. Refer to "SERVICING OF THE REFRIGERATION SYSTEM".

RECEIVER-DEHYDRATOR ASSEMBLY

The functions of this unit are to absorb moisture and foreign material that may be present in

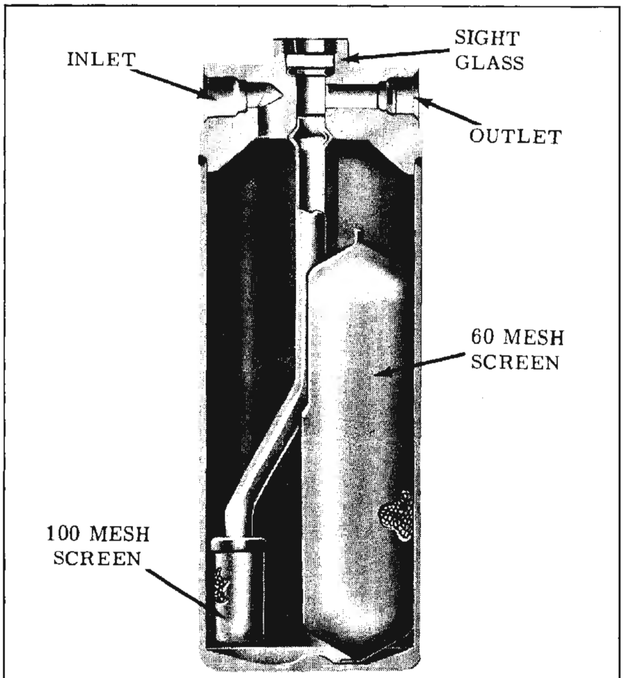


Fig. 15-117 Receiver - Dehydrator Assembly

the system after assembly, and to insure a solid charge of liquid refrigerant in the line feeding the expansion valve, providing the system is properly charged. This unit is not serviceable, and should be replaced when there has been a leak in the low pressure side of the system that permitted air and moisture to be drawn into the system. (Fig. 15-117)

EXPANSION VALVE

The expansion valve, mounted inside the evaporator case, controls the flow of refrigerant into the evaporator. It is adjusted so that the temperature of the refrigerant at the evaporator outlet must be 6°F. higher than the temperature of the refrigerant at the inlet before more refrigerant is allowed to enter the evaporator. A capillary tube filled with carbon dioxide provides the temperature regulation of the expansion valve. The capillary tube is fastened to the low pressure refrigerant line coming out of the evaporator inside the evaporator case so that it communicates the temperature of the refrigerant at this point to the expansion valve. If the temperature differential between the inlet and outlet decreases below 6°F., the expansion valve will automatically reduce the amount of refrigerant entering the evaporator. If the temperature differential increases above 6°F., the expansion valve will automatically allow more refrigerant to enter the evaporator, thus increasing the cooling. The only service operations to be performed on the expansion valve are the cleaning and/or replacement of the inlet filter screen. (Fig. 15-118)

NOTE: It is very important that the expansion valve capillary tube bulb be tightly clamped to the low pressure refrigerant line coming out of the evaporator for proper operation. Both the low pressure line and capillary tube should be cleaned at the points of contact.

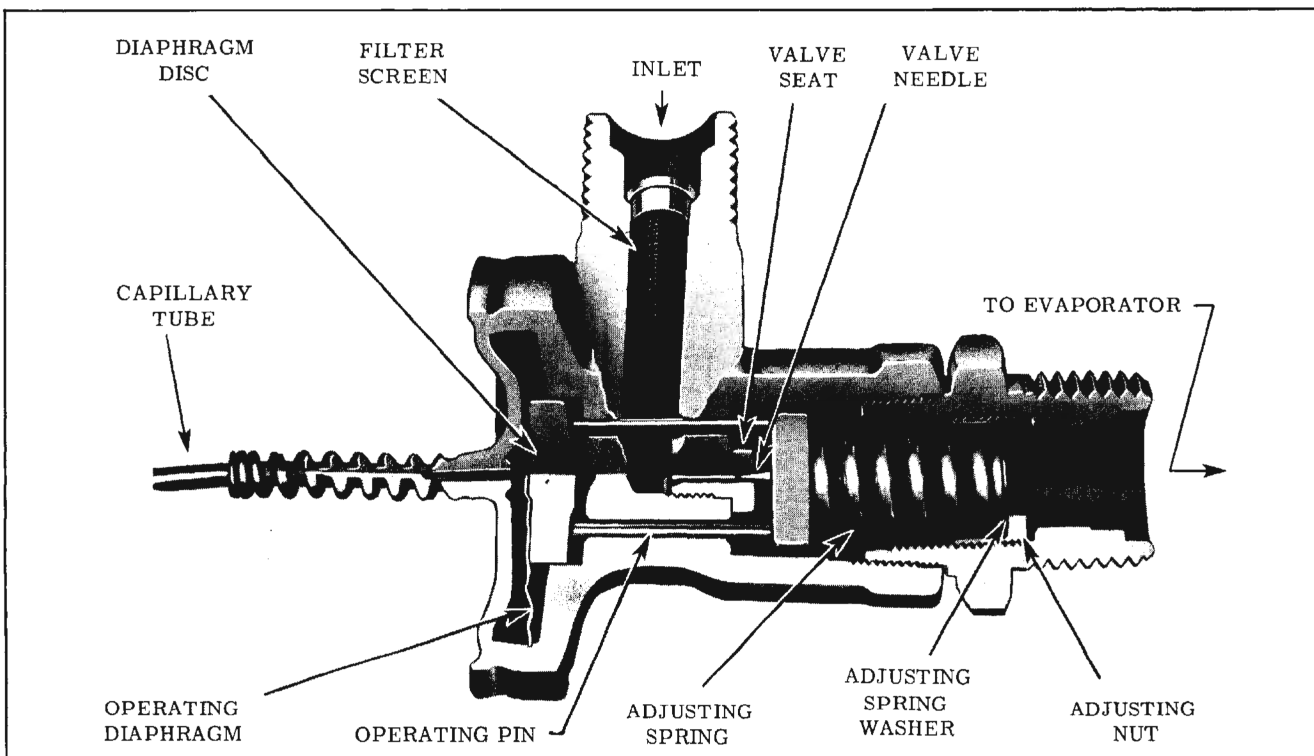


Fig. 15-118 Expansion Valve

EVAPORATOR

The evaporator (cooling coils) is located in a housing which is attached under the instrument panel above the transmission hump.

Air from the blower housing is directed through the evaporator case to the distribution hoses and air outlets inside the car. Heat is absorbed from the air by the liquid refrigerant entering the evaporator, causing the refrigerant to vaporize.

SUCTION THROTTLING VALVE

The suction throttling valve performs two functions in the refrigeration circuit. First, it limits the evaporator minimum pressure to prevent "freeze-up" of the evaporator coils, and second, it provides a means for controlling evaporator discharge air temperature.

The valve controls minimum evaporator pressure by throttling the flow of refrigerant through the suction line. The evaporator pressure is maintained by a balance of spring force, above the diaphragm, and evaporator pressure below the diaphragm. The valve is used as a temperature control, through the use of a lever controlled bowden cable. (Fig. 15-119)

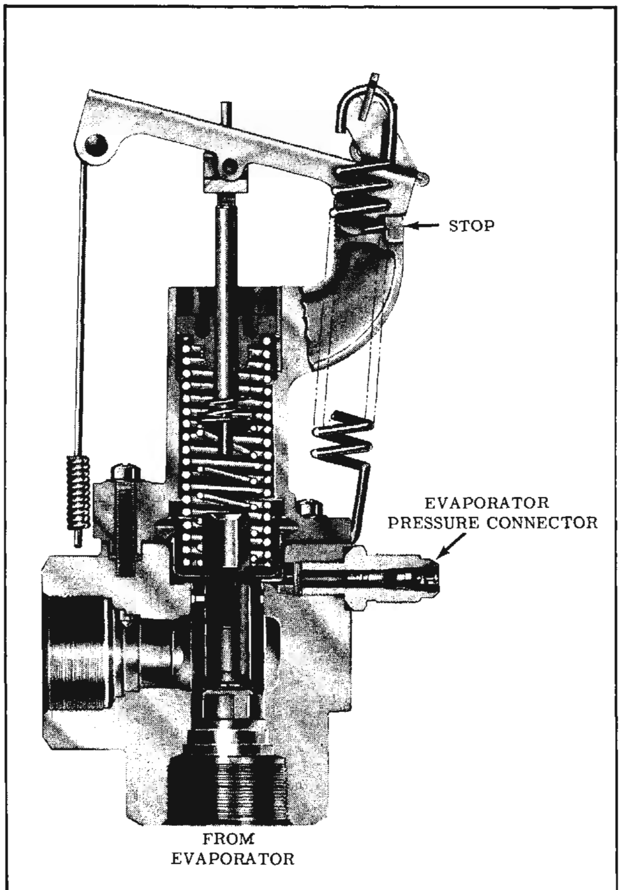


Fig. 15-119 Suction Throttling Valve

As the temperature lever is moved to the right, the evaporator pressure is gradually reduced. With the temperature lever at the extreme right position, maximum cooling of the evaporator and consequently maximum cooling of the discharge air results. The suction throttling valve should be adjusted to maintain a mimimum evaporator pressure of 23-24 p.s.i.

REFRIGERATION CIRCUIT (Fig. 15-120)

Heat laden, low pressure vapor refrigerant is drawn into the compressor and pumped from the compressor through the muffler to the condenser under high pressure. The vapor is heated as a result of the compression process. As it passes through the condenser, the high pressure - high temperature vapor is cooled, which causes the vapor to condense into liquid. The liquid refrigerant passes from the condenser into the receiver-dehydrator which acts as a reservoir. The liquid in the receiver is still under high pressure.

Liquid refrigerant from the receiver now passes on to the expansion valve. The expansion valve meters refrigerant into the evaporator core. When the pressure in the evaporator is reduced, the liquid refrigerant immediately begins to boil at low temperature as it enters the evaporator. As the refrigerant passes through the evaporator, it continues to boil, absorbing heat from (and thereby cooling) the air passing through the evaporator core. By the time the refrigerant leaves the evaporator, it has completely vaporized and has warmed approximately 6°F.

Refrigerant returns from the evaporator through the suction pressure line to the compressor. When the evaporator pressure drops below 24 p.s.i., the suction throttling valve restricts the flow of refrigerant to the compressor, thereby raising the evaporator pressure to prevent freezing of the core. It is this same action that regulates the amount of cooling when the temperature lever on the instrument panel is moved to the left.

PRECAUTIONS IN HANDLING REFRIGERANT 12

(Refer to F.S.C. Air Conditioner Section)

SPECIAL EQUIPMENT

(Refer to F.S.C. Air Conditioner Section)

SERVICING OF INDIVIDUAL UNITS (NOT IN REFRIGERANT SYSTEM)

The following services and repairs concern parts of the air conditioning system which can be serviced without opening the refrigerant system.

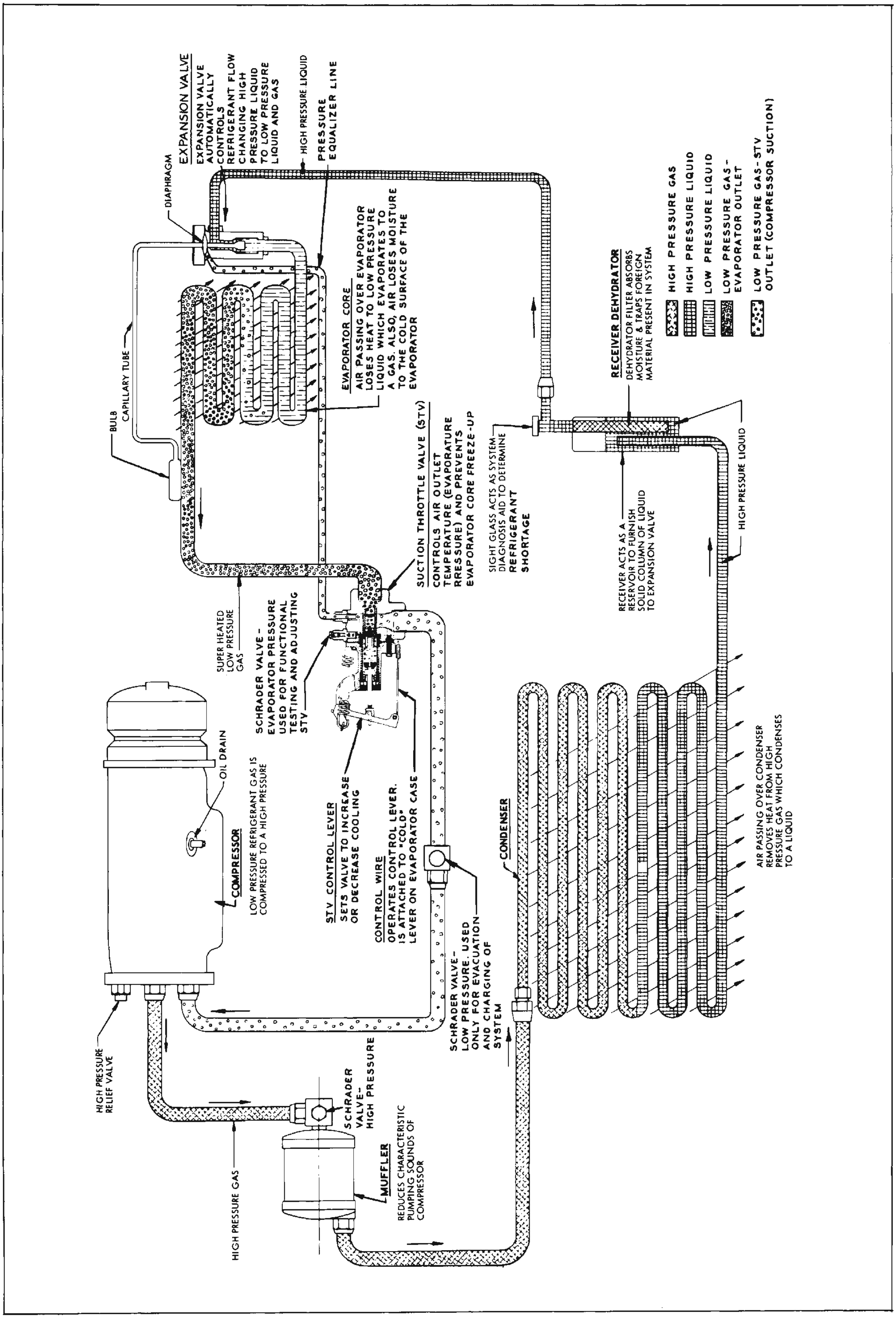


Fig. 15-120 Refrigeration Circuit

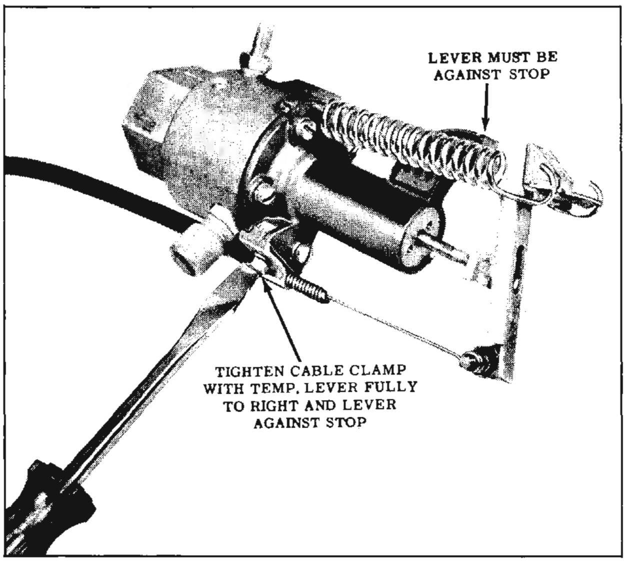


Fig. 15-121 Cable Adjustment

COMPRESSOR BELT ADJUSTMENT

Tool BT-33-70 is used to check the compressor belt tension.

If belt requires adjustment:

1. Loosen the compressor bolts and nuts.
2. Pivot the compressor until the pointers on Tool BT-33-70 are even with line on tool plunger.
3. Tighten the compressor bracket adjusting link bolts.

SUCTION THROTTLING VALVE

Cable Adjustment

1. Operate the control lever to be sure the cable is not kinked.
2. Position temperature lever fully to the right and loosen cable clamp screw on the valve. (Fig. 15-121)
3. Position cable in the clamp to force the valve lever against its stop.
4. With temperature lever held fully to the right and with valve lever held against its stop, tighten cable clamp screw.

NOTE: When adjusting suction throttle valve after system has been discharged, the temperature control lever must be moved back and forth 10 to 15 times to normalize the diaphragm.

Valve Adjustment

NOTE: Be sure cable is properly adjusted before adjusting valve.

Should it become necessary to adjust the valve, the following steps must be performed:

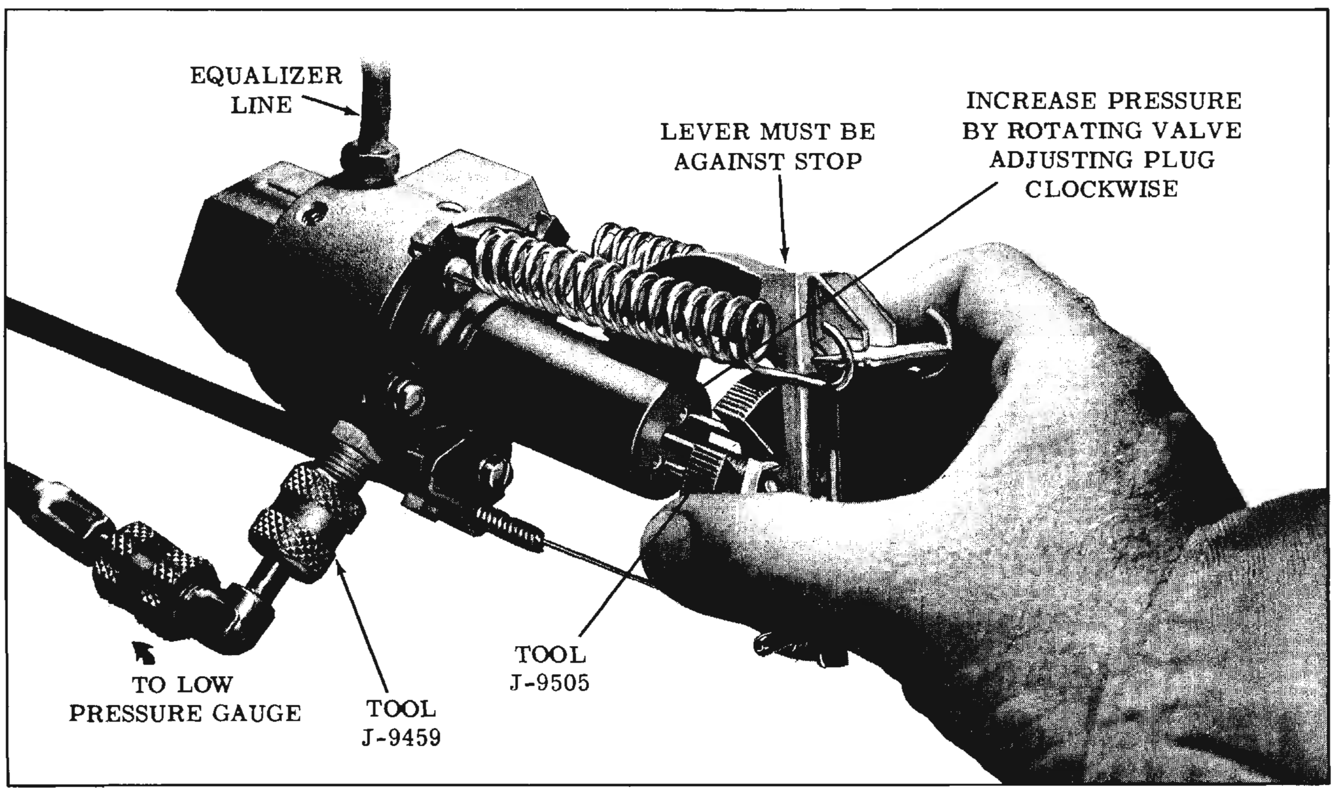


Fig. 15-122 Adjusting Suction Throttling Valve

1. Remove the Schrader valve cap at the suction throttle valve.

2. Install adapter J-9459 on the low pressure gauge hose (gauge set closed) and connect to suction throttle valve.

3. Purge the gauge and hose by opening gauge valve momentarily.

4. Start engine, adjust engine r.p.m. to 1600, set temperature control at extreme right and depress "HI" blower speed button.

5. Allow system to operate a few minutes. Slowly increase engine r.p.m. until evaporator pressure no longer decreases. Evaporator pressure must be 23-24 p.s.i. If the minimum reading is not 23-24 p.s.i., adjust valve to 23 p.s.i. as follows:

   a. Engage the pins on Tool J-9505 in holes in valve plug. (Fig. 15-122)

   b. Turn plug to adjust. (Clockwise to increase)

      NOTE: If ice is forming on the evaporator, the pressure may be increased by a half-pound at a time until the condition is eliminated.

6. Turn engine off, remove tools and install Schrader valve cap.

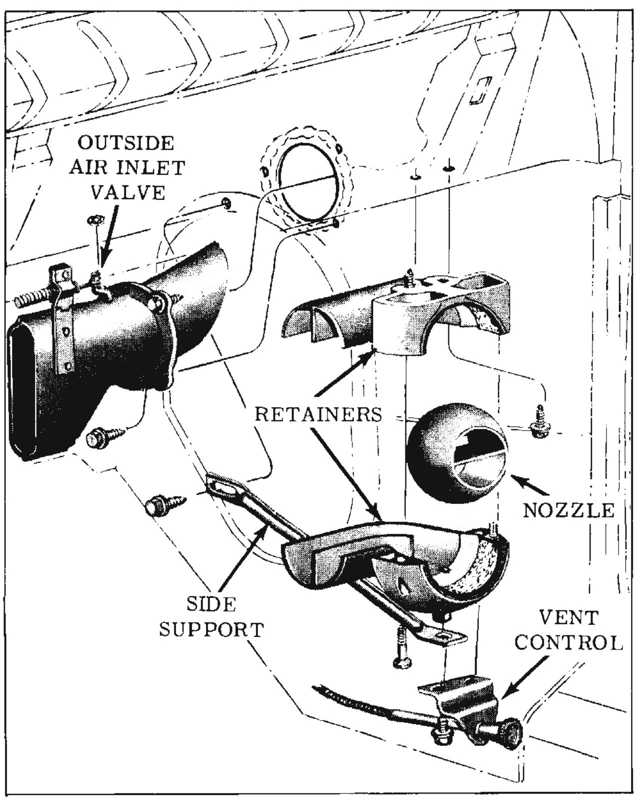


Fig. 15-123 Air Outlet and Outside Air Inlet Valve

AIR OUTLETS

Removal

1. Remove ventilation control knob to lower outlet retainer attaching screws. (Fig. 15-123)

2. Remove two lower retainer to upper retainer attaching screws. Remove lower retainer and outlet ball by guiding retainer out of end of duct.

3. Remove the upper retainer from the instrument panel by removing two attaching screws.

Installation

1. Position upper outlet retainer in end of duct and to instrument panel. Retain with two screws.

2. Position ball and lower retainer to upper retainer and install two attaching screws.

3. Position ventilation control knob to lower retainer with outlet brace sandwiched between ventilation control knob bracket and lower retainer at outboard attaching screw hole. Install two attaching screws.

OUTSIDE AIR INLET VALVE

Removal

1. Remove R.H. air outlet ball and retainers assembly.

2. Remove R.H. cowl ventilation grille, foundation panel and insulator.

3. Remove "springrip" washer and disconnect outside air inlet valve control cable. (Fig. 15-123)

NOTE: It may be necessary to remove the R.H. duct to provide access to the control cable.

4. Remove three attaching screws and remove inlet valve from cowl panel.

Installation

1. Reseal inlet hole, position inlet valve to cowl and retain with three attaching screws.

2. Connect cable and adjust so valve closes completely with temperature control lever to extreme L.H. position.

3. Install insulator, foundation panel and ventilator grille.

4. Install R.H. outlet ball and retainer.

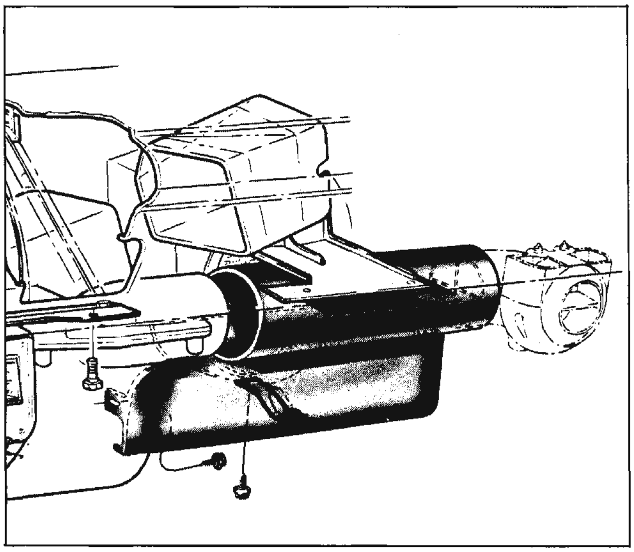


Fig. 15-124 Duct Removal

BLOWER ASSEMBLY

Removal

1. Remove R.H. outlet ball and retainer.
2. Remove R.H. duct. (Fig. 15-124)
3. Disconnect blower 12 volt lead wire from blower connector. (Fig. 15-125)
4. Remove carpet retaining screw and roll carpet down to provide access to blower lower mounting bracket.
5. Remove blower lower bracket to toe pan attaching screw.
6. Remove blower front bracket to instrument panel attaching screws and remove blower, and blower to evaporator assembly duct as an assembly.

Installation

1. Position blower and duct assembly to evaporator assembly, instrument panel and toe-pan. (Fig. 15-125)
2. Install front blower bracket to instrument panel attaching screws.
3. Install blower lower bracket to toe-pan attaching screw, sandwiching ground wire between toe-pan and bracket. (Fig. 15-125)
4. Connect blower 12-volt lead wire to blower connector.
5. Reposition carpet and install correct retaining screw.
6. Install R.H. duct and R.H. outlet ball and retainers.

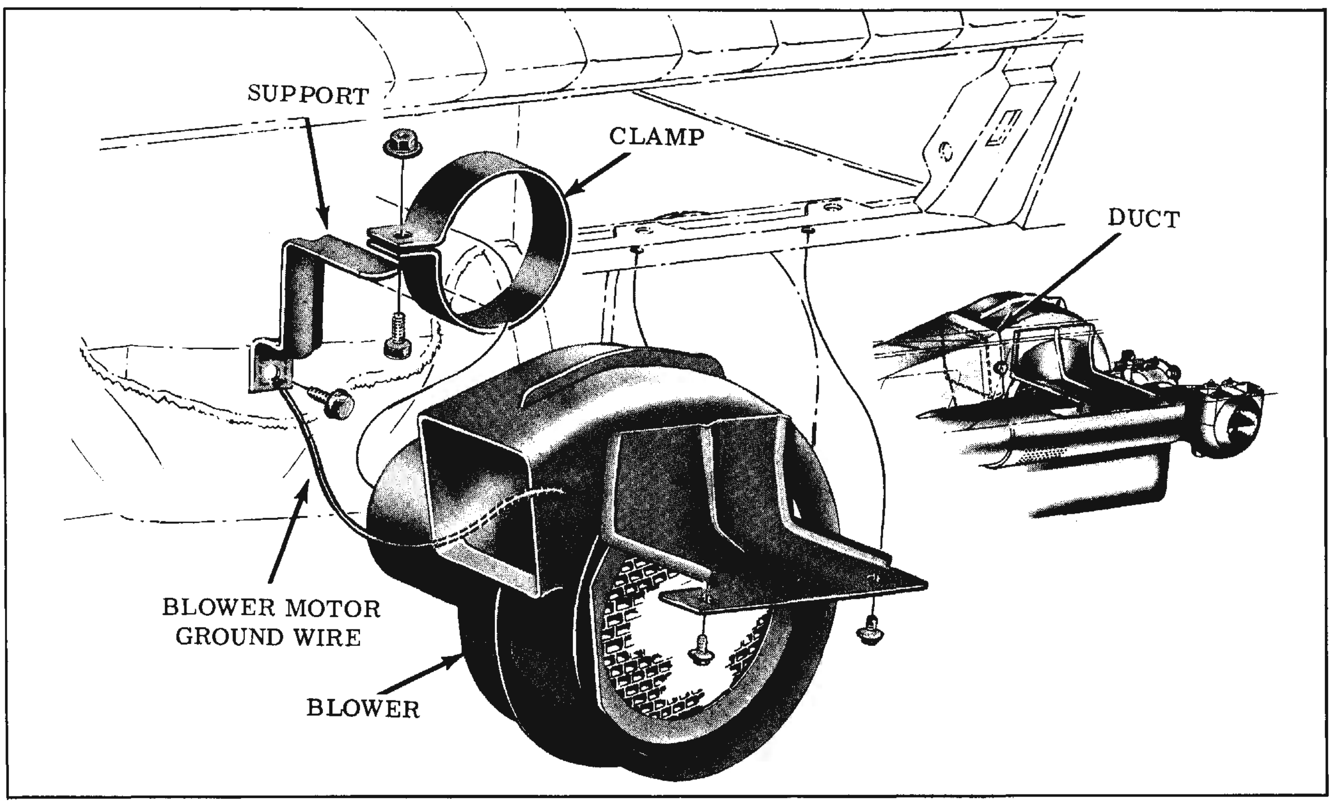


Fig. 15-125 Blower Assembly

COMPRESSOR CLUTCH, PULLEY AND COIL
(Refer to F.S.C. Air Conditioner Section)

The procedure for the F-85 differs from the F.S.C. only in that the compressor must be removed from the car in order to remove the clutch components.

SERVICING REFRIGERANT SYSTEM

DISCHARGING THE SYSTEM
(Refer to F.S.C. Air Conditioner Section)

EVACUATING THE SYSTEM
(Refer to F.S.C. Air Conditioner Section)

CHARGING THE SYSTEM
(Refer to F.S.C. Air Conditioner Section)

Charging the F-85 system differs from the F.S.C. procedure as follows:

The engine speed in Step 4 should be set at 1500 r.p.m.

Step 5 should read: Depress the "HI" speed button and slide the temperature control fully to the right.

Step 7 should read: When 2-1/2 lbs. of refrigerant has entered the system, close the refrigerant drum valve and the low pressure gauge valve.

SUCTION THROTTLING VALVE

Removal

1. Disconnect the evaporator assembly from the dash by removing the screws from the front support bracket and the two brace to cowl attaching screws.

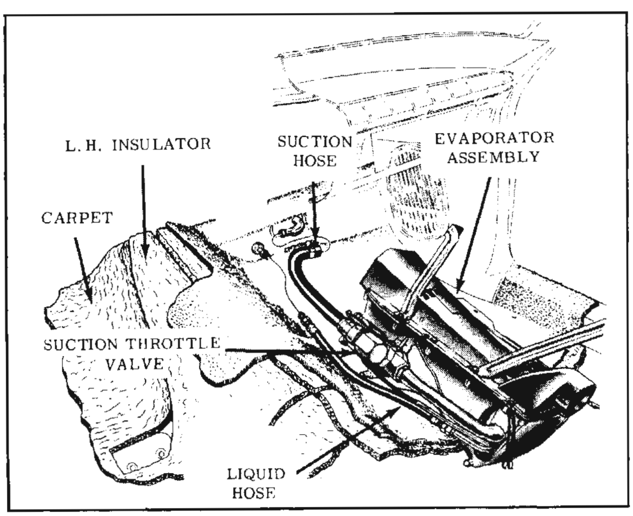


Fig. 15-126 Removing Suction Throttling Valve

2. Swing the assembly to the side as shown in Fig. 15-126. Disconnect the control cable, equalizer line and suction line. Remove the valve to case attaching screws.

Installation

1. Position the valve and attach it to the case.
2. Connect the suction line and equalizer line.
3. Connect and adjust the control cable.
4. Position the evaporator assembly and install mounting screws.

Disassembly (Fig. 15-127)

1. Remove the two over center assist springs.
2. To aid during assembly, scribe a line on the suction throttle valve cover and body.
3. Carefully remove the cover assembly by removing the five cover attaching screws.

   CAUTION: Cover is under heavy spring tension.
4. Remove the three springs and spring retainer.
5. Remove the diaphragm cup and spring seat.
6. Remove the diaphragm and valve assembly from the valve body.
7. Remove the diaphragm from the valve.
8. Remove the gauge fitting. The Schrader valve may be removed from the fitting.

Cleaning and Inspection

After complete disassembly of the unit, thoroughly clean all metal parts in a clean solvent and blow out all passages with dry air. Clean the screen in the throttle valve of any foreign material.

Inspect the springs for distortion or collapsed coils. Do not stretch the springs. Inspect the valve and bore for nicks or scratches.

Assembly (Fig. 15-127)

1. Install the gauge fitting in the valve body, the Schrader valve in the fitting if removed, and the fitting cap.
2. Lubricate the tab of the diaphragm with 525 viscosity oil and install in the suction throttle valve, then install valve in the valve body and align the screw holes in diaphragm with holes in valve body.

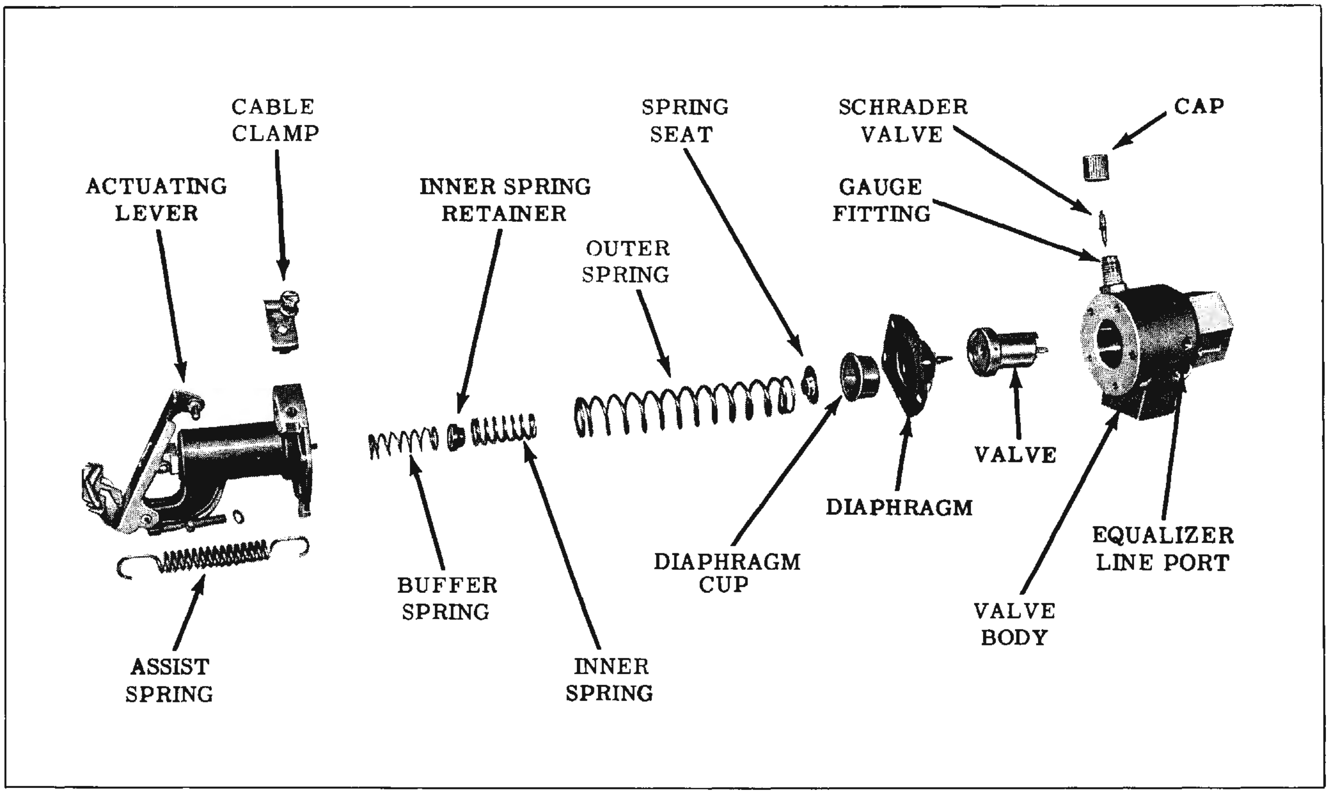


Fig. 15-127 Suction Throttling Valve

3. Place the diaphragm cup in the pocket of the diaphragm, then install the spring seat into the diaphragm cup.

4. Stack up the three springs and spring retainer on the spring seat in the diaphragm cup as follows:

   a. The heavy short spring.

   b. Place spring retainer in this spring.

   c. The light short spring in the seat of the spring retainer.

   d. Then the long spring over these two springs.

5. With the actuating lever down, away from the stop as far as possible, place the cover assembly on the springs so the scribe marks are in line.

6. Check to be sure the diaphragm screw holes are still aligned with the holes in the valve body, then compress spring by pushing on the cover to engage the actuating pin in the hole of the spring retainer.

   NOTE: It may be necessary to hold the actuating lever down to engage the pin in the spring retainer. After the pin is engaged in the spring retainer, allow the actuating lever to move while compressing the springs.

7. Loosely install the five cover to valve body attaching lock washers and screws.

8. With a 3/8" diameter brass drift, push the valve into the cover to properly position diaphragm into the cavity of the cover to prevent pinching between cover and valve body when tightening screws, then tighten screws evenly.

9. With the actuating lever in the full upward position, the actuating pin should travel downward 3/32" before contact is made with the inner spring retainer.

   NOTE: This contact is determined by feel as the lever is moved downward from the full up position.

10. If the movement or travel of the actuating pin is not to this dimension, make the following adjustment. The upper threaded end of the actuating pin which projects through the plastic nut has two milled flats to provide surface for wrench grip for changing the adjustment. Turning the actuating pin clockwise or downward will decrease the travel before contact. Conversely, turning the actuating pin counterclockwise or upward will increase the travel before contact.

    This adjustment is to assure that regulated spring pressure is relieved when lever is against the stops while operating at maximum

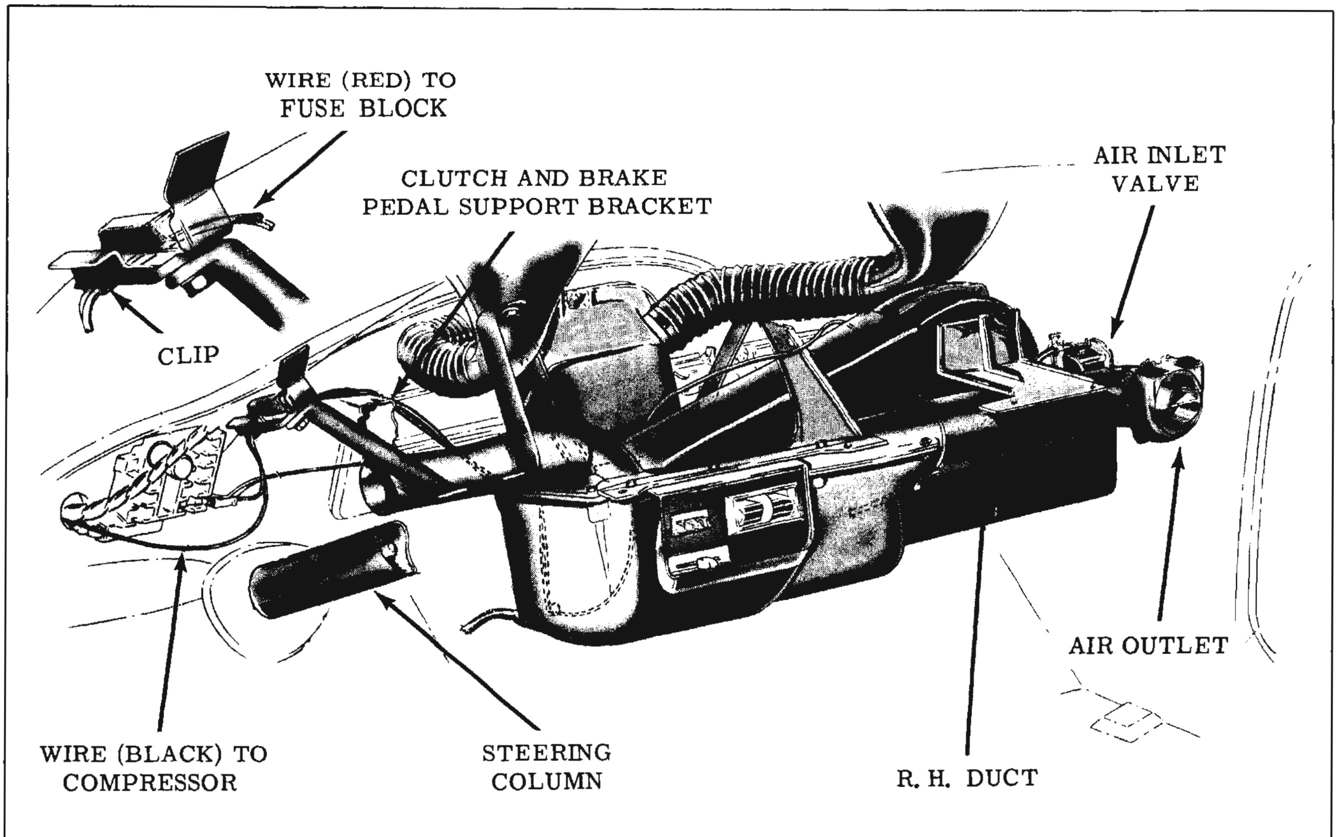


Fig. 15-128 Air Conditioner Wiring

cooling. This adjustment also controls evaporator pressure for minimum cooling temperature.

11. After the correct travel of the pin has been made, assemble the assist springs. Attach the one hook of the springs to the tabs on the cover flange. Stretch and hook the opposite ends of the springs into the outside notches of the lever arm.

EVAPORATOR CASE AND EXPANSION VALVE

NOTE: The expansion valve cannot be replaced without removing the evaporator assembly from the case.

Removal

1. Discharge refrigeration system as outlined under "DISCHARGING THE SYSTEM".

2. Disconnect evaporator wiring. (Fig. 15-128). Disconnect two drain hoses at back of evaporator. Disconnect left hand outlet duct from case. Remove right hand and left hand rear bracket to case screws. Remove two front case bracket to instrument panel screws. Lower case assembly and swing the assembly to the side. (Fig. 15-126 & 129)

3. Disconnect liquid hose and suction hose at back of evaporator case. Tape fittings to prevent entrance of dirt and moisture.

4. Remove eight screws from evaporator case, then remove upper section of case.

5. Disconnect the suction throttling valve control cable, equalizer line and suction line. Remove the suction throttling valve to case attaching screws. Tape fittings.

6. If necessary to service expansion valve, remove expansion valve from evaporator by loosening the line fitting and removing the capillary bulb clamp. (Fig. 15-130)

Installation

1. With rubber gasket cemented to evaporator, position the evaporator assembly in case and install attaching screws.

2. Install suction throttling valve and connect lines and control cable.

3. Place upper section of case in position, then install eight attaching screws.

4. Remove tape from lines, oil the fittings with 525 viscosity oil, then connect the liquid hose and suction hose to lines at toe pan.

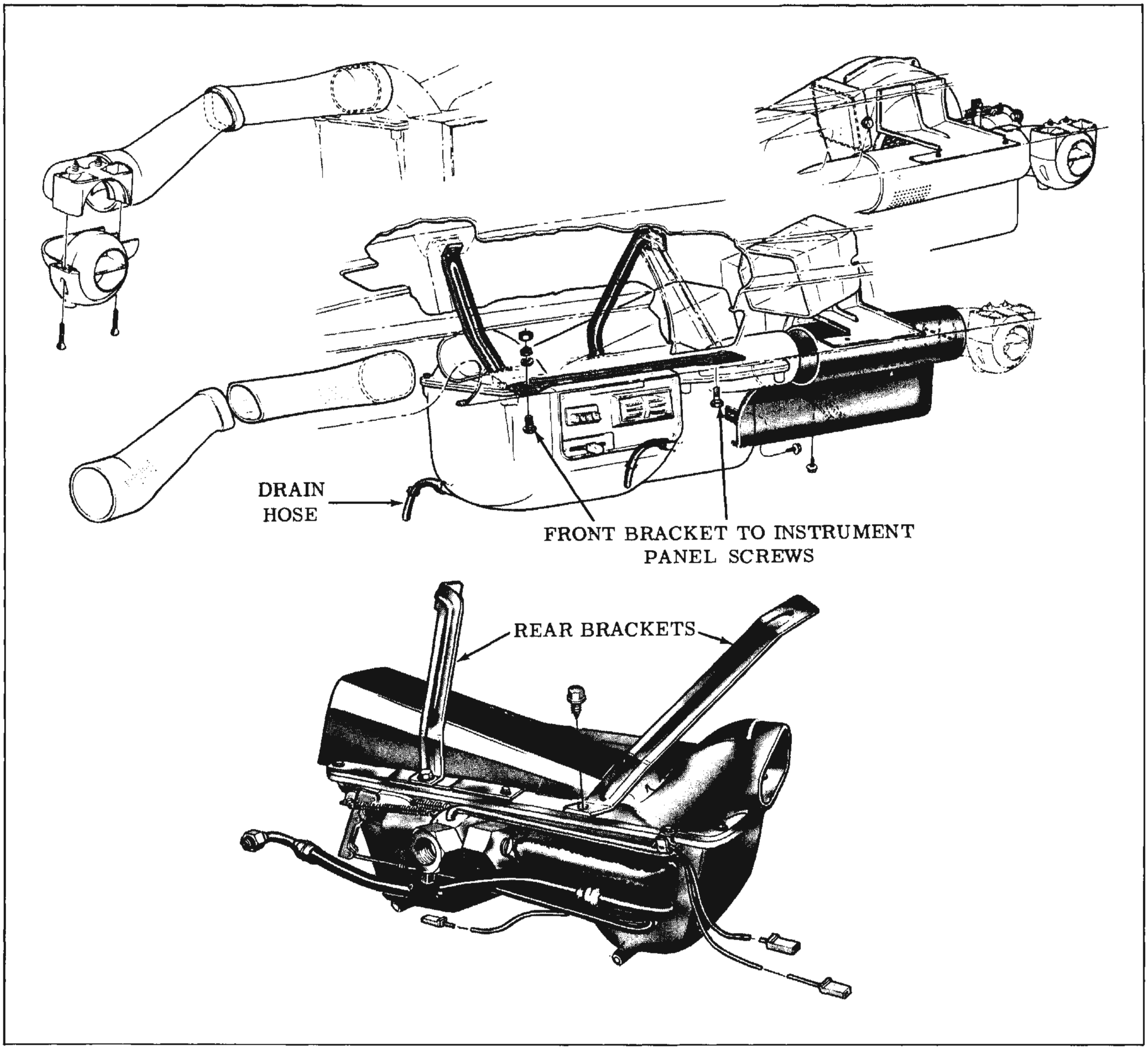


Fig. 15-129 Evaporator Case Attachment

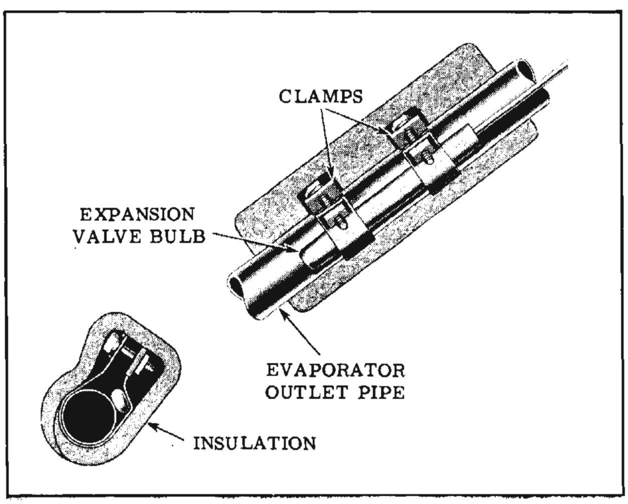


Fig. 15-130 Expansion Valve Bulb

5. Position case assembly under instrument panel, connecting right hand duct. Install two front bracket to instrument panel screws. Install right hand and left hand rear bracket to case screws. Connect left hand duct to case. Connect drain hoses to evaporator case.

6. Evacuate the system as outlined under "EVACUATING THE SYSTEM".

7. Charge the system as outlined under "CHARGING THE SYSTEM".

8. Leak test all line fittings that were disconnected. Refer to "SPECIAL EQUIPMENT - LEAK DETECTOR".

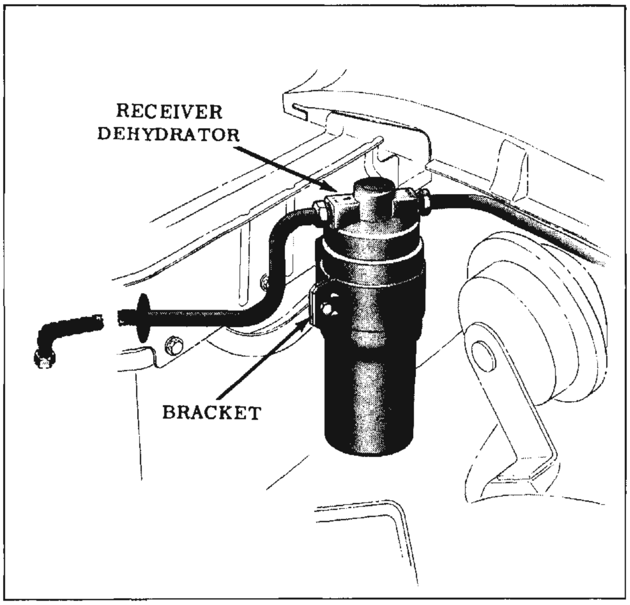


Fig. 15-131 Receiver - Dehydrator Installation

RECEIVER-DEHYDRATOR

Removal

1. Discharge system as outlined under "DISCHARGING THE SYSTEM".
2. Disconnect the receiver-dehydrator to condenser pipe at the receiver-dehydrator. (Fig. 15-131)
3. Disconnect the receiver-dehydrator to evaporator pipe at the receiver-dehydrator.
4. Loosen receiver-dehydrator mounting clamp screw and remove receiver-dehydrator.

Installation

1. Position receiver-dehydrator in mounting clamp aligning inlet to the condenser pipe. Tighten clamp screw.

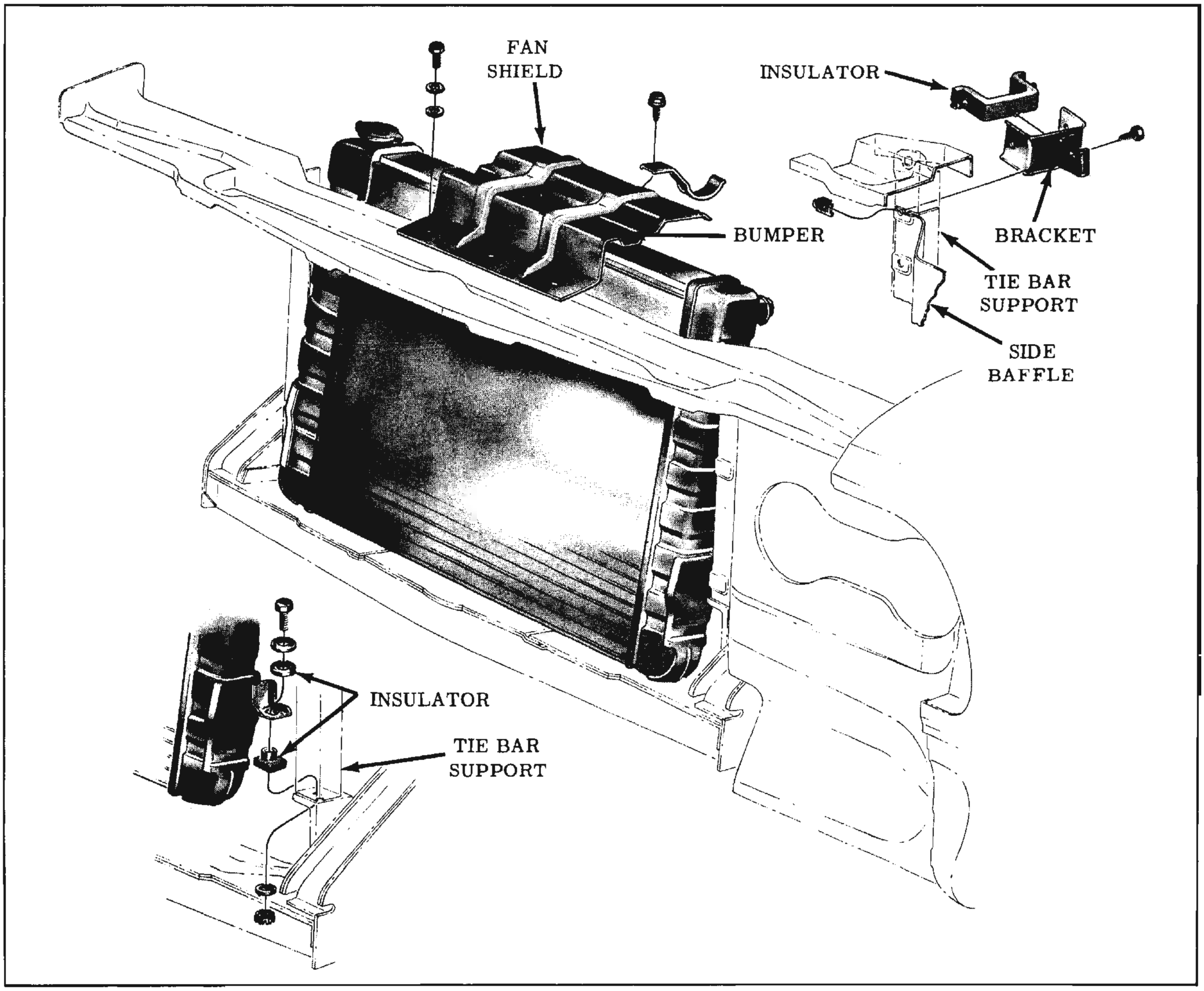


Fig. 15-132 Radiator Attachment

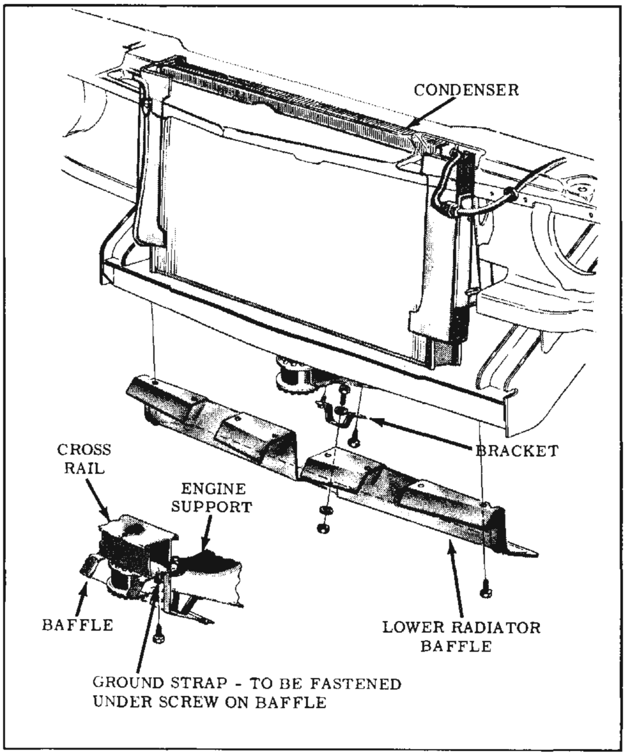


Fig. 15-133 Condenser Pipes

2. Connect pipes to receiver-dehydrator using new "O" rings and 525 viscosity oil at fittings.

3. Evacuate the system as outlined under "EVACUATING THE SYSTEM".

4. Charge the system as outlined under "CHARGING THE SYSTEM".

5. Leak test pipe fittings as outlined under "SPECIAL EQUIPMENT - LEAK DETECTOR".

CONDENSER

Removal

1. Drain radiator.

2. Remove radiator fan shield, disconnect radiator hoses; and, on Hydra-Matic transmission equipped cars, disconnect transmission oil cooler lines.

3. Remove radiator support to tie-bar support screws at each side of radiator. (Fig. 15-132)

4. Remove attaching parts at radiator lower mounting bracket. (Fig. 15-132)

5. Remove radiator.

6. Discharge system as outlined under "DISCHARGING THE SYSTEM".

7. Disconnect condenser pipes from condenser. Cap lines. (Fig. 15-133)

8. Remove condenser bracket to radiator tie-bar attaching parts and remove condenser. (Fig. 15-134)

Installation

1. Position condenser to tie-bars and secure with attaching parts as shown in inset of Fig. 15-134.

2. Connect pipes to condenser using new "O" rings and 525 viscosity oil at fittings.

3. Position radiator to tie-bars and secure with attaching parts as shown in Fig. 15-132.

4. Connect radiator hoses; and, on Hydra-Matic equipped cars, connect oil cooler lines.

5. Install radiator fan shield and replenish radiator coolant.

6. Evacuate the system as outlined under "EVACUATING THE SYSTEM".

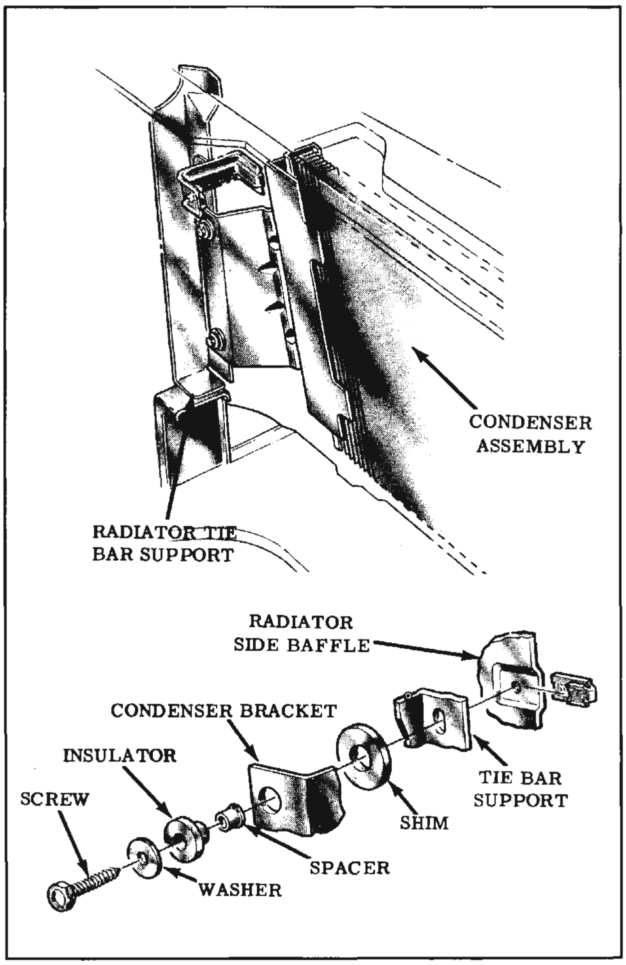


Fig. 15-134 Condenser Attachment

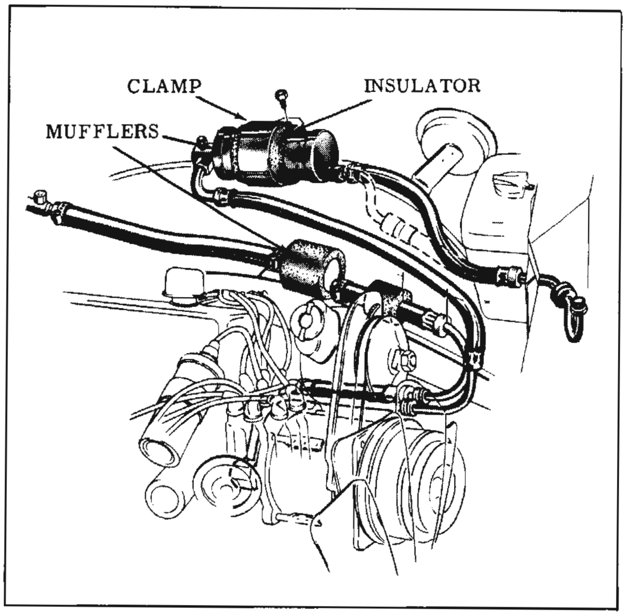


Fig. 15-135 Muffler Assemblies

7. Charge the system as outlined under "CHARGING THE SYSTEM".

8. Leak test pipe fittings as outlined under "SPECIAL EQUIPMENT - LEAK DETECTOR".

MUFFLERS

DISCHARGE MUFFLER

Removal

1. Discharge system as outlined under "DISCHARGING THE SYSTEM".

2. Disconnect compressor discharge hose and condenser to muffler hose from muffler. Cap hoses. (Fig. 15-135)

3. Remove muffler clamp screw, spread clamp and remove muffler from clamp.

Installation

1. Position muffler in clamp as shown in Fig. 15-135. Be sure muffler outlet is positioned down so that muffler will drain towards the condenser. Center insulator in clamp and install clamp screw.

2. Connect hoses to muffler using new "0" rings and 525 viscosity oil at fittings.

3. Evacuate the system as outlined under "EVACUATING THE SYSTEM".

4. Charge the system as outlined under "CHARGING THE SYSTEM".

5. Leak test hose fittings at muffler as outlined under "SPECIAL EQUIPMENT - LEAK DETECTOR".

SUCTION MUFFLER

Removal

1. Discharge system as outlined under "DISCHARGING THE SYSTEM".

2. Loosen inlet and outlet clamps at muffler hose connection. (Fig. 15-135)

3. Remove muffler from compressor suction hoses.

Installation

1. Position muffler to hoses with muffler outlet (off-center pipe) towards compressor and position outlet down so muffler will drain toward compressor. (Fig. 15-135)

2. Tighten hose clamp.

3. Evacuate the system as outlined under "EVACUATING THE SYSTEM".

4. Charge the system as outlined under "CHARGING THE SYSTEM".

5. Leak test hose connections muffler as outlined under "SPECIAL EQUIPMENT - LEAK DETECTOR".

COMPRESSOR

Removal (With Power Steering)

1. Raise hood, drain radiator, disconnect wiring connector at compressor.

2. Discharge system as outlined under "DISCHARGING THE SYSTEM".

3. Remove power steering pump pulley and drive belt.

4. Remove two power steering pump to front bracket nuts. Remove pump to rear bracket nut. (Fig. 15-136)

5. Disconnect compressor discharge and suction hoses from service valve and cap fittings.

6. Raise car and remove front and rear compressor pivot bolts and adjusting bolts. Leave compressor front adapter and yoke assembly attached to the compressor. (Fig. 15-136)

7. Loosen lower power steering pump bracket to cylinder block bolt. (Pump bracket is slotted at this fastening.)

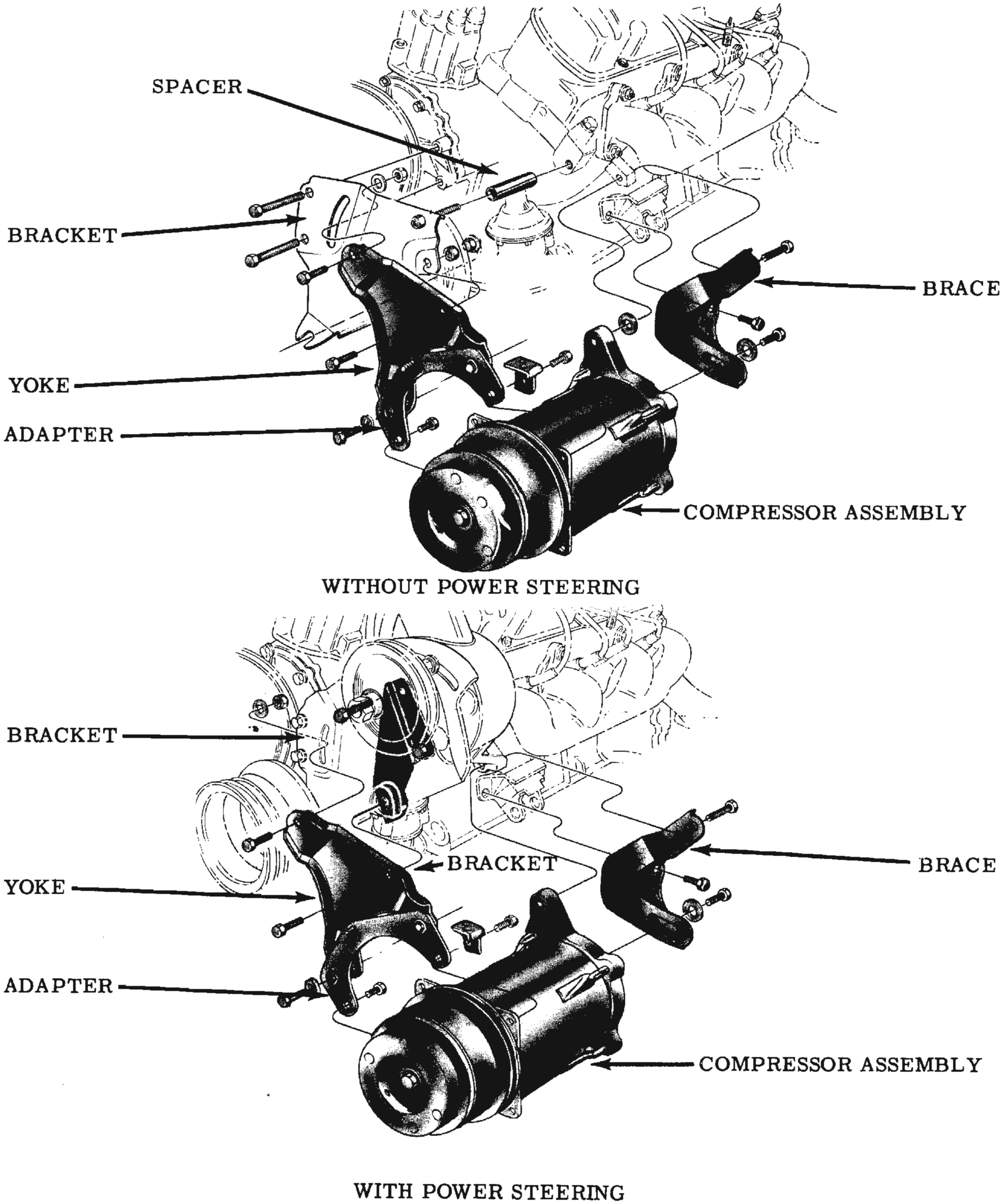


Fig. 15-136 Compressor Mountings

8. Lower car and remove two pump bracket to cylinder block bolts at front engine cover. Remove pump bracket and position pump to one side.

9. Remove two rear pump bracket and compressor brace to cylinder head attaching bolts. Remove bracket and brace.

10. Remove compressor and hoses by pivoting pulley end of compressor upward and lifting assembly up out of engine compartment.

Installation

1. Position compressor to rear bracket and install the rear pivot bolt and nut loosely.

2. Position rear power steering pump bracket and compressor brace to cylinder head and install two attaching bolts. Torque bolts 25-35 ft. lbs.

3. Position front pump bracket and pump to engine with slot of front bracket on lower bracket attaching bolt. Loosely install front compressor pivot bolt and pump stud nuts at front and rear pump brackets.

4. Install two upper front bracket to cylinder block bolts, (long bolts which pass through front cover) using sealer on bolt threads. Torque bolts 25-35 ft. lbs.

5. Install pump pulley and pump drive belt. Adjust belt tension and tighten pump adjusting nut and both pivot nuts.

6. Connect compressor suction and discharge hoses to respective service valves using new "O" rings and 525 viscosity oil at fittings. Connect compressor wiring.

7. Raise car and tighten lower front bracket to cylinder block bolt. Set compressor adjusting and pivot bolts. Torque bolts 25-35 ft. lbs.

8. Lower car and replenish radiator coolant.

9. Evacuate system as outlined under "EVACUATING THE SYSTEM".

10. Charge the system as outlined under "CHARGING THE SYSTEM".

11. Leak test compressor hose fittings at service valves and at compressor as outlined under "SPECIAL EQUIPMENT - LEAK DETECTOR".

Removal (Without Power Steering)

1. Raise hood, drain radiator and discharge system as outlined under "DISCHARGING THE SYSTEM".

2. Disconnect compressor wiring at compressor. Disconnect compressor hoses from service valve and cap fittings.

3. Raise car, remove rear compressor adjusting bolts and pivot bolt.

4. Loosen lower compressor bracket to cylinder head bolt.

5. Lower car and remove front compressor adjusting bolt and pivot bolt. Remove belt.

6. Remove two front bracket to cylinder block bolts at engine front cover. Remove front bracket to cylinder head bolt and spacer and remove bracket.

7. Remove compressor and hoses by pivoting pulley ends of compressor upward and lifting assembly up out of engine compartment.

Installation

1. Position compressor to engine and position front bracket to front cover. Install two front bracket to cylinder block bolts, using sealer on threads. Torque 25-35 ft. lbs. Loosely install compressor front pivot and adjusting bolts.

2. Raise car, tighten lower bracket to front cover bolt, and loosely install compressor rear pivot and adjusting bolts. Install belt, set tension and tighten adjusting bolts and pivot bolts.

3. Lower car, replenish radiator coolant and connect compressor suction and discharge hoses to replenish service valves, using new "O" rings and 525 viscosity oil at fittings. Connect compressor wiring.

4. Evacuate the system as outlined under "EVACUATING THE SYSTEM".

5. Charge the system as outlined under "CHARGING THE SYSTEM".

6. Leak test compressor hose fittings at service valves and at compressor as outlined under "SPECIAL EQUIPMENT - LEAK DETECTOR".

COMPRESSOR SHAFT SEAL
(Refer to F.S.C. Air Conditioner Section)

DISASSEMBLY
(Refer to F.S.C. Air Conditioner Section)

COMPRESSOR HOSES

Removal

The compressor discharge and suction hoses can be removed from the compressor by removing

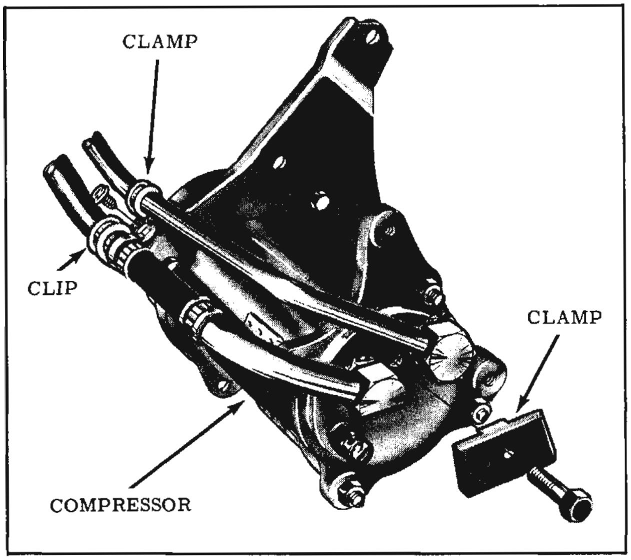


Fig. 15-137 Compressor Hose Attachment

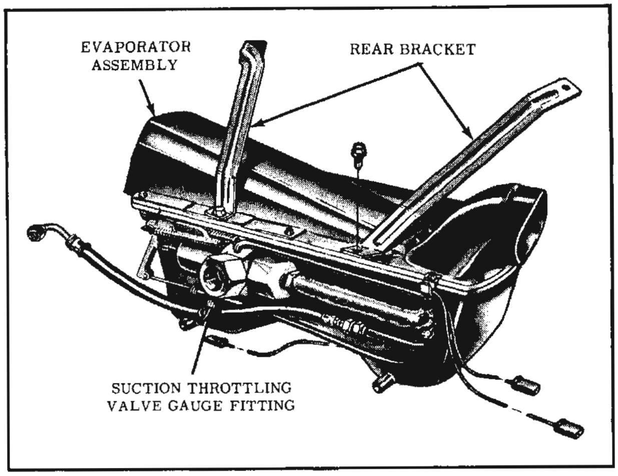


Fig. 15-138 Suction Throttling Valve Gauge Fitting

the clamp at the rear of the compressor and by removing the pipe retaining clamps at the front compressor mounting bracket as shown in Fig. 15-137.

CHECKING AND ADDING OIL
(Refer to F.S.C. Air Conditioner Section)

The procedure for the F-85 differs from the F.S.C. only in that the oil capacity is 10.0 ozs.

PERFORMANCE TEST

The performance test should be made with the car doors and windows open, the temperature control lever fully to the right, blower speed switch on "HI", and auxiliary fan in front of the radiator, and the car hood raised.

1. Remove Schrader valve fitting cap at suction throttling valve. (Fig. 15-138)
2. Install Adapter J-5420 on the low pressure gauge hose, and connect the adapter to the Schrader valve fitting at the suction throttling valve, then momentarily open low pressure gauge valve to purge gauge hose.
3. Make sure high pressure gauge valve is closed.
4. Remove the high pressure Schrader valve cap and install high pressure gauge hose using Adapter J-5420. Momentarily open high pressure gauge to purge the gauge and hose.
5. In "neutral", adjust engine speed to maintain 2000 r.p.m. until stabilization is achieved.
6. After temperature and humidity have been determined, compare test results with the Performance Chart.
7. To obtain low pressure reading at evaporator, proceed as follows:
   a. Connect tachometer and set engine speed at 2000 r.p.m. Record evaporator pressure, discharge air nozzle temperature and discharge pressure. Compare readings with the Performance Chart.
8. When test is completed, shut off engine, disconnect gauge hoses and install protective caps.
9. Install Schrader valve fitting caps.

PERFORMANCE CHART

In Front Of Car		Evaporator Pressure At Suction Throttling Valve	Engine	Discharge Air R.H. Nozzle	Discharge Pressure
Relative Humidity %	Air Temp. °F.		R.P.M.	Temp. ± 1° F.	± 10 lbs.
20	70	24	2000	32.5	119
	80	24		34.5	142
	90	24		35.5	190
	100	24.5		39	234
	110	30		46	270
30	70	24	2000	33	124
	80	24		36	151
	90	24		38.5	199
	100	27		42.5	244
	110	33.5		50.5	287
40	70	24	2000	33.5	129
	80	24		37.5	159
	90	24.5		41	208
	100	30		46.5	255
	110	36.5		55	303
50	70	24	2000	34	134
	80	24		39	167
	90	26		43	206
	100	33.5		50	265
	110	40		60	320
60	70	24	2000	34.5	139
	80	24		40.5	177
	90	28.5		44	225
	100	36.5		51.5	276
	110	43.5		64.5	337
70	70	24	2000	35	144
	80	24.5		42	187
	90	30.5		47.5	233
	100	39.5		56.5	286
80	70	24	2000	35.5	149
	80	25.5		43.5	196
	90	33		49.5	242
	100	43		60	297
90	70	24	2000	36	154
	80	26.5		45	205
	90	35		52	251
	100	46		63	307

DIAGNOSIS OF PERFORMANCE TEST RESULTS

CONDITION AND CAUSE	CORRECTION
EVAPORATOR PRESSURE TOO HIGH	
A. Defective or improperly adjusted suction throttling valve.	A. Adjust or repair as necessary.
B. Restriction in suction line.	B. Remove, inspect, and clean or replace.
C. Loose compressor drive belts.	C. Adjust as outlined.
D. Defective clutch or coil.	D. Check or replace as necessary.
E. Defective expansion valve.	E. Replace as necessary.
F. Expansion valve capillary tube not tight to evaporator suction line.	F. Check clamp for tightness.
G. Clutch slipping.	G. Refer to CLUTCH SLIPPAGE.
HIGH PRESSURE SIDE OF SYSTEM TOO HIGH	
A. Engine overheated.	A. Check engine cooling system.
B. Restricted air flow through condenser.	B. Remove foreign material from engine radiator and condenser.
C. Air in system or overcharge of refrigerant.	C. Momentarily discharge system on discharge side with engine not running; then, operate system and recheck pressure. Repeat as necessary. Check sight glass with system under load.
D. Restriction in condenser, receiver dehydrator assembly, or any discharge of liquid line.	D. Remove parts, inspect for restricted passage, and clean or replace.
E. Too much oil in compressor.	E. Drain oil and add correct amount.
NOZZLE DISCHARGE AIR TOO WARM (With Other Readings OK)	
A. Air duct not properly connected.	A. Inspect air hoses and manifolds.
CLUTCH SLIPPAGE	
A. Head pressure too high.	A. Discharge system until bubbles appear in sight glass and then add one pound of refrigerant.
B. Pulley wobbles.	B. Check and replace, if necessary, the pulley bearing. If pulley has been worn by bearing, replace pulley.
VELOCITY OF AIR AT DISCHARGE NOZZLES TOO LOW	
A. Restricted evaporator core in evaporator assembly.	A. Wash evaporator core.
B. Restricted air duct.	B. Inspect and clean as required.
C. Defective blower motor.	C. Check and replace if necessary.
D. Defective switches.	D. Check and replace if necessary.
E. Poor wiring connection (Low voltage at blower.)	E. Correct wiring.

DIAGNOSIS OF PERFORMANCE TEST RESULTS (Cont'd.)

CONDITION AND CAUSE	CORRECTION
EVAPORATOR PRESSURE TOO LOW	
A. Insufficient Refrigerant charge.	A. Add refrigerant.
B. Restricted air flow through evaporator.	B. Check air flow.
WATER LEAKING OUT OF EVAPORATOR CASE ASSEMBLY	
A. Plugged or kinked evaporator drain hose.	A. Clean or align as necessary.

PRESSURE—TEMPERATURE RELATIONSHIP OF REFRIGERANT REFRIGERANT—12

Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure	Temp. °F	Pressure
-8	5.4	22	22.4	52	49.0	82	87.0	112	140.1
-6	6.3	24	23.9	54	51.0	84	90.1	114	144.2
-4	7.2	26	25.4	56	53.0	86	93.2	116	148.4
-2	8.2	28	27.0	58	55.4	88	96.4	118	153.0
0	9.2	30	28.5	60	58.0	90	99.6	120	157.1
2	10.2	32	30.1	62	60.0	92	103.0	122	161.5
4	11.3	34	32.0	64	62.5	94	106.3	124	166.1
6	12.3	36	33.4	66	65.0	96	110.0	126	171.0
8	13.5	38	35.2	68	67.5	98	113.3	128	175.4
10	14.6	40	37.0	70	70.0	100	117.0	130	180.2
12	15.9	42	39.0	72	73.0	102	121.0	132	185.1
14	17.1	44	41.0	74	75.5	104	124.0	134	190.1
16	18.4	46	43.0	76	78.3	106	128.1	136	195.2
18	19.7	48	45.0	78	81.1	108	132.1	138	200.3
20	21.0	50	47.0	80	84.1	110	136.0	140	205.5

GENERAL SPECIFICATIONS

Engine Idle Speed	(Refer to Engine Tune-Up and/or Carburetion Section)
Cooling System Capacity (With Air Conditioning)	11 qts.
Fuse (at Fuse Block)	SFE 20 Amps.
Amount of Refrigerant 12 in System	2 Lbs. 8 Oz.
Total Amount of Oil in Refrigerant System	10 Fluid Oz.
Type of Oil	Frigidaire 525 Viscosity

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking torque during inspection may be 15% below specified minimum.

Application	Ft. Lbs.
Compressor Front Bracket to Cylinder Block	20-25
Compressor Front Bracket to Block at Front Cover	20-35
Front Yoke to Front Bracket (Adjustment Slot)	25-35
Brace and/or Front Adapter to Front Bracket	25-35
Compressor to Front Adapter	20-25
Compressor Front Bracket and Spacer to Cylinder Head	25-35
Compressor and Rear Brace to Block	25-35
Rear Brace to Compressor	20-35
Front Adapter to Yoke	25-35
Power Steering Front Bracket to Cylinder Block	20-25
Power Steering Front Bracket to Block at Front Cover	25-35
Power Steering Front Bracket to Pump	25-35
Power Steering Rear Bracket to Cylinder Block	25-35
Pump Pulley Nut	40-45 to slip pulley

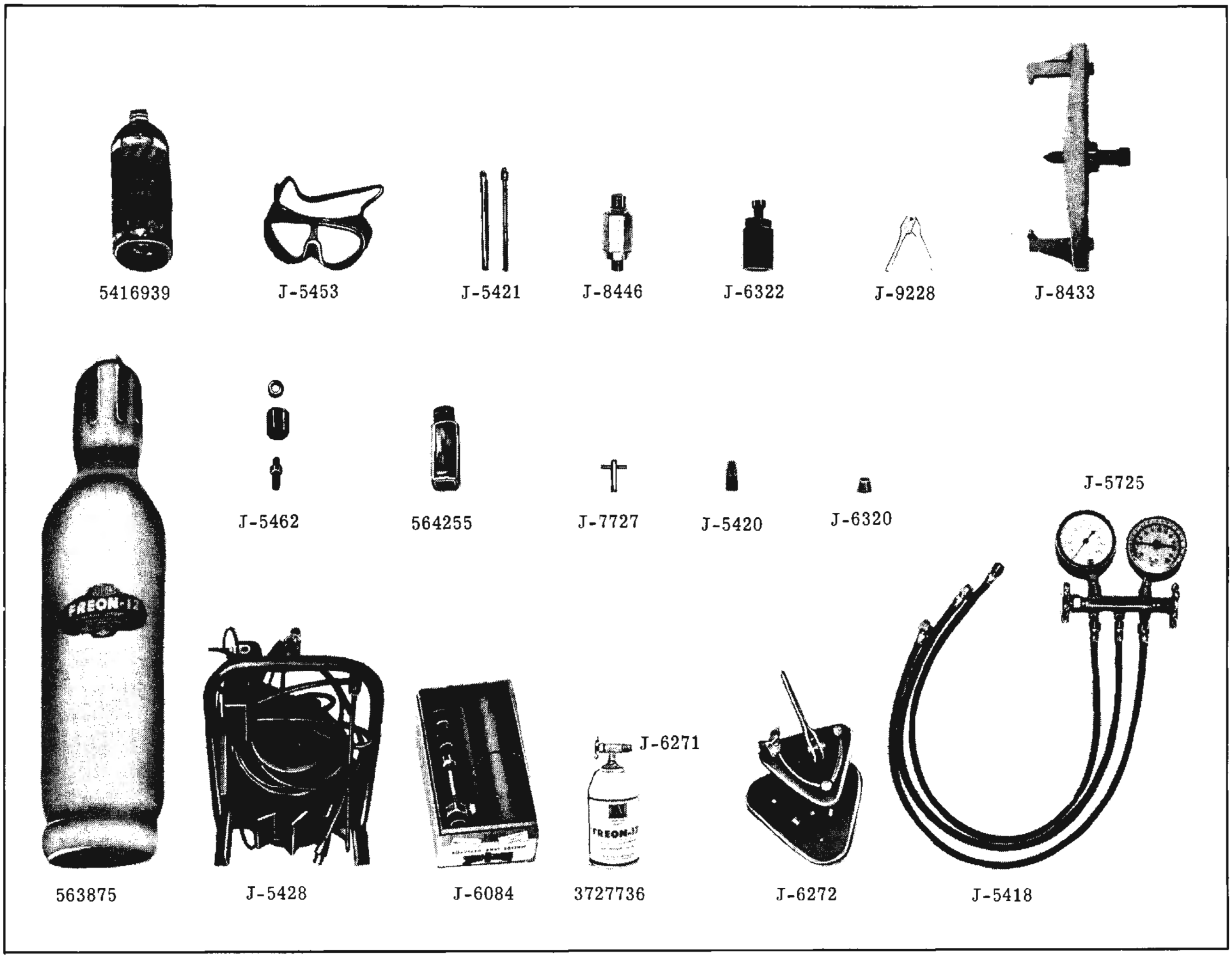


Fig. 15-139 Tools

J-5418	Gauge Charging Line
J-5420	Gauge Adapter
J-5421	Pocket Thermometer
J-5428	Vacuum Pump
J-5453	Goggles
J-5462	Freon Drum Hook-Up Set
J-5725	Gauge Manifold Test Unit
J-6084	Leak Detector Kit
J-6271	Fits-All Valve
J-6272	#3 Multi-Opener
J-6320	Compressor Seal Protector
J-6322	Compressor Clutch Plate Puller
J-7727	"Hot Gas" By-Pass Valve Adjusting Tool
J-8433	Pulley Puller
J-8446	Compressor Clutch Plate and Pulley Installer
563875	25 Lbs. Freon 12
564255	4 Oz. Leak Detector
3727736	15 Oz. Freon 12
5416939	525 Viscosity Oil

BODY

(FULL SIZE CAR)

CONTENTS OF SECTION 16

WINDSHIELD ASSEMBLY

WINDSHIELD GARNISH MOLDINGS

Removal and Installation (Figs. 16-1 and 16-2)

1. Place protective covering over front seat and instrument panel.
2. Remove moldings in following order: side, lower and upper moldings.

   NOTE: On "67" styles, remove side garnish molding attaching screws. Raise top, remove screw attaching side reveal to windshield header, pry up corner of side reveal molding overlapping windshield header and remove side garnish molding. Remove sunshade supports prior to removing upper garnish moldings.

REAR VIEW MIRROR SUPPORT

Removal and Installation

1. Remove one side of upper garnish molding.

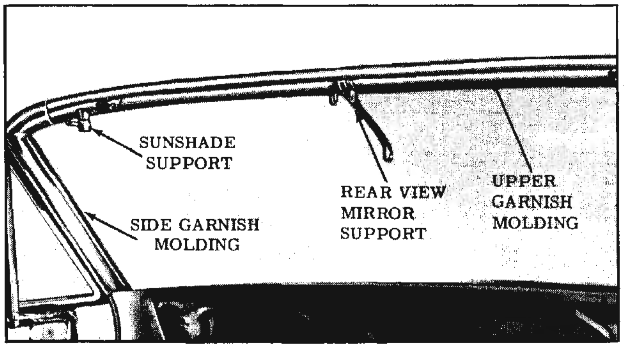


Fig. 16-1 Garnish Moldings and Supports

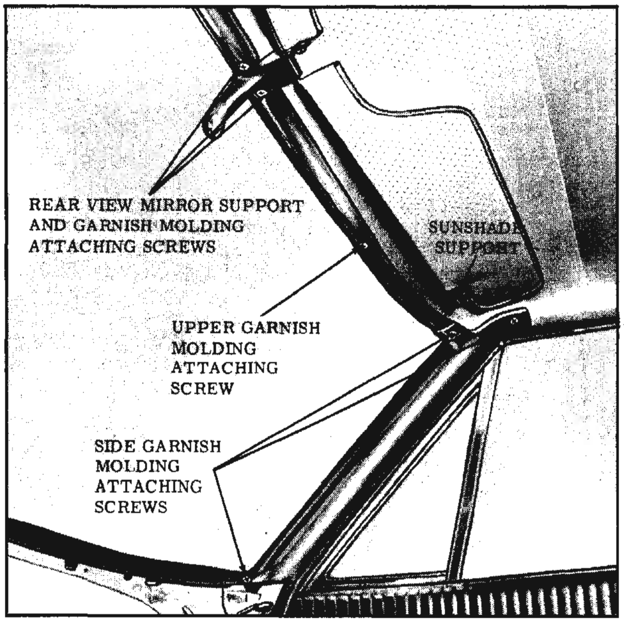


Fig. 16-2 Garnish Moldings and Supports

2. Remove support attaching screws and slide support to one side and remove support.

3. To install, reverse removal procedure. (Fig. 16-1 and Fig. 16-2)

WINDSHIELD REVEAL MOLDINGS

The windshield reveal moldings consist of a one piece upper, right and left side and right and left lower moldings. On all styles except "67" styles, the upper reveal moldings are secured to the openings by clips. On "67" styles, the upper reveal molding is secured to the upper windshield frame by screws at each end and studs and nuts in the center. The side reveal moldings on all except 88 and S88 "47" styles and all "67" styles are secured to the opening by clips. On 88 and S88 "47" styles and all "67" styles, the side reveal moldings are secured to the windshield pillars by screws, which are hidden by the windshield pillar weatherstrip retainers. The lower reveal moldings on all styles are secured to the upper shroud assembly by screws through the molding clip tabs.

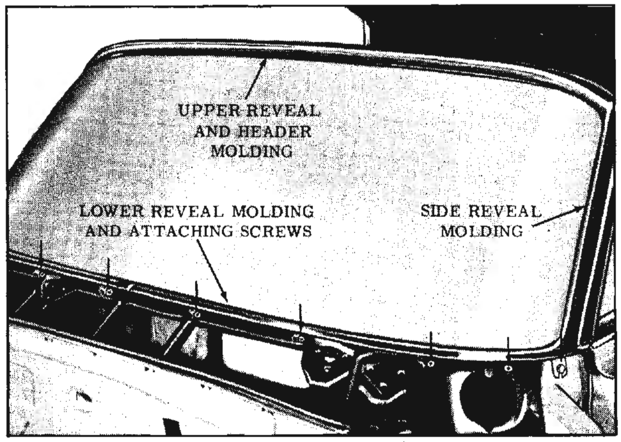


Fig. 16-3 Windshield Reveal Moldings

NOTE: The outer most attaching screw on each side of the lower molding is hidden by the front fender and may be removed by opening the front door. The outer molding clip is slotted allowing removal of the molding without completely removing the attaching screw. (Fig. 16-3)

Removal

1. Place protective covering over hood and front fenders.

2. Remove windshield wiper arms, escutcheon nuts and escutcheons.

3. Remove air intake grille attaching screws. (Fig. 16-4)

4. Lift up grille and slide forward to remove.

   CAUTION: Care should be exercised to make certain grille does not contact hood, chipping paint.

5. Remove lower reveal molding attaching screws except end screws, open door, loosen both end attaching screws, lift up molding disengaging slotted clip from screws and remove molding. (Fig. 16-3)

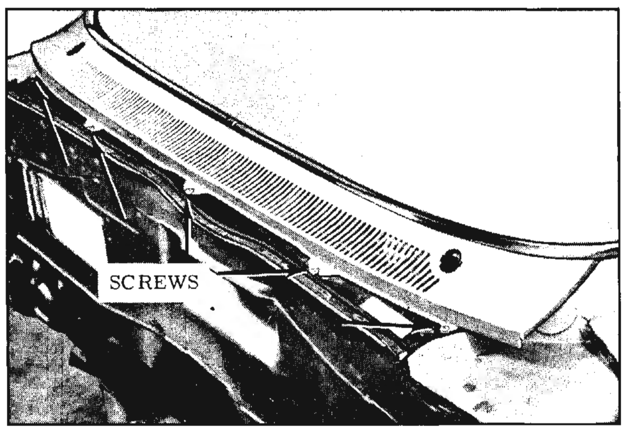


Fig. 16-4 Air Intake Grille

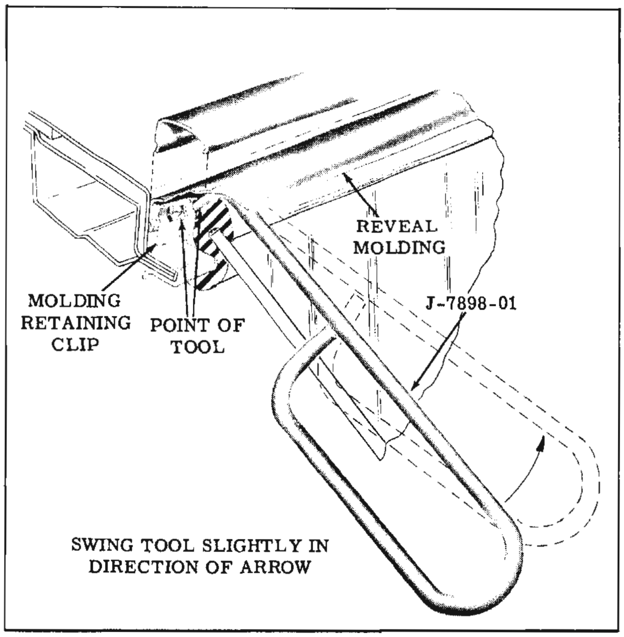


Fig. 16-5 Removing Reveal Molding

NOTE: Do not completely remove molding end attaching screws from body.

6. On all except 88 and S88· "47" styles and all "67" styles, tool J-7898-01 may be used to remove the side and upper reveal moldings. When using reveal molding removing tool (J-7898-01) carefully lift up edge of molding sufficiently to engage point of tool between molding and molding clip as indicated in illustration, to disengage prongs of clip from molding and lift molding free of clip. Repeat this operation at each molding clip. (Fig. 16-5)

   NOTE: In some instances a putty knife may be used to aid in removing the moldings from the opening. Care should be exercised when removing moldings to eliminate any damage to the moldings or body paint.

7. On 88 and S88 "47" styles and all "67" styles, the side reveal moldings are secured by screws at the windshield pillar and roof rail and it is necessary to loosen the windshield and side roof rail weatherstrip retainer to gain access to the attaching screws. On "67" styles, raise top to loosen windshield pillar weatherstrip, remove screws and molding.
8. On all styles except "67" styles, carefully remove the upper reveal molding with tool J-7898-01. (Fig. 16-5) On "67" styles, remove screws at outer ends of molding; then, remove upper garnish molding to gain access to stud nuts. Remove nuts and molding.

Installation

Make certain there is sufficient sealer in cavity between windshield rubber channel and body. If sealer is required, apply necessary medium-bodied sealer.

1. Upper reveal moldings: On all except "67" styles, snap upper reveal moldings in place. On "67" styles, seal attaching studs and holes and install molding.

2. Side reveal moldings: On 88 and S88 "47" styles and all "67" styles, seal attaching screw holes and install moldings.

3. On 88 and S88 "47" styles and all "67" styles, seal side roof rail and windshield pillar weatherstrips and retainers and install.

4. Install lower reveal molding and previously removed hardware parts.

WINDSHIELD GLASS

Removal

1. Place protective covering over front seat and instrument panel.

2. Place protective covering over hood and front fenders.

3. Remove garnish moldings.

4. Remove windshield wiper arms, escutcheon nuts and escutcheons.

5. Remove air intake grille.

6. Remove windshield reveal moldings.

   NOTE: If glass is broken or cracked, mark centerline of glass and body so alignment of glass to body opening may be checked to locate cause of glass break (glass off center, strain break, etc.).

7. On inside of body, loosen lip of rubber channel from pinchweld flange along top and sides of windshield as follows: with palm of hand, apply pressure to glass near edge, (Fig. 16-6) at the same time, use a blunt putty knife and carefully assist rubber channel over pinchweld flange.

8. After windshield channel is free from pinchweld flange, with aid of helper, carefully lift windshield assembly from opening and place on a protected bench.

CHECKING BODY WINDSHIELD OPENING

It is important that the body windshield opening be checked thoroughly before installation of a replacement windshield glass. The following procedure outlines the method which may be used to

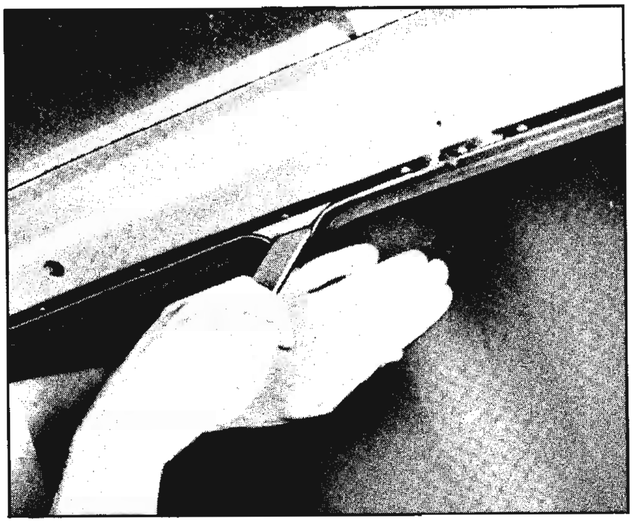


Fig. 16-6 Windshield Glass Removal

check the windshield opening.

1. Remove the windshield from body.

2. Check windshield rubber channel for any irregularities.

3. Clean off old sealer around windshield opening and check entire body opening flange for any irregularities.

4. Install Windshield Checking Blocks J-8942. (Fig. 16-7)

5. With aid of helper, carefully position replacement glass on blocks in windshield opening.

   CAUTION: Care should be exercised to make certain glass does not strike body metal during installation. Edge chips can lead to future breaks.

6. With windshield supported and centered in the body opening by checking blocks, check relationship of glass to body opening around entire

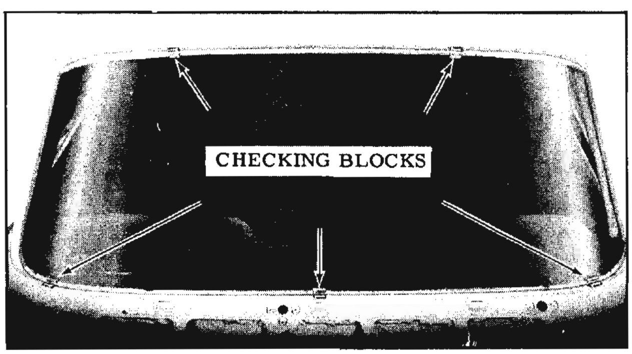


Fig. 16-7 Windshield Opening Check

perimeter of glass. Check glass to body relationship as follows:

   a. The inside surface of glass should be a uniform distance from pinchweld flange. The dimension should be from 1/4" to 5/16".

   b. The outer edge of glass should be a uniform distance from body metal, measured in plane of the glass. This dimension should be from 5/16" to 3/8".

7. Mark any sections of body to be re-formed, remove glass and re-form opening as required.

8. Re-check windshield opening, then mark the centerline on the glass and body so that glass can be accurately centered in the opening when installed.

Installation

1. Clean out old sealer in glass cavity of windshield rubber channel and around base of rubber channel.

2. Install rubber channel to glass.

3. Install a strong cord in pinchweld cavity of rubber channel completely around windshield. Tie ends of cord and tape to inside surface of glass at bottom center of glass. (Fig. 16-8)

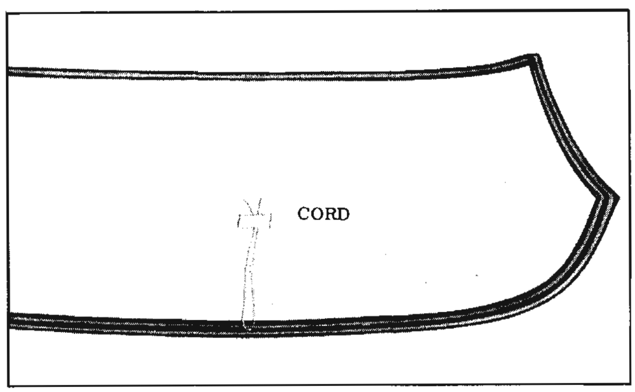


Fig. 16-8 Cord Installation

4. Apply a ribbon of medium-bodied sealer completely around base of rubber channel. (View 1, Fig. 16-9)

5. Inspect condition of each molding clip, install new clips where necessary, make certain clips are properly sealed to pinchweld and body (View 2, Fig. 16-9) except "67" styles.

6. Apply a 1/4" bead of medium-bodied sealer to the base of windshield opening flange at pillar areas extending 4" inboard along top edge and approximately 8" inboard along lower edge of windshield opening.

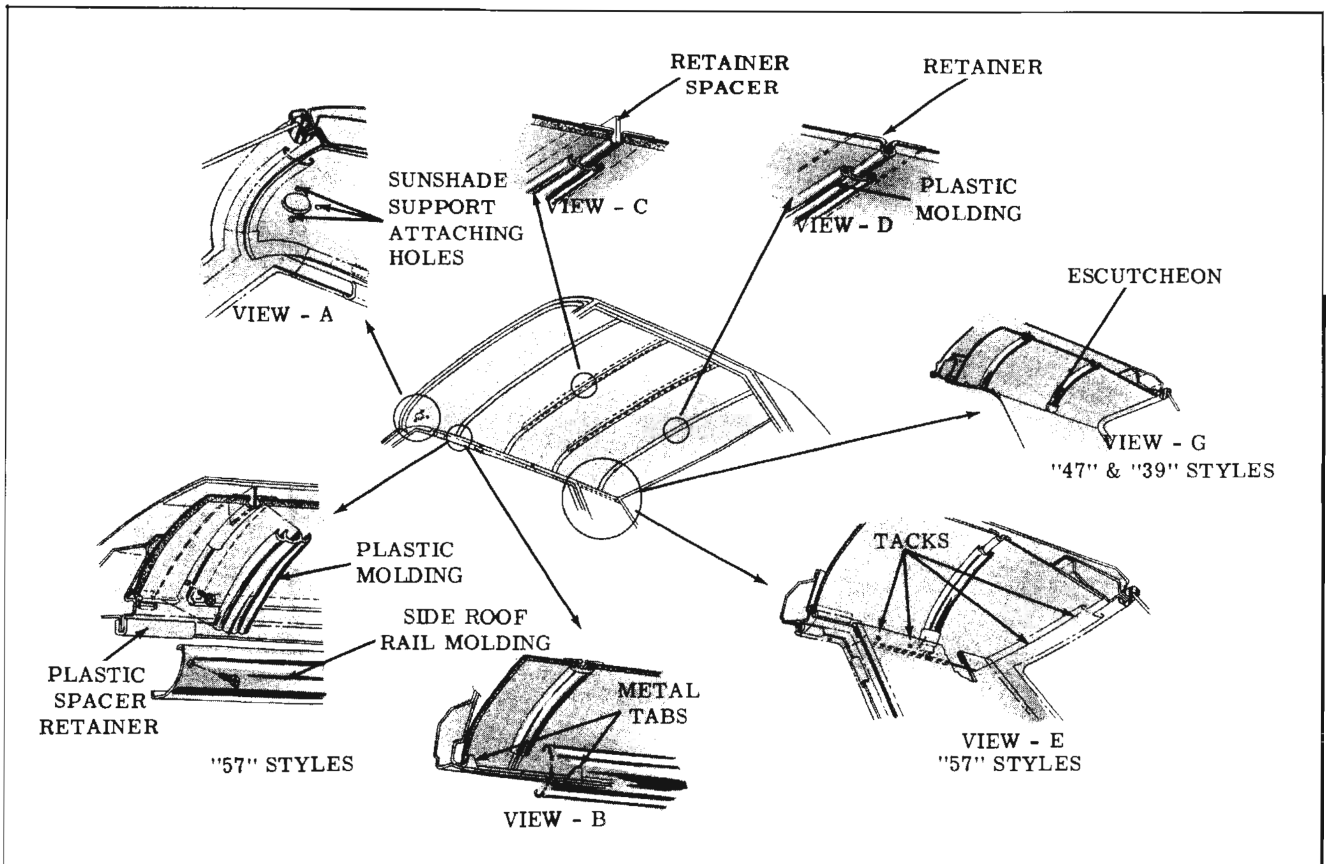


Fig. 16-9 Headlining Installation

7. With aid of helper, carefully position and center windshield assembly in windshield opening.

   CAUTION: Do not position by tapping or hammering glass at any time.

8. When the glass and channel are properly positioned in the opening, slowly pull both ends of cord starting at lower center of windshield to seat lip of rubber channel over pinchweld flange. Cord should be pulled first across bottom of windshield, then up each side and finally across top of windshield.

9. Using a pressure type applicator, seal inner and outer lips of rubber channel to glass with weatherstrip adhesive. (View 4, Fig. 16-9) Seals are to extend completely around rubber channel.

10. Clean off excess sealer from windshield glass.

11. On outside of windshield, apply medium-bodied sealer between windshield rubber channel and opening across top and sides. (View 5, Fig. 16-9)

12. Re-install all previously removed parts and remove protective coverings.

WINDSHIELD GLASS REPLACEMENT (WHEN CHECKING OF OPENING IS NOT REQUIRED)

Removal

1. Place protective covering over front seat and instrument panel.

2. Place protective covering over hood and front fenders.

3. Remove upper and side garnish moldings and mirror support. On "67" styles, remove sunshade supports.

4. Remove upper and side reveal moldings.

5. Remove windshield wiper arms.

6. On inside of body, loosen lip of rubber channel from pinchweld flange along top and sides of windshield as follows: with palm of hand, apply pressure to glass near edge, (Fig. 16-6) at the same time, use a blunt putty knife and carefully assist rubber channel over pinchweld flange across top and sides only.

7. Tilt glass forward sufficiently to remove glass from channel and remove glass.

   NOTE: Do not remove lower portion of

rubber channel from pinchweld or break seal between rubber channel and lower pinchweld.

Installation

1. Clean out cavity of windshield rubber channel of all old sealer, etc.
2. Apply a mild soap solution to cavity and outer lip of rubber channel.
3. Place windshield glass in rubber channel.
4. Working from inside of body with a screwdriver, work the inner lip of the windshield channel over the pinchweld flange, up each side and across the top.

   CAUTION: Do not attempt to position glass by tapping or hammering at any time.

5. Using a pressure type applicator, seal inner and outer lips of rubber channel to glass with weatherstrip adhesive. (View 4, Fig. 16-9) Seals are to extend completely around rubber channel.
6. On outside of windshield, apply medium-bodied sealer between windshield rubber channel and opening across top and sides. (View 5, Fig. 16-9)
7. Clean off excess sealer.
8. Re-install all previously removed parts and remove protective coverings.

MINOR WATERLEAKS AT WINDSHIELD

In many instances minor waterleaks around the windshield may be corrected by performing the following operations.

1. Leaks between rubber channel and glass.
   a. Working from outside of the body and using a pressure applicator with a narrow tip, apply weatherstrip adhesive (black) between glass and rubber channel on the outside of the glass completely around perimeter of glass.
2. Leaks between rubber channel and body.
   a. Working from outside of the body along top and sides of body opening, remove side and/or upper reveal moldings. Apply sufficient amount of medium-bodied sealer to fill cavity between rubber channel and body opening.
   b. Working from inside of body, remove inside garnish moldings, apply sufficient amount of medium-bodied sealer between inner lip of rubber channel and body opening. Watertest and clean off excessive sealer.

DOORS

FRONT AND REAR DOORS

DOOR BOTTOM DRAIN HOLE SEALING STRIPS

Door bottom drain hole sealing strips (dust flaps) are attached to door inner panels over door bottom drain holes and are designed to prevent entry of dust and cold air at these areas. These strips are retained by two integral retaining plugs, are constructed of a vinyl material and do not require lubrication. Two sealing strips are used on each door.

Removal and Installation

1. With a putty knife, carefully pry out retaining plugs. (Fig. 16-10)
2. To install, insert tip of a blunt tool (such as a dull ice pick) into retaining plug and push plugs into retaining holes.

WINDOW GLASS RUN CHANNEL INNER AND OUTER STRIP ASSEMBLIES

Glass run channel strip assemblies are used on all doors and are designed to prevent cold air and water from entering the body between the door window lower sash channel and door inner and outer panels. The inner strip assembly is constructed of a pile fabric material with a metal

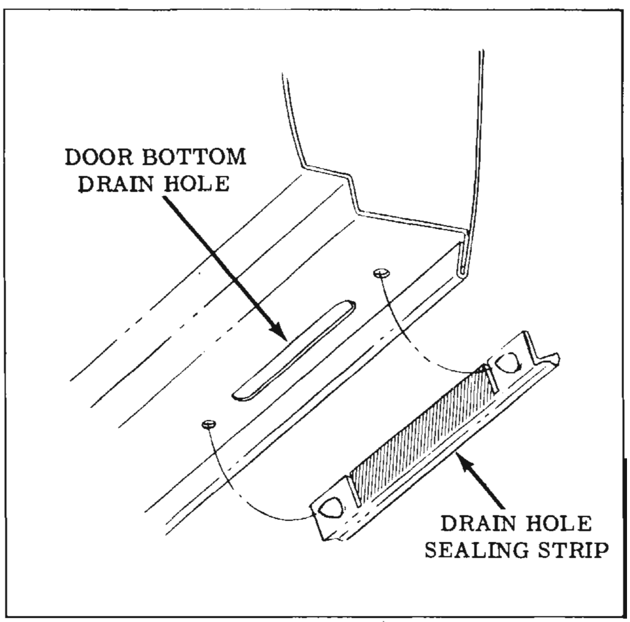


Fig. 16-10 Drain Hole Sealing Strip

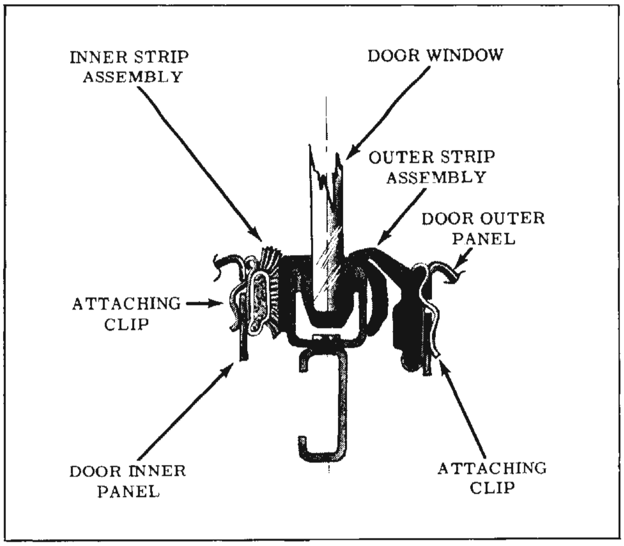


Fig. 16-11 Glass Run Channel Inner and Outer Strip Assemblies

backing and is secured to top of door trim pad by a series of staples. The inner strip is not normally removed separately for service procedures. The outer strip assembly is constructed of a molded rubber and is secured to a metal retainer by a series of staples. On styles equipped with a door window belt reveal molding, the metal retainer is an integral part of this molding which is attached to the door outer panel by three screws. On styles not equipped with a molding, the outer strip assembly is attached to the door outer panel by a series of attaching clips and is further retained by two attaching screws.

On all styles, the inner strip assembly remains in a stationary position during operation of door glass. On the outer strip assembly, however, the inboard section of the sealing lip is lifted and held in position by the door window lower sash channel or filler when door glass is raised. (Fig. 16-11)

Removal and Installation

1. Lower door window and apply masking tape over door outer panel adjacent to outer strip assembly to protect paint finish.

2. Check outer strip assembly for location of attaching screws. This location varies with style and size of door, however; on most styles, the front door ventilator will have to be removed to gain access to forward attaching screw. If necessary, remove the front door ventilator assembly as described under FRONT DOOR section.

3. On some styles, it may be necessary to remove the door window lower stop or stop bumper and lower door window as far down as possible to gain access to the outer strip assembly attaching screws.

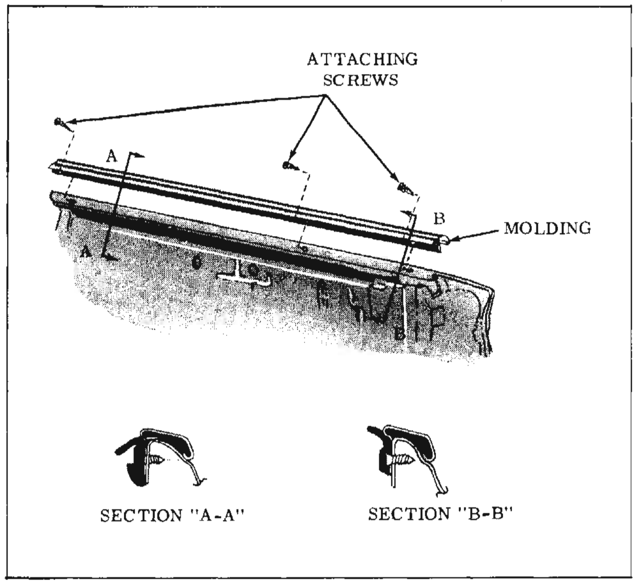


Figure 16-12 Run Channel Outer Strip with a Belt Reveal Molding

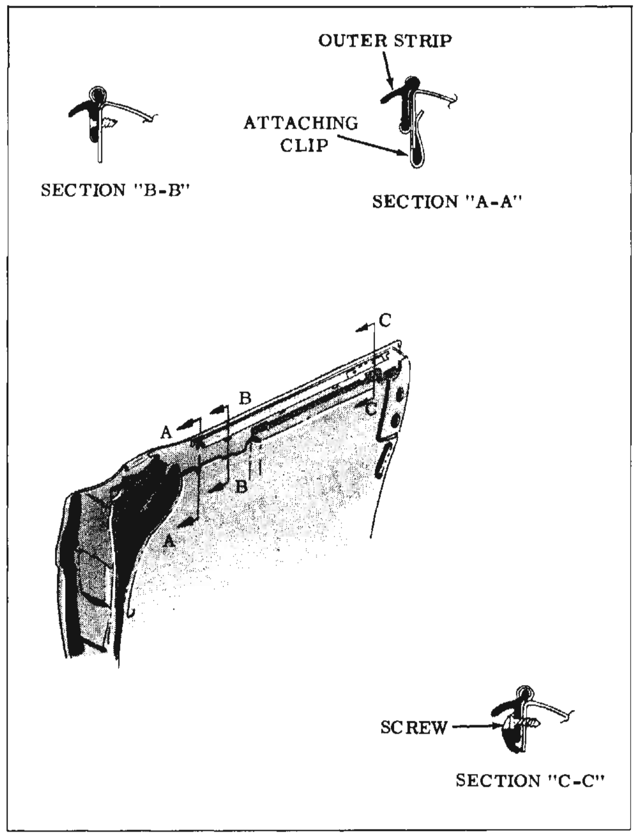


Figure 16-13 Run Channel Outer Strip without a Belt Reveal Molding

4. Remove all outer strip assembly attaching screws (three screws on styles equipped with a belt reveal molding and two screws on all other styles). See Figure 16-12 for styles with a belt reveal molding and Figure 16-13 for all other styles.

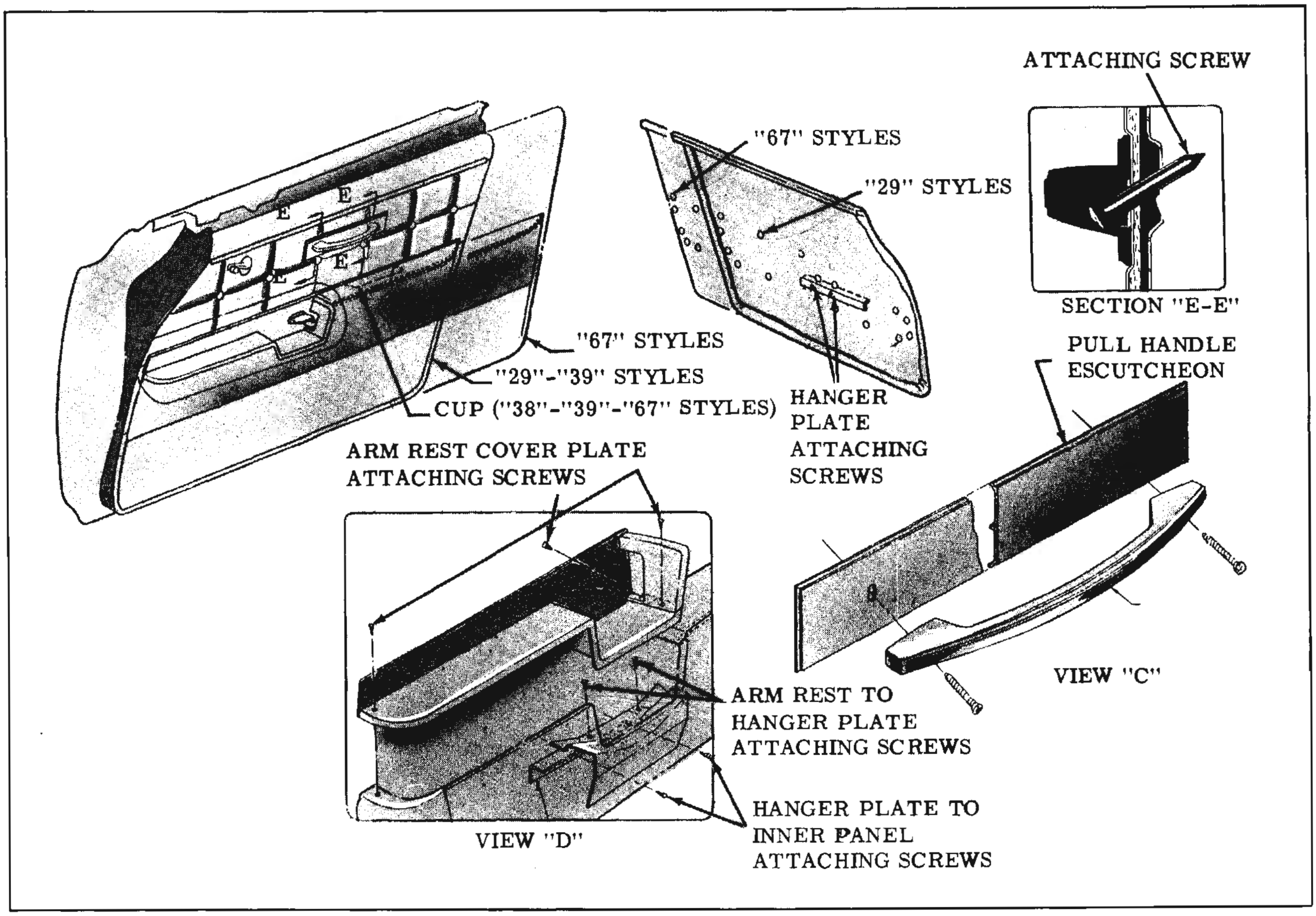


Fig. 16-14 Door Pull Handles (3829-39-67 Styles)

5. On styles equipped with a belt reveal molding, the outer strip assembly and molding can now be removed.
6. On all other styles, firmly press outer strip assembly in a downward motion to disengage attaching clips from door outer panel return flange and remove strip assembly from door outer panel.
7. To install, reverse removal procedure.

DOOR PULL HANDLE (3829-39 and 67 Styles)

Removal and Installation

1. Remove two screws securing door pull handle to door inner panel and remove pull handle from door. (View "C", Figure 16-14)
2. To install, reverse removal procedure. It may be necessary to seal pull handle attaching screw holes with body caulking compound prior to installation.

DOOR SWITCH MOUNTING BASE (3819 and 3847 Styles)

Removal and Installation

1. Remove screws securing base to door and remove assembly. Be sure to disconnect switch terminal block(s) from switch assembly.
2. To install, reverse removal procedure.

DOOR INSIDE HANDLES

Removal and Installation

A. On styles equipped with door inside remote control "paddle" handles, proceed as follows:

1. Remove door arm rest.
2. Remove handle-to-remote attaching bolt and remove handle from door.
3. To install, reverse removal procedure.

B. On styles not equipped with "paddle" handles and for removal of manually operated door ventilator and window inside handles, proceed as follows:

1. Depress door trim assembly at handle sufficiently to install tool J-7797 between handle and bearing plate. (Fig. 16-15)
2. Push handle retaining spring out of

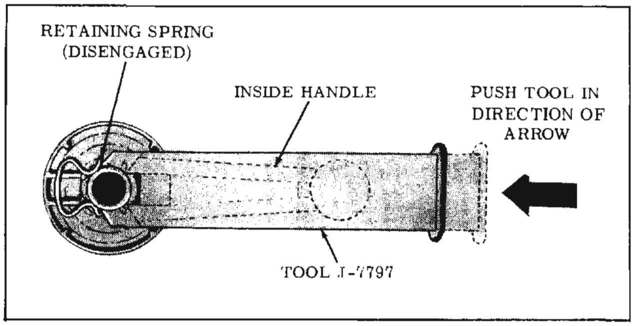


Fig. 16-15 Disengaging Inside Handle Spring

engagement and remove handle and bearing plate from door.

3. To install, position retaining spring on handle and bearing plate over regulator spindle. Position handle on spindle at same angle as handle on opposite door and push handle until spring is engaged.

   NOTE: Handles are installed in a horizontal position with open end forward when glass is in a full up position.

DOOR ARM REST ASSEMBLIES (All Styles except 3829-39 and 67)

Removal and Installation

1. Remove screws securing arm rest to door inner panel and remove assembly from door. (Fig. 16-16)
2. To install, reverse removal procedure. It may be necessary to seal arm rest attaching screw holes in door inner panel with body caulking compound prior to installation.

DOOR ARM REST ASSEMBLY (3829-39 and 67 Styles)

The arm rest is attached to the door trim pad on these styles.

Removal and Installation

1. Remove door pull handle or pull handle and lamp assembly attaching screws.
2. Where applicable, remove switch plate and mounting base.

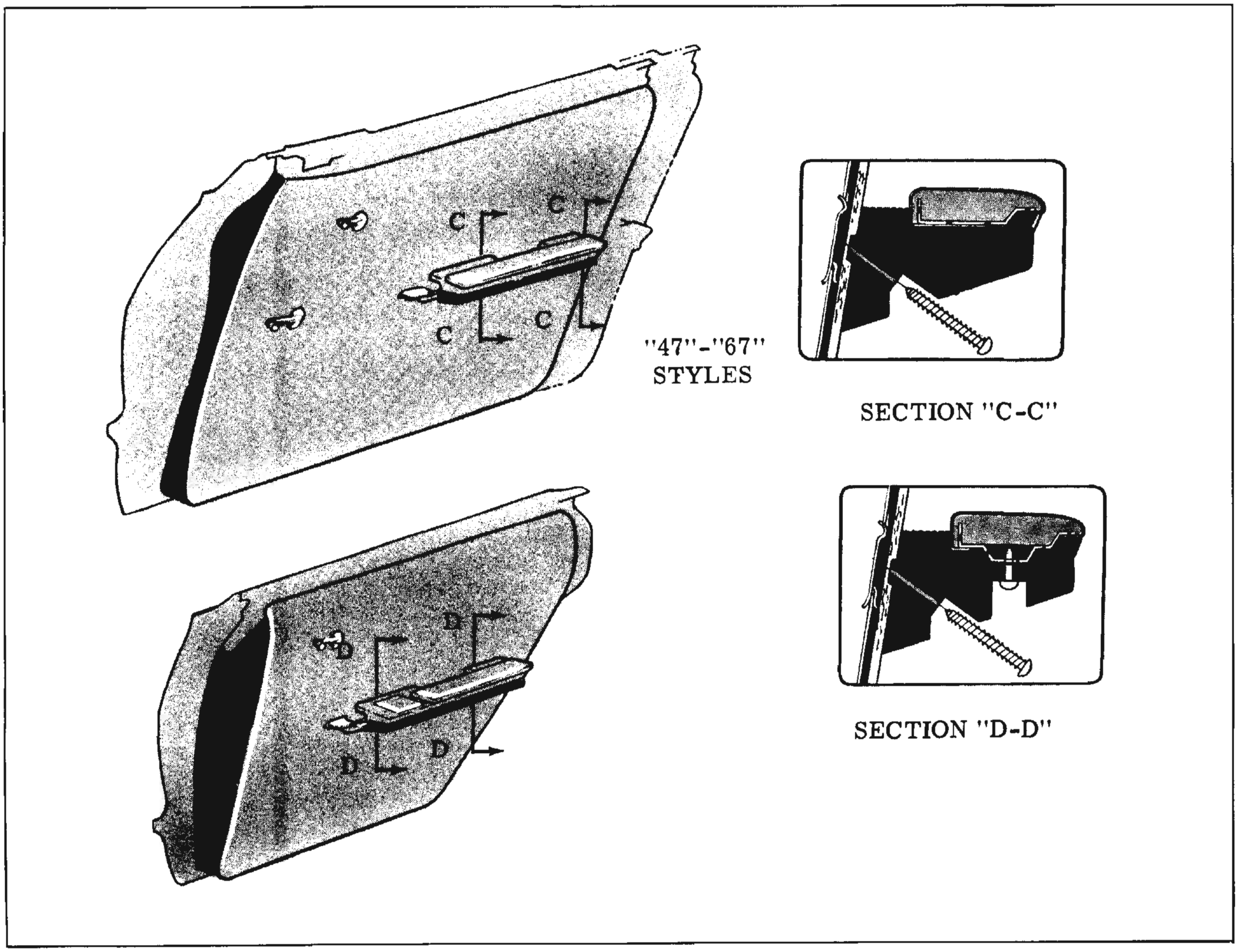


Fig. 16-16 Door Arm Rest Assemblies

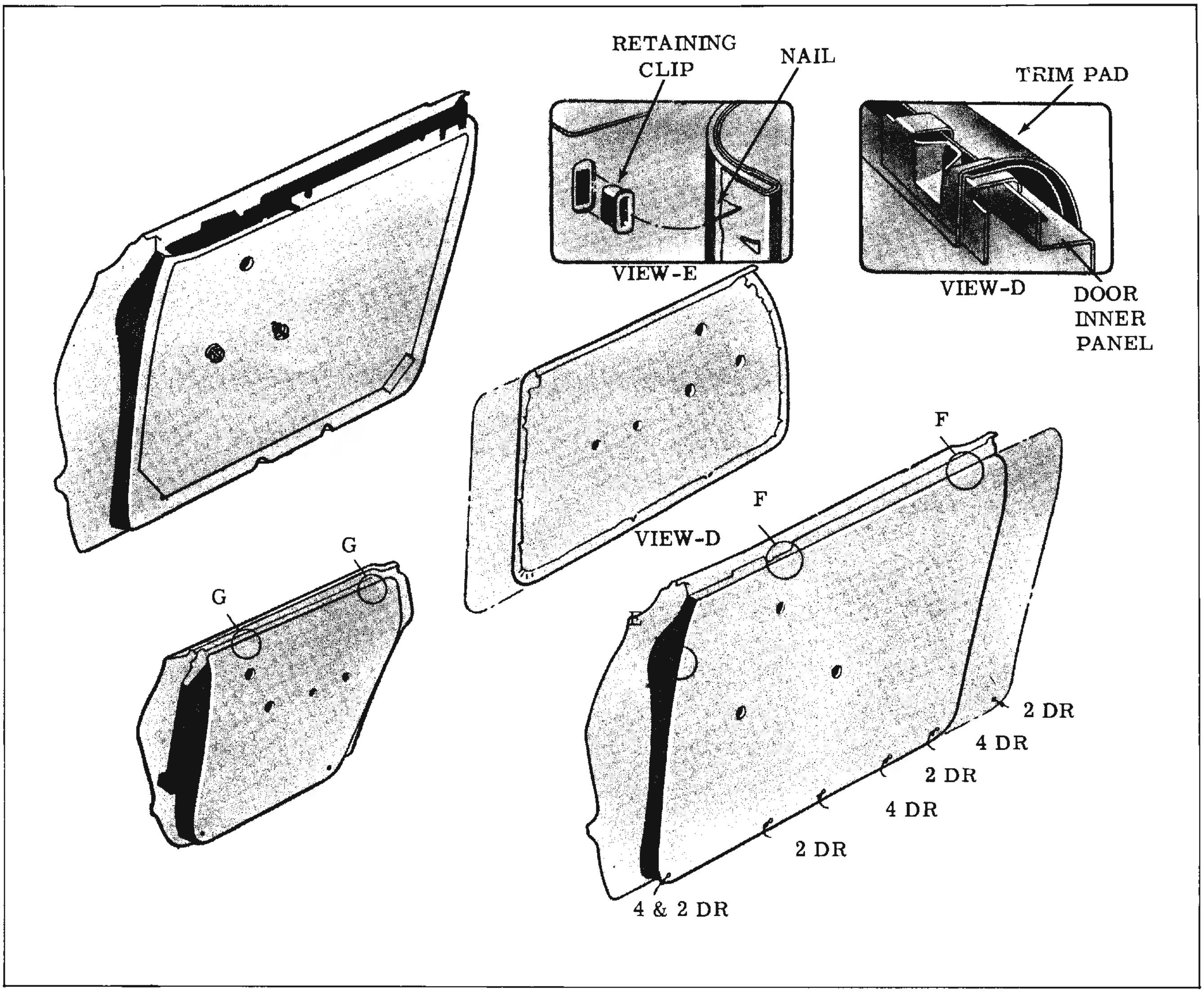


Fig. 16-17 Door Trim Assemblies

3. Remove door inside handles and door trim pad.

4. Remove arm rest screw and washer assemblies and remove arm rest from door trim pad.

   NOTE: This should be done as a bench operation.

5. To install, reverse removal procedure.

DOOR TRIM ASSEMBLIES

All door trim assemblies are the hang-on type and are further secured by attaching screws along bottom edge and by retaining nails inserted into plastic retaining cups in the door inner panel. (Views "D" and "E", Fig. 16-17)

Removal and Installation

1. Remove door inside hardware, locking rod knob and arm rest assembly.

2. Remove screws securing trim assembly to door inner panel. (Fig. 16-17)

3. With a clean rubber mallet, tap trim assembly along front and rear edges to free trim assembly retaining nails in slots.

4. Place tool J-6335, or flat-bladed tool, between water deflector and door trim assembly at lower edge of trim assembly. Working upward, carefully loosen front and rear edges of door trim assembly from door inner panel.

   NOTE: Exercise care not to disturb inner panel water deflector.

5. Lift trim assembly upwards and carefully disengage trim from top of door inner panel, then remove trim assembly from door.

   NOTE: On styles equipped with electric window regulator, after trim assembly is disengaged from top of door inner panel, disconnect switch terminal block(s) from switch assembly(s).

7. To install, reverse removal procedure. Broken retaining nails should be replaced with repair tabs, which are available as service parts.

WATER DEFLECTOR

A waterproof paper deflector is used to seal the door inner panel and prevent entry of water into body. The polyethylene (black) side of the deflector is placed against the inner panel. The deflector fits into a retaining slot at the lower section of the door inner panel and deflects water to bottom of door and out door bottom drain holes. The deflector is further secured by a string loaded sealing material along both front and rear edges and by the application of waterproof sealing tape at front and rear lower corners.

Whenever work is performed on front or rear doors where the water deflector has been disturbed, the deflector must be properly resealed and taped to the inner panel to prevent serious waterleaks.

For sealing, body caulking compound is recommended if additional sealing material is required.

When access to the door inner panel is required to perform service operations, the deflector may be partially detached or completely removed from the inner panel. If the existing water deflector is damaged so that it will not properly seal the door inner panel, replacement of deflector is absolutely necessary.

The following procedure covers complete removal and installation of the water deflector. If only partial detachment is required, perform only those steps which are necessary to expose the required area of the door inner panel.

Removal

1. Remove door trim assembly.
2. Remove strips of waterproof body tape securing lower corners of water deflector.
3. With a putty knife, or other suitable flat-bladed tool, carefully break cement bond securing upper corners of water deflector to door inner panel. Make sure string, located within sealer, is against water deflector and carefully slide putty knife between sealer and door inner panel along both sides of door to disengage sides of water deflector from door inner panel.
4. Disengage lower edge of water deflector from retaining slot in door inner panel and remove water deflector.

Installation

1. Inspect water deflector and repair any tears or holes with waterproof body tape applied to both sides of deflector. If bond between polyethylene and deflector paper has been torn, cut or damaged, apply waterproof body tape to both sides of deflector over damaged area to prevent water from wicking on uncoated side of deflector paper.
2. If a new deflector is to be installed, use old water deflector as a template to trim new deflector to proper size and to cut holes for door inside hardware. If old sealer does not effect an adequate seal, remove all old cement from door inner panel and replace with a continuous bead of body caulking compound (approximately 3/16" diameter).
3. If the door arm rest attaching screw holes are located in the door inner panel, seal these holes with body caulking compound.
4. Position water deflector to door inner panel with polyethylene coated side (black) of deflector against inner panel. Insert lower edge of deflector in retaining slot and firmly roll or press sealed areas to obtain a good bond between deflector and door inner panel.
5. Seal lower corners of water deflector with 2" or 2-1/2" waterproof body sealing tape.
6. Clean off any excessive cement or caulking compound and install previously removed door trim and inside hardware.

SPRING CLIPS

A spring clip is used to secure remote control connecting rods and inside locking rod connecting links to door levers. A slot in the clip provides for disengagement of the clips, thereby, facilitating detachment of linkage.

To disengage a spring clip, use a screwdriver to slide clip out of engagement. (Fig. 16-18)

OUTSIDE HANDLE ASSEMBLY

Removal and Installation

1. Raise door window. Remove door trim

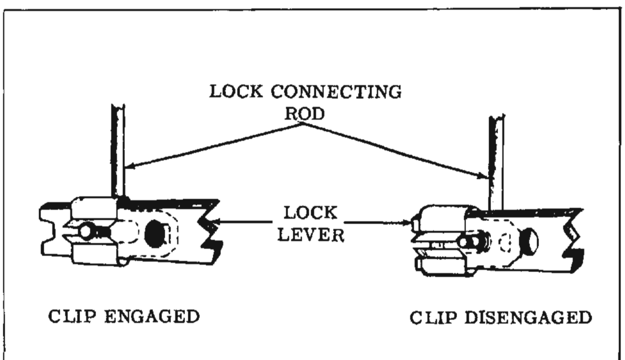


Fig. 16-18 Door Lock Spring Clip

assembly and detach upper rear corner of inner panel water deflector sufficiently to gain access to door outside handle attaching screws.

2. Remove screws and door lock handle and gaskets from outside of body.
3. To install, reverse removal procedure.

OUTSIDE HANDLE PUSH BUTTON

Assembly and Disassembly

1. Remove door outside handle.
2. Depress retainer slightly and turn 1/4 turn. Remove retainer, spring, push button and shaft and sealing ring from handle.
3. To assemble, reverse disassembly procedure. (Fig. 16-19)

FRONT DOORS

DOOR WEATHERSTRIPS ("29", "39", "47", "57" and "67" Styles)

The front door weatherstrip assembly incorporates nylon component fasteners. This fastener is the same size at all locations (3/16" diameter) and is available as a service part.

A fastener removing tool can be fabricated as shown in Figure 16-20. When a removal tool is fabricated, make sure all sharp edges or metal burrs are removed so as not to damage weatherstrip or paint finish during its usage.

Removal

1. Remove snap fasteners securing ends of weatherstrip at belt line of door hinge and lock pillar panels. (Fig. 16-21)
2. Carefully break cement bonds securing weatherstrip to door. A putty knife will prove helpful in breaking cement bond. (Fig. 16-22)

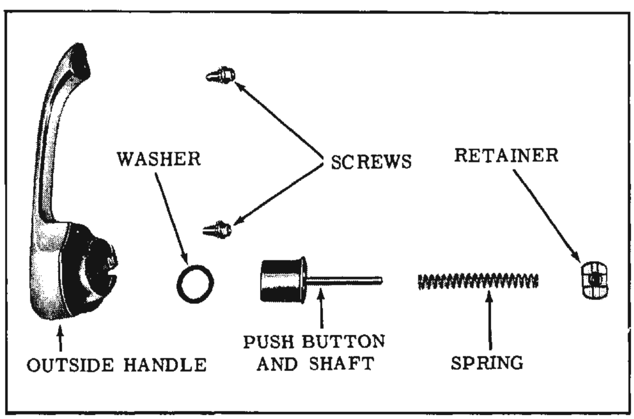


Fig. 16-19 Outside Handle Assembly

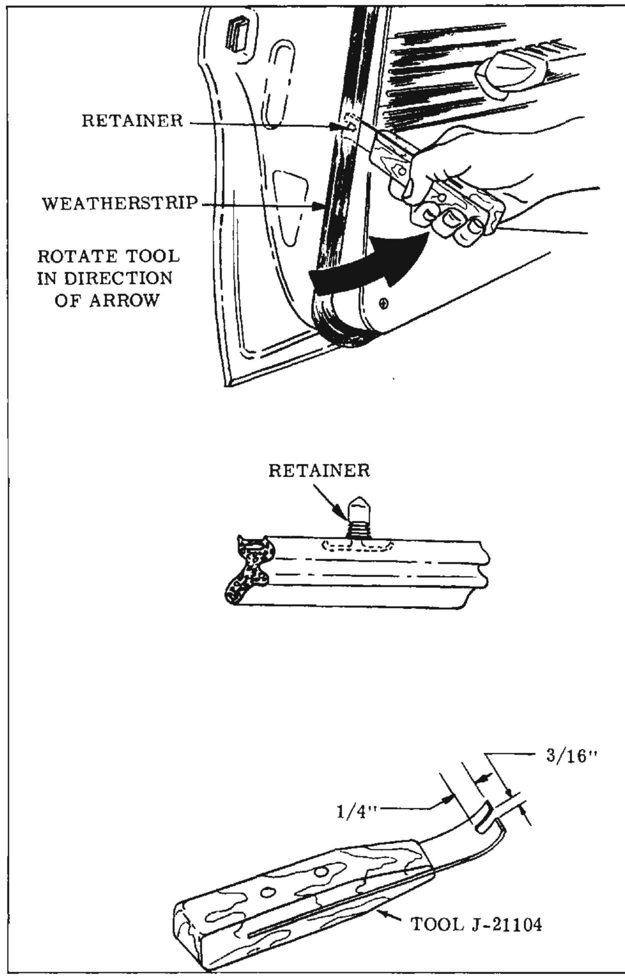


Fig. 16-20 Front Door Weatherstrip Removal

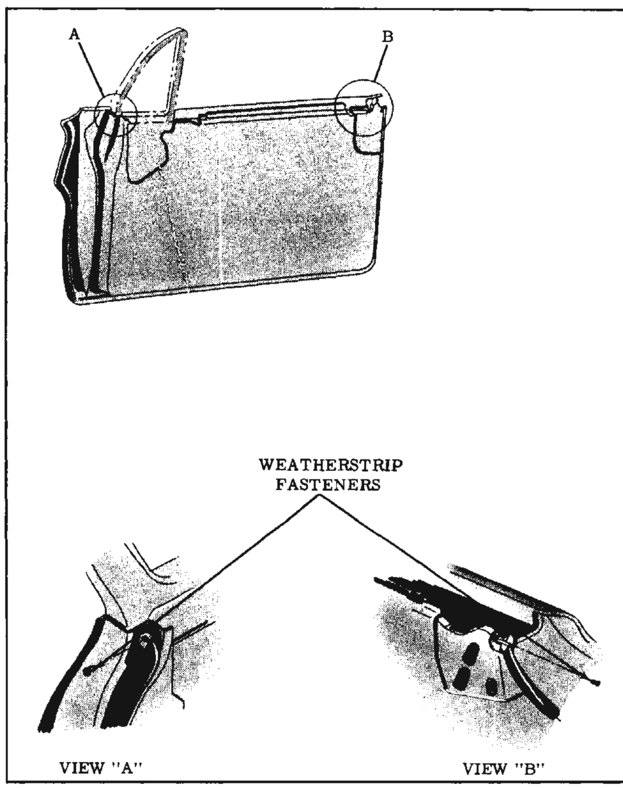


Fig. 16-21 Front Door Weatherstrip

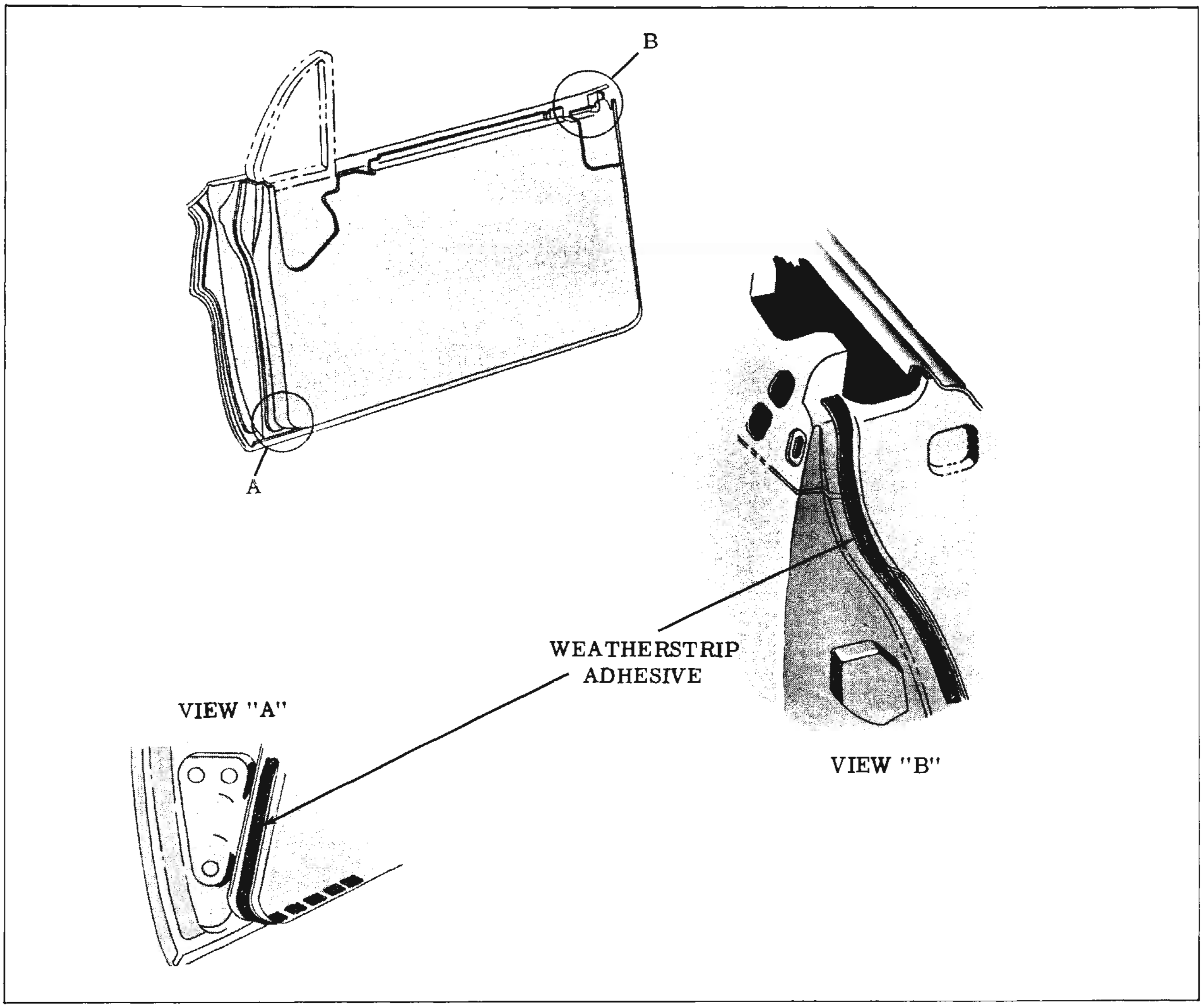


Fig. 16-22 Front Door Weatherstrip Cementing

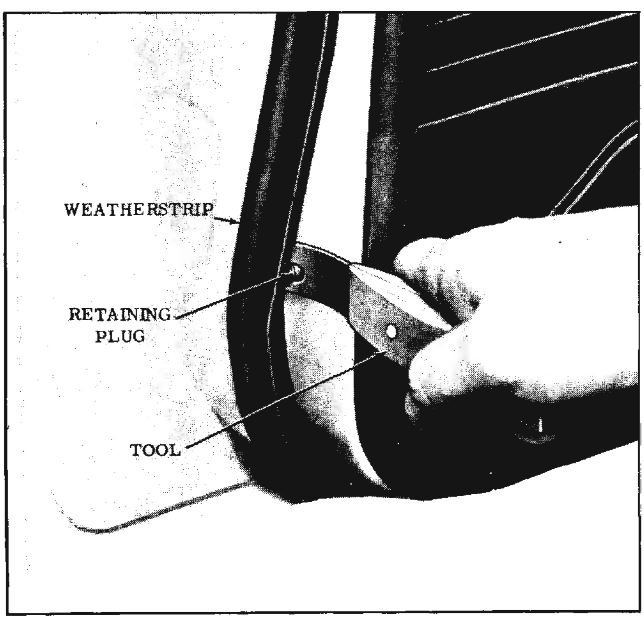


Fig. 16-23 Removing Retaining Plug

3. Slide tool under weatherstrip at a fastener location and grip fastener as close to door panel as possible; then, gently pry fastener out of its respective door piercing. (Fig. 16-23)

   CAUTION: Exercise care not to damage serrations or fasteners during removal as they are necessary to maintain a good weather-seal.

Installation

1. Check weatherstrip nylon fasteners for damage and replace, if necessary.

2. Clean off old cement from door to insure a clean cementing surface. Apply a bead of weatherstrip adhesive to lock pillar facing of door. Begin adhesive application at belt line and continue down door for approximately seven to nine inches. (Fig. 16-22)

   NOTE: Cement usage is usually limited to door lock pillar panel (at belt line) and at forward lower corner of door. Cement, however, can be applied at any point where additional retention of weatherstrip is needed.

3. Beginning at either front or rear section of door, install snap fasteners. Install weatherstrip fasteners by pressing fasteners into door panel piercings.

   NOTE: In the event a weatherstrip becomes damaged at a fastener location and will not properly retain the fastener, remove fastener and cement weatherstrip into place. If, however, two or more consecutive fasteners will not remain engaged in the weatherstrip, replacement of the weatherstrip will probably be necessary.

All door weatherstrips are impregnated with a silicone lubricant and additional lubrication should not be required.

DOOR WEATHERSTRIPS ("19", "35", "45" and "69" Styles)

The front door weatherstrip assembly incorporates nylon component fasteners. This fastener is the same size at all locations (3/16" diameter) and is available as a service part.

A tool can be fabricated from any other comparable metal tool as shown in Figure 16-20. When a removal tool is fabricated, make sure all sharp edges or metal burrs are removed so as not to damage weatherstrip or paint finish during its usage.

Removal

1. Carefully break cement bond securing weatherstrip to door. A putty knife can be used to help break cement bond. (Fig. 16-24)

2. Slide tool under weatherstrip at a fastener location and grip fastener as close to door panel as possible; then, gently pry fastener out of its respective door piercing. (Fig. 16-23)

   CAUTION: Exercise care not to damage serrations of fasteners during removal as they are necessary to maintain a good weatherseal.

Installation

1. Check weatherstrip nylon fasteners for damage and replace, if necessary.

2. Clean off old cement from door to insure a clean cementing surface. Apply a bead of weatherstrip adhesive to hinge and lock pillar

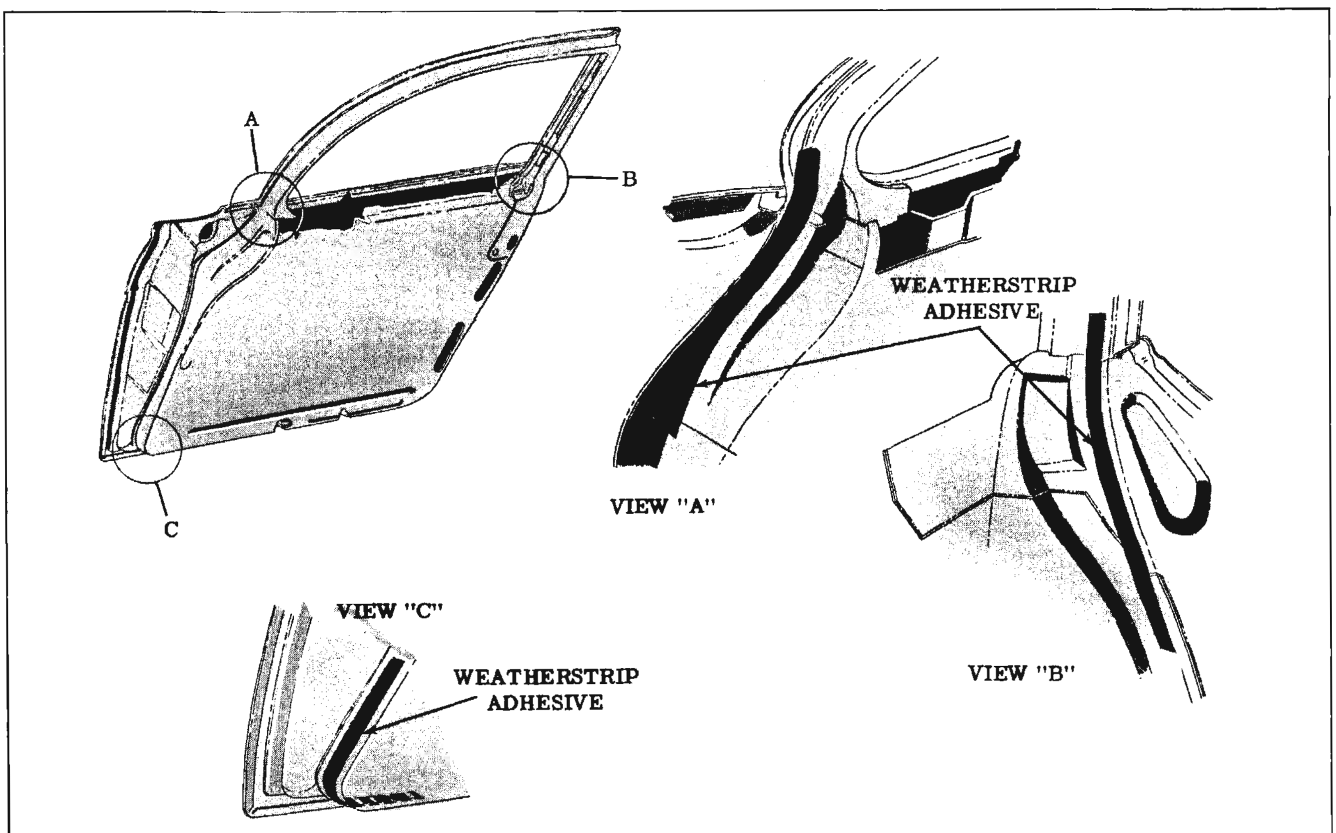


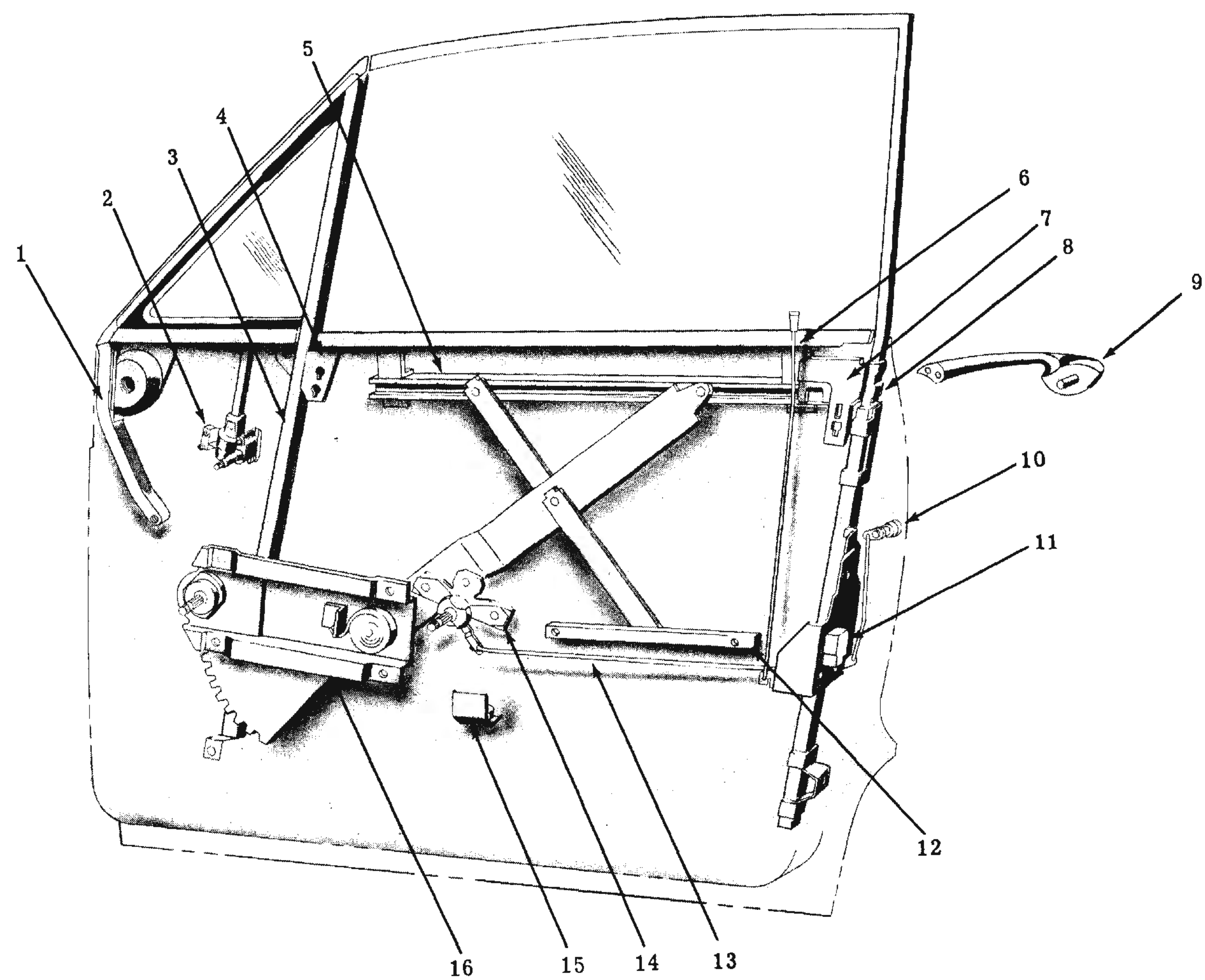
Fig. 16-24 Weatherstrip Adhesive Application

facing of door. Begin adhesive application slightly above belt line and continue down door for approximately seven to nine inches. If necessary, weatherstrip adhesive can also be applied to lower forward corner of door. (Fig. 16-24)

NOTE: Cement usage is usually limited to door hinge and lock pillar panel (at belt line) and at forward lower corner of door. Cement, however, can be applied at any point where additional retention of weatherstrip is needed.

3. Position front door weatherstrip so that preformed section is at upper rear corner of door header and install weatherstrip fasteners by pressing fasteners into door panel piercings.

NOTE: In the event a weatherstrip becomes damaged at a fastener location and will not properly retain the fastener, remove fastener and cement weatherstrip into place. If, however, two or more consecutive fasteners will not remain engaged in the weatherstrip,



1. VENTILATOR EXTENSION (CASTING)
2. VENTILATOR ASSEMBLY
3. VENTILATOR DIVISION CHANNEL
4. WINDOW FRONT UP-STOP
5. WINDOW LOWER SASH CHANNEL CAM
6. LOCK TO LOCKING LEVER ROD
7. WINDOW REAR UP-STOP
8. WINDOW REAR GUIDE ASSEMBLY
9. OUTSIDE HANDLE ASSEMBLY
10. LOCK CYLINDER AND CONNECTING ROD
11. LOCK ASSEMBLY
12. WINDOW INNER PANEL CAM
13. REMOTE CONTROL TO LOCK CONNECTING ROD
14. REMOTE CONTROL ASSEMBLY
15. WINDOW LOWER STOP
16. WINDOW REGULATOR ASSEMBLY

Fig. 16-25 Front Door Hardware (Typical of Holiday and Sedan)

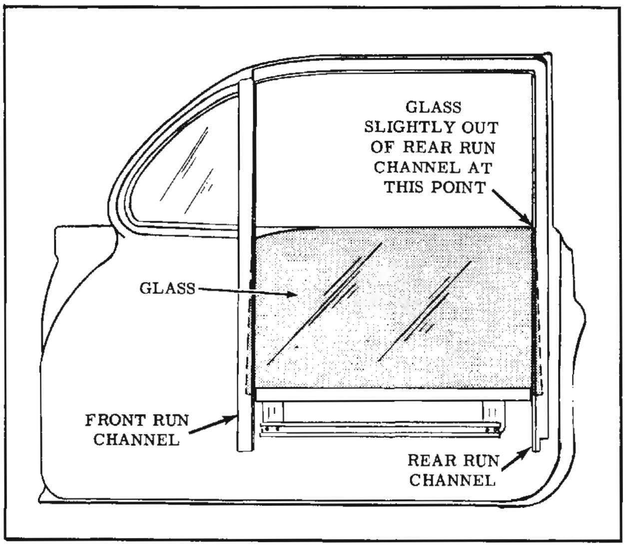


Fig. 16-26 Front Door (Typical)

replacement of the weatherstrip will probably be necessary.

4. Clean off any excess weatherstrip adhesive.

   NOTE: All door weatherstrips are impregnated with a silicone lubricant and additional lubrication is not required.

FRONT DOOR HARDWARE ("29", "39", "47", "57" and "67" Styles)

Figure 16-25 is typical of hard top coupe and sedan style front doors with the trim assembly and inner panel water deflector removed. This illustration identifies the component parts of the front door assembly, their relationship and various attaching points.

Figure 16-26 is typical of all closed style front doors, illustrating the proper position of a fully lowered door window for maximum glass stability.

FRONT DOOR ASSEMBLY AND HINGES

The front door hinges are the swing-out type with an integral door check on the top hinge assembly and a two position hold open on the lower hinge assembly. The hinges are attached to the front body hinge pillar and to the door assembly with bolts and anchor plates. Either of two methods may be used to remove the door from the body.

A. The door and hinges can be removed as an assembly from the body hinge pillar.

B. The door can be removed from the hinge straps.

Removal

1. Place a protective covering over front fender at door opening to protect paint finish.

2. If door and hinges are to be removed from body pillar, additional access may be obtained at lower hinge by loosening front fender lower rear attaching bolt.

3. Mark hinge locations on door or hinge pillar depending on method of removal being used.

4. On bodies equipped with electrically powered window regulators:

   a. Remove door trim assembly and detach inner panel water deflector sufficiently to gain access to wire connector(s) at motor(s).

   b. Detach wire harness from inner panel as required and disconnect motor(s) from harness at connector(s).

   c. Remove electric conduit from door and remove wire harness from between door panels through opening in door hinge pillar.

5. With door properly supported, remove bolts securing upper and lower hinges to front body hinge pillar or door hinge pillar. (Fig. 16-27) With aid of a helper, remove door assembly from body.

Installation

1. As an anti-squeak precaution, before installing

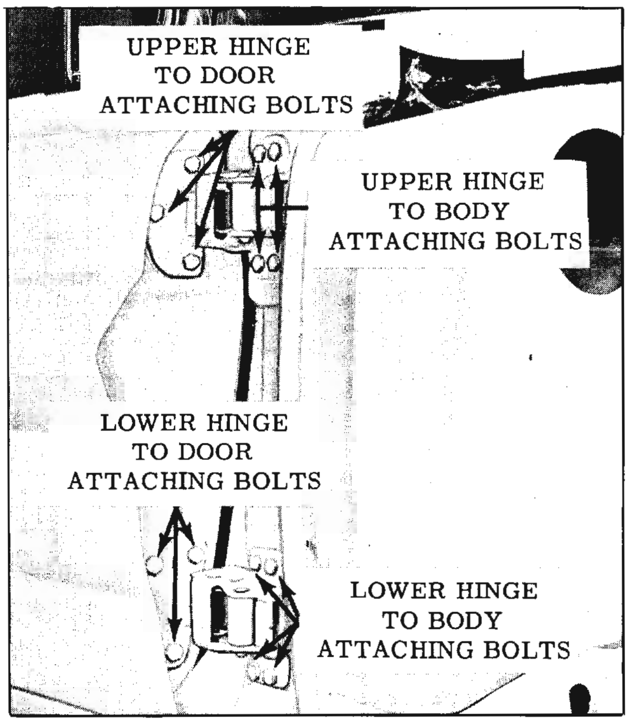


Fig. 16-27 Front Door Hinge Attachment

door, coat attaching surface of hinge with heavy-bodied sealer.

2. With aid of a helper, reinstall door to body opening. Align hinges within scribe marks and tighten bolts. Check door for proper alignment.

3. On bodies equipped with electrically-operated window regulators:

   a. Install wire harness between door panels and reinstall harness to door inner panel. Connect regulator motor.

   b. Install conduit to door inner panel. Check operation of electric window assembly.

4. Where required, seal door inner panel water deflector as specified in DOOR INNER PANEL WATER DEFLECTOR and reinstall previously removed parts.

5. For lubrication information see LUBRICATION SECTION.

Adjustments

In or out or up and down adjustments are provided at door hinge pillar. Fore and aft adjustments are provided at front body hinge pillar.

NOTE: After performing any door adjustments on 47-57-67-29-39 styles, the front door ventilator and window should be checked for proper alignment with the side roof rail weatherstrip and adjusted as required. In addition, the door lock to striker engagement should be checked and adjusted if necessary.

1. For in and out or up and down adjustments, loosen hinge to door pillar attaching bolts. (Fig. 16-27) Adjust door as required and tighten bolts.

   NOTE: When performing in and out adjustments, adjust one hinge at a time so as not to disturb up and down adjustment.

2. To adjust door fore or aft, loosen hinge to body pillar attaching bolts. (Fig. 16-27) Adjust door as required and tighten bolts.

   NOTE: One or more of the attaching bolts are not accessible due to inadequate wrench clearance. When fore and aft adjustments are performed, the recommended procedure is to remove the obstructing attaching bolt and perform adjustments with the remaining three bolts. After satisfactory adjustments have been made, replace the previously removed bolt. The removal of the obstructing bolt and subsequent adjustments can best be accomplished with a ratcheting boxsocket wrench.

FRONT DOOR LOCK STRIKERS

Removal and Installation

1. With a pencil, mark position of striker on body pillar.

2. Remove three door lock striker attaching screws and remove striker and adjusting plates from pillar.

3. To install, seal all striker plate attaching screw clearance holes with body caulking compound.

4. Apply a 1/8" bead of body caulking compound around entire back surface of striker plate. No skips must exist in caulking compound. Place striker and adjusting plates within marks on pillar and install striker plate attaching screws.

   IMPORTANT: Whenever a door has been removed and installed, or realigned, the door SHOULD NOT be closed completely until a visual check is made to determine if lock extension will engage in striker notch. Where required, door lock striker service spacers should be installed so that door can be closed and an accurate check made to determine spacer requirements.

5. Clean off all excess caulking compound.

Adjustments

1. To adjust striker up or down or in or out, loosen striker plate attaching screws and shift striker and adjusting plates as required, then tighten screws.

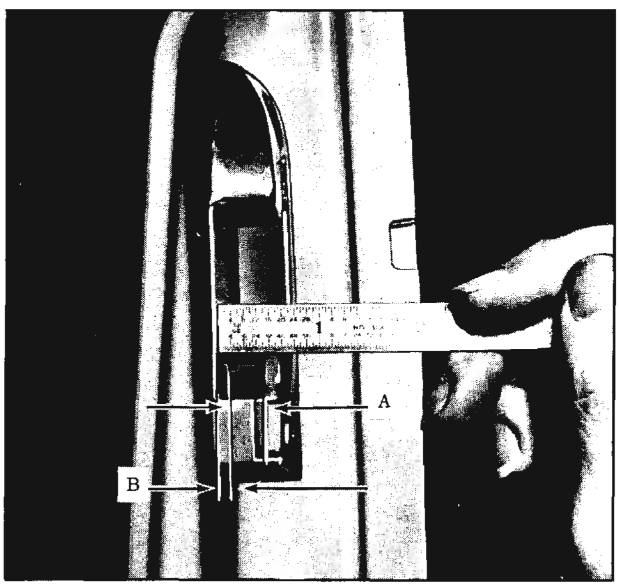


Fig. 16-28 Door Lock Striker Engagement Check

DIMENSIONAL SPECIFICATIONS FOR USE OF DOOR LOCK STRIKER SERVICE SPACERS

1. Door should be properly aligned before checking door spacer requirements.
2. To determine if door lock striker emergency spacers are required, apply modeling clay or body caulking compound in door lock striker notch where lock extension engages and then close door to form a measurable impression in clay or caulking compound. (Fig. 16-28)

When dimension "A" from rear face of striker teeth to rear edge of depression in clay is less than 11/32", install service spacers and proper length striker attaching screws as indicated.

Dimension "A"	No. of Spacers Required	Spacer Thickness	Striker Attaching Screws*
11/32" to 9/32"	1	1/16"	Original
9/32" to 7/32"	1	1/8"	(1/8" longer)
7/32" to 5/32"	1-(1/16" Spacer) 1-(1/8" Spacer)	3/16"	(1/8" longer)
5/32" to 3/32"	2-(1/8" Spacer)	1/4"	(1/4" longer)
*Zinc or cadmium-plated flat-head cross recess screw with countersunk washer.			

NOTE: Dimension "B" in the illustration should never be less than 1/8".

DOOR WEDGE PLATES ("67" Styles)

Door wedge plates are used as a positive "hold" of front doors with doors in the closed position by providing a .040" interference between wedge plates. Wedge plates are retained by two screws and are installed at the top section of door and body lock pillars. The body wedge plate is constructed of metal and the door wedge plate is constructed of nylon. If necessary, shims can be installed under the door wedge plate. These shims are available as a service part.

Check and Adjustment

1. From inside of car with door closed, fold back windhose and insert feeler gauge between wedge plates to determine amount of clearance.
2. If clearance exists, add shim(s) to equal the measured clearance plus an additional .040".

Removal and Installation

1. Remove two screws securing wedge plate to body panel and remove wedge plate. (Fig. 16-29)
2. To install, reverse removal procedure.

LOCK CYLINDER ASSEMBLY

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector sufficiently to expose large access hole.
2. Through access hole, with a screwdriver, disengage door lock cylinder to lock connecting rod from door lock. (See DOOR LOCK SPRING CLIP)
3. On all except "39" styles, with a flat-bladed tool, slide lock cylinder retaining clip forward from door lock pillar facing sufficiently to permit removal of lock cylinder with attached connecting rod from door. On "39" styles, disengage spring clip from inside of door.

NOTE: Door lock cylinder connecting rod may be removed from lock cylinder as a bench operation or prior to removing cylinder.

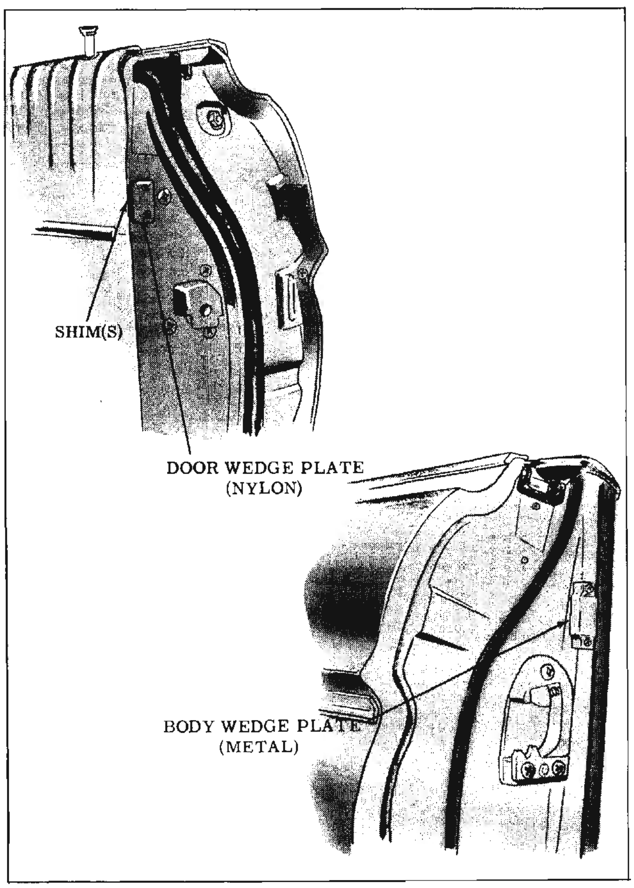


Fig. 16-29 Door Wedge Plates

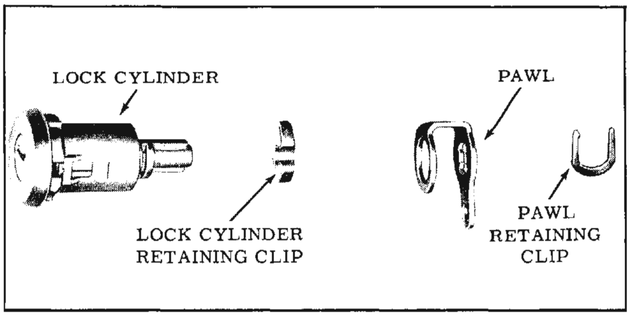


Fig. 16-30 Door Lock Cylinder Assembly

4. To install, reverse removal procedure. Check operation of lock cylinder and lock prior to installing inner panel water deflector.

Disassembly and Assembly

1. Remove lock cylinder assembly from door.

2. Remove pawl retaining clip, pawl and lock cylinder retaining clip. (Fig. 16-30)

3. To assemble, reverse disassembly procedure.

   NOTE: The lock cylinder housing scalp used in production is usually damaged when removed and must be replaced by a new scalp which is available as a service part. The service lock cylinder housing scalp is secured by tabs.

INNER PANEL CAM ASSEMBLY

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. Remove bolts securing door inner panel cam assembly and disengage cam from regulator balance arm and remove cam from door. (Fig. 16-31)

3. To install, reverse removal procedure. Prior to installation, lubricate entire length of cam with 630 AAW Lubriplate or equivalent.

Adjustments

1. To correct a condition where the glass is cocked in the glass run channels, loosen inner panel cam attaching screws, adjust either end of cam up or down as required and tighten screws.

DOOR LOCK ASSEMBLY

All locks are the rotary bolt type lock with the safety interlock feature. With the safety interlock feature, it is important that the lock extension and housing engages properly in the door lock striker and that, where necessary, striker emergency spacers of the proper thickness are used to obtain proper engagement.

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. Through access hole, disengage spring clips securing lock cylinder rod, remote control connecting rod and inside locking rod to lock and disengage rods from lock (See DOOR LOCK SPRING CLIPS).

3. On 47-57-67-29-39 styles, remove door window rear glass run channel lower attaching

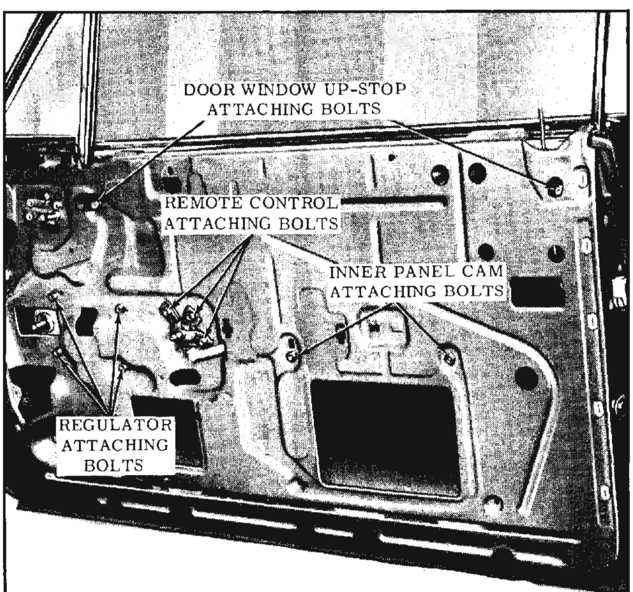


Fig. 16-31 Front Door Hardware (Typical Holiday)

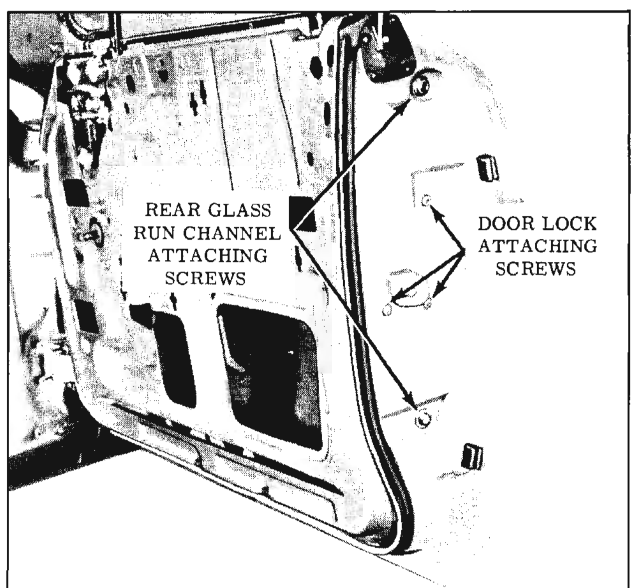


Fig. 16-32 Door Lock and Run Channel

screw and loosen upper attaching screws on lock pillar facing of door and at top of door inner panel to permit removal of lock.

4. On 11-69-19-35-45 styles, from inside of door, remove rear glass run channel lower attaching nut or screw and pull channel forward to permit removal of lock.

5. Remove door lock attaching screws from lock pillar facing of door and remove lock assembly from door. (Fig. 16-32)

6. To install, reverse removal procedure. Prior to installation, apply a ribbon of medium-bodied sealer (approximately 1/4" in diameter) across face of lock frame. Check unit for proper operation and, if necessary, adjust glass run channel for proper alignment prior to installation of inner panel water deflector.

FRONT DOOR REMOTE CONTROL ASSEMBLY AND CONNECTING ROD

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. Remove remote control attaching screws and disengage remote control from connecting rod. (Fig. 16-31)

3. To remove remote control connecting rod, carefully disengage spring clip securing rod to lock and remove rod from lock. Disengage rod from spring clip on door inner panel where necessary, and remove rod.

4. To install, reverse removal procedure. Check door lock and remote control assemblies for proper operation prior to installing inner panel water deflector.

FRONT DOOR VENTILATOR REGULATOR—MANUAL AND ELECTRIC

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector sufficiently to gain access to regulator attaching bolts.

2. On styles equipped with electric ventilator regulators, disconnect regulator motor wires at connector.

3. Remove ventilator tee shaft attaching bolt and ventilator regulator attaching bolts. (Fig. 16-33)

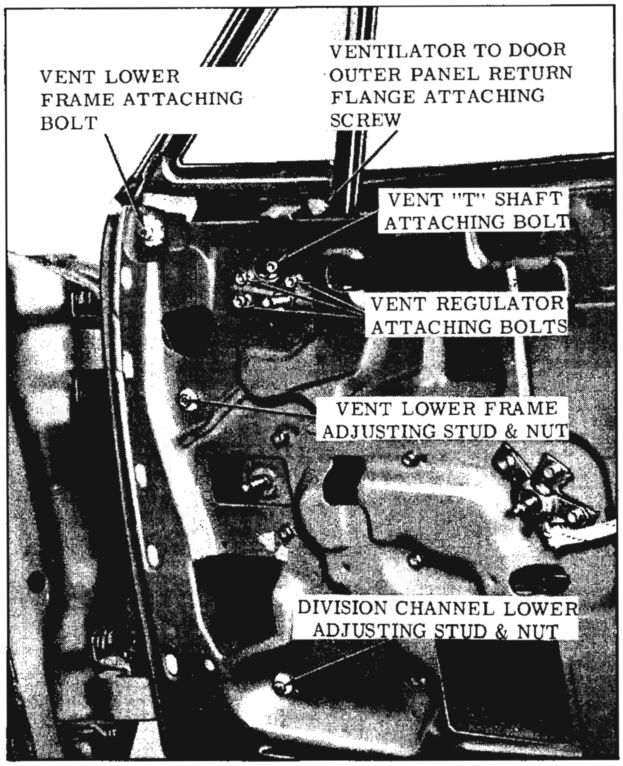


Fig. 16-33 Ventilator Assembly Attachment

4. Disengage ventilator regulator shaft from ventilator tee shaft and remove regulator and motor assembly from door through access hole.

5. To install, reverse removal procedure. Check operation of ventilator assembly prior to installing inner panel water deflector.

Adjustments

1. Excessive "play" of ventilator at pivot shaft, when ventilator is in an open position, can be corrected by tightening ventilator tee shaft to regulator attaching bolt. (Fig. 16-33)

   NOTE: Bolt should be tightened carefully to avoid stripping threads in regulator spiral gear shaft.

FRONT DOOR VENTILATOR ASSEMBLY—MANUAL AND ELECTRIC ("29", "39", "47" "57" and "67" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.

2. Lower door window. Remove ventilator to door outer panel return flange attaching screw. (Fig. 16-33)

3. At front of ventilator assembly, break cement bond securing front door hinge pillar sealing strip (at belt) to ventilator assembly.

4. Remove ventilator division channel lower adjusting stud and nut. (Fig. 16-33)

5. On styles equipped with electrically operated ventilator assemblies, disconnect motor and regulator assembly from ventilator frame and remove motor and regulator unit through large access hole in door inner panel.

6. Remove ventilator lower frame attaching bolt and ventilator lower frame adjusting stud nut. (Fig. 16-33)

7. Remove ventilator regulator.

8. Lift ventilator assembly upward and remove from door.

9. To install, reverse removal procedure. Prior to installation of ventilator assembly, apply a bead of body caulking compound to door outer panel return flange along area contacted by ventilator assembly. Adjust ventilator assembly as described under FRONT DOOR VENTILATOR ADJUSTMENTS.

Adjustments

The front door ventilator assembly can be adjusted up or down and in or out at the top and forward section for alignment in the door opening and proper weatherstrip contact in the ventilator area. The lower portion of the ventilator division channel can be adjusted in or out and fore and aft for alignment with the door window glass.

1. Remove door trim assembly and detach inner panel water deflector.

2. Remove ventilator frame to outer panel attaching screw.

3. Loosen ventilator lower frame to outer panel attaching screw.

4. Loosen ventilator division channel lower adjusting stud nut and ventilator lower frame adjusting stud nut.

5. To adjust ventilator assembly fore or aft to windshield pillar side roof rail weatherstrip, position lower frame adjusting stud and nut and division channel stud and nut as required and tighten attaching nuts.

6. To adjust ventilator assembly in or out, turn adjusting studs on either the lower frame, division channel or both, as required, and tighten nuts.

7. After the necessary adjustments have been performed, tighten all nuts and bolts and replace ventilator to door outer panel attaching screw.

   NOTE: In some cases it may be necessary to relocate ventilator to door outer panel return flange attaching screw.

8. Seal water deflector to door inner panel and install door trim and inside hardware.

FRONT DOOR VENTILATOR ASSEMBLY ("19", "35", "45" and "69" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.
2. Remove ventilator regulator assembly.
3. Lower door window. Remove ventilator to door outer panel return flange attaching screw.
4. Remove ventilator division channel lower adjusting stud and nut.
5. Remove ventilator upper attaching screws along window frame. (Fig. 16-34)
6. Lower ventilator assembly sufficiently to tilt assembly inward; then lift ventilator assembly upward and remove from door.
7. To install, reverse removal procedure.

Adjustments

To adjust ventilator division channel in or out

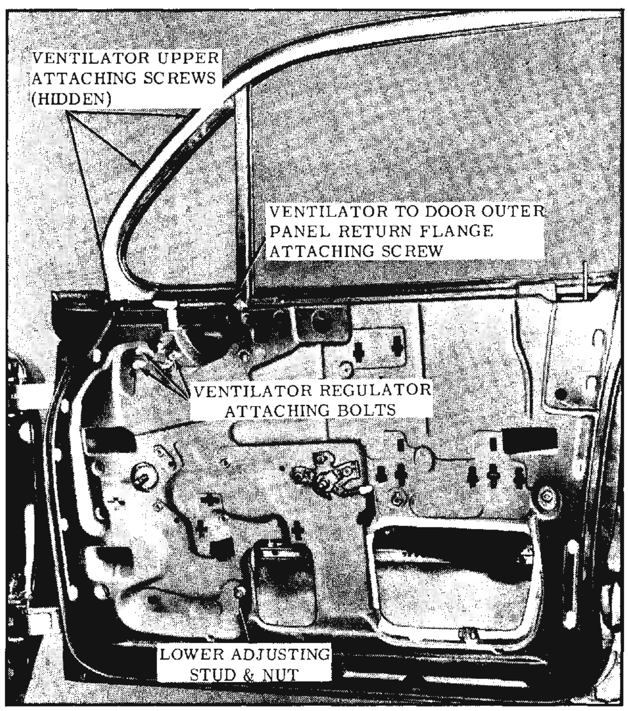


Fig. 16-34 Ventilator Assembly Attachment

or fore or aft, remove door trim assembly and detach inner panel water deflector sufficiently to loosen division channel lower adjusting stud nut. Adjust stud in or out as required or position channel fore or aft as required; then tighten stud nut.

FRONT DOOR WINDOW ASSEMBLY—MANUAL AND ELECTRIC ("29", "39", "47", "57" and "67" Styles)

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. Through holes in inner panel, remove screw securing window assembly front and rear stops to lower window sash channel. Lower window slightly and remove stops. (Fig. 16-31)

3. Lower door window to expose window lower sash channel cam attaching screws. On styles equipped with electric window regulators, disconnect wiring harness feed wire from regulator motor at connector.

   NOTE: It may be necessary to loosen the ventilator frame and tilt it forward to facilitate removal of door window.

4. Remove window lower sash channel cam attaching screws and disengage cam from window sash channel. Then lift window assembly upward and remove from door.

   CAUTION: DO NOT OPERATE REGULATOR MOTOR after window assembly is disengaged from regulator. Operation of motor with load removed may damage unit.

5. To install, reverse removal procedure. Before installing window lower sash channel cam, lubricate entire length of cam with 630AAW Lubriplate or equivalent. Check window for proper operation prior to installing inner panel water deflector and door trim pad.

Adjustments

The door window glass may be adjusted to provide proper contact with the side roof rail weatherstrip. Adjustments have also been provided to relieve a binding door glass due to misalignment of the glass run channels. To perform the following adjustments, remove door trim assembly and detach inner panel water deflector, where necessary, to gain access to hardware attaching points.

1. To correct a condition where glass is "cocked" in glass run channels, loosen inner panel cam attaching screws, adjust cam up or down as required and retighten screws. (Fig. 16-31)

2. To adjust upper front portion of window assembly in or out for proper contact with side roof rail weatherstrip, adjust ventilator assembly in or out as described under FRONT DOOR VENTILATOR ADJUSTMENTS.

3. To adjust lower portion of ventilator division channel for alignment with window assembly, lower door window and loosen ventilator division channel adjusting stud nut. Turn adjusting stud in or out or position lower end of channel fore or aft, as required; then retighten adjusting stud nut. (Fig. 16-33)

4. To adjust upper rear of window assembly in or out for proper contact with side roof rail weatherstrip, or to adjust rear of window assembly in or out at belt line, loosen rear glass run channel attaching screws at lock pillar facing of door and screw at top of door inner panel. Position channel in or out as required and tighten screws. (Fig. 16-32)

   NOTE: Adjustments 2, 3 and 4 must be coordinated to provide a properly operating front door window.

5. To adjust limit of "up" travel of window assembly for proper contact with side roof rail weatherstrip, raise door window and through inner panel access holes, loosen door window front and rear stop assembly attaching bolts. Adjust stops up or down as required, then tighten attaching bolts. (Fig. 16-31)

FRONT DOOR WINDOW ASSEMBLY—MANUAL AND ELECTRIC— ("19", "35", "45" and "69" Styles)

Removal and Installation

1. Lower door window. Remove door trim assembly and detach inner panel water deflector.

2. Remove door ventilator assembly as described under FRONT DOOR VENTILATOR - Removal and Installation.

3. On styles equipped with electric window regulators, disconnect wiring harness feed wires from regulator motor at connector.

   CAUTION: DO NOT OPERATE REGULATOR MOTOR after window assembly is disengaged from regulator. Operation of motor with load removed may damage unit.

4. Remove screws securing window lower sash channel cam to window assembly and carefully disengage cam from window lower sash channel.

5. Rotate rear edge of window assembly upward and remove window assembly from between inner and outer panels.

6. To install, reverse removal procedure. Check window for proper operation before installing inner panel water deflector. Prior to installation, lubricate entire length of lower sash channel cam with 630 AAW Lubriplate or equivalent.

Adjustments

1. To correct a condition where glass is "cocked" in glass run channels, loosen inner panel cam attaching screws, adjust cam up or down as required and tighten screws. (Fig. 16-34)

2. To adjust lower portion of ventilator division channel for proper alignment with door window assembly, lower door window and loosen ventilator adjusting stud nut. Turn adjusting stud in or out or position lower end of channel fore or aft as required; then tighten adjusting stud nut. (Fig. 16-34)

3. To adjust lower portion of window glass run channel in or out for proper alignment with door window, raise door window. From inside door, loosen glass run channel lower attaching nut or screw, adjust channel as required and tighten nut or screw. (Fig. 16-34)

FRONT DOOR WINDOW REGULATOR ASSEMBLY—MANUAL AND ELECTRIC ("29", "39', "47", "57" and"67" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.

2. Remove ventilator division channel lower adjusting stud and nut. (Fig. 16-33)

3. On styles equipped with manual window regulators, lower window. Remove window lower sash channel cam attaching screws and disengage sash channel cam from window lower sash channel; then raise window and prop in full up position. Disengage sash channel cam from window regulator arm rollers.

4. On styles equipped with electric window regulators, remove door ventilator assembly and front door window.

5. On styles equipped with electric window regulators, disconnect wire harness feed wires from regulator motor at connector.

   CAUTION: DO NOT OPERATE REGULATOR MOTOR after window assembly is disengaged from regulator. Operation of motor with load removed may damage unit.

6. Remove window regulator attaching bolts. Disengage regulator balance arm roller from inner panel cam and carefully remove regulator assembly from door. (Fig. 16-31)

   NOTE: On some models, only one end of inner panel cam is open sufficiently to permit removal of regulator arm roller.

7. To install, reverse removal procedure. Check window for proper operation prior to installing inner panel water deflector and door trim pad.

FRONT DOOR WINDOW REGULATOR ASSEMBLY—MANUAL AND ELECTRIC ("19", "35", "45" and "69" Styles)

Removal and Installation

1. Remove door trim pad and detach inner panel water deflector.

2. Remove ventilator division channel lower adjusting stud and nut. (Fig. 16-34)

3. On styles equipped with electric window regulators, disconnect wire harness feed wires from regulator motor at connector.

   CAUTION: Do not operate regulator motor with load removed.

4. Remove door window lower sash channel cam. (Fig. 16-34)

5. Roll window to a full up position and place a 2" or 2-1/2" piece of body tape over door upper frame and top of door glass on both sides of glass. This is necessary to positively hold the door window in a full up position.

6. Remove inner panel cam and window regulator attaching bolts and carefully remove regulator assembly from door. (Fig. 16-34)

7. To install, reverse removal procedure. Check window for proper operation prior to installing inner panel water deflector and door trim pad.

FRONT DOOR WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY

The electric motor assembly on electrically operated windows is a twelve volt, reversible direction motor with a built-in circuit breaker and a self-locking gear drive.

Removal and Installation

1. Remove front door electric window regulator assembly from door and clamp it in a vise. (Fig. 16-35)

   CAUTION: BE SURE TO PERFORM STEPS

No. 2 and 3 BEFORE ATTEMPTING TO REMOVE MOTOR FROM REGULATOR. The regulator lift arm, which is under tension from the counter-balance spring, can cause serious injury if motor assembly is removed without locking the sector in position with a nut and bolt.

2. Drill a 1/4" hole through back plate and sector at location indicated at either A, B, or C, depending on position of lift arm.

   NOTE: Do not drill into motor housing, part of which is indicated by dotted line. In addition, locate hole a sufficient distance from edge of sector to insure proper retention of the sector.

3. Insert 3/16" bolt through hole in back plate and sector and install nut to bolt. Do not tighten nut.

4. Remove motor attaching bolts and remove motor assembly from regulator. (Fig. 16-35)

   NOTE: Clean off steel chips from regulator sector and motor pinion gear.

5. To install, reverse removal procedure. If difficulty is encountered when trying to line up motor attaching holes, the regulator lift arm may be moved up or down manually so that motor pinion gear will mesh with teeth on regulator sector and regulator attaching holes will line up.

   NOTE: Be sure to remove temporary nut and bolt from regulator before installing it in door.

FRONT DOOR WINDOW GLASS RUN CHANNEL ASSEMBLY ("19", "35", "45" and "69" Styles)

Removal and Installation

1. Lower door window. Remove door trim assembly and detach inner panel water deflector.

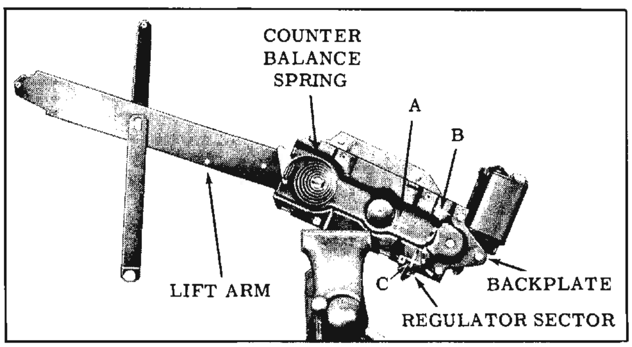


Fig. 16-35 Regulator and Motor Assembly

2. Remove front door ventilator assembly and slide window forward slightly to expose lock pillar portion of glass run channel.

   NOTE: Exercise care so that exposed front edge of glass does not come in contact with body metal.

3. Through inner panel access hole, loosen nut or screw securing lower end of glass run channel. (Fig. 16-34)

4. Squeeze glass run channel together along upper and lock pillar sections of window frame and pull or carefully pry channel assembly from window frame. Remove channel assembly from door.

5. To install, reverse removal procedure.

REAR DOORS

REAR DOOR WEATHERSTRIPS ("29" and "39" Styles)

The rear door weatherstrip is a one-piece mechanical retained type. Mechanical retention consists of a series of weatherstrip attaching clips which fit into individual sealing plugs along door bottom and sides. The weatherstrip is also mechanically retained by nylon snap fasteners at belt line of hinge and lock pillar panels. In addition, "39" style rear door weatherstrips are further retained by a single weatherstrip attaching clip and screw at upper radius of lock pillar panel. Cement usage is limited to door lock pillar panels (at belt line) and at forward lower corners of door. Cement, however, can be applied at any point where additional retention of weatherstrip is needed.

Removal

1. Remove snap fasteners securing ends of weatherstrip at belt line of door hinge and lock pillar panels. (Fig. 16-36)

2. On "39" style rear doors, remove the single weatherstrip attaching clip screw located at upper radius of lock pillar. (Fig. 16-37)

3. Carefully break cement bond securing weatherstrip to door. A putty knife will prove helpful in breaking cement bond. (Fig. 16-38)

4. Insert tip of tool J-5757 at retaining clip locations and carefully snap clips from sealing plugs. (Fig. 16-39)

Installation

1. Check weatherstrip attaching clips for proper contour and reform, if necessary, using Clip Reforming Tool J-5984. (Fig. 16-40)

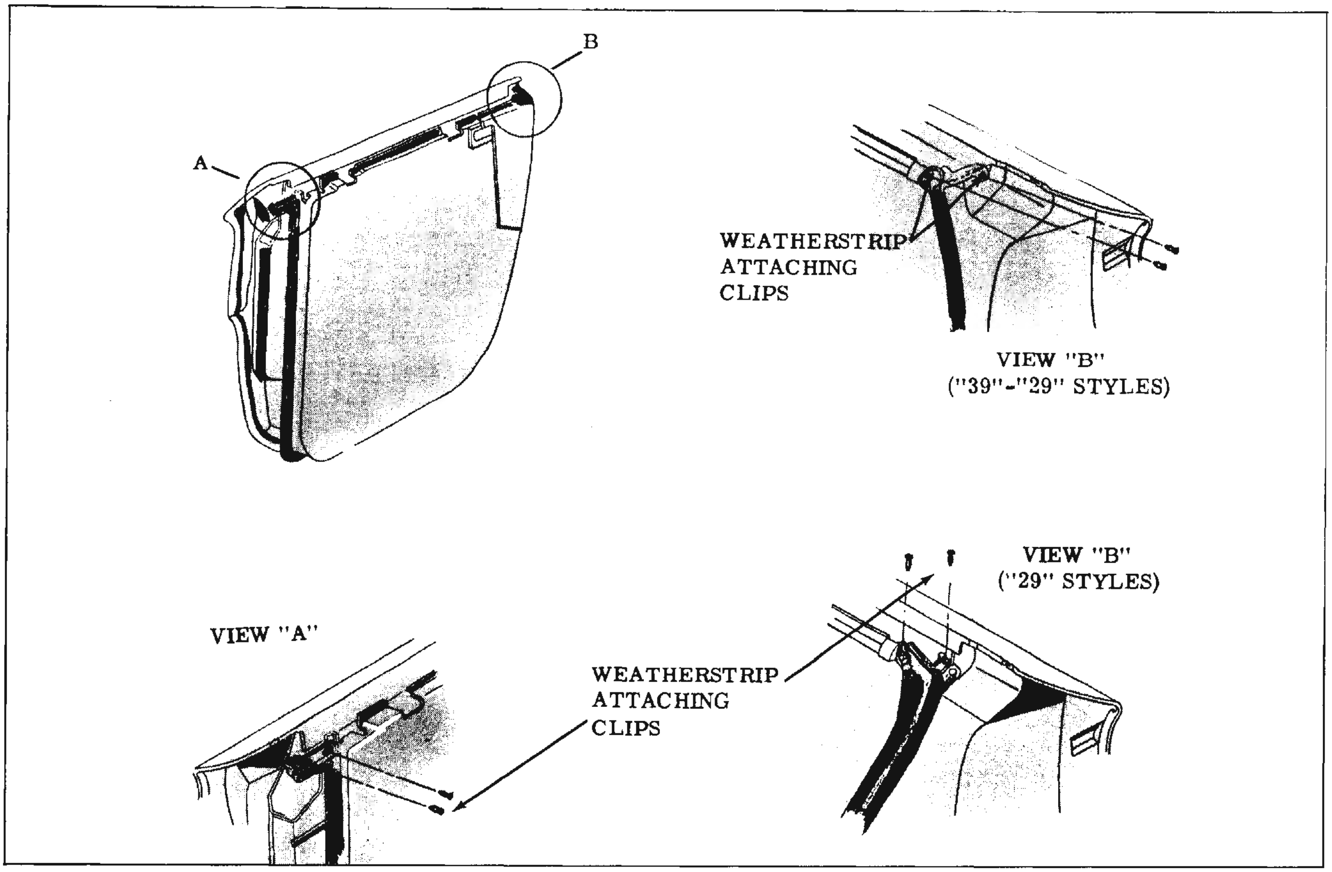


Fig. 16-36 Rear Door Weatherstrip Attaching Clips

2. Inspect all attaching clip sealing plugs. Any missing plugs should be replaced. A plug which is loose and will not remain engaged in the door panel piercing can be corrected by installing a 1/2" by 1" piece of cloth-backed waterproof tape over piercing and making an "X" pattern slit in tape to accommodate sealing plug. If, after this operation, the plug is still loose; install a second piece of tape over the existing repair. This procedure can also be used to repair any waterleaks that develop at sealing plug locations. A damaged sealing plug must be replaced. (Section "D-D", Fig. 16-38)

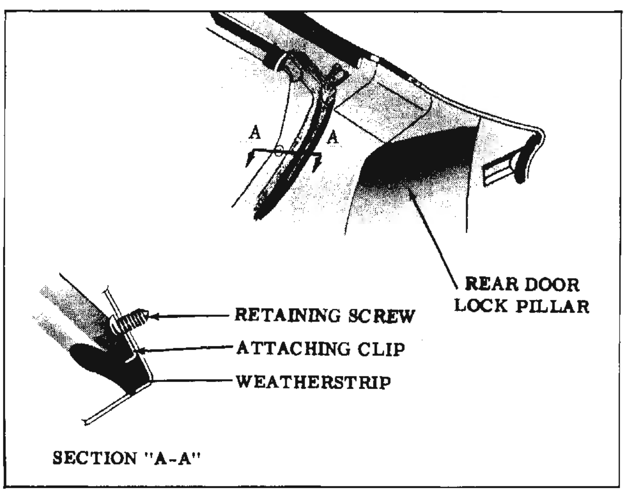


Fig. 16-37 Weatherstrip Attaching Screws (39 Style)

3. Clean off old cement from door to insure a clean cementing surface. Apply a bead of weatherstrip adhesive to lock pillar facing of door and at lower front corner of door. (View "B" and "C", Fig. 16-38).

   NOTE: When applying weatherstrip adhesive to lock pillar facing of door, begin application at belt line and continue down door for approximately seven to nine inches. If necessary, weatherstrip adhesive can also be applied to hinge pillar facing of door.

4. Beginning at either front or rear section of door, install snap fasteners. Install weatherstrip attaching clips into their respective sealing plugs by placing notched end of tool J-5757 into loop of wire clip and pushing clip into sealing plug. (Fig. 16-39)

   NOTE: Do not distort weatherstrip attaching clips or unsatisfactory weatherstrip retention will result.

All door weatherstrips are impregnated with a silicone lubricant and additional lubrication should not be required.

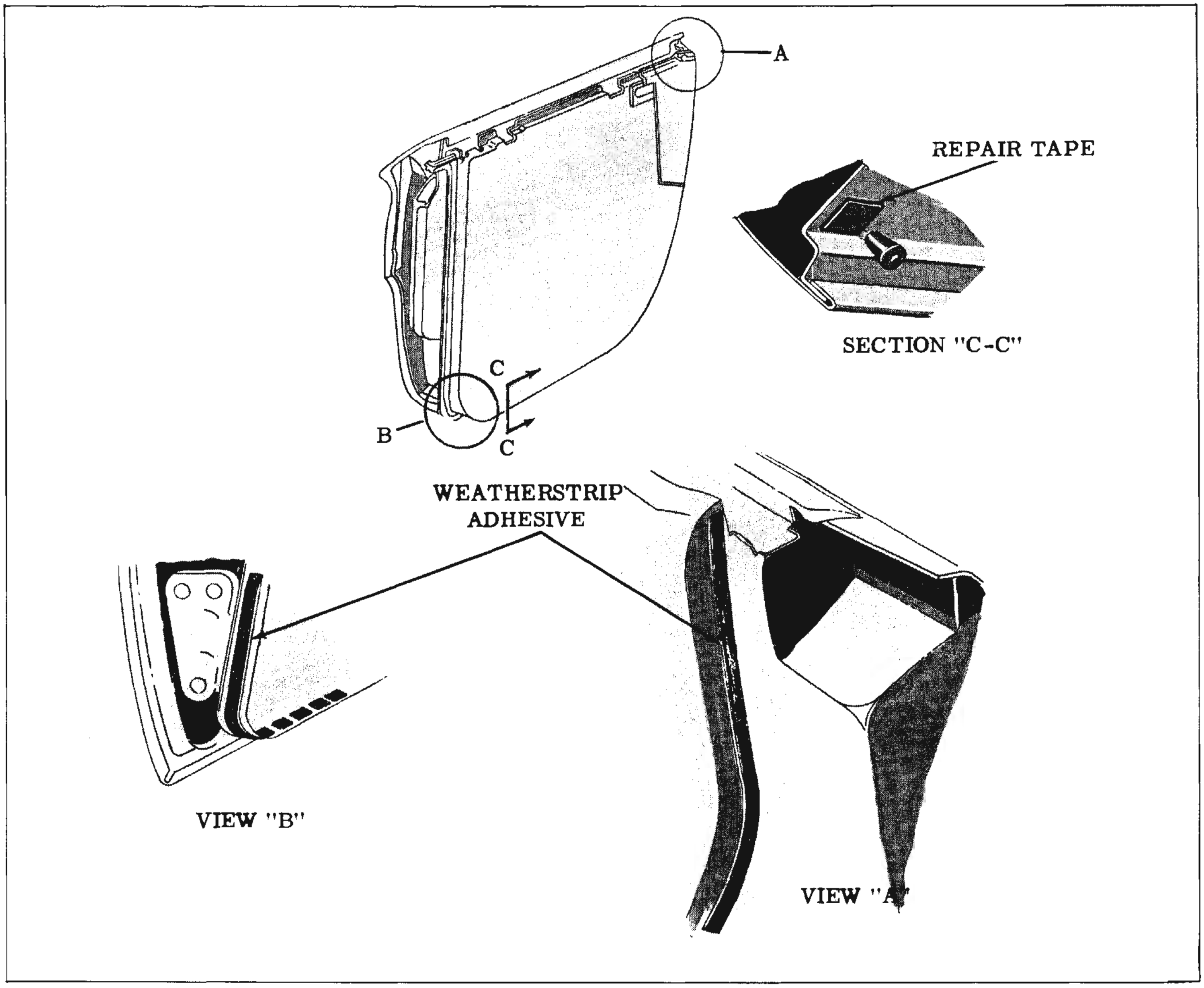


Fig. 16-38 Weatherstrip Adhesive Application (29 Style Shown-39 Style Typical)

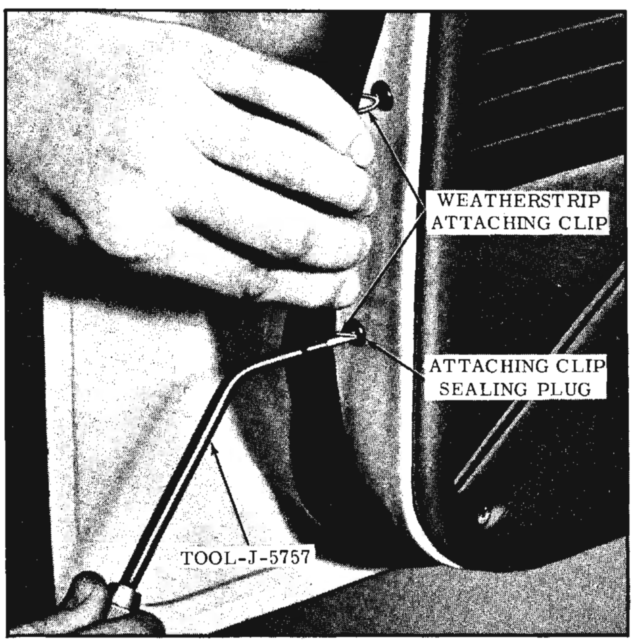


Fig. 16-39 Installing Weatherstrip Clip

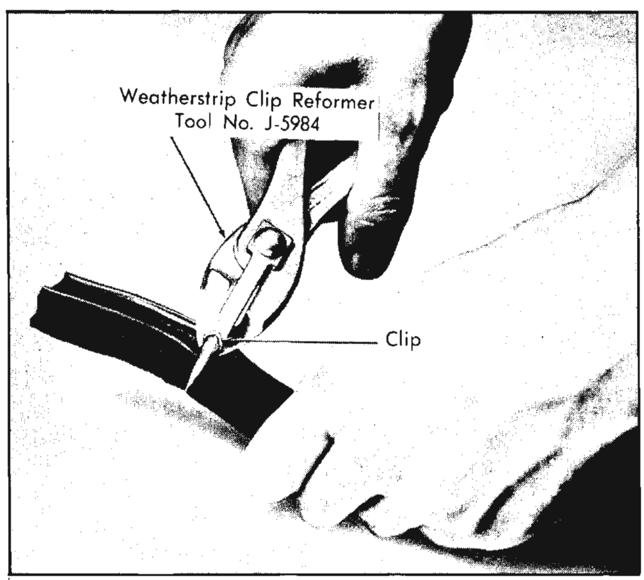


Fig. 16-40 Reforming Weatherstrip Clip

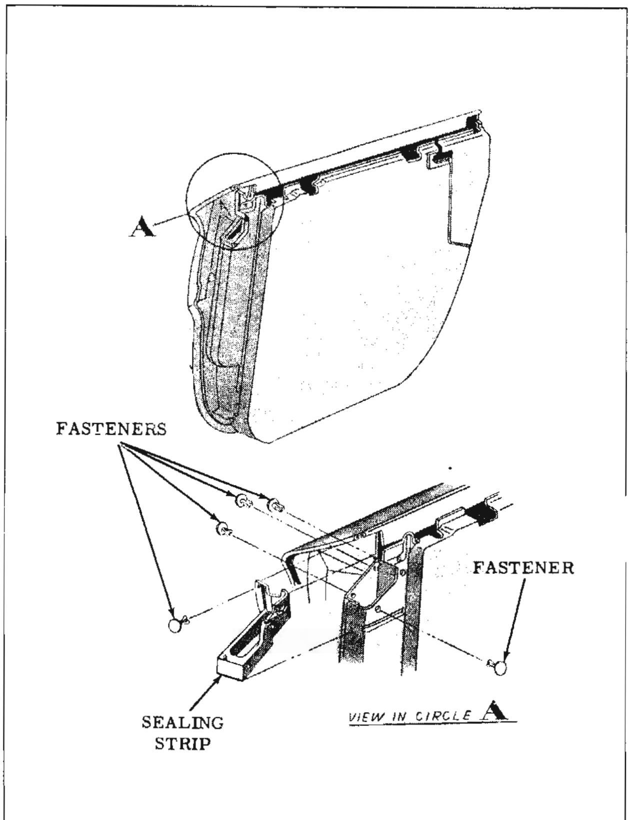


Fig. 16-41 Door Hinge Pillar Sealing (at Belt)

REAR DOOR HINGE PILLAR SEALING STRIP—AT BELT ("29" and "39" Styles)

Removal and Installation

1. Remove snap fasteners securing sealing strip to hinge pillar facing of rear door and remove strip. (Fig. 16-41)

2. To install, reverse removal procedure.

REAR DOOR WEATHERSTRIPS ("19", "35", "45" and "69" Styles)

The rear door weatherstrip is a one-piece design, cemented at belt line and retained by weatherstrip attaching clips for the remainder of the door. Around bottom of door, from belt line of hinge pillar to belt line of lock pillar, the attaching clips fit into sealing plugs.

Removal

1. Insert tip of tool J-5757 at clip locations and carefully snap clips from sealing plugs. (Fig. 16-39)

2. Some weatherstrips may be additionally secured by a two-prong clip, attached to lock and/or hinge pillar of door at belt line. This clip is attached by a single screw and must be removed prior to removal of weatherstrip. When clip is reinstalled, make sure both prongs are positioned over wire located in center of weatherstrip. Fig. 16-42 shows clips attached to a front door weatherstrip but is typical of rear doors. This clip can be satisfactorily used to retain almost any area of a rear door weatherstrip that proves troublesome. (Fig. 16-42)

3. Carefully break cement bond securing weatherstrip to door. If necessary, a putty knife can be used to help break cement bond. (Fig. 16-43)

4. Insert tool J-5757 at clip locations on door upper frame and carefully snap clips from piercings and remove weatherstrip from door.

Installation

1. Check all weatherstrip attaching clips for proper contour and reform, if necessary, using Clip Reforming Tool J-5984. (Fig. 16-40)

2. Inspect all attaching clip sealing plugs. Any missing or damaged plug must be replaced. A plug that is loose and will not remain engaged in the door panel piercing can be corrected by installing a 1/2" by 1" piece of cloth-backed waterproof tape over piercing and making an "X" pattern slit in tape to accommodate sealing plug. If plug is still loose, repeat this operation by installing a second piece of tape over existing repair.

3. Clean off old cement from door to insure a clean cementing surface. Apply a bead of weatherstrip adhesive to hinge and lock pillar facings of door. Begin adhesive application slightly above belt line and continue down door for approximately seven to nine inches. If necessary, weatherstrip adhesive can also be applied to lower corners of door. (Fig. 16-43)

4. Position rear door weatherstrip so that preformed section is at upper front corner of door header.

5. Install weatherstrip into door upper frame by inserting tool J-5757 into loop of wire clips and pushing clips into their respective piercings. (Fig. 16-39)

6. Press weatherstrip into place at cemented areas and, if applicable, reinstall weatherstrip two-prong attaching clip. Make sure prongs of clip are inserted over wire of weatherstrip. (Fig. 16-42)

7. Install weatherstrip into attaching clip sealing plugs by installing tool J-5757 into loop of wire clips and pushing clips into their respective plugs. (Fig. 16-39)

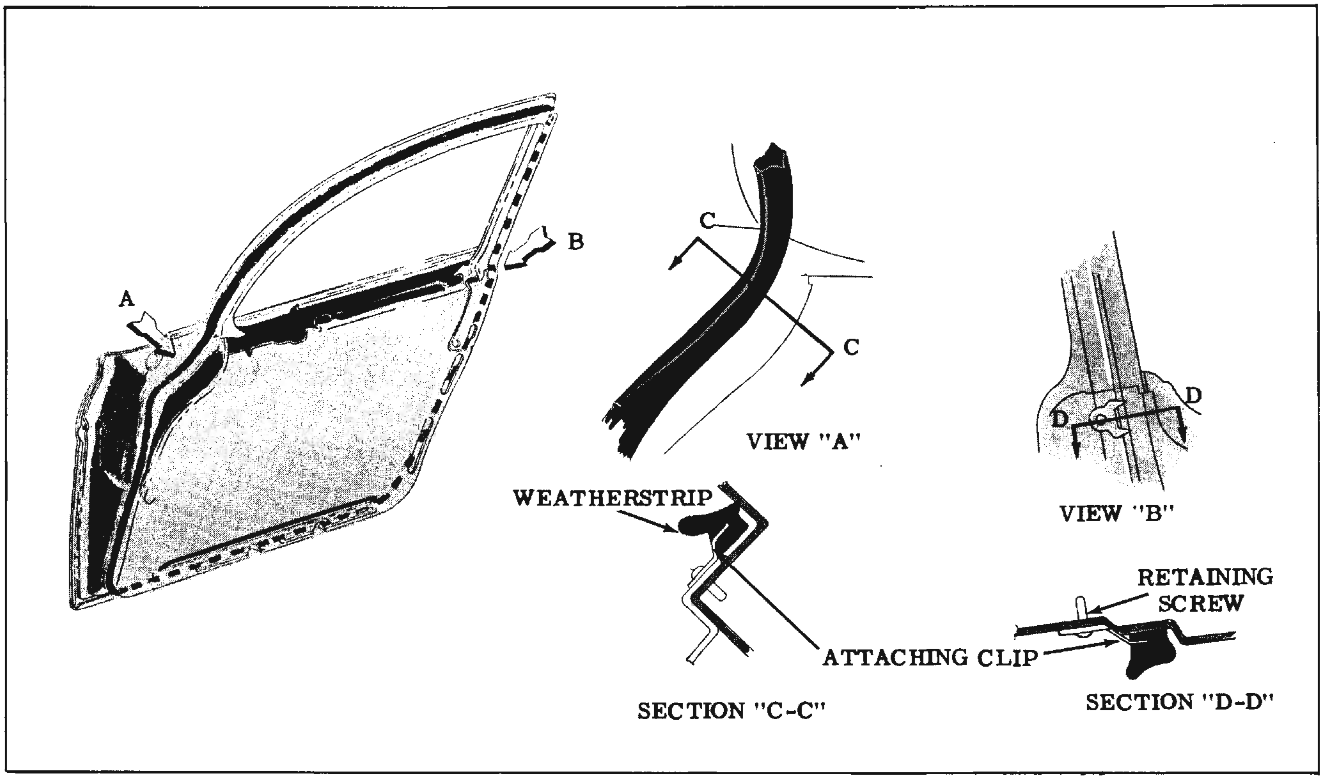


Fig. 16-42 Two Prong Weatherstrip Attaching Clip (Front Door Shown-Rear Typical)

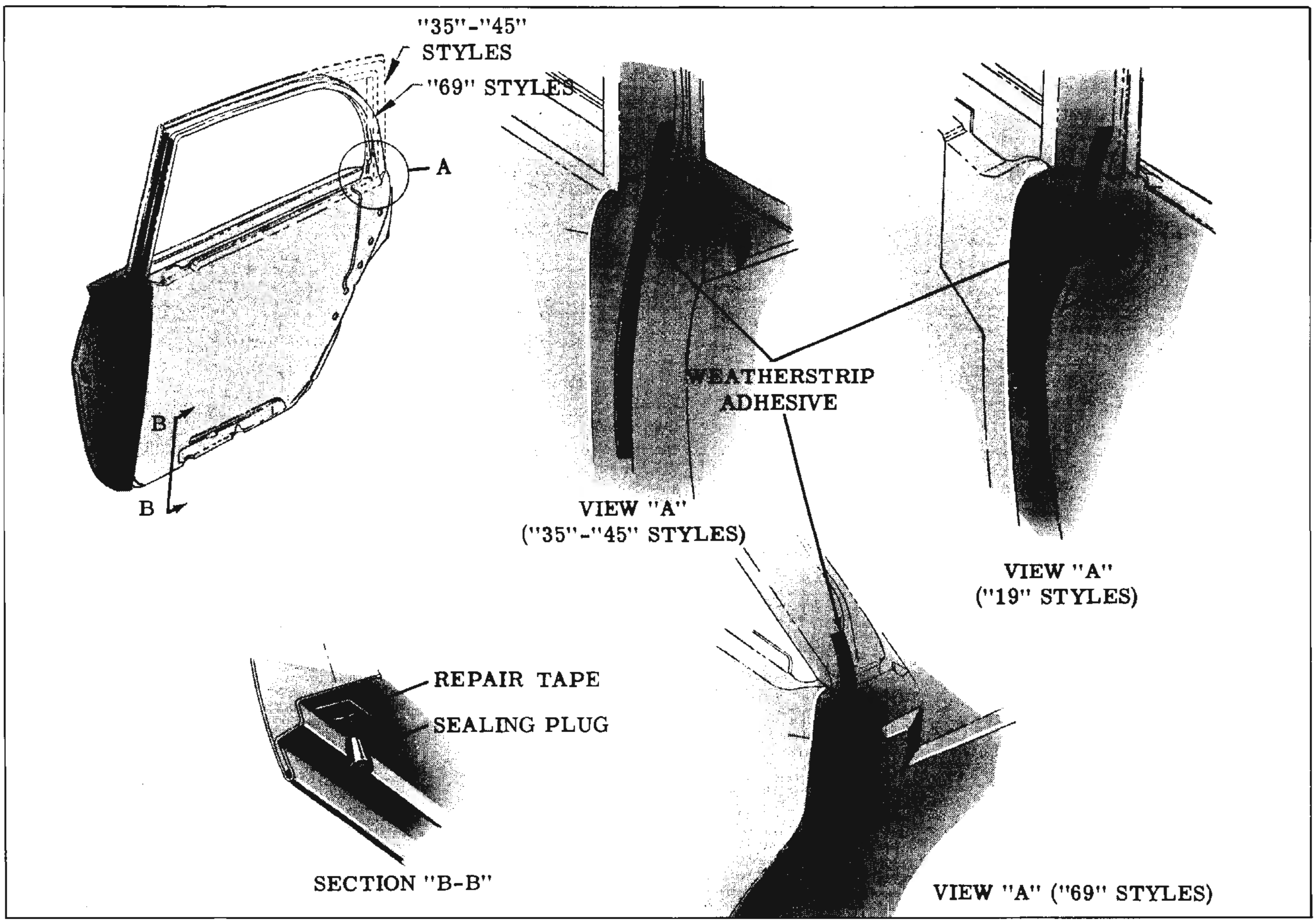
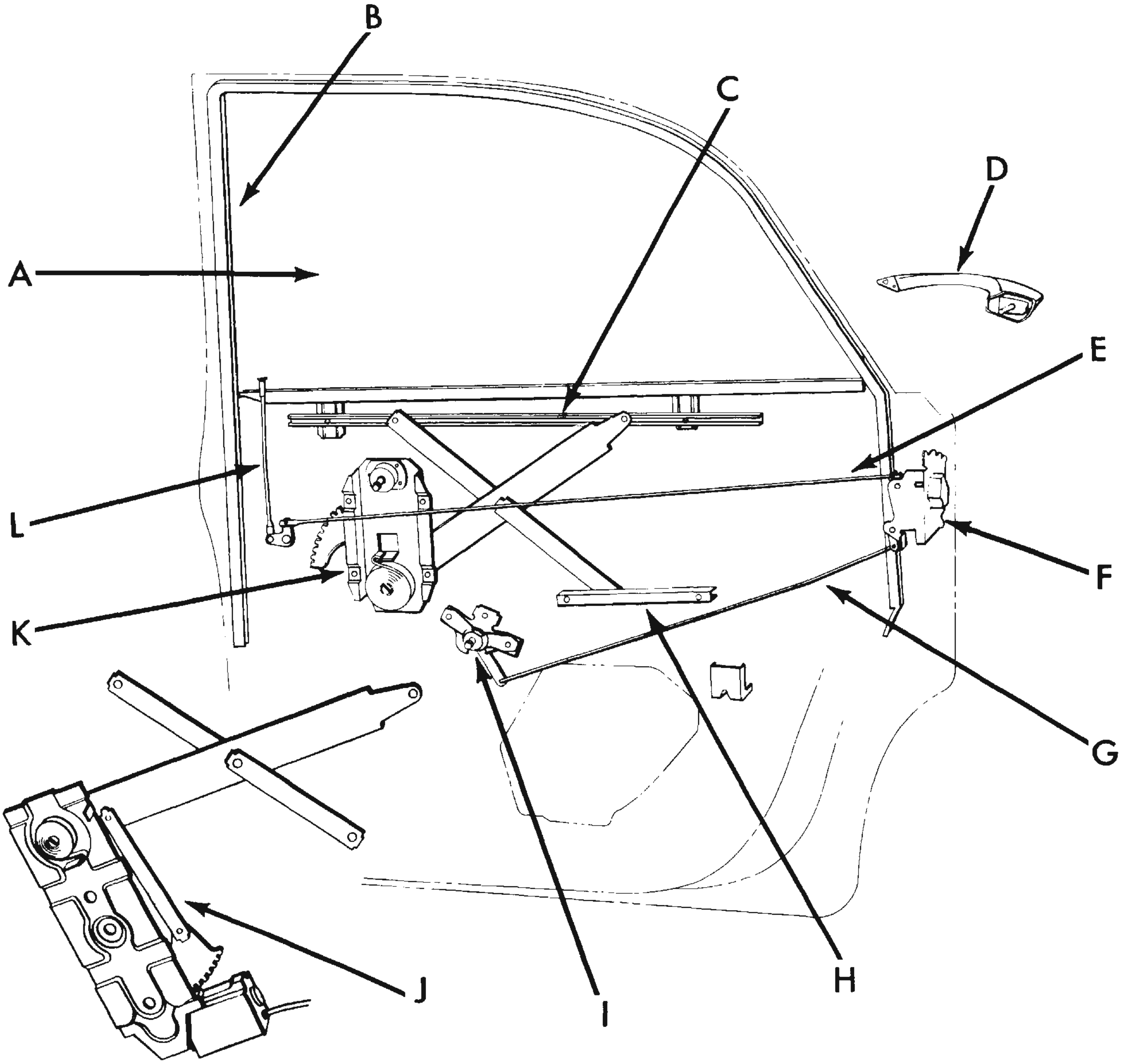
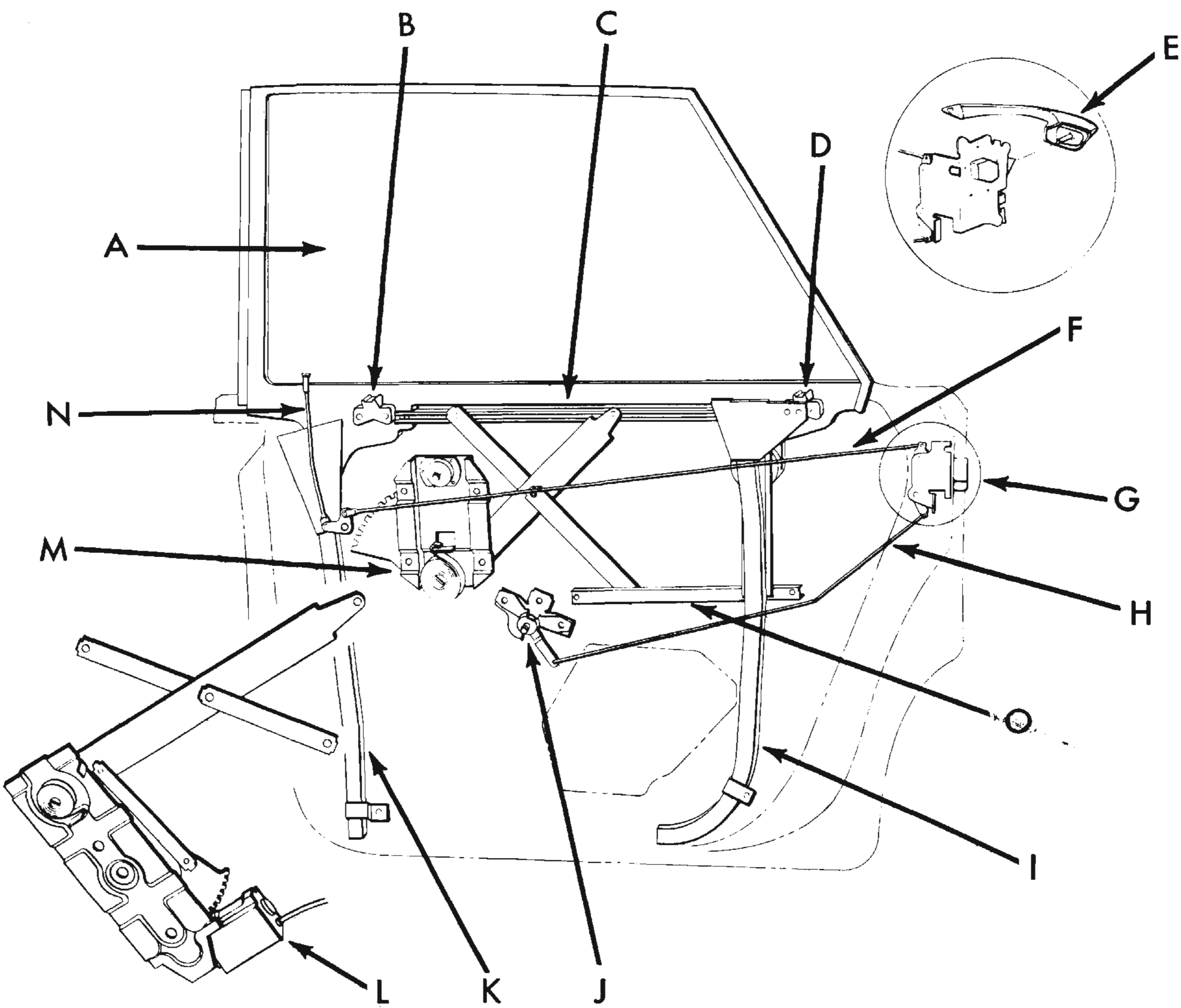


Fig. 16-43 Rear Door Weatherstrip Adhesive Application



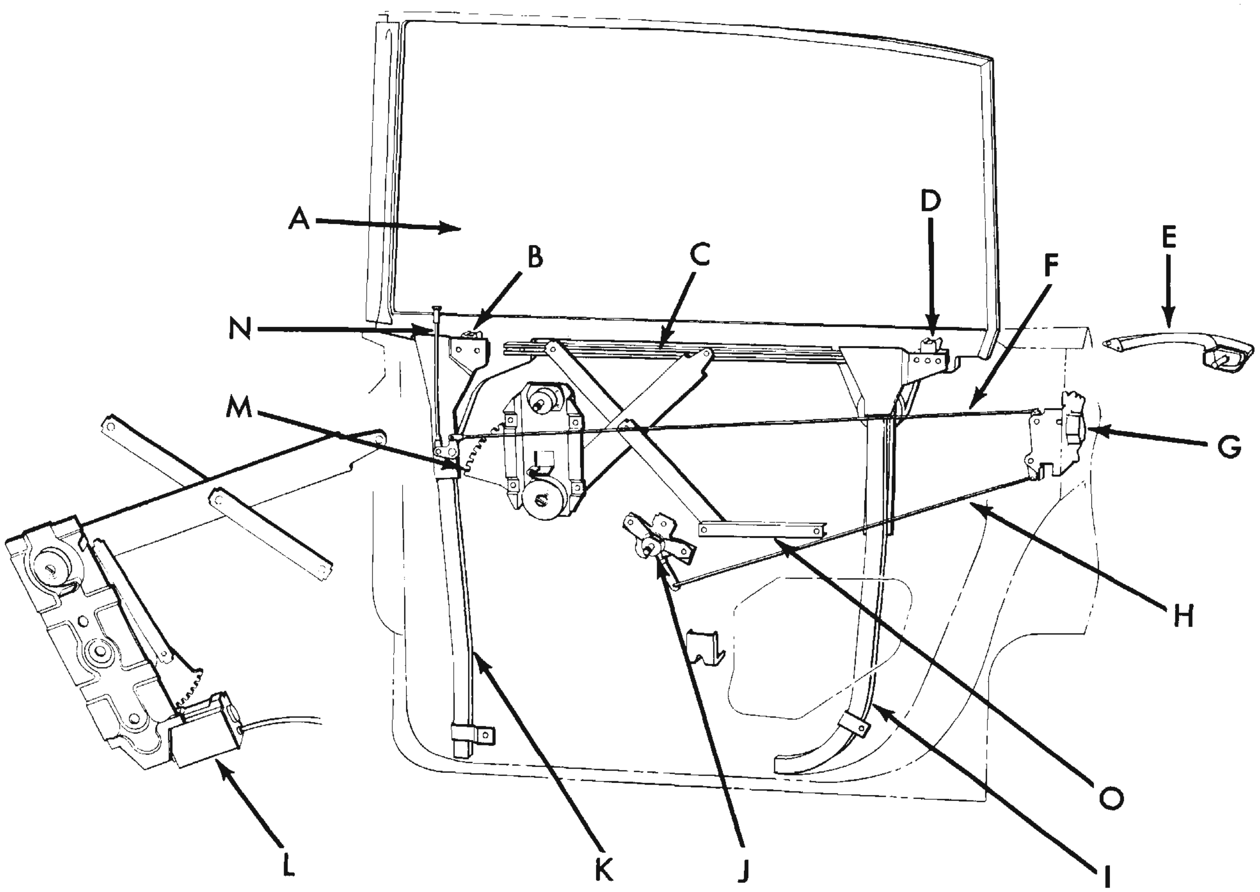
A. REAR DOOR WINDOW ASSEMBLY
B. REAR DOOR WINDOW GLASS RUN CHANNEL ASSEMBLY
C. REAR DOOR WINDOW LOWER SASH CHANNEL CAM
D. REAR DOOR OUTSIDE HANDLE ASSEMBLY
E. REAR DOOR INSIDE LOCKING TO LOCK ROD ASSEMBLY
F. REAR DOOR LOCK ASSEMBLY
G. REAR DOOR LOCK REMOTE CONTROL TO LOCK ROD ASSEMBLY
H. REAR DOOR INNER PANEL CAM ASSEMBLY
I. REAR DOOR LOCK REMOTE CONTROL ASSEMBLY
J. REAR DOOR WINDOW ELECTRIC REGULATOR AND MOTOR ASSEMBLY
K. REAR DOOR WINDOW REGULATOR ASSEMBLY
L. REAR DOOR INSIDE LOCKING ROD

Fig. 16-44 Typical of Closed Body Styles



A. REAR DOOR WINDOW ASSEMBLY
B. REAR DOOR WINDOW FRONT FEMALE WEDGE PLATE
C. REAR DOOR WINDOW LOWER SASH CHANNEL CAM
D. REAR DOOR WINDOW REAR FEMALE WEDGE PLATE
E. REAR DOOR OUTSIDE HANDLE ASSEMBLY
F. REAR DOOR LOCK TO LOCKING LEVER ROD
G. REAR DOOR LOCK ASSEMBLY
H. REAR DOOR LOCK REMOTE CONTROL TO LOCK ROD ASSEMBLY
I. REAR DOOR WINDOW REAR GUIDE CAM ASSEMBLY
J. REAR DOOR LOCK REMOTE CONTROL ASSEMBLY
K. REAR DOOR WINDOW GUIDE FRONT CAM ASSEMBLY
L. REAR DOOR WINDOW ELECTRIC REGULATOR AND MOTOR ASSEMBLY
M. REAR DOOR WINDOW REGULATOR ASSEMBLY - MANUAL
N. REAR DOOR INSIDE LOCKING ROD
O. REAR DOOR WINDOW INNER PANEL CAM ASSEMBLY

Fig. 16-45 Typical of Holiday Styles (4-Window)



A. REAR DOOR WINDOW ASSEMBLY
B. REAR DOOR WINDOW FRONT FEMALE WEDGE PLATE
C. REAR DOOR WINDOW LOWER SASH CHANNEL CAM
D. REAR DOOR WINDOW REAR FEMALE WEDGE PLATE
E. REAR DOOR OUTSIDE HANDLE ASSEMBLY
F. REAR DOOR LOCK TO LOCKING LEVER ROD
G. REAR DOOR LOCK ASSEMBLY
H. REAR DOOR LOCK REMOTE CONTROL TO LOCK ROD ASSEMBLY
I. REAR DOOR WINDOW REAR GUIDE CAM ASSEMBLY
J. REAR DOOR LOCK REMOTE CONTROL ASSEMBLY
K. REAR DOOR WINDOW GUIDE FRONT CAM ASSEMBLY
L. REAR DOOR WINDOW ELECTRIC REGULATOR AND MOTOR ASSEMBLY
M. REAR DOOR WINDOW REGULATOR ASSEMBLY - MANUAL
N. REAR DOOR INSIDE LOCKING ROD
O. REAR DOOR WINDOW INNER PANEL CAM ASSEMBLY

Fig. 16-46 Typical of 29 Styles (6-Window)

IMPORTANT: Do not distort weatherstrip attaching clips as unsatisfactory weatherstrip retention will result.

8. Clean off any excess weatherstrip adhesive.

NOTE: All door weatherstrips are impregnated with a silicone lubricant and additional lubrication should not be required.

REAR DOOR HARDWARE ("19", "35", "45" and "69" Styles)

Figure 16-44 is typical of sedan and station wagon style rear doors with the trim pad and inner panel water deflector removed.

Figure 16-45 is typical of a hard top sedan "39" style rear door with the trim assembly and inner panel water deflector removed.

Figure 16-46 is typical of a hard top sedan "29" style rear door with the trim assembly and inner panel water deflector removed.

Figure 16-47 is typical of "69" style rear doors. This illustration indicates a fully lowered door window in proper position for maximum glass stability.

Figure 16-48 is typical of "19" style rear doors. This illustration indicates a fully lowered door window in proper position for maximum glass stability.

REAR DOOR HINGES

The rear door hinges are attached to the center pillar with two butt-type hinges. The hinges are secured to the center pillar and door hinge pillar by screws and anchor plates. The lower hinge

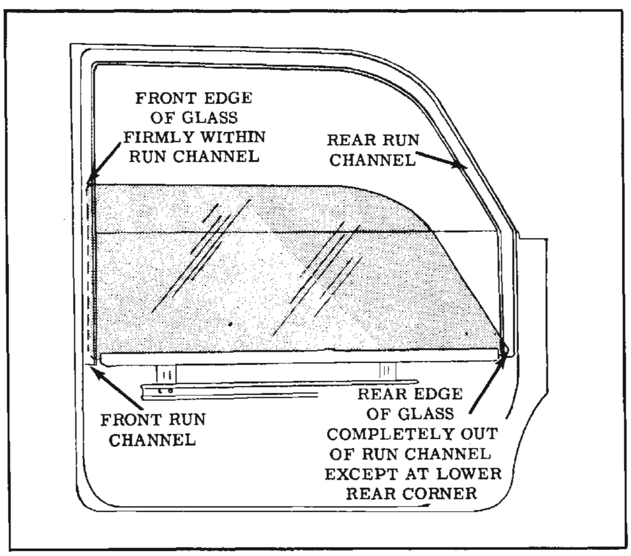


Fig. 16-47 Rear Door ("69" Style)

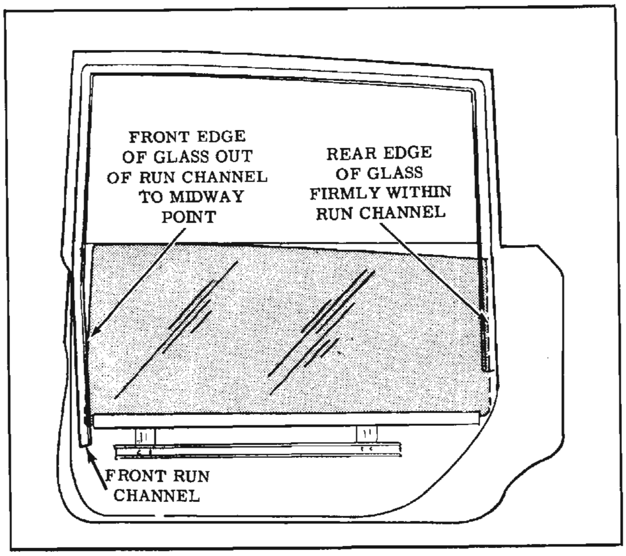


Fig. 16-48 Rear Door ("19" Styles)

incorporates an integral door check and hold-open.

Removal

The door and hinges can be removed as an assembly from the center pillar or the door can be removed from the hinge straps.

1. On "29" and "39" styles, lower door window.

2. Clean off excess sealer around each hinge strap and mark location on door hinge pillar or center pillar, depending on method of removal being used.

3. On bodies equipped with electrically powered window regulators:

   a. Remove door trim assembly and detach inner panel water deflector sufficiently to gain access to wire connector at motor.

   b. Detach wire harness from door inner panel and disconnect regulator motor from harness at connector.

   c. Remove electrical conduit from door and remove wire harness from between door panels through opening in door hinge pillar.

4. With door properly supported, remove three upper and lower hinge attaching screws at door hinge pillar or center pillar depending on method of removal. (Fig. 16-49 and 16-50)

NOTE: On "29" and "39" styles, the rear door lower hinge to center pillar middle attaching bolt is also the rear door jamb switch. Be sure to disconnect wire before removing door.

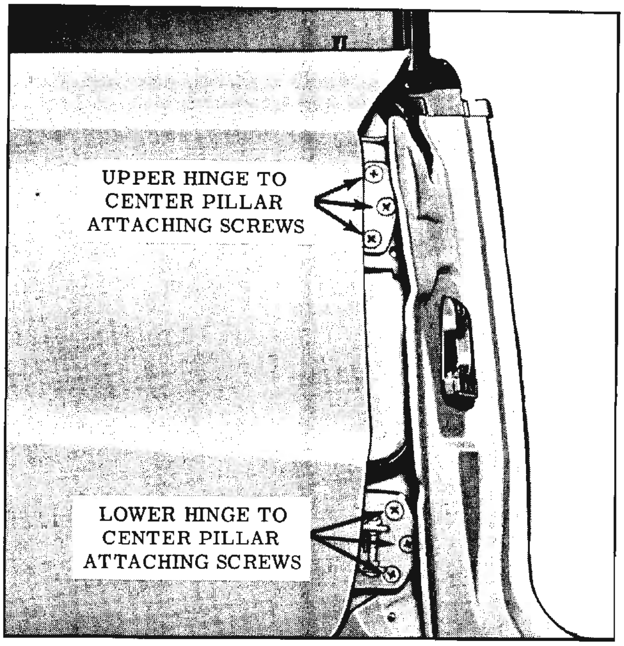


Fig. 16-49 Rear Door to Pillar Attachment

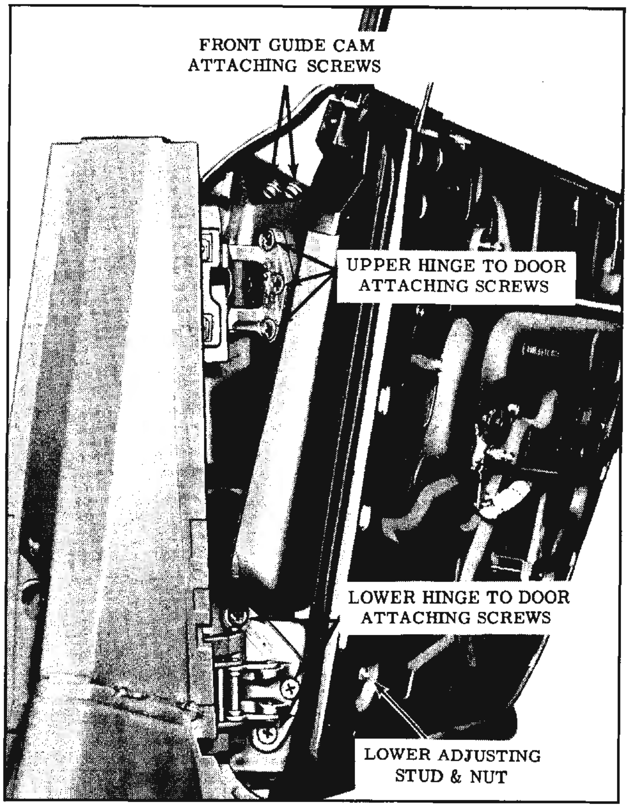


Fig. 16-50 Rear Door to Hinge Attachment

5. With aid of helper, remove door from body.

Installation

1. With a scraper and mineral spirits, clean off old sealing compound at hinge attaching areas. This operation should be performed carefully to avoid the possibility of soiling adjacent trim material.

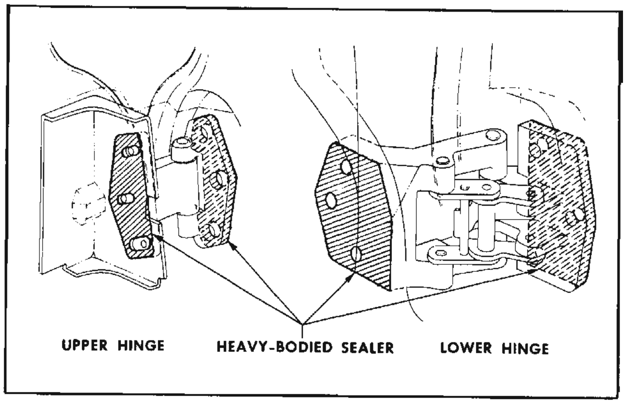


Fig. 16-51 Rear Door Hinge Anti-Squeak Sealing

2. Apply a coat of heavy-bodied sealer to attaching surfaces of hinge straps or corresponding surfaces of door or body. (Fig. 16-51)

3. With a helper, lift door into position. Install screws loosely, align strap within scribe marks on pillar and tighten bolts. Check door for proper alignment.

4. On doors equipped with power operated windows:

   a. Install wiring harness inside of door. Connect regulator motor and install wiring harness to inner panel.

   b. Install conduit to door hinge pillar. Check operation of electric window assembly.

5. Where required, seal door inner panel water deflector as specified in DOOR INNER PANEL WATER DEFLECTOR and reinstall all previously removed parts.

6. For lubrication information see LUBRICATION section.

Adjustments

In or out or up and down adjustments are provided at door hinge pillar. Fore and aft and a slight up and down adjustment are provided at center pillar. When checking the door for alignment, remove door lock striker from body pillar to allow door to hang free on its hinges.

NOTE: After performing any adjustments, the rear door window on "29" and "39" styles should be checked for proper alignment with the side roof rail weatherstrip. In addition, door lock extension to striker engagement should be examined and adjusted if necessary.

1. For in and out or up and down adjustment, loosen hinge to door pillar attaching screws, adjust door as required and tighten screws. (Fig. 16-50)

NOTE: When performing in and out or fore and aft adjustments, adjust one hinge at a time so that up and down adjustment is maintained.

2. To adjust door fore or aft, loosen hinge to center pillar attaching screws, adjust door fore or aft as required and tighten screws. (Fig. 16-49)

CAUTION: The rear door upper hinge on 69-19-35-45 styles is constructed of die cast aluminum which will break under strain of bending in an attempt to short-cut adjustments. Use only the recommended procedures for adjusting rear doors.

REAR DOOR LOCK ASSEMBLY

Locks are the rotary bolt type with the safety interlock feature. With the safety interlock feature, it is very important that the lock extension engages properly in the door lock striker notch and that, where necessary, striker emergency spacers of the proper thickness can be used to obtain proper engagement.

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. On "35", "45", "19" and "69" styles, through large access hole, remove screw securing lower end of glass run channel at door lock pillar and raise end of channel to expose lock assembly. (Fig. 16-52)

3. Through access hole, disengage spring clips and detach inside lock connecting rod and remote control connecting rod from lock assembly (see DOOR LOCK SPRING CLIPS).

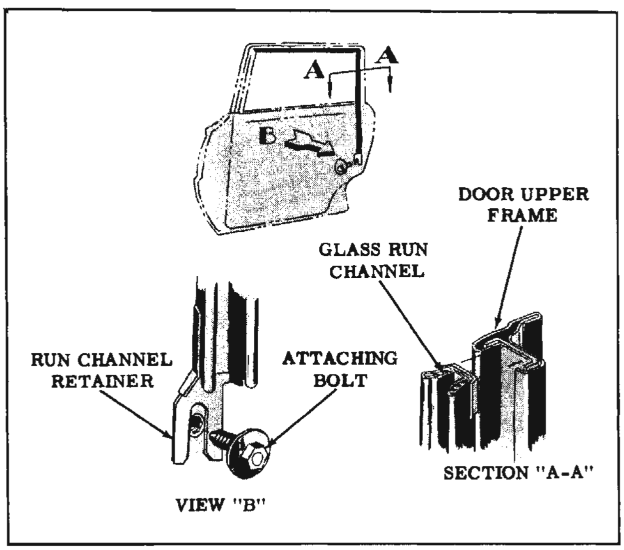


Fig. 16-52 Glass Run Channel (35, 45, 19 & 69 Styles)

4. At lock pillar facing, remove door lock attaching screws and remove lock assembly through access hole.

5. To install door lock, reverse removal procedure. Check all operations of door lock before installing door trim and inside hardware.

REAR DOOR LOCK STRIKERS

Removal and Installation

1. With a pencil, mark position of striker on body pillar.

2. Remove three door lock striker attaching screws and remove striker and adjusting plates from pillar.

3. To install, seal all striker plate attaching screw clearance holes with body caulking compound.

4. Apply a 1/8" bead of body caulking compound around entire back surface of striker plate; skips must not exist in caulking compound. Place striker and adjusting plates within marks on pillar and install striker plate attaching screws.

NOTE: Whenever a door has been removed and installed or realigned, the door should not be closed completely until a visual check is made to determine if lock extension will engage in striker notch. Where required, door lock striker service spacers should be installed so that door can be closed and an accurate check made to determine proper spacer requirements.

5. Clean off all excessive body caulking compound.

Adjustments

To adjust striker up or down or in or out, loosen striker plate attaching screws and shift striker and adjusting plates as required and tighten screws.

DIMENSIONAL SPECIFICATIONS FOR USE OF DOOR LOCK STRIKER SERVICE SPACERS

1. Door should be properly aligned before checking door spacer requirements.

2. To determine if door lock striker emergency spacers are required, apply modeling clay or body caulking compound in door lock striker notch where lock extension engages and close door to form a measurable impression in clay or caulking compound. (Fig. 16-53)

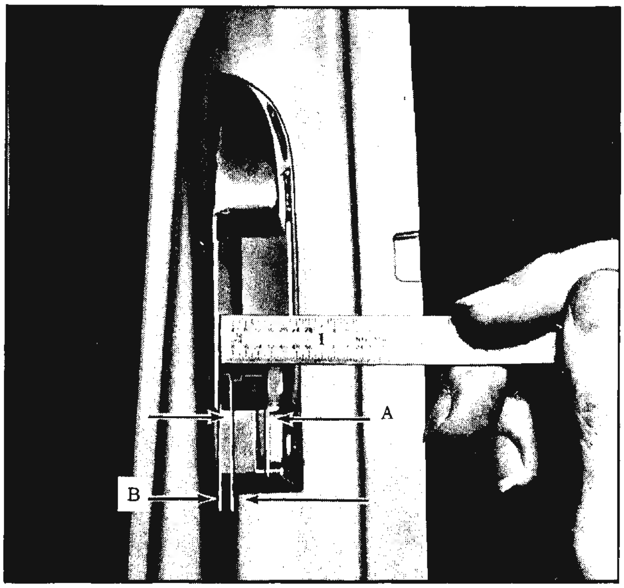


Fig. 16-53 Lock Striker Engagement Check

When dimension "A" from rear face of striker teeth to rear edge of depression clay is less than 11/32", install emergency spacers and proper length striker attaching screws as indicated.

NOTE: Dimension "B" in the illustration should never be less than 1/8".

Striker attaching screws should be zinc or cadmium-plated flat-head cross recess screws with a countersunk washer.

Dimension "A"	No. of Spacers Required	Spacer Thickness	Striker Attaching Screws
11/32" to 9/32"	1	1/16"	Original
9/32" to 7/32"	1	1/8"	Emergency (1/8" longer)
7/32" to 5/32"	1-(1/16" Spacer) 1-(1/8" Spacer)	3/16"	Emergency (1/8" longer)
5/32" to 3/32"	2-(1/8" Spacer)	1/4"	Emergency (1/4" longer)

REAR DOOR INNER PANEL CAM

The inner panel cam is attached to the door inner panel by two 7/16" attaching bolts and is designed as a guide for the door window regulator balance arm.

Removal and Installation

1. Raise door window, remove door trim pad and detach inner panel water deflector sufficiently to expose inner panel cam attaching bolts. (Fig. 16-54)

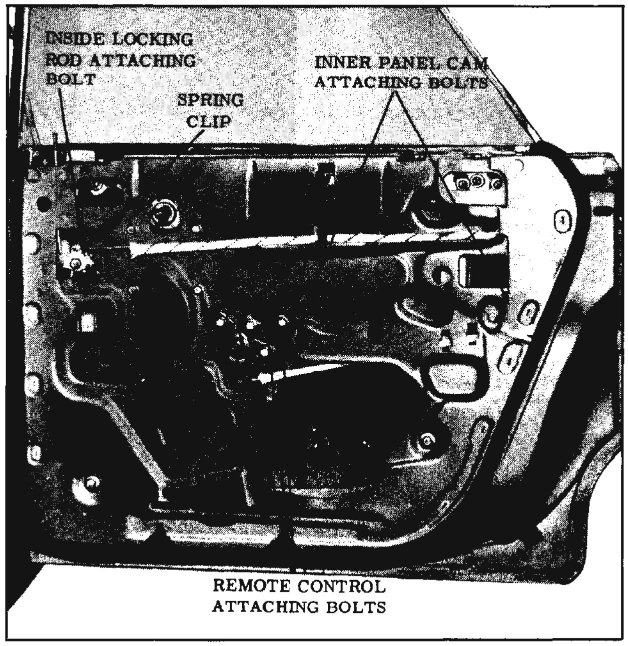


Fig. 16-54 Rear Door Hardware

2. Remove inner panel cam attaching bolts and disengage cam from window regulator balance arm roller and remove cam from door.
3. To install, reverse removal procedure. Prior to installation of inner panel cam, lubricate entire length of cam with 630AAW Lubriplate or equivalent.

   NOTE: The forward end of the inner panel cam is adjustable up or down. This adjustment can be used to help correct a rotated or cocked door window.

REAR DOOR LOCK TO LOCKING LEVER ROD

Removal and Installation

1. Raise door window, remove door trim pad and detach inner panel water deflector sufficiently to expose locking rod assembly.
2. Remove inside locking rod knob from rod.
3. On 19-69-35-45 styles, remove screw securing lower end of glass run channel at door hinge pillar to gain access to spring clip securing rod to lock. (Fig. 16-52)
4. Disengage spring clip securing inside locking rod assembly to door lock and disengage rod from lock.
5. Disengage rod from spring clip on door inner panel. Remove inside locking rod attaching bolt and remove assembly from door. (Fig. 16-54)
6. To install, reverse removal procedure. Check

operation of inside locking rod assembly before installing water deflector and door trim pad.

REAR DOOR REMOTE CONTROL ASSEMBLY AND CONNECTING ROD

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector sufficiently to gain access to remote control attaching bolts.
2. Remove remote control attaching bolts and remove remote control from connecting rod. (Fig. 16-54)
3. On 19-69-35-45 styles, remove glass run channel lower attaching screw to gain access to spring clip securing rod to lock. (Fig. 16-52)
4. Disengage remote control connecting rod from lock and remove rod from door.
5. To install remote control and connecting rod, reverse removal procedure. Position remote control rearward sufficiently to take up slack in linkage so that all clearances are taken out of linkage in a rearward position. Check all operations of door lock before installing door inner panel water deflector and trim pad.

REAR DOOR WINDOW LOWER SASH CHANNEL CAM

Removal and Installation

1. Remove door trim pad and detach inner panel water deflector.
2. Lower door window sufficiently to gain access to sash channel cam two attaching screws (through access holes in door inner panel) and remove screws. (Fig. 16-55)
3. While supporting window by hand, carefully disengage cam from window sash channel and rollers on window regulator arms and remove cam from door.

   CAUTION: After removal of lower sash channel cam, carefully lower door window to bottom of door to prevent damage to glass.
4. To install, reverse removal procedure. Prior to installation, lubricate entire length of window lower sash channel cam with 630AAW Lubriplate or its equivalent. Check operation of window prior to installing inner panel water deflector and door trim pad.

REAR DOOR WINDOW REGULATOR ASSEMBLY-MANUAL AND ELECTRIC

Removal and Installation

1. Lower door window. Remove door trim assembly and detach inner panel water deflector.
2. Remove door window lower sash channel cam. Then carefully raise window and prop in a raised position.
3. On styles equipped with electric window regulators, disconnect wiring harness feed wires from regulator motor at connector.
4. On styles equipped with electric window regulators, loosen rear guide cam upper attaching screw and bolt and remove lower adjusting

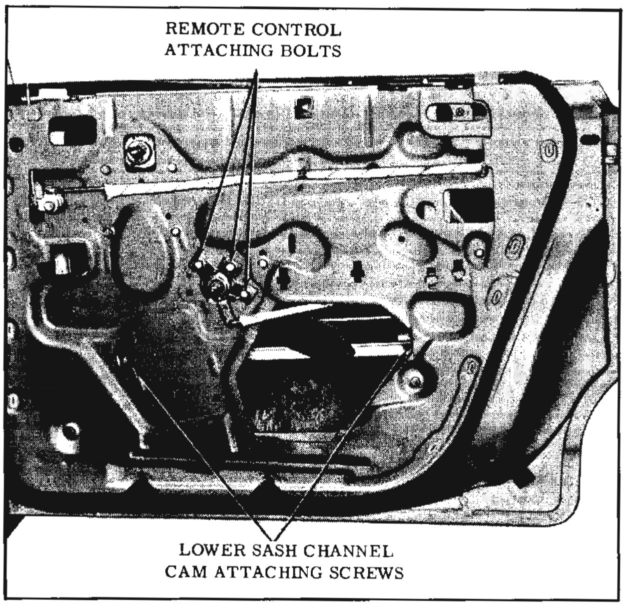


Fig. 16-55 Lower Sash Channel Cam Screws

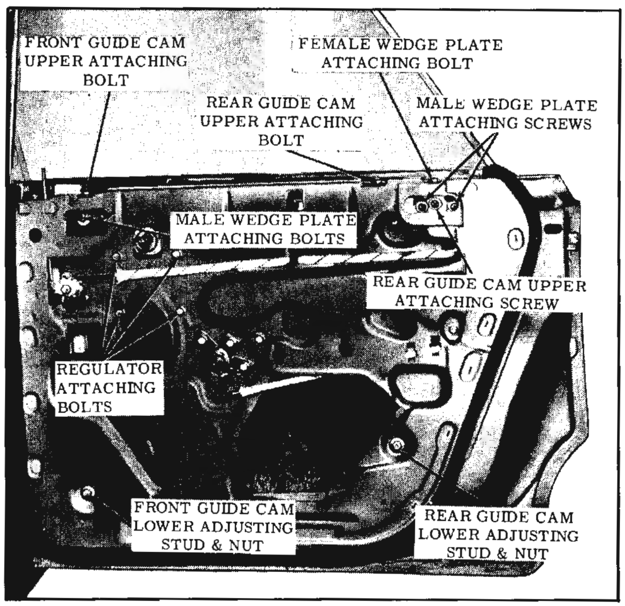


Fig. 16-56 Rear Door Hardware

stud and nut. This is necessary to move lower section of rear guide cam rearward far enough to permit removal of electric window regulator and motor assembly. Figure 16-56 shows the rear guide cam attachments and is typical of rear guide cams equipped with power windows.

CAUTION: Do not operate regulator motor after window assembly is disengaged from regulator. Operation of motor with load removed may damage unit.

4. Remove regulator attaching bolts (four), disengage balance arm from inner panel cam and remove regulator assembly through large access hole. (Fig. 16-56)

5. To install, reverse removal procedure. Check operation of window before installing inner panel water deflector and rear door trim pad.

REAR DOOR WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY

The electric motor assembly is a 12-volt reversible motor with a built-in type circuit breaker and a self-locking gear drive. The motor is attached to the regulator assembly with bolts.

Removal and Installation

1. Remove electric window regulator assembly from door and/or rear quarter and clamp securely in vise. (Fig. 16-57)

CAUTION: BE SURE TO PERFORM STEPS 2 AND 3 BEFORE ATTEMPTING TO REMOVE MOTOR FROM REGULATOR. The regulator lift arm, which is under tension from the counterbalance spring, can cause serious injury if the motor is removed without locking the sector in position.

2. Drill a 1/4" hole through sector and back plate. (View "A", Fig. 16-57)

NOTE: Locate hole a sufficient distance from edge of sector to insure proper retention of the sector.

3. Insert a 3/16" bolt through hole in back plate and sector and install nut to bolt (do not tighten nut).

4. Remove motor attaching bolts and remove motor assembly from regulator. (Fig. 16-57)

NOTE: Clean off steel chips from regulator sector and motor pinion gear after drilling operation.

5. To install, reverse removal procedure. If difficulty is encountered when trying to line up motor assembly attaching holes, the regulator lift arm may be moved up or down manually so that motor pinion gear will mesh with teeth on regulator sector, and regulator attaching holes will line up.

NOTE: Be sure to remove temporary nut and bolt from regulator before installing.

REAR DOOR WINDOW REAR GLASS RUN CHANNEL ("19" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.

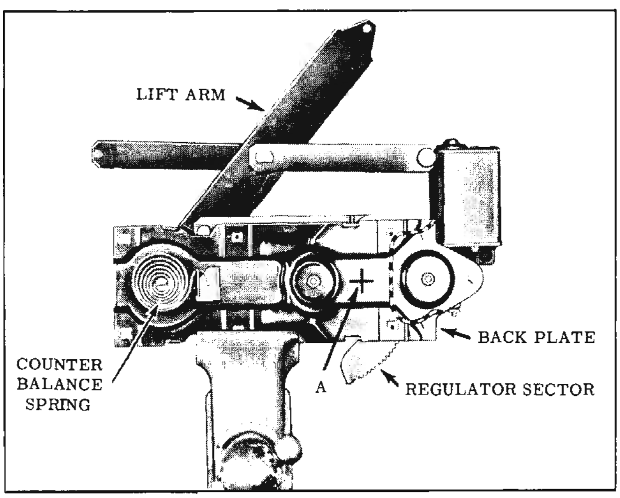


Fig. 16-57 Rear Door Window Regulator

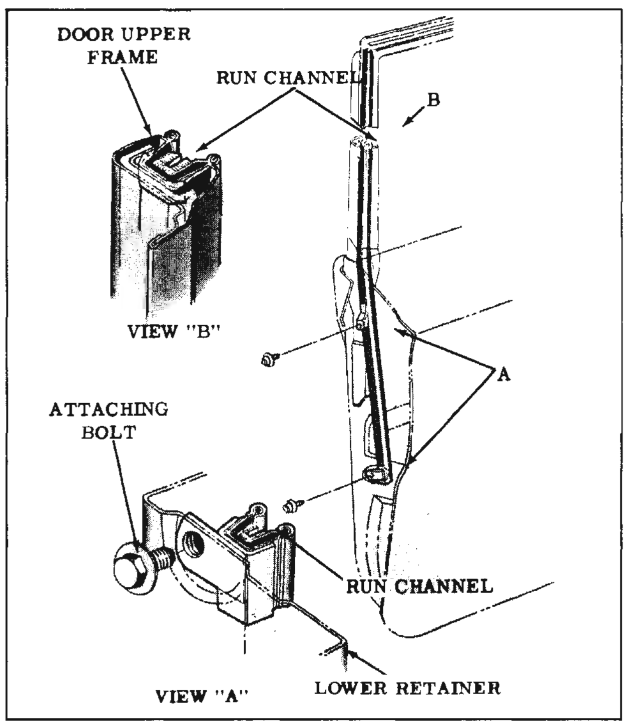


Fig. 16-58 Front Run Channel ("19" Style)

2. Carefully lower window assembly to bottom of door.

3. Remove lower attaching bolts (two) from hinge pillar facing of door inner panel. (Fig. 16-58)

4. Carefully disengage glass run channel attaching clips along front of door window frame. Pull glass run channel inboard and upward and remove channel from between inner and outer panel.

   CAUTION: After glass run channel has been removed, front edge of door glass is left exposed and unprotected. Care should be exercised so that glass does not strike window frame at any point as glass may be damaged.

5. To install, reverse removal procedure. Check operation of rear door window and, where required, adjust glass run channel for proper operation of window assembly.

REAR DOOR WINDOW ASSEMBLY ("19", "35", "45" and "69" Styles)

Removal and Installation

1. Lower door window. Remove door trim assembly and detach inner panel water deflector.

2. Remove rear door window front glass run channel on "19" styles.

3. Remove lower sash channel cam attaching screws and disengage cam from sash channel. (Fig. 16-59)

   NOTE: On styles equipped with electric window regulators, disconnect wiring harness electrical feed plug from regulator motor at connector. DO NOT operate regulator motor after window assembly is disengaged from regulator. Operation of motor with load removed may damage unit.

4. On "35", "45" and "69" styles, rotate rear edge of window assembly downward and remove glass from door.

5. On "19" styles, rotate rear edge of window assembly upward and remove glass from door.

6. To install, reverse removal procedure. Prior to installation of window lower sash channel cam, lubricate entire length of cam with 630 AAW Lubriplate or equivalent. Check operation of window assembly and, where required, adjust window as described under REAR DOOR WINDOW GLASS RUN CHANNEL ASSEMBLIES AND REAR DOOR INNER PANEL CAM.

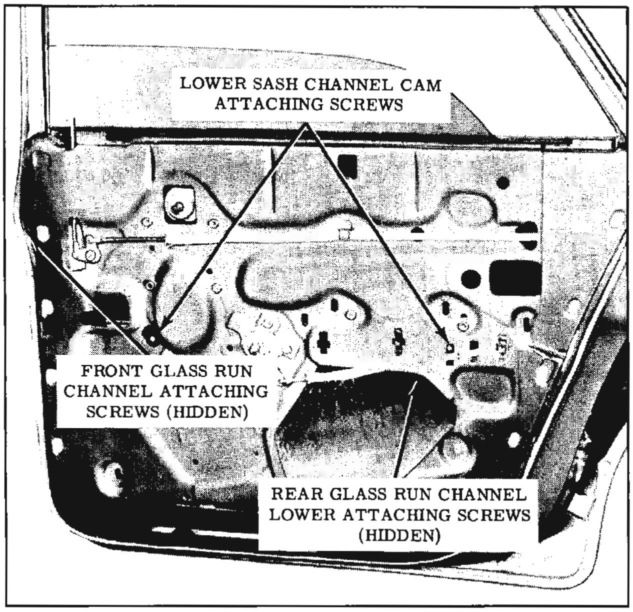


Fig. 16-59 Rear Door ("19", "35", "45", and "69" Style)

REAR DOOR WINDOW REAR GLASS RUN CHANNEL ("19" Styles)

Removal and Installation

1. Raise door window, remove door trim assembly and detach inner panel water deflector sufficiently to gain access to rear glass run channel lower attaching nut. Remove nut and disengage lower end of run channel. (Fig. 16-60)

2. Remove front run channel and rear door window.

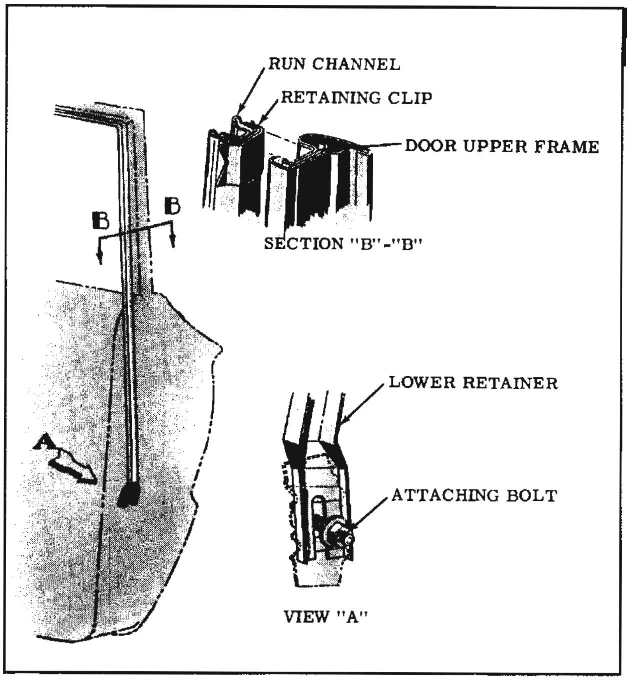


Fig. 16-60 Rear Glass Run Channel ("19" Style)

3. Carefully disengage glass run channel attaching clips along top and lock pillar portion of window frame. Then pull rear door glass run channel inboard and upward and remove channel from between inner and outer panels.

4. To install, reverse removal procedure. Check operation of rear door window and, where required, adjust glass run channel for proper window operation.

REAR DOOR WINDOW GLASS RUN CHANNEL ADJUSTMENTS ("19", "35", "45" and "69" Styles)

To adjust front or rear glass run channel in or out or up or down, loosen channel attaching screw(s), adjust channel as required and tighten screws. After any adjustments, check window for proper operation.

NOTE: Adjustment of both channels must be coordinated to provide proper operation of the rear door window assembly.

REAR DOOR WINDOW GUIDE FRONT CAM ASSEMBLY ("29" and "39" Styles)

The window guide front cam assembly incorporates an attaching support bracket at the upper edge of the guide cam which is attached to the door hinge pillar facing by two bolts. The front cam can be removed without removing this attaching bracket.

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.
2. Through inner panel access hole, remove front guide cam upper attaching screw(s) and front guide cam lower adjusting stud and nut. (Fig. 16-56)
3. Carefully disengage guide cam from window lower sash channel roller and remove guide cam through access hole.
4. To install, reverse removal procedure. Prior to installation, lubricate entire length of guide cam with 630AAW Lubriplate or equivalent. Reseal front guide cam lower adjusting stud and nut with body caulking compound.
5. Check operation of window assembly and, where required, adjust window as described under REAR DOOR WINDOW ADJUSTMENTS.

REAR DOOR WINDOW GUIDE FRONT CAM SUPPORT ("39" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.
2. Raise door window. Through inner panel access hole remove front guide cam upper attaching bolt. (Fig. 16-56)
3. At door hinge pillar facing, remove two screws securing guide cam support and remove support through access hole.
4. To install, reverse removal procedure. Check operation of window assembly and, where required, adjust window as described under REAR DOOR WINDOW ADJUSTMENTS.

REAR DOOR WINDOW GUIDE REAR CAM ASSEMBLY ("29" and "39" Styles)

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.
2. Remove rear cam upper attaching screws and lower adjusting stud and nut. (Fig. 16-56)
3. Carefully disengage cam from roller on window guide assembly and remove rear cam through large access hole.
4. To install, reverse removal procedure. Prior to installation, lubricate entire length of cam with 630AAW Lubriplate or equivalent. If exposed, seal cam lower adjusting stud and nut with body caulking compound.
5. Check operation of window assembly and, where required, adjust window as described under REAR DOOR WINDOW ADJUSTMENTS.

REAR DOOR WINDOW ASSEMBLY—MANUAL AND ELECTRIC ("29" and "39" Styles)

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.
2. Through access holes in door inner panel, remove screws securing rear door window front and rear male wedge plates to window lower sash channel and remove wedge plates. (Fig. 16-56)
3. Lower door window and remove lower sash channel cam attaching screws. (Fig. 16-55)

   NOTE: On styles equipped with electric window regulators, disconnect wiring harness electrical feed plug from regulator motor at connector.

   CAUTION: DO NOT OPERATE REGULATOR MOTOR after window assembly is disengaged from regulator. Operation of motor with load removed may damage unit.

4. Carefully raise door window and remove from door.

5. To install, reverse removal procedure. Check window for proper alignment and, where necessary, align window as described under REAR DOOR WINDOW ADJUSTMENTS. Prior to installation of window lower sash channel cam, lubricate entire length of cam with 630 AAW Lubriplate or equivalent. Also lubricate lower sash channel cam rollers and pivot area of rear door window rear guide.

Adjustments

IMPORTANT: The rear door assembly should be properly aligned in the body opening before adjusting the rear door window.

Unless otherwise specified, the following window adjustments are for both manually and electrically-operated windows.

NOTE: To perform the following rear door window adjustments, remove door trim assembly and detach inner panel water deflector.

1. Up and down adjustment:

   a. Through inner panel access holes, loosen screws securing front and rear male wedge plates to window lower sash channel.

   b. Reposition window assembly as required, adjust front and rear male wedge plates up or down as required; then tighten wedge plate attaching screws. Check operation of window assembly.

      IMPORTANT: The front or rear of window assembly may be adjusted up or down by adjusting either front or rear male wedge plate up or down as required. In cases of major adjustment, however, both wedge plates should be adjusted.

2. Fore or aft adjustment:

   a. Loosen lower adjusting stud nut of both front and rear guide cams. (Fig. 16-56)

   b. Loosen screw(s) securing upper end of front and rear guide cams, position window fore or aft as required, then tighten screw(s) and lower stud nut on each cam.

   c. Check window for proper operation and, if necessary, readjust rear door window front and/or rear male wedge plates fore or aft to insure proper contact with female wedge plates on door inner panel.

      NOTE: On styles where lower adjusting stud and nut are not covered by a water deflector, seal stud and nut with body caulking compound.

3. In or out adjustment:

   The in and out adjustment of the rear door window assembly can be obtained by adjusting the front and rear guide cams in or out as required. It is desirable, however, to adjust only one guide cam at a time in order to maintain the fore and aft adjustment of the window assembly.

   a. With window in full up position, loosen front guide cam adjusting stud nut. (Fig. 16-56)

   b. Loosen front female wedge plate attaching screw.

   c. Loosen two front guide cam support attaching screws on door hinge pillar facing.

   d. Position front of window assembly in or out as required and adjust front female wedge plate accordingly; then tighten wedge plate attaching screw.

   e. Adjust front guide cam lower adjusting stud in or out as required and tighten nut. Tighten front guide cam support attaching screws on door hinge pillar facing.

   f. Reseal lower adjusting stud and nut with body caulking compound.

   g. Position window assembly in or out as required; then tighten screws.

   h. Adjust lower adjusting stud in or out as required and tighten stud nut. Check window for proper operation.

   NOTE: On styles where lower adjusting stud and nut are not covered by a water deflector, seal stud and nut with body caulking compound.

SIDE ROOF RAIL WEATHERSTRIP (3247 and 3547 Styles)

The side roof rail weatherstrip assembly is a one piece type which is secured to the front body hinge pillar with a snap fastener. The remainder of the weatherstrip is secured to the side roof rail by weatherstrip adhesive and a weatherstrip retainer and reveal molding assembly.

Removal

1. Remove snap fastener securing weatherstrip at front body hinge pillar.

2. Carefully disengage inner lip of side roof rail

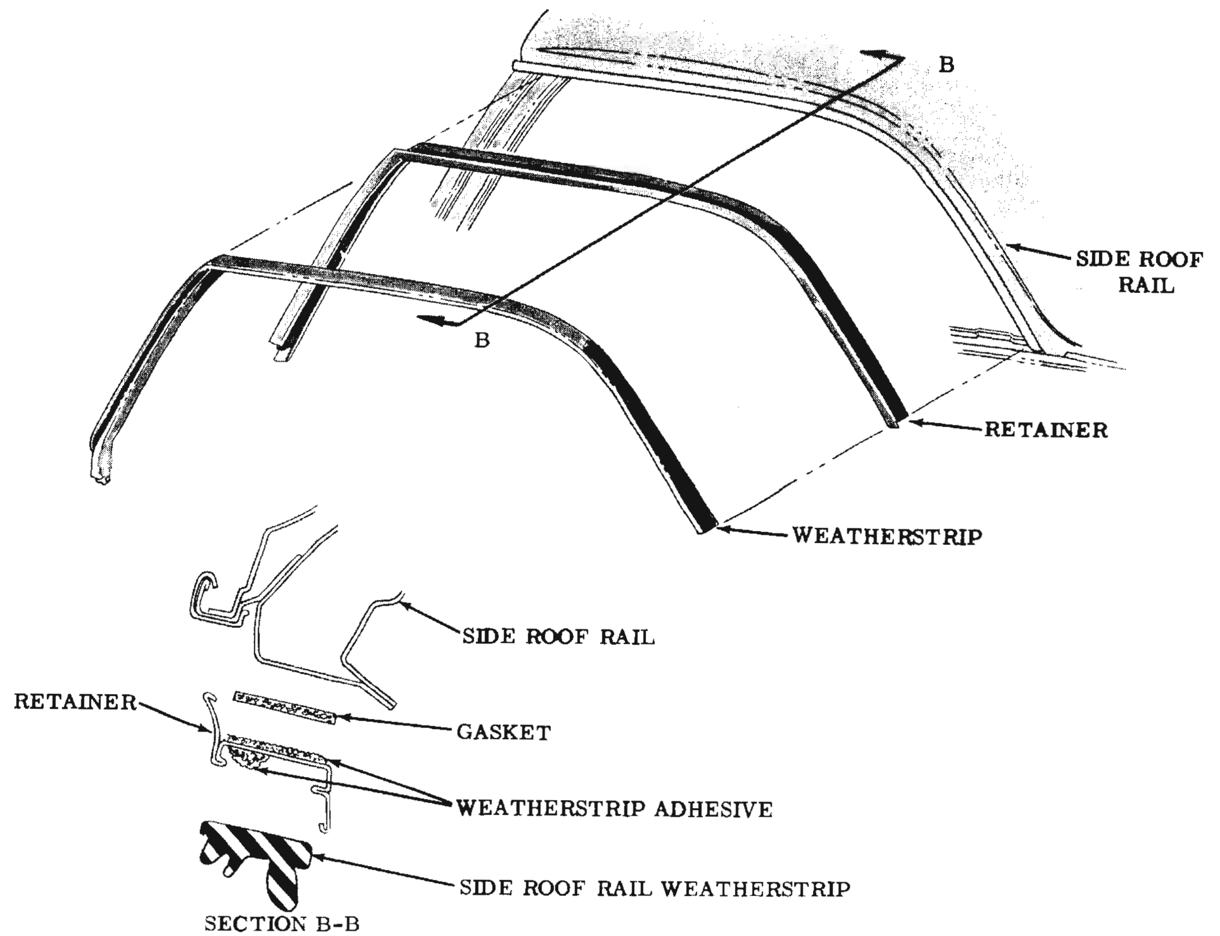


Fig. 16-61 Side Roof Rail Weatherstrip Assembly (47" Style)

weatherstrip from retainer. Using a flat-bladed tool, carefully break cement bond between weatherstrip and weatherstrip retainer and reveal molding assembly.

3. Remove side roof rail weatherstrip from body.

Installation

1. Clean off old cement from side roof rail weatherstrip retainer to insure a clean cementing surface.

2. Apply a continuous bead (approximately 3/16" diameter) of weatherstrip adhesive along entire outboard surface of side roof rail weatherstrip retainer. (Section "B-B", Fig. 16-61)

3. With a flat-bladed tool, engage inboard edge of weatherstrip and then outboard edge of weatherstrip into weatherstrip retainer.

4. Install snap fastener at front body hinge pillar and clean off all excessive weatherstrip cement.

SIDE ROOF RAIL WEATHERSTRIP (3829 Style)

The side roof rail weatherstrip assembly is a one piece type which is secured to the front body hinge pillar with a snap fastener. The remainder of the weatherstrip is secured to the side roof rail by weatherstrip adhesive and a weatherstrip retainer and reveal molding assembly.

Removal

1. Remove snap fastener securing weatherstrip at front body hinge pillar.

2. Carefully disengage inner lip of side roof rail weatherstrip from retainer. Using a flat-bladed tool, carefully break cement bond between weatherstrip and weatherstrip retainer and reveal molding assembly.

3. Remove side roof rail weatherstrip from body.

Installation

1. Clean off old cement from side roof rail

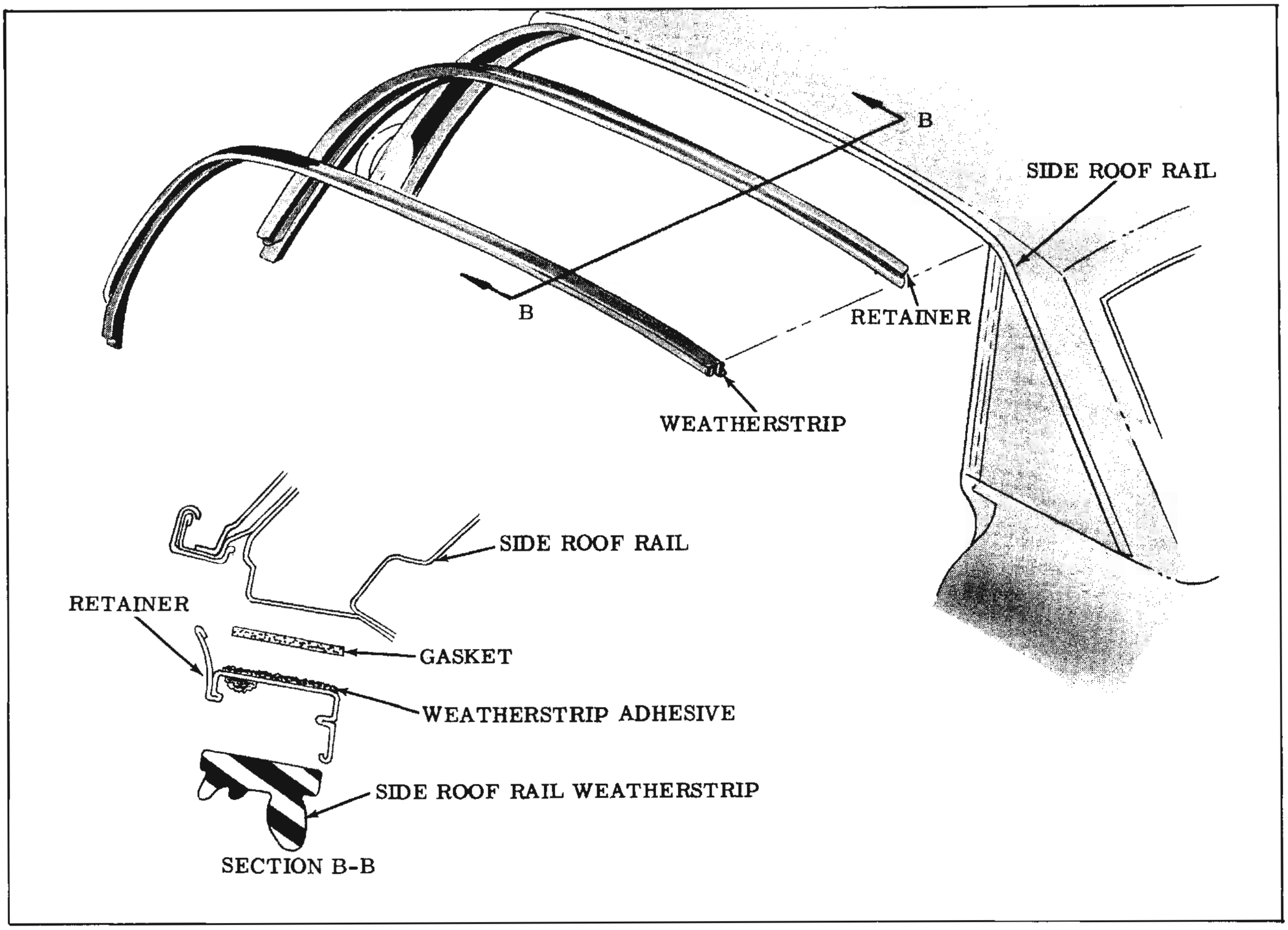


Fig. 16-62 Side Roof Weatherstrip Assembly ("29" Style)

weatherstrip and weatherstrip retainer to insure a clean cementing surface.

2. Apply a continuous bead (approximately 3/16" diameter) of weatherstrip adhesive along entire outboard surface of side roof rail weatherstrip retainer. (Section "B-B", Fig. 16-62)

3. Apply weatherstrip cement to rear end of side roof rail weatherstrip and cement weatherstrip to front end of stationary rear quarter window.

4. With a flat-bladed tool, engage inboard edge of weatherstrip into weatherstrip retainer.

5. Install snap fastener at front body hinge pillar and clean off all excessive weatherstrip cement.

SIDE ROOF RAIL WEATHERSTRIP (3239, 3539, 3657, 3839, 3847 and 3947 Styles)

The side roof rail weatherstrip assembly is a one-piece type which is secured to the front body hinge pillar with a snap fastener. The remainder of the weatherstrip is secured to the side roof rail by weatherstrip adhesive and a weatherstrip retainer and reveal molding assembly.

Removal

1. Remove snap fastener securing weatherstrip at front body hinge pillar.

2. Carefully disengage inner lip of side roof rail weatherstrip from retainer. Using a flat-bladed tool, carefully break cement bond between weatherstrip and weatherstrip retainer and reveal molding assembly.

3. Remove side roof rail weatherstrip from body.

Installation

1. Clean off old cement from side roof rail weatherstrip and weatherstrip retainer to insure a clean cementing surface.

2. Apply a continous bead (approximately 3/16" diameter) of weatherstrip adhesive along entire outboard surface of side roof rail weatherstrip retainer. (Section "B-B", Fig. 16-63)

3. With a flat-bladed tool, engage inboard edge of weatherstrip and then outboard edge of weatherstrip into weatherstrip retainer.

4. Install snap fastener at front body hinge

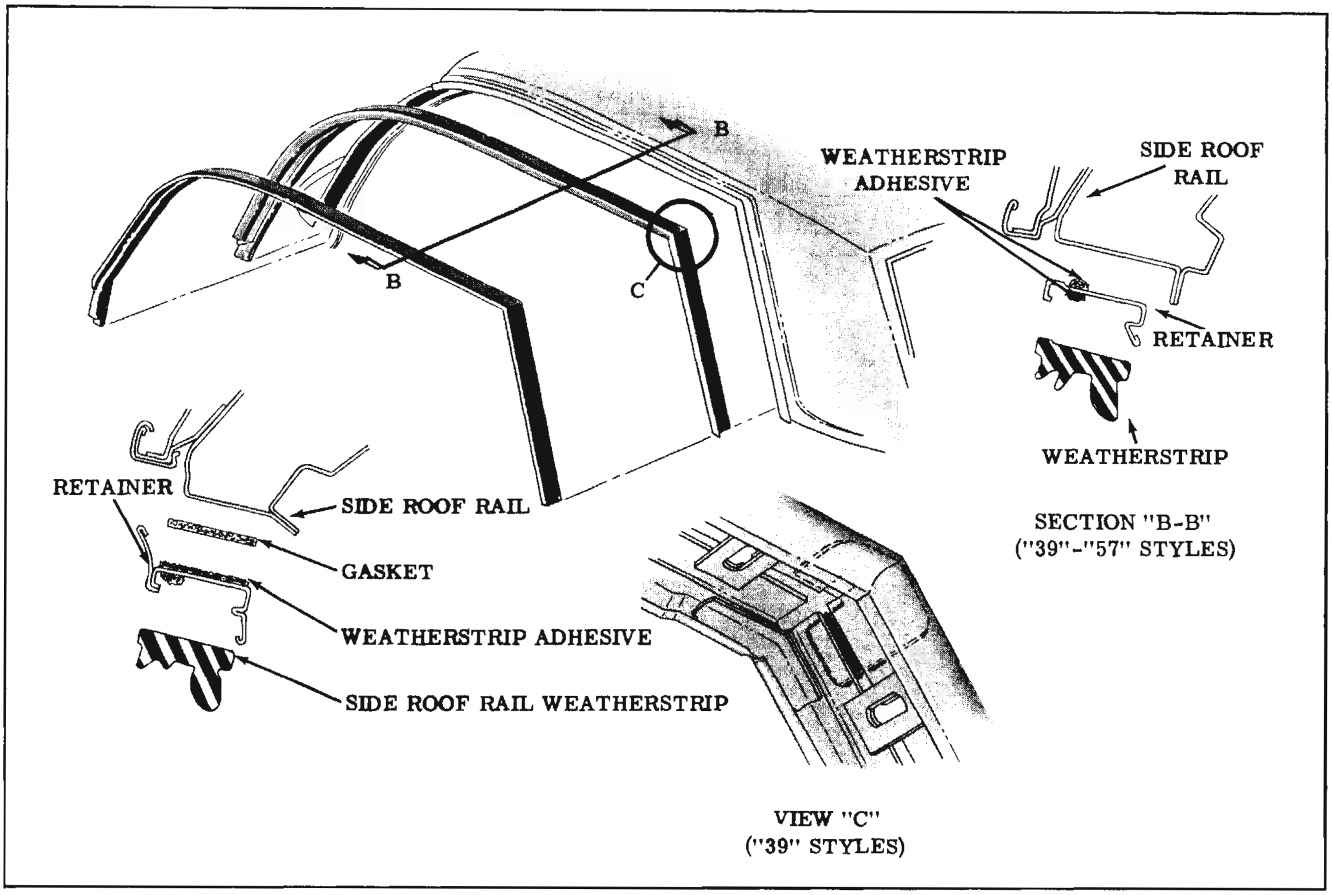


Fig. 16-63 Side Roof Rail Weatherstrip ("39" and "57" Styles)

pillar and clean off all excessive weatherstrip cement.

SIDE ROOF RAIL WEATHERSTRIP ADJUSTMENTS ("29", "39", "47" and "57" Styles)

With doors and windows closed, front door window and rear door or rear quarter window upper frames should make an even continuous contact with the side roof rail weatherstrip. If necessary, adjust weatherstrip, ventilator assembly, front door window and rear door or rear quarter window to obtain proper weatherstrip contact.

The attaching holes in the side roof rail weatherstrip retainer are elongated, allowing in and out adjustment of the side roof rail weatherstrip; however, the amount of adjustment is small and is not intended to correct improper ventilator or door window alignment. It is necessary to remove the weatherstrip to adjust the retainer.

IMPORTANT: Before attempting to adjust the side roof rail weatherstrip, first check that the body side glass is properly aligned and, where necessary, adjust for proper alignment as directed under VENTILATOR, FRONT DOOR WINDOW, REAR DOOR WINDOW AND REAR QUARTER WINDOW ALIGNMENT.

1. To adjust the side roof rail weatherstrip in or out, first determine and mark retainer at area or areas to be adjusted.
2. Remove side roof rail weatherstrip.
3. Loosen retainer attaching screws slightly in area to be adjusted and adjust retainer in or out as required.
4. Tighten retainer attaching screws and install side roof rail weatherstrip.

REAR QUARTER WINDOW, TRIM AND HARDWARE

The procedures for servicing the rear quarter are arranged according to body style in the following sequence:

Two Door Coupes (47 and 57 Styles)
Convertibles (67 Styles)
Four Door Sedans (19, 29, 39 & 69 Styles)

Figures 16-64, 16-65 and 16-66 identify the major components of the rear quarter hardware.

NOTE: Use caution when performing service operations on or near the rear quarter window as it is made of solid tempered safety plate glass

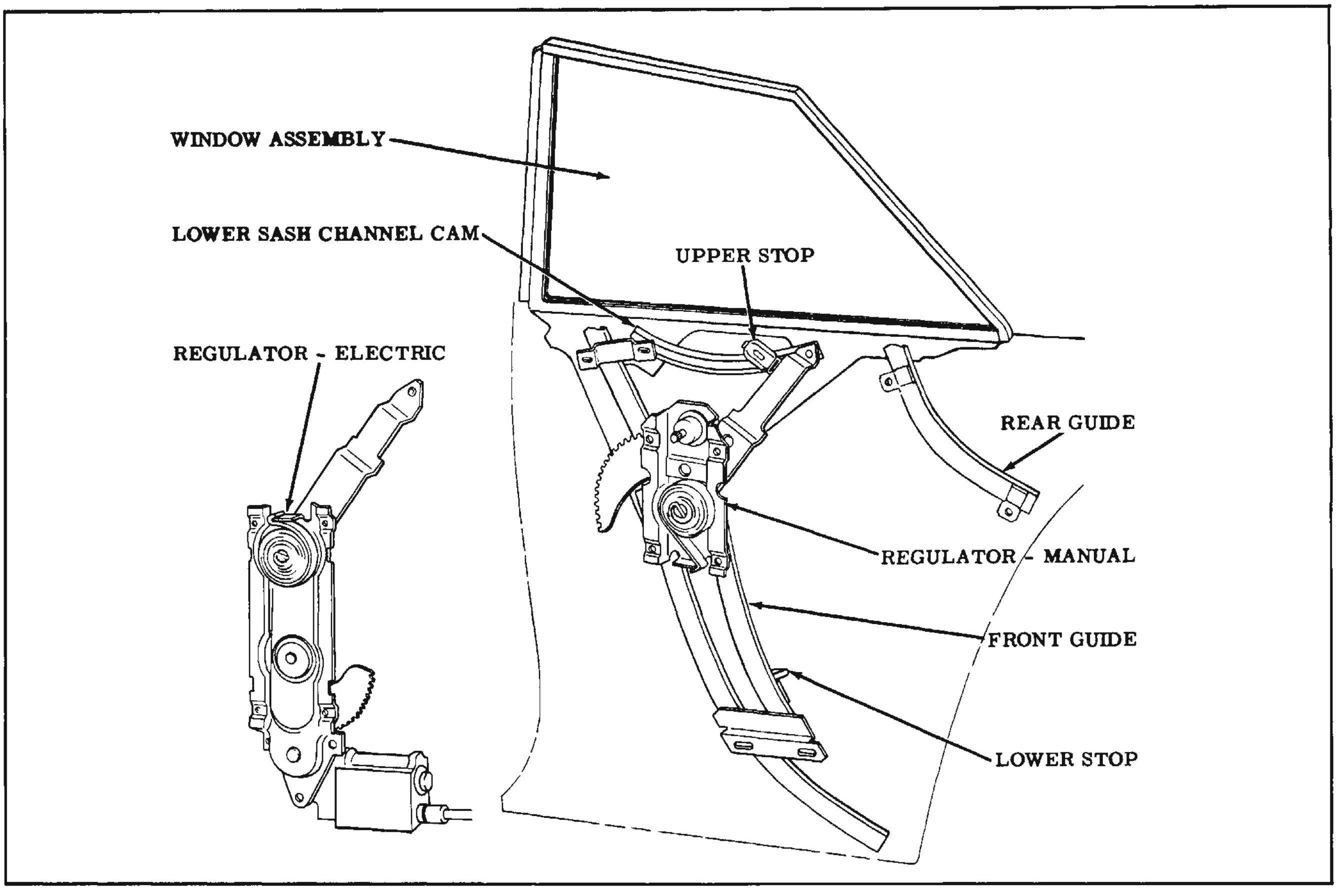


Fig. 16-64 Rear Quarter Hardware (3947 Style)

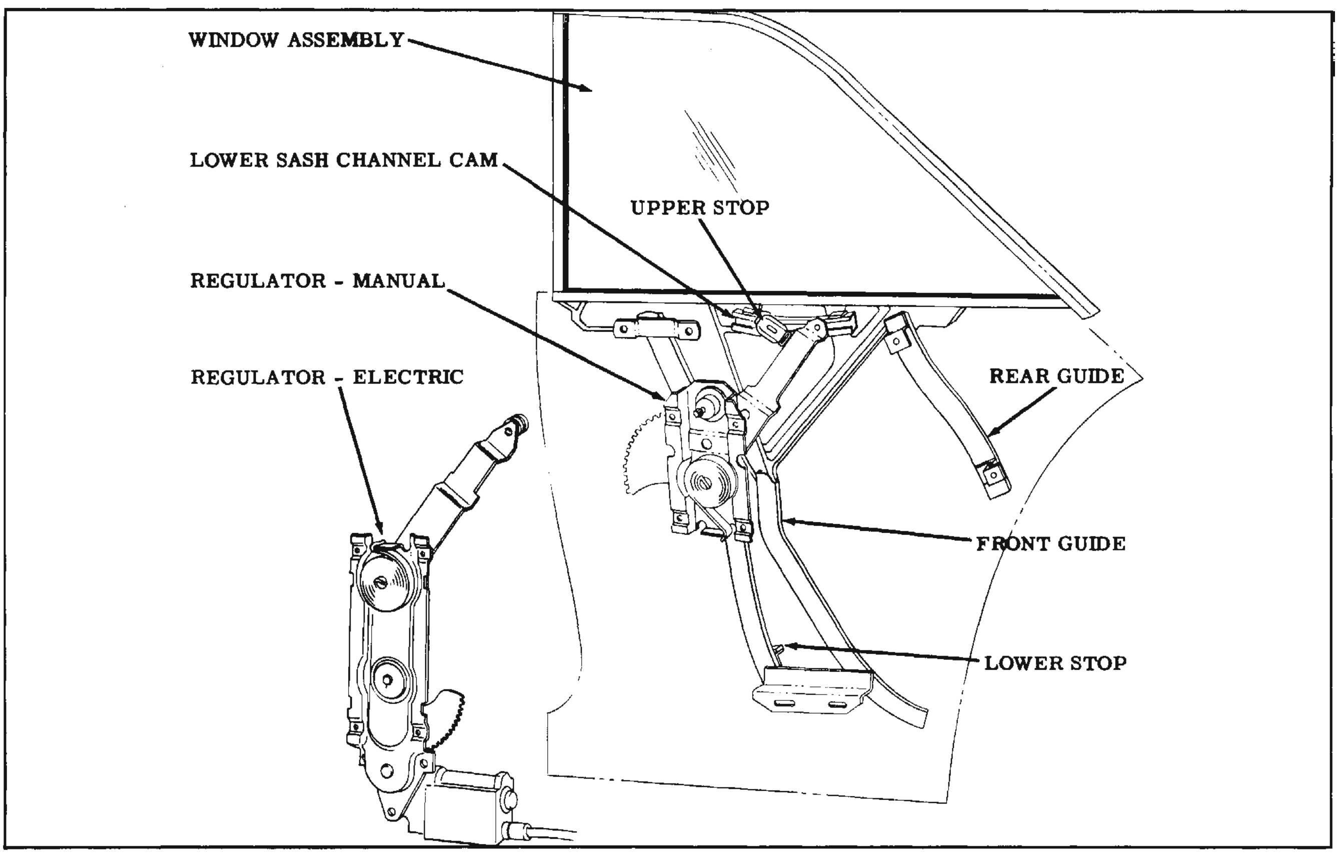


Fig. 16-65 Rear Quarter Hardware (3247, 3547, 3657 Styles)

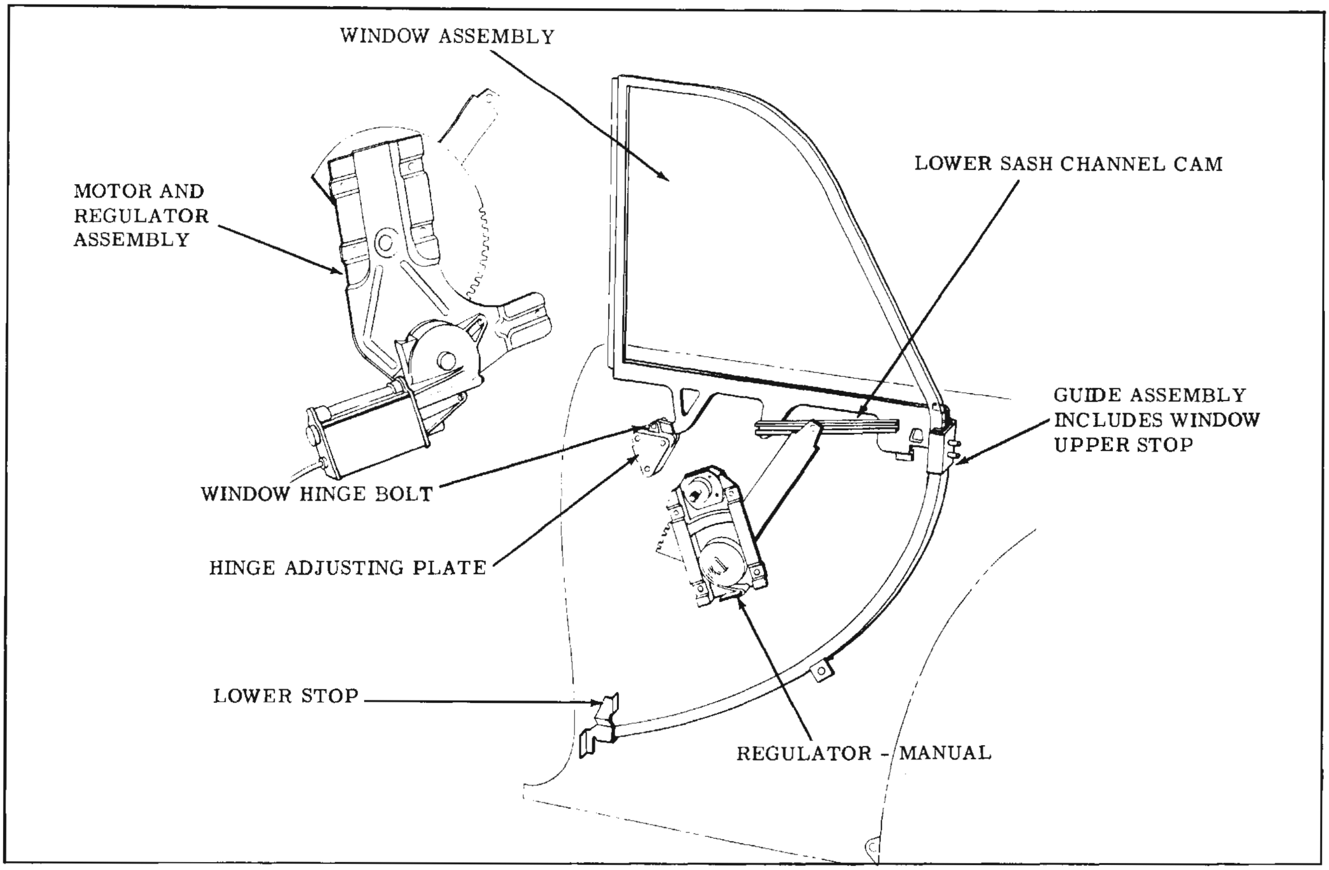


Fig. 16-66 Rear Quarter Hardware ("67" Styles)

and edge chips or deep scratches can cause it to shatter.

REAR QUARTER ARM REST ASSEMBLY ("47" and "57" Styles)

Removal and Installation

1. Remove rear seat cushion, seat back, and seat back filler panel.
2. Remove attaching screws at front and rear of arm rest.
3. On styles with electrical devices in arm rest assembly, carefully detach arm rest from rear quarter inner panel sufficiently to disconnect wire harness connectors.
4. Remove arm rest assembly from rear quarter panel.
5. To install arm rest assembly, reverse removal procedure. Check operation of any electrical devices.

TRIM ASSEMBLY ("47" and "57" Styles)

Removal and Installation

1. Remove rear seat cushion and seat back assemblies.
2. Remove rear quarter arm rest assembly. Remove quarter belt finishing moldings where present.
3. On styles with manually-operated windows, remove window regulator handle and anti-friction washer.
4. Remove screws securing rear quarter filler panel to quarter panel and remove filler panel.
5. Using a trim panel removing tool, J-6335, carefully pry trim assembly retaining nails from tacking strip; then lift trim assembly upward to disengage from retainers at top of rear quarter inner panel and remove assembly from body.
6. To install rear quarter trim assembly, reverse removal procedures.

   NOTE: If any retaining nails are broken off, they can be replaced with door trim assembly nailing strip replacement tabs which are available as a service part.

WINDOW ASSEMBLY—MANUAL OR ELECTRIC (3247, 3547 and 3657 Styles)

Removal and Installation

1. Remove rear seat cushion and seat back

assemblies and rear quarter arm rest and trim assemblies. Remove inner panel access hole cover

NOTE: On models equipped with electric window regulators, disconnect feed wire connector from electric motor.

CAUTION: Do not operate regulator motor after the window assembly is disengaged from the regulator, operation of the motor with the load removed may damage the unit.

2. Remove rear quarter window rear guide attaching screw. (Fig. 16-67) Disengage rear guide from roller on window lower sash channel and remove guide.

3. With the rear quarter window in the half-down position, remove the lower sash channel cam attaching screws. (Fig. 16-67) Detach cam from roller on regulator arm and remove cam.

4. Remove rear quarter window front guide adjusting stud nuts. (Fig. 16-67)

5. With the rear quarter window in the half down position, disengage the front guide adjusting studs from the adjusting stud holes in the rear quarter inner panel, then disengage front guide from rollers on rear quarter window. Remove rear quarter window from between the panels by lifting upward and inward.

6. To install rear quarter window, insert the window between the panels and prop in the "up" position. Engage front guide channels to rollers on window lower sash channel frame. Allow window to drop to the half down position and insert front guide adjusting studs into the adjusting stud holes in the rear quarter inner panel. Install previously removed parts.

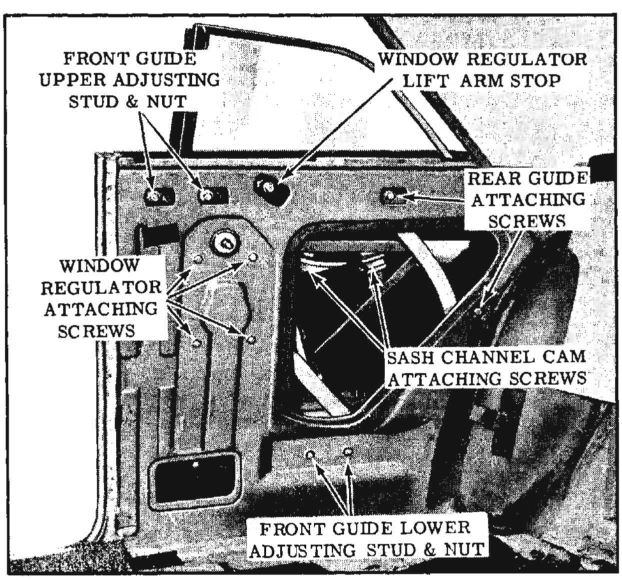


Fig. 16-67 Rear Quarter Hardware ("47" Style)

Prior to installation of window lower sash channel cam and the front and rear guides, lubricate the channels of the cam and guides with Lubriplate or its equivalent along the entire length of the channel.

Adjust rear quarter window for proper alignment and operation as described under REAR QUARTER WINDOW ADJUSTMENTS for "47" and "57" Styles. Seal all hardware attachments that have been disturbed and the inner panel access hole cover, as specified under REAR QUARTER INNER PANEL SEALING for "47" and "57" styles.

WINDOW ASSEMBLY— MANUAL AND ELECTRIC (3847 and 3947 Styles)

Removal and Installation

1. Remove rear seat cushion and seat back assemblies and rear quarter arm rest and trim assemblies. Remove inner panel access hole cover.

   NOTE: On models equipped with electric window regulators, disconnect feed wire connector from electric motor.

   CAUTION: Do not operate regulator motor after the window assembly is disengaged from the regulator. Operation of the motor with the load removed may damage the unit.

2. Remove rear quarter window rear guide attaching screws. (Fig. 16-67) Disengage rear guide from roller on window lower sash channel and remove guide.

3. With the rear quarter window in the half-down position, remove lower sash channel cam attaching screws. (Fig. 16-67) Detach cam from roller on regulator arm and remove cam.

4. Mark (scribe) position of window lower stop on front guide to enable reinstalling stop in same position. Loosen window lower stop attaching screw and slide stop to bottom of guide.

5. Lower window to run lower roller on window sash channel frame out of front guide channel at the bottom.

6. Lift window upward and inboard to disengage upper roller on window sash channel from rear channel on front guide. Remove window assembly from body.

7. To install, reverse removal procedure. Prior to installation, lubricate channel of window lower sash channel cam with Lubriplate or its equivalent. Seal all hardware attachments that

have been disturbed, as specified under REAR QUARTER INNER PANEL SEALING for "47" and "57" styles.

WINDOW ADJUSTMENTS ("47" and "57" Styles)

1. Remove rear seat cushion and seat back assemblies. Remove rear quarter arm rest and trim assemblies.

2. To adjust the window fore or aft, loosen the front and rear guide attaching stud nuts. (Fig. 16-67) Position the window and guides fore or aft as required; then tighten the attaching stud nuts.

3. To adjust the rear quarter window in or out, loosen the front guide upper attaching stud nuts. (Fig. 16-67) Adjust the studs in or out as required; then tighten the stud nuts.

4. To adjust the top of the rear quarter window in or out, loosen the front guide lower attaching stud nut. (Fig. 16-67) Adjust the stud in or out as required, then tighten the stud nut.

5. To relieve a binding condition between the channels of the front and rear guide, loosen the front and rear guide adjusting stud nuts. (Fig. 16-67) Operate window to full-up position and tighten upper stud nuts on the front guide and forward attaching screw on rear guide. Operate window to full-down and tighten remaining nuts.

6. To limit the forward and upward travel of the rear quarter window, adjust the regulator lift arm stop as required. (Fig. 16-67)

7. To limit the down travel of the rear quarter window, remove the inner panel large access hole cover, loosen the lower stop assembly attaching bolt (located at the lower end of the window front guide cam) and adjust stop up or down as required.

   NOTE: After performing window adjustments, seal hardware attaching screws which have been disturbed, as specified under REAR QUARTER INNER PANEL SEALING for "47" and "57" styles.

WINDOW REGULATOR ASSEMBLY—MANUAL OR ELECTRIC ("47" and "57" Styles)

Removal and Installation

1. Remove rear quarter window as described under WINDOW ASSEMBLY - MANUAL OR ELECTRIC - REMOVAL.

   NOTE: On styles equipped with electric window regulators, disconnect feed wire plug from electric motor.

   CAUTION: Do not operate regulator motor after the window assembly is disengaged from the regulator or after the regulator assembly is removed from the body. Operation of the motor with the load removed may damage the unit.

2. Remove rear quarter window regulator attaching screws. (Fig. 16-67) Remove regulator assembly through large access hole.

   NOTE: The procedure for removing the electric motor from the rear quarter window regulator is described and illustrated under REAR DOOR AND/OR REAR QUARTER WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY in the Door Section.

3. To install, reverse removal procedure. Seal all hardware attaching locations that have been disturbed as specified under REAR QUARTER INNER PANEL SEALING for "47" and "57" styles.

WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY ("47" and "57" Styles)

Removal and Installation

See REAR DOOR AND/OR REAR QUARTER WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY in the Door Section.

WINDOW FRONT GUIDE ASSEMBLY ("47" and "57" Styles)

Removal and Installation

1. Remove rear seat cushion and seat back. Remove rear quarter arm rest and trim assemblies. Remove rear quarter inner panel large access hole cover.

2. With window in "up" position, remove the window front guide upper and lower attaching stud nuts. (Fig. 16-67)

3. Maneuver guide assembly between rear quarter panels so that upper end of guide can be started out of large access hole; then remove guide assembly.

4. To install rear quarter window front guide assembly, reverse removal procedure. Prior to installation of the front guide assembly, lubricate channels of guide with Lubriplate or its equivalent along full length of channels.

   Adjust front guide assembly for proper window alignment and operation as described under REAR QUARTER WINDOW ADJUSTMENTS for "47" and "57" styles.

Seal front guide attaching screws as specified under REAR QUARTER INNER PANEL SEALING for "47" and "57" styles.

WINDOW REAR GUIDE ASSEMBLY ("47" and "57" Styles)

Removal and Installation

1. Remove rear seat cushion and back assemblies. Remove rear quarter arm rest and trim assemblies. Remove rear quarter inner panel large access hole cover.

2. With the window in the "up" position, remove the window rear guide attaching screws. (Fig. 16-67) Disengage guide from roller on window lower sash channel and remove guide through access hole.

3. To install, reverse removal procedure. Prior to installation of the rear guide, lubricate the entire length of the channel with Lubriplate or its equivalent.

4. Adjust rear guide for proper window alignment and operation as described under REAR QUARTER WINDOW ADJUSTMENTS for "47" and "57" styles.

5. Seal rear guide attaching screws as specified under REAR QUARTER INNER PANEL SEALING for "47" and "57" styles.

WINDOW GLASS RUN OUTER SEALING STRIP (3247 and 3547 Styles)

Removal and Installation

1. Remove rear seat cushion and back assemblies. Remove rear quarter arm rest and trim assemblies.

2. Remove rear quarter inner panel large access hole cover. Loosen window lower stop attaching screw located on lower end of window front guide assembly; then operate window to the extreme low position.

3. Remove screws at forward end of outer sealing strip securing outer sealing strip to rear quarter outer panel return flange. Disengage outer sealing strip retaining clips from rear quarter outer panel return flange by pressing strip assembly downward.

   NOTE: If necessary, use a screwdriver to disengage retaining clips, however, use care not to damage painted surfaces or to distort shape of clips.

4. To install, reverse removal procedure.

FOLDING TOP COMPARTMENT SIDE TRIM PANEL ASSEMBLY ("67" Styles)

Removal and Installation

1. Remove rear seat cushion and seat back.

2. Remove attaching screws securing front and rear of side trim panel.

3. Raise trim panel and move it inboard.

4. Disconnect electrical leads, where present, and remove side trim panel.

5. To install folding top compartment side trim panel, reverse removal procedure.

REAR QUARTER TRIM ASSEMBLY ("67" Styles)

Removal and Installation

1. Remove folding top compartment side trim panel assembly.

2. On styles with manually-operated windows, remove window regulator handle and anti-friction washer.

3. Using a trim panel removing tool, J-6335, carefully pry trim assembly retaining nails from tacking strips; then lift assembly upward to disengage from retainers at top of rear quarter inner panel and remove assembly from body.

4. To install rear quarter trim assembly, reverse removal procedure.

   NOTE: If any retaining nails are broken off, they can be replaced with door trim assembly nailing strip replacement tabs which are available as a service part.

QUARTER WINDOW ASSEMBLY—MANUAL OR ELECTRIC ("67" Styles)

Removal and Installation

1. Lower folding top and operate rear quarter window to half-down position. Remove rear seat cushion and seat back. Remove folding top compartment side trim panel and rear quarter trim assembly.

2. On styles equipped with electric window regulators, remove access hole cover and disconnect the wiring harness electrical feed plug from the regulator motor.

   CAUTION: DO NOT OPERATE REGULATOR MOTOR after window is disengaged from regulator. Operation of motor with load removed may damage the unit.

3. Remove window pivot bolt. (Fig. 16-68) Disengage window male hinge from female hinge plate; then raise window to disconnect window lower sash channel cam from roller on window regulator lift arm and remove window.

4. To install rear quarter window assembly, reverse removal procedure. Prior to installation, lubricate pivot hinge and window lower sash channel cam with Lubriplate or its equivalent.

5. Adjust rear quarter window for proper alignment and operation, as described under REAR QUARTER WINDOW ADJUSTMENTS for "67" styles. Seal window pivot bolt and inner panel access hole cover as specified under REAR QUARTER INNER PANEL SEALING for "67" styles.

QUARTER WINDOW ADJUSTMENTS ("67" Styles)

1. To adjust the limit of the rear quarter window up travel, loosen the window guide upper attaching screws. (Fig. 16-68) Adjust upper stop to desired position and tighten guide attaching screws.

2. To adjust the rear quarter window up or down or fore or aft; or to adjust the top or the rear of the window in or out, the folding top compartment side trim panel and rear quarter trim assembly must be removed to gain access to the pivot bolt and adjusting studs.

   a. Up or down or fore or aft window adjustment: Loosen pivot bolt and both adjusting stud nuts. (Fig. 16-68) Position window as required; then tighten pivot bolt and stud nuts.

   b. In or out adjustment of top of window: Loosen lower adjusting stud nuts and slightly loosen rear stud nut. Adjust lower stud in or out, as required; then tighten both stud nuts. (Fig. 16-68)

   c. In or out adjustment of rear of window: Loosen pivot hinge rear adjusting stud nut and (slightly) lower adjusting stud nut. Loosen window guide upper attaching nuts and center stud nut. (Fig. 16-68) Adjust rear adjusting stud in or out, as required, then tighten both stud nuts. Adjust window guide for proper alignment with window and tighten upper attaching nuts and center stud nut.

NOTE: After performing any rear quarter window adjustment, seal all attaching screws which have been disturbed as specified under REAR QUARTER INNER PANEL SEALING for "67" styles.

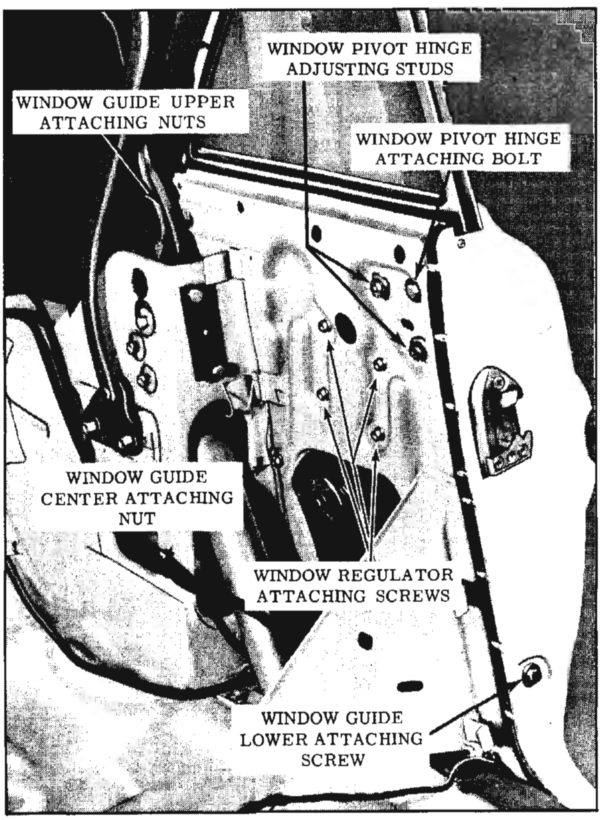


Fig. 16-68 Rear Quarter Hardware ("67" Styles)

QUARTER WINDOW REGULATOR—MANUAL OR ELECTRIC ("67" Styles)

Removal and Installation

1. Remove rear seat cushion and back, folding top compartment side trim panel and rear quarter trim assembly.

2. Remove rear quarter inner panel access hole cover.

3. Operate window to full-up and prop in that position.

4. On styles equipped with electric window regulators, disconnect feed wire plug from electric motor.

   CAUTION: DO NOT OPERATE REGULATOR MOTOR after the regulator assembly is disengaged from the window assembly or after it is removed from the body. Operation of the motor with the load removed may damage the unit.

5. Remove regulator attaching screws. (Fig. 16-68) Disengage regulator lift arm roller from window lower sash channel cam and remove regulator.

6. To install window regulator assembly, reverse removal procedure.

7. Lubricate regulator sector, window cams and pivot hinge with Lubriplate or its equivalent.

8. Seal regulator attaching screws and inner panel access hole cover as specified under REAR QUARTER INNER PANEL SEALING for "67" styles.

QUARTER WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY ("67" Styles)

The procedure for removing the electric motor from the rear quarter window regulator assembly is similar to the procedure described under REAR DOOR AND/OR REAR QUARTER WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY in the Door Section.

QUARTER WINDOW GUIDE ("67" Styles)

Removal and Installation

1. Remove rear seat cushion and seat back. Remove folding top compartment side trim panel, and rear quarter trim assembly.

2. Remove inner panel access hole cover and rear quarter window assembly. On styles equipped with electric window regulators, remove window regulator assembly.

3. Remove window guide upper and center attaching nuts and lower attaching screw. (Fig. 16-68) Disengage window guide and remove guide through large access hole.

4. To install rear quarter window guide, reverse removal procedure. Adjust the window guide for proper window alignment and operation as described under REAR QUARTER WINDOW ADJUSTMENTS for "67" styles.

5. Seal window guide attaching screws, access hole plug at lock pillar and inner panel access hole cover as specified under REAR QUARTER INNER PANEL SEALING for "67" styles.

QUARTER WINDOW GLASS RUN OUTER SEALING STRIP ("67" Styles)

1. Remove rear quarter window assembly.

2. Remove screws securing sealing strip to outer panel and remove strip.

3. To install rear quarter window glass run outer sealing strip, reverse removal procedure.

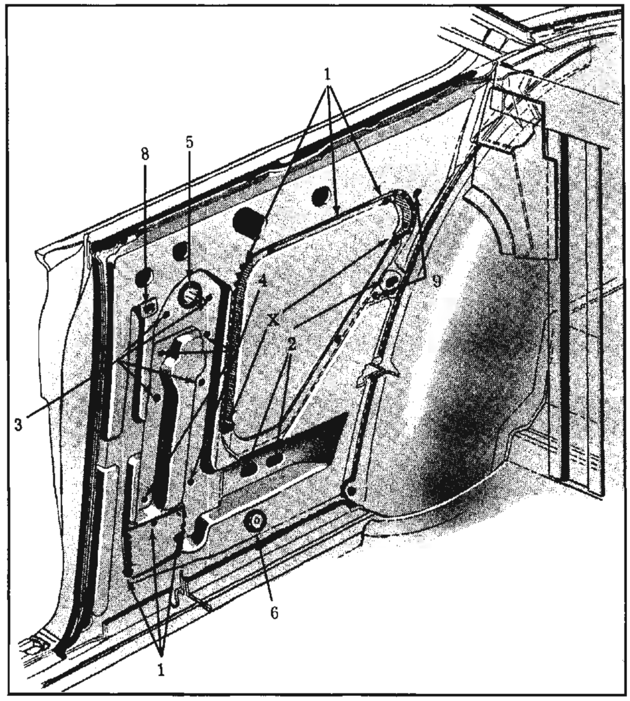


Fig. 16-69 Inner Panel Sealing ("47" and "57" Styles)

REAR QUARTER INNER PANEL SEALING ("47", "57" and "67" Styles)

Whenever the rear quarter inner panel openings have been disturbed, the area must be resealed before the rear quarter trim is reinstalled.

Following are the rear quarter inner panel openings and hardware attaching locations that must be sealed to prevent water entry and possible trim damage. The item numbers are referenced to illustrations as follows:

(47 and 57 styles - Figure 16-69)
(67 styles - Figure 16-70)

NOTE: When body caulking compound is used, work compound firmly to metal surfaces to obtain good adhesion.

1. Large and Small Access Hole Covers - Prior to installation of access hole cover, apply a continuous bead of body caulking compound (1/8" in diameter) across top and down sides of opening contacted by cover.

   After installation of cover, apply body caulking compound at lower corners where cover crosses over to inside of inner panel.

2. Window Guide and Glass Run Channel Attaching Screws - Apply body caulking compound over window guide attaching screws and holes to effect a weathertight seal. On convertible styles, apply weatherstrip adhesive (black) around the window guide attaching hole plug to effect seal between inner panel and plug.

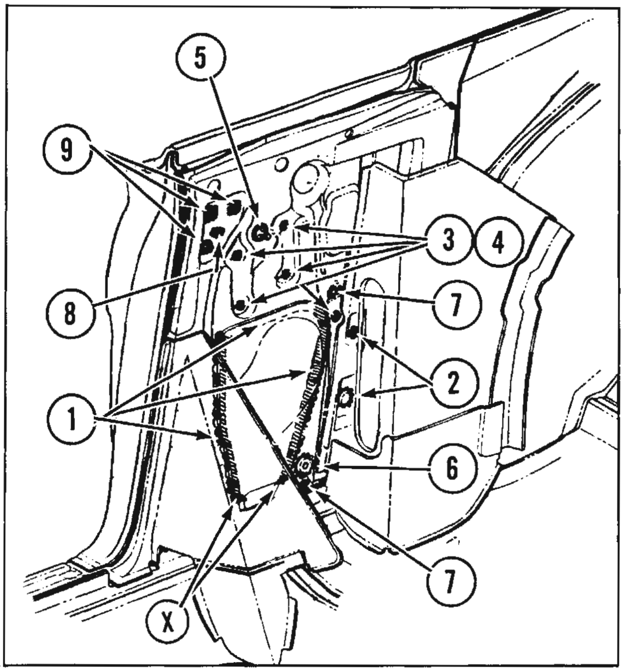


Fig. 16-70 Inner Panel Sealing ("67" Styles)

3. Manual Window Regulator Attaching Screws - Apply weatherstrip adhesive (black) over attaching screws.

4. Electric Window Regulator Attaching Screws - Apply weatherstrip adhesive (black) over attaching screws.

5. Window Regulator Spindle Hole Sealing Washer - Apply weatherstrip adhesive over exposed surface of washer to seal pores of sponge rubber and joint between inner panel and washer.

   On convertible coupe styles with electrically operated windows, apply weatherstrip adhesive (black) around the manual regulator spindle hole; then apply waterproof body tape over spindle hole.

6. Wire Harness and Grommet Hole (Styles with electrically operated windows) - Apply weatherstrip adhesive (black) around the grommet and wire to effect a seal between wire and grommet and between grommet and inner panel.

7. Wire Harness Clip Hole (Styles with electrically operated window) - Apply weatherstrip adhesive over hole.

8. Gage Slot - Apply waterproof body tape over slot.

Item 9 for "47" and "57" styles only. (Fig. 16-69)

9. Seat Back to Quarter Panel Filler Panel Attaching Screw Holes - Apply weatherstrip adhesive (black) over filler panel attaching holes.

Item 9 for "67" styles only. (Fig. 16-70)

9. Window Hinge Attaching Screws - Apply body caulking compound over hinge attaching screws. Press compound firmly to assure a good bond and watertight seal.

REAR QUARTER LOWER TRIM ASSEMBLY ("19", "29" and "39" Styles)

Removal and Installation

1. Remove rear seat cushion and seat back.

2. Remove back window side garnish molding and side roof rail rear finishing molding. On "19" and "29" styles, remove rear quarter window front garnish molding. Remove screw securing metal trim support ("69" styles only).

3. Using a trim panel removing tool, J-6335, carefully pry trim assembly retaining nails from tacking strip; then lift trim assembly upward to disengage from retainers at top of rear quarter inner panel and remove assembly from quarter panel.

4. To install rear quarter trim assembly, reverse removal procedure.

REAR QUARTER UPPER TRIM ASSEMBLY (3239, 3539, 3819 and 3829 Styles)

Removal and Installation

1. Remove back window side garnish molding and side roof rail rear finishing molding.

2. Carefully break cement bond securing trim foundation to roof extension inner panel; then remove trim assembly.

3. To install, first apply trim cement to contacting surfaces of trim foundation and roof extension inner panel. Position trim and press or roll to assure a good cement bond. Install back window side garnish molding and side roof rail rear finishing molding.

REAR QUARTER UPPER TRIM ASSEMBLY (3247, 3547, 3657, 3839, 3847 and 3947 Styles)

Removal and Installation

1. Remove back window side garnish molding and side roof rail rear finishing molding. Remove quarter belt finishing molding, where present.

2. On styles with courtesy lamps in the upper trim assembly, remove courtesy lamp lens

and two screws securing reflector and remove lamp assembly.

3. Carefully insert a trim panel removing tool, J-6335, between headlining and upper edge of upper trim assembly. Disengage upper trim assembly retaining clips from roof extension inner panel by pulling inboard at clip locations. Remove trim assembly from body.

4. To install, reverse removal procedure.

QUARTER WINDOW ("19" and "29" Styles)

Removal and Installation

1. Remove rear seat cushion and seat back. Remove back window side garnish molding and rear quarter window front garnish molding. Remove rear quarter lower trim assembly.

2. On "19" styles, remove screws securing glass rubber channel retainer along bottom of window and retainer at front of window. On "29" styles, remove screws securing three glass rubber channel retainers at bottom of window and retainer at top of window. Using a suitable tool, carefully break sealer bond between rubber channel and body opening.

3. Carefully push rear quarter glass and rubber channel assembly inward and remove assembly from opening.

   NOTE: The rear quarter window rubber channel may be removed from the glass as a bench operation.

4. To install, reverse removal procedure. Prior to installing quarter window glass and rubber channel, clean off old sealer from rubber channel and body opening to insure a smooth sealing surface. Apply a ribbon of medium-bodied sealer in corner of rear quarter side outer panel rabbet ("1", Fig. 16-71) completely around window opening. After glass and rubber channel have been installed, apply a bead of weatherstrip cement between outer surface of the glass and rubber channel ("2", Fig. 16-71) completely around the window and rubber channel. Clean off excess sealer and cement.

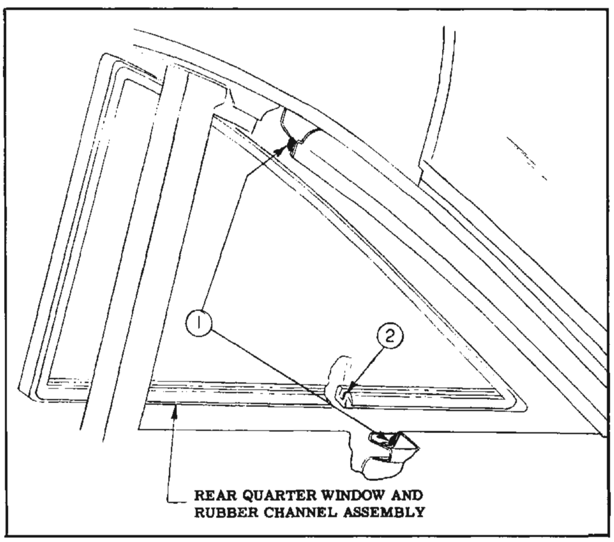


Fig. 16-71 Sealing Quarter Window

HEADLINING (All Styles except 3235, 3245, 3535, 3657, 3839, 3847 and 3947)

The headlining assembly is formed to the contour of the roof panel by concealed listing wires. Both ends of the listing wires are located in holes in the side roof rails.

The headlining is secured at the windshield by cement and tacks or staples and along the side roof rails by tacks, staples, cement, or a pronged retainer. The headlining is secured at the back window by tacks or staples and cement.

CAUTION: Clean hands and tools are essential when working with headlining material.

Removal

1. Place protective coverings over seat cushions and backs.

2. Prior to removing headlining, remove following hardware and trim assemblies if present.

   a. Windshield side and upper garnish moldings.

   b. Rear view mirror support.

   c. Sunshade supports.

   d. Dome, side roof rail, or rear quarter courtesy lamps.

   e. Coat hooks.

   f. Side roof rail moldings.

   g. Back window garnish moldings.

   h. Center pillar finishing moldings.

   i. Rear quarter trim, where necessary.

3. Carefully remove tacks or staples securing headlining at windshield and back window opening.

4. Remove tacks or staples on side roof rails on the 32-3547 and 3829 styles. (View K, Fig.

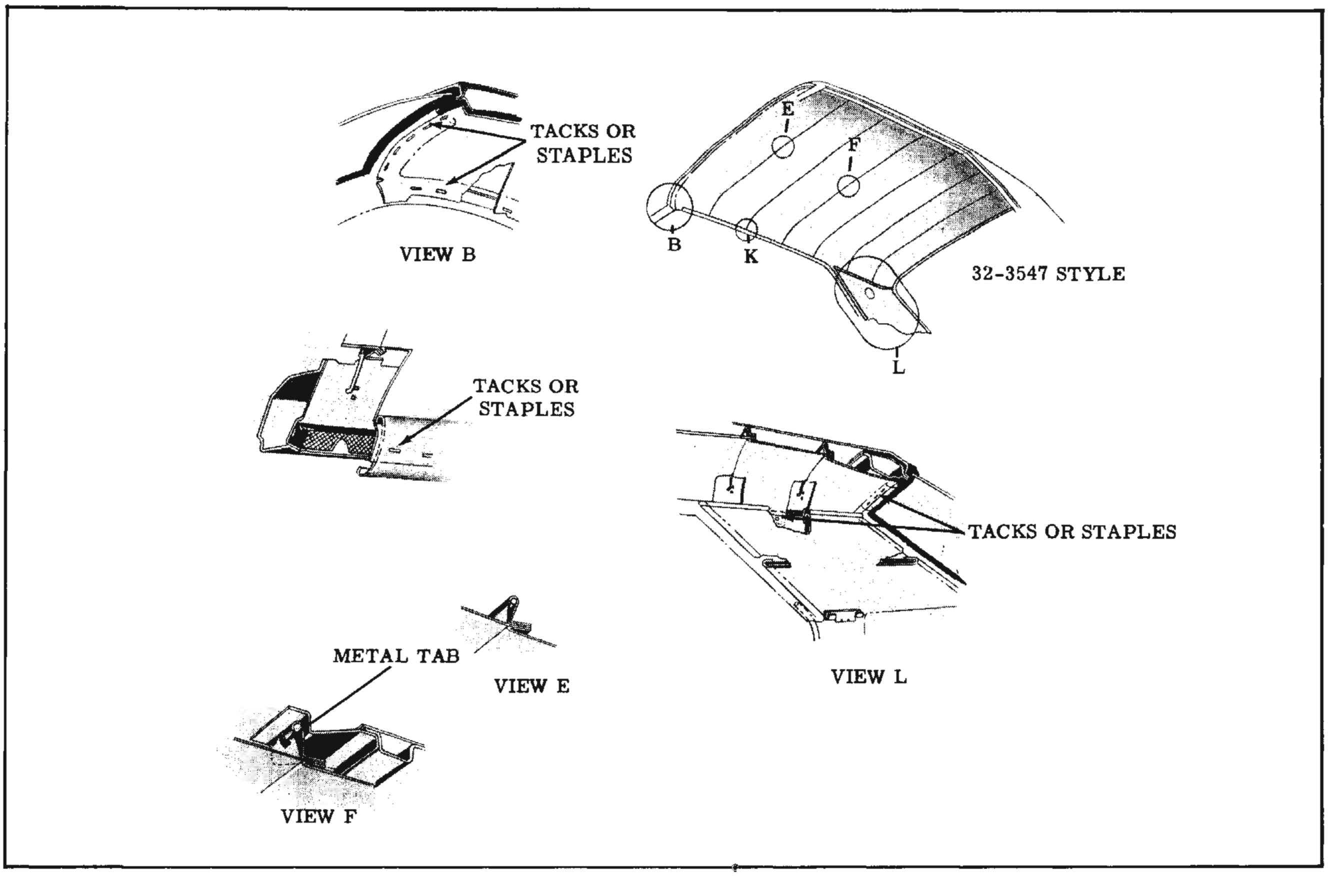


Fig. 16-72 Headlining Installation (3247 and 3547 Styles)

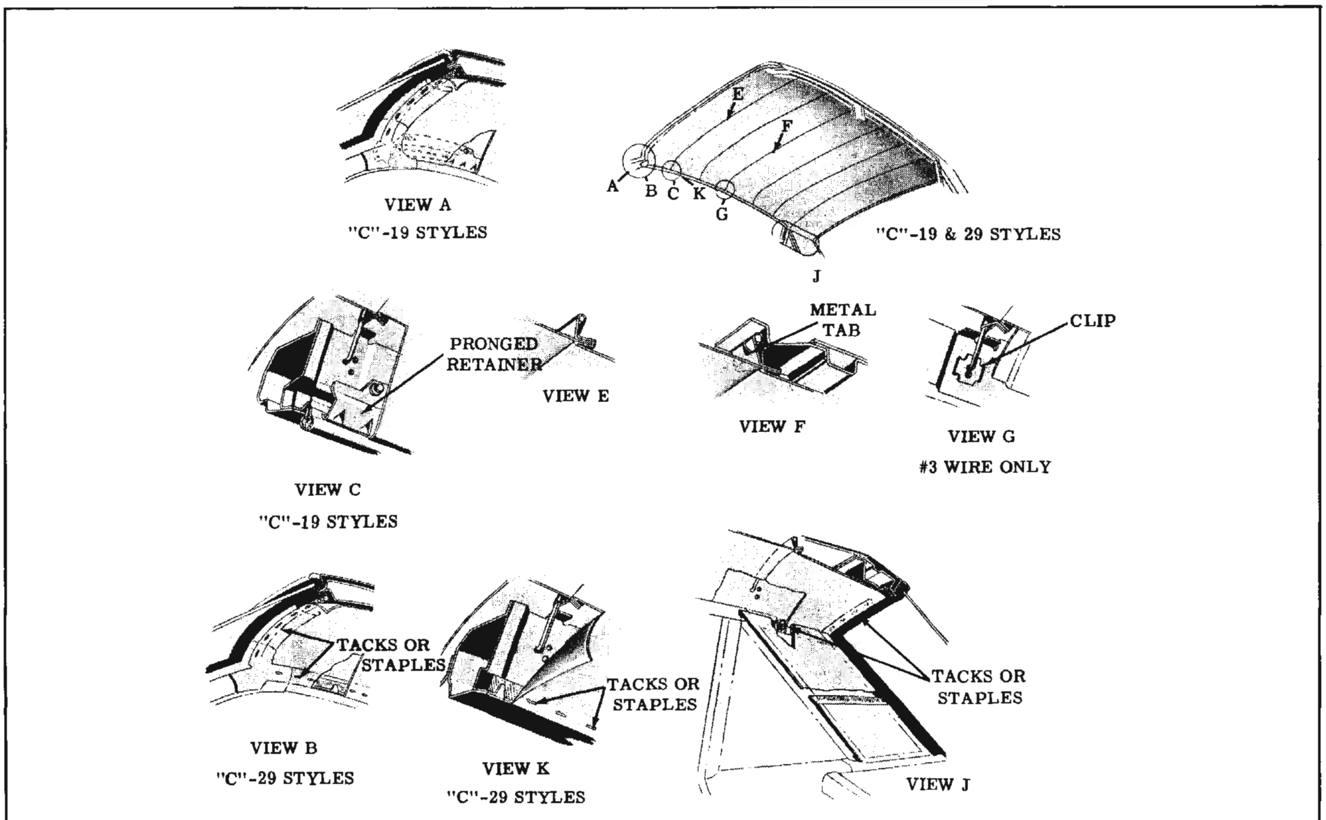


Fig. 16-73 Headlining Installation ("19" and "29" Styles)

16-72 and Fig. 16-73) On 32-3569 and 3819 styles, use headlining inserting tool J-2772 and carefully disengage headlining from pronged retainer along side roof rails. (View C, Fig. 16-74 and Fig. 16-73). Along side roof rails on 32-3539 styles, carefully remove plastic retainer on side roof rail pinchweld flange. (View P, Fig. 16-75)

5. Carefully detach cemented edge of headlining around entire perimeter.

6. Working from front to rear body, disengage headlining listing wires from holes in side roof rails, gathering or folding headlining with listing wires on outside to keep headlining clean.

   IMPORTANT: Note in which holes ends of listing wires are installed in side roof inner rails. Listing wires should be placed in same hole when replacing headlining.

7. At front roof bow, bend down metal tabs securing listing wires. (View F, Figs. 16-72, 16-73, 16-74 and 16-75)

8. Remove rear listing wire support on 32-3539 styles. (View T, Fig. 16-75)

9. Remove headlining from body.

10. If replacing headlining, remove listing wires from pockets of headlining.

   IMPORTANT: Listing wires removed from old headlining must be installed in corresponding pockets of new headlining.

Installation

1. If previously removed, install listing wires into pockets of new headlining assembly.

2. Apply trim cement to headlining attaching surfaces at windshield, side roof rail, and back window opening.

3. Lift entire headlining assembly into body and install rear listing wire. On 32-3539 styles, install rear listing wire support. (View T, Fig. 16-75)

4. Center and align rearward end of headlining and stay tack at center of back window opening.

5. Working forward, install ends of listing wires into listing wire holes in side roof rails.

   NOTE: Each listing wire should rest against roof panel deadener after it is installed. Listing wires may be adjusted up or

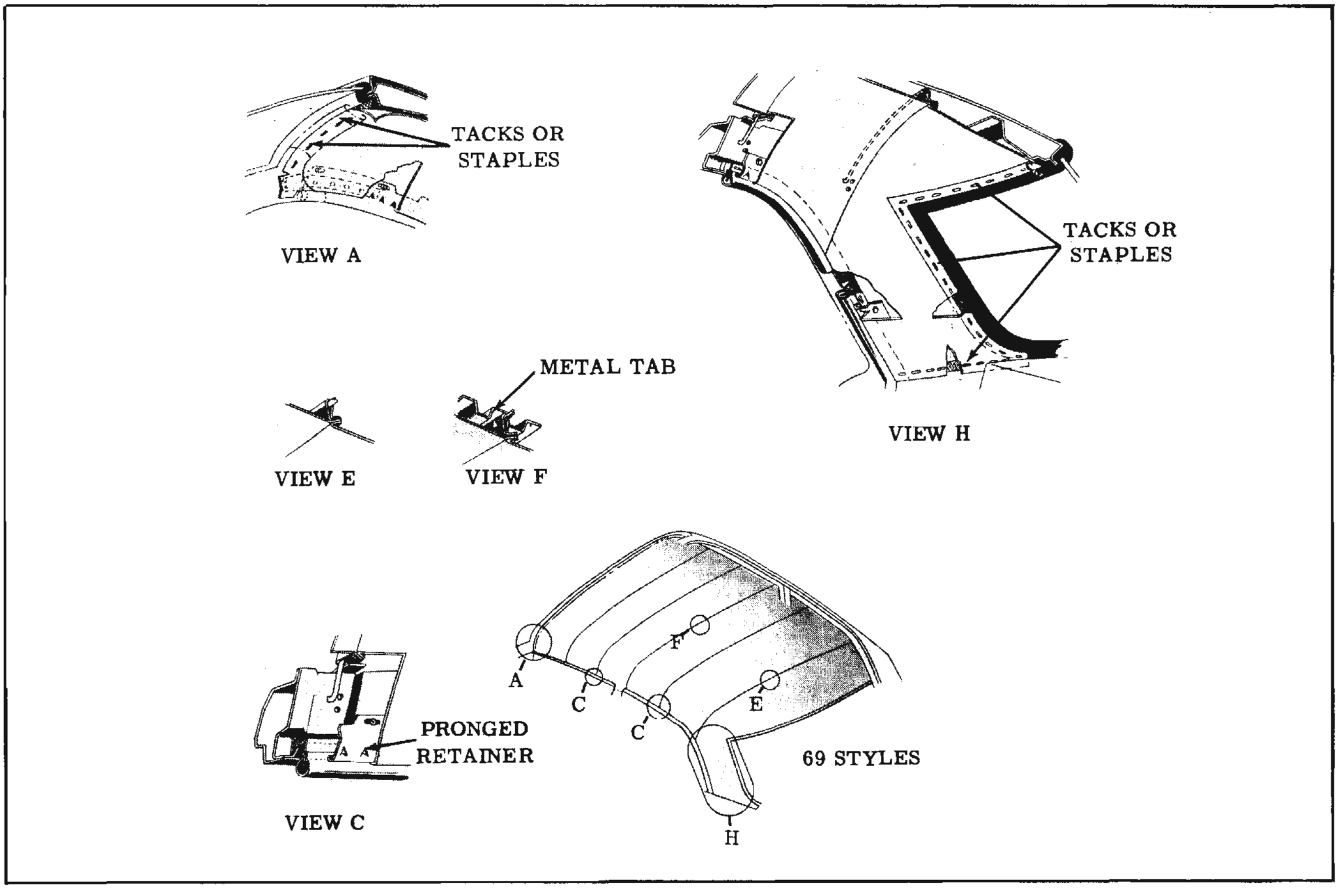


Fig. 16-74 Headlining Installation (3269 and 3569 Styles)

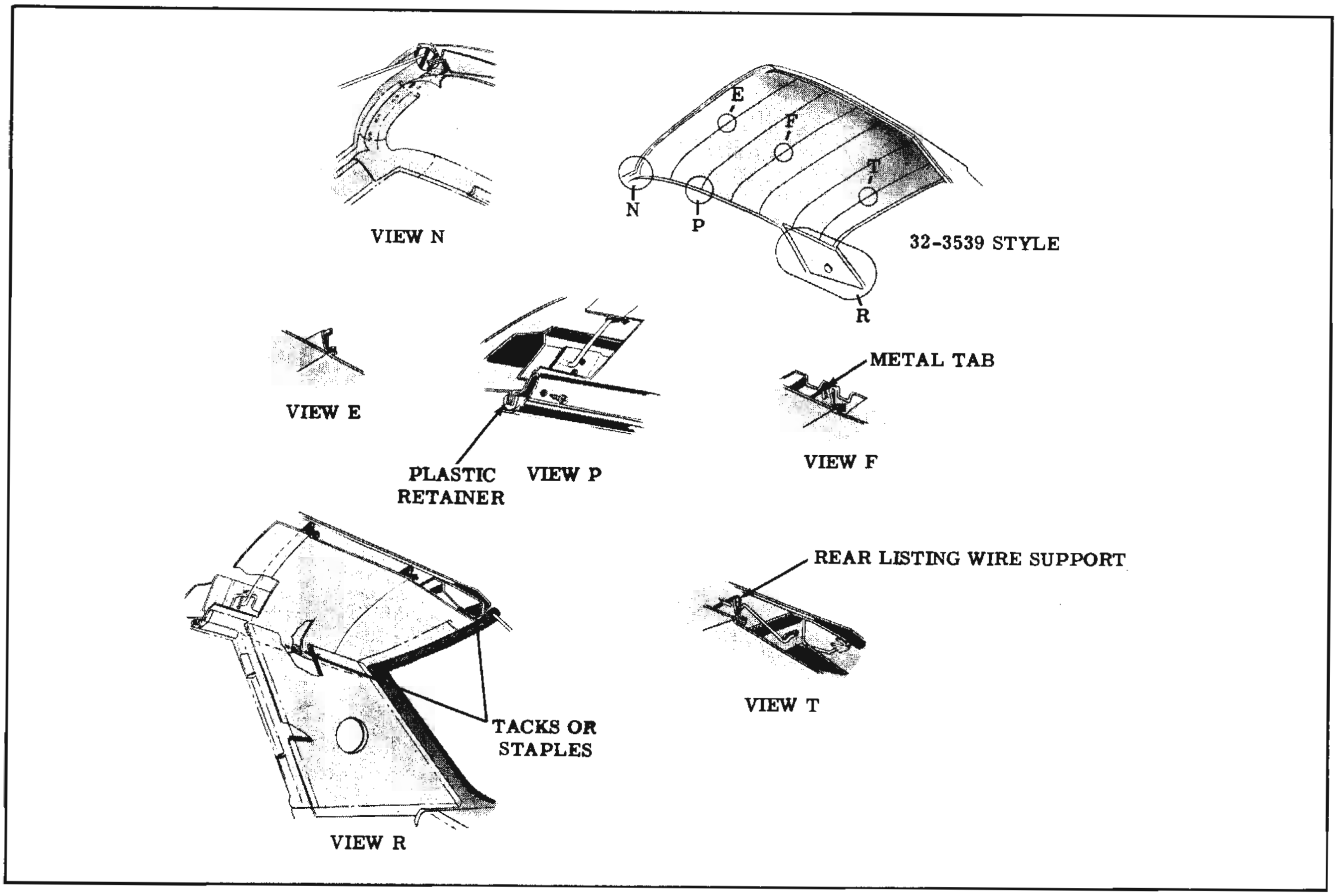


Fig. 16-75 Headlining Installation (3239 and 3539 Style)

down by placing in appropriate holes in side roof inner rails.

6. At front roof bow, bend up metal tabs securing listing wire and listing wire pocket. (View F, Figs. 16-72, 16-73, 16-74 and 16-75)

7. Stretch and stay tack headlining along entire windshield and back window opening. Stay tack headlining in rear quarter area where required. (View H, Fig. 16-74, View L, Fig. 16-72, View J, Fig. 16-73 and View R, Fig. 16-75)

8. Apply trim cement to side roof rail edge of headlining except on 32-3569 and 3819 styles. Remove all "fullness" or "draws" from headlining material and secure headlining to side roof rails.

9. Recheck for any "fullness" or "draws" in headlining material and permanently tack headlining at windshield, back window and rear quarter areas.

10. Permanently tack or staple headlining at side roof rails on 32-3547 and 3829 styles. (View K, Fig. 16-72 and 16-73) On 32-3569 and 3819 styles, use headlining inserting tool J-2772 and carefully tuck edges of headlining under pronged retainer along both side roof rails. (View C, Figs. 16-73 and 16-74) On 32-3539 styles, using headlining inserting tool, permanently install edge of headlining around side roof rail pinchweld and replace plastic retainer. (View D, Fig. 16-75)

11. Trim excess material from edge of headlining around entire perimeter.

12. Install all previously removed hardware and trim assemblies and remove protective coverings.

POLYURETHANE FOAM HEADLINING (3657, 3839, 3847 and 3947 Styles)

The headlining assembly consists of polyurethane foam sections cemented to foundation boards. Five sections of the headlining are used.

The headlining sections are secured in place by retainers formed to the contour of the roof panel. Plastic moldings are snapped over the retainers and cover the retainers and edges of the headlining sections.

When necessary, the headlining sections may be individually removed and replaced.

Removal (One or More Sections)

1. Place protective coverings over seat cushions and backs.

2. Remove side roof rail moldings. If removing front section of headlining, remove windshield upper and side garnish moldings, sunshade support assemblies and rear view mirror support. If removing rear section, remove back window garnish moldings and rear quarter trim assembly to gain access to headlining attaching location at side roof rail area. If center sections are removed, where required, remove dome lamps, coat hooks, and coat hook spacers if present.

3. With flat-bladed tool, carefully pry one end of plastic molding from retainer and remove. (View "F", Fig. 16-76) Remove plastic moldings from both retainers securing section of headlining being removed.

4. On "39" and "47" styles, carefully bend down metal tabs securing headlining section to side roof rails. (View "B", Fig. 16-76) On "57" styles, headlining is secured at side roof rails by side roof rail moldings. (View "F", Fig. 16-76)

5. When removing individual sections, use flat-bladed tool and carefully pry one edge of headlining section from retainer and remove from body.

6. If removing headlining section at back window, remove tacks securing section at back window opening.

7. When retainers are required to be removed, remove screws securing retainer to side roof rail. (View "F", Fig. 16-76) Retainer spacers are installed in the No. 2 and No. 3 retainers on "57" styles and in the No. 1 retainer on "39" and "47" styles. (View "C", Fig. 16-76)

Installation

1. If retainers were removed, make certain that retainer spacer shown in View "C" of Figure 16-76 is installed prior to installing retainers.

   NOTE: Retainers should be tight against roof panel deadener when installed. A slot in retainer at side roof rail attachment locations allows for adjustment.

2. Install headlining sections by positioning one edge in retainer and centering section in relation to other sections and side roof rails; then carefully snap remaining edge in other retainer. Where present, bend side roof rail tabs over headlining section. Snap plastic molding over retainers. On rear plastic

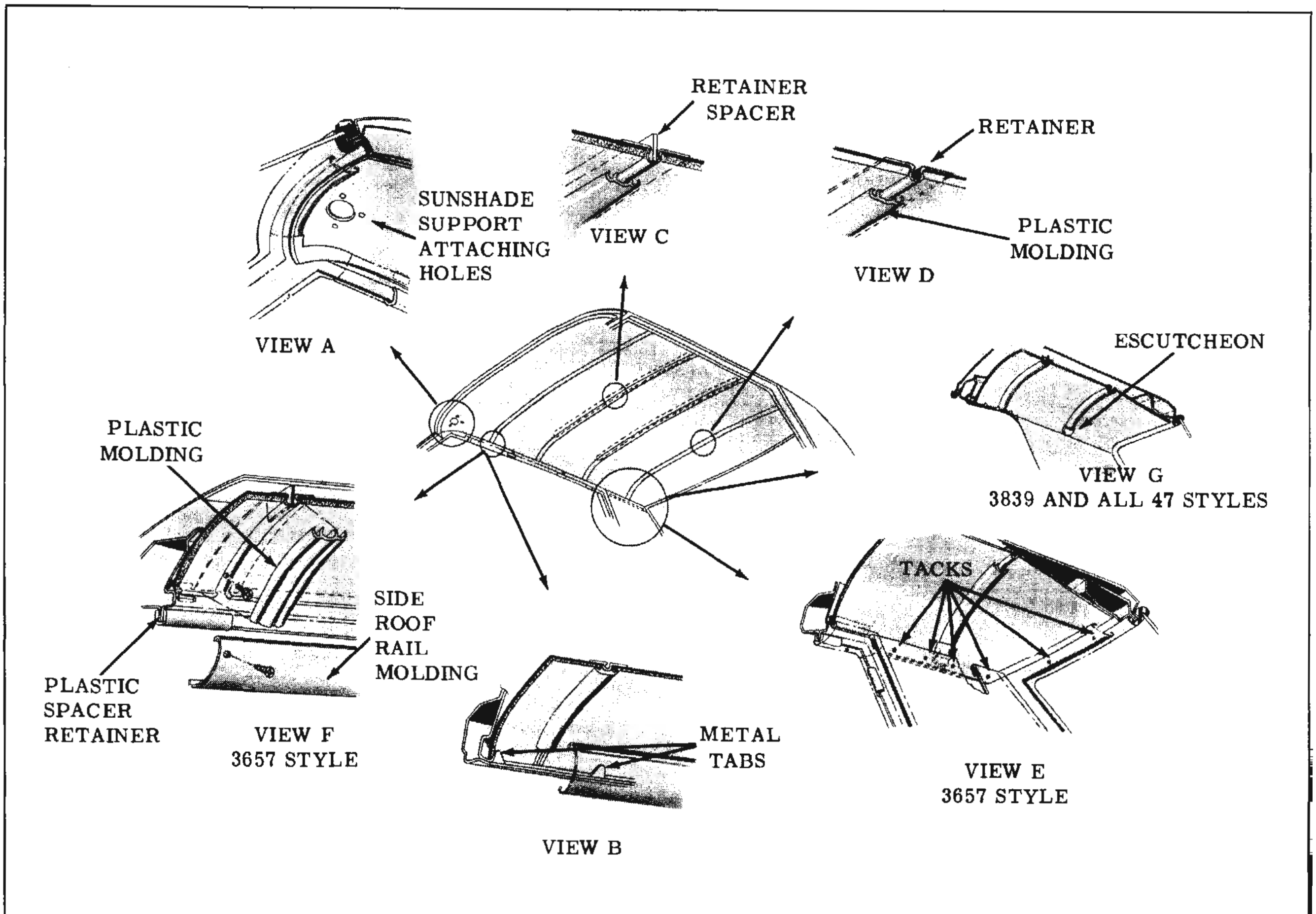


Fig. 16-76 Poly-Foam Headlining Installation

molding, install escutcheons on ends prior to installation. (View "G", Fig. 16-76)

3. If installing rear section of headlining assembly, position forward edge of section in retainer. Center and align section in relation to side roof rails and back window opening and stay tack section in place. Recheck alignment; then starting at center of back window area, permanently tack section to tacking strips at back window opening. (View "E", Fig. 16-76)

4. If installing front section of headlining assembly, position appropriate edge in retainer. Center headlining section in relation to other sections, side roof rails, and sunshade support attaching holes. (View "A", Fig. 16-76) Install sunshade supports. Where present, bend up tabs on side roof rails to retain headlining section.

   NOTE: Forward edge of front section and rearward edge of rear section are also secured in place by windshield or back window garnish moldings.

5. Install all previously removed hardware and remove protective coverings.

   NOTE: When installing side roof rail moldings on "57" styles, be certain edge of headlining section is covered by side roof rail molding.

FRONT SEATS (CONVENTIONAL)

FRONT SEAT ASSEMBLY (MANUALLY OPERATED)

Manually operated front seat adjusters provide fore and aft movement of the seat. When the knob at the left of the seat is pulled up, the seat adjusters unlock, permitting a horizontal travel of the seat. When the seat is in the desired position, the knob is released and the seat adjusters are locked.

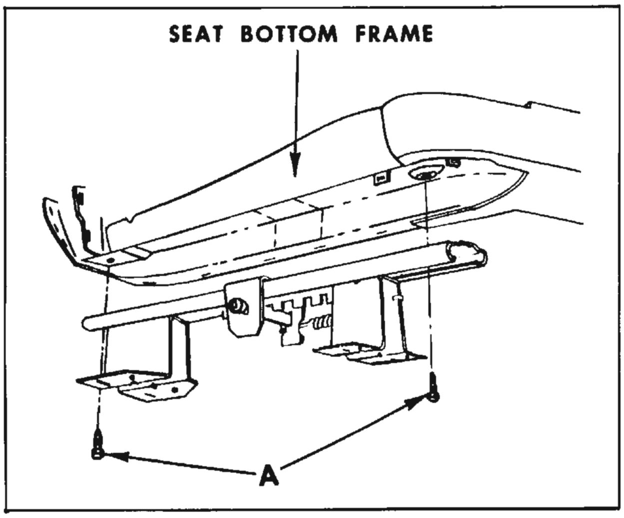


Fig. 16-77 Manually Operated Seat Adjuster

FRONT SEAT ASSEMBLY (WITH ATTACHED SEAT ADJUSTERS)

Removal and Installation

1. Turn back floor covering. Remove four adjuster-to-floor pan attaching bolts from each adjuster.
2. With the aid of a helper, remove seat assembly from body.
3. To install, reverse removal procedure.

FRONT SEAT ADJUSTER (MANUAL)

Removal and Installation

1. Remove seat assembly with attached seat adjusters from body and place upside down on a clean protected surface.
2. When removing left adjuster, it is necessary to remove the seat adjuster control knob.
3. Squeeze hooked end of seat adjuster locking wire together and slide retaining spring back over hump in locking wire, remove wire from retainer on seat bottom frame and disengage locking wire from seat adjuster.
4. Remove adjuster-to-seat bottom frame front and rear attaching bolts and remove seat adjuster from seat assembly. (Fig. 16-77)
5. To install, reverse removal procedure.
6. Check operation of seat assembly. If right adjuster does not lock or unlock satisfactorily when control handle on left adjuster is operated, remove locking wire retainer from hole in seat bottom frame and adjust retainer by selecting another hole to obtain proper tension in locking wire.

FRONT SEAT ASSEMBLY— TWO-WAY ELECTRIC (WITH ATTACHED ADJUSTERS)

The electrically operated two-way front seat assembly can be moved forward or rearward by means of a manually operated seat control switch.

Removal and Installation

1. Under front of seat, disconnect seat control switch wire harness from feed wire harness

and detach control switch harness from clip on floor pan.

2. Turn back floor covering and remove seat adjuster-to-floor pan attaching bolts from each adjuster. This will also disconnect ground wire.

3. Remove seat assembly with attached adjusters from body.

4. To install, reverse removal procedure. Make sure ground wire is installed under seat adjuster attaching bolt.

IMPORTANT: When installing seat assembly in body, seat adjusters should be parallel and "in phase" with each other. In the event the adjusters are "out of phase" (that is one adjuster reaches its full forward or rearward travel before the other adjuster), proceed as follows:

a. Operate seat control switch until one adjuster reaches full forward position. Detach horizontal drive cable from seat motor on side which has reached full forward position. Operate seat forward until other adjuster reaches full forward position; then, connect horizontal drive cable and check horizontal travel of seat.

FRONT SEAT ADJUSTERS (TWO-WAY ELECTRIC)

Removal and Installation

1. Remove front seat assembly with attached adjusters and place upside down on a clean protected surface.

2. Detach power drive cable from gear nut of adjuster to be removed. (Fig. 16-78)

3. Remove seat adjuster-to-seat bottom frame front and rear attaching bolts. (Fig. 16-78)

4. Remove adjuster from assembly.

5. To install, reverse removal procedure.

FRONT SEAT ADJUSTER GEAR NUT AND JACKSCREW ASSEMBLY (TWO-WAY ELECTRIC)

Removal and Installation

1. Remove front seat assembly with attached adjusters and place upside down on a clean, protected surface.

2. Detach power drive cable from gear nut and jackscrew assembly to be removed.

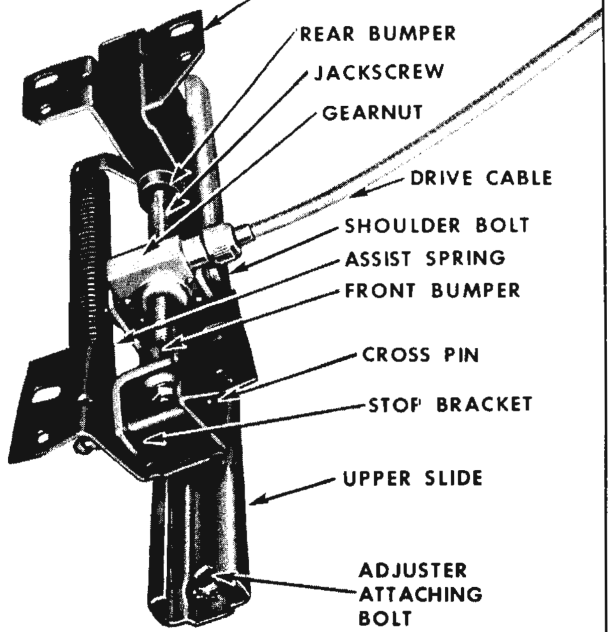


Fig. 16-78 Two Way Seat Adjuster

3. Using a "clutch" type screwdriver, remove two shoulder bolts securing gear nut to upper slide portion of seat adjuster assembly. (Fig. 16-78)

4. Remove retainer that secures stop bracket crosspin.

5. Remove gear nut and jackscrew assembly from seat adjuster assembly.

6. When installing new gear nut only, remove cotter pin, washers and rubber bumper from rear end of jackscrew and remove gear nut from jackscrew.

7. When installing new jackscrew only, remove nut, washers, rubber bumper and stop bracket with inserted rubber grommet from front end of jackscrew, as well as gear nut and washers, rubber bumper and cotter pin from rear end of jackscrew.

8. To install, reverse removal procedure.

FRONT SEAT ADJUSTER PLASTIC SHOES (TWO-WAY ELECTRIC)

Removal and Installation

1. Remove front seat adjuster to be serviced from front seat assembly.

2. Using a "clutch" type screwdriver, remove two shoulder bolts securing gear nut to upper slide portion of seat adjuster assembly. (Fig. 16-78)

3. Slide lower track and support base portion of seat adjuster, with attached jackscrew and gear nut, forward until it disengages from upper slide assembly. The four plastic shoes may now be disengaged from the positioning slots on the lower track.

4. To install, reverse removal procedure making sure that groove in plastic shoe slips onto the lower track with the thinner section of the shoe protruding above the surface of the track.

FRONT SEAT ADJUSTER ACTUATOR MOTOR (TWO-WAY ELECTRIC)

Removal and Installation

1. Remove front seat assembly.

2. Disconnect both power drive cables from actuator motor.

3. Remove two bolts that secure actuator motor support bracket to weld nuts at front of seat bottom frame and remove actuator motor with attached support bracket from seat assembly.

4. When installing new motor, disconnect motor-to-support bracket jumper ground wire from motor and transfer support bracket with inserted rubber grommets and attached jumper ground wire from old motor to new actuator motor.

5. To install, reverse removal procedure and check seat operation to extreme limit of fore and aft travel.

FRONT SEAT ASSEMBLY (FOUR-WAY TILT)

The seat adjusters are actuated by a 12 volt, reversible, shunt wound motor with a built-in circuit breaker. The motor is installed at the left side of the seat assembly. The seat motor is energized by a toggle-type control switch installed in the left seat side panel.

The seat adjuster operating mechanism incorporates a transmission assembly which includes two solenoids and four drive cables leading to the seat adjusters. One solenoid controls the vertical movement of the seat while the other solenoid controls the horizontal movement of the seat. When the control switch is actuated, the motor and one of the solenoids are energized simultaneously. Then the solenoid plunger engages with the driving gear dog. The driving gear rotates the drive cables and operates both adjusters. When the adjusters reach their limit of travel, the drive cables stop their rotating action and torque is absorbed by the rubber coupler connecting the motor and transmission. When the switch contacts are opened, a return spring returns the solenoid plunger to its original position disengaging it from the driving gear dog.

Removal and Installation

1. Under front of seat, disconnect seat control switch, cigar lighter and courtesy lamp wire harness (where present) from feed wire harness and detach control switch harness from clip on floor pan.

2. Remove both seat adjuster track covers; then turn back floor carpeting sufficiently to expose adjuster-to-floor pan attaching bolts.

3. Loosen adjuster-to-floor pan inner front attaching bolt; then, remove remaining adjuster-to-floor pan attaching bolts.

4. With aid of helper, carefully slide seat assembly forward until front adjuster pedestal is disengaged from inner front attaching bolt; then remove seat assembly with attached adjusters from body.

5. To install seat assembly, reverse removal procedure. Make sure ground wire is securely attached at left seat adjuster and under seat adjuster-to-floor pan attaching bolt.

   IMPORTANT: When installing seat assembly in body, seat adjusters should be parallel and "in phase" with each other. In the event the adjusters are "out of phase" (or one adjuster reaches its maximum horizontal or vertical travel in a given direction before the other adjuster) proceed as follows:

   a. Horizontal Travel - operate seat control switch until one adjuster reaches full forward position. Detach horizontal drive cable from adjuster which has reached full forward position. Operate seat forward until other adjuster reaches full forward position; then, connect horizontal drive cable and check horizontal travel of seat.

   b. Vertical Travel - operate seat control switch until one adjuster reaches fully raised position. Disconnect vertical drive cable from adjuster which has reached fully raised position. Operate seat upward until other adjuster has reached fully raised position; then, connect vertical drive cable and check vertical travel of seat.

FRONT SEAT ADJUSTER ASSEMBLY (FOUR-WAY TILT)

Removal and Installation

1. Operate seat assembly to fully raised and midway position.
2. Remove front seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
3. Detach the two power drive cables from adjuster to be removed.
4. Remove adjuster-to-seat bottom frame front and rear attaching bolts and remove adjuster from seat assembly.
5. To install seat adjuster assembly, reverse removal procedure. Black cable attaches to horizontal actuator.

   NOTE: Check operation of seat adjusters and make sure adjusters are "in phase". See Step No. 5 under FRONT SEAT ASSEMBLY - REMOVAL AND INSTALLATION.

FRONT SEAT ADJUSTER GEAR NUT (FOUR-WAY TILT)

Removal and Installation

1. Operate seat assembly to fully raised and midway position.
2. Remove front seat assembly from body and place upside down on a clean protected surface.
3. Remove vertical gear nut drive cable from opposite gear nut.
4. Using a clutch type screwdriver, remove shoulder screws securing linkage to vertical gear nut. (Fig. 16-79)
5. Using a portable power source, actuate vertical gear nut until gear nut is disengaged from jackscrew.

   NOTE: It may be necessary to manually raise or lower upper rear portion of adjuster to gain clearance for removal of gear nut.
6. Disconnect drive cable from gear nut.
7. To install, reverse removal procedure.

   NOTE: Check operation of seat adjusters and make sure adjusters are "in phase". See Step No. 5 under FRONT SEAT ASSEMBLY - REMOVAL AND INSTALLATION.

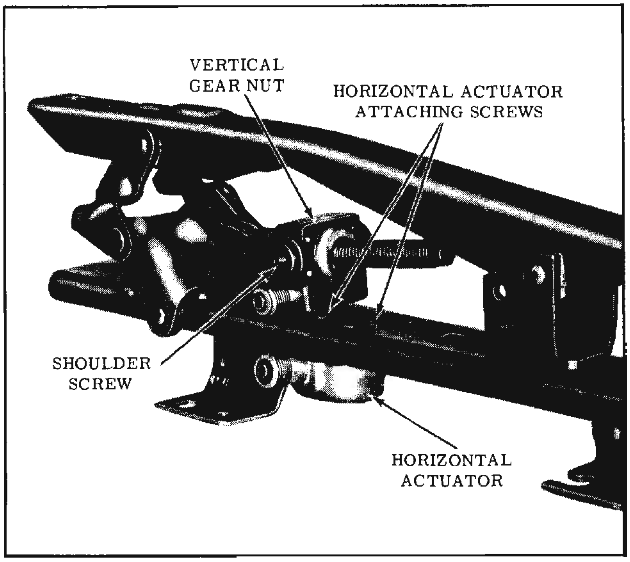


Fig. 16-79 Four-Way Tilt Seat Adjuster

FRONT SEAT ADJUSTER HORIZONTAL ACTUATOR ASSEMBLY (FOUR-WAY TILT)

Removal and Installation

1. Remove adjuster vertical gear nut.
2. Remove screws securing horizontal actuator assembly to adjuster lower track; then remove actuator from adjuster assembly. (Fig. 16-79)
3. To install, reverse removal procedure.

   NOTE: When installing horizontal actuator, adjust actuator so that drive gear is fully engaged with teeth on lower channel. When horizontal actuator attaching screws are tightened, there should be no free motion between upper and lower channels. Check operation of seat adjusters and make sure adjusters are "in phase". See Step No. 5 under FRONT SEAT ASSEMBLY - REMOVAL AND INSTALLATION.

FRONT SEAT ADJUSTER JACKSCREW (FOUR-WAY TILT)

Removal and Installation

1. Remove adjuster vertical gear nut.
2. Remove seat adjuster-to-seat bottom frame front and rear attaching bolts on side affected.
3. As a bench operation, remove jackscrew-to-adjuster linkage attaching rivet and remove jackscrew from adjuster assembly. (Fig. 16-80)

   NOTE: It may be necessary to manually

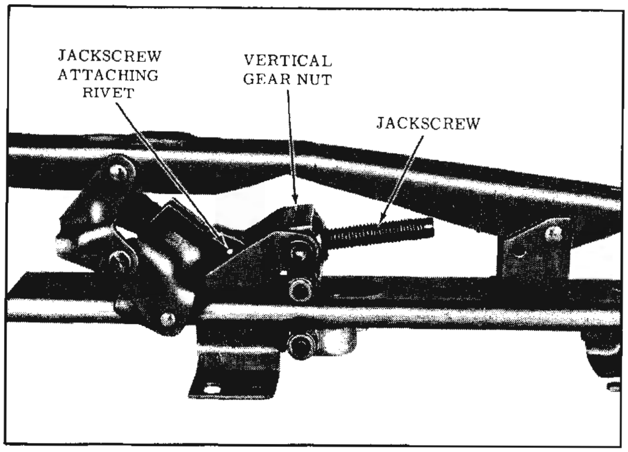


Fig. 16-80 Four-Way Tilt Seat Adjuster

raise or lower upper rear portion of adjuster to gain access to jackscrew attaching rivet.

4. To install, reverse removal procedure. Check operation of seat adjusters and make sure adjusters are "in phase". See Step No. 5 under FRONT SEAT ASSEMBLY - REMOVAL AND INSTALLATION.

FRONT SEAT ADJUSTER ELECTRIC MOTOR (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly.
2. Disconnect wire harness from motor relay and transmission assembly.
3. Remove screws securing motor and transmission support to seat bottom frame.
4. Remove motor-to-motor support attaching screws and remove motor assembly from support.
5. To install, reverse removal procedure making sure rubber coupler is properly engaged at both motor and transmission ends.

FRONT SEAT ADJUSTER HORIZONTAL AND VERTICAL CABLES (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
2. Detach both horizontal and vertical cables from seat adjuster.
3. Remove screws securing horizontal and vertical cable end plate on side of transmission from which cables are being removed and remove cables from seat assembly. (Fig. 16-81)
4. To remove one cable from end plate for service replacement, place end plate in a vise and with a suitable tool, remove knock-out plug located adjacent to cable hole. This will allow cable to be removed from end plate and a new service replacement cable installed.
5. To install horizontal and vertical cable, reverse removal procedure.

FRONT SEAT ADJUSTER TRANSMISSION (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
2. Disconnect wire harness connector from transmission. (Fig. 16-81)
3. Remove screws securing horizontal and vertical cable end plate on both sides of transmission and detach cables from transmission.
4. Remove transmission to support attaching bolts; then, disengage transmission from rubber coupler and remove transmission from seat assembly.
5. To install, reverse removal procedure.

Disassembly and Assembly of Transmission

1. Remove front seat adjuster transmission from seat assembly.
2. Remove screws securing gear and solenoid housings together; then, carefully separate housings and remove component parts of transmission assembly. (Fig. 16-82)
3. To assemble transmission, reverse removal procedure.

IMPORTANT: Prior to or during installation, lubricate frictional surfaces of driving gear thrust washer, gears, dog washers, shaft and solenoid plungers with "Lubriplate".

FRONT SEAT ASSEMBLY (SIX-WAY)

The electrically-operated six-way front seat

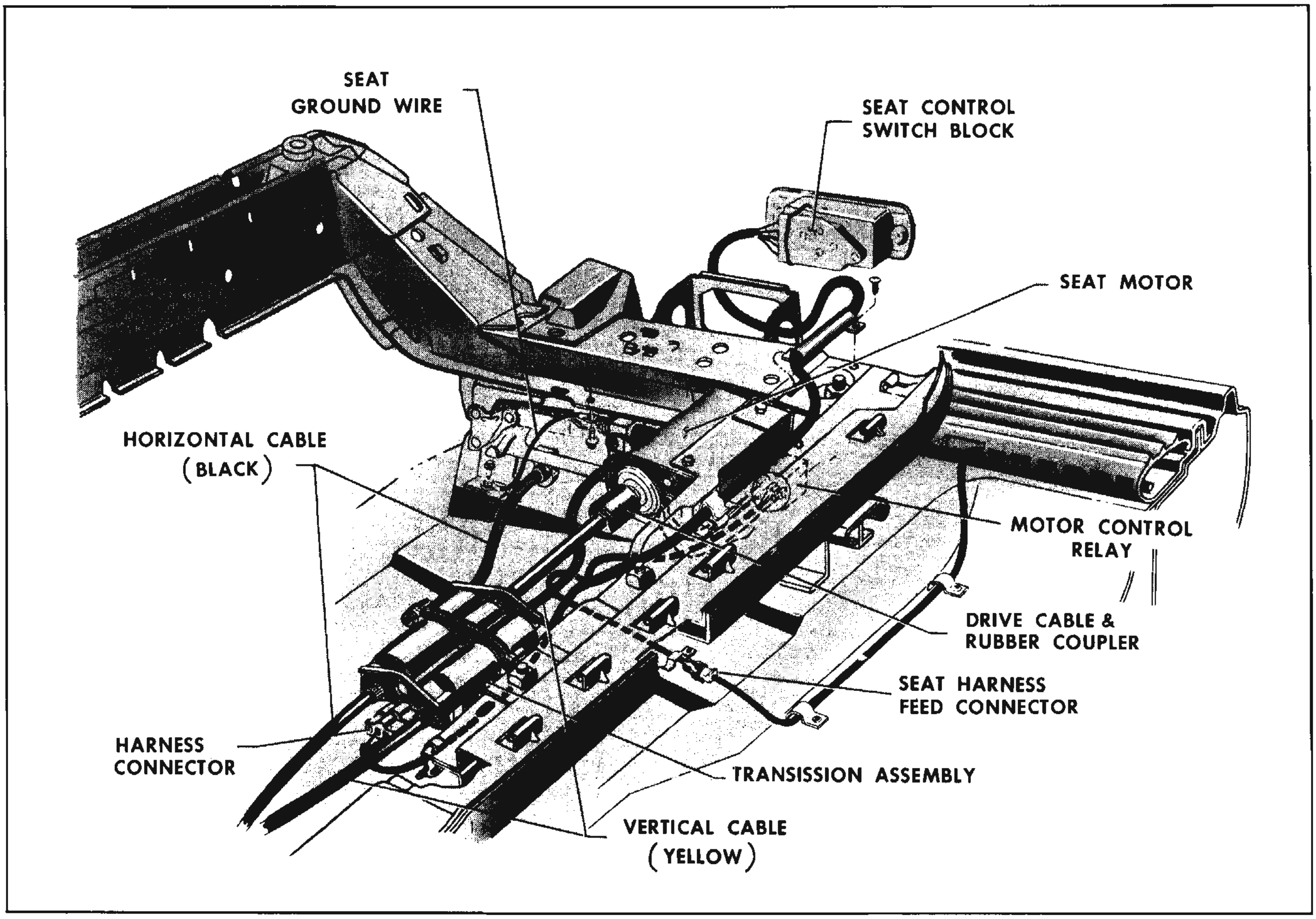


Fig. 16-81 Four-Way Seat Frame (Bench Type)

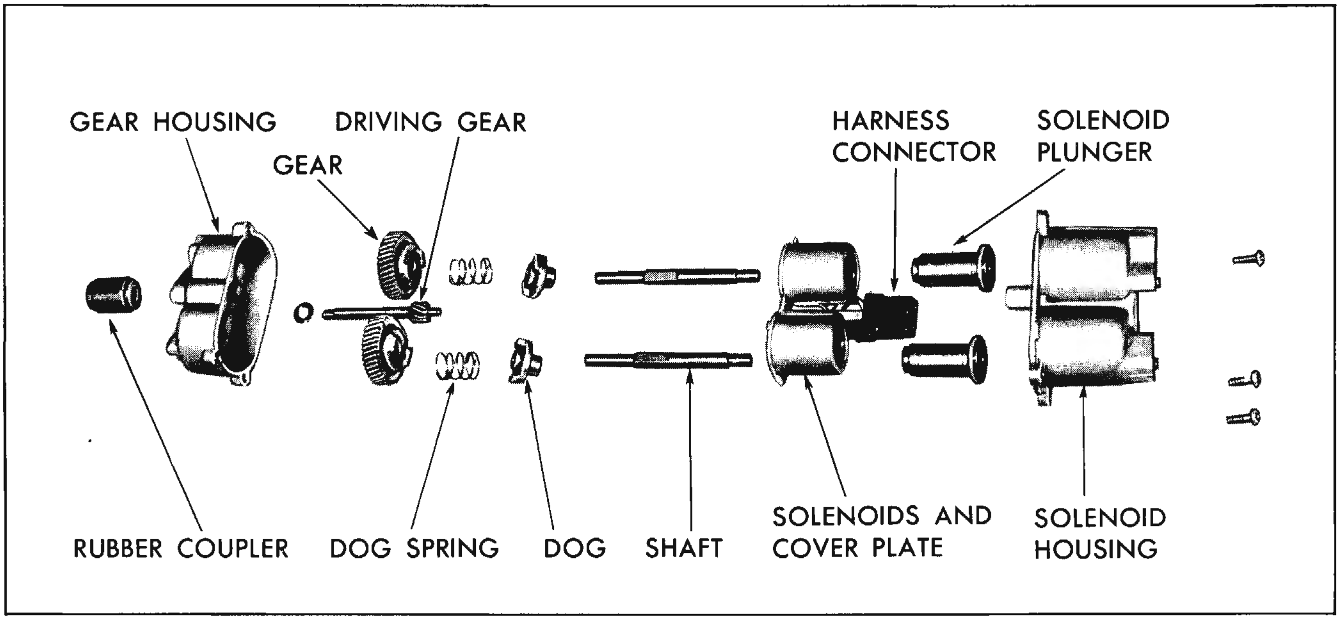


Fig. 16-82 Four-Way Seat Transmission

assembly can be moved forward, rearward, upward, downward or tilted by means of a manually-operated seat control switch. The large center control knob controls movement of the entire seat assembly horizontally. The smaller forward control knob controls the vertical movements of the front of the seat assembly causing the seat assembly to "tilt". In the same manner, the rear control knob controls vertical movement of the rear of the seat assembly. To obtain maximum

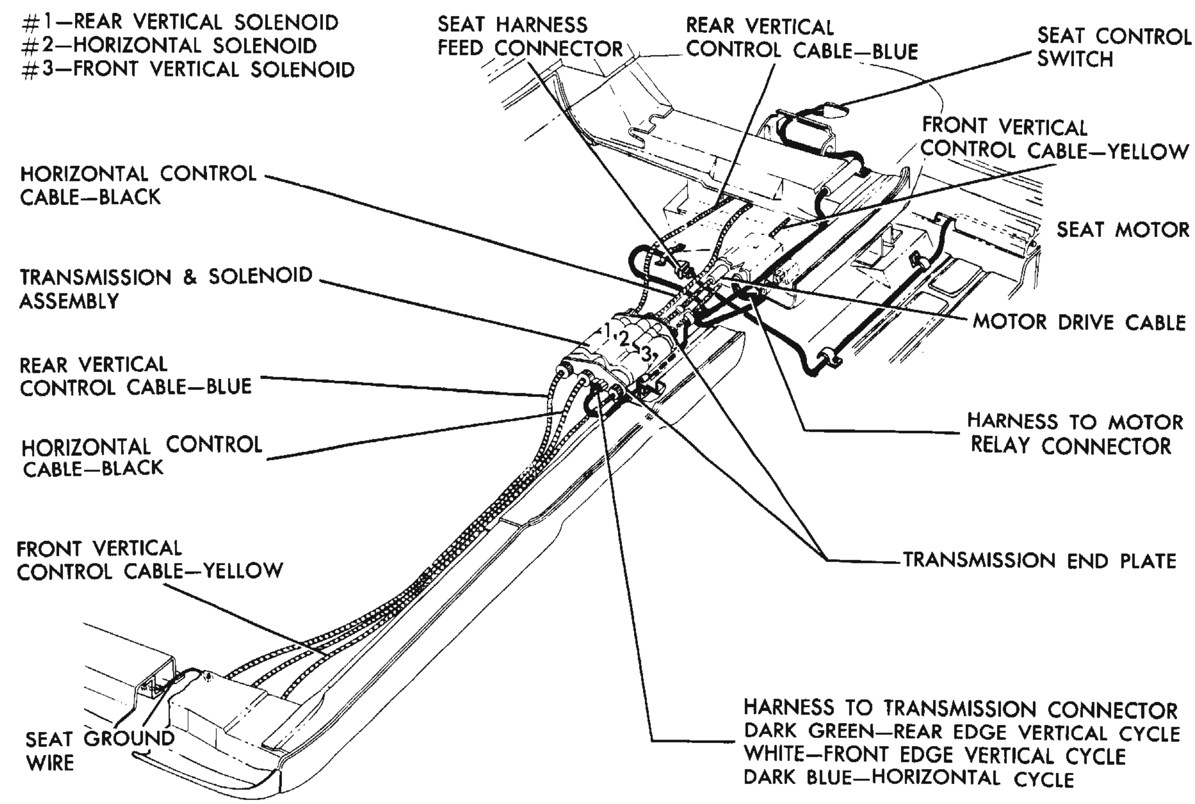


Fig. 16-83 Six-Way Seat Installation

vertical travel, it will be necessary to engage the center vertical control until the limit of travel is reached, then engage the smaller forward or rear control knob to complete the maximum travel. This is necessary due to the removal of the slip clutches in the seat transmission. This seat adjuster operating mechanism incorporates a transmission assembly which includes three solenoids and six drive cables leading to the seat adjusters.

Solenoid No. 1 (Fig. 16-83) controls the vertical movement of the rear edge of the seat. Solenoid No. 2 controls the horizontal movement of the rear edge of the seat. Solenoid No. 3 controls the vertical movement of the front edge of the seat. In addition to the six-seat adjuster drive cables at the transmission assembly, a motor drive cable is installed from the motor to the transmission assembly. When one of the control switch buttons is actuated, the motor and one of the solenoids are energized simultaneously. The solenoid plunger engages the large gears with a driving gear. The driving gear rotates the large gears which rotates the drive cables and operates both adjusters. When the switch contacts are opened, a spring returns the solenoid plunger to its original position, disengaging the large gears from the driving gear.

Removal and Installation

1. Under front of seat, disconnect seat wire harness from feed wire harness and detach control switch harness from clip on floor pan.
2. Turn back floor carpeting, remove both seat adjuster track covers and remove four seat adjuster-to-floor pan attaching bolts from each adjuster. Remove carpet retainers at front of seat adjusters.
3. With aid of a helper, remove seat assembly with attached adjusters, motor and transmission assembly from body.
4. To install seat assembly, reverse removal procedure. Make sure ground wire is securely attached at right seat adjuster and under seat adjuster-to-floor pan attaching bolt.

FRONT SEAT ADJUSTER ASSEMBLY (SIX-WAY)

Removal and Installation

1. Remove front seat assembly from body with attached adjusters, motor and transmission, and place upside down on a clean protected surface.

2. Detach the three power drive cables from adjuster to be removed.

3. Remove adjuster-to-seat bottom frame front and rear attaching bolts and remove adjuster from seat assembly.

4. To install seat adjuster assembly, reverse removal procedure. Black cable attaches to horizontal actuator; yellow cable to front vertical gear nut and blue cable to rear vertical gear nut.

   IMPORTANT: When installing seat assembly in body, seat adjusters should be parallel and "in phase" with each other. In the event the adjusters are "out of phase" (that is, one adjuster reaches its maximum horizontal or vertical travel in a given direction before the other adjuster), proceed as follows:

   a. Horizontal Travel - operate seat control switch until one adjuster reaches full forward position. Detach horizontal drive cable from adjuster which has reached full forward position. Operate seat forward until other adjuster reaches full forward position; then, connect horizontal drive cable and check horizontal travel of seat.

   b. Front and Rear Vertical Travel - operate seat control switch until one adjuster reaches fully raised position. Disconnect vertical drive cable from adjuster which has reached the full up position. Operate seat upward until other adjuster has reached the full up position; then, connect the vertical drive cable and check vertical travel of seat.

FRONT SEAT ADJUSTER VERTICAL JACKSCREW, GEAR NUTS AND SPRINGS (SIX-WAY)

Removal and Installation

1. Remove seat assembly from body.

2. Remove seat adjuster from side on which jackscrew is to be removed.

3. Using clutch-type screwdriver, remove shoulder screws securing linkages to vertical gear nuts. (Fig. 16-84)

4. Insert a No. 1 crosshead screwdriver into drive cable slot in rear vertical gear nut and actuate gear nut rearward. Actuate front vertical gear nut rearward to release tension from front assist spring.

5. Remove jackscrew front attaching nut.

6. Lift front end of jackscrew to disengage it from support and remove front assist spring and silencer.

7. Actuate front and rear gear nuts forward to release tension from rear assist spring.

8. Remove rear attaching nut from jackscrew.

9. Disengage rear end of jackscrew from support and remove jackscrew with gear nuts and spring from adjuster. Rear assist spring and silencer may now be removed from jackscrew. (Fig. 16-85)

10. To remove vertical gear nuts, turn or actuate gear nuts off jackscrew.

11. To install, reverse removal procedure making sure jackscrew is installed with unthreaded shoulder at rear of adjuster and with gear nuts installed. Rear vertical gear nut with larger diameter cable attachment is installed to rear; front vertical gear nut with smaller diameter cable attachment is installed at front. Both vertical gear nuts should have cable attachment at bottom of inner side of adjuster.

FRONT SEAT ADJUSTER HORIZONTAL ACTUATOR OR UPPER AND LOWER CHANNELS (SIX-WAY)

Removal and Installation

1. Remove front seat adjuster.

2. Remove screws securing horizontal actuator and remove actuator from seat adjuster.

3. Slide seat adjuster lower channel from upper channel and, if required, remove plastic shoes from lower channel track.

4. To install, reverse removal procedure. If lower channel has been removed from upper channel, make sure all four plastic shoes are installed on lower track. Apply "Lubriplate" or equivalent to track portion of upper channel and to teeth on lower channel. When installing horizontal actuator, adjust actuator so that drive gear is fully engaged with teeth on lower channel. When horizontal actuator screws are tightened, there should be no free motion between upper and lower channels.

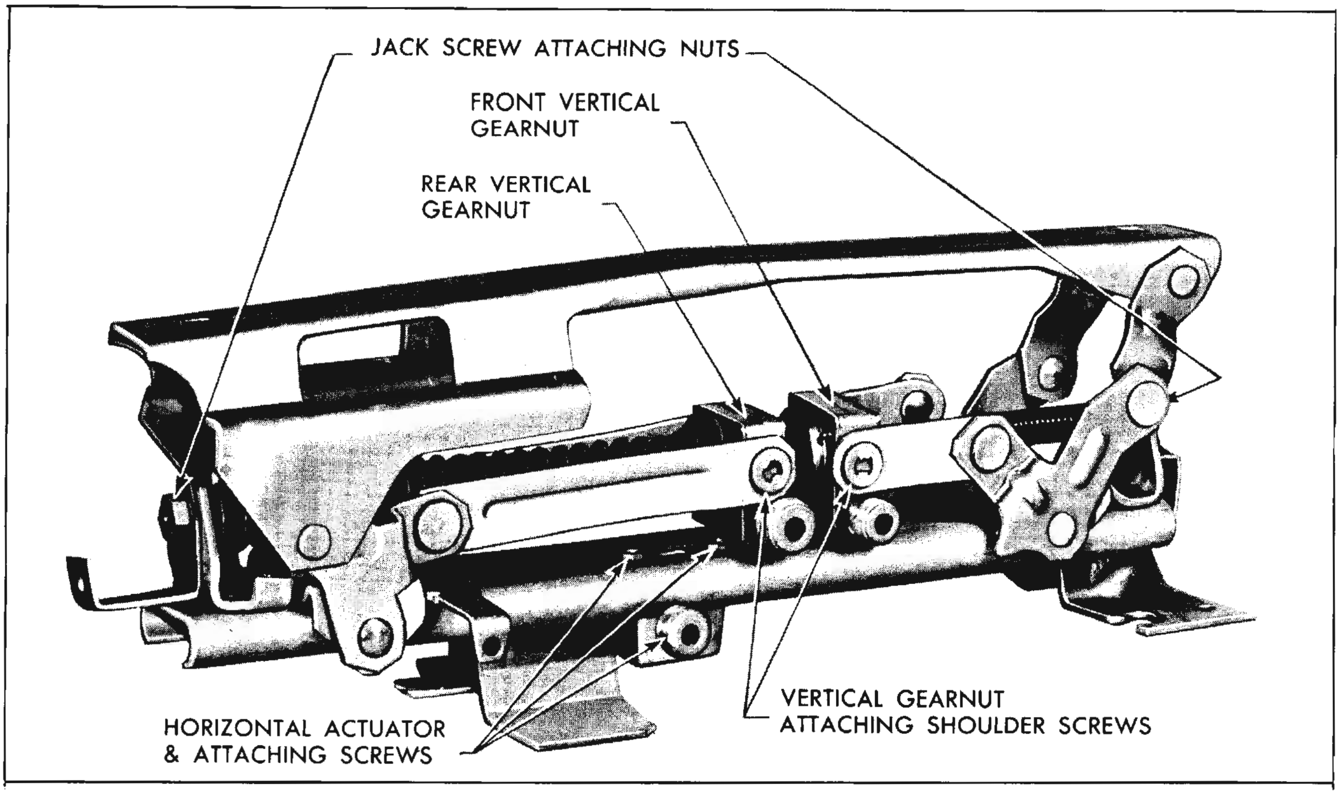


Fig. 16-84 Six-Way Seat Adjuster

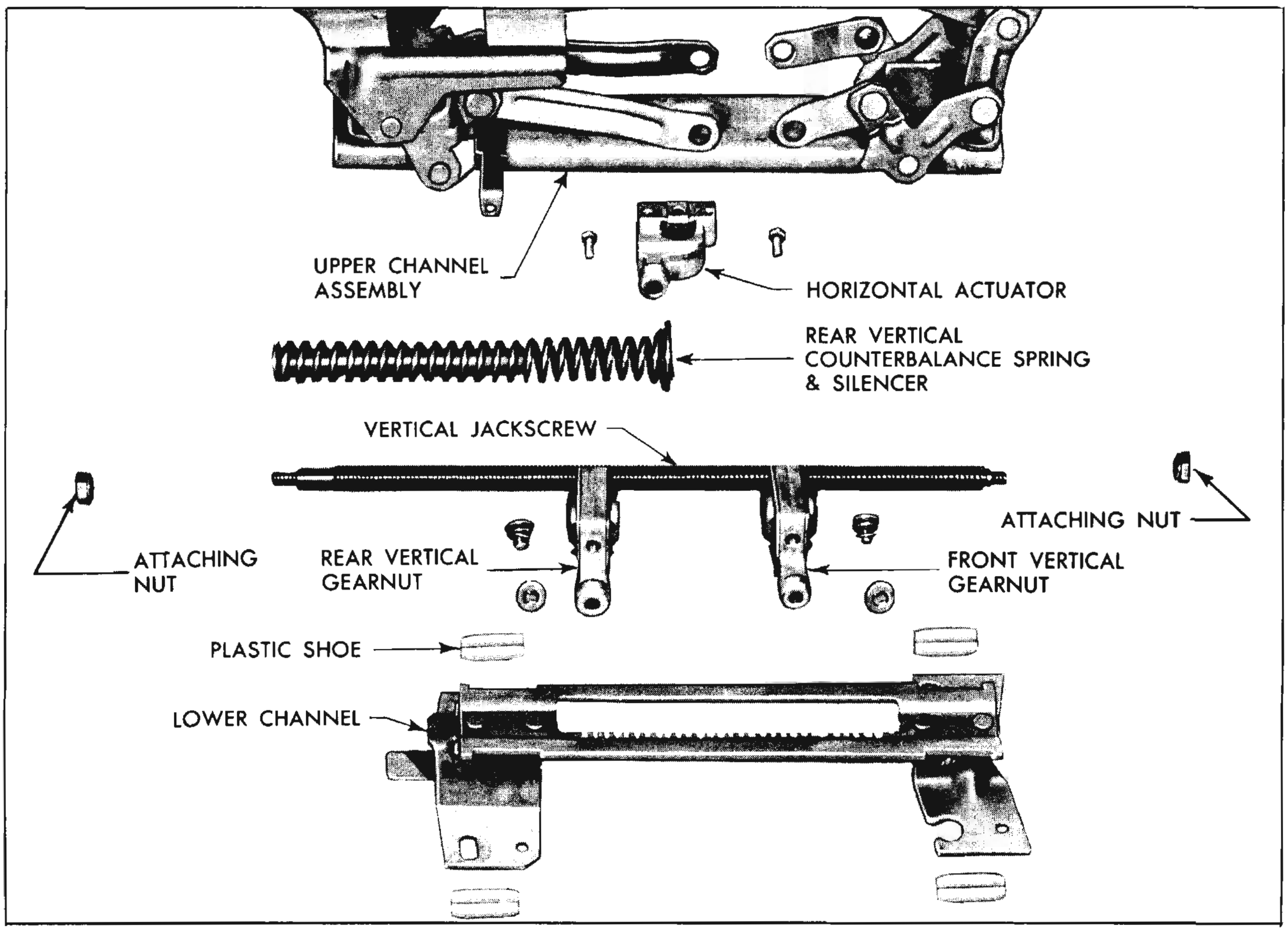


Fig. 16-85 Six-Way Seat Adjuster Assembly

FRONT SEAT ADJUSTER ELECTRIC MOTOR OR DRIVE CABLE (SIX-WAY)

Removal and Installation

1. Remove front seat assembly.
2. Remove motor support-to-seat frame attaching bolts.
3. Move motor assembly towards left side of seat sufficiently to disengage motor drive cable; then, remove motor from support assembly. Motor drive cable may be removed, if required, by removing cable end plate from transmission.
4. To install, reverse removal procedure making sure motor drive cable is properly engaged at both motor and transmission.

FRONT SEAT ADJUSTER HORIZONTAL AND VERTICAL DRIVE CABLES (SIX-WAY)

Removal and Installation

1. Remove front seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
2. Detach both horizontal and vertical cables from seat adjuster.
3. Remove screws securing horizontal and vertical cable end plate on side of transmission from which cables are being removed and remove cables from seat assembly; then disengage cables from end plate.
4. To install horizontal and vertical cables, reverse removal procedure. Make sure cables are installed to correct gear nuts. (Fig. 16-83)

FRONT SEAT ADJUSTER TRANSMISSION (SIX-WAY)

Removal and Installation

1. Remove front seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
2. Disconnect wire harness connector from transmission. (Fig. 16-83)
3. Remove screws securing horizontal and vertical cable end plate on both sides of transmission and detach cables from transmission.
4. Remove transmission to support attaching bolts; then disengage transmission from motor drive cable and remove transmission from seat assembly.
5. To install, reverse removal procedure.

Disassembly and Assembly

1. Remove front seat adjuster transmission from seat assembly.
2. Remove screw securing ground strap to solenoid housing and screws securing transmission support to gear and solenoid housings.
3. Remove screws securing gear housing to the solenoid housing; then, carefully separate housings and remove component parts of transmission assembly. (Fig. 16-86)
4. To assemble transmission, reverse removal procedure.

   IMPORTANT: Prior to or during installation, lubricate frictional surfaces of driving gear, thrust washer, large gears, dog washers, gear shaft and solenoid plungers with "Lubriplate" or equivalent.

FRONT SEATS (BUCKET TYPE)

All seat adjusters are bolted to the seat bottom frame; however, a combination of bolts and/or nuts are used to retain the adjusters to the floor pan assembly.

The four-way (tilt) seat adjusters are actuated by a 12 volt, reversible shunt wound motor with a built-in circuit breaker.

The seat adjuster operating mechanism incorporates a transmission assembly which includes two solenoids and two drive cables leading to the seat adjusters. One solenoid controls the vertical movement of the seat while the other solenoid controls the horizontal movement of the seat. When the control switch is actuated, the motor and one of the solenoids are energized simultaneously. Then the solenoid plunger engages with the driving gear dog. The driving gear rotates the drive cables and operates both adjusters. When the adjusters reach their limit of travel, the drive cables stop their rotating action and torque is absorbed by the rubber coupler connecting the motor and transmission. When the switch contacts are opened, a return spring returns the solenoid plunger to its original position disengaging it from the driving gear dog.

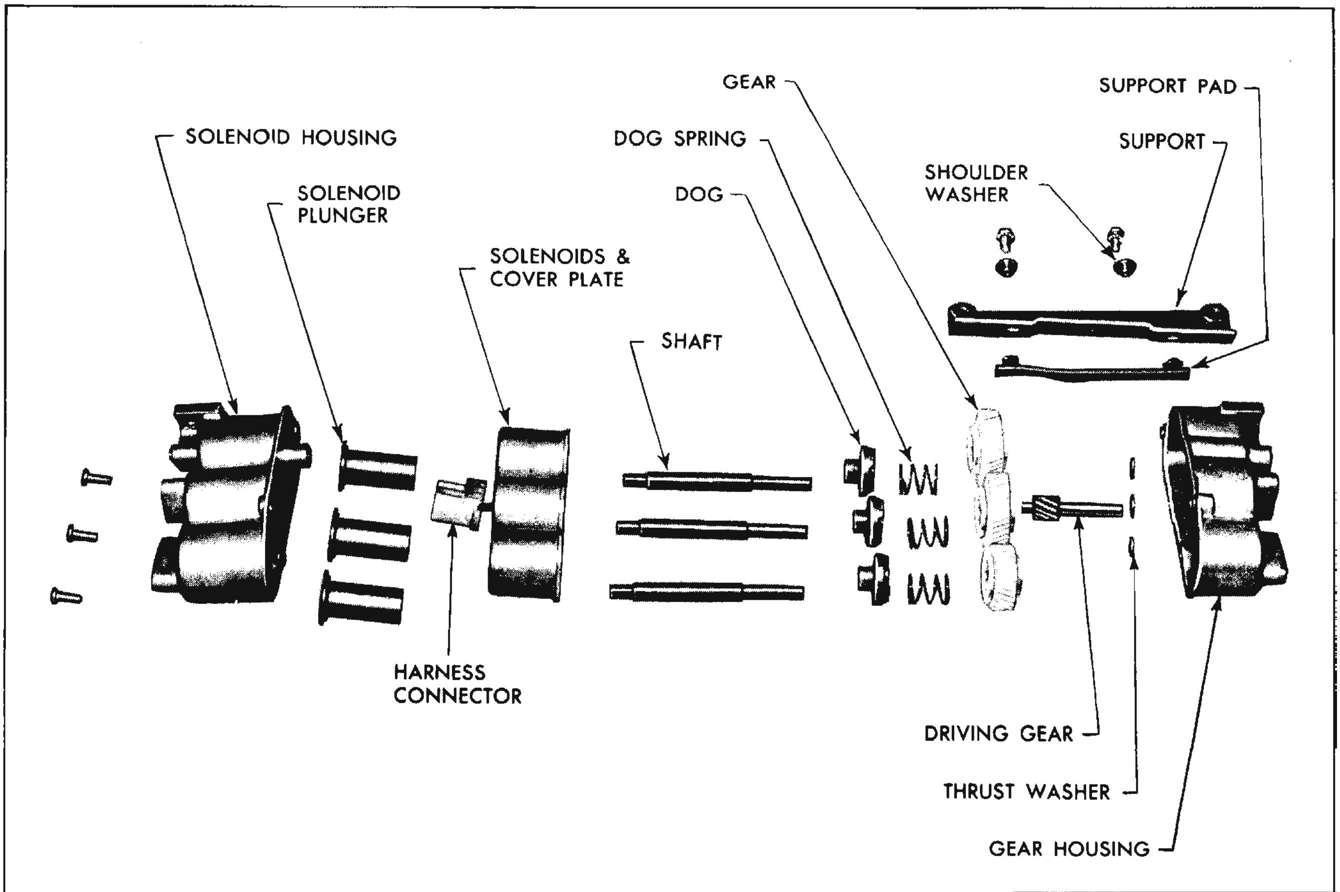


Fig. 16-86 Six-Way Seat Transmission Assembly

BUCKET TYPE FRONT SEAT ASSEMBLY (MANUAL OR POWER OPERATED)

Removal and Installation

1. Turn back floor carpeting sufficiently to expose seat adjuster-to-floor pan attaching nuts or bolts.
2. Operate seat assembly to rearward position and remove front attaching nuts.
3. Operate seat assembly to full forward position and remove adjuster to floor pan rear attaching nuts or bolts.
4. On styles equipped with power-operated seats, disconnect wiring harness from seat control switch and from actuator motor.
5. With aid of helper, remove seat assembly with attached adjusters from body.
6. To install, reverse removal procedure. Check seat adjusters for proper operation.

FRONT SEAT ADJUSTERS (MANUAL OR TWO-WAY ELECTRIC)

Removal and Installation

1. Remove front seat assembly and place upside down on a clean, protected surface.
2. If adjuster to be replaced is equipped with an assist spring, remove spring from adjuster.
3. Operate adjuster so that both front and rear attaching bolts are accessible.
4. If power-operated outboard adjuster is being replaced, disconnect power drive cable from adjuster gear nut.
5. Remove adjuster-to-seat bottom frame front and rear attaching bolts and remove adjuster from seat assembly.
6. To install, reverse removal procedure.

FRONT SEAT ADJUSTER ASSEMBLY (FOUR-WAY TILT)

Removal and Installation

1. Operate seat assembly to fully raised and midway horizontal position.
2. Remove bucket seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
3. If power-operated outboard adjuster is being

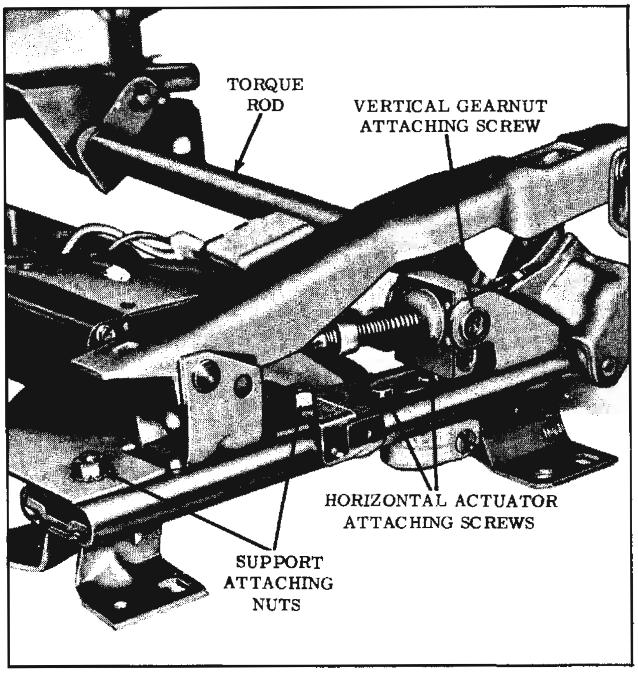


Fig. 16-87 Bucket Seat Adjuster (Outboard)

removed, disconnect power drive cable fron vertical gear nut and horizontal actuator.

4. Remove adjuster-to-seat bottom frame front and rear attaching bolts.
5. Remove nuts securing motor and transmission support to adjuster assembly (Fig. 16-87 for outboard adjuster and Fig. 16-88 for inboard adjuster).
6. Carefully disengage adjuster from support and torque tube assembly; then remove adjuster from seat.
7. To install, reverse removal procedure. Check seat adjusters for proper operation.

FRONT SEAT BACK ASSEMBLY

Removal and Installation

1. Using a flat-bladed tool, carefully remove

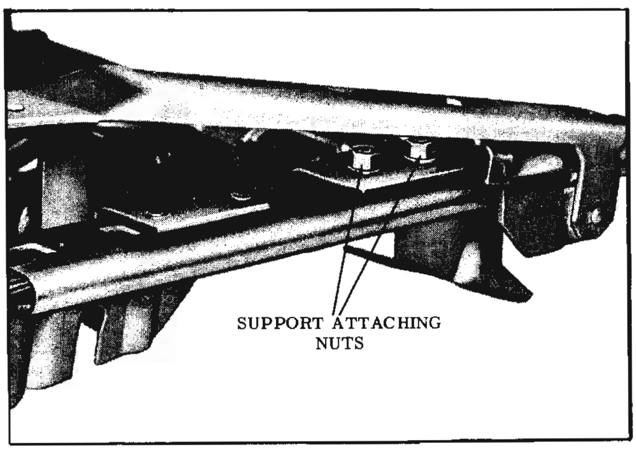


Fig. 16-88 Bucket Seat Adjuster (Inboard)

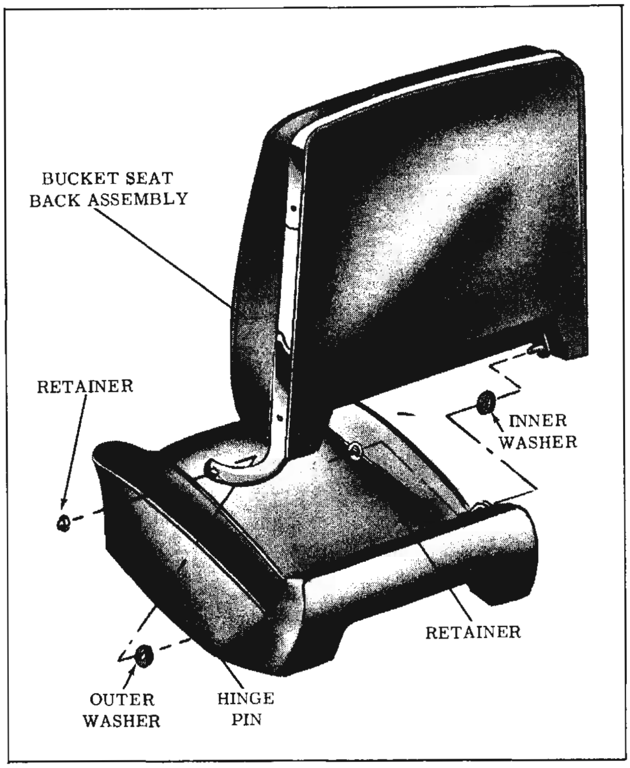


Fig. 16-89 Bucket Seat Back Removal

retainer from outer hinge pin. (Fig. 16-89)

2. Tilt seat back forward and remove retainer from inner hinge pin. (Fig. 16-89)
3. Carefully disengage front seat back outer hinge arm from pin.
4. Move entire seat back assembly inboard until inner hinge pin is disengaged from extension on seat assembly; then, remove seat back from body.
5. To install, reverse removal procedure. Prior to installation of back assembly, be sure inner and outer washers are installed over the hinge pins. (Fig. 16-89)

FRONT SEAT ADJUSTER GEAR NUT (FOUR-WAY TILT)

Removal and Installation

1. Operate seat assembly to fully raised and midway horizontal position.
2. Remove front seat assembly from body and place upside down on a clean protected surface.
3. Using a clutch type screwdriver, remove shoulder screws securing linkage to vertical gear nut. (Fig. 16-90)
4. Remove jackscrew "down" stop from jackscrew. (Fig. 16-90)

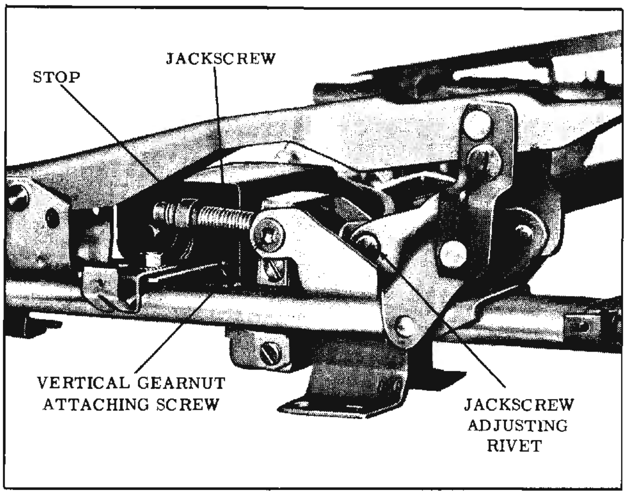


Fig. 16-90 Bucket Seat Adjuster (Outboard)

5. Using a portable power source, actuate vertical gear nut until gear nut is disengaged from jackscrew.

   NOTE: It may be necessary to manually raise or lower upper rear portion of adjuster to gain clearance for removal of gear nut.

6. Disconnect drive cable from gear nut.

7. To install, reverse removal procedure. Check seat adjusters for proper operation.

FRONT SEAT ADJUSTER JACKSCREW (FOUR-WAY TILT)

Removal and Installation

1. Remove adjuster gear nut.

2. Remove seat adjuster-to-seat bottom frame front and rear attaching bolts.

3. As a bench operation, remove jackscrew-to-adjuster linkage attaching rivet and remove jackscrew from adjuster assembly. (Fig. 16-90)

   NOTE: It may be necessary to manually raise or lower upper rear portion of adjuster to gain access to jackscrew attaching rivet.

4. To install, reverse removal procedure. Use new rivet (Part No. 5715154) to attach jackscrew-to-adjuster linkage. Check seat adjusters for proper operation.

FRONT SEAT ADJUSTER HORIZONTAL ACTUATOR ASSEMBLY (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body and place upside down on a clean protected surface.

2. Using a clutch type screwdriver, remove shoulder screws securing linkage to vertical gear nut. (Fig. 16-87)

3. Using a portable power source, actuate vertical gear nut until gear nut is against "down" stop on jackscrew assembly.

4. Disconnect drive cable from actuator assembly.

5. Remove screws securing horizontal actuator assembly to adjuster lower track; then, remove actuator from adjuster assembly. (Fig. 16-87)

6. To install, reverse removal procedure.

   NOTE: When installing horizontal actuator, adjust actuator so that drive gear is fully engaged with teeth on lower channel. When horizontal actuator attaching screws are tightened, there should be no free motion between upper and lower channels. Check seat adjusters for proper operation.

FRONT SEAT ADJUSTER ELECTRIC MOTOR (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly as previously described.

2. Disconnect wire harness from motor relay assembly.

3. Remove motor-to-motor support attaching screws and remove motor assembly from support.

4. To install, reverse removal procedure making sure rubber coupler is properly engaged at both motor and transmission ends.

FRONT SEAT ADJUSTER HORIZONTAL AND VERTICAL CABLES (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.

2. Detach both horizontal and vertical cables from seat adjuster.

3. Remove screws securing horizontal and vertical cable end plate on side of transmission

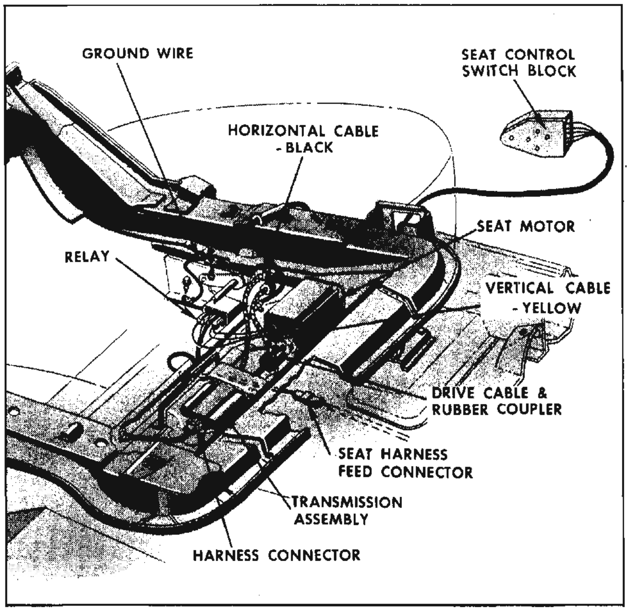


Fig. 16-91 Bucket Seat (Four-Way)

from which cables are being removed and remove cables from seat assembly. (Fig. 16-91)

4. To remove one cable from end plate for service replacement, place end plate in a vise and with a suitable tool, remove knock-out plug located adjacent to cable hole. This will allow cable to be removed from end plate and a new service replacement cable installed.
5. To install horizontal and vertical cable, reverse removal procedure.

FRONT SEAT ADJUSTER TRANSMISSION (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
2. Disconnect wire harness connector from transmission. (Fig. 16-91)
3. Remove screws securing horizontal and vertical cable end plate on both sides of transmission and detach cables from transmission.
4. Remove transmission to support attaching bolts; then, disengage transmission from rubber coupler and remove transmission from seat assembly.
5. To install, reverse removal procedure.

Disassembly and Assembly

1. Remove front seat adjuster transmission from seat assembly.
2. Remove screws securing gear and solenoid housings together; then, carefully separate housings and remove component parts of transmission assembly. (Fig. 16-92)
3. To assemble transmission, reverse removal procedure.

IMPORTANT: Prior to or during installation, lubricate frictional surfaces of driving gear thrust washer, gears, dog washers, shaft and solenoid plungers with "Lubriplate".

TORQUE TUBE ASSEMBLY) (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body and

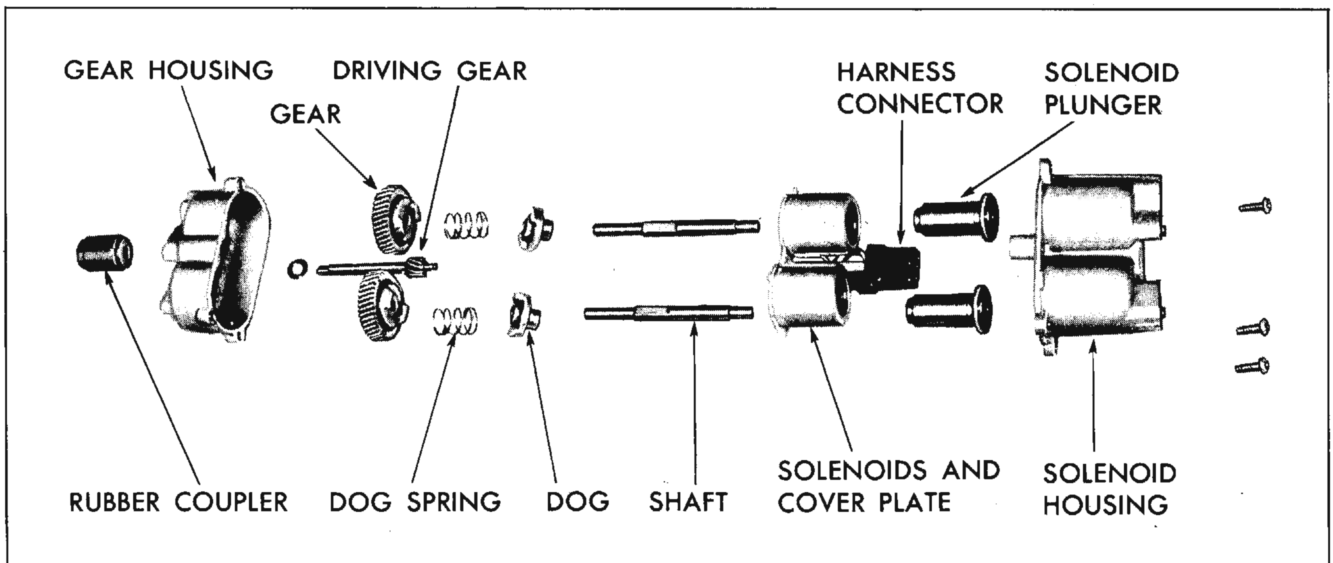


Fig. 16-92 Four-Way Seat Transmission

place upside down on a clean protected surface.

2. Remove adjuster to seat bottom frame front and rear attaching bolts.

3. Remove nuts securing motor and transmission support to inboard adjuster. (Fig. 16-88)

4. Carefully disengage adjuster from support and torque tube assembly; then, remove adjuster from seat.

5. Disengage torque tube from opposite adjuster and remove tube from seat assembly.

6. To install, reverse removal procedure. Check seat adjuster for proper operation.

MOTOR AND TRANSMISSION SUPPORT (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body and place upside down on a clean protected surface.

2. Remove nuts securing support to both adjusters. (See Fig. 16-87 for outboard adjuster and Fig. 16-88 for inboard adjuster).

3. Carefully remove support from adjusters with attached motor, transmission and relay assembly.

4. If replacing support, transfer motor, transmission and relay assembly to new part.

5. To install, reverse removal procedure. Check seat adjusters for proper operation.

MOTOR RELAY (FOUR-WAY TILT)

Removal and Installation

1. Remove front seat assembly from body and place upside down on a clean protected surface.

2. Disconnect motor-to-motor relay wire harness.

3. Remove nut securing relay to support and remove relay from seat assembly.

4. To install, reverse removal procedure.

BACK WINDOW ASSEMBLY

The back window, solid tempered safety plate glass, is retained in the back body opening by a conventional rubber channel that has one cavity to accept the glass and another cavity which "lips over" and accepts the back window opening pinchweld or retaining flange.

To remove the back window and rubber channel assembly, it is necessary to first remove the reveal moldings around the periphery of the back window.

BACK WINDOW REVEAL MOLDING RETENTION

The back window reveal moldings are retained by clips which snap over the back window pinchweld or retaining flange and engage, by means of barbed prongs, a flange on the molding, or, as in the case of the lower reveal molding on 32 and 35 series - "47" styles, another clip in the molding.

In addition to the pinchweld clip, the "19" and "29" styles utilize bolt and clip assemblies at several locations to aid in molding retention.

Figures 16-93 and 16-94 illustrate the manner in which the various types of attachment retain the molding.

Figure 16-93 also illustrates the tool to be used and the proper method for disengaging the molding from the pinchweld type clip.

Removal and Installation

With the exception of the lower reveal molding on 32 and 35 series - "47" styles, and the side and upper reveal moldings on "19" and "29" styles, the back window reveal moldings are retained entirely by pinchweld type clips. The procedure for removing a molding secured in this manner is described under PINCHWELD CLIP DISENGAGEMENT.

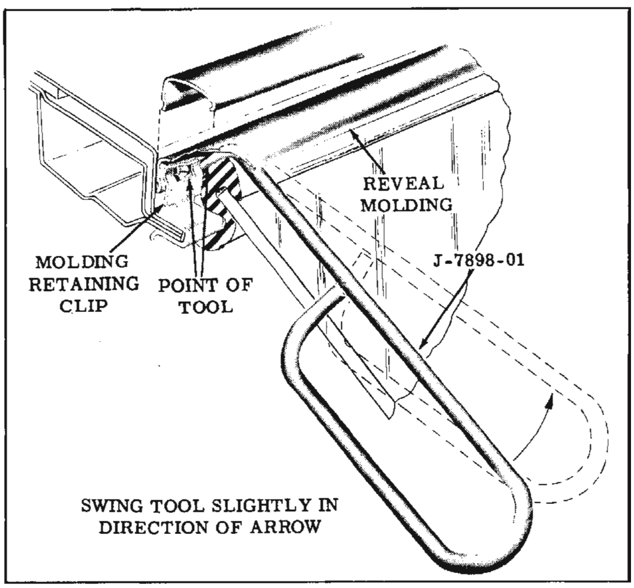


Fig. 16-93 Removing Back Window Reveal Molding

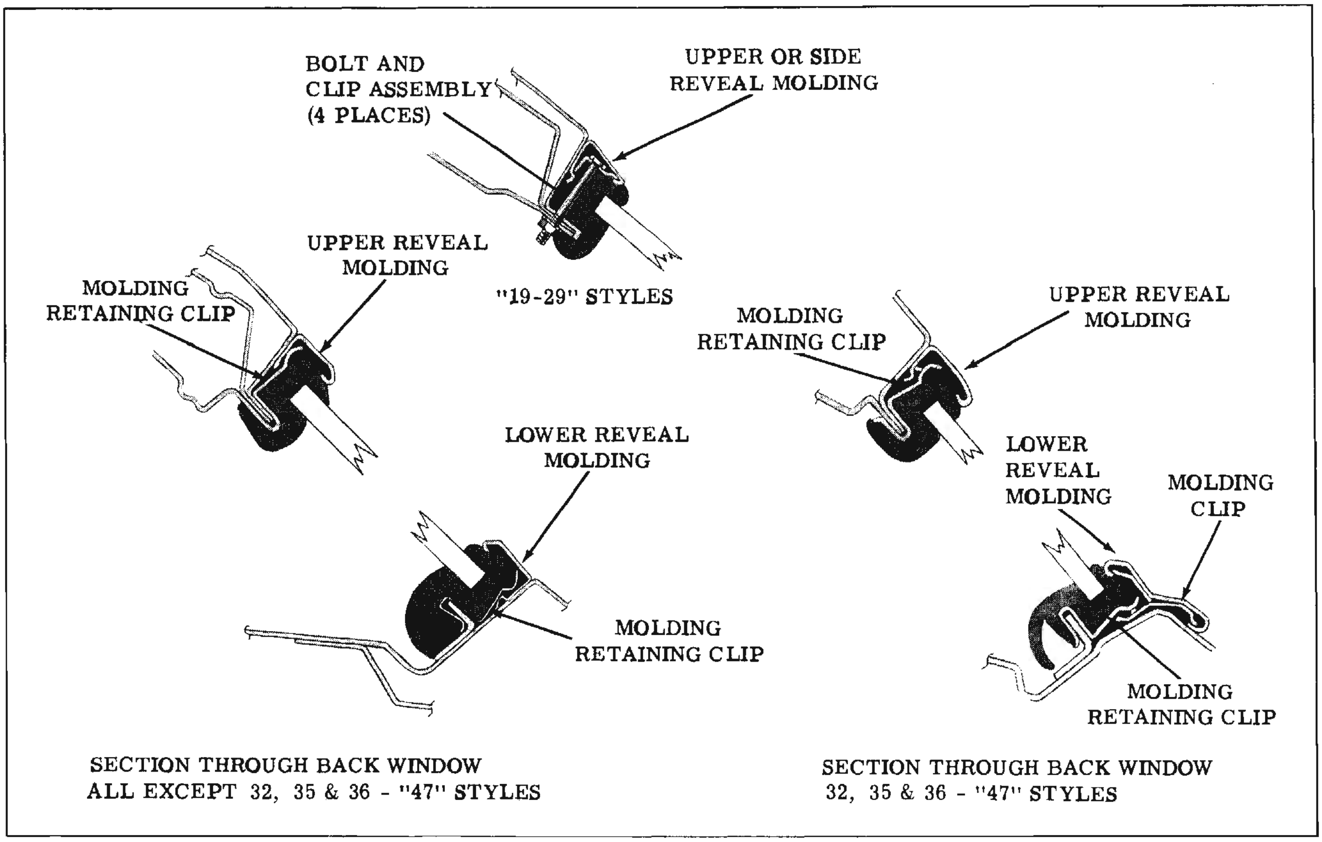


Fig. 16-94 Back Window Reveal Molding Retention

Pinchweld Clip Disengagement

Insert point of tool J-7898-01 between back window rubber channel and reveal molding. Slide tool along molding until a clip is contacted, then engage point of tool between retaining clip and molding. (Fig. 16-93) Swing tool slightly to disengage prongs of clip from molding and lift molding free of clip. Repeat this operation at each clip location.

NOTE: Do not lift excessively on molding. If clip is disengaged, molding will lift free of clip easily. If clip is not disengaged, any excessive lift on molding will cause prongs of clip to bite harder into molding making disengagement more difficult. If difficulty is being experienced in disengaging clip, push molding at clip location to relieve pressure of clip prongs while continuing efforts to disengage clip.

An occasional application of silicone lubricant to end of tool will help to slide tool between molding and rubber channel.

LOWER REVEAL MOLDING (3247 and 3547 Styles)

Removal and Installation

Remove belt reveal moldings as described in "Exterior Moldings". Using reveal molding tool J-7898-01, insert point of tool between molding and rubber channel and push or pull molding clip sideways to slide it out of engagement from pinchweld retaining clip. (Fig. 16-94). Perform this operation at each molding clip location and remove molding from body.

To install, first slide molding clips in molding so that they will be in position to engage retaining clips on body; then, position molding to body and engage clips.

SIDE AND UPPER REVEAL MOLDINGS ("19" and "29" Styles)

Removal and Installation

In addition to the pinchweld type clip the "19" and "29" styles use bolt and clip assemblies at the lower ends of the side reveal moldings and at the outer ends of the upper reveal moldings. Therefore, in order to remove any molding, the nut must be removed from at least one bolt and clip assembly. (Fig. 16-94) To remove all of the moldings, all of the nuts must be removed. These nuts are located under the inner lip of the back window rubber channel under the garnish moldings. When the desired bolt and clip assemblies have been freed, proceed to disengage the remainder of the molding from the pinchweld clips as described under PINCHWELD CLIP DISENGAGEMENT.

To install, reverse removal procedure. Make certain that bolt holes are sealed against water-leakage.

BACK WINDOW ASSEMBLY

Removal

1. Place protective coverings over rear seat cushion and seat back, over parcel shelf trim and over painted surfaces around back window. Remove back window garnish moldings.

2. Remove back window reveal moldings.

3. From inside body, carefully break seal between lip of rubber channel and pinchweld flange completely around back window.

4. Carefully push back window and rubber channel assembly outward until lip of rubber channel is disengaged from body pinchweld flange.

5. With the aid of a helper, lift complete assembly from body opening and place on a protected surface. Remove rubber channel from glass.

   IMPORTANT: Care should be exercised to make certain glass does not strike body metal during installation as edge chips can cause solid tempered safety plate glass to shatter. DO NOT attempt to grind glass.

Installation

1. Clean original sealer from back window body opening and rubber channel and install rubber channel to glass.

   IMPORTANT: Before installing back window glass, check the back window body opening and pinchweld flange for any irregularities and correct, where necessary.

2. Check installation of reveal molding clips at pinchweld and retaining flanges and replace clips, where necessary. If replacing clips, apply medium-bodied sealer to opening rabbet, prior to installing clips. ("1", View "A", Fig. 16-95)

3. Apply a continuous ribbon of medium-bodied sealer (approximately 1/2 inch wide by 1/4 inch thick) on wall of rabbet, completely around opening. ("2", Section "B-B", Fig. 16-95)

4. Insert a strong cord into pinchweld cavity of

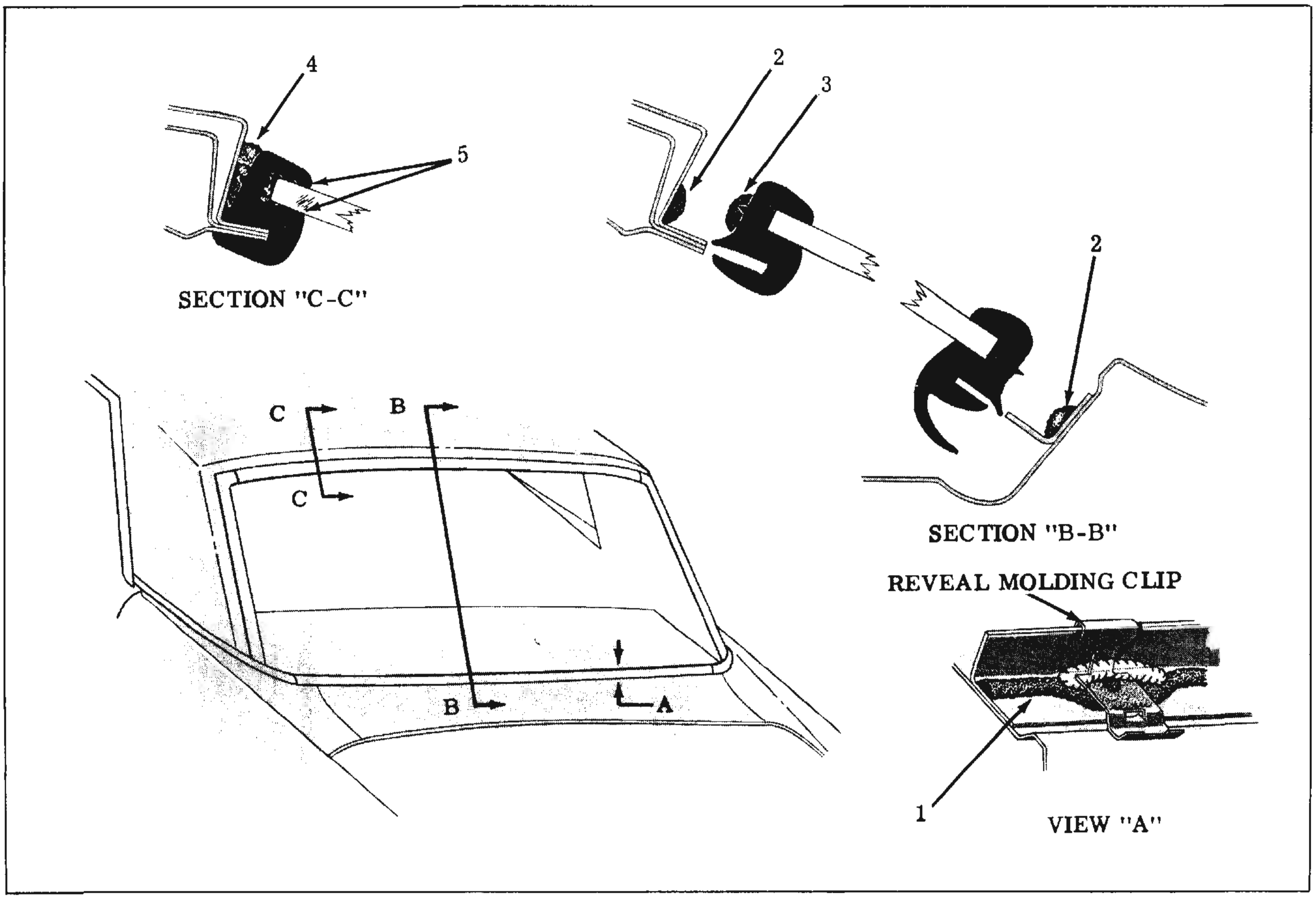


Fig. 16-95 Back Window Sealing

rubber channel; tie ends together at bottom center and tape to inside surface of glass.

5. Apply a continuous ribbon of medium-bodied sealer (approximately 1/2 inch wide by 1/4 inch thick) to base of rubber channel across top and down sides. ("3", Section "B-B", Fig. 16-95)

6. With aid of a helper, position back window assembly into body opening. While helper is applying hand pressure to outside surface of glass, use a hooked tool or other suitable tool to pull inner lip of rubber channel (located along lower portion of channel) over retaining flanges along bottom opening.

7. With aid of helper applying hand pressure to outside surface of glass, pull cords in rubber channel and, where necessary, use a hooked tool to seat lip of rubber channel over body flanges across bottom, up sides and across top of window opening.

   IMPORTANT: If, during the string-pulling operation, the rubber lip is not seating properly over the body flange, check for locations where rubber channel is tight against the body flange preventing forward movement of the glass and channel assembly into the opening. Using a hooked tool, seat the rubber lip over the body flange at any tight locations before proceeding with the cord pulling sequence.

8. Using a pressure-type applicator, apply sufficient medium-bodied sealer to completely fill any openings between rubber channel and body completely around rubber channel. ("4", Section "C-C", Fig. 16-95)

9. Using a pressure-type applicator, apply weatherstrip adhesive (black) between rubber channel and glass on inside and outside of glass around entire perimeter of glass. ("5", Section "C-C", Fig. 16-95) Application of adhesive should be continuous with no skips.

10. Install back window moldings as described under BACK WINDOW REVEAL MOLDINGS.

11. Clean off excess sealer and cement, install previously removed parts and remove protective coverings.

REAR COMPARTMENT

The rear compartment lid employs two torsion rods that are mounted between the lid and hinge assemblies to act as a counterbalance and hold-open for the lid. Notches at the hinge end of the rods allow for adjustment of the rods to increase or decrease operating effort of the lid.

The rear compartment lid lock employs a side-action snap-bolt mechanism that has provisions at the attaching locations for lateral adjustment. Up and down adjustment is available at the striker attaching locations.

All styles use a single section cement-on type weatherstrip which is cemented to the rear compartment gutter completely around the lid opening.

REAR COMPARTMENT LID

Removal and Installation

1. Open lid and place protective covering along edges of rear compartment opening to prevent damage to painted surface.

2. Disengage wire harness from clips on hinge and rear compartment lid inner panel and remove wire harness from lid where necessary.

3. Mark location of hinge straps on lid inner panel.

4. With aid of helper, remove lid attaching bolts (Fig. 16-96) and remove rear compartment lid.

5. To install rear compartment lid, reverse removal procedure. Align lid with scribe marks before tightening hinge attaching bolts.

Adjustments

1. To adjust compartment lid forward or rearward, or from side to side in body opening, loosen both hinge strap attaching bolts and adjust lid as required; then tighten bolts.

2. To adjust compartment lid at hinge area up or down, install shims between lid inner panel and hinge straps as follows:

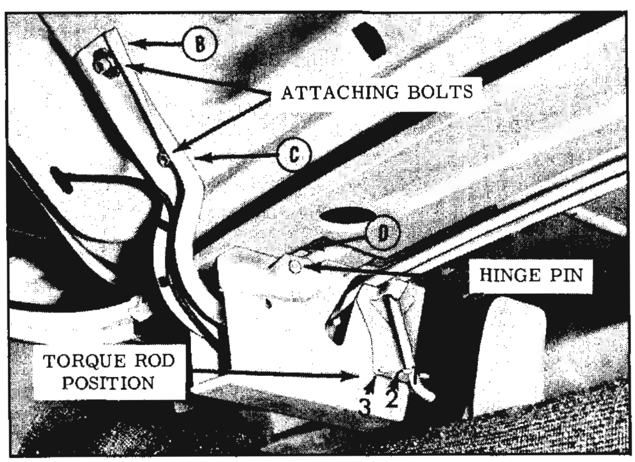


Fig. 16-96 Rear Compartment Hinge and Torque Rod

a. To raise front edge of lid at hinge area, place shim between lid inner panel and forward portion of one or both hinge straps at "C". (Fig. 16-96)

b. To lower front edge of lid at hinge area, place shim between lid inner panel and rearward portion of one or both hinge straps at "B". (Fig. 16-96)

3. To check lid lock bolt engagement with striker, see REAR COMPARTMENT LID LOCK STRIKER ENGAGEMENT CHECK.

REAR COMPARTMENT LID HINGE

Removal

1. Place protective covering over body around upper portion of rear compartment opening and provide support for lid on side where hinge is to be removed.

2. Remove rear compartment side trim foundation at hinge area if necessary. If left hinge is being removed, disengage wire harness from clip on left hinge.

3. Mark location of hinge strap on lid inner panel and remove bolts securing hinge strap to lid.

4. With a suitable tool, disengage torque rod from notched retainer on inboard face of opposite hinge box. (Fig. 16-96)

   NOTE: Mark retainer notch before removing torque rod to insure that rod is installed in same position.

5. Disengage opposite end of torque rod from movable portion of hinge strap and remove rod.

6. Bend up hinge pin retaining tab on inboard face of hinge box "D" (Fig. 16-96), remove hinge pin and then remove hinge from box.

Installation

1. Position hinge in hinge box and install hinge pin. Bend over retaining tab to secure hinge pin.

2. Position hinge strap within scribe marks on lid inner panel and install attaching bolts.

3. Install "U" shaped end of torque rod to hinge box making certain outer end of rod is engaged in hole in outboard face of hinge box.

4. Engage torque rod to lower movable portion of hinge and engage other end of rod to correct retaining notch in inboard face of opposite hinge box.

5. Check alignment of rear compartment lid and make any necessary adjustments.

6. Replace wire harness if left hinge were removed.

7. Replace all previously removed trim.

REAR COMPARTMENT TORQUE ROD ADJUSTMENT

The amount of effort required to open and close the rear compartment lid is determined by the position of the torque rod in the notches on the inboard face of the hinge boxes. If the torque rod is located in the lowest most forward notch (position #1), the amount of effort required to open the lid is the greatest and the amount of effort required to close the lid is the least. If the torque rod is located in the top or most rearward notch (position #3) the amount of effort to open the lid is the least and the amount of effort to close the lid is the greatest. (Fig. 16-96)

NOTE: It is not necessary to adjust the left and right hand torque rods at the same time or to the same final position (notch).

REAR COMPARTMENT LID LOCK CYLINDER

Removal and Installation

1. Open rear compartment lid and remove screws securing retainer to lock anchor plate.

2. Push or pull slotted retainer toward right side of body to disengage retainer from lock cylinder, then remove lock cylinder and gasket from rear end panel.

3. To install, reverse removal procedure.

REAR COMPARTMENT LID LOCK

Removal and Installation

1. Remove rear compartment lid lock cylinder.

2. Remove lid lock attaching screws and remove lock assembly from body. (Fig. 16-97)

3. To install, reverse removal procedure. Check lock for proper operation.

REAR COMPARTMENT LOCK STRIKER

Removal and Installation

1. Open rear compartment lid. Mark vertical position of striker by scribing line on striker at bottom of lid inner panel.

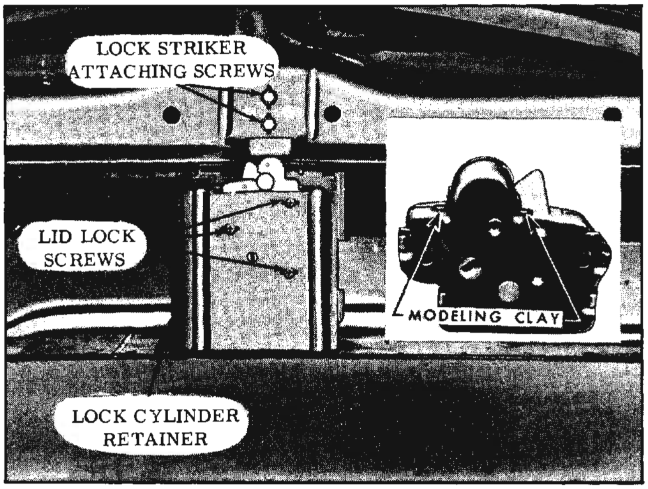


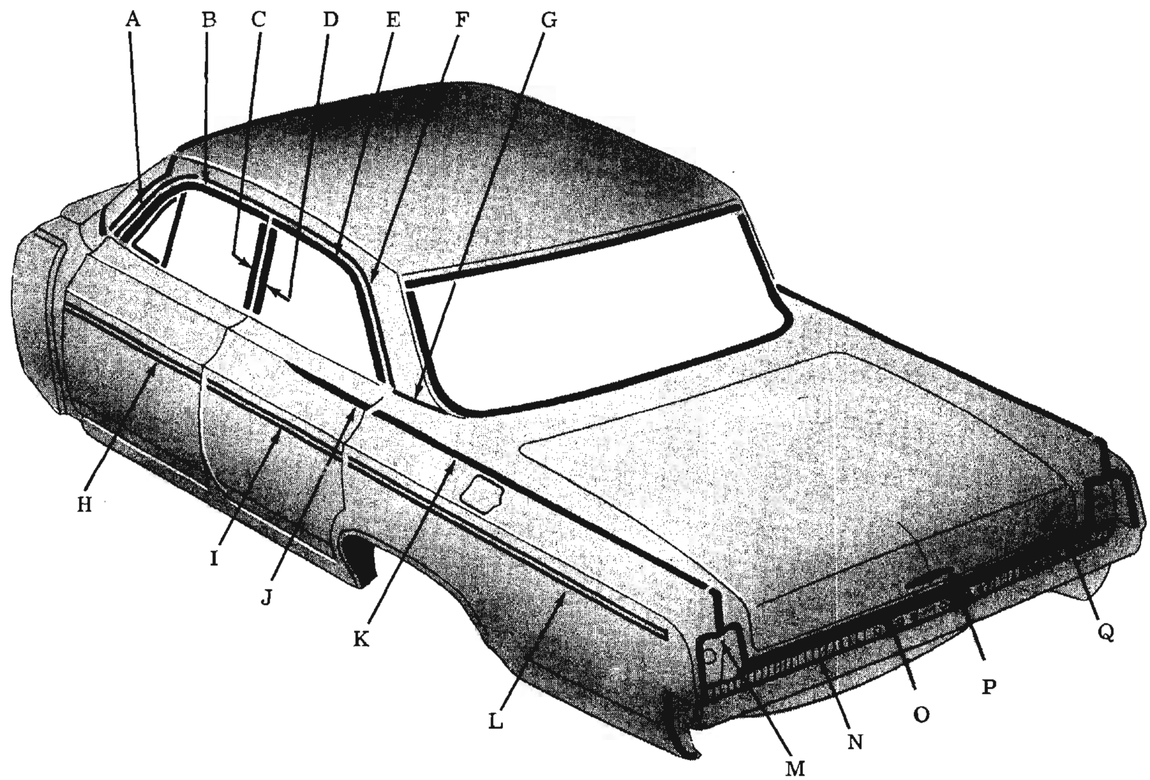
Fig. 16-97 Lid Lock and Striker

2. Remove striker attaching screws and remove striker. (Fig. 16-97)
3. To install, position striker within scribed marks. Install attaching screws and check striker for proper alignment.

Engagement

IMPORTANT: Since the rear compartment lock frame acts as a guide when entering the striker, make sure rear compartment lid is properly positioned in body opening before performing striker engagement check. To check for proper engagement of rear compartment lid lock bolt with striker:

a. Insert a small quantity of modeling clay on frame of lock at both sides of the lock bolt. (Figure 16-97) Close lid with moderate force.



A. WINDSHIELD PILLAR DRIP MOLDING SCALP
B. FRONT DOOR WINDOW FRAME UPPER SCALP MOLDING
C. FRONT DOOR WINDOW FRAME REAR VERTICAL SCALP MOLDING
D. REAR DOOR WINDOW FRAME FRONT VERTICAL SCALP MOLDING
E. REAR DOOR WINDOW FRAME UPPER SCALP MOLDING
F. ROOF DRIP MOLDING SCALP
G. QUARTER BELT REVEAL MOLDING
H. FRONT DOOR OUTER PANEL LOWER MOLDING
I. REAR DOOR OUTER PANEL LOWER MOLDING
J. REAR DOOR OUTER PANEL CROWN MOLDING
K. REAR FENDER CROWN MOLDING
L. REAR FENDER LOWER MOLDING
M. REAR OF REAR FENDER CROWN MOLDING
N. REAR END PANEL LOWER MOLDING
O. REAR END PANEL UPPER MOLDING
P. REAR COMPARTMENT LID OUTER PANEL EMBLEM
Q. REAR COMPARTMENT LID OUTER PANEL NAME PLATE

Fig. 16-98 Exterior Moldings (3569 Style)

b. Open lid and check amount of engagement of striker with lock frame as indicated by the compression of the clay. The striker bar impressions in the clay should be even on both sides of the lock frame.

c. Where required, loosen striker or lock attaching screws; adjust lock sideways or striker up or down to obtain proper engagement; then, tighten screws.

EXTERIOR MOLDINGS

The exterior moldings are identified in Figures 16-98, 16-99, 16-100 and 16-101. The moldings are secured to the body by any one or a combination of the following attachments:

a. attaching screws

b. bolt and clip assemblies with attaching nuts

c. integral studs with attaching nuts

d. bathtub-type snap-on clips

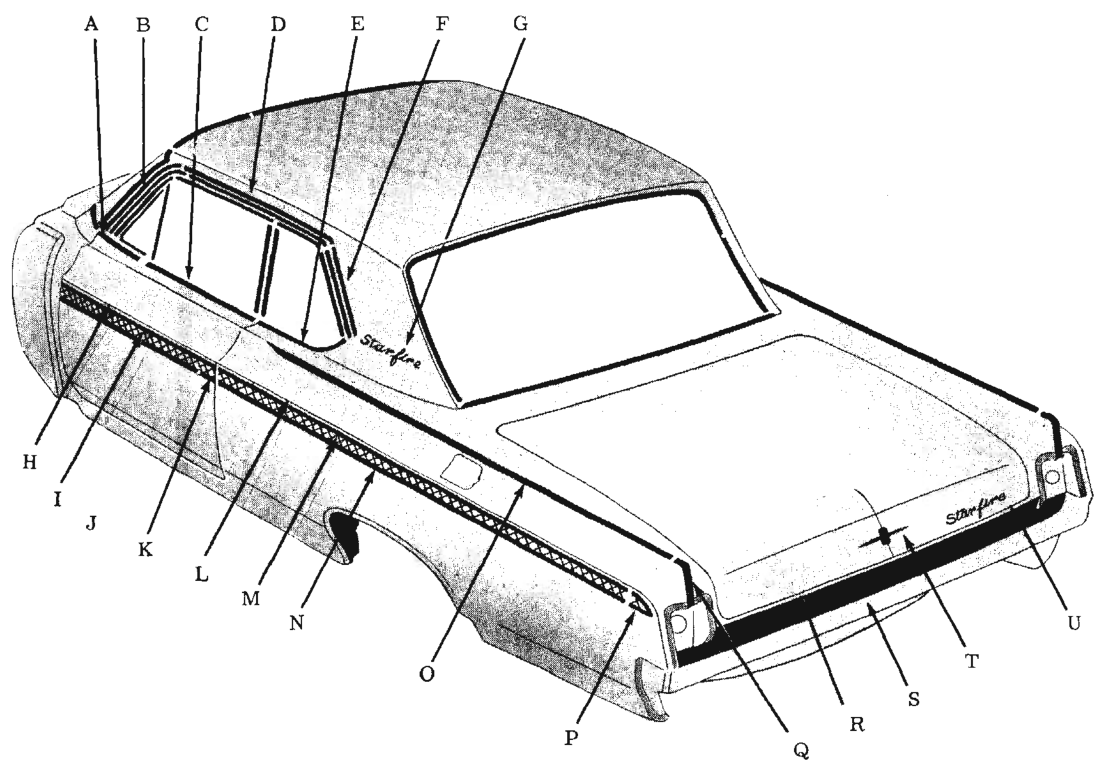
e. snap-in studs to pre-installed retainers

f. snap-in clips

Figure 16-102 illustrates typical attachments for body side moldings.

Before using the molding charts, the following information will be helpful when installing or removing exterior moldings.

1. Screw locations - the exact location for each screw is not shown or mentioned, but when hidden, the general location is indicated by naming the molding or other part which conceals the screw and, therefore, must be removed to gain access to the screw.



A. DOOR WINDOW REVEAL MOLDING (AT VENT)
B. WINDSHIELD PILLAR DRIP MOLDING SCALP
C. DOOR WINDOW REVEAL MOLDING
D. ROOF DRIP MOLDING FRONT SCALP
E. QUARTER WINDOW REVEAL MOLDING
F. ROOF DRIP MOLDING REAR SCALP
G. ROOF EXTENSION PANEL NAME PLATE
H. DOOR OUTER PANEL UPPER MOLDING
I. DOOR OUTER PANEL INSERT MOLDING
J. DOOR OUTER PANEL LOWER FRONT MOLDING
K. DOOR OUTER PANEL LOWER REAR MOLDING
L. REAR FENDER UPPER MOLDING
M. REAR FENDER INSERT MOLDING
N. REAR FENDER LOWER FRONT MOLDING
O. REAR FENDER CROWN MOLDING
P. REAR FENDER LOWER REAR MOLDING
Q. REAR OF REAR FENDER CROWN MOLDING
R. REAR END PANEL UPPER MOLDING
S. REAR END PANEL LOWER MOLDING
T. REAR COMPARTMENT LID OUTER PANEL EMBLEM
U. REAR COMPARTMENT LID OUTER PANEL NAME PLATE

Fig. 16-99 Exterior Moldings (3657 Style)

2. When a molding is overlapped, the overlapping molding is indicated in the "Engages with other molding" column and must be removed first.

GENERAL PRECAUTIONS

When removing or installing any body exterior moldings, certain precautions should be exercised.

1. Adjacent finishes should be protected with masking tape to prevent damage to finish.

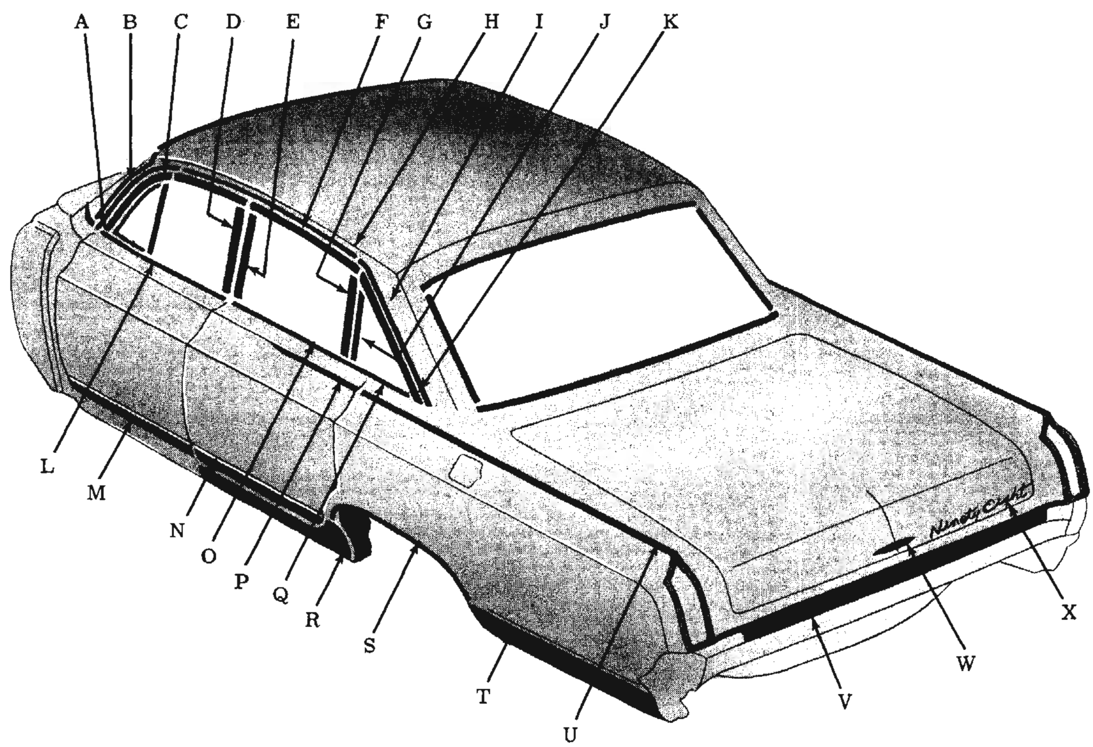
2. Proper tools and care should be employed to guard against molding damage.

SEALING OPERATION

Detailed sealing operations for each individual molding are not described on the MOLDING REMOVAL CHART, but the following information is given to permit a satisfactory sealing operation when necessary.

Medium-bodied sealer or body caulking compound are the sealers most frequently used to provide a watertight seal or for anti-rattle measures. Washers and gaskets are also used and should be replaced if damaged.

Holes in body panels for screws, bolts or clips that would permit water to enter the interior of the body should be sealed with body caulking compound or pre-sealed screws, nuts or clips.



A. FRONT DOOR WINDOW REVEAL MOLDING (AT VENT)
B. WINDSHIELD PILLAR DRIP MOLDING SCALP
C. FRONT DOOR WINDOW FRAME UPPER SCALP MOLDING
D. FRONT DOOR WINDOW FRAME REAR VERTICAL SCALP MOLDING
E. REAR DOOR WINDOW FRAME FRONT VERTICAL SCALP MOLDING
F. REAR DOOR WINDOW FRAME UPPER SCALP MOLDING
G. REAR DOOR WINDOW FRAME REAR VERTICAL SCALP MOLDING
H. ROOF DRIP MOLDING FRONT SCALP
I. ROOF DRIP MOLDING REAR SCALP
J. QUARTER WINDOW FRONT REVEAL MOLDING
K. QUARTER WINDOW UPPER REVEAL MOLDING
L. FRONT DOOR WINDOW REVEAL MOLDING
M. FRONT DOOR OUTER PANEL LOWER MOLDING
N. REAR DOOR OUTER PANEL LOWER MOLDING
O. REAR DOOR WINDOW REVEAL MOLDING
P. REAR DOOR CROWN MOLDING
Q. QUARTER WINDOW LOWER REVEAL MOLDING
R. REAR WHEEL OPENING FRONT MOLDING
S. REAR WHEEL OPENING MOLDING
T. REAR OF REAR WHEEL OPENING MOLDING
U. REAR FENDER CROWN MOLDING
V. REAR END PANEL MOLDING
W. REAR COMPARTMENT LID OUTER PANEL EMBLEM
X. REAR COMPARTMENT LID OUTER PANEL NAME PLATE

Fig. 16-100 Exterior Moldings (3819 Style)

Drip moldings require a 1/4" bead of medium-bodied sealer along the full length of the inner attaching surface. Door window scalps and center pillar scalps require a 1/8" x 1/4" x 1/4" bead of caulking compound at 5" intervals for anti-rattle purposes. Pinchwelds require medium-bodied sealer on both sides when pinchweld clips are used. The exception is the rear quarter pinchweld on convertible styles which requires water proof tape over the entire pinchweld, prior to clip installation.

MOLDING REMOVAL

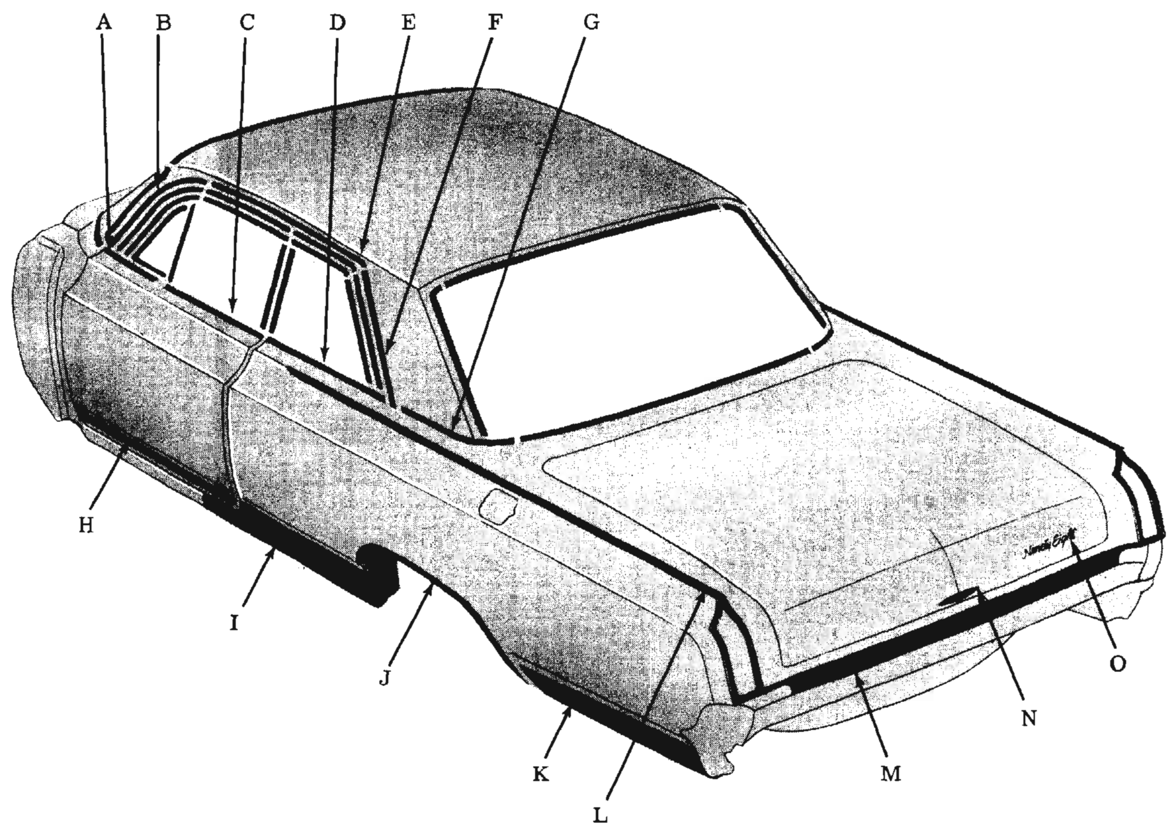
For ease of molding removal, it is sometimes important to start the removal at a particular location which is generally the "front" or "rear" of the molding. This position is indicated when necessary in the "Starting Location" column of the molding chart.

The following groups of moldings are listed with the name or description of the tool which is suitable for molding removal.

Roof Drip Scalps - pointed hook tool

Door Window Scalps - thin flat-bladed tool

Snap-on Clips - thin flat-bladed tool (putty knife)



A. DOOR WINDOW REVEAL MOLDING (AT VENT)
B. WINDSHIELD PILLAR DRIP MOLDING SCALP
C. DOOR WINDOW REVEAL MOLDING
D. QUARTER WINDOW REVEAL MOLDING
E. ROOF DRIP MOLDING FRONT SCALP
F. ROOF DRIP MOLDING REAR SCALP
G. QUARTER BELT REVEAL MOLDING
H. DOOR OUTER PANEL LOWER MOLDING
I. REAR WHEEL OPENING FRONT MOLDING
J. REAR WHEEL OPENING MOLDING
K. REAR OF REAR WHEEL OPENING MOLDING
L. REAR FENDER CROWN MOLDING
M. REAR END PANEL MOLDING
N. REAR COMPARTMENT LID OUTER PANEL EMBLEM
O. REAR COMPARTMENT LID OUTER PANEL NAME PLATE

Fig. 16-101 Exterior Moldings (3847 and 3947 Styles)

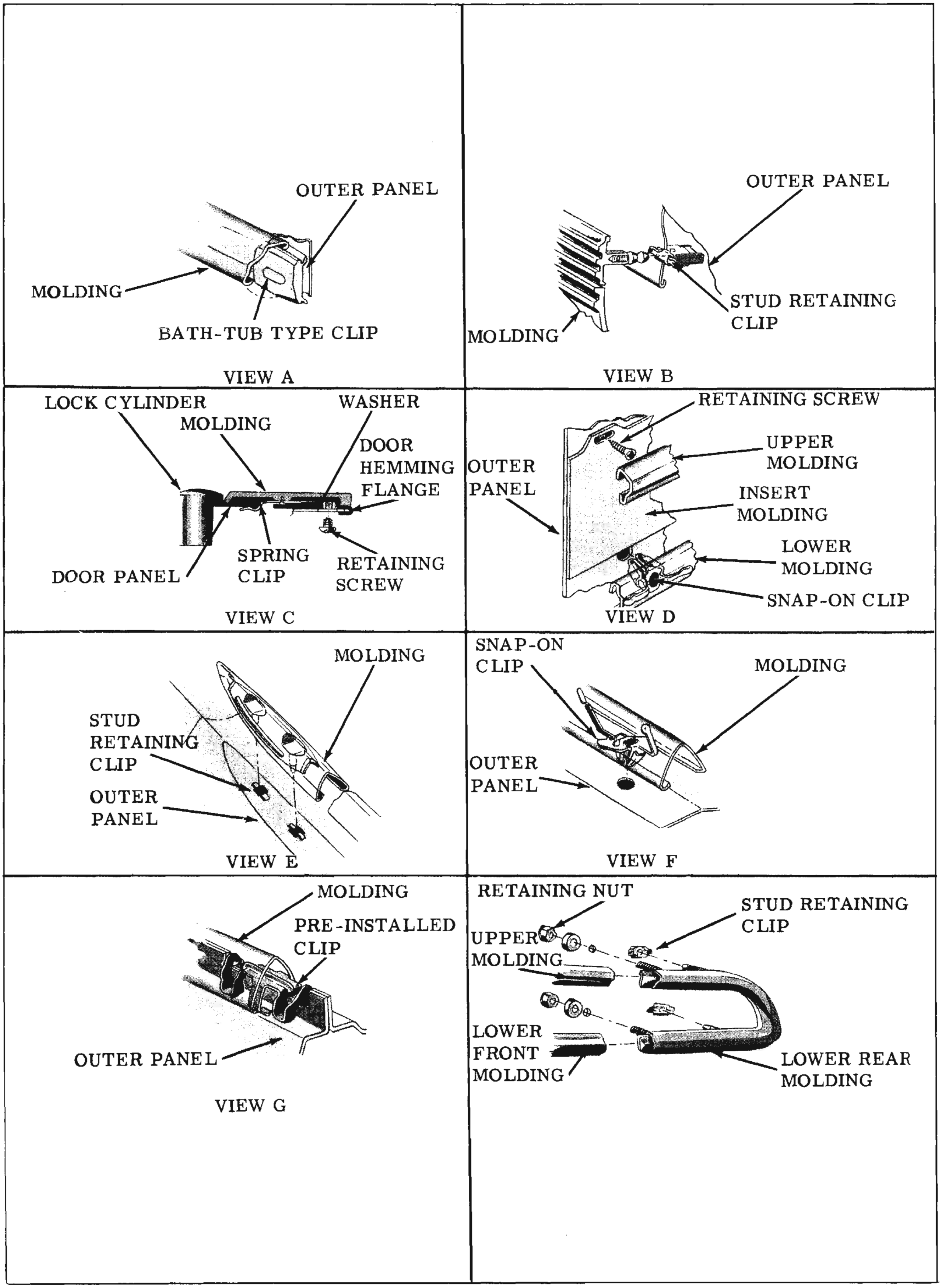


Fig. 16-102 Exterior Body Molding Attachments

Molding Name	Styles	Method of Retention					Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
		Screws	Spring (Self-Retained)	Snap-On Clips Or Retainers On Panel	Snap-On Clips On Molding	Studs With Attaching Nuts			
Windshield Pillar to Roof Drip Molding Escutcheon	3247,69	-	x	-	-	-	-		Lower Edge
Windshield Pillar Drip Molding Scalp	3239,69, 3539,69, 3947,3657, 3800 Except 67	-	x	-	-	-	-	-	Front Lower Edge
Roof Drip Molding Scalp	3269,47, 3569,47	-	x	-	-	-	Windshield Pillar Drip Molding Scalp	Side Roof Rail Weatherstrip Retainer on 47 Styles	Front Lower Edge
Roof Drip Molding Front Scalp	3239,3539, 3657,3947, 3800 Except 67	-	x	-	-	-	Windshield Pillar Drip Molding Scalp	Side Roof Rail Weatherstrip Retainer on 47 Styles.	Front Lower Edge
Roof Drip Molding Rear Scalp	3239,3539 3947,3800 Except 67	-	x	-	-	-	Roof Drip Molding Front Scalp	Quarter Window Upper Reveal on 29 Styles	Front Lower Edge
	3657	x	-	-	-	-	Roof Drip Molding Front Scalp	Side Roof Rail Weatherstrip Retainer	-
Front Door Window Frame Rear Vertical Scalp	3819 Optional 3269,3569	-	x	-	-	-	Door Window Frame Upper Scalp	-	Upper Inner Edge
Front Door Window Frame Upper Scalp	3819 Optional 3269,3569	-	x	-	-	-	-	-	Rear Inner Edge

Molding Name	Styles	Method of Retention					Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
		Screws	Spring (Self-Retained)	Snap-on Clips or Retainers on Panel	Snap-on Clips on Molding	Studs With Attaching Nuts			
Front Door Window Reveal (At Vent)	All 39,47, 57,67,3819 Optional 3269	x	-	-	-	-	-	Vent Upper Attaching Screws	-
Front Door Window Lower Reveal	3600,3800, 3947 Optional 3200,3500	x	-	-	-	-	-	Door Window Lower Bumper Stops	-
Front Door Outer Panel Lower	3200,3500	x	-	x View A	-	-	-	-	-
	3600	x	-	-	x View D	-	-	-	-
	3800,3900	x	-	- View B	-	-	-	-	-
Front Door Outer Panel Upper	3600	x	-	-	x View D	-	-	-	-
Front Door Outer Panel Lower Rear	3600	x	x View C	-	-	-	-	-	-
Front Door Outer Panel Insert	3600	x View D	-	-	-	-	Door Outer Panel Upper, Lower, Lower Rear	-	-
Rear Door Window Frame Upper Scalp	3819 Optional 3269,3569	-	x	-	-	-	-	-	Front Lower Edge
Rear Door Window Frame Front Vertical Scalp	3819 Optional 3269,3569	-	x	-	-	-	Door Window Frame Upper Scalp	-	Upper Inner Edge

Molding Name	Styles	Method of Retention: Screws	Spring (Self-Retained)	Snap-on Clips or Retainers On Panel	Snap-on Clips on Molding	Studs With Attaching Nuts	Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
Rear Door Window Frame Rear Vertical Scalp	3819	-	x	-	-	-	Door Window Frame Upper Scalp	-	Upper Inner Edge
Rear Door Window Lower Reveal	3539,69, 3800 Optional 3239,69	x	-	-	-	-	-	Door Window Lower Bumper Stops	-
Rear Door Outer Panel Lower	3200,3500	x	-	x View A	-	x	-	-	-
	3800	x	-	x	-	-	-	-	-
Rear Door Outer Panel Crown	3200,3500, 3800,3900	x	-	x View E	x View F	-	-	-	-
Quarter Window Front	3819,29	x	-	-	-	-	Quarter Window Upper and Lower Reveal	Quarter Window	
Quarter Window Upper Reveal	3819,29	x	-	-	-	-	-	Quarter Window	-
Quarter Window Lower Reveal	3819,29	x	-	-	-	-	Quarter Window Upper Reveal	Quarter Window	
	47,57	x	-	-	-	-	-	Quarter Window Lower Stops	-
	67	x	-	-	-	-	-	Quarter Window	-
Quarter Belt Reveal	3247,3547	-	-	-	-	-	Quarter Window Lower Reveal	Quarter Upper Trim Panel	-
	3839,47, 3947	-	-	-	-	x	Back Window Lower Reveal Molding Clip	Quarter Upper Trim Panel	-
	3269,3569	x	-	-	x	-	-	-	-

Molding Name	Styles	Screws	Method of Retention				Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
			Spring (Self-Retained)	Snap-on Clips or Retainers On Panel	Snap-on Clips on Molding	Studs With Attaching Nuts			
Quarter Pinchweld Finishing	67	x	-	x	-	-	Quarter Window Lower Reveal	Lower Top to Relieve Tension on Back Curtain	At radius
Rear Fender Lower	3500	-	-	x View A	-	x	-	Rear Compartment Side Trim	-
Rear Fender Lower Front	3200	-	-	x	-	x	Rear Fender Lower Rear	-	-
	3600	-	-	-	x View D	x	Rear Fender Lower Rear	Rear Compartment Side Trim	-
Rear Fender Lower Rear	3200	-	-	x	-	x	-	-	-
	3600	-	-	x View H	-	x View H	Rear Fender Upper and Lower Front	Rear Compartment Side Trim	-
Rear Fender Upper Front	3600	-	-	-	x	x	Rear Fender Lower Rear	Rear Compartment Side Trim	-
Rear Fender Insert	3600	x	-	-	-	-	Rear Fender Lower Front, Lower Rear, Upper Front	-	-
Rear Fender Crown	47,57,67	-	-	x View G	x View E	-	-	-	-
	19,29, 39,69	-	-	x View G	-	-	-	-	-

		Method of Retention							
Molding Name	Styles	Screws	Spring (Self-Retained)	Snap-on Clips or Retainers On Panel	Snap-on Clips on Molding	Studs With Attaching Nuts	Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
Rear of Rear Fender Crown	3200,3500, 3600	-	-	-	-	x	Rear Fender Crown	Rear Compartment Side Trim	-
Rear Wheel Opening Front	3800	x	-	x View B	-	-	Rear Wheel Opening	-	-
Rear Wheel Opening	3800	x	-	-	-	-	-	-	-
Rear of Rear Wheel Opening	3800	x	-	-	-	x	Rear Wheel Opening Molding	-	-
Rear Compartment Lid Name Plate	3600,3800	-	-	x	-	-	-	-	-
Rear Compartment Lid Emblem	All	-	-	x View B	-	x	-	-	-
Rear End Panel	3200	-	-	x View A	-	-	-	-	-
	3800	-	-	-	-	x	-	Back-Up Lamp Assembly	-
Rear End Panel Lower	3500,3600	-	-	-	-	x	-	-	-
Rear End Panel Upper	3500,3600	-	-	-	-	x	-	-	-
Rear End Panel Name Plate	3200	-	-	-	-	x	-	-	-
Roof Extension Panel Name Plate	3239,47 3539,47 3657	-	-	-	-	x	-	Quarter Upper Trim	-

Bathtub-type clips, of metal construction, can be removed satisfactorily by cutting them part way through or all of the way through from the outer panel with a sharp, flat-bladed tool. In some cases, it may be necessary to cut the clip from each end to remove it.

Fig. 16-103 shows the special tool, J-8954, which is required to install the narrow bathtub-type steel clips. Plastic bathtub-type clips do not require the use of a special tool for their installation.

FOLDING TOP

FOLDING TOP ADJUSTMENTS

The top linkage is attached to the body at the rear quarter area by a male hinge. The hinge is attached directly to the quarter panel brace. The front roof rail is locked at the windshield header by two hook-type locks which are an integral part of the two locking handles.

To correct some top variations, only a single adjustment is required; other top variations require a combination of adjustments. In conjunction with adjustment of the folding top, it may be necessary to adjust the door, door glass, rear quarter glass, trim sticks or side roof rail weatherstrips.

FRONT ROOF RAIL CORNER BRACE ADJUSTMENT

IF THE TOP, WHEN IN A RAISED POSITION,

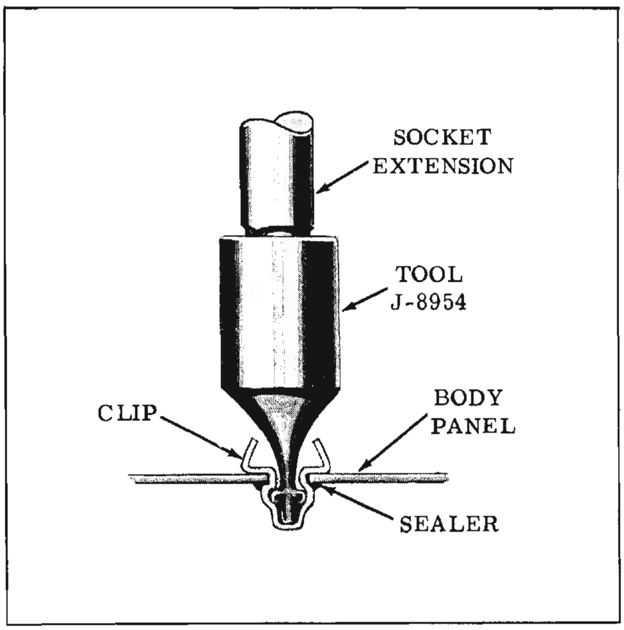


Fig. 16-103 Installing Bathtub-Type Clip

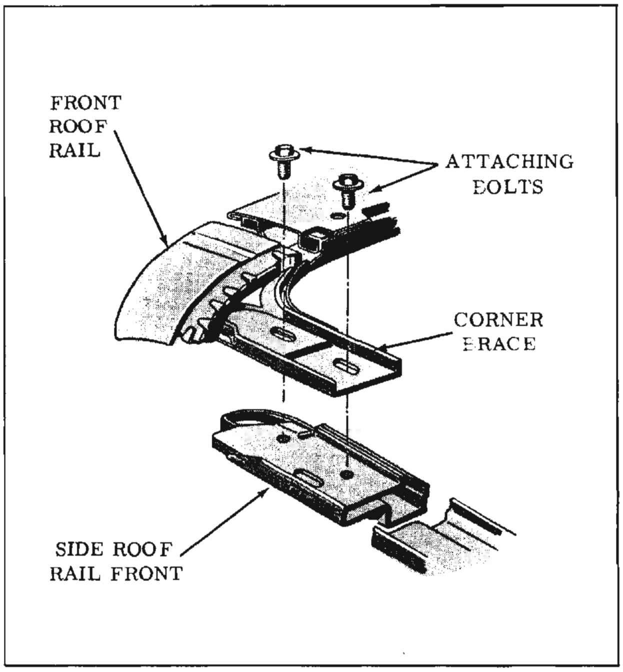


Fig. 16-104 Front Roof Rail Adjustment

IS TOO FAR FORWARD OR DOES NOT MOVE FORWARD ENOUGH TO ALLOW THE GUIDE STUDS ON THE FRONT ROOF RAIL TO ENTER HOLES IN THE STRIKER ASSEMBLIES, PROCEED AS FOLLOWS:

1. Unlatch top and raise it above windshield header. Remove side roof rail weatherstrip front attaching screws.

2. Loosen corner brace attaching bolts and adjust front roof rail fore or aft as required. Repeat on opposite side if necessary, (Fig. 16-104)

   NOTE: This adjustment is limited. If additional adjustment is required, it can be made at the folding top male hinge.

3. When front roof rail corner brace is properly adjusted, tighten attaching bolts and reinstall side roof rail front weatherstrip attaching screws. Check forward section of weatherstrip and reseal if necessary.

SUNSHADE AND STRIKER SUPPORT ASSEMBLY ADJUSTMENT

IF A DIFFICULT LOCKING ACTION, CAUSED BY MISALIGNMENT OF THE SUNSHADE AND STRIKER SUPPORT ASSEMBLY IS ENCOUNTERED AT THE FRONT ROOF RAIL, PROCEED AS FOLLOWS:

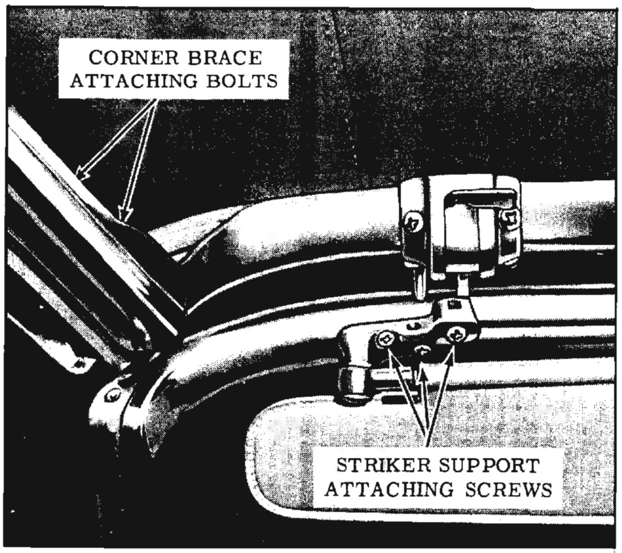


Fig. 16-105 Engaging Roof Header With Striker

1. Unlatch top and raise it above windshield header.

2. Loosen striker support attaching screws and adjust striker laterally as required; then tighten attaching screws. (Fig. 16-105)

IF, AFTER ADJUSTING THE STRIKER SUPPORT, THE LOCKING ACTION OF TOP IS STILL UNSATISFACTORY, OR IF A CLOSER FIT OF THE FRONT ROOF RAIL TO WINDSHIELD HEADER IS DESIRED, THE HOOK LEVER ON THE FRONT ROOF RAIL LOCK ASSEMBLY MAY BE ADJUSTED AS FOLLOWS:

1. To tighten locking action of top, turn hook lever clockwise.

2. To reduce locking effort of top, turn hook lever counterclockwise.

NOTE: Hook lever may be adjusted with finger pressure, no tools are required.

CONTROL LINK ADJUSTING PLATE ADJUSTMENT

WITH TOP IN UP POSITION, IF JOINT BETWEEN FRONT AND CENTER SIDE ROOF RAIL IS TOO HIGH OR TOO LOW, PROCEED AS FOLLOWS:

1. Remove folding top compartment side trim panel.

2. Mark location of control link adjusting plate on folding top compartment brace.

3. Loosen two bolts securing control link adjusting plate sufficiently to permit adjustment of plate. (Fig. 16-106)

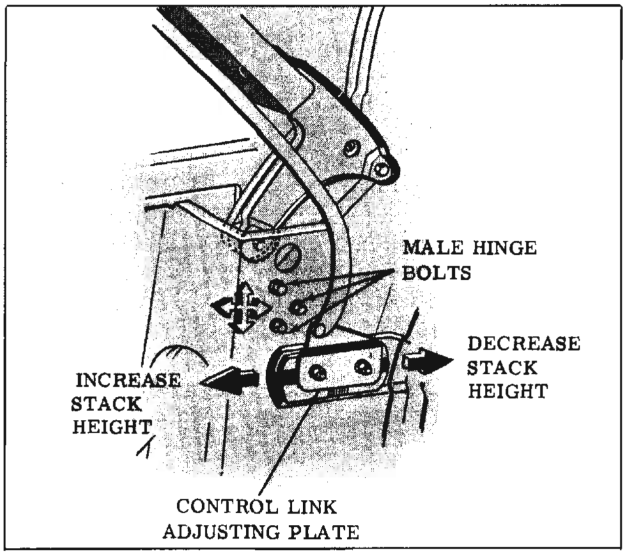


Fig. 16-106 Control Link Adjusting Plate

4. Without changing fore and aft location of adjusting plate, adjust side roof rail up or down allowing adjusting plate to move up or down over serrations on support as required; then tighten bolts.

IF TOP ASSEMBLY DOES NOT STACK PROPERLY WHEN TOP IS IN DOWN POSITION, PROCEED AS FOLLOWS:

1. Mark location of control link adjusting plate on folding top compartment brace.

2. Loosen bolts securing control link adjusting plate sufficiently to permit adjustment of plate.

3. Without changing the up or down location of adjusting plate, move adjusting plate forward or rearward (horizontally) over serrations as required to obtain desired height; then tighten bolts.

NOTE: If top cannot be fully lowered, even after control link plate has been adjusted, readjust male hinge assembly as required. Check top for proper operation.

MALE HINGE SUPPORT ADJUSTMENT

Prior to making any adjustment of top linkage at male hinge, loosen two bolts securing folding top rear quarter trim stick to rear quarter panel. This will prevent any possible damage to top when it is raised after adjustment. After making an adjustment at male hinge, check folding top at rear quarter area for proper fit and, if necessary, adjust trim stick assembly.

IF THERE IS AN EXCESSIVE OPENING BETWEEN SIDE ROOF RAIL REAR WEATHERSTRIP

AND REAR OF REAR QUARTER WINDOW, OR IF FRONT ROOF RAIL IS TOO FAR FORWARD OR REARWARD, PROCEED AS FOLLOWS:

1. Mark location of male hinge attaching bolt washers and control link assembly on folding top compartment brace.

2. Loosen male hinge assembly attaching bolts. (Fig. 16-106)

3. Move hinge fore or aft as required to obtain proper alignment between side roof rail rear weatherstrip and rear quarter window; then tighten bolts.

   IMPORTANT: Entire male hinge assembly must be adjusted forward or rearward at a 90° angle to vertical line of male hinge attachment. (Use mark at washers as guide). DO NOT allow male hinge to rotate as rotation may cause damage to lift cylinder by allowing piston to bottom or rod to bend after top has been operated.

4. Lock front roof rail to windshield, (where required, adjust front roof rail), and check fit of top material at rear quarter trim stick area. If necessary, adjust trim stick; then tighten trim stick attaching bolts.

5. Check top assembly for proper stack height and proper alignment of side roof rails over door and quarter windows. Where required, adjust control link adjusting plate.

   NOTE: If top cannot be fully raised or lowered, even after control link plate has been adjusted, readjust male hinge assembly as required. Check top for proper operation.

IF SIDE ROOF RAIL IS TOO HIGH OR TOO LOW AT REAR QUARTER WINDOW AREA, PROCEED AS FOLLOWS:

1. Mark location of male hinge attaching bolt washers and control link on folding top compartment brace.

2. Loosen male hinge assembly attaching bolts. (Fig. 16-106)

3. Without changing fore and aft location of male hinge, adjust male hinge up or down as required to obtain proper alignment between side roof rails and rear quarter windows.

   IMPORTANT: Entire male hinge assembly must be adjusted straight upward or downward at a 90° angle to horizontal line of male hinge attachment. (Use mark at washers as guide). DO NOT allow male hinge to rotate as rotation may cause damage to lift cylinder by allowing piston to bottom or rod to bend after top has been operated.

4. Tighten attaching bolts, while maintaining proper alignment of vertical scribe marks.

5. Check fit of top material at rear quarter trim stick area and, if necessary, adjust trim stick. If adjustment is not necessary, tighten trim stick attaching bolts.

6. Check top assembly for proper stack height and proper alignment of side roof rails over door and quarter windows. Where required, adjust control link adjusting plate.

   NOTE: If top cannot be fully raised or lowered, even after control link plate has been adjusted, readjust male hinge assembly as required. Check top for proper operation.

FOLDING TOP DIAGNOSIS

CONDITION	APPARENT CAUSE	CORRECTION
A. Difficult locking action at front roof rail.	1. Sunshade support misaligned.	Adjust sunshade support laterally.
	2. Lock hook lever improperly adjusted.	Adjust lock hook lever counterclockwise.
	3. Misaligned front roof rail front weatherstrip.	Loosen, realign and retack front roof rail front weatherstrip.
	4. Front roof rail misaligned.	Adjust front roof rail.
B. Top does not lock tight enough to windshield header.	1. Sunshade support misaligned.	Adjust sunshade support laterally.
	2. Lock hook lever improperly adjusted.	Adjust lock hook lever clockwise.

FOLDING TOP DIAGNOSIS (Cont'd.)

CONDITION	APPARENT CAUSE	CORRECTION
B. Cont'd.	3. Misaligned front roof rail front weatherstrip.	Loosen, realign and retack front roof rail front weatherstrip.
	4. Front roof rail misaligned.	Adjust front roof rail.
C. Top travels too far forward.	1. Front roof rail misaligned.	Adjust front roof rail rearward. (Fig. 16-104)
	2. Male hinge assembly misaligned.	Adjust male hinge assembly rearward. (Fig. 16-106)
D. Top does not travel forward far enough.	1. Front roof rail misaligned.	Adjust front roof rail forward. (Fig. 16-104)
	2. Male hinge assembly misaligned.	Adjust male hinge assembly forward. (Fig. 16-106)
	3. Improper spacing between rear trim stick and body metal.	Install an additional spacer between rear trim stick and body metal at each attaching bolt location.
E. Side roof rail rear weatherstrip too tight against rear of rear quarter window.	1. Male hinge assembly misaligned.	Adjust male hinge assembly rearward. (Fig. 16-106)
F. Gap between side roof rail rear weatherstrip and rear of rear quarter window.	1. Male hinge assembly misaligned.	Adjust male hinge assembly forward (Fig. 16-106) and/or shim side roof rail rear weatherstrip forward as required.
G. Side roof rail rear weatherstrip too tight against top of rear quarter window.	1. Male hinge misaligned.	Adjust male hinge upward. (Fig. 16-106)
H. Gap between side roof rail rear weatherstrip and top of rear quarter window.	1. Male hinge misaligned.	Adjust male hinge downward and/or shim side roof rail weatherstrip downward as required.
I. Sag at front to center side roof rail joint.	1. Control link adjusting plate misaligned.	Adjust control link adjusting plate downward. (Fig. 16-106)
	2. Center side roof rail hinge adjusting screw improperly adjusted.	Adjust screw counterclockwise. (Fig. 16-108)
J. Front and center side roof rails bow upward at hinge joint.	1. Control link adjusting plate misaligned.	Adjust control link adjusting plate upward. (Fig. 16-106)
	2. Center side roof rail hinge adjusting screw improperly adjusted.	Adjust screw clockwise. (Fig. 16-108)

FOLDING TOP DIAGNOSIS (Cont'd.)

CONDITION	APPARENT CAUSE	CORRECTION
K. Folding top dust boot is difficult to install.	1. Improper stack height due to misaligned control link adjusting plate.	Adjust control link plate rearward or forward as required. (Fig. 16-106)
	2. Misaligned folding top dust boot female fastener.	Where possible, align female with male fastener.
	3. Rear seat back assembly is too far forward.	Relocate rear seat back panel rearward until dimension "Z" between upper rear edge of rear seat back to forward edge of pinchweld finishing molding is 19-1/2" ± 1/16". The dimension is measured at approximate center line of body.
	4. Excessive build-up of padding in side roof rail stay pads.	Repair side stay pads as required.
L. Folding top dust boot fits too loosely.	1. Improper stack height due to misaligned control link adjusting plate.	Adjust control link plate forward. (Fig. 16-106)
	2. Rear seat back assembly is too far rearward.	Relocate rear seat back panel forward until dimension "Z" between upper rear edge of rear seat back to forward edge of pinchweld finishing molding is 19-1/2" ± 1/16". The dimension is measured at approximate center line of body.
M. Top material is too low over windows or side roof rails.	1. Front roof bow improperly shimmed.	*Install one or two 1/8" shims between front roof bow and slat iron. (Fig. 16-108)
	2. Excessive width in top material.	If top is too large, detach binding along affected area, trim off excessive material along side binding as required; then hand sew binding to top material.
N. Top material is too high over windows or side roof rails.	1. Front roof bow improperly shimmed.	*Remove one or two 1/8" shims from between front roof bow and slat iron. (Fig. 16-108)
	2. Front roof bow felt silencer too high.	Trim silencer to within 1/8" of top of front roof bow. (Fig. 16-108)
O. Top material has wrinkles or draws.	1. Rear quarter trim stick improperly adjusted.	Adjust rear quarter trim stick on side affected.
	2. Top material improperly installed to center or rear quarter trim stick.	Retack top material as required.

FOLDING TOP DIAGNOSIS (Cont'd.)

CONDITION	APPARENT CAUSE	CORRECTION
P. Wind whistle or waterleak along front roof rail.	1. Top does not lock tight enough to windshield header.	Adjust sunshade support laterally and/or adjust lock hook lever clockwise.
	2. Misaligned front roof rail front weatherstrip.	Retack front weatherstrip to front roof rail.
	3. Front roof rail contour does not conform to windshield header.	Contour of front roof rail may be changed slightly by reforming rail.
Q. Wind whistle or air leak between top material and side roof rail stay pads.	1. Top material hold-down cables improperly adjusted.	Adjust top material hold-down cables as required.

*When no shims are required, use attaching screw part No. 4824789 (1/4-28x5/8" No. 12 oval head with external tooth lock washer, type "T" thread cutting, chrome finish).

When one shim is required, use attaching screw part No. 4837811 (1/4-28x3/4" No.12 oval head with external tooth lock washer, type "T" thread cutting, chrome finish).

When two shims are required, use attaching screw part No. 4824257 (1/4-28x7/8" No. 12 oval head with external tooth lock washer type "T" thread cutting, chrome finish).

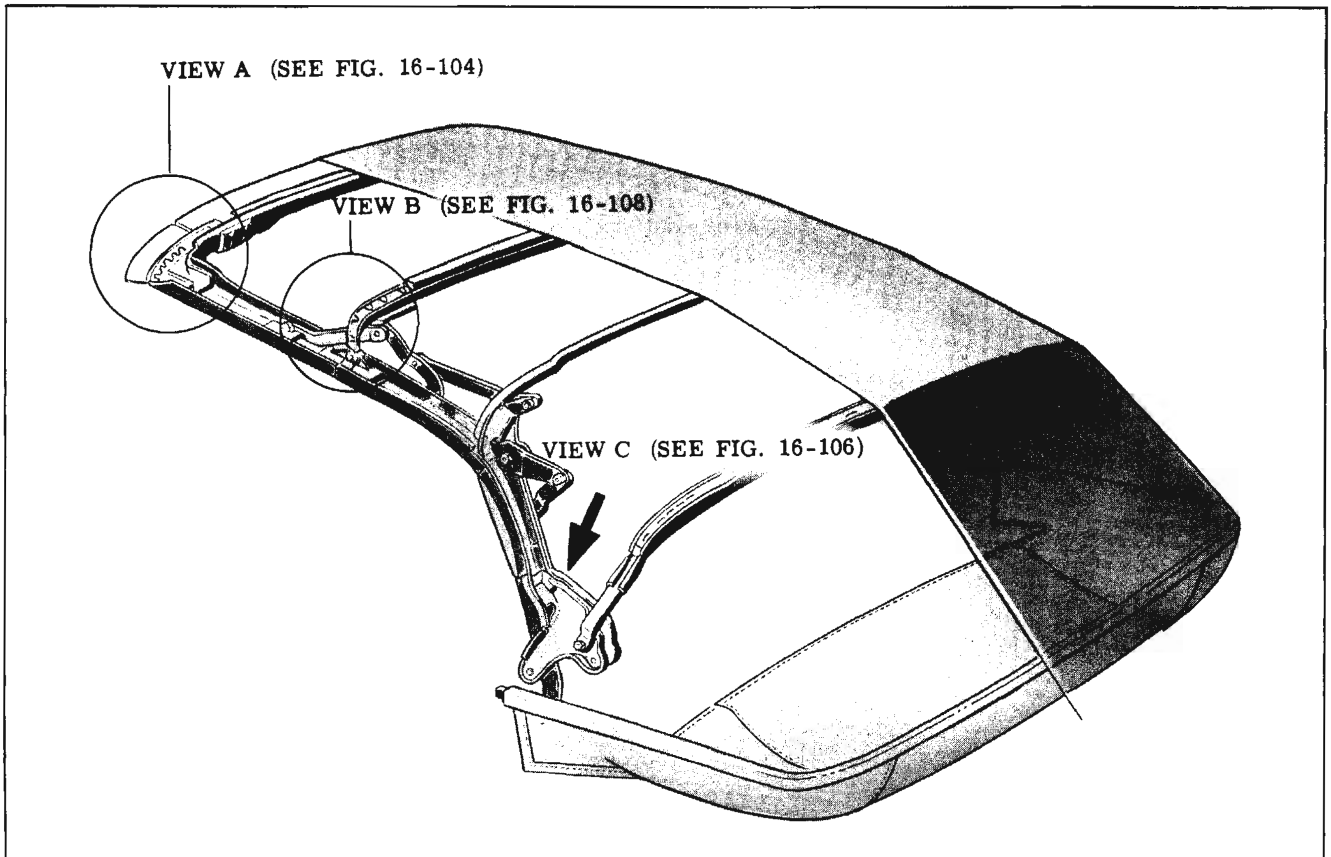


Fig. 16-107 Folding Top Adjustment

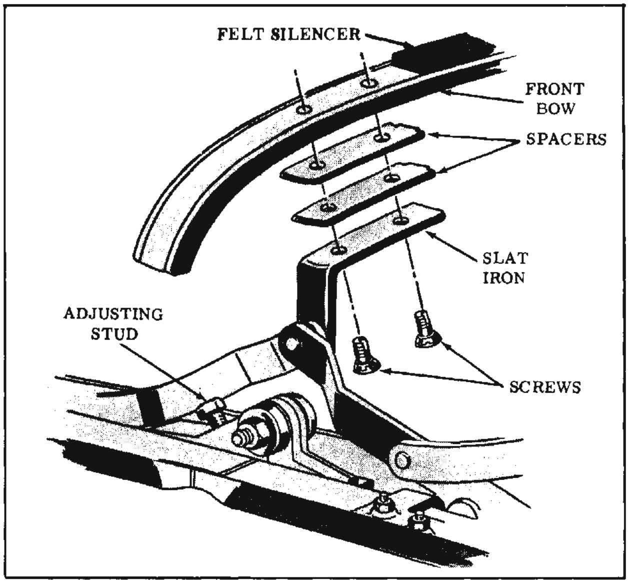


Fig. 16-108 Front Roof Bow Adjustment

FOLDING TOP TRIM ASSEMBLY COMPLETE (F-85 Typical)

Convertible top trim cover assemblies incorporate a top material hold-down cable along the right and left side roof rails. The cables are installed through a retaining pocket in the top material and are fastened at the front and rear side rails by attaching screws.

REMOVAL OF FOLDING TOP AND BACK CURTAIN TRIM ASSEMBLY

1. Place protective covers on all exposed panels which may be contacted during procedure.

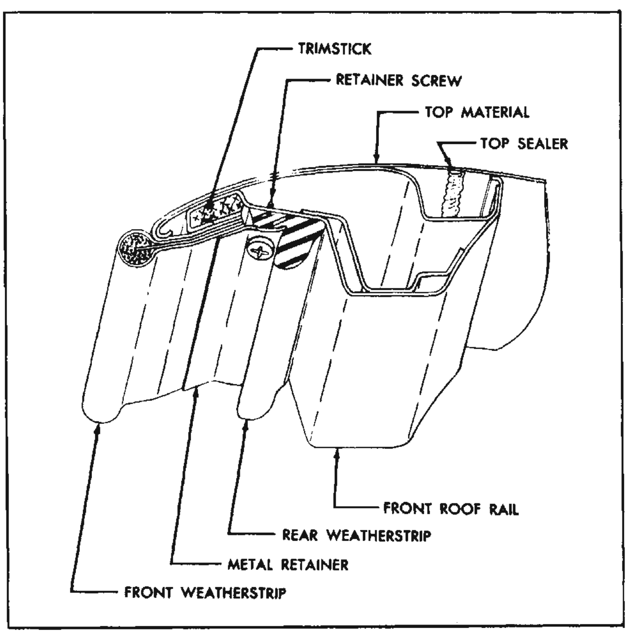


Fig. 16-109 Front Roof Rail Construction

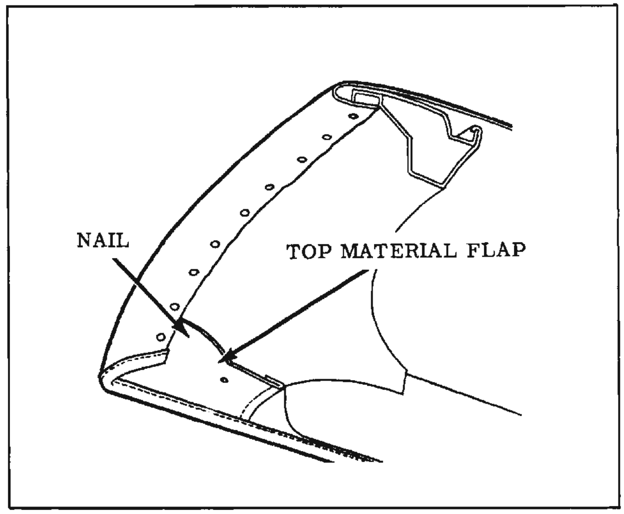


Fig. 16-110 Top Material Attachment at Roof Rail

2. Remove following trim and hardware items:
   a. Rear seat cushion and back.

      CAUTION: Disconnect rear seat speaker wire if present.
   b. Folding top compartment side trim panel assemblies.
   c. Side roof rail rear weatherstrip; then loosen folding top quarter flaps from rails.
3. At the front of body, raise front roof rail, remove retainers and front weatherstrips, detach top material from front roof rail. (Fig. 16-109)
4. Loosen front end of each side roof rail front weatherstrip sufficiently to detach top material flaps which are nailed and cemented to rails. (Fig. 16-110)

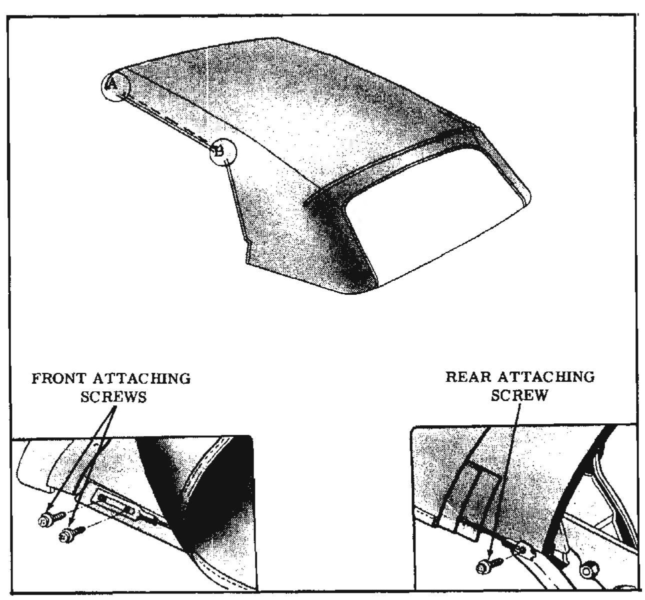


Fig. 16-111 Hold-Down Cable Attachment

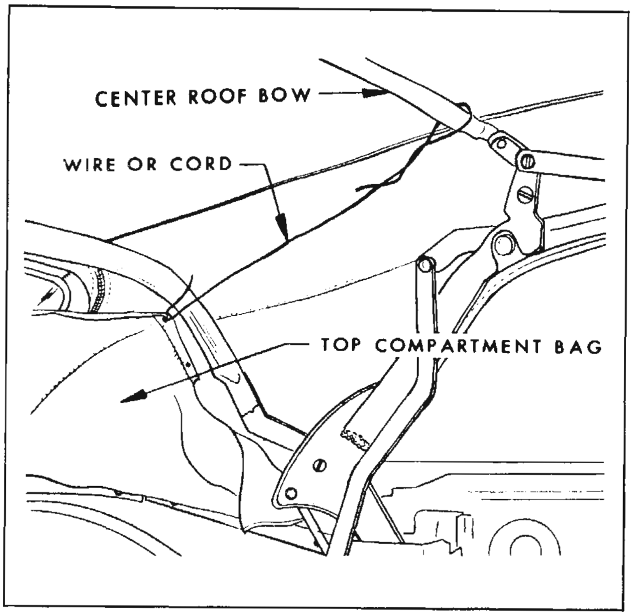


Fig. 16-112 Top Compartment Bag Held in Position

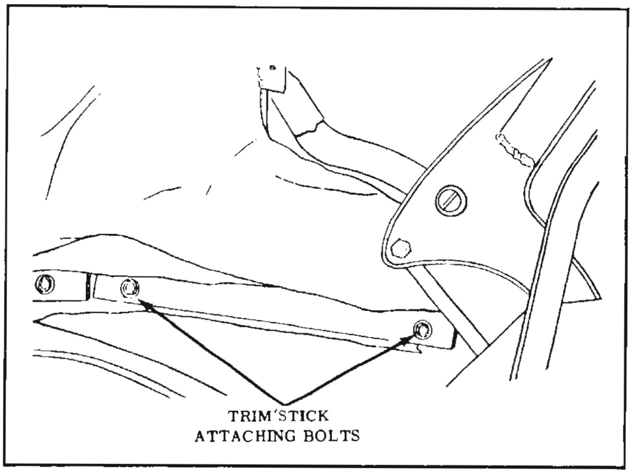


Fig. 16-113 Rear Quarter Trim Stick

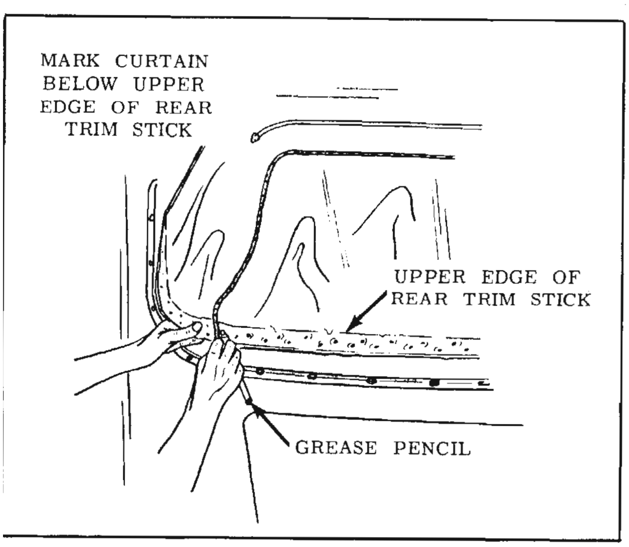


Fig. 16-114 Locating Edge of Top Material

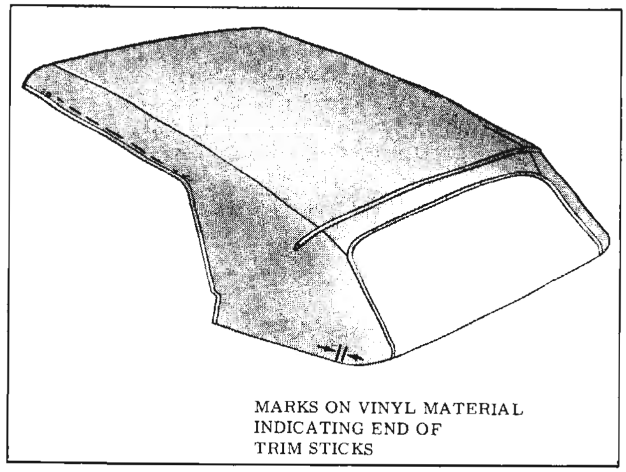


Fig. 16-115 Marking Top Material

5. At right and left side roof front and rear rails, remove hold-down cable front and rear attaching screws. (Views "A" and "B", Fig. 16-111)

6. At each side roof rear rail, pull hold-down cable rearward until cable is completely removed from top material retaining pocket.

7. Detach folding top compartment bag from rear seat back panel, thus exposing rear quarter and rear trim stick attaching bolts. Forward end of top compartment bag may be tied or wired to center roof bow to provide ready access to attaching bolts. (Fig. 16-112)

8. At each rear quarter area remove attaching bolts securing rear quarter trim stick assembly to rear quarter inner panel. (Fig. 16-113)

9. Remove rear trim stick attaching bolts; then lift trim assembly with attached quarter and rear trim sticks on top of rear compartment front panel.

10. To establish relationship of right and left inner vertical edge of old top material to back curtain assembly at rear trim stick location, mark back curtain vinyl at both locations with a grease pencil. (Fig. 16-114) Reference marks should be transferred to new back curtain when step 7 of installation procedure is performed.

    NOTE: Reference marks must be made below upper edge of rear trim stick.

11. To establish relationship of old top material to its position on rear trim sticks, cut selvage end of top material off flush with lower edge of trim sticks.

    CAUTION: When cutting top material, be careful not to cut lower selvage edge of back curtain assembly.

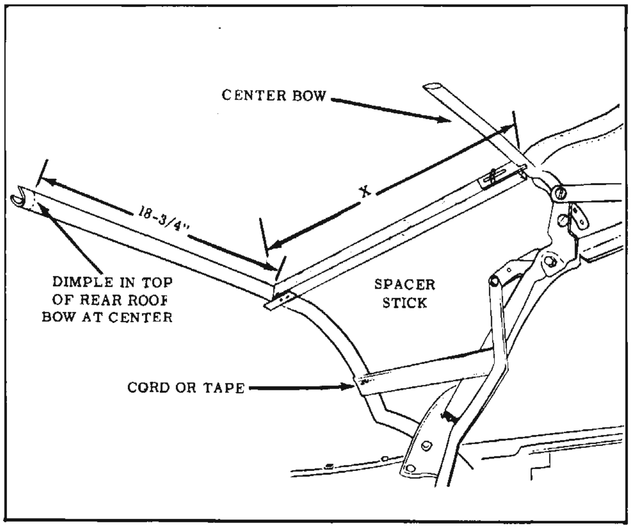


Fig. 16-116 Installation of Spacer Sticks

12. Using a pencil, mark both ends of rear and rear quarter trim sticks on vinyl surface of top material. (Fig. 16-115) Reference marks for trim sticks should be transferred to new top material when step 30 of installation procedure is performed.

13. Remove screw securing escutcheon clip at each end of wire-on binding on rear bow. Remove wire-on binding from rear bow. Detach top material from rear roof bow and from trim sticks, then remove top cover assembly.

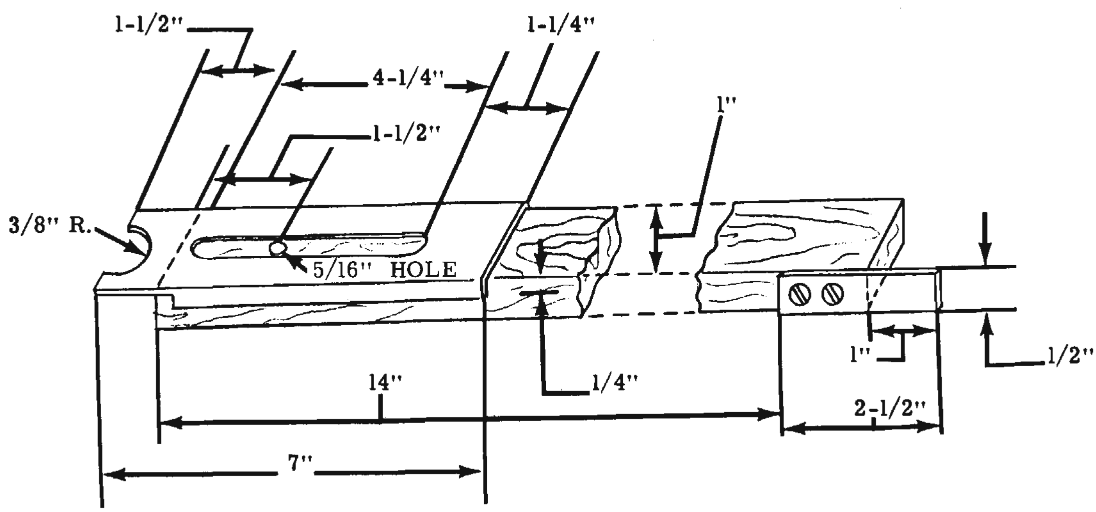
14. Lock top to windshield header. Install radius end of each adjustable spacer stick to fit against center roof bow. Install opposite end of spacer stick so that metal plate fits under rear roof bow (Fig. 16-116) Spacer sticks should be installed along inboard edge of side stay pad.

    NOTE: The approximate dimension for location of spacer sticks, measuring outboard from centerline dimple of rear roof bow, is 21".

    While exerting rearward pressure on rear bow to draw side stay pads taut, extend spacer sticks until they fit snugly between center bow and rear roof bow, then tighten wing nuts.

15. Spacer stick may be fabricated as shown in Fig. 16-117.

16. Temporarily tie or tape rear bow to rear side roof rails. (Fig. 16-116) Detach nylon webbing, side stay pads and back curtain assembly from rear bow.



MATERIAL PER STICK

WOOD - 1/2" x 1" x 15-1/2"
STEEL - 1/32" x 1/2" x 2-1/2"
STEEL - 1/32" x 1-1/2" x 7"

2 - SCREWS #6 x 1/2"
BOLT 1/4" x 20" x 1"
WING NUT 1/4" x 20"
2 - WASHERS 1/4" I.D.

Fig. 16-117 Spacer Stick Dimensions

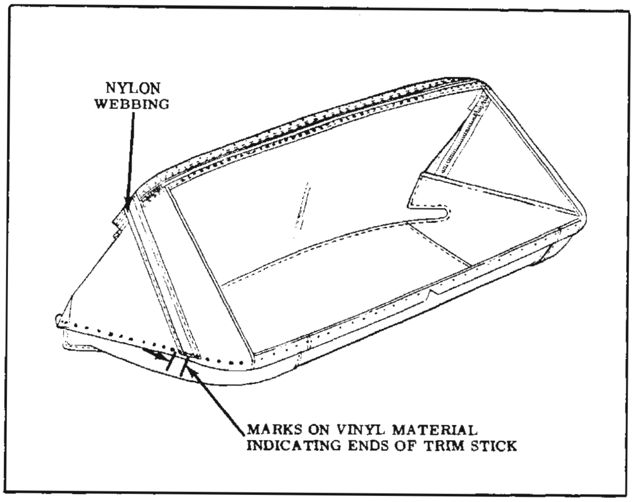


Fig. 16-118 Marking Back Curtain

17. Remove rear trim stick with attached back curtain assembly and top compartment bag from body and place on clean protected surface.

18. Using chalk, or other suitable material, mark ends of rear and rear quarter trim sticks on vinyl surface of back curtain material. (Fig. 16-118) Reference marks for trim sticks should be transferred to new back curtain material when step 7 of installation procedure is performed.

19. Remove right and left nylon webbing from rear trim stick. (Fig. 16-118)

20. Remove back curtain assembly from rear and rear quarter trim sticks.

21. Remove side stay pads. Stay pads are attached to front roof rail and front and rear bows with tacks, to center bow, and side roof front rail with screws.

INSTALLATION OF FOLDING TOP AND BACK CURTAIN TRIM ASSEMBLY

1. If new top is being installed but it was impossible to perform step 14 of removal procedure, preset spacer sticks to shortest length and install between center and rear roof bow. (Fig. 16-116) Adjust sticks so that dimension "X" in Fig. 16-116 (measured along spacer stick from front upper rolled edge of rear roof bow to center of center bow) is 16-3/8" ±1/4".

   Tie or tape rear bow to rear side roof rails.

   NOTE: In all cases, above dimension may be changed slightly within tolerances to correspond with new top after tryout. Dimension should be equal on both right and left sides.

2. Tack side stay pads in conventional manner to rear roof bow and stay tack pads to front roof rail. Make sure inboard edge of pad is properly aligned within depressions in bow and rail. Stay tack pad to front bow. Inboard edge of pad should be located within 1/4 inch of outboard edge of front bow felt silencer. Install pad to center bow with screws. Make sure inboard edge of pad is properly aligned within depression in bow. Install stay pad wadding using trim cement. (Fig. 16-119)

3. Trim selvage end of side stay pads just forward of rear rolled edge of rear roof bow. (Fig. 16-120)

4. Distance from center of center bow to rolled forward upper edge of rear roof bow should be 16-3/8" ±1/4".

   Re-adjust spacer sticks and side roof rail pads as required.

5. Place back curtain window assembly on clean covered work bench with exterior (vinyl) surface of back window valance facing down. Large pliable back window must be handled carefully to avoid possible damage due to scratches, abrasions, etc. Apply bead of convertible top sealer (nitrile) along lower edge of back curtain material in area which will be tacked to rear and rear quarter trim stick. (View "A-A" Fig. 16-121).

6. Apply bead of convertible top sealer (nitrile) along lower selvage edge of back curtain material. (Fig. 16-121)

7. After sealer has dried, carefully lay removed back curtain assembly over new back curtain assembly. Using a grease pencil, mark vinyl surface of new back curtain using marked edge of old curtain as guide. (See Steps 10 and 18 of removal procedure). In addition, mark trim stick bolt hole locations on new back curtain assembly.

   IMPORTANT: Where a grease pencil or similar material is used for marking back curtain vinyl, marks must be below trim stick so that they will not show after curtain is installed in body.

8. Center and position back curtain assembly to rear trim stick over attached compartment bag.

   NOTE: Notch in back curtain vinyl at lower edge indicates centerline of back curtain assembly. (Fig. 16-122) In addition, back curtain lower edge should extend 1/2" below lower edge of trim sticks. (View "A-A", Fig. 16-121)

9. Tack curtain to rear and rear quarter trim sticks. On right side, tack zipper tape to

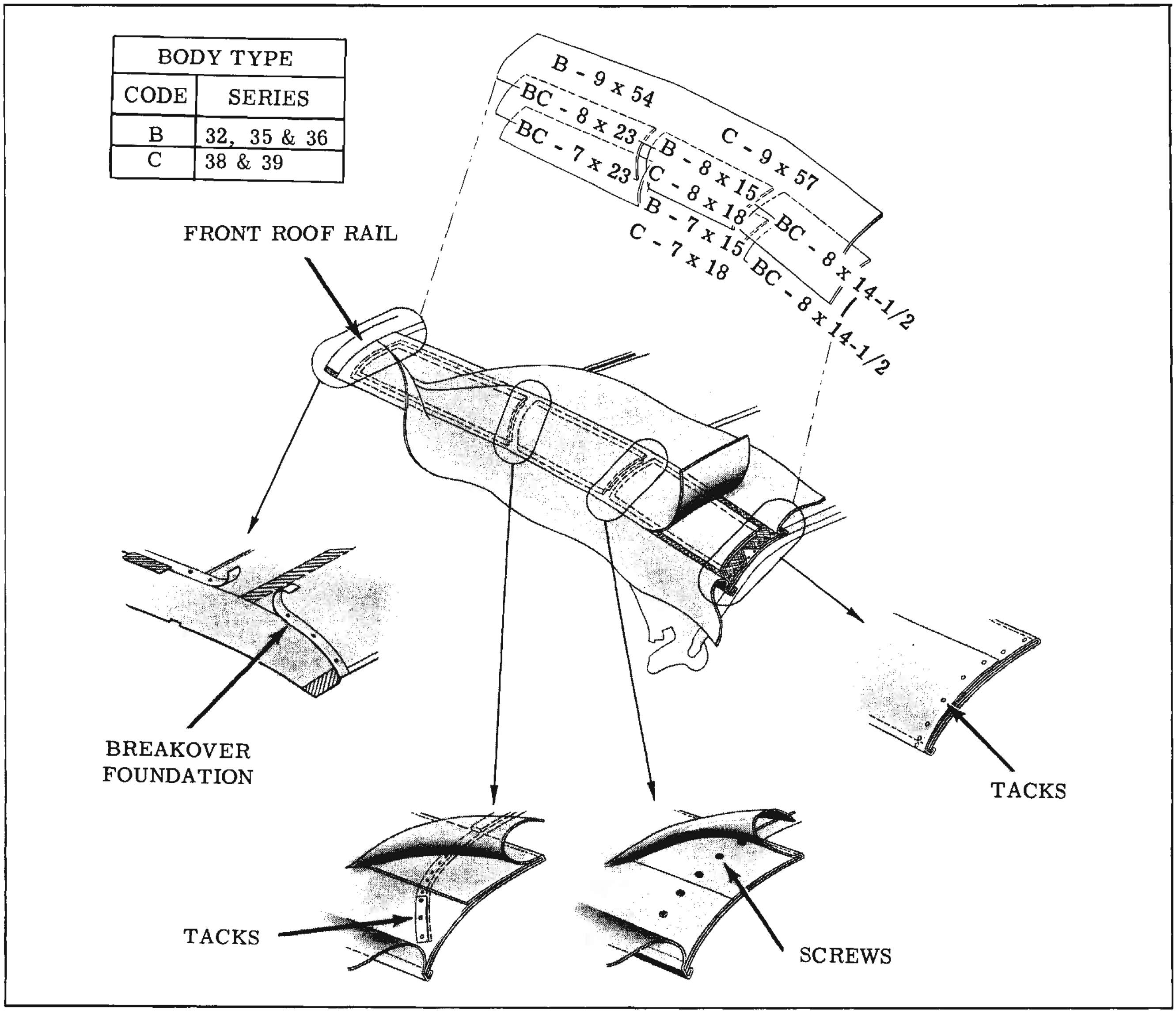


Fig. 16-119 Tacking Stay Pads

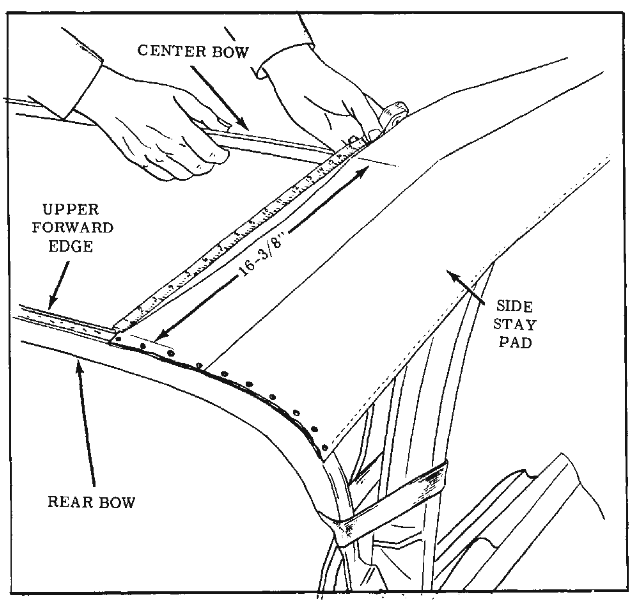


Fig. 16-120 Position of Rear Bow

forward edge of rear quarter trim stick. ("A", in direction of arrow, Fig. 16-122)

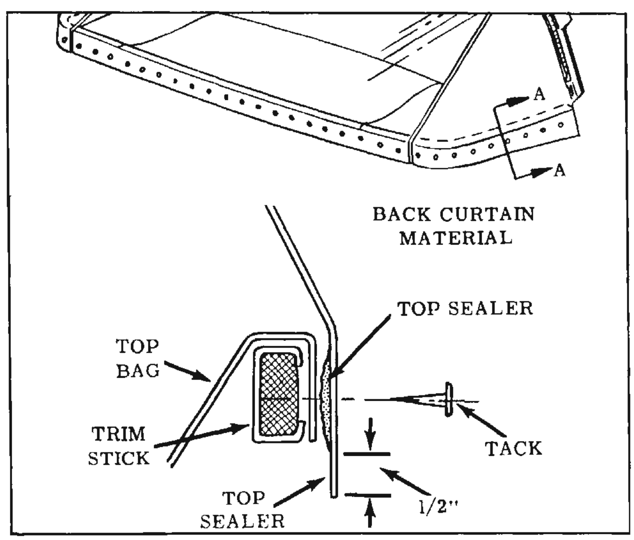


Fig. 16-121 Back Curtain Sealing

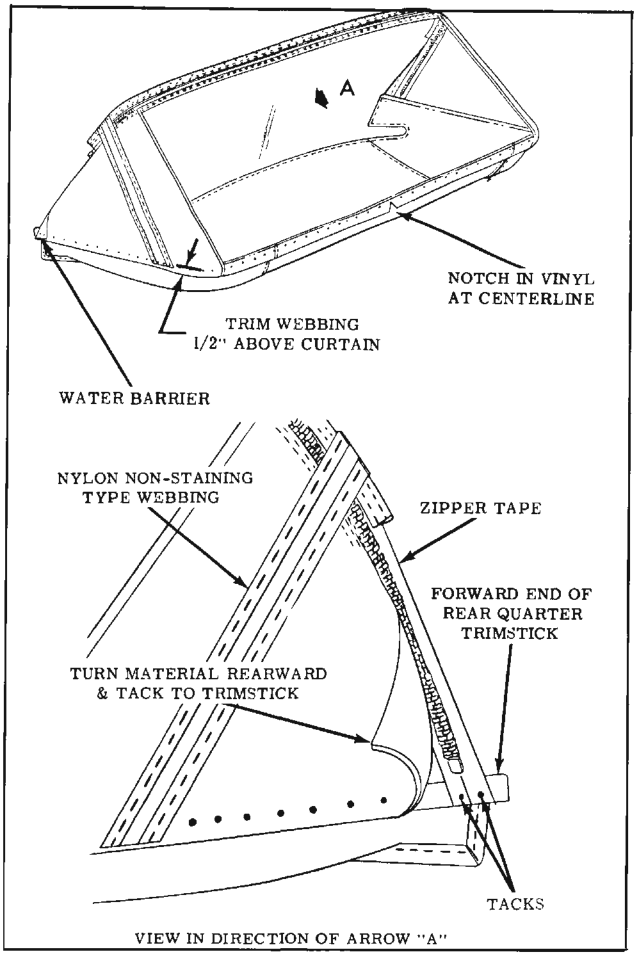


Fig. 16-122 Back Curtain Installation

NOTE: Zipper stop should be above upper edge of rear quarter trim stick. Zipper tape should not be pulled taut after back curtain has been installed to rear roof bow as zipper assembly may show through top material after top has been properly installed.

10. Tack remainder of back curtain material to rear quarter trim stick, turning forward edge of material rearward to form a water barrier. (Fig. 16-122)

11. Tacks securing back curtain assembly to trim sticks should be placed close to each side of every bolt hole in trim sticks; then pierce or punch back curtain assembly for each trim stick bolt.

12. Tack nylon webbing to rear trim stick. Forward edge of webbing should be even with edge of rear trim stick. New webbing may be cut from a piece of non-staining type webbing 2" x 19". Excess webbing should be trimmed off at rear trim stick, 1/2" above back curtain lower edge. (Fig. 16-122)

NOTE: Webbing used in build-up of side roof rail stay pads is recommended for the above operation.

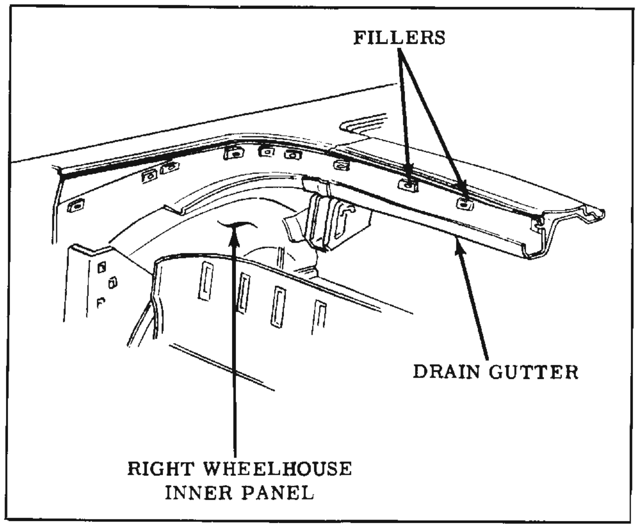


Fig. 16-123 Checking Trim Stick Fillers

13. Inspect rubber trim stick fillers cemented to body below pinchweld. Re-cement, if necessary. (Fig. 16-123)

14. Install rear trim stick with attached back curtain assembly into body.

    NOTE: Make sure that all trim stick bolts are driven completely in to represent finished condition.

15. Secure back curtain assembly with one tack to rear bow to prevent damage to plastic sheet. (Fig. 16-124)

16. Working from body center progressively outboard to right and left sides, tack back curtain upper valance to rear bow. Make sure all fullness has been drawn from curtain assembly. Fold excess back curtain upper valance material rearward and tack to rear bow. (Fig. 16-125)

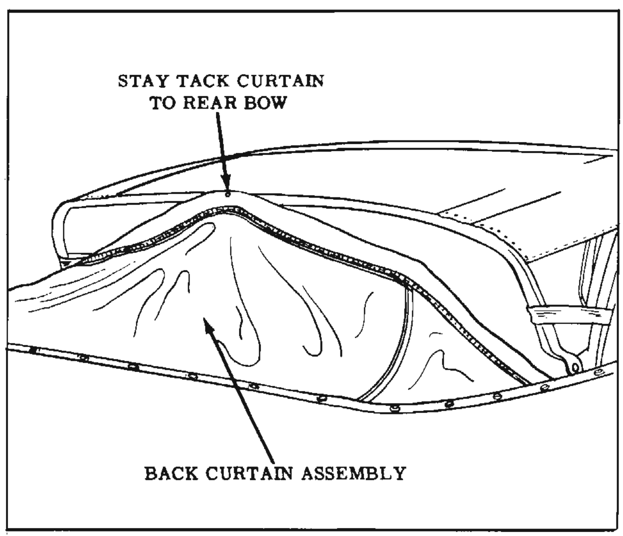


Fig. 16-124 Tacking Curtain at Rear Bow

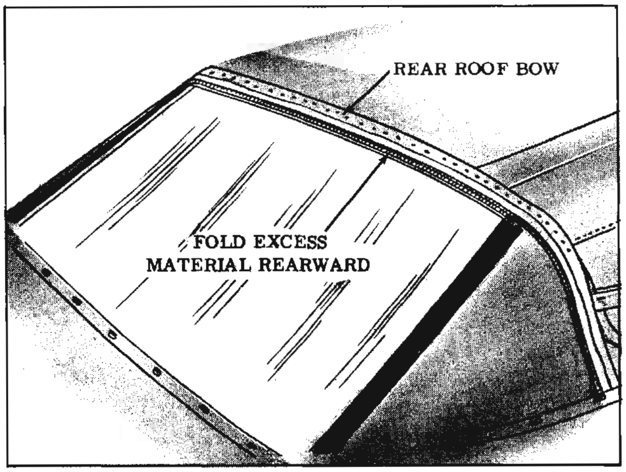


Fig. 16-125 Curtain Installation at Rear Bow

IMPORTANT: DO NOT CUT OFF EXCESS UPPER VALANCE MATERIAL AS MATERIAL MAY UNRAVEL.

17. Check contour of back curtain assembly at rear roof bow and at pinchweld molding.

18. Where required, place reference chalk mark on outer surface of back curtain along pinchweld finishing molding. Readjust back curtain assembly as required. (Fig. 16-126)

19. Where required, adjust side stay pads; then tack side stay pads to front roof rail and front bow. Attach side stay pads to center bow and side roof front rail with screws. Trim selvage end of side stay pads at front roof rail. Install stay pad covering material in conventional manner using an approved trim cement.

20. Tack nylon webbing to rear roof bow. Outboard edge of webbing should be installed even with outboard edge of side roof rail pad. Remove excess by trimming webbing just rearward of front rolled edge of rear roof bow.

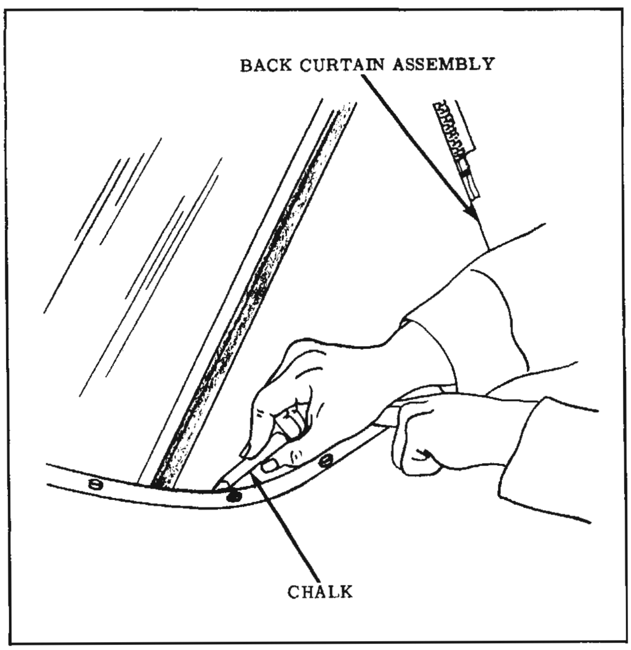


Fig. 16-126 Marking Back Curtain

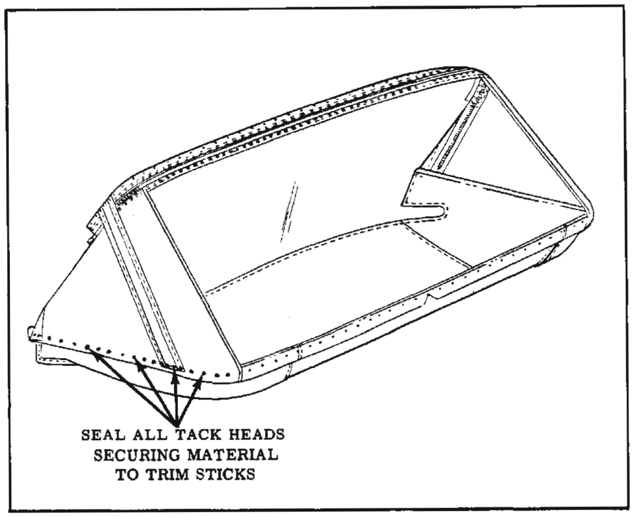


Fig. 16-127 Back Curtain Sealing

CAUTION: Do not cut back curtain or side stay pad material.

21. Detach rear trim stick with attached back curtain assembly from body.

22. Apply convertible top sealer (nitrile) around each tack head used to secure back curtain material and webbing to rear and/or rear quarter trim sticks. (Fig. 16-127)

IMPORTANT: It is not necessary to seal tacks which secure back curtain vinyl to rear trim stick.

23. Lay out new top material on clean protected surface with outer layer of material exposed.

24. Using a pencil, mark top material (mark

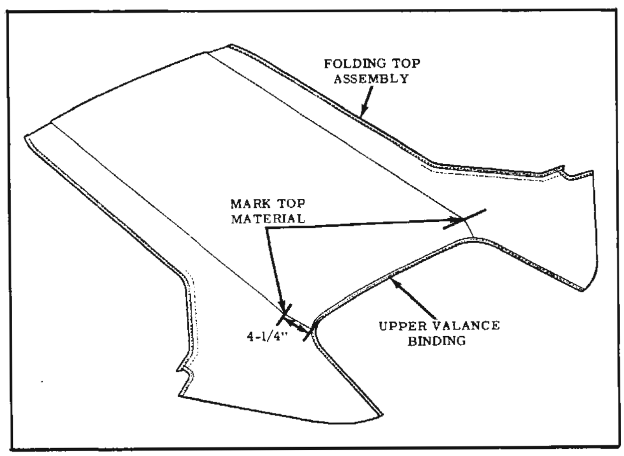


Fig. 16-128 Marking Top Material

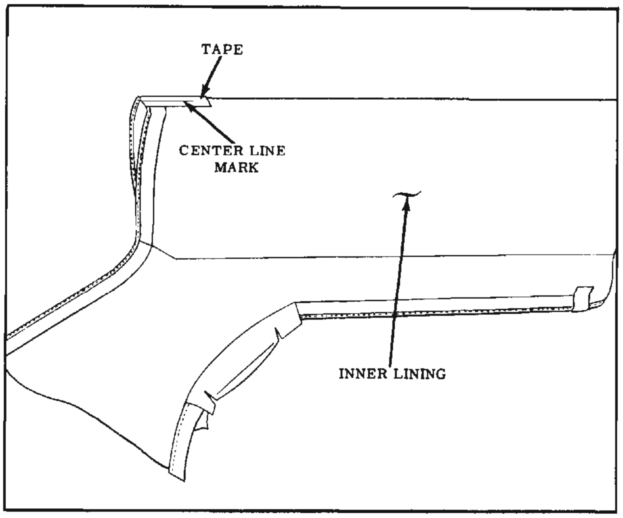


Fig. 16-129 Marking Top Assembly

should be approximately 1/2" in length) at deck seam 4-1/4" from edge of top material upper valance binding. (Fig. 16-128)

25. Fold new top material in half so that inner lining of top material is exposed. (Fig. 16-129) Install a 6" piece of tape on inner surface at centerline fold of new top material. (Fig. 16-129) Using a pencil, mark the approximate centerline of new top material along entire length of tape.

    IMPORTANT: Be sure mark will be visible inside of body after new top is installed on convertible top framework.

26. Along forward surface of rear roof bow, install a 1" piece of tape at centerline dimple of rear roof bow. Using a pencil, mark centerline of rear bow on tape. (Fig. 16-130)

27. Remove rear bow spacer sticks and positioning tape or cord.

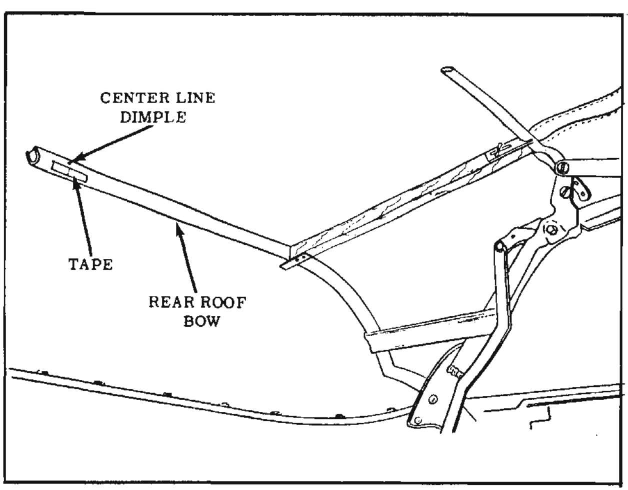


Fig. 16-130 Marking Rear Roof Bow

28. Check position of rear roof bow in relation to new folding top trim assembly by placing new top trim over folding top framework. With quarter flaps properly folded over rear side roof rails (edge of rails should match stitch lines of quarter flap seams), marks on deck seam should be in center of rear roof bow.

    NOTE: The deck seam mark will vary slightly (±1/4") depending upon position of rear roof bow. Also check centerline mark on inner lining of top material. Mark should correspond to centerline mark on rear roof bow.

29. Remove top trim material.

30. Carefully lay removed top, which was marked at lower edge of trim stick prior to removal, over new top. Align old top with new top. Using a pencil, mark vinyl surface of new top using marked edge of old top as guide. Also mark edges of trim sticks on vinyl surface of new top material. (See Steps 11 and 12 of removal procedure).

31. Apply bead of convertible top sealer (nitrile) to inner lining of top material along front roof rail. Sealer bead should be roughly parallel with forward edge of top material and located so that sealer will be completely concealed by front roof rail when top is installed. (Fig. 16-109)

32. After sealer has dried, position top trim on framework and center assembly both fore and aft and side to side.

33. On right side of top material, at rear of hold-down cable pocket, install cable through pocket in top assembly.

    NOTE: Welding rod or similar material may be bent at one end to form a hook. Then at front of hold-down pocket slip hooked end of rod into pocket. Push rod through pocket until hooked end of rod is exposed at rear of pocket. Install forward end of cable attaching bracket over hooked portion of rod; then pull cable through pocket. When cable attaching bracket is exposed at front end of hold-down pocket, disengage hooked portion of rod from cable attaching bracket. Repeat above operation on opposite side of top assembly.

34. After cables have been pulled through hold-down pockets in top material, fasten cable attaching brackets to side roof front and rear rails. (Fig. 16-111)

    IMPORTANT: Cables should be reasonably loose after installation is made at side roof rails. DO NOT adjust cables to desired tension until top material has been completely installed. (See Step 51 of installation procedure)

35. Check position of top trim at rear roof bow and at side roof rear rails. With quarter flaps properly folded over rear side roof rails (edge of rails should match stitch lines of quarter flap seams), marks on deck seam should be in center of rear roof bow.

    NOTE: The deck seam mark will vary slightly (± 1/4") depending upon position of rear roof bow. Also check centerline mark on inner lining of top material. Mark should correspond to centerline mark on rear roof bow. (Fig. 16-130)

36. Using neoprene-type weatherstrip adhesive, fasten rear quarter flaps to side roof rear rails. Make sure that quarter flap seam breaks at forward edge of side roof rear rail.

    NOTE: Material may have to be stretched from side to side to insure proper fit of top material flaps to side roof rear rails and to remove wrinkles from top material along rear roof bow.

37. Cut or pierce flaps for side roof rail rear weatherstrip attaching bolts. Install side roof rail rear weatherstrip to help maintain position of quarter flaps while adhesive is drying.

38. Using previously marked lines (ends of trim stick) as locating reference, tack top material to rear and rear quarter trim sticks. ("A", Fig. 16-131)

39. Cut or punch hole in top material for each trim stick attaching bolt.

40. Install top material into body. Make sure rear and rear quarter trim stick attaching bolts are completely driven in to represent finished condition.

41. Check fit of top material. Rear quarter trim sticks may be adjusted downward to remove minor wrinkles in top material in rear quarter area.

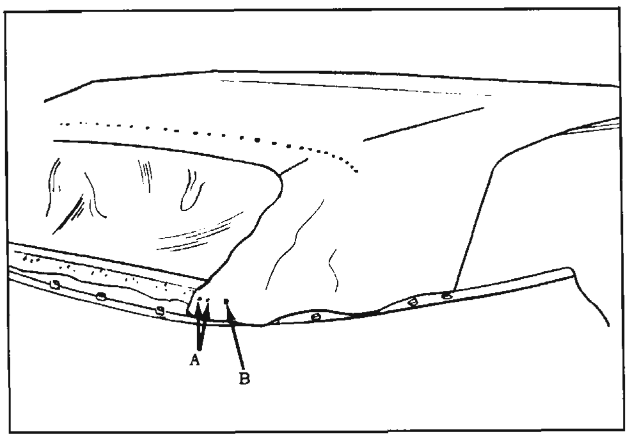


Fig. 16-131 Tacking Top Material

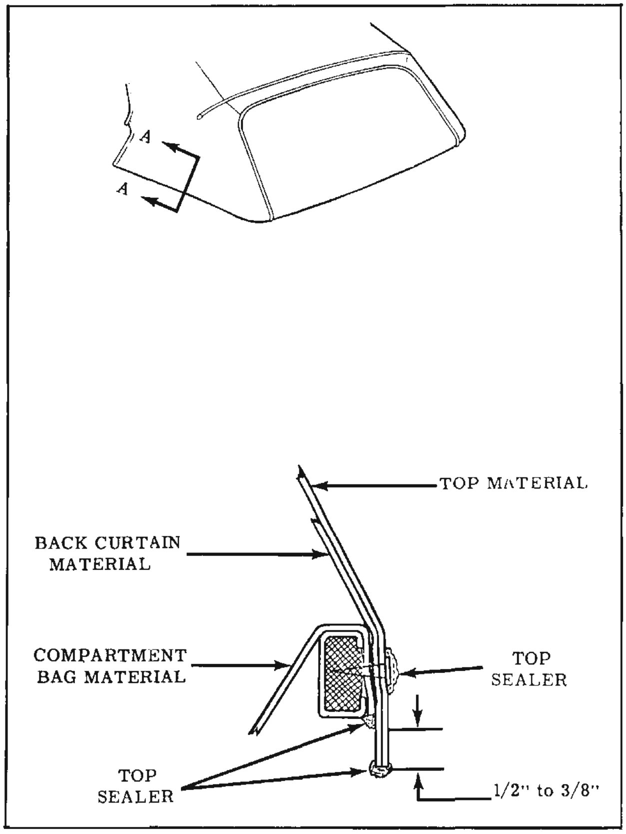


Fig. 16-132 Sealing at Trim Sticks

42. Where required, re-mark top material; then make necessary adjustments to top material by repositioning rear quarter trim sticks and/or by retacking top material to rear and/or rear quarter trim sticks.

    NOTE: In extreme cases, adjustment of top material at rear or rear quarter trim sticks may have to be performed several times before desired fit of top material is obtained.

43. Remove trim sticks with attached top material from top compartment well. Back curtain should extend 1/2" below trim sticks. (See Step 8 of installation procedure). In addition, top material must extend 1/2" to 5/8" below trim sticks to minimize water wicking on inner lining of back curtain material. (View "A-A", Fig. 16-132) Trim top material as required.

44. Apply convertible top sealer (nitrile) onto all trimmed edges, around each tack head and around each trim stick attaching bolt hole. (View "A-A", Fig. 16-132)

    CAUTION: All painted surfaces adjacent to belt finishing molding should be adequately covered to prevent possible sealer damage.

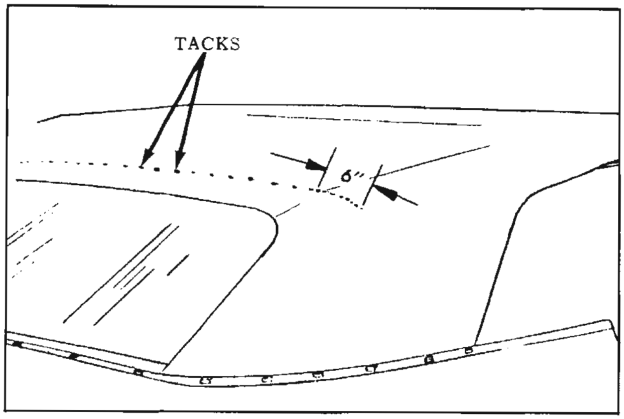


Fig. 16-133 Tacks Outboard of Seam

45. Install trim sticks with attached top material into top compartment well and tighten side and rear trim stick attaching bolts.

46. Recheck side roof rail flaps. Make sure mark at deck seams is in center of rear bow. Also re-check centerline mark on inner surface of top material at rear bow.

47. Where required, remove side roof rail rear weatherstrips. Readjust top material at side roof rails and reinstall weatherstrips.

48. While pulling top material slightly rearward, stay tack top material along rear roof bow.

IMPORTANT: Tacks must be installed along a straight line in center of rear bow. (Fig. 16-133). Tacks outboard of deck seams should be restricted to distance not to exceed six inches, which is length wire-on binding extends past seam. (Fig. 16-133)

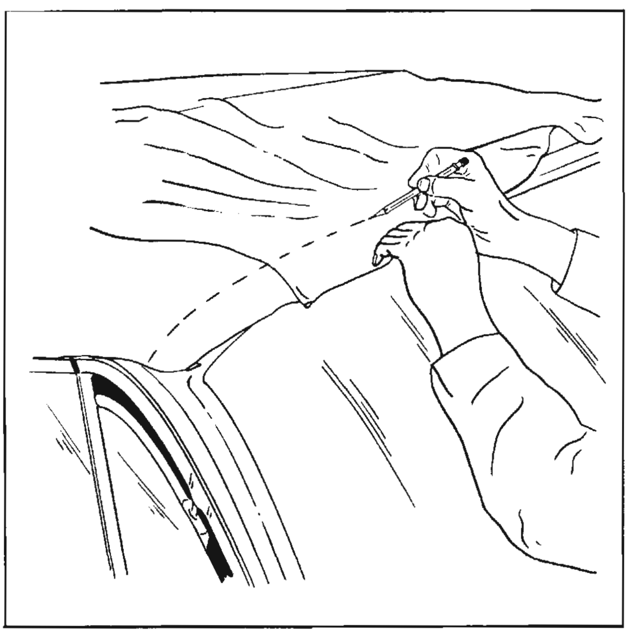


Fig. 16-134 Marking Top Material at Front Roof Rail

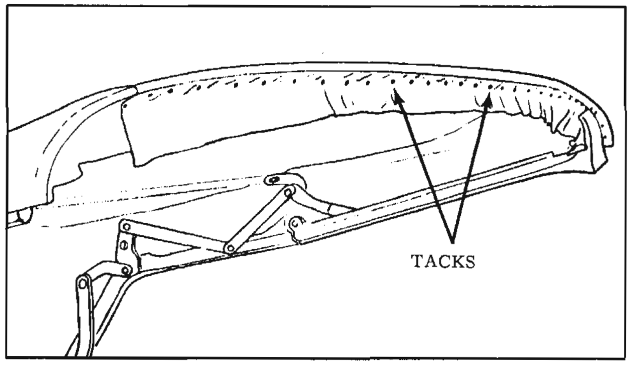


Fig. 16-135 Tacking Trim to Rail

49. At front roof rail, pull top trim material forward to desired tension. While maintaining tension on top trim, place a pencil mark on outer surface of trim material along forward edge of front roof rail. (Fig. 16-134)

50. Unlock top from windshield header and apply neoprene-type weatherstrip adhesive to tacking area of front roof rail. Pull top trim material slightly forward so that pencil marks are on underside of front edge of front roof rail. Fasten top trim to cemented area and stay tack trim to rail. (Fig. 16-135)

51. Unlock top from windshield header. Prop-up top assembly approximately 12 inches above windshield header. Loosen top material hold-down cable front attaching screws. (View "A", Fig. 16-111) Adjust cable by pulling cable taut and tighten attaching screws. Lock top to windshield header.

NOTE: Cables should be adjusted sufficiently to hold top material tightly against side roof rail stay pads. However, cables should NOT be adjusted so tight as to restrict proper locking action of the front roof rail assembly to the windshield header. Where necessary, readjust cables as required to obtain desired tension.

52. Apply neoprene-type weatherstrip adhesive to front flaps and to corresponding areas on side roof front rails. Fasten flaps to side roof front rails. (Fig. 16-110)

53. Lock top to windshield header. Check appearance of top trim as well as operation and locking action of top. (If additional tension is desired in top trim, unlock top from header and reposition top trim by pulling trim further forward. Stay tack and recheck top appearance).

54. Complete tacking of top trim to front roof rail and trim off excess material.

55. Permanently tack top material to rear roof bow. Apply bead of neoprene-type

weatherstrip adhesive around each tack head, and into two holes pierced into top material for wire-on binding clip escutcheons.

56. When completed, folding top should be free from wrinkles and draws. Install all previously removed trim and hardware and clean any soilage from top material, back curtain or pads.

FOLDING TOP TRIM (LESS BACK CURTAIN)

REMOVAL

1. Remove folding top trim as described in Steps 1 through 13 of REMOVAL OF FOLDING TOP TRIM ASSEMBLY (COMPLETE).

INSTALLATION

1. Prior to installation of new top trim material, check contour of back curtain and side stay pad assemblies. Where required, adjust back curtain and/or side stay pads as required.

2. Install new folding top trim as described in Steps 23 through 26 and 28 through 56 of INSTALLATION OF FOLDING TOP TRIM ASSEMBLY (COMPLETE).

BACK CURTAIN TRIM ASSEMBLY—COMPLETE (F-85 TYPICAL)

REMOVAL

1. Perform Steps 1, 2, 7, 8, 9, 10, and 12 as described in REMOVAL OF FOLDING TOP TRIM ASSEMBLY (COMPLETE).
2. Remove wire-on binding and escutcheons from rear roof bow.
3. Detach folding top trim from rear roof bow and from rear and rear quarter trim sticks.
4. Carefully slide top trim forward exposing tacked edge of back curtain at rear roof bow.
5. Detach nylon webbing and back curtain from rear roof bow; then remove back curtain assembly with attached trim sticks and top compartment bag from body and place on a clean protected surface.
6. Perform Steps 18, 19 and 20 as described in REMOVAL OF FOLDING TOP TRIM ASSEMBLY (COMPLETE).

INSTALLATION

1. Install spacer sticks as described in Step 1 of INSTALLATION OF FOLDING TOP TRIM ASSEMBLY (COMPLETE).
2. Seal and install back curtain assembly as described in steps 5 through 18 and 20 through 22 of INSTALLATION OF FOLDING TOP TRIM ASSEMBLY (COMPLETE).

NOTE: Extra care in positioning new curtain at same location on trim stick as old curtain and aligning of trim stick attaching bolt holes in top material with holes in trim stick, will allow reinstallation of top material to its original position with a minimum of refitting.

BACK CURTAIN VINYL

REMOVAL

1. Place protective covers on all exposed panels which may be contacted during procedure.
2. Remove rear seat cushion and back.

CAUTION: Disconnect rear seat speaker wire if present.

3. Remove folding top compartment side trim panel assemblies and side roof rail rear weatherstrips; then detach folding top quarter flaps from side roof rear rails.
4. Detach top compartment bag from seat back panel and remove all trim stick attaching bolts.
5. To establish the relationship of right and left inner vertical edge of old top material to back curtain assembly at rear trim stick location, mark back curtain vinyl at both locations with a grease pencil. (Fig. 16-114) Reference marks should be transferred to new back curtain when step 5 of installation procedure is performed.
6. Using a pencil, mark both ends of rear and rear quarter trim sticks on vinyl surface of top material. Reference marks should be used as a guide when installing top material to trim sticks after new back curtain has been installed.
7. Remove folding top material from rear and rear quarter trim sticks; then carefully slide top trim forward sufficiently to expose back curtain zipper.
8. Detach zipper tape from rear quarter trim stick.
9. Using a pair of wire cutting shears, cut zipper stop along dotted line and remove both halves of stop from zipper. (Fig. 16-136)

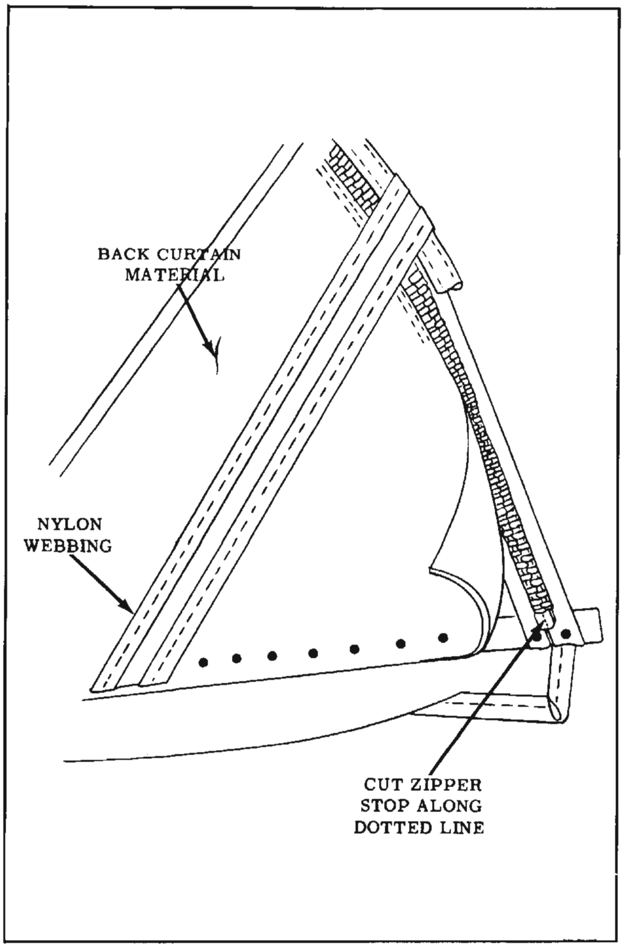


Fig. 16-136 Back Curtain Vinyl Replacement

10. Operate slide fastener off of zipper assembly.
11. Detach nylon webbing from rear trim stick.
12. Remove rear and rear quarter trim sticks with attached back curtain and compartment bag material from body and place on a clean protected surface.
13. Using chalk, mark ends of rear and rear quarter trim sticks on vinyl surface of back curtain material. (Fig. 16-118) Reference marks for trim sticks should be transferred to new back curtain material when step 5 of installation procedure is performed.
14. Using chalk, mark zipper tape at upper edge of vinyl. (Fig. 16-137)
15. Remove back curtain assembly from rear and rear quarter trim sticks.
16. As a bench operation, cut stitches securing half of zipper assembly to back curtain vinyl.

    NOTE: Back curtain vinyl and extensions (less zipper) are available as a service part.

INSTALLATION

1. Using chalk mark as guide, locate rear half of zipper to new back curtain vinyl. Zipper tape may be stapled to new back curtain to aid in holding zipper in proper position during sewing operation.

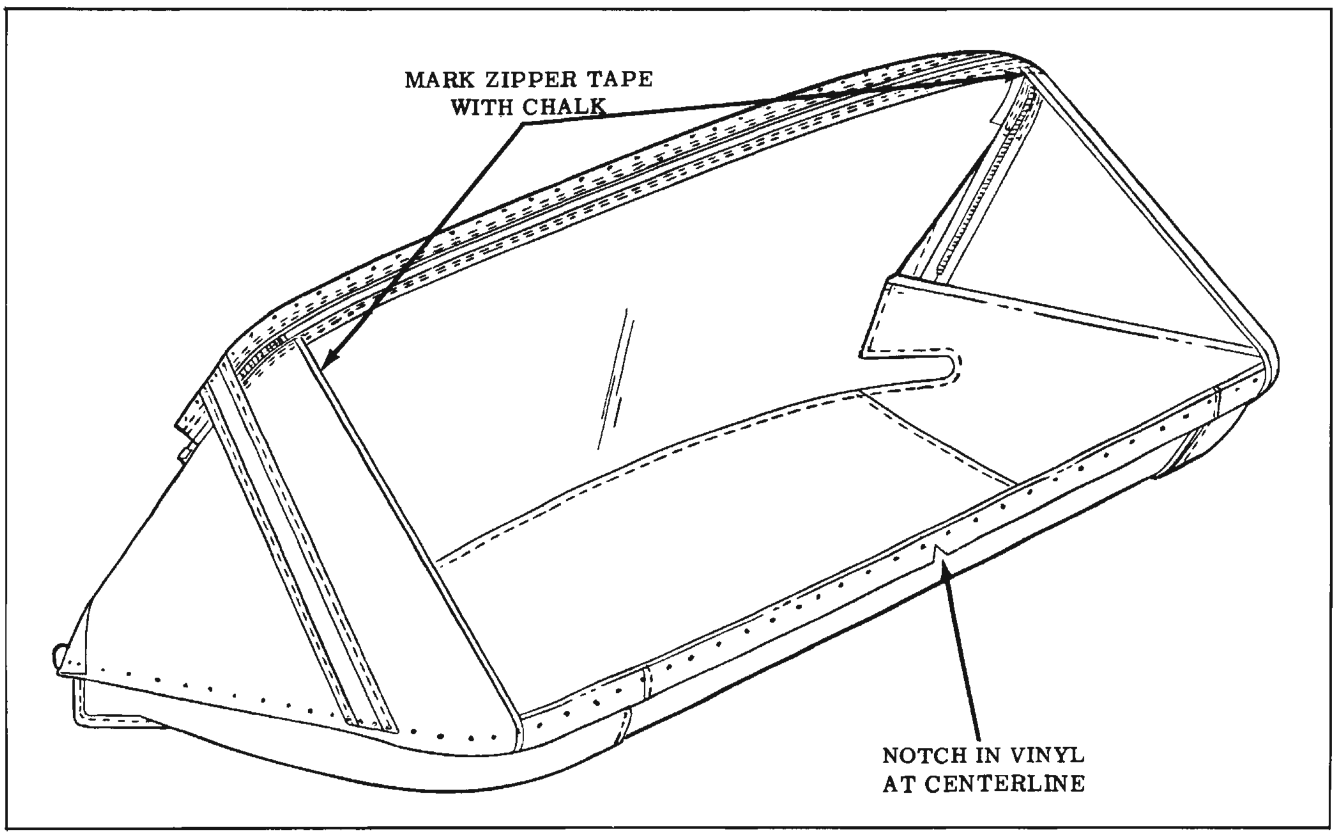


Fig. 16-137 Marking Zipper Tape

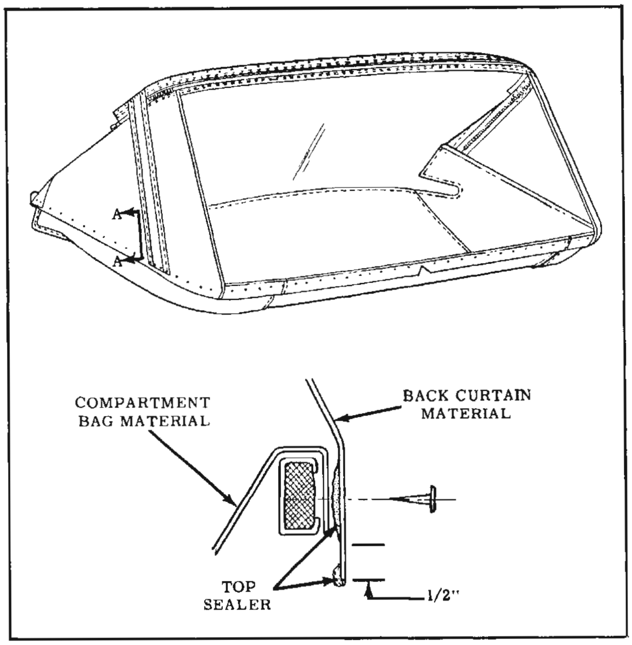


Fig. 16-138 Back Curtain Sealing

2. Sew zipper to new back curtain assembly.

3. Place back curtain window assembly on clean covered work bench with exterior (vinyl) surface of back window valance facing down. (Large pliable back window must be handled carefully to avoid possible damage due to scratches, abrasions, etc.). Apply bead of convertible top sealer (nitrile) along lower edge of back curtain material in area which will be tacked to rear and rear quarter trim sticks. (View "A-A", Fig. 16-138)

4. Apply bead of convertible top sealer (nitrile) along lower selvage edge of back curtain material. (Fig. 16-138).

5. After sealer has dried, transfer marks on old back curtain to new back curtain assembly. See steps 5 and 13 of removal procedure.

6. Center and position back curtain assembly to rear trim stick over attached compartment bag.

   NOTE: Notch in back curtain vinyl at lower edge indicates centerline of back curtain assembly. (Fig. 16-138). In addition, back curtain lower edge should extend 1/2" below lower edge of trim sticks. (Fig. 16-138)

7. Tack curtain to rear and rear quarter trim sticks. Turn forward edge of material rearward to form a water barrier. (Fig. 16-138)

8. Tacks securing back curtain assembly to trim sticks should be placed close to each side of every bolt hole in trim sticks. Then pierce or punch curtain assembly for each trim stick bolt.

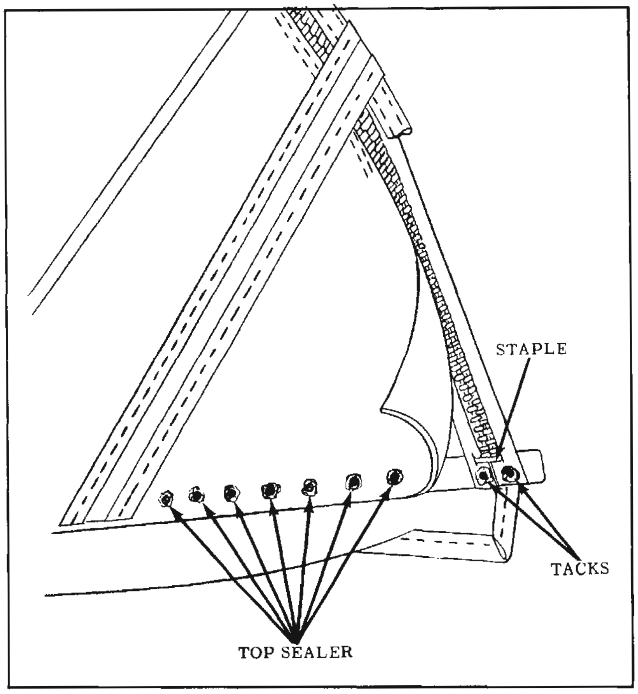


Fig. 16-139 Sealing Rear Quarter Trim Stick

9. Tack nylon webbing to rear trim stick as previously described.

10. Inspect rubber trim stick fillers cemented to body below pinchweld. Re-cement, if necessary.

11. Install slide fastener onto zipper assembly.

12. Staple both sections of zipper tape together. Staples will aid in preventing zipper scoops from disengaging and also serve as a stop for the slide fastener. (Fig. 16-139).

13. Operate slide fastener to closed position.

14. Tack zipper tape to rear quarter trim stick. (Fig. 16-139) Zipper tape should not be pulled taut as zipper teeth may show through top material after top has been properly installed.

15. Install trim sticks with attached back curtain assembly into body.

    NOTE: Make sure that all trim stick bolts are driven completely in to represent finished condition.

16. Check contour of back curtain assembly at pinchweld molding. Where required, place reference chalk mark on outer surface of back curtain along pinchweld finishing molding. Re-adjust back curtain assembly by retacking curtain to rear or rear quarter trim sticks as required.

17. Detach rear trim stick with attached back

curtain assembly from body.

18. Apply convertible top sealer (nitrile) around each tack head used to secure back curtain material and webbing to rear and rear quarter trim sticks. (Fig. 16-139)

IMPORTANT: It is not necessary to seal tacks which secure back curtain vinyl to rear trim stick.

19. After sealer has dried, carefully replace top in position in rear quarter area.

20. Using neoprene-type weatherstrip adhesive, fasten rear quarter flaps to side roof rear rails. Make sure that rear quarter flap seam is even with forward edge of side roof rear rail. Install side roof rail rear weatherstrip to help maintain position of quarter flaps while adhesive is drying.

21. Using previously marked lines (end of trim sticks) and bolt hole locations in top material as a locating reference, tack top material to rear and rear quarter trim sticks.

22. Install top material into body. Make sure rear and rear quarter trim stick attaching bolts are completely driven in to represent finished condition.

23. Check fit of top material. Rear quarter trim sticks may be adjusted downward to remove minor wrinkles in top material in rear quarter area.

24. Where required, re-mark top material; then make necessary adjustments to top material by repositioning rear quarter trim sticks or by retacking top material to rear or rear quarter trim sticks.

25. After desired fit of top material has been obtained, remove trim sticks with attached top material from top compartment well. Back curtain should extend 1/2" below trim sticks. (Fig. 16-138)

26. Apply convertible top sealer (nitrile) onto all trimmed edges, around each tack head and around each trim stick attaching bolt hole. (View "A-A", Fig. 16-132)

CAUTION: All painted surfaces adjacent to belt finishing molding should be adequately covered to prevent possible sealer damage.

27. Install trim sticks with attached top material into top compartment well and tighten side and rear trim stick attaching bolts.

28. Where required, remove side roof rail rear weatherstrips. Readjust top material at side roof rails and reinstall weatherstrips.

29. When completed, folding top and back curtain assembly should be free from all wrinkles and draws. Install all previously removed trim and hardware and clean any soilage from top material or back curtain assembly.

HYDRO-LECTRIC SYSTEM (F-85 Typical)

The high pressure hydro-lectric unit consists of a 12 volt reversible type motor, a rotor-type pump, two hydraulic lift cylinders, and an upper and lower hydraulic hose assembly. The unit is installed in the body directly behind rear seat back. (Fig. 16-140)

Fig. 16-141 illustrates and identifies the individual parts of the motor and pump assembly.

NOTE: When servicing the motor assembly or pump end plate assembly, it is extremely important that the small motor shaft "O" ring seal is properly installed over the motor armature shaft and into the pump end plate assembly prior to installing the pump rotors or the motor shaft drive ball.

MOTOR AND PUMP ASSEMBLY

Removal

1. Operate folding top to full up position.

2. Disconnect positive battery cable.

3. Place protective covering over rear seat cushion and back.

4. Working inside body, detach front edge of folding top compartment bag from rear seat back panel.

5. Working on inside of body over rear seat back, remove pump and motor shield attaching screws and remove shield.

6. Remove clips securing wire harness and hydraulic hose to rear seat back panel. (View "A" and "B", Fig. 16-140)

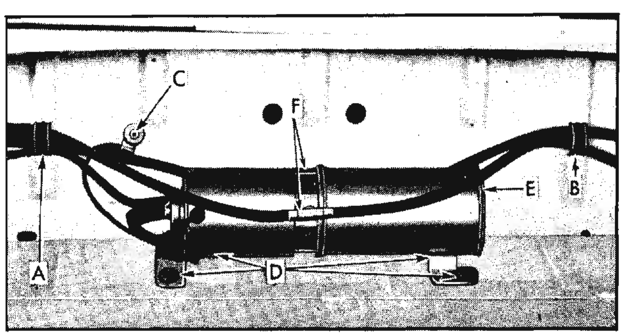


Fig. 16-140 Hydro-Lectric Motor and Pump Assembly

7. Disconnect motor leads from wire harness and ground attaching screw. (View "C" Fig. 16-140)

8. To facilitate removal, apply a rubber lubricant to pump attaching grommets; then carefully disengage grommets from floor pan. (View "D", Fig. 16-140)

9. Place absorbent rags below hose connections and end of reservoir.

10. With a straight-bladed screwdriver, vent reservoir by removing filler plug; then reinstall plug. (View "E", Fig. 16-140)

    NOTE: Venting reservoir is necessary to equalize air pressure in reservoir to that of the atmosphere. This operation prevents the possibility of hydraulic fluid being forced under pressure from disconnected lines and causing damage to trim or body finish.

11. Disconnect hydraulic lines and cap open fittings to prevent leakage of fluid. (View "F", Fig. 16-140) Use a cloth to absorb any leaking fluid, then remove unit from rear compartment.

Installation

1. If a replacement unit is being installed, fill reservoir unit with Brake Fluid Super No. 11. See FILLING OF HYDRO-LECTRIC RESERVOIR.

2. Connect hydraulic hoses, engage attaching grommets in panel and connect wiring.

3. Connect battery and operate top through its up and down cycles until all air has been "bled" from hydraulic circuit. See FILLING OF HYDRO-LECTRIC RESERVOIR.

4. Check connections for leaks and recheck fluid level in reservoir.

5. Install previously removed parts.

RESERVOIR TUBE

Disassembly From Motor and Pump Assembly

1. Remove motor and pump assembly from body.

2. Scribe a line across pump end plate, reservoir tube and reservoir tube end plate to insure a correct assembly of parts. (Fig. 16-142)

3. With a straight-bladed screwdriver, remove reservoir filler plug. Note sealing ring around plug.

4. Drain fluid from reservoir into a clean container.

5. Remove bolt from end of assembly and remove reservoir end plate and tube. Note sealing rings around bolt, reservoir end plate, and between end of reservoir tube and pump cover plate assembly.

Assembly To Motor and Pump Assembly

1. Position sealing ring on pump and assemble reservoir tube to pump according to scribe marks.

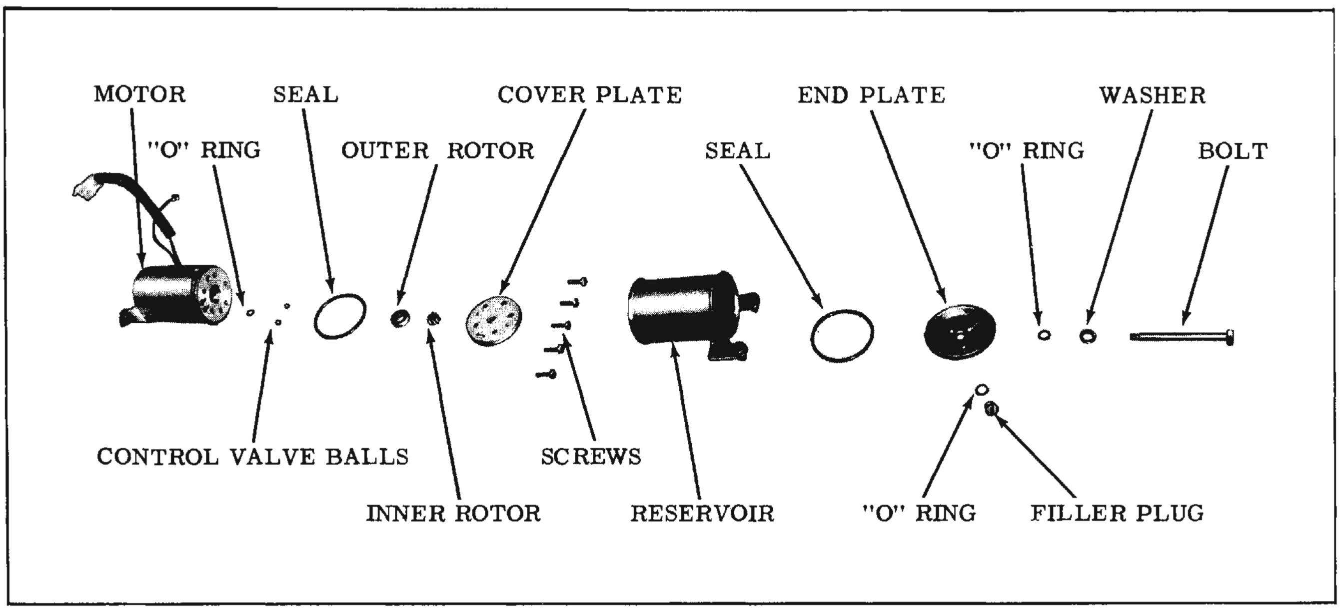


Fig. 16-141 Motor and Pump Disassembled

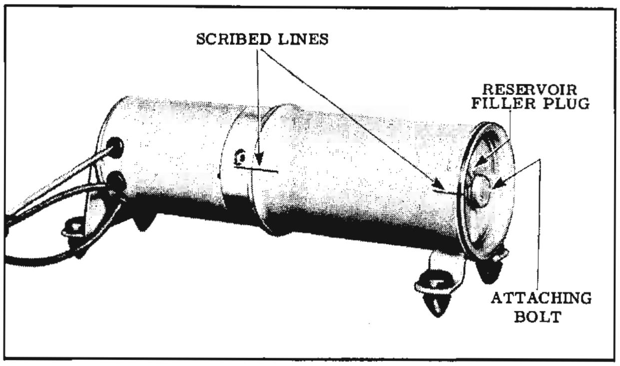


Fig. 16-142 Alignment Marks

NOTE: Bracket assembly on tube should be located at outer end when tube is assembled to pump.

2. Position sealing ring on tube end plate and position end plate on reservoir tube, according to scribe marks. Install and tighten attaching bolt.

3. Place unit in horizontal position and fill with fluid until fluid level is within 1/4 inch of lower edge of filler plug hole.

4. Make sure that sealing ring is on filler plug before installing filler plug.

OPERATION OF FOLDING TOP

When the control switch is actuated to the "up" position, the battery feed wire is connected to the red motor lead and the motor and pump assembly operate to force the hydraulic fluid through the hoses to the lower ends of the double-acting cylinders. The fluid forces the piston rods in the cylinders upward, thus raising the top. The fluid in the top of the cylinders returns to the pump for recirculation to the bottom of the cylinders. When the control switch knob is actuated to the "down" position, the feed wire is connected to the dark green motor lead and the motor and pump assembly operate in a reversed direction to force the hydraulic fluid through the hoses to the top of the cylinders. The fluid forces the piston rods in the cylinders downward, thus lowering the top. The fluid in the bottom of the cylinders returns to the pump for recirculation to the top of the cylinders.

OPERATION OF PUMP ASSEMBLY

The motor type pump assembly is designed to deliver a maximum pressure in the range of 340 psi to 380 psi. The operation of the pump assembly when raising the top is as follows:

1. Raising the Top. When the red motor lead is energized, the motor drive shaft turns the rotors clockwise as indicated by the large arrow in Fig. 16-143. The action of the pump rotors forces the fluid under pressure to the bottom of each cylinder forcing the piston upward. This action causes the fluid above the piston in each cylinder to be forced into the pump, which recirculates the fluid to the bottom of the cylinders. The additional fluid required to fill the cylinder due to piston rod displacement is drawn from the reservoir.

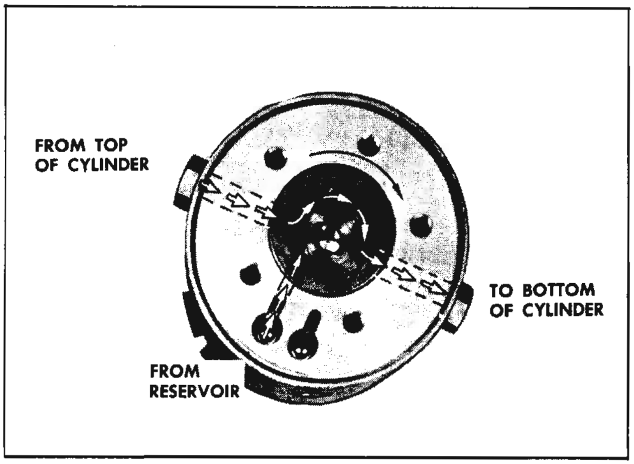


Fig. 16-143 Pump Operation to Raise Top

2. Lowering the Top. When the green motor lead is energized, the motor drive shaft turns the rotors counterclockwise as indicated by the large arrow in Fig. 16-144. The action of the pump rotors forces the fluid under pressure to the top of each cylinder. This action causes the fluid below the piston in each cylinder to be forced into the pump which recirculates the fluid to the top of each cylinder. The surplus hydraulic fluid due to piston rod displacement flows into the reservoir.

FLUID CONTROL VALVE

The fluid control valve consists of a rocker

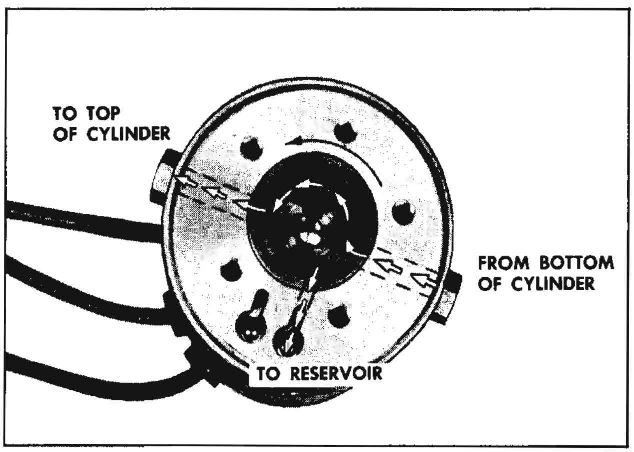


Fig. 16-144 Pump Operation to Lower Top

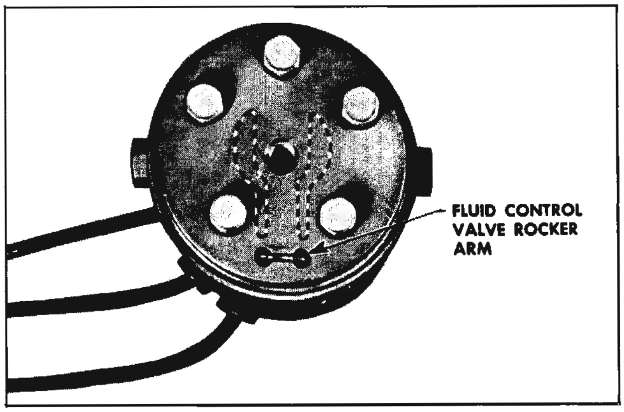


Fig. 16-145 Pump Cover Plate

arm installed in the pump cover plate, and two steel balls. Fig. 16-145 shows the top surface

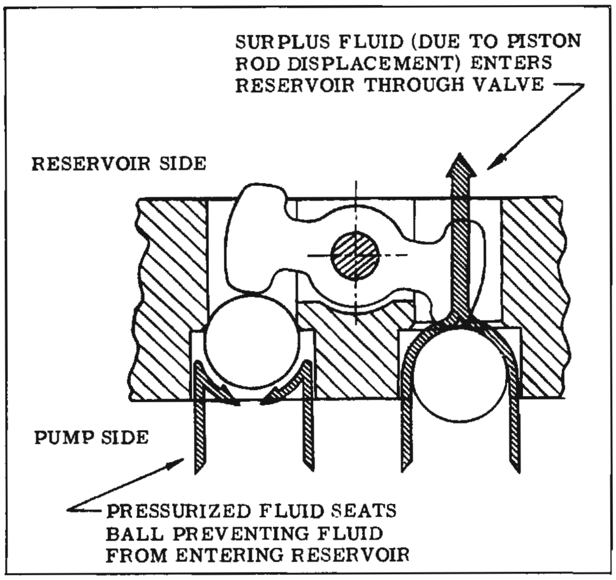


Fig. 16-146 Fluid Control Valve (Top Lowered)

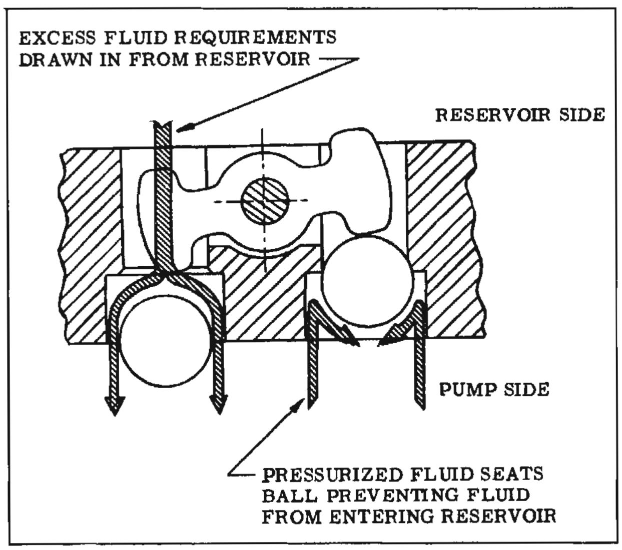


Fig. 16-147 Fluid Control Valve (Top Raised)

of the pump coverplate. The dotted lines indicate the cavities on the bottom side of the coverplate. The cavities are designed to permit fluid flow between pump rotors and the reservoir.

Fig. 16-146 and Fig. 16-147 illustrates the operation of the fluid control valve.

MECHANICAL CHECKING PROCEDURE

If there is a failure in the hydro-lectric system and the cause is not evident, the mechanical operation of the top should first be checked. If the folding top assembly appears to have a binding action, disconnect the top lift cylinder piston rods from the top linkage and then manually raise and lower the top. The top should travel through its up and down cycle without any evidence of a binding action. If a binding action is noted when the top is being locked at the header, check the alignment of the door windows, ventilators and rear quarter windows with relation to the side roof rail weatherstrips. Make all necessary adjustments for correct top alignment. See FOLDING TOP ADJUSTMENTS. If a failure continues to exist after a check for mechanical failure has been completed, the hydro-lectric system should then be checked for electrical or hydraulic failures.

ELECTRICAL CHECKING PROCEDURE

If a failure in the hydro-lectric system continues to exist after the mechanical operation has been checked, the electrical system should then be checked. A failure in the electrical system may be caused by a low battery, breaks in wiring, faulty connections, mechanical failure of an electrical component, or wires or components shorting to one another or to body metal. Before beginning checking procedures, check battery output.

Checking for Current at Folding Top Control Switch

1. Disengage terminal block from rear of switch.
2. Connect light tester to central feed terminal of switch terminal block.
3. Ground light tester ground lead to body metal.
4. If light tester does not light, there is an open or short circuit between power source and switch.

Checking the Folding Top Control Switch

If there is current at the feed wire terminal of the terminal block, operation of switch can be checked as follows:

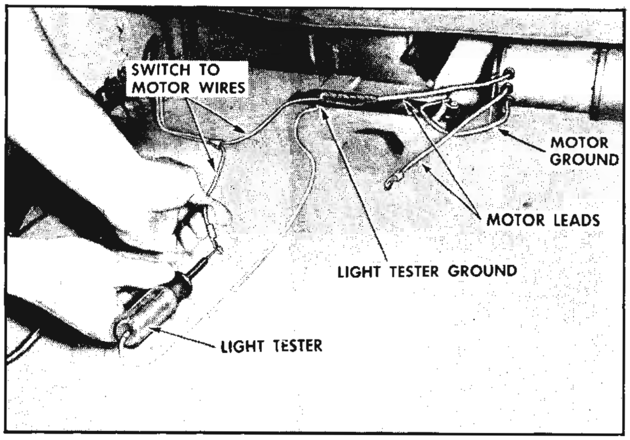


Fig. 16-148 Checking Motor Wiring

1. Place a No. 12 jumper wire on switch terminal block between center terminal (feed) and one motor wire terminal. If motor operates with jumper wire but did not operate with switch, switch is defective.

2. Connect jumper wire between center terminal and other motor wire terminal on switch terminal block. If motor operates with jumper wire, but did not operate with switch, switch is defective.

Checking Switch to Motor Lead Wires

If switch is found to be operating properly, the switch to motor lead wires can be checked as follows: (Fig. 16-148)

1. Disconnect green switch-to-motor wire from motor lead in rear compartment.

2. Connect a light tester to green switch-to-motor wire terminal.

3. Ground light tester ground lead to body metal.

4. Actuate switch to "down" position. If tester does not light, there is an open or short circuit in wire.

5. Disconnect red switch-to-motor wire from motor lead.

6. Connect light tester to red switch-to-motor wire terminal.

7. Actuate switch control knob to "up" position. If tester does not light, there is an open or short circuit in wire.

Checking the Motor Unit

If a light tester indicates current at the motor lead terminals of the switch-to-motor wires, but motor unit does not operate from switch, a final check of the motor unit can be made as follows:

1. Check connection of motor ground wire to body metal. (View "C" Fig. 16-140)

2. Connect jumper wire from battery positive pole to motor lead terminal that connects to green switch to motor wire. The motor should operate to lower top.

3. Connect jumper wire to motor lead terminal that connects to red switch-to-motor wire. The motor should operate to raise top.

4. If motor fails to operate on either or both of these checks, it should be repaired or replaced.

5. If motor operates with jumper wire but will not operate from switch-to-motor wires, the trouble may be caused by reduced current resulting from damaged wiring or poor connections.

HYDRAULIC CHECKING PROCEDURE

Failures in the hydraulic system can be caused by lack of hydraulic fluid, leaks in hydraulic system, obstructions or kinks in hydraulic hoses or faulty operation of a cylinder or pump.

Checking Hydraulic Fluid Level in Reservoir

1. Operate top to raised position.

2. At rear compartment, remove pump and motor shield.

3. Place absorbent rags below reservoir at filler plug.

4. With a straight-bladed screwdriver, remove filler plug. Fluid level should be within 1/4 inch of lower edge of filler plug hole.

5. If fluid is low, add Hydraulic Brake Fluid Super No. 11 to bring to specified level. See FILLING OF HYDRO-LECTRIC RESERVOIR.

6. Reinstall filler plug and pump and motor shield.

Checking Operation of Lift Cylinders

1. Remove rear seat cushion and folding top compartment side panel assemblies.

2. Operate folding top control switch and observe lift cylinders during "up" and "down" cycles for these conditions:

a. If movement of cylinder is not coordinated or sluggish when the motor is actuated, check hydraulic hoses from motor and pump to cylinder for kinks.

b. If one cylinder rod moves slower than the other, cylinder having slower moving rod is defective and should be replaced.

c. If both cylinder rods move slowly or do not move at all, check the pressure of the pump. See CHECKING PRESSURE AT THE PUMP.

NOTE: To insure proper operation of the lift cylinders, the top lift cylinder rods should be cleaned and lubricated at least twice a year. To perform these operations, raise top to "up" position and wipe exposed portion of each top lift cylinder piston rod with a cloth dampened with brake fluid to remove any oxidation and/or accumulated grime. With another clean cloth, apply a light film of brake fluid to the piston rods to act as a lubricant.

CAUTION: Exercise care so that brake fluid does not come in contact with any painted or trimmed parts of the body.

Checking Pressure at Pump

1. Remove motor and pump assembly from rear compartment.
2. Install plug in one port, and pressure gauge in port to be checked. (Fig. 16-149)
3. Actuate motor with applied terminal voltage within range of 9.5 volts to 11.0 volts. Pressure gauge should show a pressure between 340 p.s.i. and 380 p.s.i.
4. Check pressure in other port.

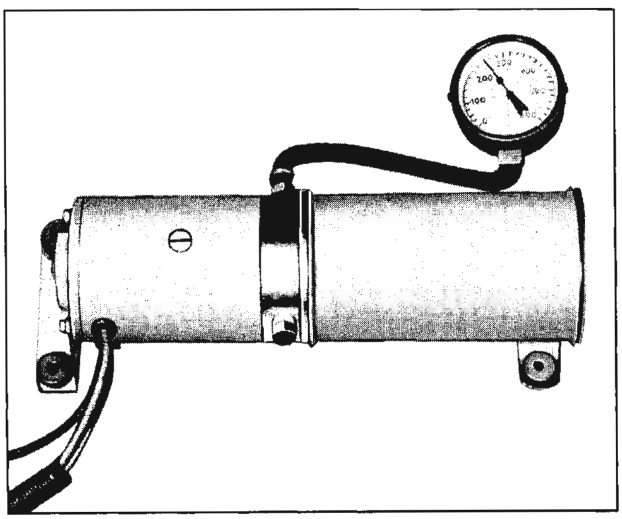


Fig. 16-149 Checking Pump Pressure

NOTE: A difference in pressure readings may exist between the pressure port for top of cylinders and pressure port for bottom of cylinders. This condition is acceptable if both readings are within the limit of 340 p.s.i. and 380 p.s.i.

5. If the pressure is not within specified limits, unit is defective and should be repaired or replaced, as required.

REMOVAL OF FOLDING TOP LIFT CYLINDER

1. Remove rear seat cushion and back.
2. Remove folding top compartment side trim panel assembly.
3. Lock top to windshield header.
4. Fully raise door and rear quarter window on side affected.
5. Disconnect positive battery cable to prevent accidental operation of motor and pump assembly.
6. Remove attaching nut, bolt, bushing and washer from upper end of lift cylinder. (Fig. 16-150)
7. Remove side roof rear rail to male hinge attaching nut and bolt. (Fig. 16-150)

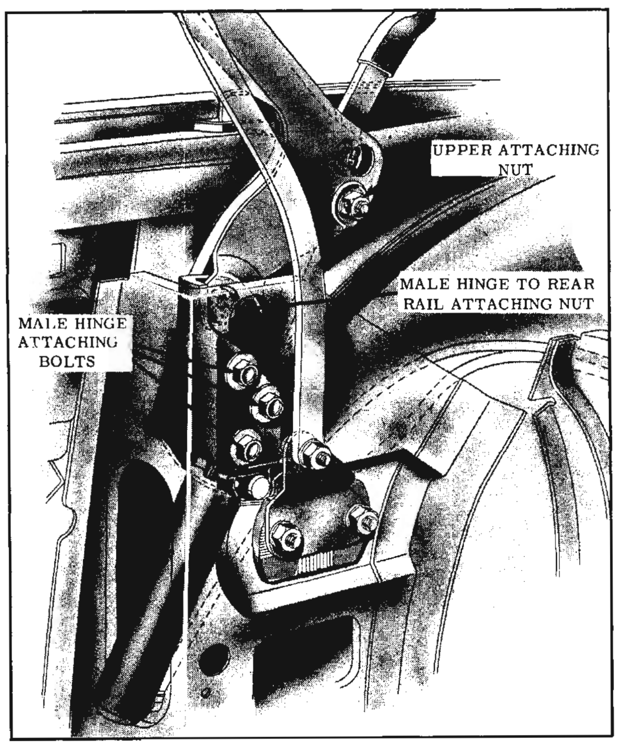


Fig. 16-150 Lift Cylinder Removal

8. Remove folding top male hinge to top compartment brace attaching bolts. (Fig. 16-150)

9. Carefully pull male hinge with attached cylinder rearward until male hinge is disengaged from side roof rear rail; then move hinge and cylinder assembly to inboard side of top compartment brace.

10. Remove screws securing lift cylinder to male hinge; then remove hinge from cylinder.

11. Disconnect and cap hydraulic connections on cylinder on each hose; then remove cylinder.

    CAUTION: Prior to disconnecting hydraulic connections, place suitable wiping rags under connections to absorb any drippage of hydraulic fluid.

12. To install, reverse removal procedure with following exceptions:

    a. To aid in installation of lift cylinder piston rod to folding top side roof rear rail, connect battery and use power to raise cylinder piston rod to extended position.

    b. Operate folding top assembly down and up to insure proper linkage alignment of side rails. Where required, adjust male hinge assembly as described under FOLDING TOP ADJUSTMENTS.

    c. Operate folding top assembly down and up several times, then check and correct level of hydraulic fluid in reservoir. See FILLING OF HYDRO-LECTRIC RESERVOIR.

FILLING OF HYDRO-LECTRIC RESERVOIR

This procedure virtually eliminates discharge or spillage of hydraulic fluid and possible trim damage while filling and bleeding system.

Filler Plug Adapter

1. Drill 1/4 inch diameter hole through center of spare reservoir filler plug.

2. Install two inch length of metal tubing (1/4" O.D. x 3/16" I.D.) into center of filler plug and solder tubing on both sides of filler plug to form air tight connection.

Filling and Bleeding of Reservoir

1. With top in raised position, remove folding top compartment bag material from rear seat back panel. Remove pump and motor shield.

2. Place absorbent rags below reservoir at filler plug. Using a straight-bladed screwdriver, slowly remove filler plug from reservoir.

   IMPORTANT: When installing new or overhauled motor and pump assembly, as a bench operation, fill reservoir to specified level with hydraulic fluid. This operation is necessary as pump must be primed prior to operation to avoid drawing excessive amount of air into hydraulic system.

3. Install filler plug adapter to reservoir and attach four or five foot length of 3/16 inch I.D. rubber tubing or hose to filler plug tubing.

4. Install opposite end of hose into a container of hydraulic brake fluid super No. 11.

   NOTE: Container should be placed in rear compartment area of body, below level of fluid in the reservoir. In addition, sufficient fluid must be available in container to avoid drawing air into hydraulic system.

5. Operate top to down or stacked position. After top is fully lowered, continue to operate motor and pump assembly (approximatey 15 to 20 seconds), or until noise level of pump is noticeably reduced. Reduction in pump noise level indicates that hydraulic system is filling with fluid.

6. Operate top several times or until operation of top is consistently smooth in both up and down cycles.

7. Remove hose from filler plug tubing and remove filler plug adapter from reservoir.

8. Check level of fluid in reservoir and reinstall original filler hole plug.

   NOTE: Fluid level should be within 1/4 inch of lower edge of filler plug hole.

ELECTRICAL

POWER WINDOW AND VENTILATOR CIRCUITS

POWER OPERATED WINDOWS

FRONT CROSS-OVER HARNESS

This harness is installed beneath the instrument panel and completes the circuit from the right door to the left door windows. The front harness also includes the wiring for the front door windows. (Fig. 16-151) The multiple connector located at the front harness is used only for manufacturing purposes and is not intended to be disengaged in service.

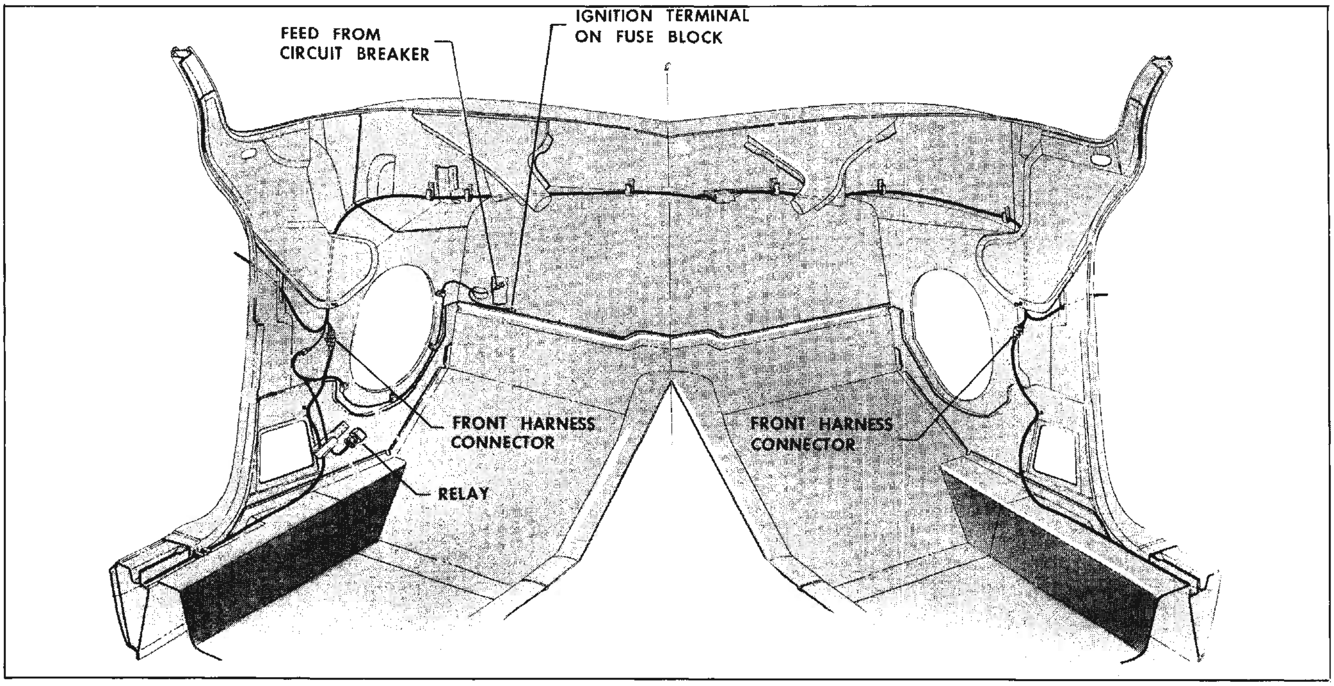


Fig. 16-151 Front Door Power Window Wiring

REAR DOOR OR REAR QUARTER WINDOW HARNESS

A separate harness controls the operation of the right and left rear door or quarter windows. The right and left harnesses are connected to the front cross-over harness beneath the outer ends of the instrument panel. (Fig. 16-152)

The power windows are operated by a rectangular shaped 12 volt series wound motor with an internal circuit breaker and a self-locking rubber coupled gear drive. The harness to window motor connector is designed with a locking embossment to insure a positive connection. When disengaging the harness connector from the motor, it is necessary to depress the thumb release.

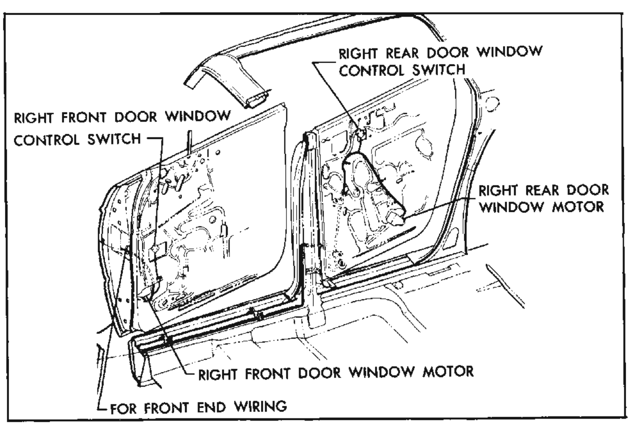


Fig. 16-152 Power Window Wiring at Doors

When installing the harness, the thumb release must be held depressed until the embossment on the female connector is locked in the hole of the motor connector.

The power window electrical circuit is protected by a 40 ampere circuit breaker. The circuit breaker is located on the dash in the engine compartment.

In addition to the circuit breaker, a relay is used in the circuit and installed at the left side of the dash. The relay prevents the operation of the power windows until the ignition switch is turned "on".

POWER WINDOW CIRCUIT CHECKING PROCEDURES

Failures in a circuit are usually caused by short circuits or open circuits. Open circuits are usually caused by breaks in the wiring, faulty connection or mechanical failure in a component such as a switch or circuit breaker. Short circuits are usually caused by wires from different components of the circuit contacting one another or by a wire or component grounding to the metal of the body due to a screw through the wire, insulation cut through by sharp metal edge, etc.

It may be necessary to use only one or all of the procedures outlined to locate an electrical failure in the circuit. If the location of the failure is evident, follow only the steps required to check the affected wire or component. If the location of the failure is not evident, follow the procedure as outlined. Be sure to check the harness connectors beneath the outer ends of the instrument panel for proper engagement.

Checking Feed Circuit Continuity at Circuit Breaker

1. Connect one light tester lead to battery side of circuit breaker and ground other lead. If tester does not light, there is an open or short circuit in feed circuit to breaker.

2. To check circuit breaker, disconnect the output feed wire (the wire opposite the power source feed to the breaker) from the breaker and with light tester, check terminal from which wire was disconnected. If tester does not light, circuit breaker is inoperative.

Checking Relay Assembly

1. With light tester, check relay feed (dark blue wire terminal). If tester does not light, there is an open or short circuit between relay and circuit breaker.

2. Turn ignition switch on and with light tester, check output terminal of relay (red wire terminal). If tester does not light, the relay is inoperative or there is a short or open circuit between ignition switch (white wire) and relay assembly. (Check fuse at dash panel.)

Checking Feed Circuit Continuity at Window Switch

1. Connect one light tester lead to feed terminal of switch block and ground other tester lead to body metal. (Fig. 16-153)

2. If tester does not light, there is an open or short circuit between switch and power source.

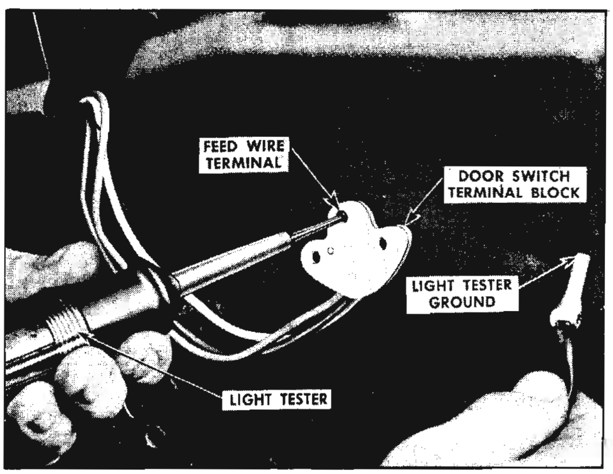


Fig. 16-153 Checking at Window Switch

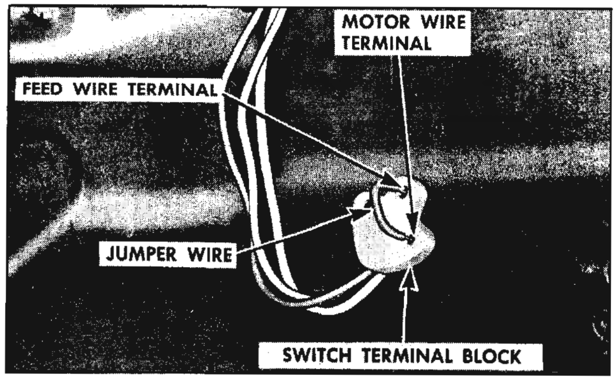


Fig. 16-154 Checking Window Control Switch

Checking Window Switch

1. Insert one end of a No. 12 gauge jumper wire to the switch feed terminal and the other end to one of the motor lead terminals in the switch block. Repeat this check on the remaining motor lead terminal. (Fig. 16-154)

2. If the motor operates with the jumper wire, but does not operate with the switch, the switch is defective.

Checking Wires Between Door Window Switch and Motor

1. Disengage harness connector from window motor connector. The thumb release on the harness connector must be depressed before it can be disengaged from the motor.

2. Insert one end of a No. 12 gauge jumper wire to the switch feed terminal and the other end to one of the motor lead terminals in the switch block. (Fig. 16-154)

3. With light tester, check for current at terminal being checked. If tester does not light,

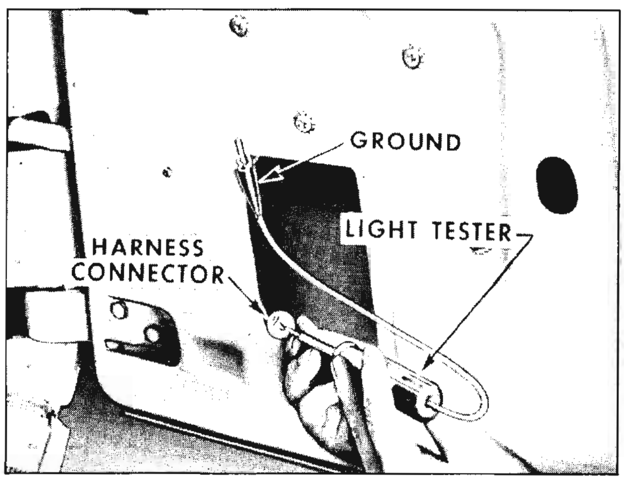


Fig. 16-155 Checking Wiring Between Switch and Door Window Motor

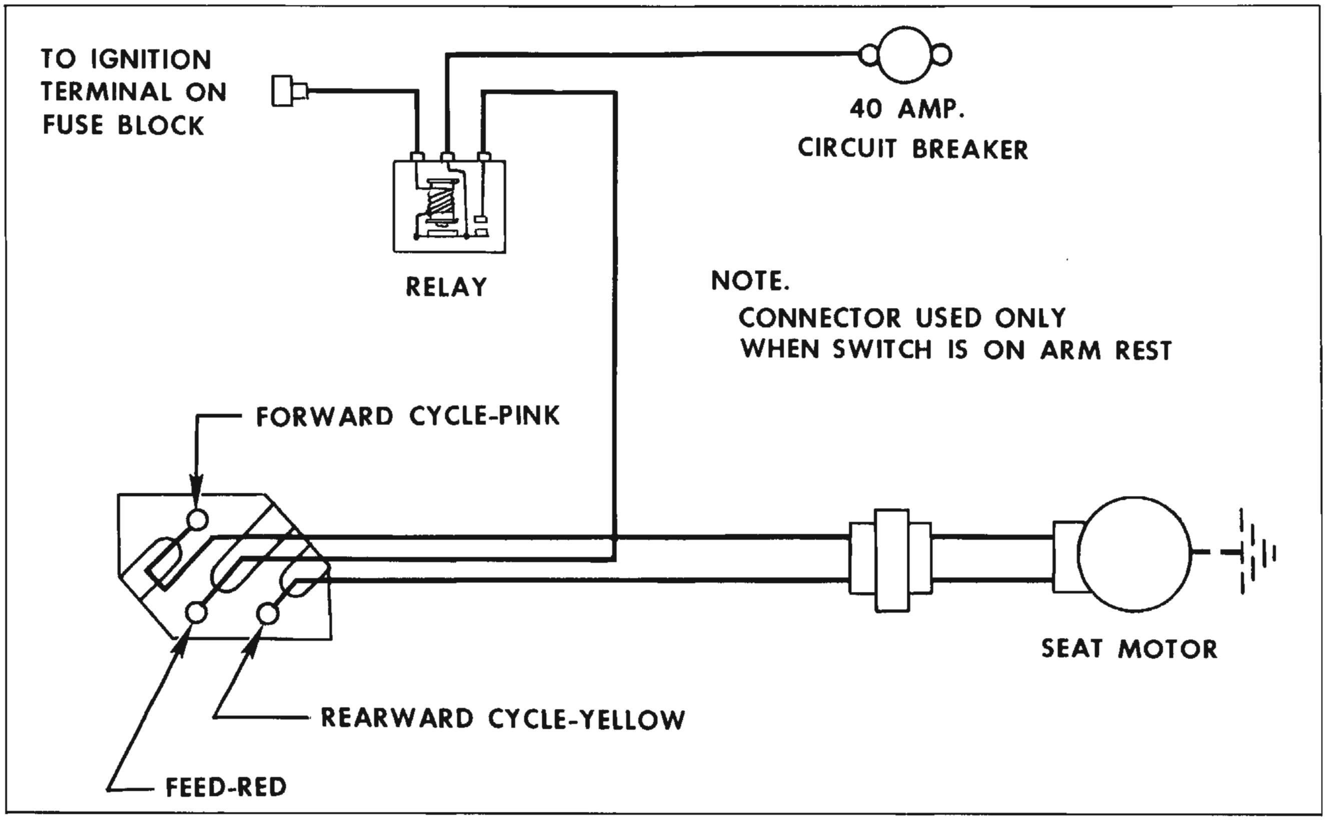


Fig. 16-156 Power Window Circuit

there is an open or short circuit in the harness between the control switch and motor connector. (Fig. 16-155)

Checking Door Window Motor

1. Check window regulator and channels for possible mechanical bind of window.
2. Check attachment of window motor to inner panel to insure an effective ground.
3. Connect one end of a No. 12 gauge jumper wire to the power source and the other end to one of the terminals on the window motor.
4. If the motor fails to operate with a jumper wire, the motor is defective and should be repaired or replaced as required. Check the other motor lead in the same manner.

DIAGNOSIS

The following typical failures and corrections have been listed as an aid for eliminating electrical failures in the power window electrical circuit. It should be noted that multiple failures in the circuit may lead to a combination of conditions, each of which must be checked separately. (Fig. 16-156)

TYPICAL FAILURES OF POWER WINDOWS

CONDITION	CAUSE	CORRECTION
1. None of the windows will operate.	Short or open circuit in power feed circuit.	A. Check circuit breaker operation. B. Check relay operation at left cowl. C. Check feed connection to power harness beneath instrument panel. D. Check the feed circuit wires for possible short or open circuit.

TYPICAL FAILURES OF POWER WINDOWS (Cont'd.)

CONDITION	CAUSE	CORRECTION
2. Right rear door window does not operate from master control switch on left front door or from control switches on right rear door. Left door window operates.	A. Short or open circuit between right rear door harness and power window front harness. B. Short or open circuit in affected window control switch or window motor circuit. C. Possible mechanical failure or bind in window channels. D. Defective window motor.	A. Check harness connectors beneath outer ends of instrument panel for proper installation. B. Check wires in power window front harness for possible short or open circuit. C. Check operation of rear door window control switch. D. Check circuit from window control switch to window motor for short or open circuit. E. Check window regulator and channels for possible mechanical failure or bind. F. Check operation of motor.
3. Right door windows will operate from left door master control switch but will not operate from right door control switches. Left door windows operate.	Open or short circuit in front harness feed wire circuit.	Follow up feed wire in front harness for possible short or open circuit.

HORIZONTAL SEATS (Fig. 16-157)

The seat adjusters are actuated by a twelve volt series wound motor located near the front left side of the seat bottom frame and energized by a control switch installed in the left seat side panel. On 3829, 39, 67 and 3947 styles the control switch is located in the left front door arm rest.

TYPICAL FAILURES AND CORRECTIONS

The Seat Motor Does Not Operate in Either The Forward or Rearward Direction

Cause

1. Open or short circuit in feed harness.
2. Inoperative motor.

Correction

1. Connect one light tester lead to feed terminal of switch block and ground other tester lead to body metal. If tester does not light, there is an open or short circuit between switch and power source.
2. Check operation of seat control switch with jumper wire. See CHECKING DOOR WINDOW CONTROL for similar operation.
3. Check circuit from control switch to motor for short or open circuit and check ground wire attachment at adjuster.
4. Check operation of motor with No. 12 gauge jumper wire. Connect one end of jumper wire to power source and the other end to one of the seat motor terminals. Motor should operate.

   Perform same check at the other motor terminal. If motor does not operate, repair or replace motor as required.

The Seat Motor Operates in Only One Direction

Cause

1. Defective switch.

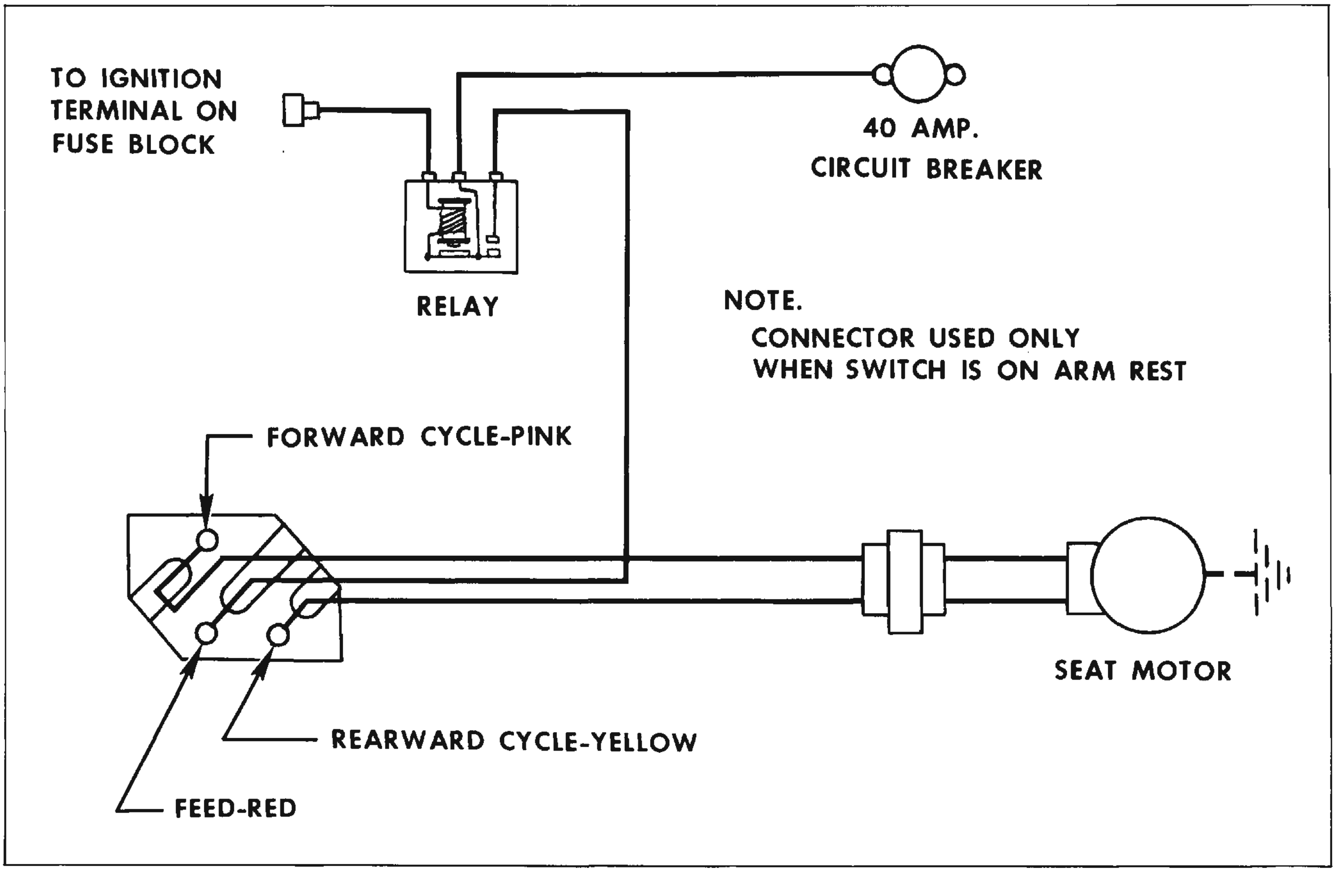


Fig. 16-157 Electric Horizontal Seat Circuit

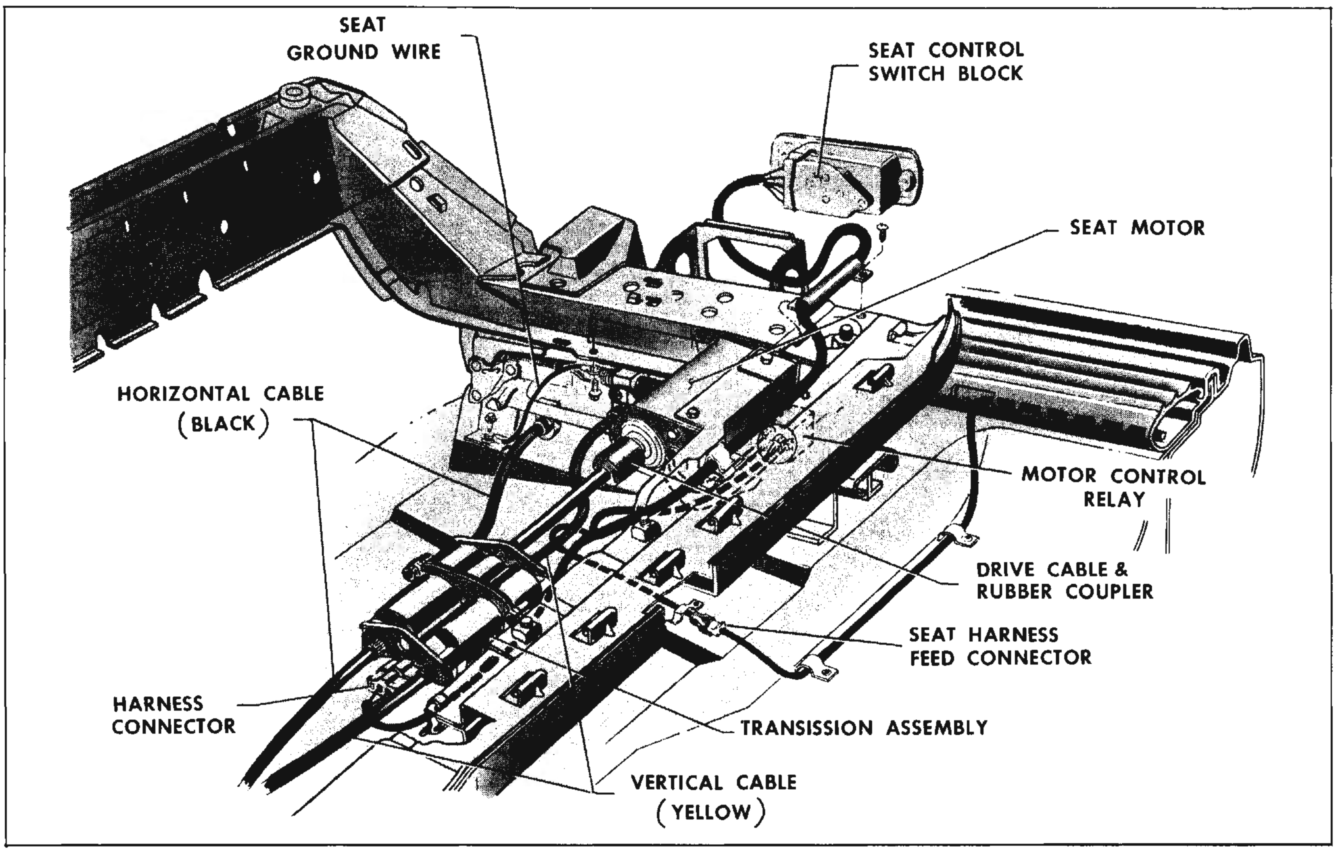


Fig. 16-158 Four-Way Seat (Bench Type)

2. Open or short circuit in motor feed wires.

3. Defective seat motor.

Correction

1. Check operation of seat control switch with jumper wire.

2. Check circuit from control switch to motor for short or open circuit.

3. Check operation of motor with No. 12 gauge jumper wire. Connect one end of jumper wire to power source and the other end to one of the seat motor terminals. Motor should operate. Perform same check at the other motor terminal. If motor does not operate, repair or replace motor as required.

FOUR-WAY TILT SEAT

The seat adjusters for the bench type and bucket type seats are actuated by a 12 volt, reversible, shunt wound motor with a build-in circuit breaker. See Fig. 16-158 for bench type seat, and Fig. 16-159 for bucket seat installation.

The seat motor is energized by toggle-type control switch installed in the left seat side panel. On 3829, 39, 67 and 3947 styles, the control switch is located in the left front door arm rest.

The seat adjuster operating mechanism incorporates a transmission assembly which includes two solenoids and four drive cables on bench type seats and two drive cables on bucket seats, leading to the seat adjusters. One solenoid controls the rear vertical movement of the seat, while the other solenoid controls the horizontal movement of the seat. When the control switch is actuated, the motor and one of the solenoids are energized simultaneously. Then the solenoid plunger causes the shaft dog to engage with the large gear dog. Power is then transmitted through the transmission shaft which in turn drives the actuator cables. When the adjusters reach their limit of travel, the drive cables stop their rotating action and torque is absorbed by the rubber coupler connecting the motor and transmission. When control switch lever is released, the switch contacts open, a spring returns the shaft dog and solenoid plunger to their original position disengaging the shaft dog from the large gear dog.

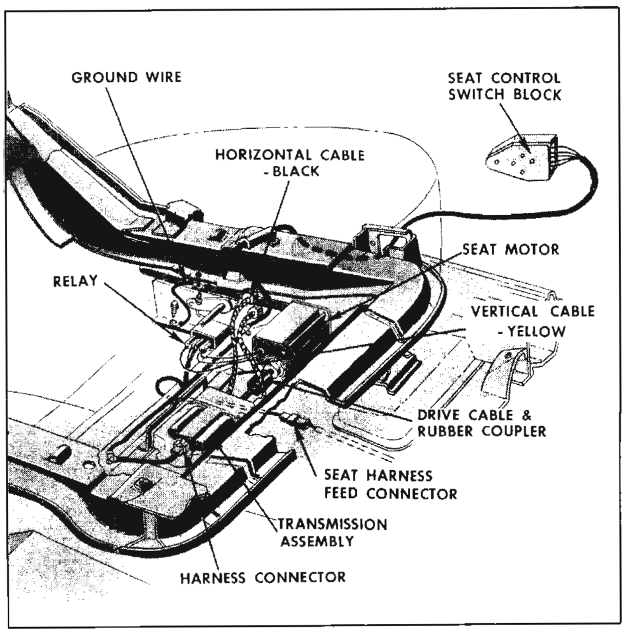


Fig. 16-159 Four-Way Seat (Bucket Type)

CHECKING PROCEDURE (4-WAY SEAT)

It may be necessary to use only one or all of the procedures outlined to locate an electrical failure in the circuit. If the location of the failure is evident, follow only the steps required to check the affected wire or component. If the location of the failure is not evident, follow the procedures as outlined. Before performing any extensive check procedures, check the seat adjuster drive cables for proper attachment. In addition, study the seat circuit diagrams to become familiar with the seat circuit.

Checking for Current at Circuit Breaker

1. Connect one light tester lead to battery side of circuit breaker (located at dash panel in engine compartment) and ground other lead. If tester does not light, there is no current at battery side of circuit breaker.

2. To check circuit breaker, disconnect switch feed wire from breaker, and with a light tester, check for current at switch side of circuit breaker. If tester does not light, there is no current flowing through circuit breaker.

Checking the Circuit Relay Assembly

1. With light tester, check for current at circuit breaker side of relay. If tester does not light, there is a short or open circuit between circuit breaker and relay assembly.

2. Turn ignition switch on and with a light tester, check for current at output side of relay. If tester does not light, the relay is defective or there is a short or open circuit between ignition switch and relay assembly. Check wires before replacing relay.

NOTE: Ignition switch must be on for performing the remainder of checking procedure.

Checking Feed Circuit Continuity at Relay on Seat Motor

1. Disengage three-way connector body from the seat motor relay.

2. Insert one light tester lead into the relay power feed (red wire) connector slot on the harness, and ground other tester lead.

3. If tester does not light, there is no current at end of feed wire. Failure is caused by an open or short circuit in feed circuit.

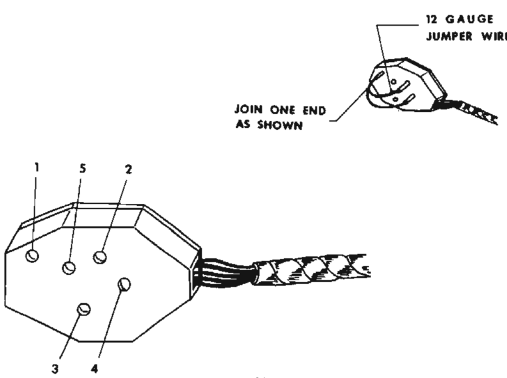
Checking for Current at Seat Control Switch

1. Connect one light tester lead to feed terminal of switch block and ground other light tester lead to body metal.

2. If tester does not light, there is no current at switch block. Failure is caused by an open or short circuit between switch block and power source.

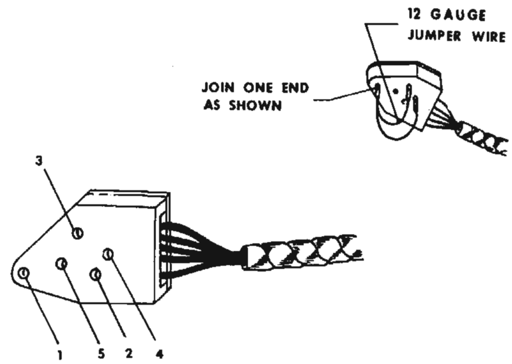
Checking the Seat Control Switch

In the following operations which specify the seat control switch to be actuated, a switch that has been checked for proper operation may be connected to the switch block. If a switch is not available, a three-way jumper wire can be made to perform the switch function. The method of making the jumper wire and the switch locations to be connected to obtain a specific movement of the seat are shown in Figs. 16-160 and 16-161. If a jumper wire is used, number the locations on the switch block as indicated in the illustration.



LOCATION	WIRE COLOR	FUNCTION
1	RED	SWITCH FEED
2	YELLOW	FIELD FEED-REARWARD & UP CYCLE
3	DARK BLUE	SOLENOID-HORIZONTAL MOVEMENT
4	PINK	FIELD FEED-FORWARD & DOWN CYCLE
5	DARK GREEN	SOLENOID-VERTICAL MOVEMENT

Fig. 16-160 Four-Way Seat Switch Block (Arm Rest)



LOCATION	WIRE COLOR	FUNCTION
1	WHITE	SWITCH FEED
2	YELLOW	FIELD FEED-REARWARD & UP CYCLE
3	DARK BLUE	SOLENOID-HORIZONTAL MOVEMENT
4	PINK	FIELD FEED-FORWARD & DOWN CYCLE
5	DARK GREEN	SOLENOID-VERTICAL MOVEMENT

Fig. 16-161 Four-Way Seat Switch Block (Side Panel)

NOTE: To make jumper wire, obtain two pieces of No. 12 gauge wire, each 4-1/2" long. Join one end of each wire as shown in diagram. The joined end can be inserted in the feed location in the switch block; one of the remaining ends can be inserted into one of the solenoid locations.

1. Obtain switch or jumper wire and connect to switch block.

2. Operate switch if used. If adjusters operate with new switch or jumper wire, but did not operate with original switch, the original switch is defective or connector block was not sufficiently engaged.

   IMPORTANT: To obtain a seat movement using a three-way jumper wire at the switch block, the switch feed location, one of the motor field wire locations and one of the solenoid locations have to be connected simultaneously.

   The switch locations to be connected to obtain a specific seat movement are outlined as follows:

   a. To raise seat, place jumper wire in locations 1, 2 and 5.

   b. To lower seat, place jumper wire in locations 1, 4 and 5.

   c. To operate seat forward, place jumper wire in locations 1, 3 and 4.

   d. To operate seat rearward, place jumper wire in locations 1, 2 and 3.

Checking Wires Between Control Switch and Motor Relay

1. Disengage three-wire harness connector from relay at motor.
2. Insert one light tester lead into the motor field connector slot on harness and ground other lead.
3. Actuate seat switch to energize field wire being tested.
4. If tester does not light, there is no current at end of wire. Failure is caused by an open or short circuit between end of wire and switch. Check other motor field wire in the same manner.

Checking the Relay Assembly

1. Disconnect three leads from relay assembly. These are the wires leading from the motor to the relay.
2. Connect one end of a jumper wire to one of the motor field feed studs on the relay and ground the other end of the jumper wire.
3. Connect one light tester lead to motor armature feed stud on relay and ground other tester lead.
4. With jumper wire, energize the field stud which is not grounded.

 CAUTION: Do not energize grounded side. If tester does not light, the relay is defective.

Checking the Motor Assembly

1. Disconnect motor field feed wires from motor.
2. Connect one end of a No. 12 gauge jumper wire to battery positive pole and other end to one of the motor field and the armature wires.
3. If motor does not operate, motor is defective.

Check the remaining motor field wire in the same manner.

Checking Wires Between Switch and Solenoids

1. Disconnect harness connector from transmission assembly.
2. Connect one light tester lead to one terminal of power feed and ground other light tester lead to body metal.
3. Operate switch to wire being tested. If tester does not light, there is no current at the end of harness wire. Failure is caused by an open or short circuit between end of wire and switch or defective switch.
4. Check other wire in same manner.

 NOTE: One wire in connector is a blank. Check wiring diagram for colors of wires actually used.

Checking the Solenoid

1. Check solenoid ground strap attachment for proper ground.
2. Connect one end of a No. 12 gauge jumper wire to the battery positive pole and the other end to the lead of the solenoid being checked.

 CAUTION: To prevent damaging the solenoid, do not energize solenoid for more than one minute.

3. Operate switch to actuate adjuster motor and solenoid being checked.
4. If adjusters do not operate and there is no mechanical failure of the adjusters, the solenoid is defective.

 NOTE: If solenoid is functioning properly, a "click" may be heard when solenoid plunger operates.

TYPICAL FAILURES AND CORRECTIONS (FOUR-WAY SEATS)

CONDITION	CAUSE	CORRECTION
1. Seat adjuster motor does not operate.	a. Short or open circuit between power source or switch and motor.	a. Check circuit from power source and switch to motor to locate failure.
	b. Defective motor relay.	b. Replace relay.
	c. Defective motor.	c. Check motor. If defective, repair or replace as required.
	d. Defective switch.	d. Replace switch.
	e. Defective circuit breaker.	e. Replace circuit breaker.

TYPICAL FAILURES AND CORRECTIONS (FOUR-WAY SEATS) (Cont'd.)

CONDITION	CAUSE	CORRECTION
2. Seat adjuster motor operates in both directions but seat adjusters are not actuated.	a. Short or open circuit between switch and affected solenoid. b. Defective solenoid. c. Defective switch.	a. Check circuit from switch to solenoid to locate failure. b. Check solenoid. If defective, repair or replace as required. c. Replace switch.
3. Seat Adjuster motor operates in one direction only, seat moves down and forward, but does not move up and rearward.	a. Short or open circuit between one of the motor relay wires and seat control switch. b. Defective field coil in motor c. Defective switch.	a. Check circuit between affected motor relay wire and seat switch. b. Check motor. If defective, repair or replace as required. c. Replace switch.

SIX-WAY SEAT

The seat adjusters are actuated by a 12 volt motor installed at the left side of the seat assembly. (Fig. 16-162)

The motor is energized by a 3 button-type control switch located in the left side panel.

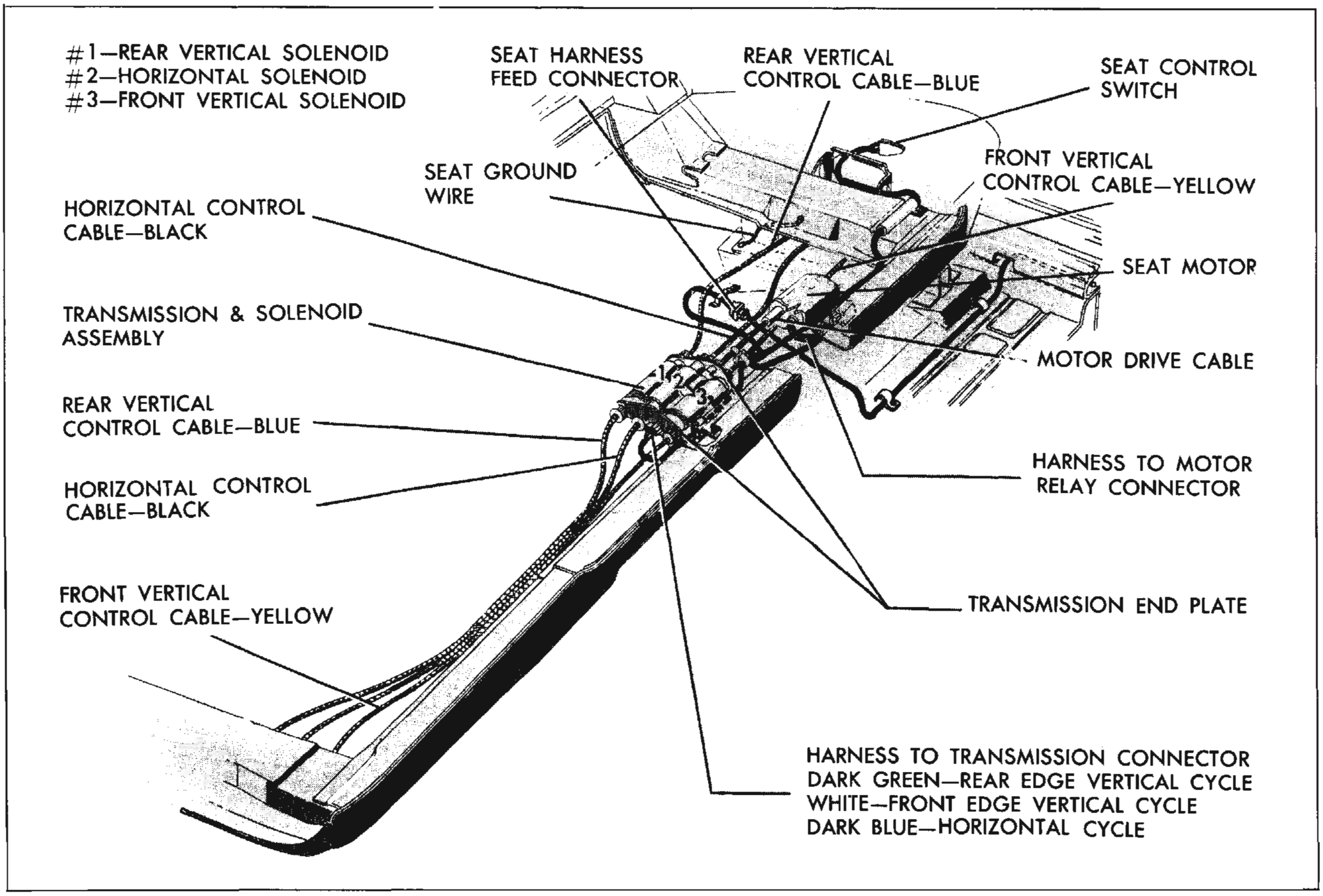
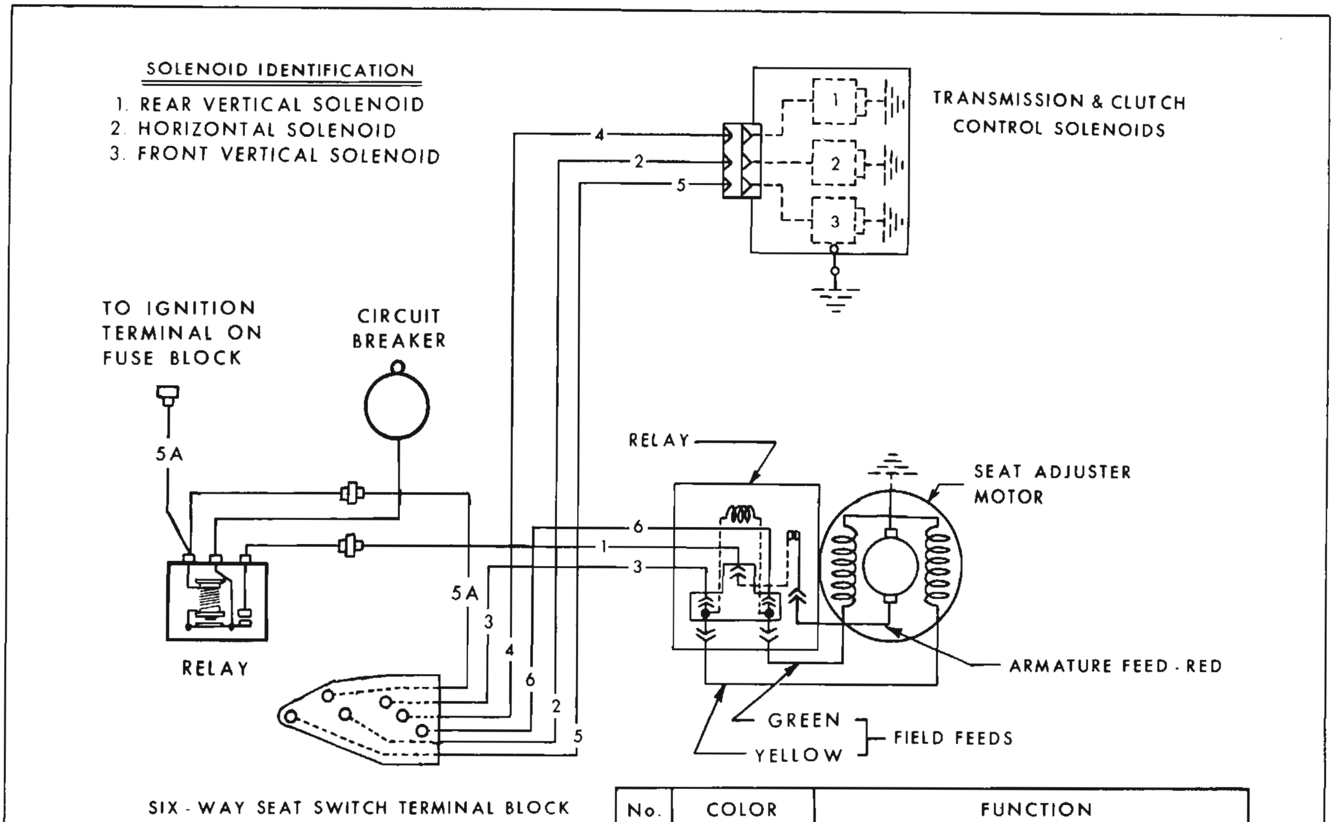


Fig. 16-162 Six-Way Seat Installation



No.	COLOR	FUNCTION
1	RED	FEED
2	DARK BLUE	SOLENOID - HORIZONTAL MOVEMENT
3	PINK	FIELD FEED - REARWARD & DOWNWARD
4	DARK GREEN	SOLENOID - REAR EDGE VERTICAL
5	WHITE	SOLENOID - FRONT EDGE VERTICAL
5A	WHITE	FEED TO CONTROL SWITCH
6	YELLOW	FIELD FEED - FORWARD & UPWARD

Fig. 16-163 Six-Way Seat Circuit

On 3829, 39, 67 and 3947 styles, the control switch is installed in the left front door arm rest.

ELECTRIC SEAT OPERATION (Figs. 16-163 and 16-164)

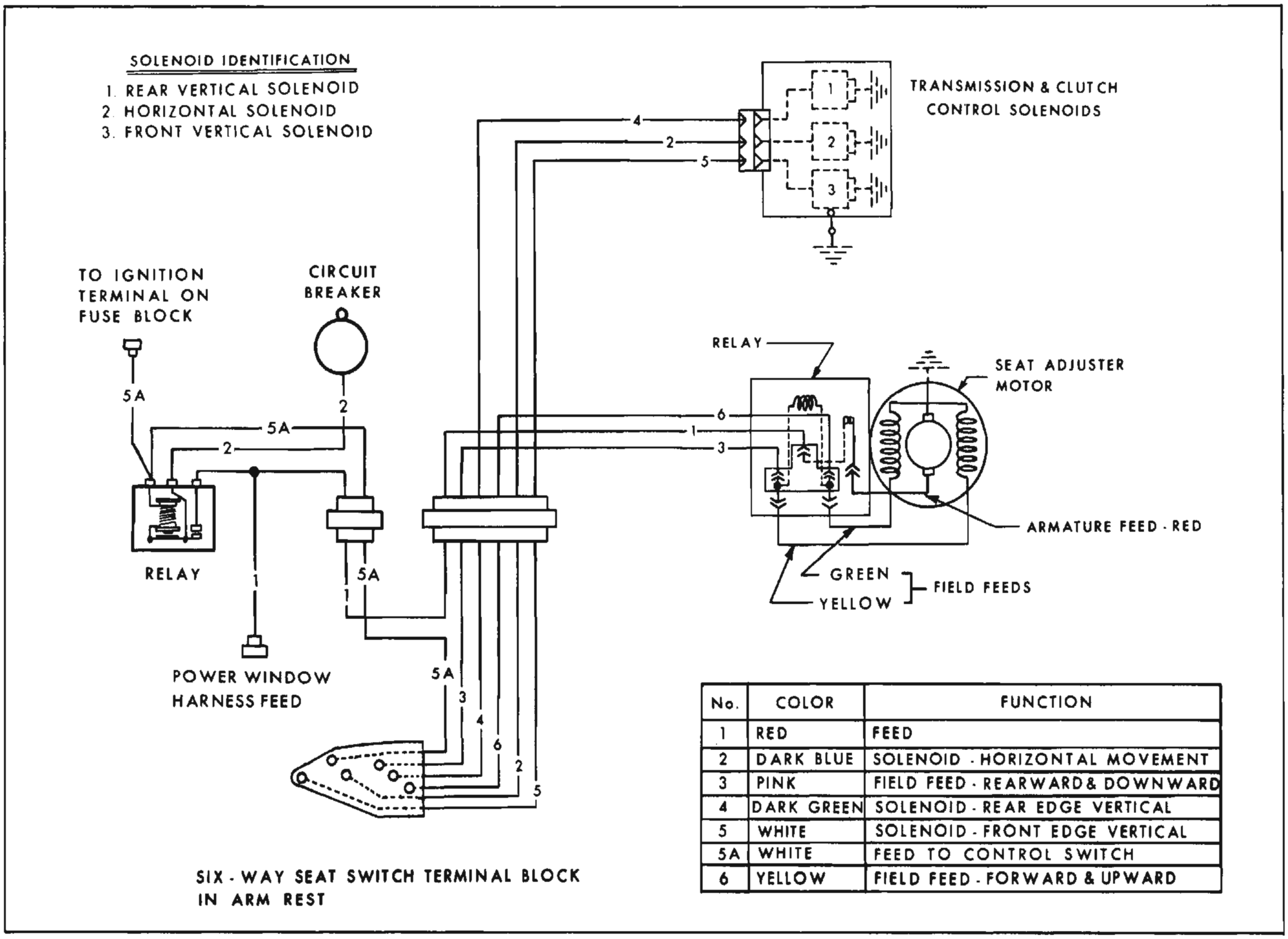
When one of the control switch buttons is actuated, current flows to the transmission solenoid which controls the desired seat movement. The energizing of the solenoid coil results in the solenoid plunger dog engaging the gear mechanism to rotate the control cable. The same switch action which energized the solenoid produces a current flow through the motor control relay to one of the motor field coils. The current flows through the relay, closes the contacts between the relay power source and the armature motor lead wire, and results in the operation of the seat motor. When the control switch lever is released, the switch contacts open, a spring returns the shaft dog and the solenoid plunger to their original position disengaging them from the gear dog.

CIRCUIT CHECKING PROCEDURES

It may be necessary to use only one or all of the procedures outlined to locate an electrical failure in the circuit. If the location of the failure is evident, follow only the steps required to check the affected wire or component. If the location of the failure is not evident, follow the procedure as outlined. Before performing any extensive check procedures, check the seat adjuster drive cables for proper attachment. In addition, study the seat circuit diagrams to become familiar with the seat circuit.

Check Feed Circuit Continuity at Circuit Breaker

1. Connect one light tester lead to battery side of circuit breaker and ground other lead Circuit breaker is located at the left side in front of the dash panel. If tester does not light, there is an open or short circuit in feed circuit to breaker.



No.	COLOR	FUNCTION
1	RED	FEED
2	DARK BLUE	SOLENOID - HORIZONTAL MOVEMENT
3	PINK	FIELD FEED - REARWARD & DOWNWARD
4	DARK GREEN	SOLENOID - REAR EDGE VERTICAL
5	WHITE	SOLENOID - FRONT EDGE VERTICAL
5A	WHITE	FEED TO CONTROL SWITCH
6	YELLOW	FIELD FEED - FORWARD & UPWARD

Fig. 16-164 Six-Way Seat Switch Block (In Arm Rest)

2. To check circuit breaker, disconnect the output feed wire (the wire opposite the power source feed to the breaker) from the breaker and with light tester, check terminal from which wire was disconnected. If tester does not light, circuit breaker is inoperative.

Checking Relay Assembly at Dash

1. With light tester, check relay feed (dark blue wire terminal). If tester does not light, there is an open or short circuit between relay and circuit breaker.

2. Turn ignition switch on and with light tester, check output terminal of relay (red wire terminal). If tester does not light, the relay is inoperative or there is a short or open circuit between ignition switch (white wire) and relay assembly. (Check fuse at dash panel).

Check Circuit Continuity at Seat Switch

1. Connect one light tester lead to feed terminal of switch block and ground other test lead to body metal. (Fig. 16-165)

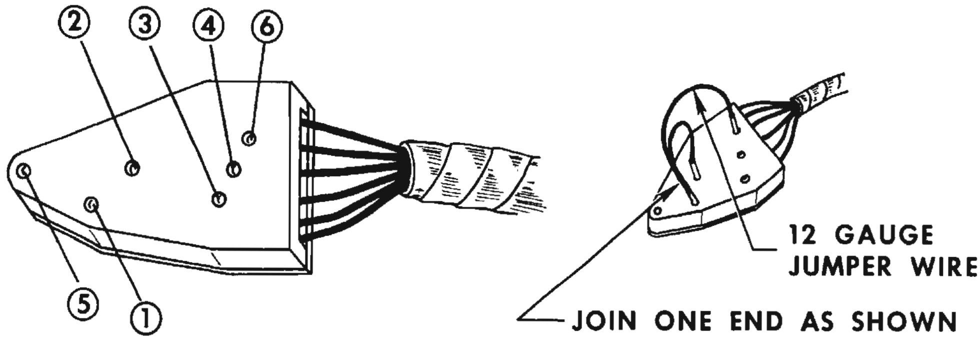
2. If tester does not light, there is an open or short circuit between switch and power source. The seat circuit incorporates 2 major feed circuits from the relay which is actuated by the ignition switch. The circuit from the ignition switch to the relay is protected by a 25 amp. fuse located at the fuse block on the dash. When the ignition switch is turned "on", current flows through the fuse to the white wire terminal on the relays and to the seat control switch. Simultaneously, the energizing of the relay results in the contacts within the relay closing and providing current to the seat motor armature on the relay.

Check Circuit Continuity at Relay on Seat Motor

1. Disengage 3-wire connector body from the seat motor relay terminal.

2. Insert one light tester lead into the relay power feed (red wire) connector slot on the harness, and ground the other light tester lead.

3. If tester does not light, there is no current



LOCATION	WIRE COLOR	FUNCTION
1	WHITE	SWITCH FEED
2	DARK BLUE	SOLENOID-HORIZONTAL MOVEMENT
3	PINK	FIELD FEED-REARWARD & DOWN CYCLE
4	DARK GREEN	SOLENOID-REAR EDGE VERTICAL CYCLE
5	WHITE	SOLENOID-FRONT EDGE VERTICAL CYCLE
6	YELLOW	FIELD FEED-FORWARD & UP CYCLE

Fig. 16-165 Six-Way Seat Switch Block (In Seat Panel)

at end of feed wire. Failure is caused by an open or short in feed circuit. The current for this circuit is controlled by the ignition switch and relay. The ignition switch must be turned "on" for current to be present at this terminal.

NOTE: In the following operations which specify the seat control switch to be actuated, a switch that has been checked for proper operation may be connected to the switch block. If a switch is not available, a three-way jumper wire can be made to perform the switch function. The jumper wire and the switch locations to be connected to obtain a specific movement of the seat are shown in Figure 16-165. If a jumper wire is used, number the locations on the switch block as indicated in the illustration. Details outlining the making and use of the jumper wire, follow checking procedures.

Checking the Seat Control Switch

1. Obtain switch or jumper wire and connect to switch block.

2. Operate switch. If adjusters operate with new switch or jumper wire, but did not operate with original switch, the original switch is defective.

3. Check all six movements of seat adjuster.

Checking Wires Between Control Switch and Motor Relay

1. Disengage 3-wire harness connector from relay at motor.

2. Insert one light tester lead into the motor field connector slot on harness and ground the other lead.

3. Actuate seat switch to energize field wire being tested.

4. If tester does not light, there is no current at end of wire. Failure is caused by an open or short circuit between end of wire and switch. Check other motor field wire in the same manner.

Check the Relay Assembly

1. Disconnect 3 motor leads from relay assembly. These are the wires leading from the motor to the relay.

2. Connect one end of a jumper wire to one of the motor field feed studs on the relay and ground the other end of the jumper wire.

3. Connect one end of light tester to motor armature feed stud on relay and ground other light tester lead.

4. With a jumper wire, energize the field stud which is not grounded. If tester does not light, the relay is defective.

Check the Motor Assembly

1. Disconnect the motor armature feed lead and one of the motor field feeds from the relay assembly.

2. With a jumper wire, energize the armature feed and one of the field feeds.

3. If motor does not operate, it is defective. Check the other motor field feed in the same manner.

Checking Solenoid to Switch Wire

1. Disengage harness connector from transmission.

2. Connect one light tester lead to end of harness wire being tested and ground other lead.

3. Operate switch to energize wire being tested. If tester does not light, there is no current at end of wire. Failure is caused by an open or short circuit between end of wire and switch.

Checking the Solenoid

1. Check solenoid ground strap attachment for proper ground.

2. Energize solenoid being checked with jumper wire.

   NOTE: If solenoid is functioning, a "click" should be heard when solenoid plunger operates "in" and "out".

   CAUTION: To prevent damaging the solenoid, do not energize solenoid for more than one minute.

3. With solenoid energized, actuate seat control switch to energize adjuster motor.

4. If adjusters do not operate, and there is no mechanical failure in the seat unit, the solenoid is defective.

THREE WAY JUMPER WIRE FOR CHECKING SEAT SWITCH

To make jumper wire, obtain 2 pieces of No. 12 gauge wire, each 4-1/2" long, join one end of each wire as shown in Figure 16-165. The joined end can be inserted in the feed location in the switch block; one of the remaining ends can be inserted into one of the field locations in the switch block; the other end can be inserted into one of the solenoid locations.

IMPORTANT: To obtain a seat movement using a 3-way jumper wire at the switch block, the switch feed location, one of the motor field wire locations and one of the solenoid locations must be connected.

On Bodies With Switch in Seat Side Panel

1. To raise front edge of seat, place jumper in locations 1, 6 and 5.

2. To lower front edge of seat, place jumper in locations 1, 3 and 5.

3. To raise rear edge of seat, place jumper in locations 1, 6 and 4.

4. To lower rear edge of seat, place jumper in locations 1, 3 and 4.

5. To move seat forward, place jumper in locations 1, 2 and 6.

6. To move seat rearward, place jumper in locations 1, 3 and 2.

On Bodies With Switch in Arm Rest

1. To raise front edge of seat, place jumper in locations 1, 3 and 5.

2. To lower front edge of seat, place jumper in locations 1, 6 and 5.

3. To raise rear edge of seat, place jumper in locations 1, 3 and 4.

4. To lower rear edge of seat, place jumper in locations 1, 6 and 4.

5. To move seat forward, place jumper in locations 1, 3 and 2.

6. To move seat rearward, place jumper in locations 1, 6 and 2.

TYPICAL ELECTRICAL FAILURES AND CORRECTIONS (SIX-WAY SEAT)

Seat Adjuster Motor Does Not Operate

Cause

a. Short or open circuit between power source or switch and motor.

b. Defective motor.

Correction

a. Check circuit from power source and switch to motor to locate failure.

b. Check ignition switch circuit through relay at left shroud.

c. Check motor. If defective, repair or replace as required.

Seat Adjuster Motor Operates, But Seat Adjusters Are Not Actuated.

or

Seat Adjuster Motor Operates, Front Edge Of Seat Moves Up And Down And Seat Moves Forward And Rearward. The Rear Edge Of Seat Cannot Be Operated.

Cause

a. Short or open circuit between switch and affected solenoid.

b. Defective solenoid.

Correction

a. Check circuit from switch to solenoid to locate failure.

b. Check solenoid. If defective, repair or replace as required.

Seat Adjuster Motor Operates And Seat Adjusters Move Front And Rear Edge Of Seat Up And Forward, But Will Not Move The Seat Down And Rearward.

or

Seat Adjuster Motor Operates And Seat Adjusters Move Front And Rear Of Seat Down And Rearward, But Will Not Move The Seat Up And Forward.

Cause

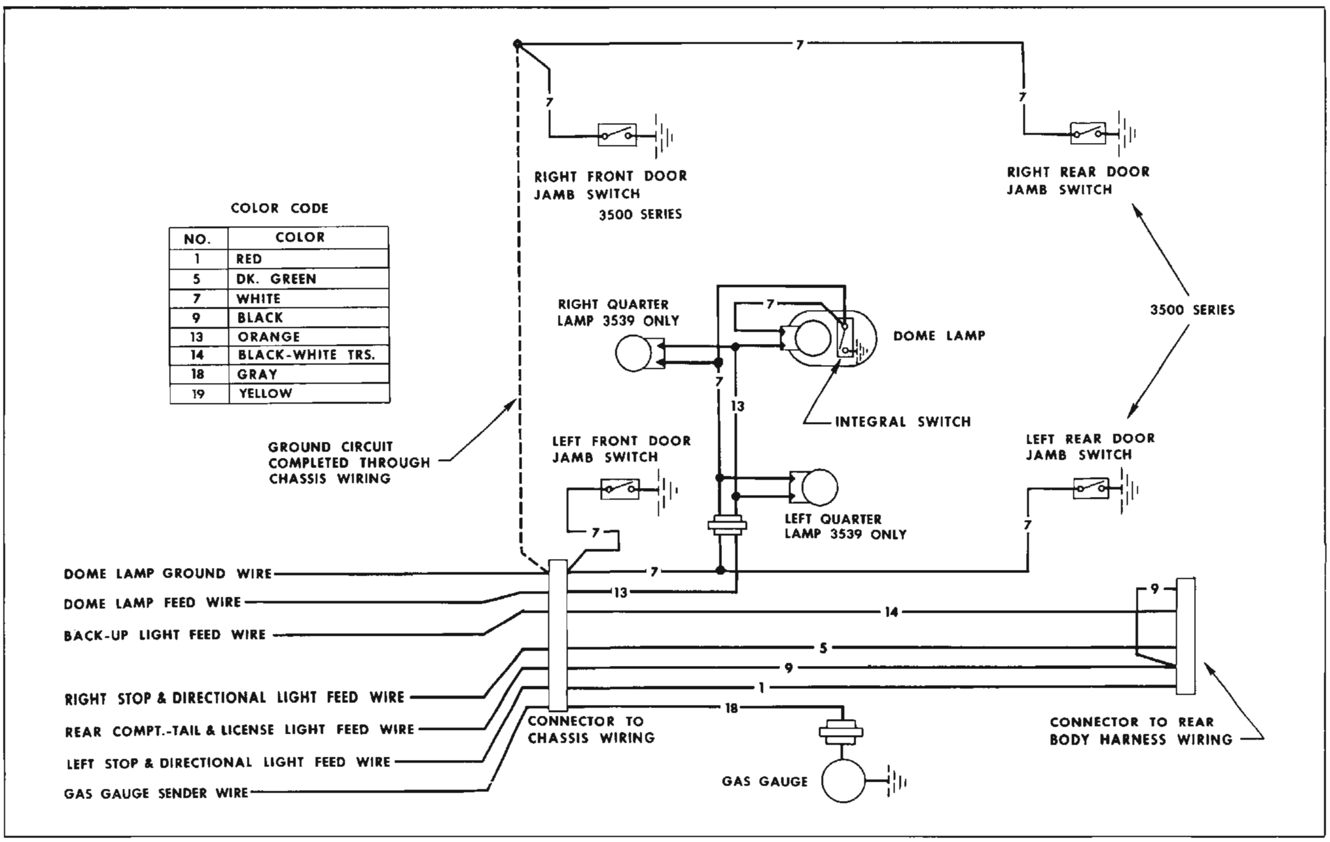
a. Short or open circuit between one of the motor field wires and seat control switch.

b. Defective field coil in motor.

Correction

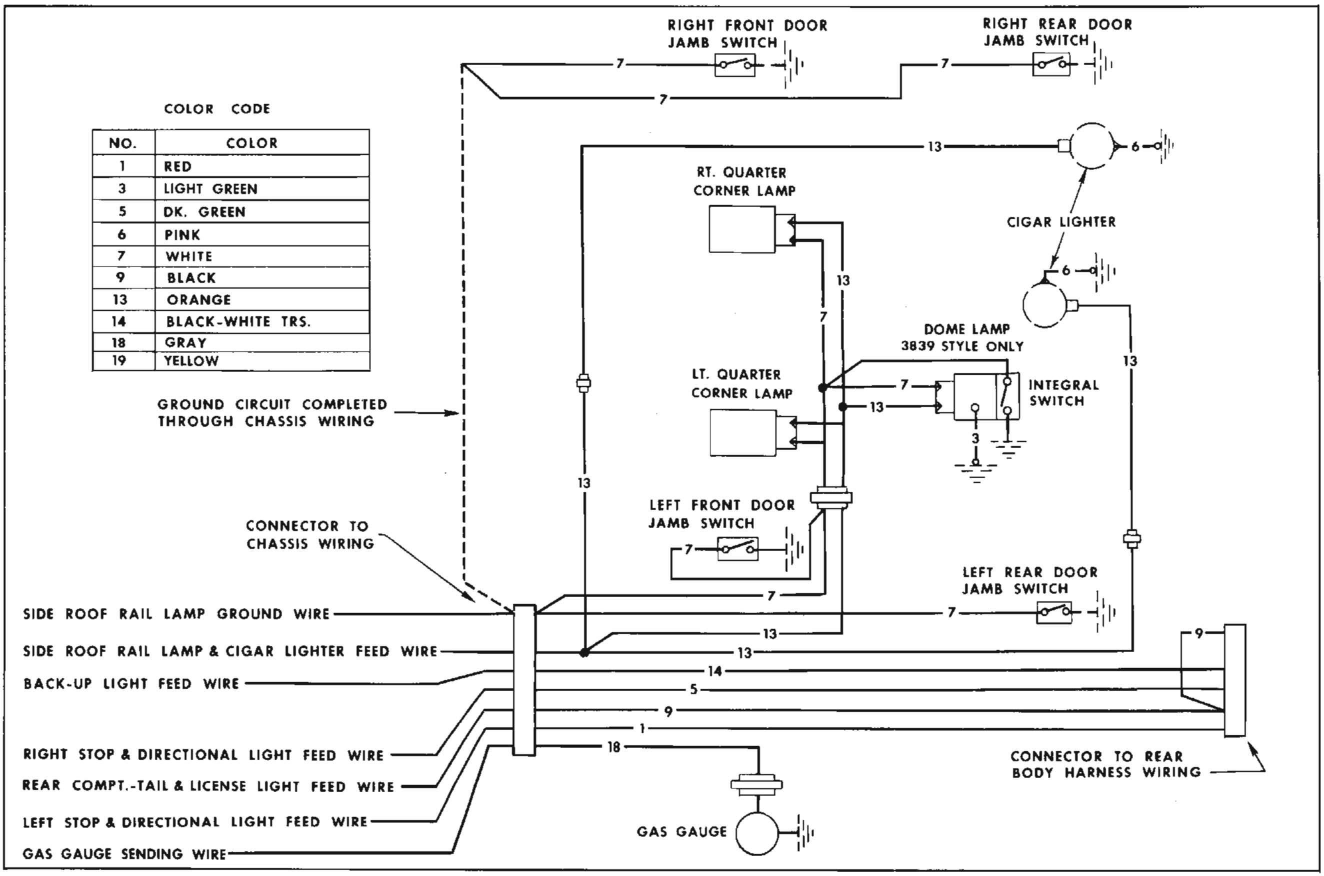
a. Check circuit between affected motor field wire and seat switch.

b. Check motor. If defective, repair or replace as required.



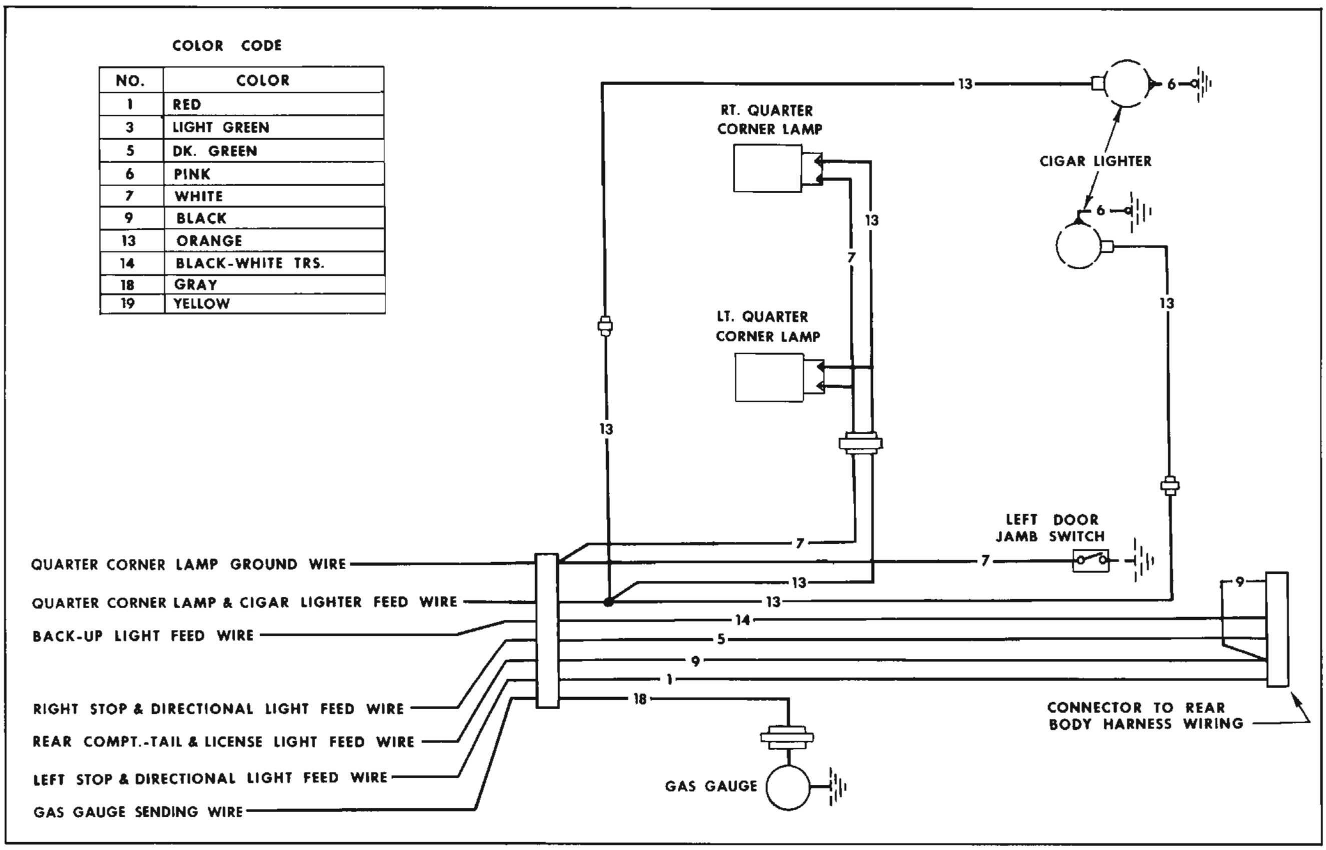
NO.	COLOR
1	RED
5	DK. GREEN
7	WHITE
9	BLACK
13	ORANGE
14	BLACK-WHITE TRS.
18	GRAY
19	YELLOW

Fig. 16-166 Front Body Wiring Circuit (3211-47-39-69 and 3539-69 Styles)



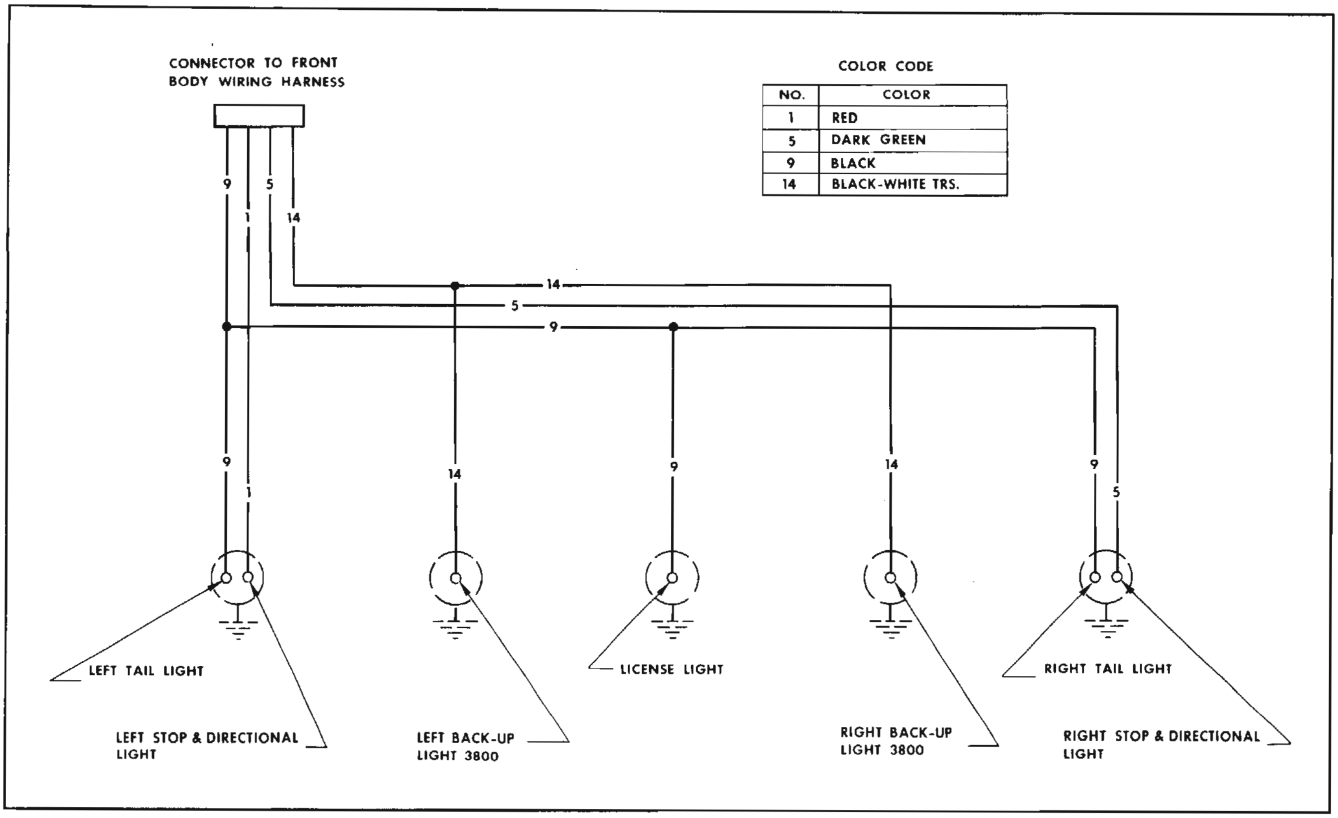
NO.	COLOR
1	RED
3	LIGHT GREEN
5	DK. GREEN
6	PINK
7	WHITE
9	BLACK
13	ORANGE
14	BLACK-WHITE TRS.
18	GRAY
19	YELLOW

Fig. 16-167 Front Body Wiring Circuit (3829-39 Styles)



NO.	COLOR
1	RED
3	LIGHT GREEN
5	DK. GREEN
6	PINK
7	WHITE
9	BLACK
13	ORANGE
14	BLACK-WHITE TRS.
18	GRAY
19	YELLOW

Fig. 16-168 Front Body Wiring Circuit (3657 and 3947 Styles)



NO.	COLOR
1	RED
5	DARK GREEN
9	BLACK
14	BLACK-WHITE TRS.

Fig. 16-169 Rear Body Wiring Circuit

ROOF PANEL FABRIC COVER 3247 and 3547 Styles Equipped With a Fabric Roof Cover Assembly

The roof panel fabric cover is a vinyl coated fabric covering applied to the metal roof panel. The fabric covering is made of three parts with dielectrically joined center section to side section seams.

The roof cover is attached at the windshield and back window openings by drive nails. Screws (or drive nails) are used at the belt line of the rear quarter area. A flexible retainer secures the fabric cover inside the right and left drip moldings. In addition, the roof panel fabric cover is cemented to the entire surface of the roof panel with a nitrile type non-staining cement.

REMOVAL

1. Remove the following parts:

   a. Windshield assembly

   b. Back window assembly

   c. Windshield pillar finishing moldings

   d. Roof drip molding scalps

   e. Rear quarter reveal moldings (at belt)

   f. Roof extension panel emblem and/or plate assembly

2. Clean off all excess sealer from windshield and back window openings.

3. Remove drive nails from edge of fabric cover at windshield and back window opening. At roof panel extension (at belt) remove screws or drive nails.

   NOTE: Drive nails can best be removed by first driving a screwdriver or suitable tool under the heads of the nails to loosen them. Diagonal cutters or similar tool can then be used to grasp nails and twist them out. Unnecessary enlargement of holes in roof panel should be avoided.

4. Remove flexible retainers securing fabric cover inside right and left drip moldings by inserting tip of screwdriver under forward end of retainers. (View "A", Fig. 16-170) Working from front to rear of body, disengage fingers of retainers from side roof rail drip molding flanges. Continue above operation until retainers can be removed from body.

   NOTE: New retainers should be used when replacing fabric cover.

5. Prior to removing fabric cover, application of heat in rear quarter areas will permit

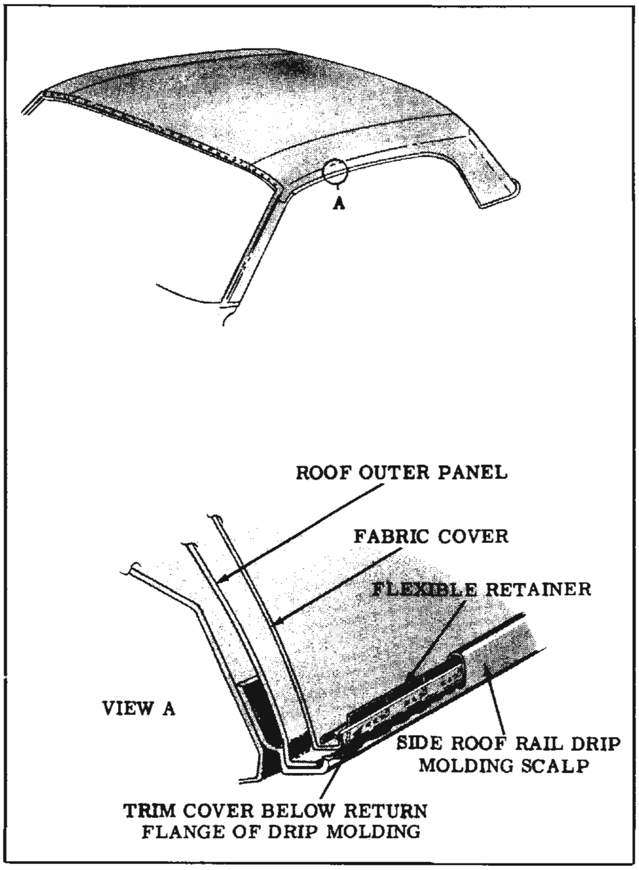


Fig. 16-170 Fabric Roof Cover

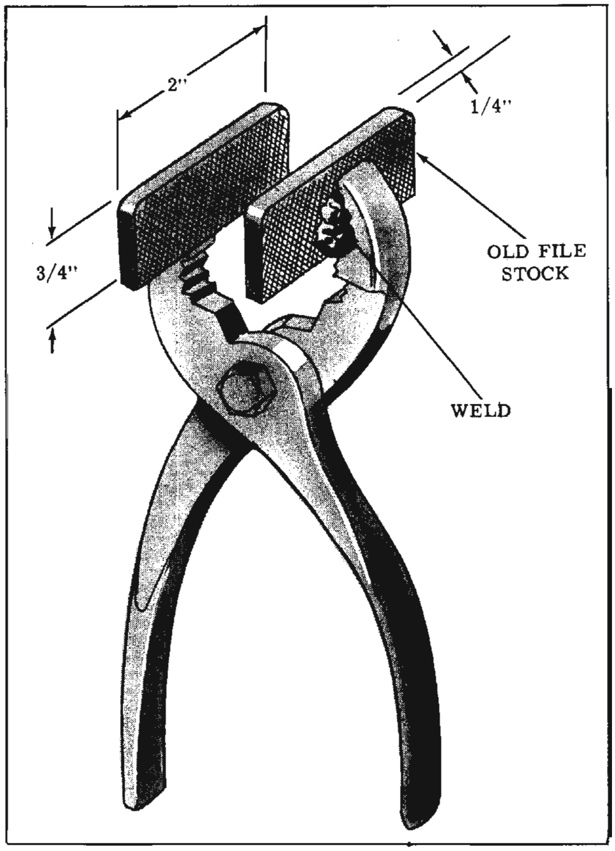


Fig. 16-171 Fabric Cover Pliers

easier loosening of cemented edges.

6. Loosen cemented edges of fabric roof cover at windshield, side roof rails, back window, and rear quarter areas; then, carefully remove fabric cover from remaining cemented area of roof panel.

INSTALLATION

1. Check all cementing surfaces on body to insure a smooth surface. Cementing surface must be smooth to prevent "highlighting" of excess cement through fabric cover after new cover has been installed. Clean off old cement as required.

   NOTE: A cleaner such as 3M Adhesive Cleaner or equivalent, should be used to remove or smooth out excess old cement. Apply solvent and allow to soak before rubbing.

   CAUTION: Be certain to follow manufacturer's directions when using cleaner.

2. To permit easier fitting and removing of wrinkles from new cover assembly, where possible, install new cover at room temperature (approximately 72^{0}).

   NOTE: Where new cover is installed at temperatures below 72^{0}, pliers fabricated as shown in Fig. 16-171 will aid in removing wrinkles.

3. Determine center line of roof panel by marking center points on windshield and back window openings with chalk or equivalent.

4. Fold cover lengthwise, precisely at center location and mark center location at front and rear of cover.

5. Lay cover on roof panel and align to correspond with center line of roof panel. Determine proper material overhang at windshield and back window openings.

6. Fold fabric cover on center line and lay on right side of roof panel, allowing material to overhang at windshield and back window opening.

7. Apply approximately an 8" wide strip of nitrile non-staining vinyl trim adhesive such as 3M Vinyl Trim Adhesive or Permalastic Vinyl Trim Adhesive or equivalent along exposed inner layer of fabric cover adjacent to center line. (Fig. 16-172)

   If nitrile non-staining cement is not available, use neoprene type non-staining weatherstrip cement such as 3M Super Weatherstrip Cement or equivalent.

NOTE: When using nitrile non-staining cement, it may be necessary to apply two coats to fabric cover.

IMPORTANT: Exercise care when applying cement on inner layer of cover so cement does not come in contact with outer layer.

8. Apply cement to corresponding area of roof panel, which is to left of center line of roof panel.

9. At front and rear of fabric cover, grasp edge of material at seam and center line locations. Slide folded cover to center line of roof panel. Securely hold cover at center line location at windshield opening. Pull cover at rear, making certain center line of folded fabric cover corresponds to center line of roof panel. Securely hold fabric cover at back window opening. Turn folded left half of fabric cover over and fasten cover to cemented portion of roof panel.

NOTE: This operation should center fabric cover on roof panel. Center marks on windshield and back window openings must correspond to center marks on fabric cover.

10. Once 8" strip of fabric cover is cemented to roof panel, fold over uncemented left side portion of fabric cover. Apply cement on inner layer of fabric cover to extend approximately 1" beyond dielectric seam. Apply cement to corresponding area of body. (See Fig. 16-172)

IMPORTANT: Application of cement SHOULD NOT OVERLAP with previously cemented area, as "highlighting" of excess cement through fabric cover will result.

11. Cement prepared portion of fabric cover to roof panel MAKING CERTAIN DIELECTRIC SEAM IS STRAIGHT.

12. Fold over fabric cover and apply cement to remaining portion of fabric cover and roof panel and drip molding. Cement cover to roof panel and drip molding. (Fig. 16-172)

NOTE: When installing fabric cover to inside of drip molding, a small thin-edged piece of plastic, or similar material, may be used to insert cover in place inside drip molding. Exercise care so damage will not occur to cover when performing this operation.

13. Cement perimeter of fabric cover in rear quarter area. Be certain fabric cover is cemented at emblem or plate assembly attaching locations. This type of cement application will permit easier fitting of cover in rear quarter area. (Fig. 16-172)

14. Repeat steps 10, 11, 12 and 13 on right side.

15. At windshield and back window openings cement cover into opening as shown in View "A", Fig. 16-173.

Apply extra bead of cement to each side of dielectric seam between fabric cover and roof panel at windshield and back window openings. (View "A", Fig. 16-173)

16. Install drive nails at windshield and back window openings. (View "A", Fig. 16-173 shows typical drive nail installation.)

NOTE: When installing drive nails it is

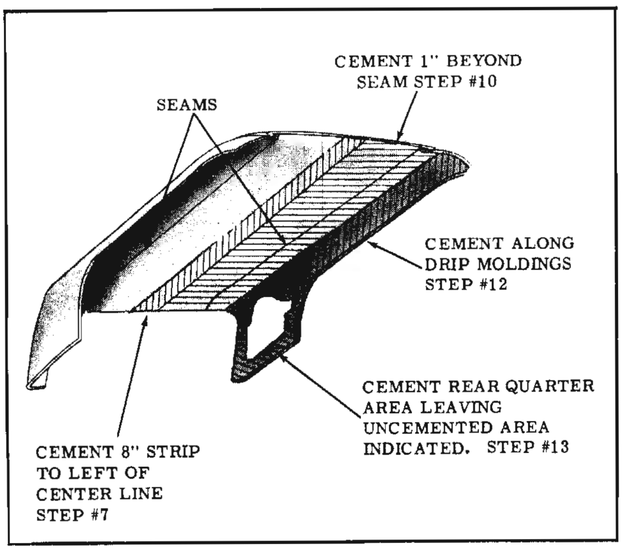


Fig. 16-172 Cementing Fabric Cover

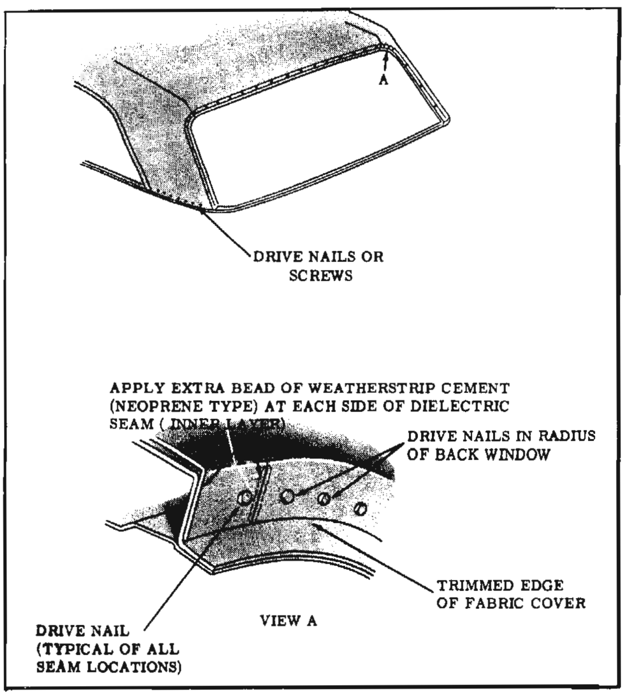


Fig. 16-173 Drive Nail Installation

best to first use an awl or similar tool to initiate a hole in metal. Strike drive nails only hard enough to seat them. Installation of drive nails should also be as low as possible in windshield and back window opening. This will aid in preventing cutting edge of fabric cover due to a missed hammer blow when drive nails are installed.

17. Install screws (or drive nails) at belt line of rear quarter area. (Fig. 16-170)

18. Trim off material at windshield, back window, and rear quarters. View "A", Fig. 16-173 shows where trimmed edge should occur in openings.

    NOTE: Install fabric cover at windshield pillar area in same manner as original installation.

19. Using fabric cover trimming tool (J-21092), or suitable small knife, trim fabric cover just under lip of roof drip molding. (View "A", Fig. 16-170)

20. Prior to installing flexible retainers in side roof rail drip moldings, spread them slightly to insure a tight fit.

21. Install flexible retainer starting at radius area above rear quarter window. Working toward rear of body, if necessary, carefully drive retainer downward with a blunt-edged tool. Working toward front of body, install remaining portion of retainer. Retainer fingers should be seated in flange of drip molding. (View "A", Fig. 16-170)

22. Install all previously removed moldings and assemblies.

    NOTE: If, after cover installation is completed, creases or fold marks are still visible, they may be removed by applying heat to area affected. Care must be exercised so that material is not over heated as loss of design pattern embossed in cover will result. Normally creases or fold marks will gradually disappear after cover assembly has been exposed to the elements.

FIESTA

GENERAL DESCRIPTION

The fiesta has a manually or electrically operated tail gate window. To provide for maximum cargo space, the second seat back(s) can be folded forward to obtain additional floor area.

A special option is available on two seat styles, which includes a vertically mounted spare tire in the right rear quarter panel, and a lock on the rear floor section. This option provides additional storage area, with security.

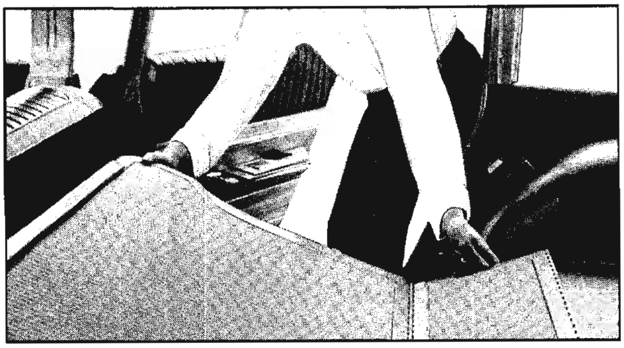


Fig. 16-174 Folding Rear Seat Back

On three seat styles, the back of the third seat folds rearward into the floor. To raise the seat back, it is necessary to lift up on the floor panel while raising the seat back. (Fig. 16-174) On three seat styles, the third seat back lifts from the floor. (Fig. 16-175) The windshield, instrument panel front seat and front and rear doors are the same as used on sedans. For servicing of these items, refer to their respective procedures in the BODY SECTION.

OPERATION OF TAIL GATE WINDOW

MANUAL REAR WINDOW CONTROL

To open the tail gate, it is FIRST NECESSARY TO LOWER THE REAR WINDOW. This is accomplished by pulling out the window control knob, placing the indicator on OPEN and turning the handle counterclockwise until the window is COMPLETELY DOWN. (Fig. 16-176) A mechanical safety device prevents the tail gate from being opened until the window is down completely. When lowering is completed, turn the indicator to FOLD. This places the control knob in "free wheeling" so it may be rotated to locate in the recess at the bottom of the control assembly when folded back into position.

When the window is completely down, the tail gate is opened by grasping the latch, located top

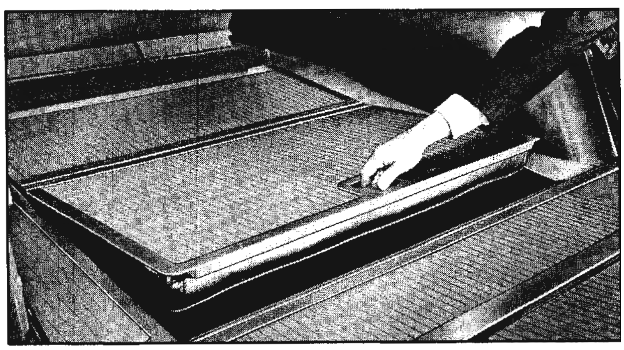


Fig. 16-175 Folding Third Seat ("45" Style)

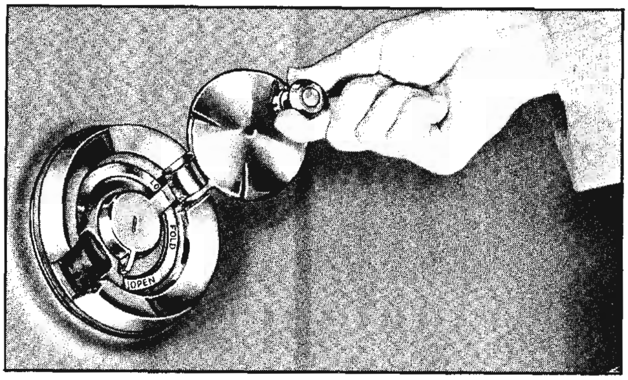


Fig. 16-176 Manual Window Control

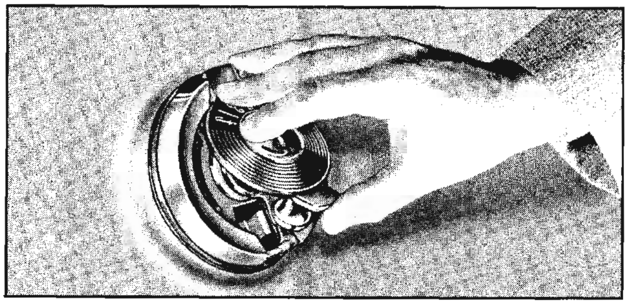


Fig. 16-177 Manual Control Handle Latch

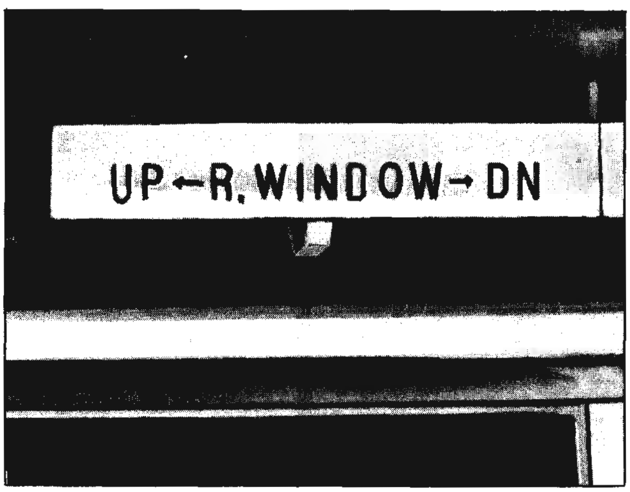


Fig. 16-178 Electric Window Control

center of the inner panel of the tail gate, and pulling up and to the rear.

NOTE: The handle CANNOT BE RECESSED unless the cap cylinder is rotated from open to either fold or lock position.

To raise the window, pull out control knob, place indicator in OPEN position and turn knob clockwise. When the window is completely closed, turn the indicator to FOLD and replace control knob in closed position. (Fig. 16-177)

To lock the tail gate, lift the control handle, insert the door and ignition key and turn the indicator counterclockwise to LOCK. Remove key and replace control handle in closed position.

ELECTRIC REAR WINDOW CONTROL (Fig. 16-178)

The window is lowered from the outside by inserting the door and ignition key in the tail gate and turning counterclockwise. Turning the key clockwise raises the window. The rear window may also be raised and lowered from the driver's compartment with the control located in the center of the instrument panel above the radio. This switch operates only when the ignition is ON or in ACCESSORY position, whereas the switch on the tail gate operates independently of the ignition.

NOTE: Electric rear window switch located on left rear side panel of three seat models, operates only when ignition switch is in ON or ACCESSORY position.

As in the case of the manual control, the window must be completely down before the tail gate can be opened. When the tail gate is open, a switch automatically prevents the window from being raised.

IMPORTANT: Tail gate must be fully engaged in strikers to operate electric rear window. The nylon plunger located in the L.H. striker must be depressed by the tail gate lock case and this can only be accomplished when the tail gate is fully closed in the striker. If window does not operate, open gate, depress and hold nylon plunger (Fig. 16-180) and operate switches. If window operates while holding plunger fully compressed, this indicates the striker switch and tail gate lock case are not meeting properly. Adjust striker so that component parts mate. If window still does not operate, check wire connections for possible short or open circuit.

To Operate Window With Tail Gate Open

When service requires that the glass be raised and lowered with the tail gate open, the manually operated window can be cranked up or down. On the electrically operated window, it will be necessary to depress the switch plunger which is located in the left tail gate striker plate (Figs. 16-179 and 16-180) and then operate window switch.

CAUTION: Tail gate glass must be fully down before closing the tail gate.

SPARE TIRE

TWO SEAT STYLES (Fig. 16-181)

The spare tire and tire changing equipment are located under a hinged section of the rear floor.

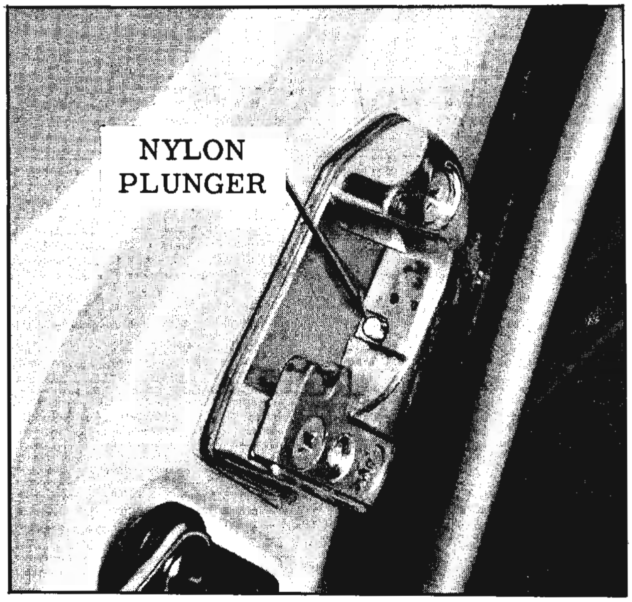


Fig. 16-179 Tail Gate Striker Switch

To gain access, lift the section using the finger hole provided. The section may be held open by swinging out the end of the support bar (located under rear side of the floor panel of the opened section) and placing it in the retaining hole which is in the left side.

SPECIAL OPTION AND THREE SEAT STYLES (Fig. 16-182)

On special option and three seat styles, the spare tire is mounted in a compartment in the R.H. quarter panel.

To remove tire, it is necessary to remove the tire cover, then lift up rear edge of auxiliary floor and pull rearward.

REAR SEAT ASSEMBLY

The rear seat cushion can be removed in the same manner as on conventional styles. The seat back trim assembly can be removed by first removing the rear seat cushion, then removing the

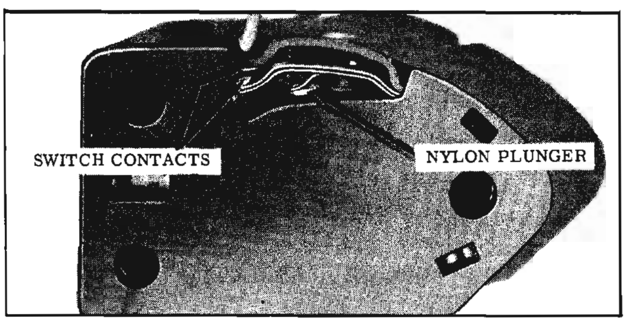


Fig. 16-180 Striker

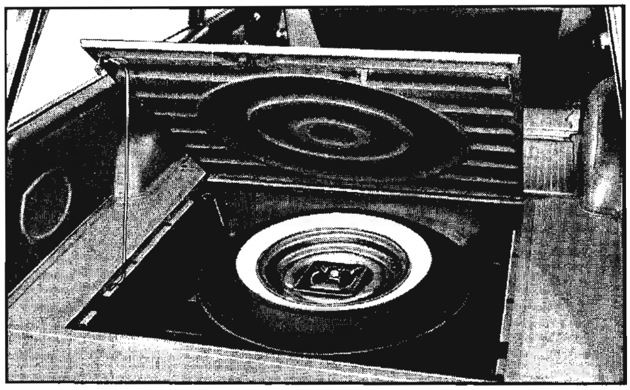


Fig. 16-181 Spare Tire Location ("35" Style)

trim to back panel attaching screws. The rear seat back floor pivot brackets can be removed by disconnecting the links and removing the bracket to floor pan bolts.

REAR SEAT BACK PANEL, AUXILIARY FLOOR AND HINGE ASSEMBLY

Removal and Installation

1. Remove the rear seat cushion.
2. Remove the hinge to auxiliary floor panel attaching screws.
3. Remove retainers and disengage links from the floor pivot brackets.
4. Remove the seat back panel, auxiliary floor and hinge assembly.

To install, reverse the removal procedure.

THIRD SEAT ASSEMBLY ("45" STYLE)

The seat cushion of this seat can be removed by lifting up on rear edge of cushion (rear of car) approximately 2", then pulling toward rear of car. It is important that cushion be lifted vertically first, due to type of clamp holding cushion in position.

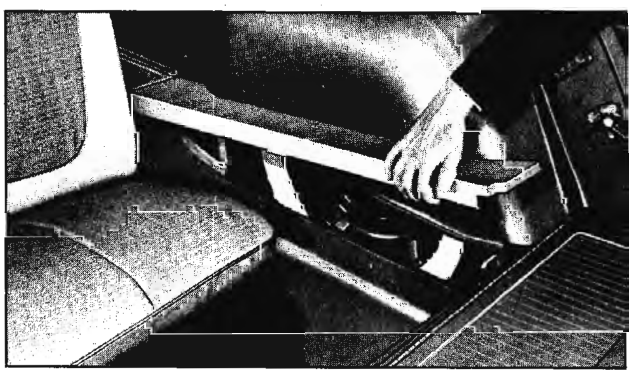


Fig. 16-182 Spare Tire (Special Option and "45" Style)

Fold backrest toward down position approximately half way. Lift auxiliary floor away from backrest and unhook the two springs from the auxiliary floor.

Place backrest to up position and remove four bracket to floor attaching bolts and remove assembly.

TAIL GATE

REMOVE AND INSTALL

1. Lower window, open tail gate.
2. Remove the tail gate inner panel cover.
3. Disconnect water deflector around tail gate hinge.
4. If equipped with electric window lift or wiper:
   a. Disconnect water deflector and remove large access hole cover(s).
   b. Raise window, disconnect the wiring harness from the motor(s) and tail gate and remove harness from the bottom of the tail gate.
5. Fully open tail gate and support in this position.
6. Disconnect tail gate support arms at tail gate.
7. Remove the three hinge to tail gate attaching bolts from each hinge. Scribe around bolt holes for hinge location.
8. On manual operated windows, raise window approximately 6".
9. Position the tail gate in the near closed position to relax the torque rods, then with aid of a helper lift tail gate from hinges.
10. To install, reverse the procedure, align the tail gate and reseal water deflector. Apply body caulking compound around hinge where it enters the tail gate. (Fig. 16-183)

ADJUSTMENTS

The "in" and "out" and sidewise adjustment is provided at the body hinge and "up" and "down" adjustment is provided at the hinge on the tail gate. In and out adjustments at the top of the tail gate are provided at the lock strikers, which are adjusted the same as a door lock striker.

TORQUE RODS (Tail Gate)

REMOVE AND INSTALL (Fig. 16-184)

1. Remove tail gate. (Refer to TAIL GATE - REMOVE AND INSTALL)
2. Block follow board securely in "up" position.
3. Remove two bolts securing each torque rod to the movable hinge. Pull torque rods out of stationary hinge.

To assemble, reverse the removal procedure.

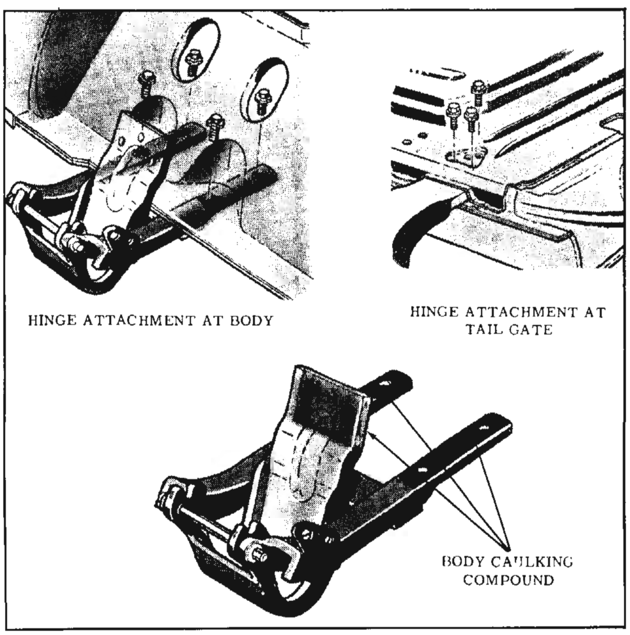


Fig. 16-183 Hinge Sealing and Installation

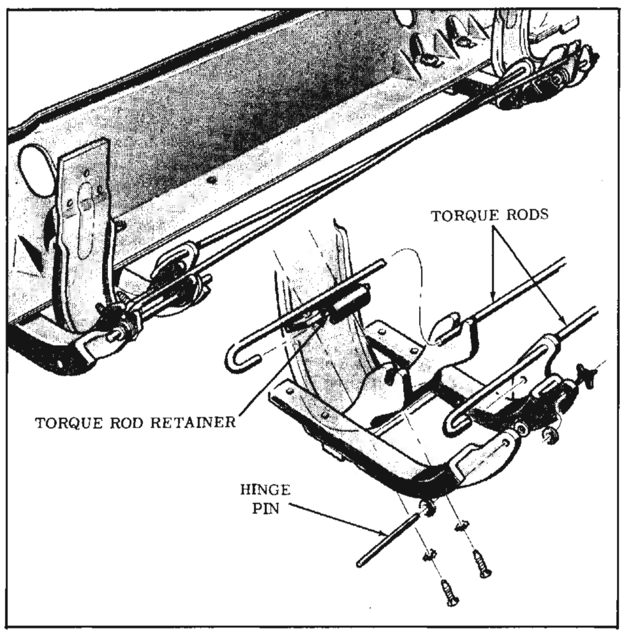


Fig. 16-184 Tail Gate Torque Rods

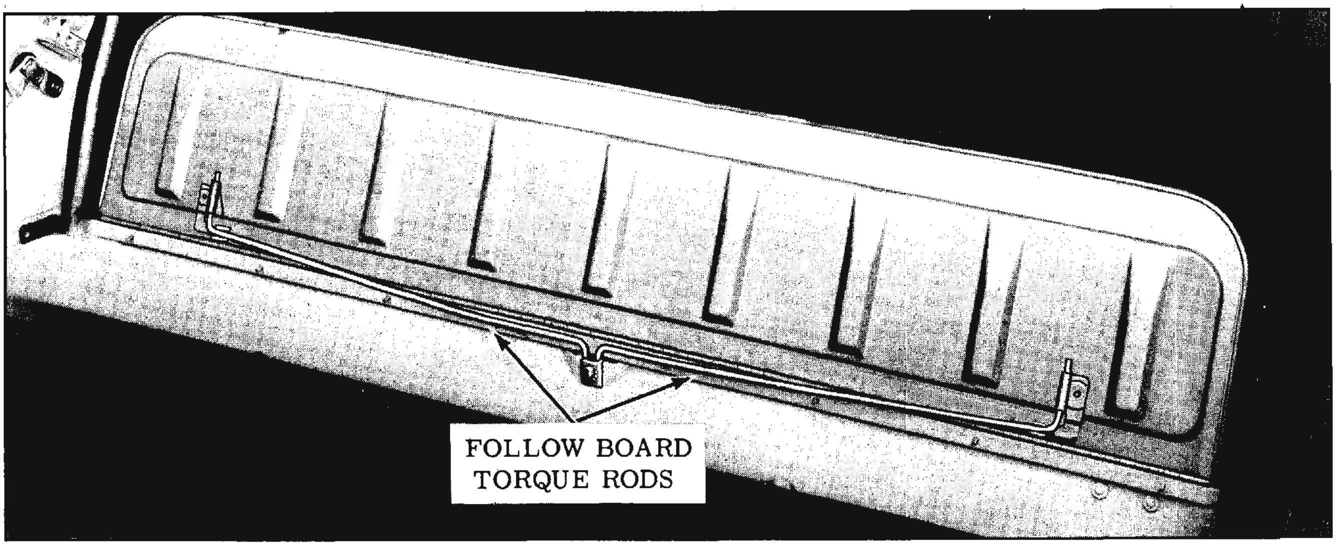


Fig. 16-185 Follow Board Torque Rods

Install torque rods as shown in Fig. 16-184.

FOLLOW BOARD TORQUE RODS

REMOVE AND INSTALL (Fig. 16-185)

1. Place follow board in down position.

2. Remove two outer screws in follow board. This will disconnect rods from follow board.

3. Lift up follow board.

4. Loosen torque rod clamp in center of body.

To install, reverse removal procedure. The outer torque rod clamps can be attached to follow board when in the "down" position by reaching under the follow board and holding a clamp to the follow board and by inserting screw.

HINGE REPLACEMENT

Either half of the tail gate hinge can be removed independently of the other.

1. Remove the tail gate assembly. (Refer to TAIL GATE - REMOVE AND INSTALL.)

2. Disconnect torque rods from hinge to be removed. (Fig. 16-184)

3. Disconnect bumper to obtain clearance for hinge removal.

4. Scribe hinge location on body to aid in alignment upon installation.

5. Remove hinge assembly.

6. If only half of the hinge assembly is to be replaced, remove the hinge pin retainer and hinge pin.

7. To install, reverse the removal procedure. Apply heavy-bodied sealer to the attaching surfaces of hinge straps or corresponding surfaces of the body and tail gate. (Fig. 16-183)

TAIL GATE WEATHERSTRIP

The weatherstrip assembly incorporates nylon component fasteners. This fastener is the same size at all locations (3/16" diameter) and is available as a service part.

A fastener removing tool can be fabricated as shown in Figure 16- 20. When a removal tool is fabricated, make sure all sharp edges or metal burrs are removed so as not to damage weatherstrip or paint finish during its usage.

Removal

1. Remove snap fasteners securing ends of weatherstrip at belt line.

2. Carefully break cement bonds securing weatherstrip. A putty knife will prove helpful in breaking cement bond.

3. Slide tool under weatherstrip at a fastener location and grip fastener as close to panel as possible; then, gently pry fastener out. (Fig. 16-23)

CAUTION: Exercise care not to damage serrations or fasteners during removal as they are necessary to maintain a good weatherseal.

Installation

1. Check weatherstrip nylon fasteners for damage and replace, if necessary.

2. Clean off old cement from panel to insure a clean cementing surface. Apply a bead of weatherstrip adhesive at belt line and continue down panel for approximately seven to nine inches.

   NOTE: Cement usage is usually limited to panel at belt line. Cement, however, can be applied at any point where additional retention of weatherstrip is needed.

3. Beginning at either side, install snap fasteners. Install weatherstrip fasteners by pressing fasteners into door panel piercing.

   NOTE: In the event a weatherstrip becomes damaged at a fastener location and will not properly retain the fastener, remove fastener and cement weatherstrip into place. If, however, two or more consecutive fasteners will not remain engaged in the weatherstrip, replacement of the weatherstrip will probably be necessary.

Weatherstrips are impregnated with a silicone lubricant and additional lubrication should not be required.

HEADLINER

REMOVE AND INSTALL

The headliner consists of five sections of perforated hardboard retained by plastic retainer finishing moldings. The plastic retainer finishing moldings snap onto retainers, which are attached to the roof top crossbows. Side aluminum retainers (used on 88 to retain outer edges of headliner over front and rear door area) are retained by screws to the side roof inner rail. To remove the front headliner section, the windshield upper garnish moldings, rear view mirror support, sun visors and side roof rail molding (S88) must be removed. To remove the rear section, the roof top header garnish molding must be removed.

1. Remove side roof rail molding, if present.

2. With a screwdriver or suitable tool, pry one end of the plastic retainer finishing molding loose from its retainer. Then "peel" the plastic retainer finishing molding from its retainer. (Fig. 16-186)

   NOTE: Two retainer finishing moldings must be removed to remove any one panel, with the exception of the front and rear panels.

3. Slide headliner section back sufficiently to clear finishing molding retainer, then lift sides out of side retainers and remove section.

4. To install, reverse removal procedure.

QUARTER TRIM PANELS

The quarter trim panels are retained as shown in Figs. 16-187 and 16-188. The rear quarter trim panels on either side of the body have to be removed to install tail lamp assemblies.

NOTE: Tail lamp bulbs can be replaced by removing the lens.

FLOOR AND TAIL GATE TRIM COVERS

FLOOR TRIM COVERS

The auxiliary flooring is composed of individual panels with vinyl or carpet covering. All coverings are retained by an adhesive and in addition, carpet coverings are further retained by sheet metal screws. Any floor covering can be removed, after removal of carpet screws, by working the cemented covering loose from the panel with a putty knife. Use a waterproof adhesive for cementing new floor covering.

TAIL GATE PANEL AND TRIM COVER

1. Fold back follow board and remove skid strips. Remove carpet screws.

2. Pull panel assembly outward to disengage it from lower molding.

3. With a putty knife or suitable tool, pry the vinyl or carpet from the panel.

4. To install, clean panel thoroughly and install

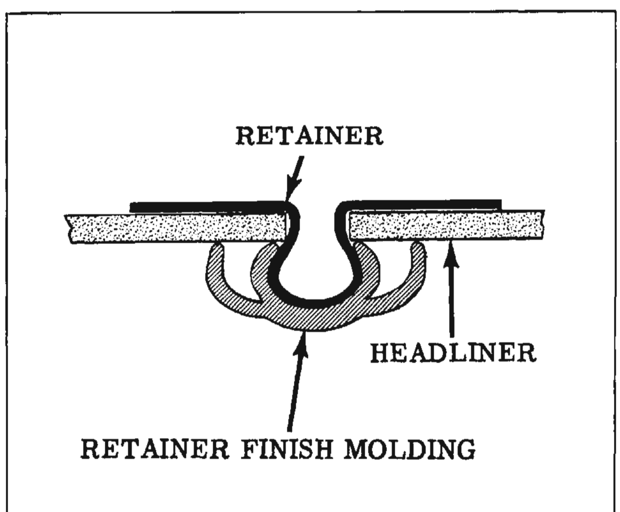


Fig. 16-186 Headliner and Retainer

new covering. Coat the back side of the covering as well as the panel with waterproof adhesive. Allow it to become tacky, then position the covering and press-roll onto panel.

5. Install the panel assembly, carpet screws and skid strips.

REAR QUARTER WINDOW ASSEMBLY

REMOVAL

1. Remove rear quarter window garnish moldings.
2. Remove the rear quarter trim panels.
3. Remove screws securing retainers at top, front and bottom of window assembly.
4. Using a suitable tool, carefully break seal bond between rubber channel and body opening, then have helper carefully push glass and rubber channel inboard and remove assembly from opening.

NOTE: Rubber channel may be removed from glass as a bench operation.

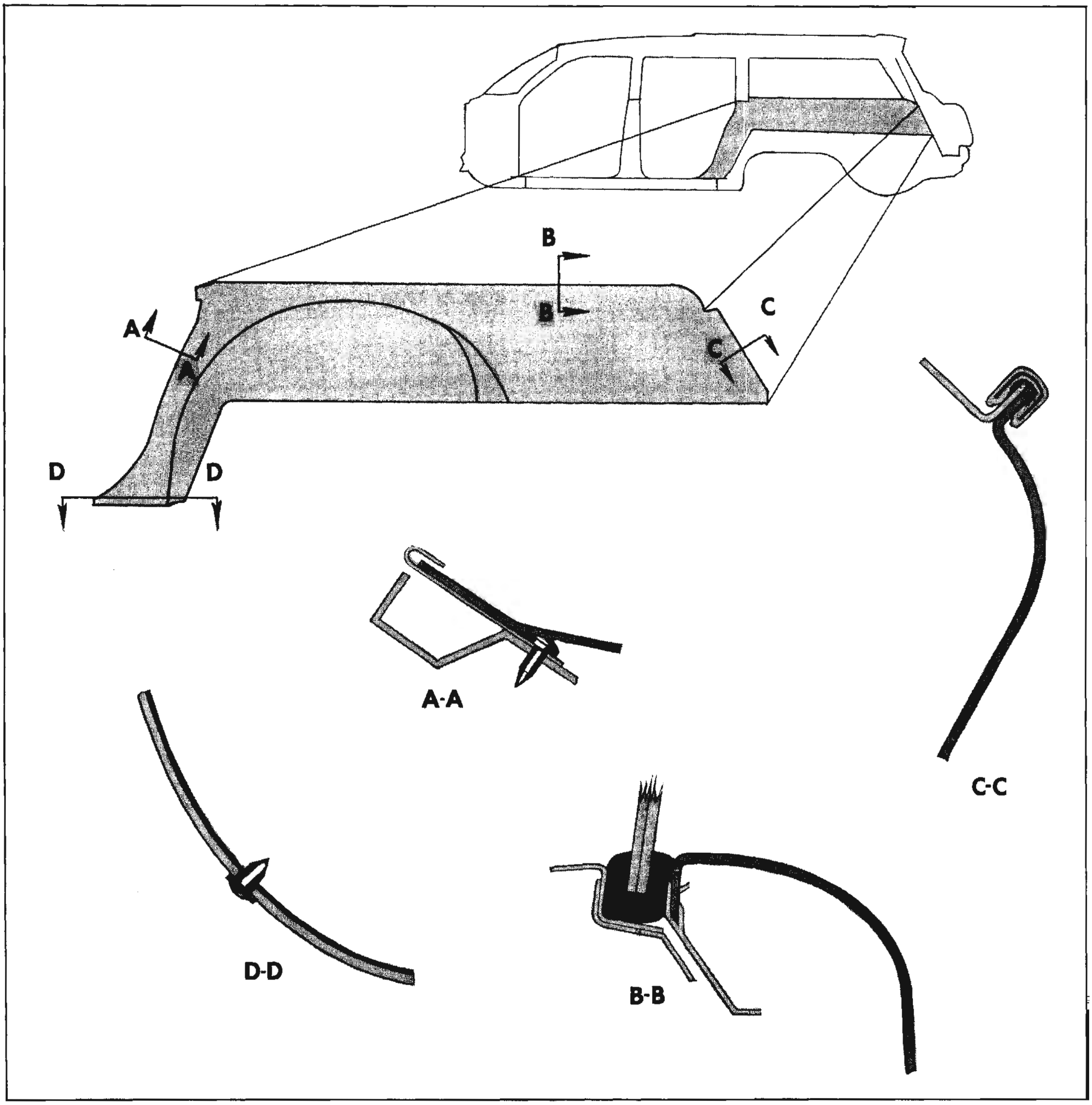


Fig. 16-187 Quarter Trim Panel (Two Seat, Without Luggage Option)

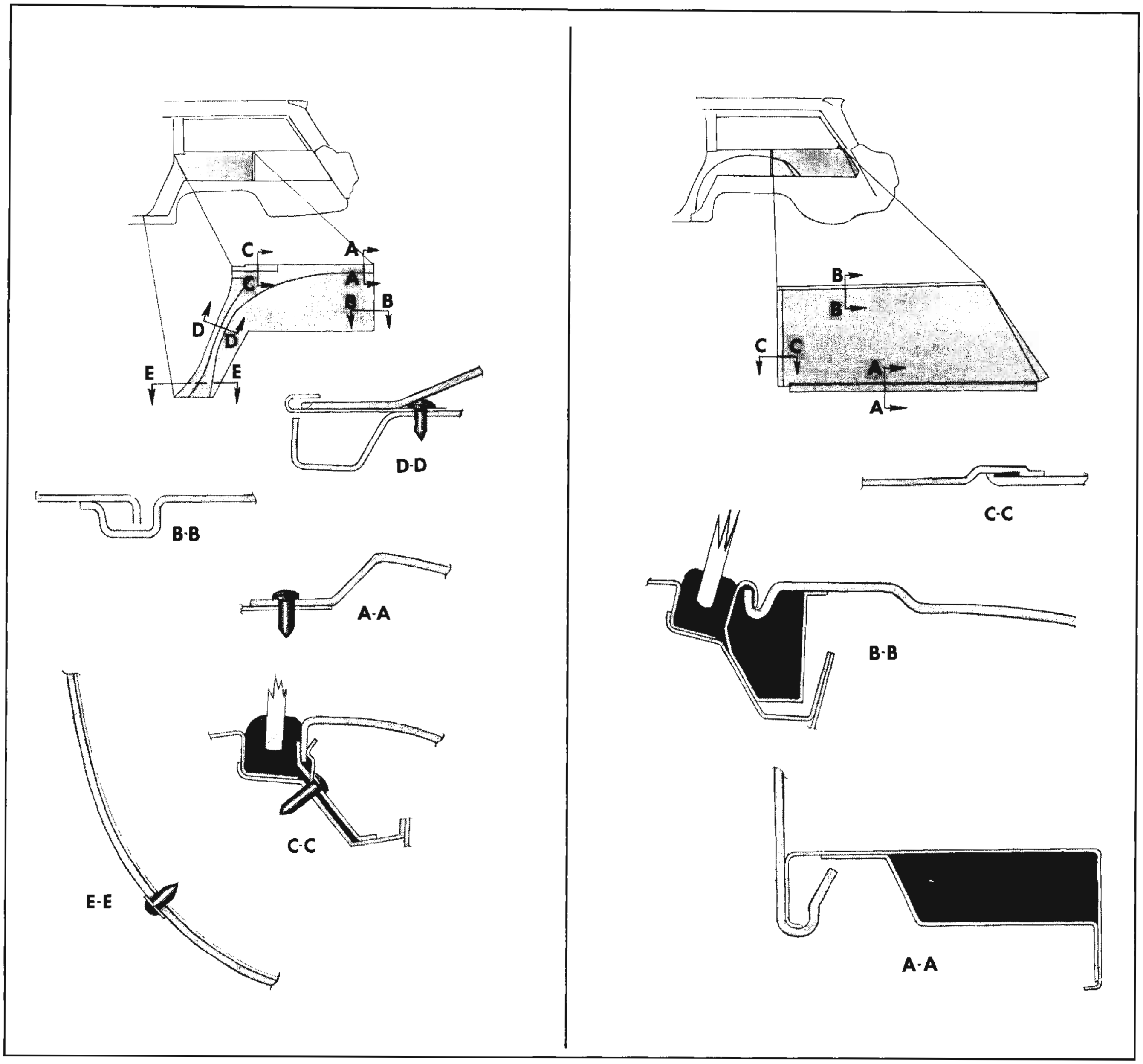


Fig. 16-188 Quarter Trim Panels (With Luggage Option or Third Seat)

INSTALLATION

1. Clean off old sealer from rubber channel and body opening to insure a smooth sealing surface.

2. Check drain hose for any obstructions and clean out, if necessary.

3. Apply a ribbon of medium-bodied sealer in corner of rear quarter reveal moldings completely around window opening.

4. Install quarter window assembly and install retainers and clips.

5. Using a plews oiler or any other suitable applicator, apply a bead of neoprene base weatherstrip cement between glass and outer wall of rubber channel completely around window. Clean off excess sealer.

6. Replace all previously removed parts and remove protective coverings.

NAME PLATE LETTERS AND MOLDINGS (Fig. 16-189 and 16-190)

NAME PLATE AND LETTERS

To remove the name plate or letters, it is necessary to remove the tail gate inner panel cover, disconnect the water deflector and remove

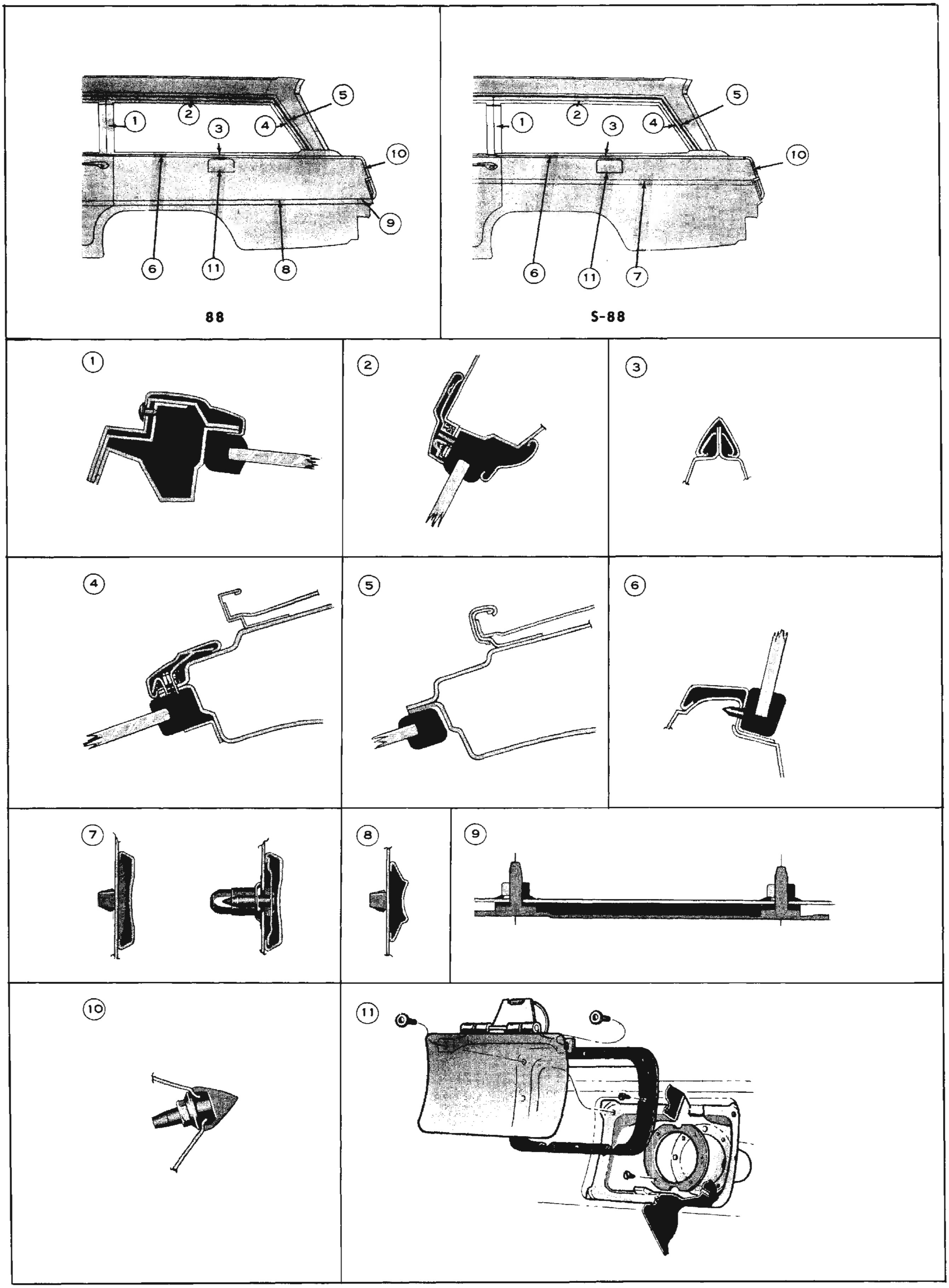


Fig. 16-189 Quarter Panel Exterior Molding Attachment

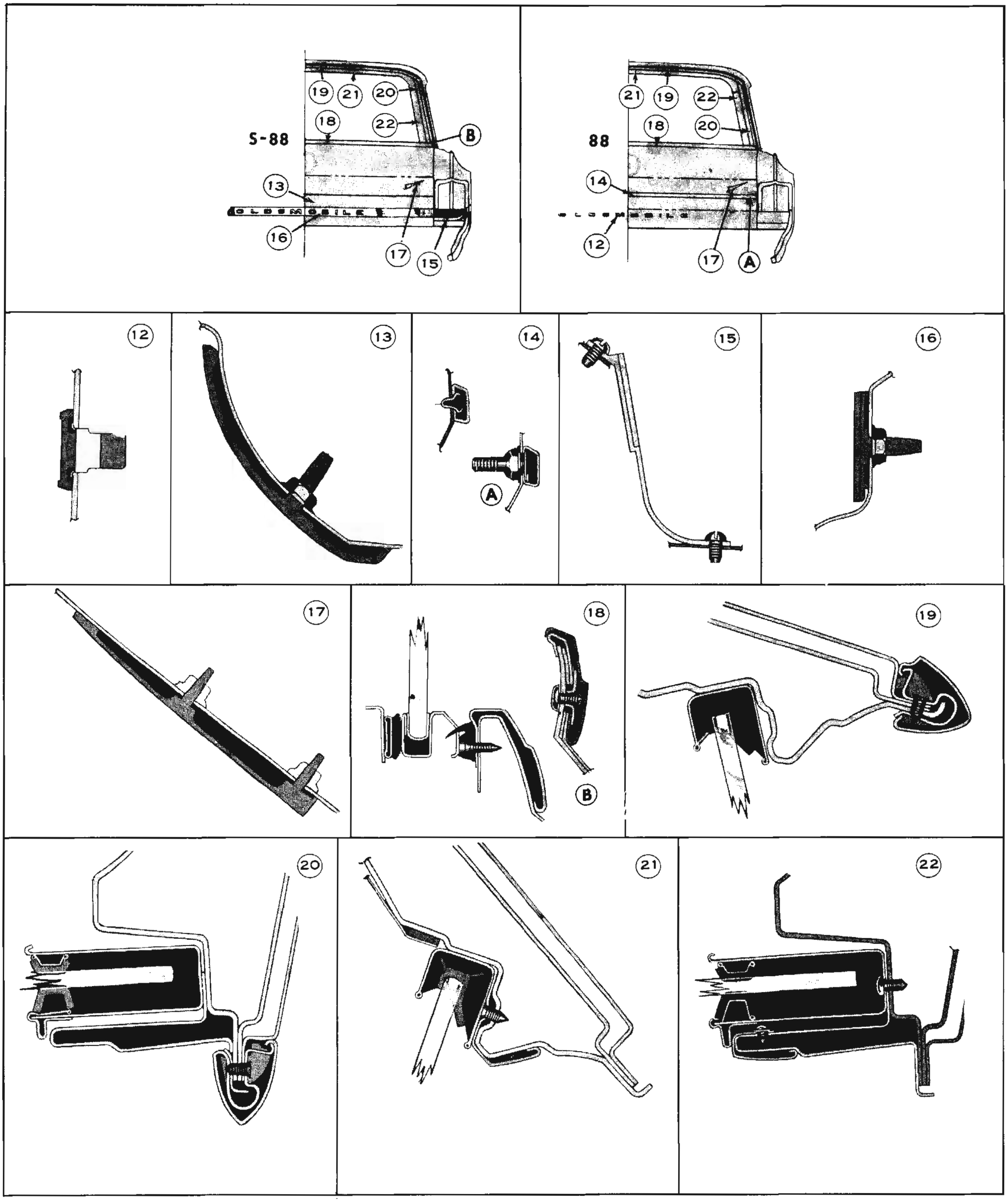


Fig. 16-190 Tail Gate Letters and Exterior Molding Attachment

the access hole cover(s). After the letters are installed, apply body caulking compound around the letter studs, reverse the removal procedure and reseal water deflector.

QUARTER WINDOW REVEAL MOLDING

The quarter window reveal moldings, upper, lower and rear, can be removed after the quarter window and rubber channel are removed.

QUARTER WINDOW SCALP

The quarter window scalp moldings, front, upper and rear, can be removed after the quarter window and rubber channel are removed.

REAR FENDER MOLDING

The rear fender molding is attached by eight snap-in clips and in addition the S88 uses a bolt and clip assembly at the rear end of the molding. The molding attaching nuts are accessible by removing the rear quarter trim pad or upright spare tire, on cars so equipped.

ROOF DRIP MOLDING

The roof drip moldings are attached by snapping the molding over the roof drip rail.

BODY PINCHWELD FINISHING MOLDINGS

The body pinchweld finishing moldings are retained by snapping the moldings over retaining clips.

TAIL GATE WINDOW REVEAL— UPPER, LOWER AND SIDE MOLDINGS

The tail gate window upper moldings, right and left, are secured to the body by attaching screws. The left reveal molding overlaps the right reveal molding at the center and the attachment is secured with a screw. Both upper reveal moldings are overlapped at the outer ends by the side reveal moldings.

To remove the moldings, remove the tail gate window upper glass run channels and the side reveal moldings. Remove the upper reveal molding attaching screws and remove the moldings. The moldings may be removed individually. Removal of either reveal molding individually requires detachment of the opposite side upper glass run channel at the center.

To install the moldings, apply a continuous ribbon of medium-bodied sealer (1/4" diameter) to the center of the inner surface of each molding and along the entire length of the molding. Position and install the right molding before the left molding. Seat and install the glass run channels and the side reveal moldings.

The tail gate window lower reveal molding is attached with screws which are accessible after the tail gate window is removed.

The tail gate window side moldings, right and left, are secured to the body by a slide-on attachment and by screws.

To remove the moldings, remove the rear body opening garnish moldings and panels and the tail gate window upper glass run channels. Remove the attaching screws and slide the moldings downward and inward from the body. When removing either molding individually, detach the opposite upper glass run channel at the center.

To install the moldings, apply a continuous ribbon of medium-bodied sealer to fill the cavity formed by the attaching surfaces of each molding. Position the moldings to the body and to the upper reveal moldings and install the attaching screws. Seal and install the upper glass run channels. Install the previously removed parts.

TAIL GATE WINDOW ASSEMBLY (MANUAL OR ELECTRIC) (Fig. 16-191)

Removal

1. Remove the tail gate window garnish molding.
2. Carefully operate window fully outward until the window lower sash channel right and left cam attaching bolts are accessible.

   NOTE: If cam attaching bolts are not accessible, bend the sheet metal until bolts are accessible. (Fig. 16-192)

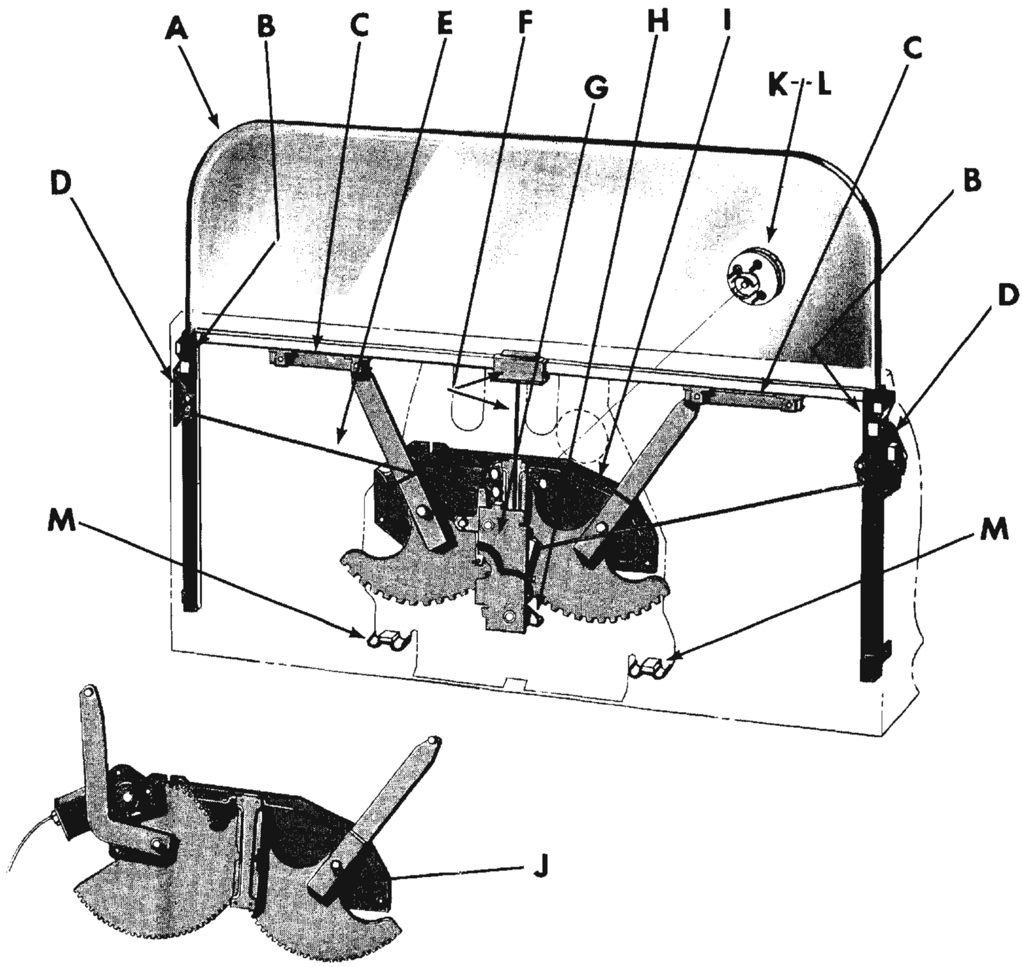
3. Remove window lower sash channel right and left cam attaching bolts. Disengage cams from window lower sash channel; then carefully remove window assembly.

   CAUTION: DO NOT OPERATE REGULATOR MOTOR after the window assembly is disengaged from the regulator or removed from the tail gate. Operation of the motor with the load removed may damage the unit and make it inoperative.

4. To install tail gate window assembly, reverse removal procedure. Prior to installing window lower sash channel cams, lubricate channel portion of cam with "Lubriplate" or its equivalent.

TAIL GATE WINDOW ADJUSTMENTS

1. To adjust the tail gate window forward or



A. Tail Gate Window Assembly

B. Tail Gate Window Glass Side Run Channel Assembly - Right and Left

C. Tail Gate Window Lower Sash Channel Cam - Right and Left

D. Tail Gate Lock Assembly - Right and Left

E. Tail Gate Lock Remote Control Connecting Rod - Right and Left

F. Tail Gate Lock Remote Control Inside Handle Assembly - Includes Push Rod

G. Tail Gate Lock Remote Control Assembly

H. Tail Gate Lock Remote Control Locking Lever - Actuated By Window

I. Tail Gate Window Regulator Assembly - Manual

J. Tail Gate Window Regulator Assembly - Electric

K. Tail Gate Window Regulator Outside Handle Assembly

L. Tail Gate Window Regulator Outside Lock Cylinder Switch and Escutcheon Assembly

M. Tail Gate Window Rubber Bumber Stops

Fig. 16-191 Tail Gate Assembly

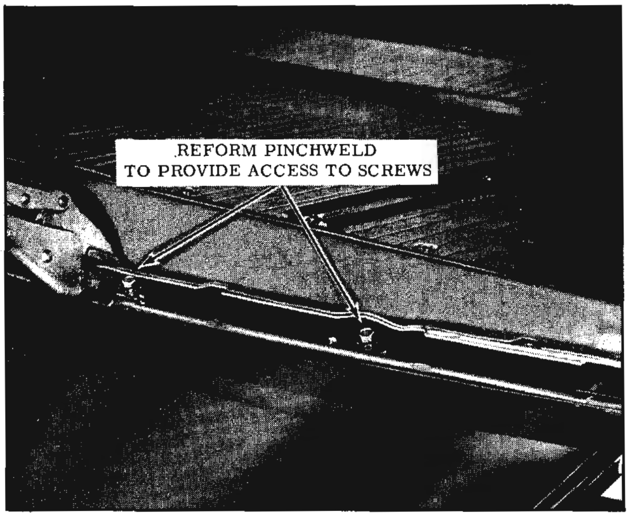


Fig. 16-192 Tail Gate Window Removal

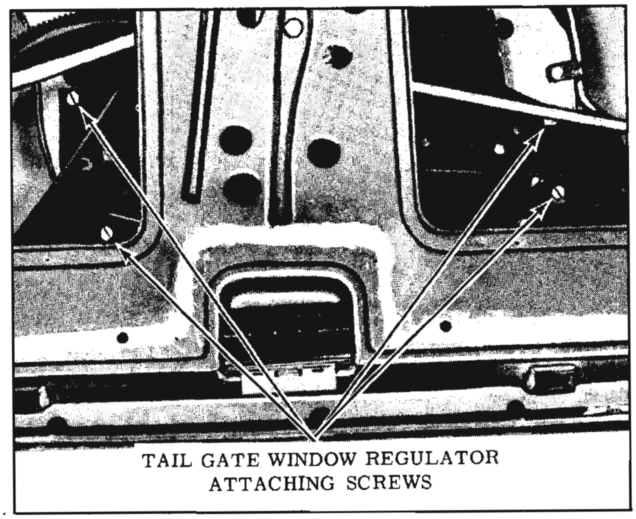


Fig. 16-193 Regulator Removal

rearward for proper alignment with the window glass run channel (on body), and/or to eliminate a binding condition of the window in the tail gate glass run side channels, loosen the tail gate glass run side channel(s) lower attaching bolt at tail gate lock pillar. Move lower end of channel forward or rearward, as required, and tighten lower attaching bolt.

NOTE: The vertical portion of the tail gate window glass upper run channels are adjustable forward or rearward for proper alignment with the tail gate glass.

2. To correct a condition where the glass is "cocked" in the glass run channels, loosen window regulator attaching screws, rotate regulator assembly clockwise or counter-clockwise, as required, to eliminate "cocked" condition. (Fig. 16-193)

TAIL GATE WINDOW REGULATOR ASSEMBLY (MANUAL OR ELECTRIC)

REMOVAL AND INSTALLATION

1. Remove tail gate window assembly, as described under TAIL GATE WINDOW ASSEMBLY - Removal and Installation.

2. Remove the inner panel cover lower retainer, inner panel cover and skid strips.

3. Detach tail gate lock remove control right connecting rod from remove control.

4. On styles equipped with electrically operated tail gate window, disconnect tail gate harness connector from motor.

CAUTION: DO NOT OPERATE REGULATOR MOTOR after window assembly is disengaged from the regulator or after the regulator is removed from the tail gate. Operation of the motor with the load removed may damage the unit and make it inoperative.

5. Remove regulator attaching screws. (Fig. 16-193) Remove regulator assembly through access hole.

NOTE: To remove electric motor from regulator assembly see TAIL GATE WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY - Removal and Installation.

6. To install tail gate window regulator assembly, reverse removal procedure. Prior to installing regulator, lubricate the teeth on the regulator sectors with "Lubriplate".

Prior to resealing tail gate inner panel water deflector, check operation of window and tail gate locking mechanism. Where necessary, adjust tail gate window, tail gate lock

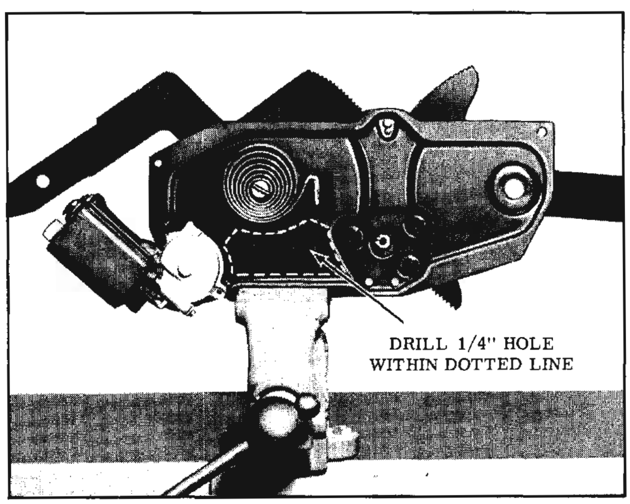


Fig. 16-194 Regulator Removal

strikers or tail gate lock remote control for proper operation.

TAIL GATE WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY

Removal and Installation

1. Remove tail gate window regulator and electric motor assembly as described under TAIL GATE WINDOW REGULATOR ASSEMBLY - Removal and Installation.

2. Place regulator assembly in a vise as shown in Fig. 16-194.

   CAUTION: BE SURE to perform Steps 3 and 4 before attempting to remove the motor from the regulator. The regulator lift arms, which are under tension from the counterbalance spring, can cause serious injury if the motor is removed without locking the sectors in position.

3. Drill a 1/4" hole through regulator backplate and main sector within area indicated by dotted lines. (Fig. 16-194)

   NOTE: Do not locate hole less than 1/2" away from edge of backplate, sector or holes in backplate and sector. Do not use holes in backplate or sector as they are too large and locking bolt can slip out.

4. Insert a 3/16" bolt through hole in backplate and sector and install nut to bolt. (Do not tighten nut.)

5. Remove three motor attaching bolts, and remove motor assembly from regulator.

   NOTE: Clean off steel chips from the regulator sectors and motor pinion gear after drilling operation.

6. To install regulator electric motor assembly, reverse removal procedure.

   NOTE: Be sure to remove nut and bolt locking sector after motor is installed.

TAIL GATE WINDOW REGULATOR OUTSIDE HANDLE ASSEMBLY (Manually Operated)

Removal and Installation

1. Remove inner cover panel lower molding and inner cover panel.

2. Detach tail gate inner panel water deflector sufficiently to gain access to access holes, shown at "A". (Fig. 16-195)

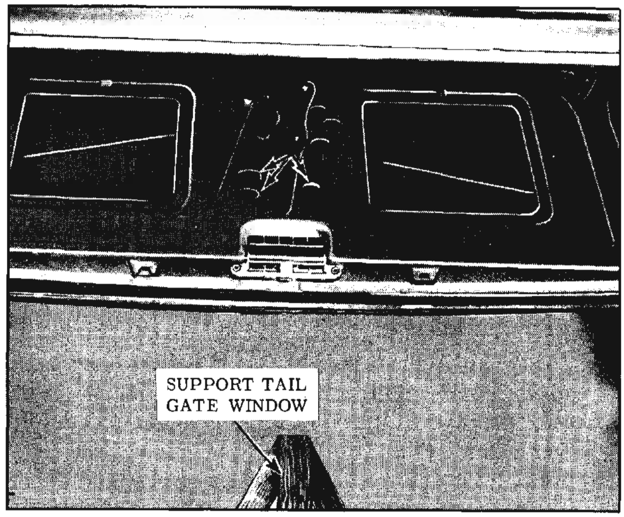


Fig. 16-195 Outside Handle Removal

3. Carefully raise window until holes in window regulator are aligned with inner panel access holes "A".

   CAUTION: Support portion of window assembly extending out of tail gate.

4. Through access holes, remove tail gate handle attaching nuts and remove handle assembly and gasket from tail gate. To disassemble tail gate handle assembly, see TAIL GATE HANDLE ASSEMBLY - Disassembly and Assembly.

5. To install tail gate handle assembly, reverse removal procedure. Make sure sealing gasket is installed between tail gate outer panel and handle escutcheon and make sure handle clutch is properly engaged with window regulator clutch. Check operation of window prior to resealing water deflector. Reseal tail gate inner panel water deflector as specified under TAIL GATE INNER PANEL WATER DEFLECTOR.

TAIL GATE WINDOW LOCK CYLINDER ASSEMBLY

Removal and Installation

1. Using an awl or suitable punch, carefully punch through webbed hole in face of lock cylinder cap (selector lever).

2. With key in lock cylinder and selector lever in "Lock" position, insert a piece of wire (paper clip) in hole on face of lock cylinder cap and depress plunger with wire sufficiently to allow key and selector lever to be turned counterclockwise approximately 1/8 turn; then, remove lock cylinder and cap assembly.

3. To install lock cylinder and cap assembly,

reverse removal procedure. Prior to installation, lubricate frictional surfaces of lock cylinder and cap parts with "Lubriplate" or its equivalent.

TAIL GATE WINDOW HANDLE ASSEMBLY

Disassembly and Assembly (Fig. 16-196)

1. Remove window regulator handle assembly.
2. Using an awl, remove clutch spring retainer; then remove clutch washer and spring washer, and remove clutch and lock cylinder assembly from unit. (Fig. 16-196)
3. Using snap ring pliers or other suitable tool, remove housing spring retainer; then remove housing washer and spring washer, and remove backplate from handle and knob housing.

   NOTE: Plastic shoes can be removed from handle and knob housing by carefully prying shoes from housing. (Fig. 16-196)

4. If replacing handle and knob assembly, remove screws securing handle and knob retainers; then disengage handle and knob including handle pin from housing.
5. To install handle assembly, reverse removal procedure. Prior to installation, lubricate frictional surfaces of part with "Lubriplate".

TAIL GATE WINDOW LOCK CYLINDER AND CASE ASSEMBLY

Disassembly and Assembly

1. Remove window regulator handle assembly.
2. Using an awl, remove clutch spring retainer; then remove clutch washer and spring washer, and remove clutch and lock cylinder assembly from unit. (Fig. 16-196)
3. Insert a piece of wire (paper clip) in hole on face of lock cylinder cap. While holding lock cylinder case, depress plunger with wire sufficiently to allow key and selector lever to be turned counterclockwise approximately 1/8 turn; then, remove lock cylinder and cap assembly and detent spring from handle assembly. (Fig. 16-197)

   NOTE: When removing lock cylinder and cap assembly from case, place finger over locking pawl to prevent pawl and spring from popping out. (Fig. 16-197)

4. Remove locking pawl and pawl spring from lock cylinder case.
5. To install lock cylinder and case assembly,

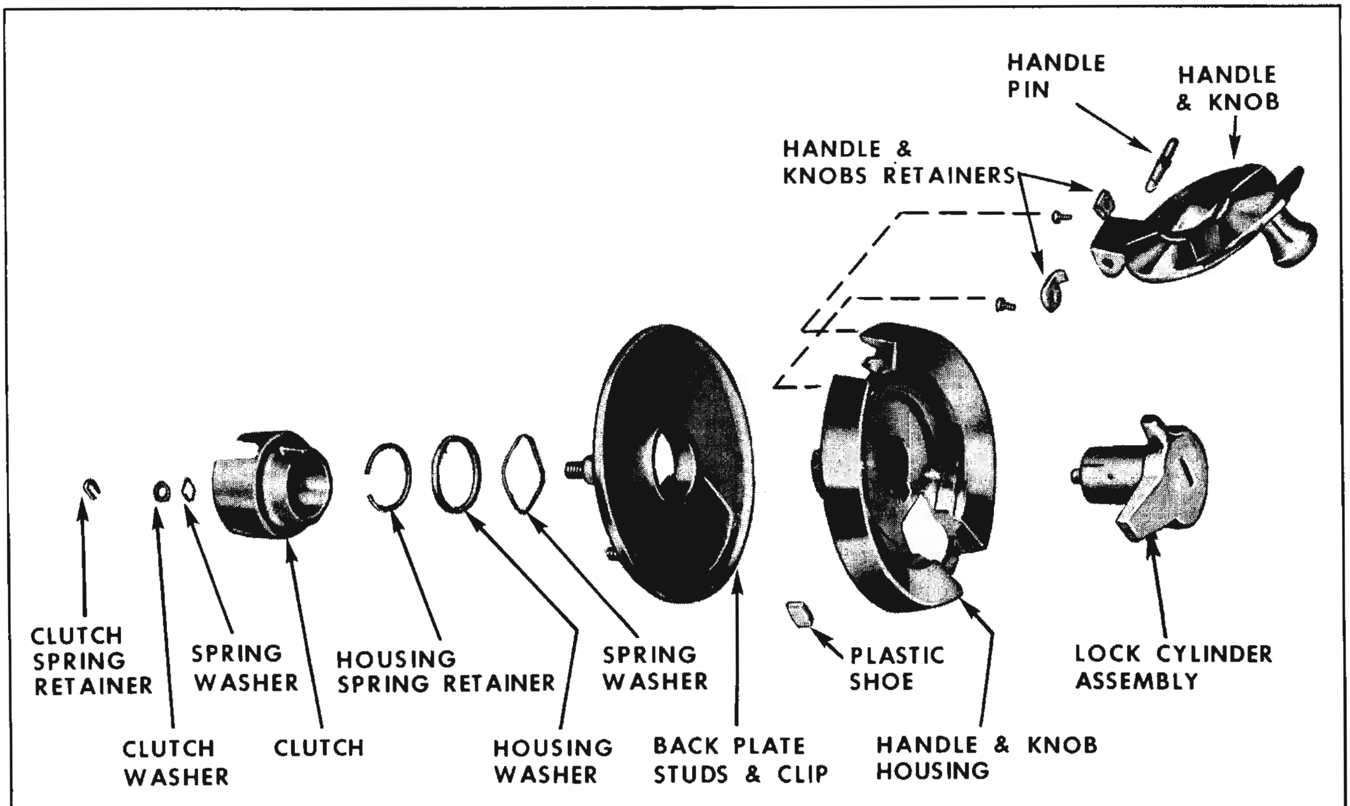


Fig. 16-196 Window Regulator Outside Handle Assembly

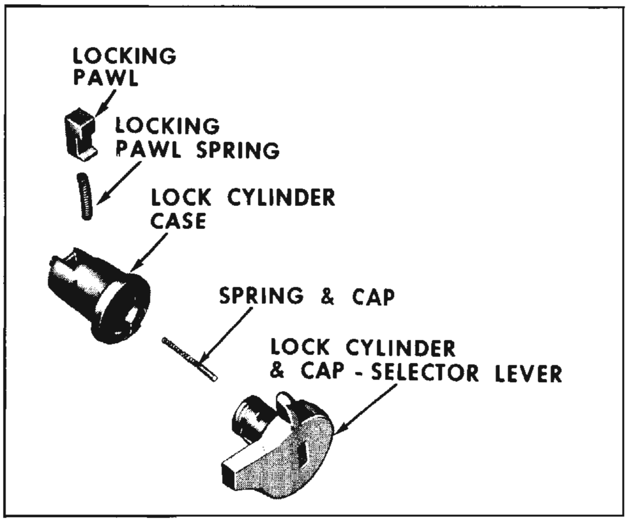


Fig. 16-197 Lock Cylinder and Case

reverse removal procedure. Prior to installation, lubricate frictional surfaces of parts with "Lubriplate".

TAIL GATE ELECTRIC WINDOW LOCK CYLINDER SWITCH AND ESCUTCHEON ASSEMBLY

Removal and Installation (Fig. 16-198)

1. Remove inner cover panel lower molding and inner cover panel.

2. Detach tail gate inner panel water deflector sufficiently to gain access to access holes "A" for removal of assembly attaching nuts. (Fig. 16-195)

3. Carefully operate window upward until holes in window regulator assembly are aligned with inner panel access holes.

CAUTION: Support portion of window extending out of tail gate.

4. Remove lock cylinder, switch and escutcheon assembly attaching nuts. Detach assembly from tail gate outer panel sufficiently to disconnect junction block from switch; then, remove assembly and gasket from tail gate.

To disassemble electric window lock cylinder, switch and escutcheon assembly see ELECTRIC WINDOW LOCK CYLINDER, SWITCH AND ESCUTCHEON ASSEMBLY - Disassembly and Assembly.

TAIL GATE ELECTRIC WINDOW LOCK CYLINDER SWITCH AND ASSEMBLY

Removal and Installation

1. Remove tail gate electric window lock cylinder, switch and escutcheon assembly.

2. Disengage lock cylinder and switch retainer and remove lock cylinder and switch assembly from escutcheon. (Fig. 16-198)

3. To install lock cylinder and switch assembly, reverse removal procedure.

Disassembly and Assembly

1. Using a pointed tool inserted through holes in lock cylinder case, depress tab of switch clips and remove clips. (Fig. 16-198)

2. Carefully pull switch and switch cam from lock cylinder case. (Fig. 16-198)

3. Bend out crimped flange of lock cylinder case cap sufficiently to remove cap; then remove lock cylinder cap and springs.

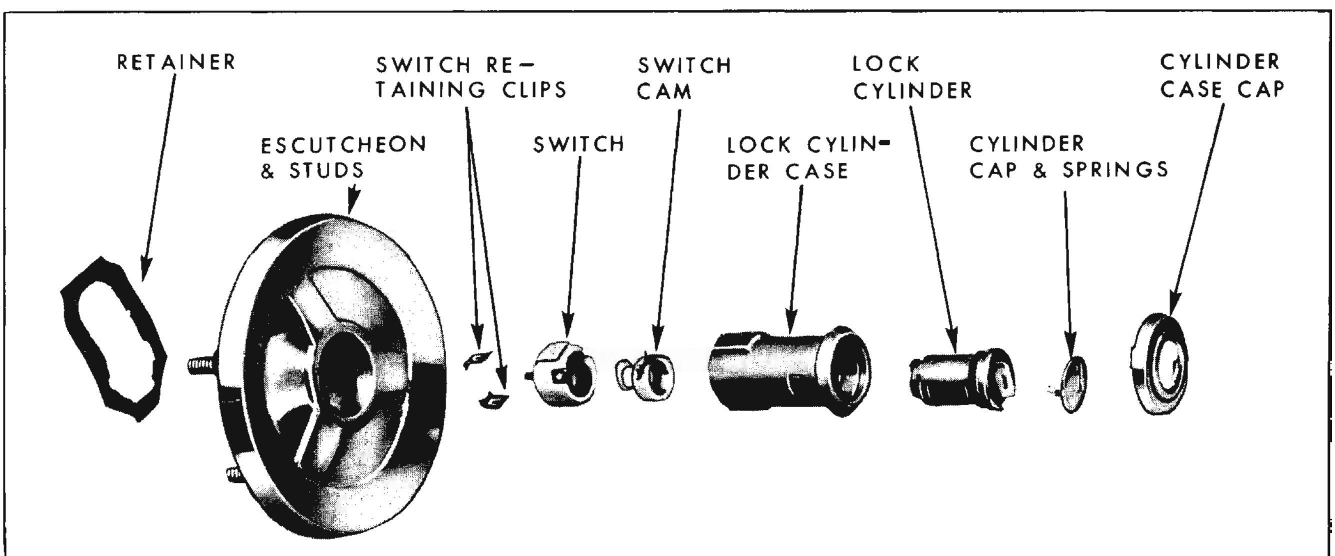


Fig. 16-198 Electric Lock Cylinder and Switch

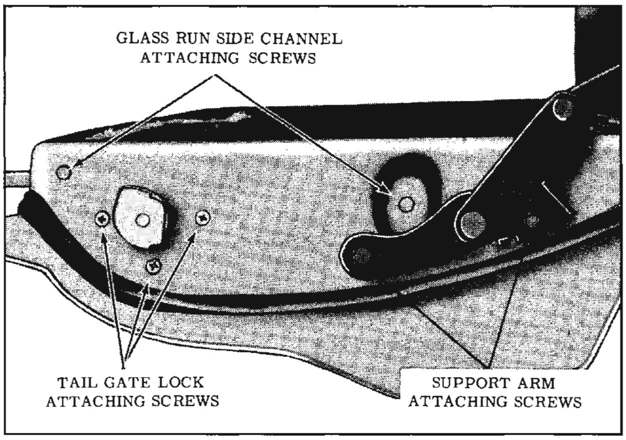


Fig. 16-199 Tail Gate Lock and Support Arm

NOTE: The crimped flange on lock cylinder case caps necessitates damaging cap during removal from lock cylinder case; however, service replacement caps are available which have four bend over tabs for installation.

4. To assemble lock cylinder and switch assembly, reverse removal procedure. Prior to installation, lubricate frictional surfaces of lock cylinder and switch parts with "Lubriplate" or its equivalent. Install a new service replacement lock cylinder case cap.

TAIL GATE LOCK ASSEMBLY (RIGHT OR LEFT)

Removal and Installation

1. Remove tail gate window assembly and inner panel cover and disconnect water deflector.

2. Remove tail gate window glass run side channel attaching screws and remove channel from side of tail gate from which lock is being removed. (Fig. 16-199 and 16-201)

3. Disengage spring clip and detach lock remote control connecting rod from lock remote control. (Fig. 16-201)

4. Remove tail gate lock attaching screws and remove tail gate lock with attached connecting rod. (Fig. 16-201) Detach connecting rod from lock.

5. To install tail gate lock assembly, reverse removal procedure. Prior to installing lock assembly into tail gate, apply a bead of body caulking compound to lock frame along joint of lock bolt housing, as indicated at "1". (Fig. 16-200)

When attaching connecting rod to lock bellcrank lever, make sure bellcrank lever is in position shown in Fig. 16-201. When installing

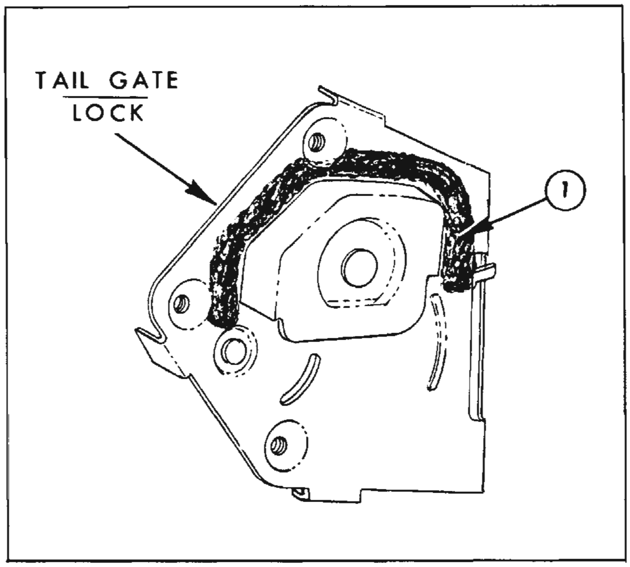


Fig. 16-200 Tail Gate Lock Sealing

connecting rod to remote control, gently pull connecting rod towards remote control lever to seat bellcrank lever at lock. Turn remote control lever adjusting screw until hole in lever is aligned with end of connecting rod; then install connecting rod to lever. (Fig. 16-199)

NOTE: Check clips at ends of remote control levers for proper retention of connecting rods and replace, if necessary.

Prior to resealing water deflector, check operation of tail gate locking mechanism.

TAIL GATE LOCK REMOTE CONTROL INSIDE HANDLE ASSEMBLY

Removal and Installation (Fig. 16-202)

1. Remove tail gate belt finishing molding and tail gate inner cover panel. Detach inner water deflector sufficiently to gain access to inner panel.

2. Loosen tail gate lock remote control attaching screws and move remote control towards bottom of tail gate sufficiently to disengage end of handle push rod from hole in remote control lever. (Fig. 16-202)

   NOTE: In some instances it may be necessary to reach into tail gate and actuate remote control lever to disengage push rod from lever.

3. Remove handle attaching screws located under handle and remove handle assembly (includes push rod) from tail gate.

4. To install tail gate lock remote control inside handle assembly, reverse removal procedure. Lubricate frictional points of inside handle assembly with "Lubriplate".

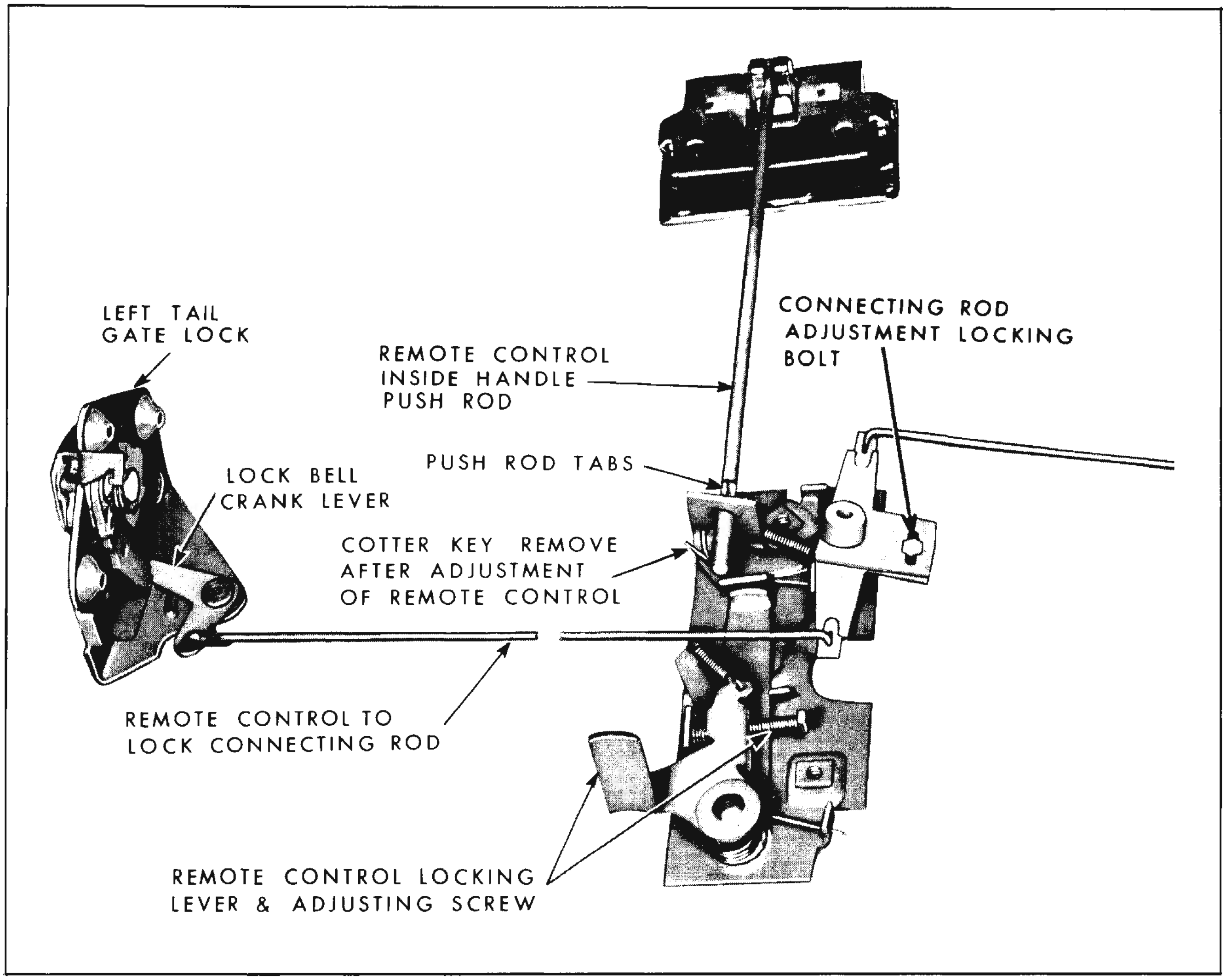


Fig. 16-201 Tail Gate Lock Remote Control

NOTE: To engage end of handle push rod into hole in remote control lever, it may be necessary to raise window to gain access to lever. Adjust remote control upward until tabs on handle push rod just contact remote control lever.

Prior to resealing tail gate inner panel water deflector, check operation of tail gate locking mechanism and, where necessary, adjust door lock strikers or remote control for proper operation.

TAIL GATE LOCK REMOTE CONTROL ASSEMBLY

Removal

1. Remove tail gate window assembly and inner panel cover and disconnect water deflector.

2. Disengage clips securing lock connecting rods to remote control and detach connecting rods from remote control. (Fig. 16-202)

3. Remove tail gate lock remote control attaching screws. Disengage remote control from inside handle push rod and remove remote control from tail gate.

Installation

1. Engage inside handle push rod into hole in

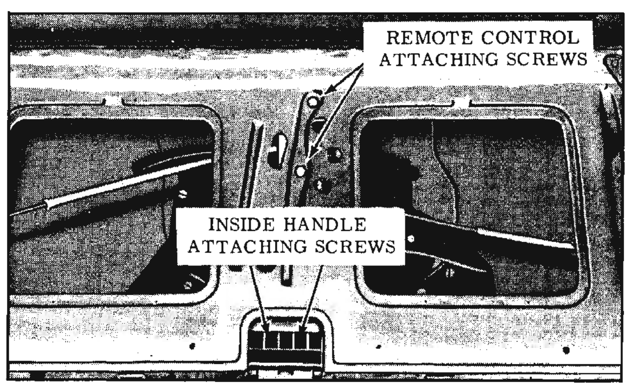


Fig. 16-202 Remote Control Removal

remote control lever, then loosely install remote control attaching screws.

2. Adjust remote control assembly up or down until tabs on push rod just contact remote control lever and tighten remote control attaching screws.

   IMPORTANT: If installing a new remote control assembly, remove cotter key at "A" in Fig. 16-202, after adjustment, to free locking lever.

3. Gently pull lock connecting rod towards remote control lever to seat bellcrank lever at lock, turn remote control lever adjusting screw until hole in lever is aligned with end of connecting rod. (Fig. 16-202) Install connecting rod to lever.

   NOTE: Check clips at ends of remote control levers for proper retention of connecting rods and replace, if necessary.

4. Check operation of tail gate locking mechanism. To open tail gate when window assembly is removed, depress tail gate lock remote control locking lever through access hole and at the same time operate the tail gate remote control inside handle. (Fig. 16-202)

5. Install tail gate window assembly as described under TAIL GATE WINDOW ASSEMBLY - Installation.

6. Lower window just below the tail gate window side reveal moldings, then adjust remote control locking lever adjusting screw so that lever is just contacting window sash channel frame. Check operation of remote control inside handle. Handle should remain locked until window upper sash channel frame is below tail gate side reveal moldings.

7. Seal water deflector and install previously removed parts.

TAIL GATE INNER PANEL WATER DEFLECTOR

A waterproof paper tail gate inner panel water deflector is cemented to the tail gate inner panel and deflects water into the bottom of the tail gate where it can drain out the bottom drain holes. The bottom of the water deflector is cemented to the inner panel in a manner that will deflect water towards designated access holes where the water can readily enter into the bottom of the tail gate.

IT IS IMPORTANT THAT WHENEVER ANY WORK IS PERFORMED ON THE TAIL GATE WHERE THE WATER DEFLECTOR HAS BEEN DISTURBED, THE DEFLECTOR MUST BE PROPERLY SEALED TO THE TAIL GATE INNER PANEL.

Partial Detachment

1. Remove tail gate cover panel assembly.

2. Carefully disengage deflector along top and sides inside cemented edge of deflector. (Fig. 16-203)

   NOTE: DO NOT TEAR WATER DEFLECTOR.

3. Roll deflector back to gain access to tail gate inner panel.

Resealing Procedure

1. To reseal water deflector, first inspect water deflector for any tears or holes and, where necessary, repair any tears or holes with waterproof body tape applied to both sides of deflector.

2. Apply body caulking as shown in Fig. 16-203, properly position water deflector and press firmly to obtain a good bond and seal.

3. Install panel and cover panel assembly.

WATER DEFLECTOR REPLACEMENT

Removal

1. Remove tail gate cover panel assembly.

2. Break cement bond securing edges of water deflector to door inner panel and remove water deflector from tail gate.

Installation

1. Using old water deflector as template, trim new deflector to proper size.

2. Apply a bead of body caulking compound (approximately 3/16" diameter) to tail gate inner panel as indicated in Fig. 16-203.

   IMPORTANT: The body caulking compound should be applied along the lower portion of the tail gate exactly as shown in illustration to assure proper drainage of water through inner panel access holes into bottom of tail gate.

3. Position water deflector to tail gate inner panel with polyethylene coated side of deflector against inner panel. Firmly press or roll sealed areas to obtain a good bond between deflector and tail gate inner panel.

4. Clean off all excess caulking compound, then install previously removed tail gate cover panel assembly.

BODY MOUNTS

To minimize vibration and noise, the body mounts must be properly torqued. Body mounts which are not tightened sufficiently will cause body "chucking" and damage to the insulators. If body mounts are tightened excessively, the cushioning effect of the insulators is impaired resulting in squeaks and body "drumming". Body mount bolts and studs must be torqued 35 to 45 ft. lbs.

For installation of body mounts refer to Figure 16-205.

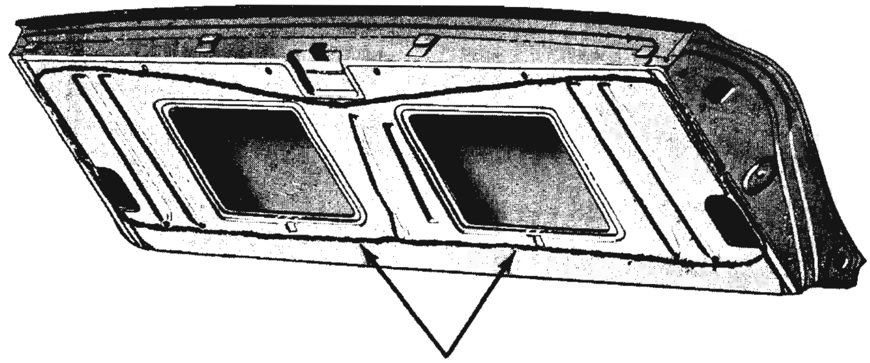


Fig. 16-203 Water Deflector Sealing

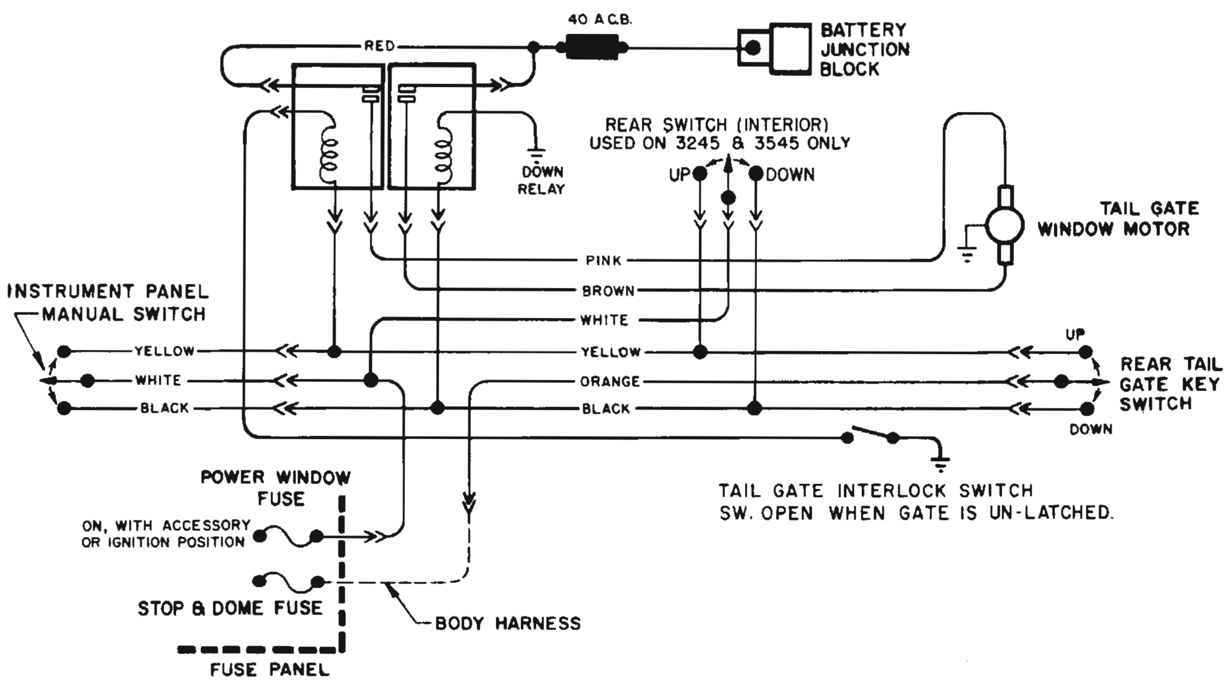


Fig. 16-204 Tail Gate Wiring Diagram

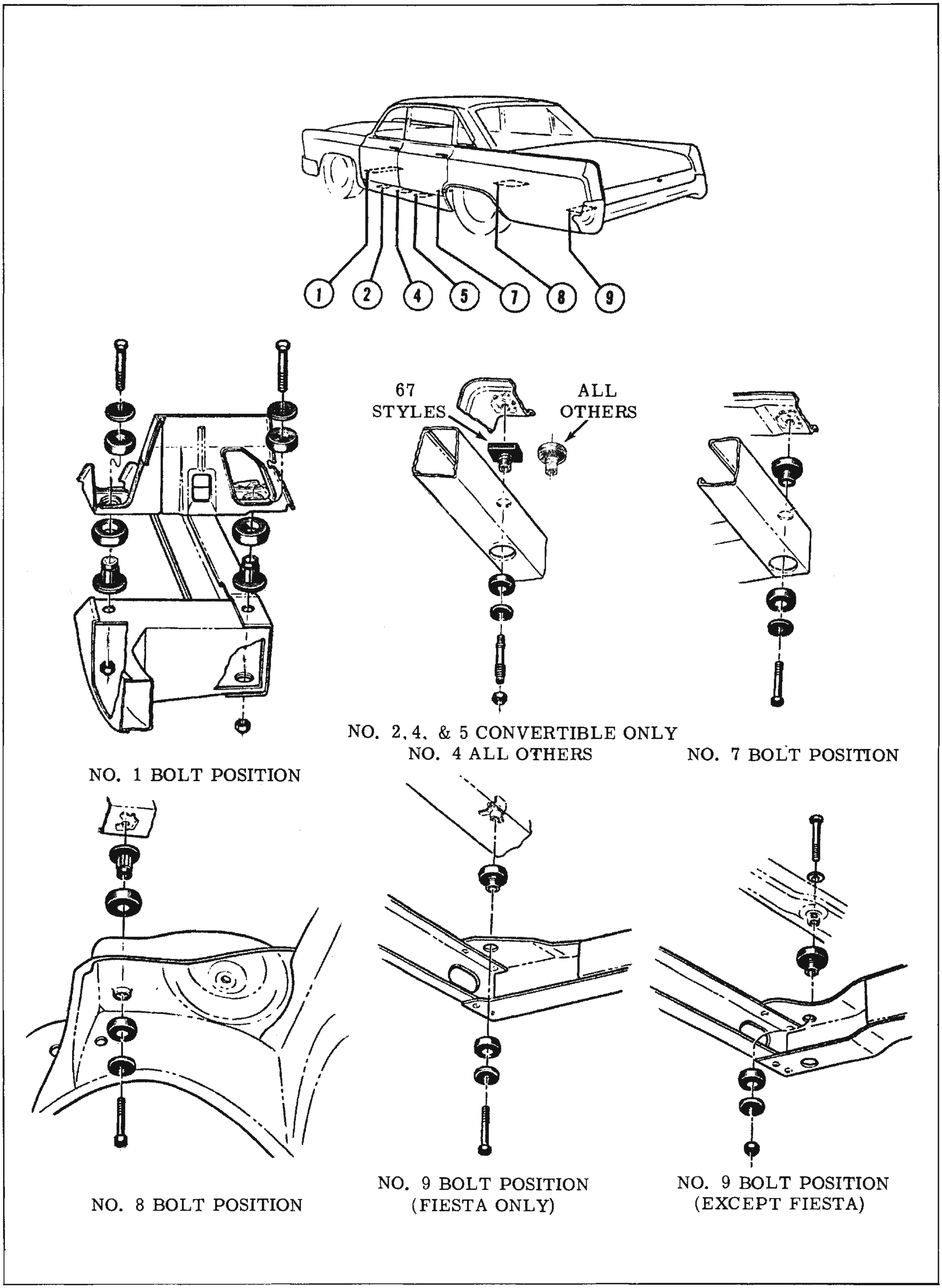


Fig. 16-205 Body Mounts

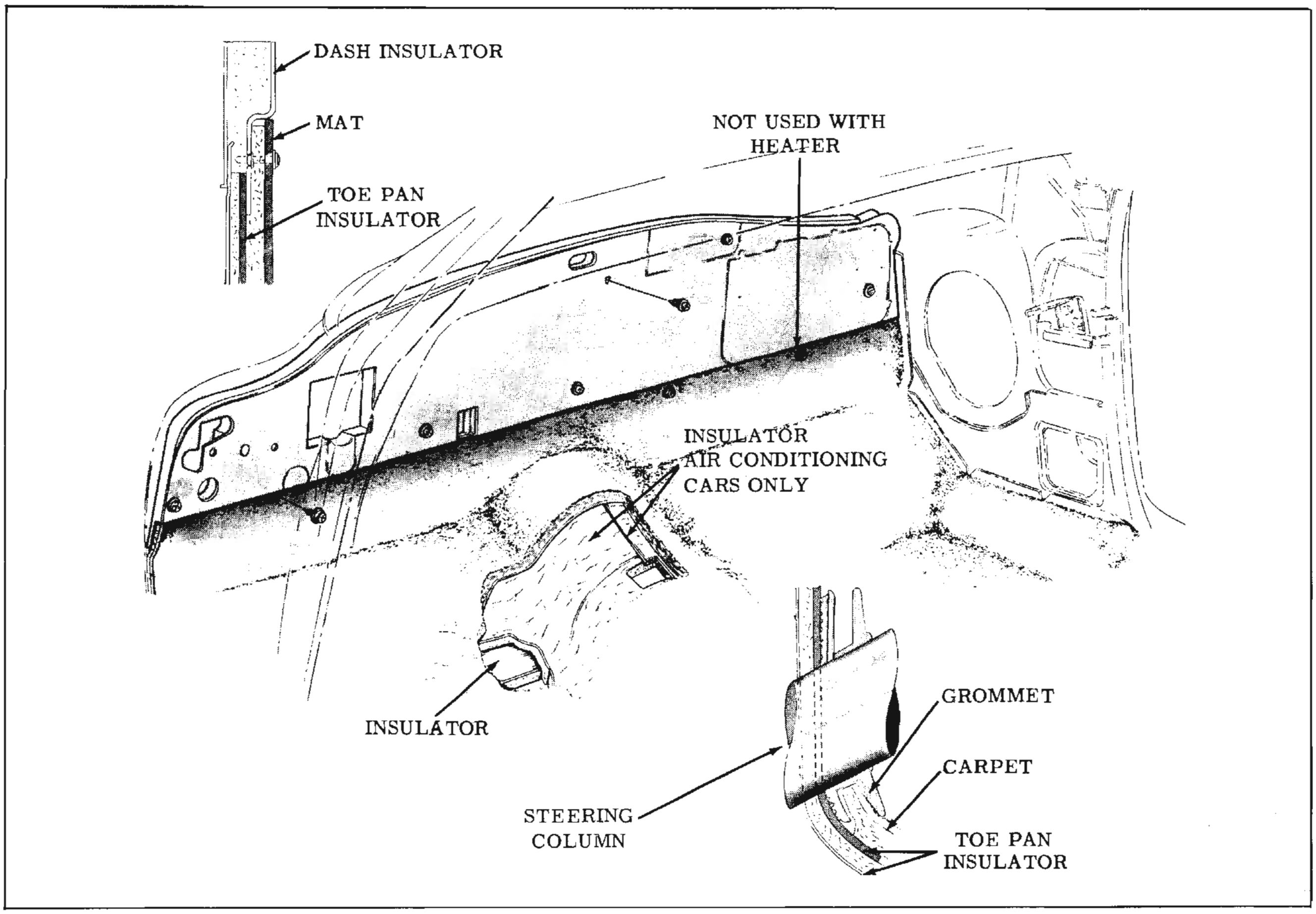


Fig. 16-206 Front Floor Mat Installation

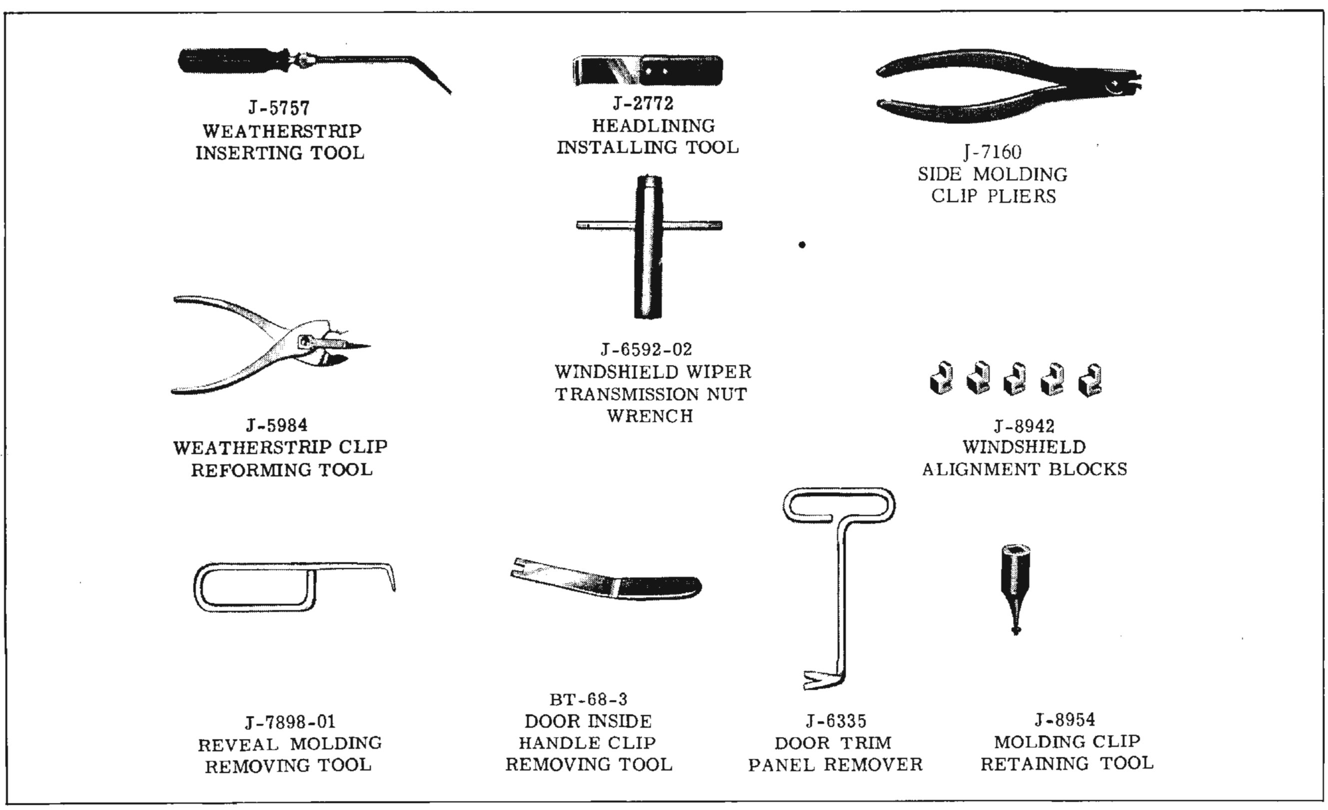


Fig. 16-207 Trim and Hardward Tools

1963 PAINT SERVICE NUMBERS

EXTERIOR COLORS

Comb. Code	Color Name	R.M. Stock No.	DuPont Stock No.
A	Ebony Black	A-946	88-L
C	Provincial White	A-1199	4024-L
D	Sheffield Mist	A-1477	4247-L
F	Wedgewood Mist	A-1481	4250-L
H	Cirrus Blue	A-1480	4249-L
J	Willow Mist	A-1485	4255-L
K	Barktone Mist	A-1535	4393-L
L	Regal Mist	A-1536R	4389-LH
P	Pacific Mist	A-1476	4253-L
R	Sand Beige	A-1486	4256-L
S	Saddle Mist	A-1537	4392-L
T	Sahara Mist	A-1478	4257-L
V	Holiday Red	A-1538R	4387-LH
W	Midnight Mist	A-1539	4395-L
X	Antique Rose	A-1540	4388-L

INSTRUMENT PANEL AND INTERIOR LACQUER COLORS

GLOSS

Color	Rinshed-Mason Stock No.	DuPont Stock No.
Silver	62011	95552
Light Fawn	62T82	77991
Light Pink	62B72	95560-H
Medium Saddle	62C82	95562
Medium Green	62034	95481
Medium Blue	62024	95480
Medium Fawn	62082	95478
Medium Aqua	62036	95479
Medium Red (Maroon)	62053M	4066-H
Medium Gray (S.W. Floor)	62012	95554
Dark Gray	62013	95553
Dark Green	62032	95556
Dark Blue	63022	95892
Dark Fawn	62083	95561
Dark Aqua	62031	95559
Dark Red (Maroon)	62051M	94969-H
Dark Saddle	63082	96222
Black	400	44

FLAT

Color	Rinshed-Mason Stock No.	DuPont Stock No.
Dark Fawn	62084	4435-L
Dark Saddle	63081	4436-L
Dark Green	62035	4434-L
Dark Blue	63021	4430-L
Dark Gray	62013	4433-L
Dark Aqua	62031	4429-LH
Dark Red (Maroon)	62051	4431-LH
Black	400	4428-L

BODY

(F-85)

CONTENTS OF SECTION 16

BODY CONSTRUCTION

The over-all rigidity of the integral body construction is drawn from each of the individual metal components which, when welded together, comprise the body shell assembly. The floor pans and rail assemblies forming the underbody area incorporate attachment provisions for the power train and the suspension systems. The underbody, therefore, contributes the greatest amount of strength to the body assembly. This type of integral construction eliminates the conventional independent chassis frame and has become known as the "unitized" type of body construction.

DESCRIPTION

The underbody assembly is comprised of side rails, cross rails, floor pan cross bars, inner and outer rocker panels and other floor panel components. The underbody is of all-welded construction. Misalignment in the underbody can affect fit of doors and rear compartment lid. Most important, however, underbody misalignment can influence the suspension system, thereby causing many of the problems that arise from a suspension misalignment. Underbody alignment, therefore, should be exact to within plus or minus 1/16" of the specified dimensions.

In the event of extensive collision damage, major underbody repairs may be required to re-establish proper alignment. Extensive collision damage may include twist, side-sway, complicated sags or a combination of these conditions in the underbody area. In some cases, it may be determined that the most practical method of repairing the damage is to employ a frame straightening machine and a qualified operator. A frame machine offers a variety of controlled pushing and pulling operations as well as accurate frame centering and leveling gauges which are especially helpful in checking the conditions described above.

To assist in checking alignment of the underbody components, repairing minor underbody damage or locating replacement parts, the following underbody dimension and alignment checking information is presented.

BODY TRAM GAUGE

An accurate method of determining the alignment of the underbody utilizes a measuring tram gauge. The tram gauge required to perform all recommended measuring checks properly must be capable of extending from a length of approximately twelve inches to a length of ninety inches.

Dimensions shown in the upper portion of Fig. 16-201 are calculated on a horizontal plane parallel to the plane of the underbody. Precision measurements can be made only if the tram gauge is always parallel to the plane of the underbody. This can be controlled by setting the vertical pointers on the tram gauge according to the dimensions shown in the lower portion of Fig. 16-201.

At least one of the vertical pointers on the

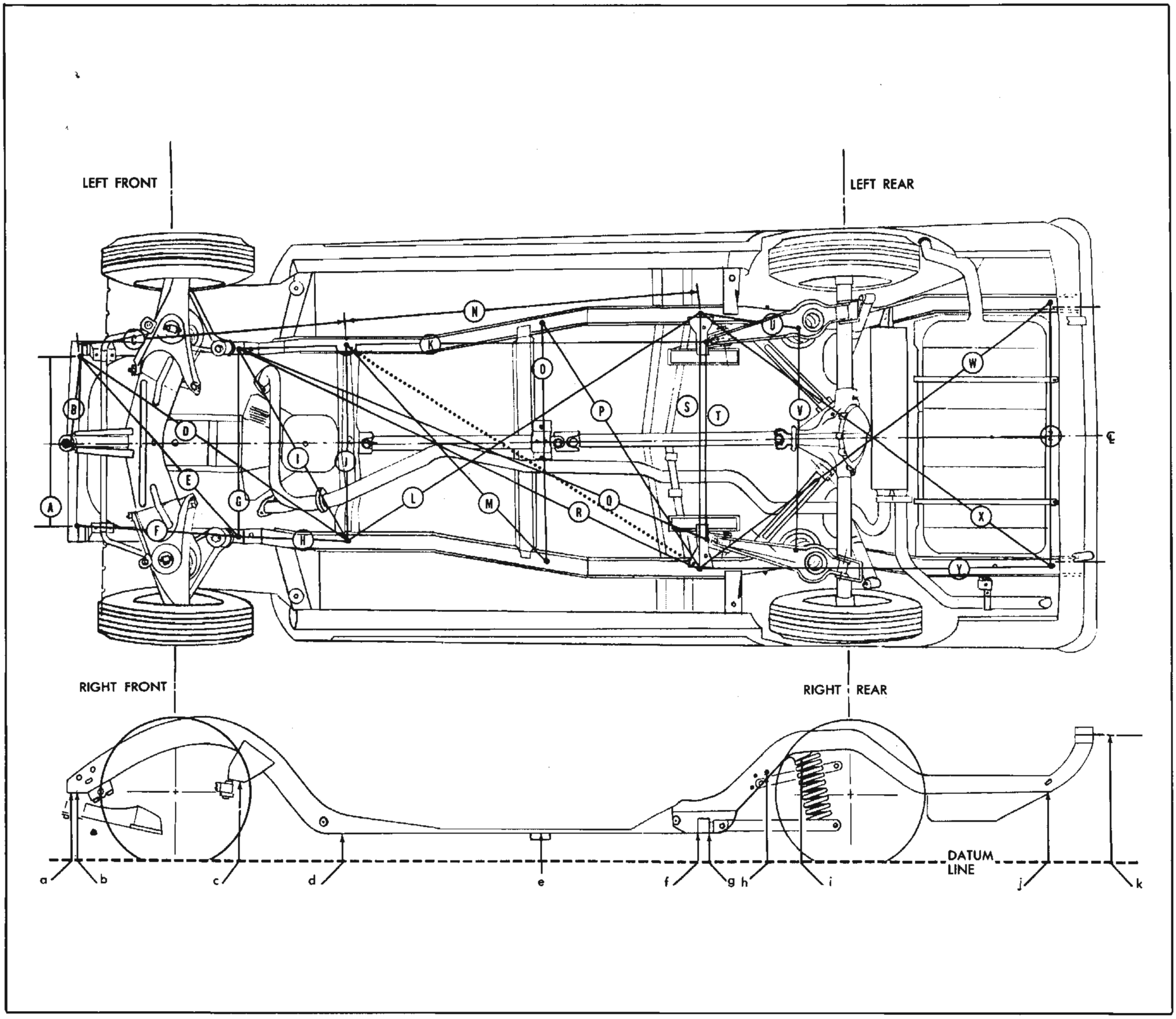


Fig. 16-201 Underbody Alignment Reference Dimensions

tram gauge must have a minimum reach of seventeen inches.

A proper tramming tool is essential for analyzing and determining the extent of collision misalignment present in underbody construction.

UNDERBODY ALIGNMENT REFERENCE POINTS

DESCRIPTION

Figure 16-202 shows the specific reference points used in making underbody measurements. Dimensions to gauge holes and other unthreaded holes are measured to dead center of the holes and flush to the adjacent surface metal.

Following is a description of the specific body reference points for the horizontal and vertical dimensions:

1. Center of hole in front cross rail for front cross member front center attaching bolt (front suspension removed).

2. Rear edge of front cross rail at point of contact with inboard facing of motor compartment side rail. See View "A" in Fig. 16-202.

3. Center of 3/4" diameter gauge hole in lower horizontal surface of front suspension rear support bracket (just rearward of front cross member rear attaching point on each side of car).

4. Center of 5/16" diameter gauge hole in bottom surface of each motor compartment side rail (located in area of transmission rear cross member attaching bolt holes).

5. Center of 5/16" diameter pierced hole in each floor pan side rail slightly rearward of drive shaft center bearing support crossbar.

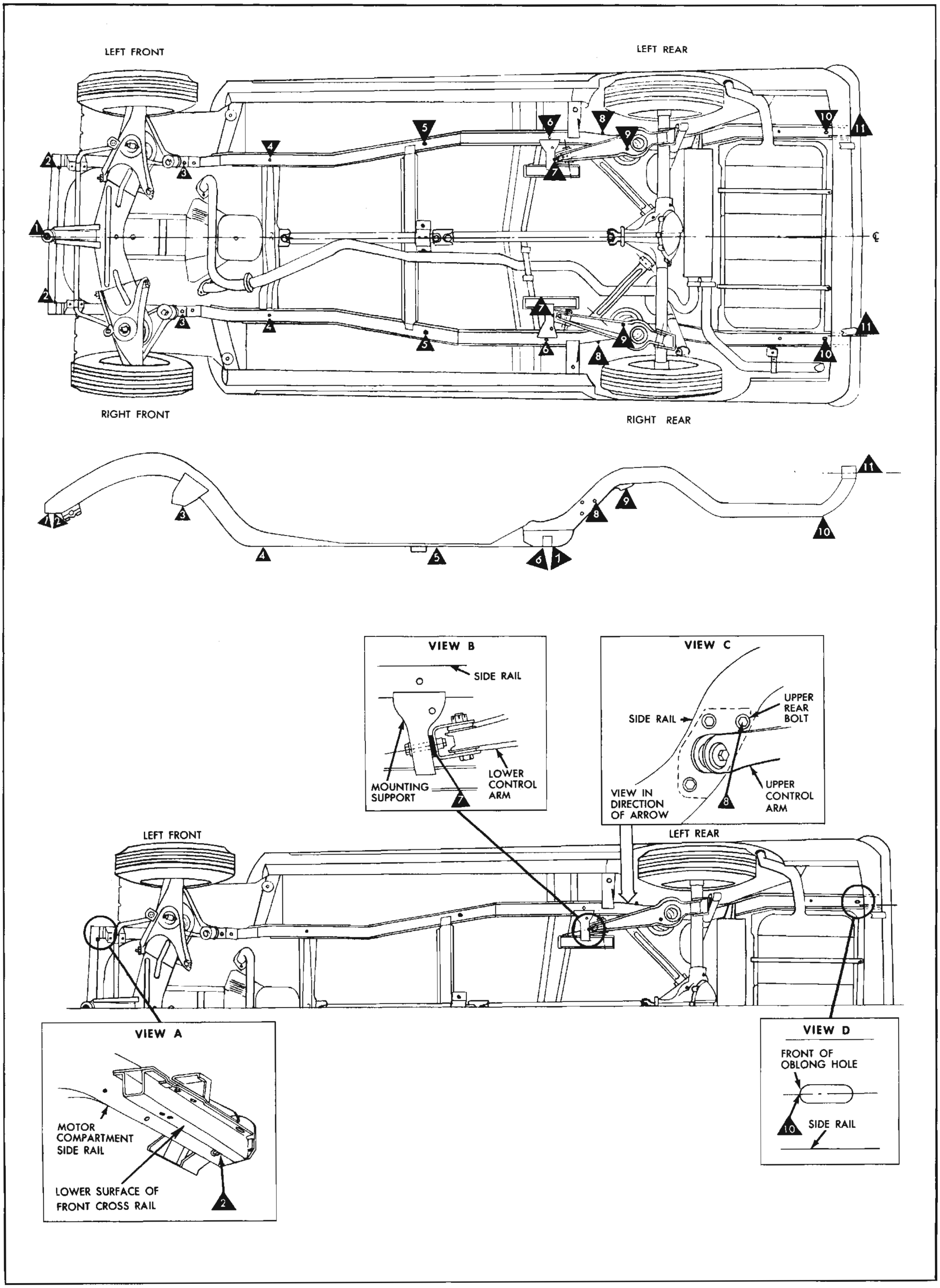


Fig. 16-202 Location of Underbody Alignment Reference Points

6. Center of 5/16" diameter gauge hole in bottom surface of rear compartment side rail (located outboard of the forward attaching area of the rear axle lower control arm).

7. Lower rear edge of rear suspension mounting support, directly below center of rear axle lower control arm front support bracket attaching bolt hole. See View "B" in Fig. 16-202.

8. Center of rear axle upper control arm upper rear attaching bolt hole on outboard side of rear compartment side rail. See View "C" in Fig. 16-202.

9. Center of hole in rear spring upper mounting plate (on rear compartment side rail).

10. Center front edge of oblong hole in bottom surface of rear compartment side rail (located slightly forward of rear end lower panel). See View "D" in Fig. 16-202.

    NOTE: Reference point "10" in left side rail (gas tank filler neck side) is 1-5/16 inches further from body centerline than reference point "10" in right side rail (tail pipe side).

11. Center of inboard attaching bolt hole for rear bumper support.

UNDERBODY DIMENSION CHART
(Refer to Fig. 16-201)

HORIZONTAL

Fig. Ref.	Dimension	Ref. Point	to Ref. Point	
A	28-29/32	2	2	
B	14-15/32	1	2	(either side)
C	48	2	4	(same side)
D	56-5/8	2	4	(opp. side)
E	40-29/32	2	3	(opp. side)
F	27-23/32	2	3	(same side)
G	31-5/32	3	3	
H	20-9/32	3	4	(same side)
I	37-3/16	3	4	(opp. side)
J	31-5/32	4	4	
K	81-29/32	3	7	(same side)
L	69-1/2	4	6	(opp. side)
M	48-25/32	4	5	(opp. side)
N	59-7/8	4	6	(same side)
O	38-3/16	5	5	
P	46-11/16	5	6	(opp. side)
Q	87-23/32	3	7	(opp. side)
R	87-19/32	3	6	(opp. side)
S	40-1/8	6	6	
T	31-21/32	7	7	
U	17-23/32	6	9	(same side)
V	37-23/32	9	9	
W	69-23/32	6	10	(left side)
X	68-15/16	6	10	(right side)
Y	55-7/8	6	10	(same side)
Z	42	10	10	(same side)

VERTICAL

Fig. Ref.	Dimension	Datum Line to Ref. Point
a	12-1/2	1
b	12-7/16	2
c	14-3/8	3
d	6-1/16	4
e	6-1/16	5
f	6	6
g	6-1/32	7
h	14-11/16	8
i	16-13/32	9
j	10	10
k	18-21/32	11

PRINCIPLES OF TRAMMING

As indicated in the underbody dimension chart, all diagonal dimensions (except "W" and "X") are of equal distance to the same matching reference points on the opposite side of the body. These are commonly referred to as crosscheck dimensions.

EXAMPLE: Dimension "L" is 69-1/2 inches measuring from reference point "4" on right side to reference point "8" on left side; the crosscheck dimension between reference point "4" on left side to reference point "8" on the right side (indicated by dotted line in Fig. 16-201) is also 69-1/2 inches.

To measure the distance accurately between the two reference points on the underbody, two specifications are required:

1. The horizontal dimension between the two reference points to be trammed.

2. The vertical dimension from the datum line to the reference points to be trammed. As an

example, diagonal measurement "R" (calculated on a horizontal plane) between reference point "3" and reference point "6" is 87-19/32 inches.

The specifications from the datum line to the reference points indicate a vertical height difference of 8-3/8 inches between forward reference point "3" and rearward reference point "6". The front vertical pointer used at reference point "3" should be adjusted so as to extend 8-3/8 inches further from the tram bar than the rear pointer used at reference point "6".

With the proper settings the tram bar will be on a plane parallel to that of the body plane. The exception to this would be when one of the reference points is included in the misaligned area; then, the parallel plane between the body and the tram bar may not prevail. After completion of the repairs, the tram gauge should be set at the specified dimensions to check the accuracy of the repair operation.

Car Preparation

Preparing the car for the underbody alignment check involves the following:

1. Raise car.

2. Remove necessary parts to gain access.

3. Visual damage inspection should be made to eliminate needless measuring. Obviously damaged or misaligned areas can often be located by sight.

Tramming Sequence

The tramming sequence will vary depending upon the nature and location of the misaligned area. Basically there are eleven key reference points that should be utilized when making underbody alignment checks. These reference points are shown on Fig. 16-202.

1 - Center of front cross member front attaching bolt hole.

3 - Center of gauge holes in front cross member rear attaching bolt support brackets.

4 - Center of gauge holes in motor compartment side rail at transmission.

5 - Center of gauge holes in side rails at drive shaft center bearing support.

6 - Center of gauge holes in rear compartment side rail at lower control arm.

7 - Below center of lower control arm front support bracket attaching holes.

Prior to performance of any tramming operation, the accuracy of reference points to be used must be determined. A measurement that originates from a reference point which is included in a damaged area will produce untrue results and confuse the evaluation of the underbody condition.

Unlike the conventional type of frame design, the unitized type of body construction seldom develops the two conditions of "twist" and "diamond" in the floor pan area as a result of front or rear end collisions. Therefore, underbody alignment checking can usually originate from the 5/16" diameter gauge holes in the side rails (reference points "4", "5" and "6").

If inspection indicates that these locations have been disturbed and are not suitable for measuring, one of the undamaged suspension locations should be used as a beginning reference point. If a rare situation should exist where all of the key, locations are not suitable as reference points, repair operations should begin with the body floor pan area. All other underbody components should be aligned progressively from this area.

CENTERING GAUGES

Another tool that is extremely useful in repairing underbody collision damage is a body centering gauge set. The centering gauges automatically indicate the body centerline and the body level. Collision damage may result in twist, side-sway or sags to the underbody which may not be readily apparent to the naked eye. Sighting along the center vertical pointers and along the horizontal bars of the centering gauges will make these conditions very apparent and will help to isolate the particular areas which are affected. A minimum of three centering gauges must be used simultaneously. Fig. 16-203 shows five pair of attaching points (A, B, C, D and F) which are located symmetrically on both sides of the body and are considered suitable for mounting most types of hang-on centering gauges.

Magnetically attached type of centering gauges may also be used at these points as well as at other points along the bottom surface of the side rails from the front of the car to the rear axle area.

From the rear axle area to the rear of the car, the left side rail (gas tank filler neck side) is positioned 1-5/16 inches further from the body centerline than the right side rail. Compensation for this variance must be made when using any type of centering gauge in this area.

Following is a description of the specific attaching locations shown in Fig. 16-203.

1. Lowest point of oblong hole located in front compartment side rail (located slightly above

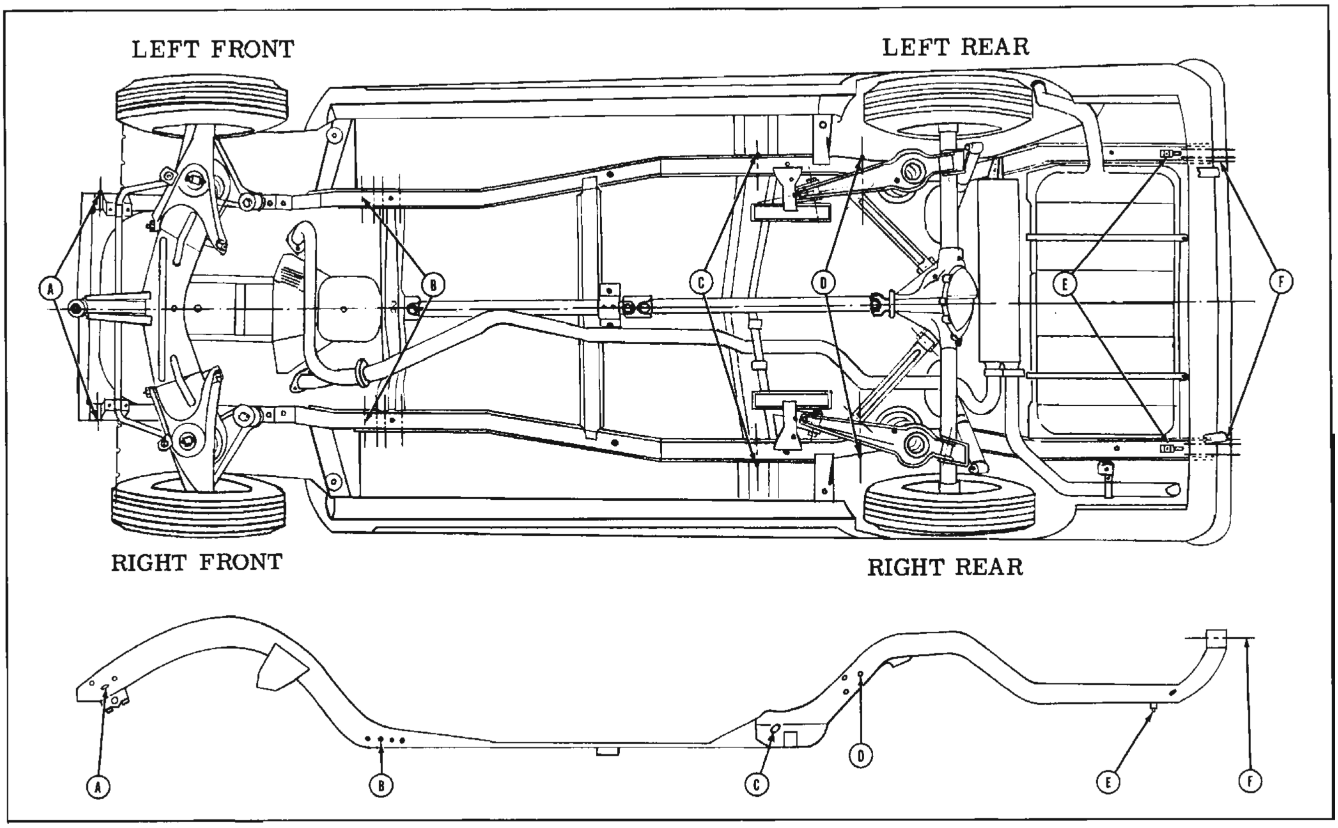


Fig. 16-203 Centering Gauge Attaching Points

and ahead of the front stabilizer support brackets).

2. Transmission rear cross member support attaching bolt holes in side rails, use corresponding hole locations on right and left sides.

3. Rear tie down hole in rear compartment side rail.

4. Upper rear attaching hole for rear axle upper control arm forward support (bolt removed).

5. Optional: If magnets are used, they should be attached to lower surface of rear compartment side rail. Rear edge of both magnets should be at front edge of oblong hole in each side rail (just forward of rear end lower panel). Left magnet (gas tank filler neck side) and right magnet (tail pipe side) should be positioned to compensate for variance between centers of side rails and body centerline (1-5/16 inches differential).

6. Lowest point of oblong hole on vertical surfaces of the rear compartment side rail (just rearward of the flashweld joint).

NOTE: Locations "E" and "F" require that compensation be made for variance between centers of side rails and body centerline (1-5/16 inches differential). Specific adapters are available for this purpose.

7. Rear bumper inboard attaching bolt holes. Bumper assembly must be removed for this hook-up.

WINDSHIELD ASSEMBLY

GARNISH MOLDINGS

The windshield garnish moldings on all styles except "67" styles consist of upper right and left moldings, lower center molding and right and left lower outer moldings. On "67" styles, the windshield header moldings consist of right and left end moldings and center molding. All moldings are secured by screws. (Fig. 16-205)

Removal and Installation

1. Place protective coverings over front seat and instrument panel.

2. Remove rear view mirror support; then remove upper moldings. On "67" styles raise top, remove sunshade supports; then remove end and center moldings. (Fig. 16-206)

3. Remove lower end moldings.

4. Remove lower center molding.

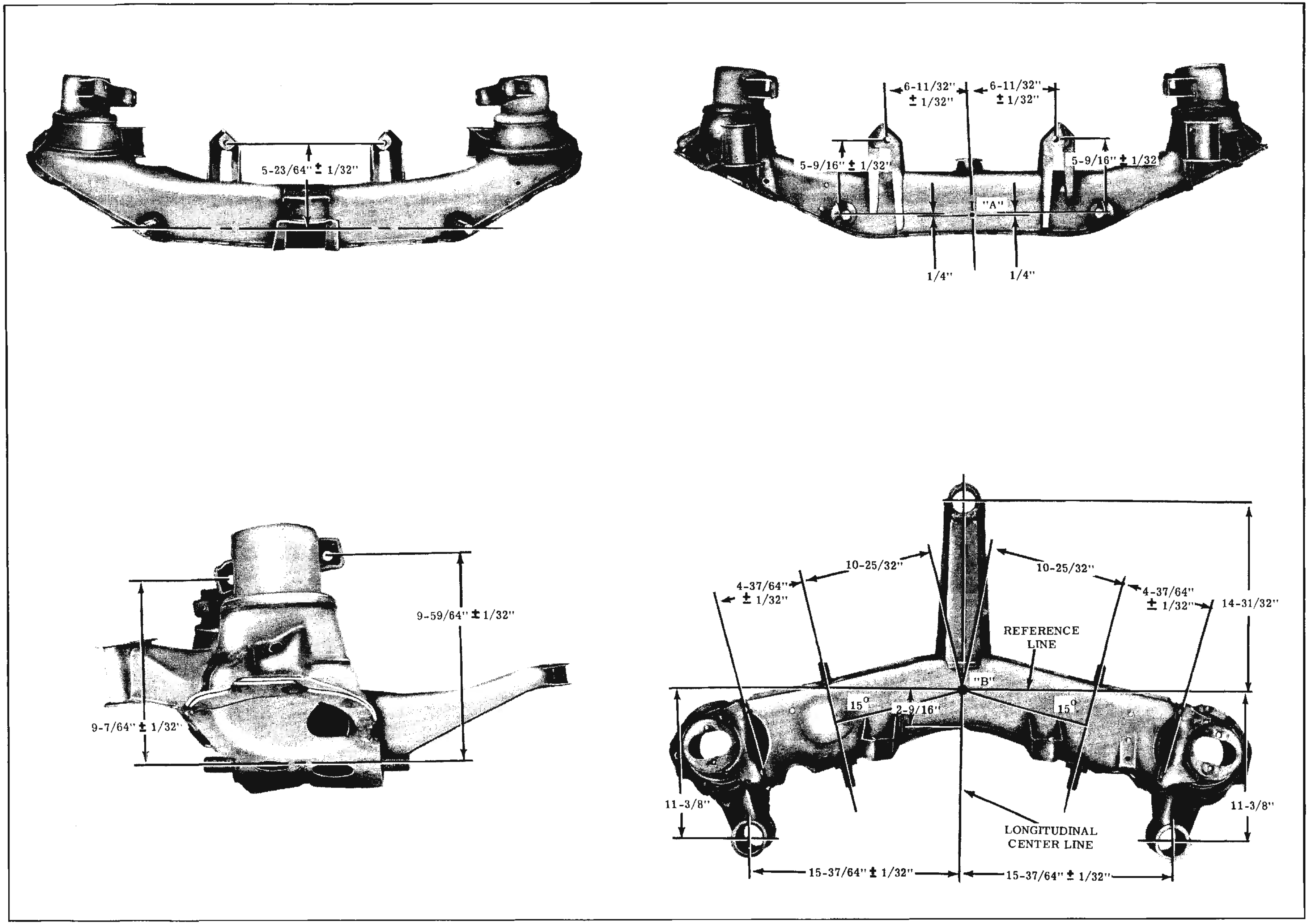


Fig. 16-204 Front Suspension Crossbar Alignment Dimensions

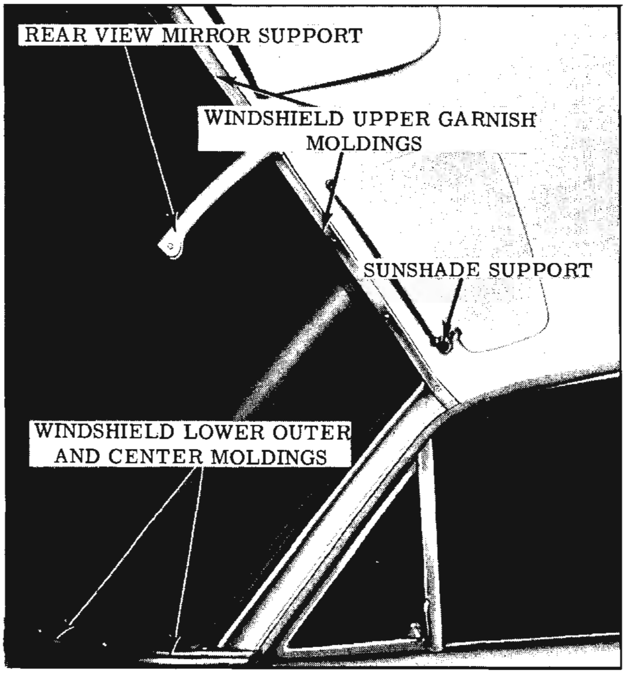


Fig. 16-205 Garnish Molding Attachment

5. To install, on "67" styles, apply a 3/16" bead of medium-bodied sealer the entire length of the windshield header before installing the header moldings. Apply additional sealer to the underside of end moldings to insure water-tight seal to the junction of the center molding. (Fig. 16-207)

   Clean off excess sealer and reverse removal procedure.

GLASS (Rubber Channel Installation)

Removal

1. Place protective covering over hood, front fenders, instrument panel and front seat assembly.
2. Remove rear view mirror support assembly.

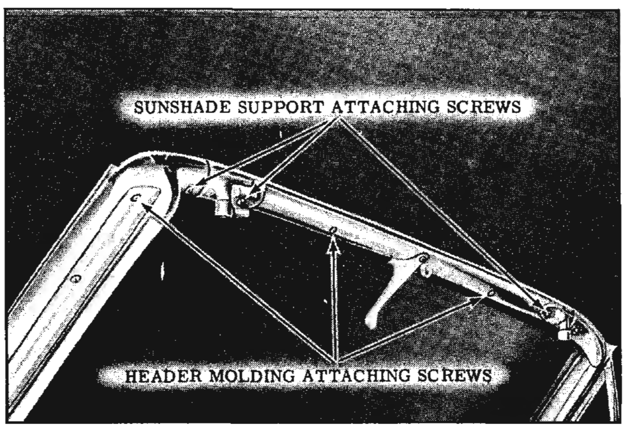


Fig. 16-206 Garnish Molding (67 Styles)

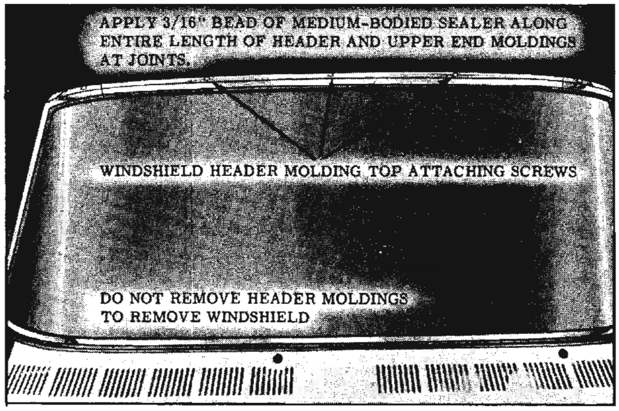


Fig. 16-207 Garnish Molding Sealing

3. Remove lower windshield garnish moldings.

   NOTE: It is not necessary to remove upper header moldings on "67" styles to remove windshield assembly.

4. Remove windshield wiper arms.
5. On inside of body, loosen lip of rubber channel from pinchweld flange along top and sides of windshield as follows:

   With palm of hand, apply pressure to glass near edge. (Fig. 16-208) At same time, use a blunt putty knife or other suitable tool and carefully assist rubber channel over pinchweld flange.

6. After windshield rubber channel is free from pinchweld flange, with aid of helper, carefully lift windshield assembly from body opening and place it on a protected bench.
7. Remove windshield reveal moldings from rubber channel on styles incorporating reveal moldings.

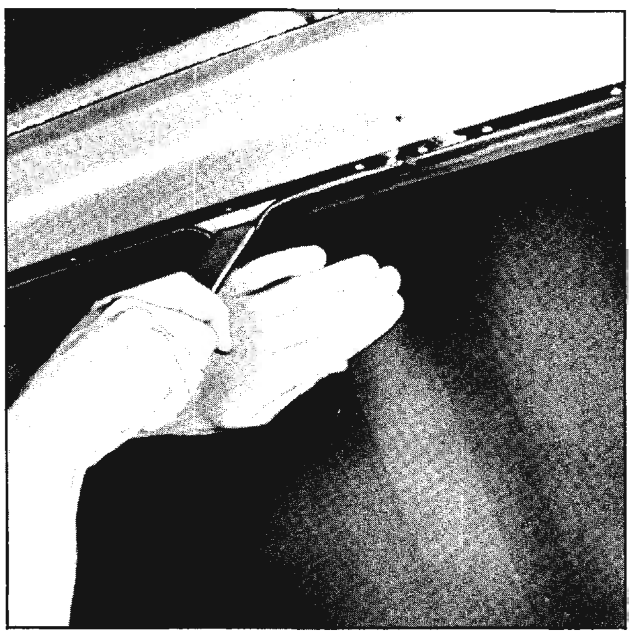


Fig. 16-208 Windshield Glass Removal

8. Remove rubber channel from glass.

Checking Body Windshield Opening

It is important that the body windshield opening be checked thoroughly before installation of a replacement windshield glass. The procedure below outlines the method which may be used to check the windshield opening.

1. Remove windshield from body.

2. Check windshield rubber channel for any irregularities.

3. Clean off old sealer around windshield opening and check entire body opening flange for any irregularities.

4. Install five (5) windshield checking blocks #J-8942 to pinchweld flange. (Fig. 16-209) Position one block over lower pinchweld flange on each side of body approximately twelve inches (12") inboard from the lower outer corner of the opening. Position final block on lower pinchweld flange in center of windshield opening. Position one block over upper pinchweld flange midway between center block and each outboard block on lower retaining flange.

5. With aid of helper, carefully position replacement glass on blocks in windshield opening.

   CAUTION: Care should be exercised to make certain glass does not strike body metal during installation. Edge chips can lead to future breaks.

6. With windshield glass supported and centered in the body opening by checking blocks, check relationship of glass to body opening around entire perimeter of glass. Check glass to body relationship as follows: (Fig. 16-210)

   a. The inside surface of the glass should be uniform distance from pinchweld flange. The dimension should be from 1/4" to 5/16".

   b. The outer edge of glass should be a uniform distance from body metal, measured in the plane of glass. This dimension should be from 5/16" to 3/8".

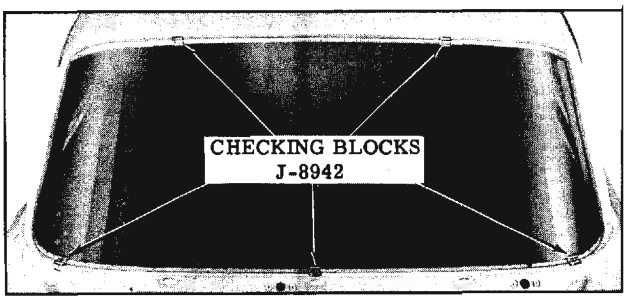


Fig. 16-209 Body Windshield Opening

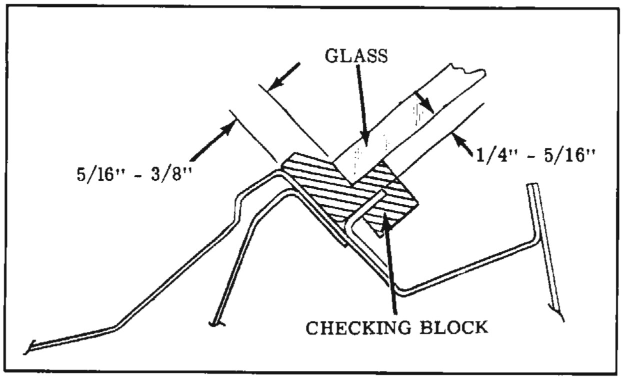


Fig. 16-210 Windshield Opening Check

7. Mark any section of body to be re-formed, remove glass and re-form opening as required.

8. Recheck windshield opening as outlined above. Then mark the center line on the glass and body so that glass can be accurately centered in opening when installed.

Installation

1. Clean out old sealer in glass cavity of windshield rubber channel and around base of rubber channel.

2. Install rubber channel to glass.

3. Install reveal moldings in rubber channel on styles incorporating reveal moldings.

4. Insert a strong cord in pinchweld cavity of rubber channel completely around windshield. Tie ends of cord and tape to inside surface of glass at bottom center of glass. (Fig. 16-211)

5. Apply a ribbon of medium-bodied sealer completely around base of rubber channel as indicated by "1". (Fig. 16-212)

6. Apply a bead of medium-bodied sealer, approximately 1/4" in diameter to corner of windshield opening rabbet around each side of windshield for distance indicated by "3".

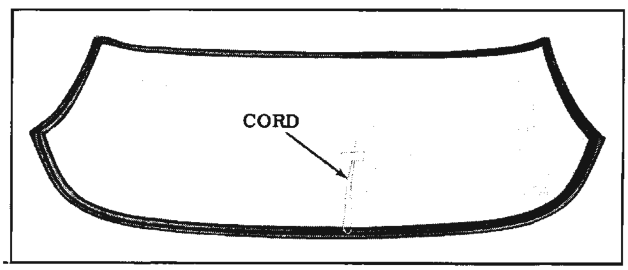


Fig. 16-211 Windshield Installation

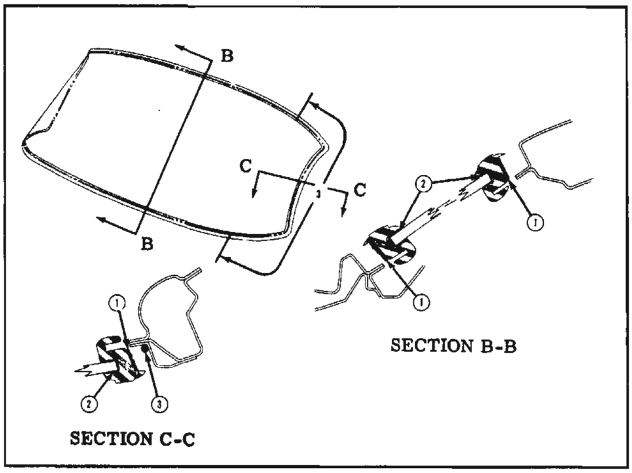


Fig. 16-212 Windshield Sealing

7. With aid of helper, carefully position and center windshield assembly in windshield opening.

   CAUTION: Do not position glass by tapping or hammering at any time.

8. When the glass and channel are properly positioned in opening, slowly pull ends of cord, starting at lower center of windshield, to seat lip of rubber channel over pinchweld flange. Cord should be pulled first across bottom of windshield, then up each side and finally across top of windshield.

9. Using a pressure type applicator, seal inner and outer lips of rubber channel to glass as indicated by "2" with an approved weatherstrip adhesive. Seals are to extend completely around rubber channel.

10. Clean off excess sealer from windshield glass with mineral spirits.

11. Reinstall all previously removed parts and remove protective coverings.

MINOR WATERLEAK CORRECTIONS (RUBBER CHANNEL INSTALLATION)

Minor waterleaks around the windshield may be corrected by performing the following operations.

1. Leaks between rubber channel and glass.

   a. Using a pressure applicator (plews oiler or equivalent) with a narrow tip, apply weatherstrip adhesive (black) between glass and rubber channel on the outside of the glass completely around perimeter of glass.

2. Leaks between rubber channel and body.

   a. Using a pressure applicator with a narrow tip, work from outside of the body. Apply medium-bodied sealer under outer lip of rubber channel around entire perimeter of body opening.

GLASS (ADHESIVE CAULKED) INSTALLATION (Except "67" Styles)

The adhesive caulked windshield installation incorporates a synthetic rubber compound (Windshield Adhesive Caulking Material) in place of the conventional rubber channel. The installation also requires a larger windshield glass, special rubber spacers, redesigned reveal and garnish moldings and molding clips. The design of the body windshield opening, however, remains the same as on units using a rubber channel windshield installation. The service procedures must be performed as specified to assure a watertight and proper windshield installation.

Removal—Short Method

1. Place protective coverings over front seat, hood, air intake grille and front fenders.

2. Remove windshield wiper arm and blade assemblies and radio antenna, where present on the front fender.

3. Remove windshield lower garnish moldings.

   NOTE: In some cases garnish moldings may adhere to adhesive caulking material making removal difficult. In these cases, proceed with Steps 4, 5, 6 and 7; then, remove garnish moldings (lower only) after glass has been removed.

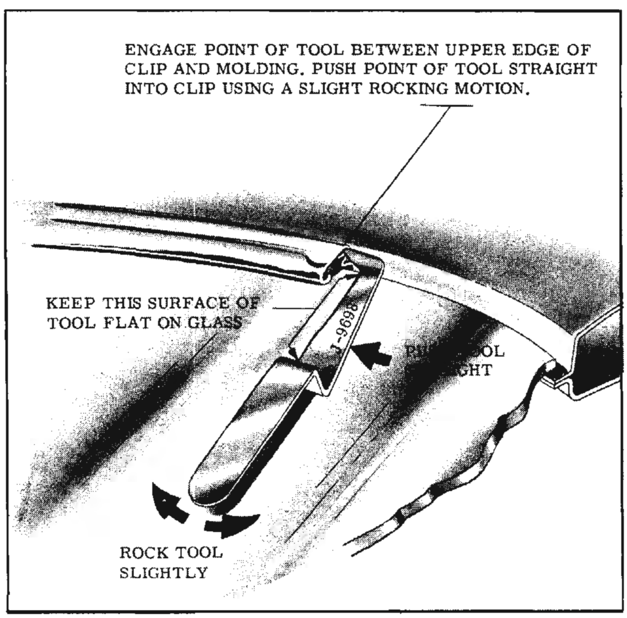


Fig. 16-213 Disengaging Reveal Molding From Clip

4. Remove windshield reveal moldings as follows: use reveal molding clip disengagement Tool, J-9698. (Fig. 16-213) Remove upper reveal moldings first. Next, disengage side reveal moldings and outer ends of lower reveal molding from clips; then, remove side reveal moldings. Remove lower reveal molding.

5. Secure one end of steel music wire to piece of wood (for handle). Insert other end of wire through caulking material at lower corner of windshield; then, secure end of wire to another piece of wood (handle).

6. With aid of helper, carefully cut (pull steel wire) through caulking material, up side of windshield, across top, down opposite side and across bottom of windshield. (Fig. 16-214) Make sure inside wire is held close to plane of glass to prevent cutting an excessive amount of adhesive caulking material from opening. This can be accomplished by holding inside wire close to plane of glass with one hand while pulling wire with other hand.

7. Remove windshield glass from body opening. Place replacement glass on a protected surface of glass-holding fixture. If original glass is to be reinstalled, remove old caulking material from glass.

Installation-Short Method

NOTE: The windshield glass used in an adhesive caulked windshield installation is larger than

Fig. 16-214 Glass Removal

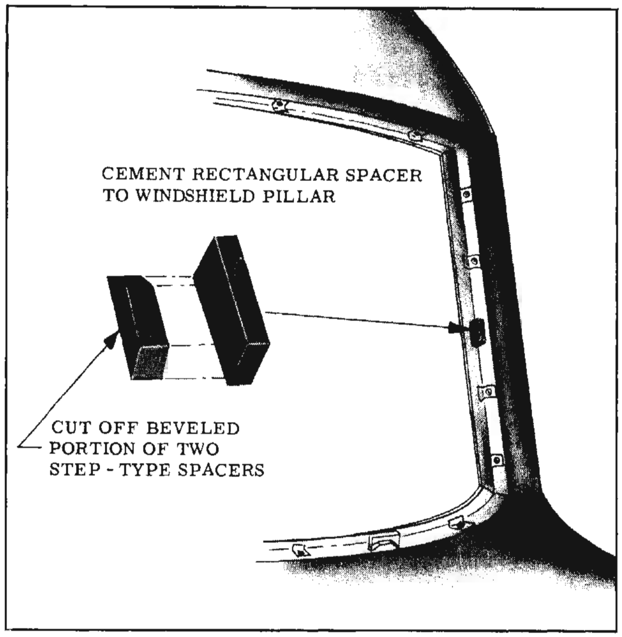


Fig. 16-215 Rubber Spacer Installation

the glass used with the rubber channel. Do not attempt to install a rubber channel type windshield glass with the adhesive caulking installation method.

1. Check all reveal molding retaining clips for damage. If retaining end of clip is bent away from body panel more than 1/32", replace the clip with a new self-sealing screw-on clip.

2. Cut the beveled portion from two step-type spacers to make two rectangular spacers. (Fig. 16-215) Using weatherstrip adhesive (neoprene-type), cement one rectangular spacer at each windshield pillar.

3. Clean inside edge surface of glass so that glass is free of any foreign material (oil, grease, sealer, etc.). Using a small, clean, lint-free cloth, apply a film of silane primer (approximately 1/2" wide) to inside edge surface of glass completely around glass.

4. Cut off painted tip of cartridge nozzle along edge of paint line. (Fig. 16-216)

5. Mix adhesive caulking material and accelerator thoroughly according to directions on container.

   IMPORTANT: Once caulking material is mixed, there will be approximately 35 minutes of working time with the material. Subsequent steps should be performed immediately after caulking material is mixed.

6. Carefully apply a smooth continuous bead of caulking material on inside surface of glass next to edge completely around glass. (Fig. 16-216) Caulking material should be between 1/8" to 3/16" dia.

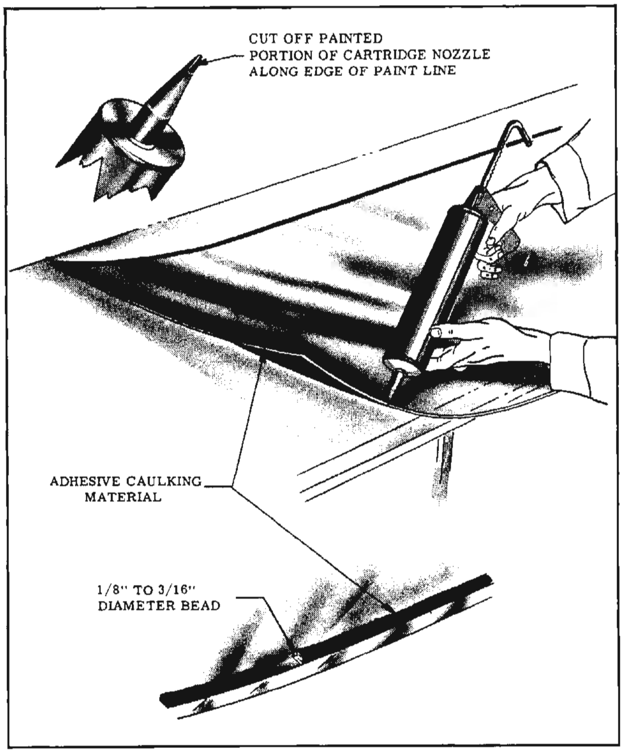


Fig. 16-216 Adhesive Caulking Application

CAUTION: Do not apply more material than specified to avoid excessive clean-up.

7. With aid of helper, lift glass with one hand on outside of glass and one hand on inside of glass. Carefully set glass against lower center spacer or adhesive caulking bead, maintaining glass in a near-vertical position. While one man holds glass in this position, the second man can reach around the windshield pillar and hold glass; then, first man can reach around windshield pillar. (Fig. 16-217) Carefully position glass into opening, making certain that glass is properly centered and positioned on lower spacers.
8. Press glass firmly to set caulking material.
9. Inspect installation for proper seal between new caulking material and original material. If a gap is encountered, use caulking gun to apply sufficient material from outside the glass to fill the void.

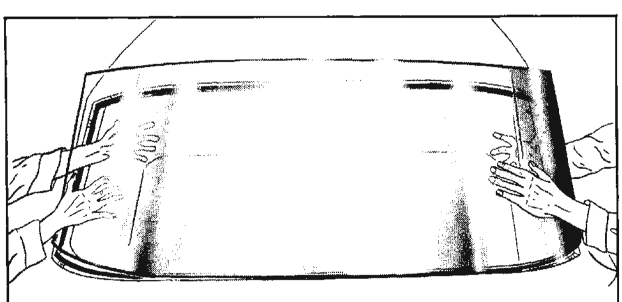


Fig. 16-217 Windshield Installation

10. Watertest windshield immediately using cold water spray. If any waterleaks are encountered, use flat-bladed screwdriver or stick and work caulking material into leak point to correct leak. This operation is usually performed most effectively from outside the body.
11. Install windshield lower and side reveal moldings; then, upper reveal moldings. Install windshield garnish moldings and previously removed hardware. Remove protective coverings and clean up.

The length of time required for adhesive caulking material to cure depends upon prevailing temperatures. Heat will accelerate the curing of caulking material and cold temperatures will retard the curing of caulking material.

After completion of installation keep car in the warmest place available until delivered to customer.

Extended Method

The extended method should be used when the installation requires replacement of a complete bead of adhesive caulking material around the windshield opening and heavier application of material on the glass.

Removal—Extended Method

1. Place protective coverings over:

   a. Instrument panel and windshield pillars, apply tape to inside of windshield pillars.

   b. Front seat assembly.

   c. Hood, air intake grille and front fenders.

2. Remove windshield wiper arm and blade assemblies; and radio antenna, where present.

3. Remove windshield garnish moldings.

   NOTE: In some cases garnish moldings may adhere to adhesive caulking material making removal difficult. In these cases, proceed with Steps 4, 5, 6 and 7; then, remove remaining garnish moldings after glass has been removed.

4. Remove windshield reveal moldings as follows:

   Use reveal molding clip disengagement Tool, J-9698. (Fig. 16-213) Remove upper reveal moldings first. Next, disengage side reveal moldings and outer ends of lower reveal molding from clips; then, remove side reveal moldings. Remove lower reveal molding.

5. Secure one end of steel music wire to piece of wood (for handle). Insert other end of wire through caulking material at lower corner of windshield; then, secure end of wire to another piece of wood (handle).

6. With aid of helper, carefully cut (pull steel wire) through caulking material, up side of windshield, across top down opposite side and across bottom of windshield. (Fig. 16-214) To facilitate cutting through rubber spacers, use a sawing motion with steel wire. Avoid contact of steel music wire with garnish moldings by keeping inside wire close to plane of glass.

7. Remove windshield glass from body opening. Place replacement glass on a protected surface or glass-holding fixture. If original glass is to be reinstalled, remove old caulking material from glass.

8. With a small stick or small screwdriver, remove major portion of sealer completely around opening.

9. Using sharp scraper or wood chisel, remove major portion of adhesive caulking material from body pinchweld flange.

   NOTE: It is not necessary to clean off all old caulking material completely from body opening; however, there should not be any loose pieces of caulking material left in the opening.

Installation—Extended Method

IMPORTANT: The windshield glass used in an adhesive caulked windshield installation is larger than the glass used with the rubber channel. Do not attempt to install a rubber channel type windshield glass with the adhesive caulking installation method.

1. Check all reveal molding retaining clips for damage. If retaining end of clip is bent away from body panel more than 1/32", remove clip. Replace with a new self-sealing screw-on clip.

2. If seal at joint of windshield lower retaining flange and body has been damaged, seal joint with weatherstrip adhesive.

3. Using weatherstrip adhesive (neoprene-type), cement eight (8) rubber spacers at bottom, sides and top of body opening at locations indicated in Fig. 16-218. The three flat-type spacers are used along the top of the opening. The five step-type spacers are used at the windshield pillars and along the bottom of the opening. Use a 1/16" thick water-proof shim under each of the three lower spacers.

4. To install, seal holes in pillar, install molding. Seal weatherstrip and retainer and install.

5. Position replacement windshield glass in body opening. Carefully check relationship of glass to body pinchweld completely around opening. The overlap of glass to body pinchweld and retaining flanges should be equal with a minimum overlap of 3/16". (See Fig. 16-218) Where necessary, position water-proof shims under the lower spacers or trim spacers to obtain the required overlap of glass to body upper and lower flanges. Remove glass from body opening and place on protected surface or glass-holding fixture.

6. Clean inside edge surface of glass so that glass is free of any foreign material (oil, grease, sealer, etc.). Using a small clean, lint-free cloth, apply a film of silane primer (approximately 1/2" wide) to inside edge surface of glass completely around glass. Also apply silane primer to sealing surface of pinchweld and retaining flanges.

7. Cut off unpainted portion of cartridge nozzle along edge of paint line. (Fig. 16-219)

8. Mix adhesive caulking material and accelerator thoroughly according to directions on container. IMPORTANT: Once caulking material is mixed, there will be approximately 35 minutes of working time with the material. Subsequent steps should be performed immediately after caulking material is mixed.

9. Carefully apply a smooth continuous bead of caulking material on inside surface of glass next to edge completely around glass. (Fig. 16-219) Caulking material should be approximately 1/4" wide at the base, and form a pyramid 3/8" high. If, during application, an air bubble is encountered in material, back up the applicator and apply sufficient material to fill the void and to disperse the bubble before continuing.

10. The reveal molding clips are self-sealing and should not require sealing before installing the windshield.

11. With aid of helper, lift glass with one hand on outside of glass and one hand on inside of glass. Carefully set glass on lower center spacer, maintaining glass in a near-vertical position. While one man holds glass in this position, the second man can reach around the windshield pillar and hold glass; then, first man can reach around windshield pillar. (Fig. 16-217) Carefully position glass into opening, making certain that glass is properly positioned on spacers.

12. Press glass lightly to set caulking material to windshield opening flanges.

13. Watertest windshield immediately using cold water spray. If any waterleaks are encountered, use flat-bladed screwdriver or stick and work caulking material into leak point to correct leak. This operation is usually performed most effectively from inside the body.

    CAUTION: Do not run a heavy stream of water directly on caulking material while the material is still soft.

14. Install windshield lower and side reveal moldings; then, upper reveal moldings. Install windshield garnish moldings and windshield wiper arm and blade assemblies. Remove protective coverings and clean up.

NOTE: It is recommended, where possible, that the adhesive caulking material be allowed to cure to the tack-free stage before delivery to the owner. Curing of the adhesive caulking material may be accelerated, after water-testing, by applying heat with one of the following methods:

a. Spray hot water (120°F. to 160°F.) on caulking material for 10 to 15 minutes. This is the preferred method as it cures

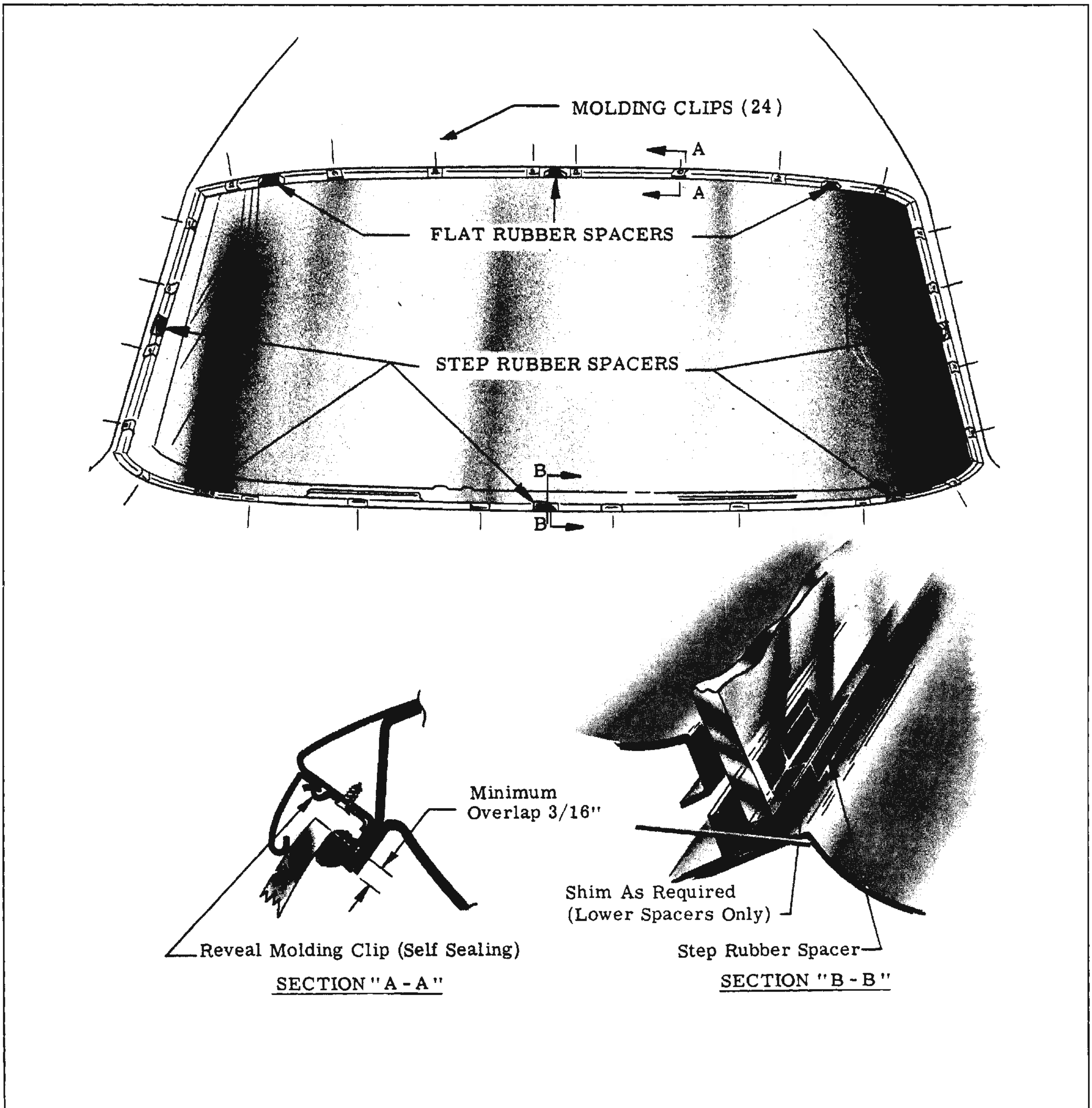


Fig. 16-218 Windshield Spacer and Reveal Molding Clip Locations (Extended Method)

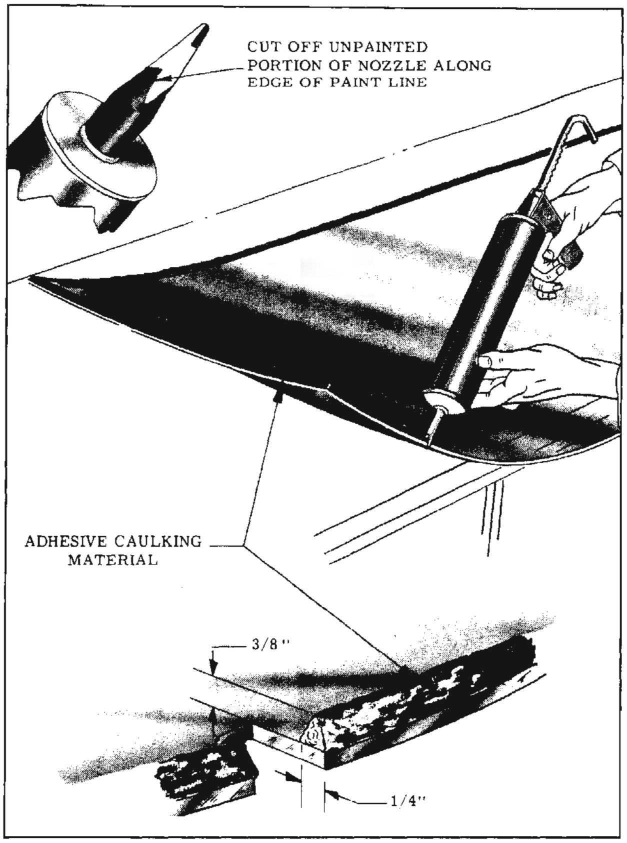


Fig. 16-219 Adhesive Caulking Material Application (Extended Method)

the material to the tack-free point in the shortest amount of time.

b. Use paint drying heat lamps at moderate distance from glass (120°F. to 160°F.). Apply heat uniformly to entire glass.

When applying heat to accelerate curing, the initial glass temperature should not be lower than average room temperature (72°F).

If spray nozzle is not available, direct the flow of water on the glass and allow the water to flow on the material. Keep the direct force of the water off the soft caulking material.

The length of time required for caulking material to cure to the tack-free point and to completely cure under normal air-drying conditions depends upon prevailing temperatures. Heat will accelerate the curing of caulking material. Cold temperatures will retard the curing of caulking material. If heat is not applied, caulking material cures to the tack-free state in approximately five to six hours at normal air-drying temperatures of approximately 77°F.

REVEAL MOLDING

The windshield reveal moldings are secured in a cavity of the windshield rubber channel. The moldings consist of an upper and lower reveal molding and a right and left side reveal molding. The ends of the side reveal moldings overlap the upper and lower reveal moldings. (Fig. 16-220)

Removal

1. Mark center line on glass and body, remove windshield assembly and place it on a protected bench.
2. Locate and mark center of upper and lower reveal moldings.
3. Carefully remove side reveal moldings from cavity of rubber channel; then, remove upper and lower reveal moldings.

Installation

1. Install and center upper and lower reveal moldings in cavity of rubber channel; then install side reveal moldings.

   NOTE: To facilitate installation of the moldings, apply a mild soap solution to the cavity of the rubber channel prior to installing the moldings.

2. Install windshield assembly in body.

PILLAR DRIP MOLDING

Removal and Installation

1. On all except "47" and "67" styles, remove screws securing drip molding and remove molding.
2. To install, apply medium-bodied sealer to screw attaching holes as indicated by #1 and to drip molding as indicated by #2 in Fig. 16-221 and reverse removal procedure.
3. On "47" and "67" styles it is necessary to remove the windshield pillar weatherstrip retainer, to gain access to the attaching screws. Remove attaching screws and molding.

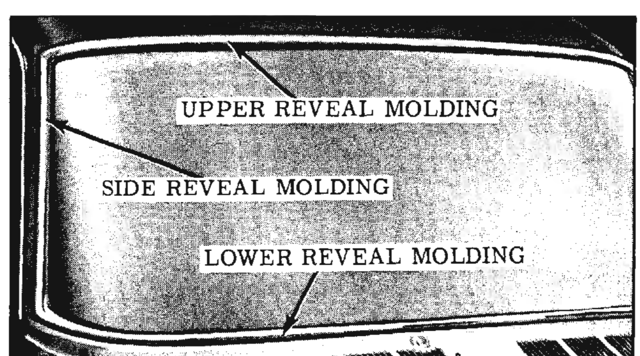


Fig. 16-220 Windshield Reveal Moldings

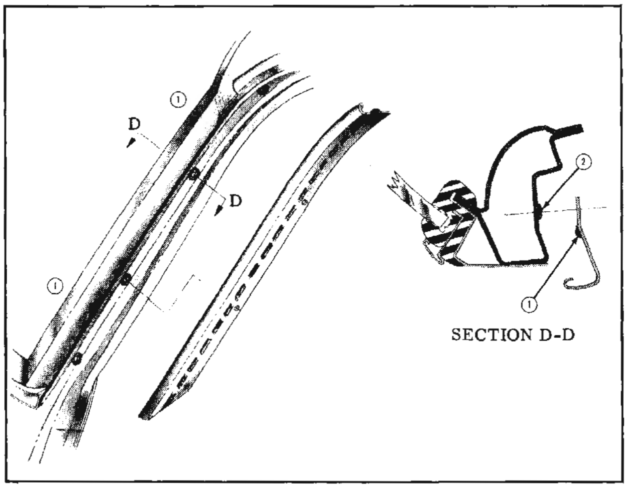


Fig. 16-221 Windshield Pillar Drip Molding Sealing

INSTRUMENT PANEL ASSEMBLY

COMPARTMENT DOOR

Removal and Installation

1. Mark location of compartment door hinge on door inner panel.
2. Remove hinge stop attaching screws from door inner panel. (Fig. 16-222)
3. Remove door hinge attaching screws from door inner panel and remove door.
4. To install, position door within locating lines and install attaching screws. Install hinge stop and adjust as necessary.

Adjustments

1. To reposition compartment door up or down in its opening, loosen hinge and hinge stop attaching screws at door inner panel and shift door in desired direction.

   NOTE: A slight up or down adjustment may also be obtained at hinge-to-instrument panel attachment.

2. To position the door right or left, loosen hinge-to-instrument panel attaching screws located on underside of instrument panel and shift door to desired position. Adjust stop assembly accordingly on door inner panel.
3. The door lock striker may be adjusted by loosening attaching screws and moving striker forward or rearward. (Fig. 16-222)

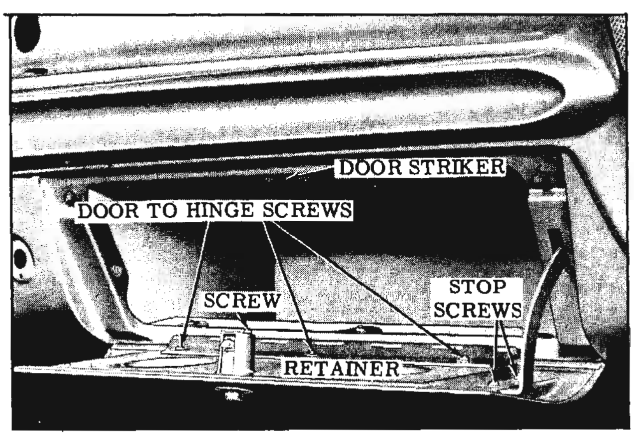


Fig. 16-222 Instrument Panel Compartment Door

COMPARTMENT DOOR HINGE STOP ASSEMBLY

Removal and Installation

1. Remove hinge stop attaching screws (Fig. 16-222) and remove from body.
2. To install, reverse removal procedure. Check for proper alignment of hinge stop to door inner panel.

INSTRUMENT PANEL RADIO SPEAKER GRILLE

The radio speaker grille is attached to the upper instrument panel by studs and nuts.

Removal and Installation

1. From underside of instrument panel remove radio speaker grille attaching nuts and remove grille. (Fig. 16-223)
2. To install, reverse removal procedure.

INSTRUMENT PANEL COVER

The instrument panel cover assembly is secured to the upper instrument panel by cement around

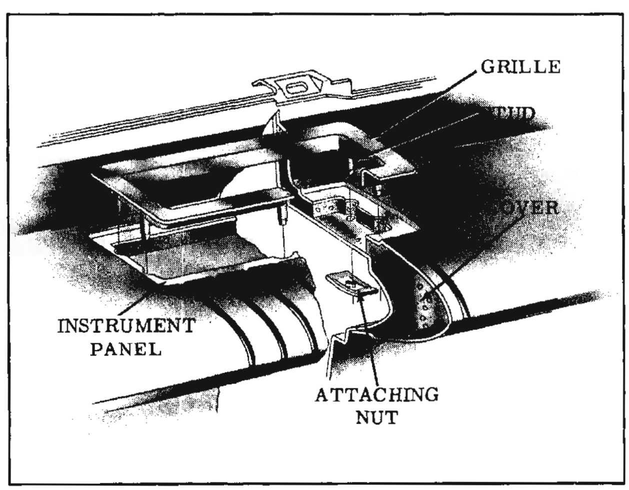


Fig. 16-223 Radio Speaker Grille

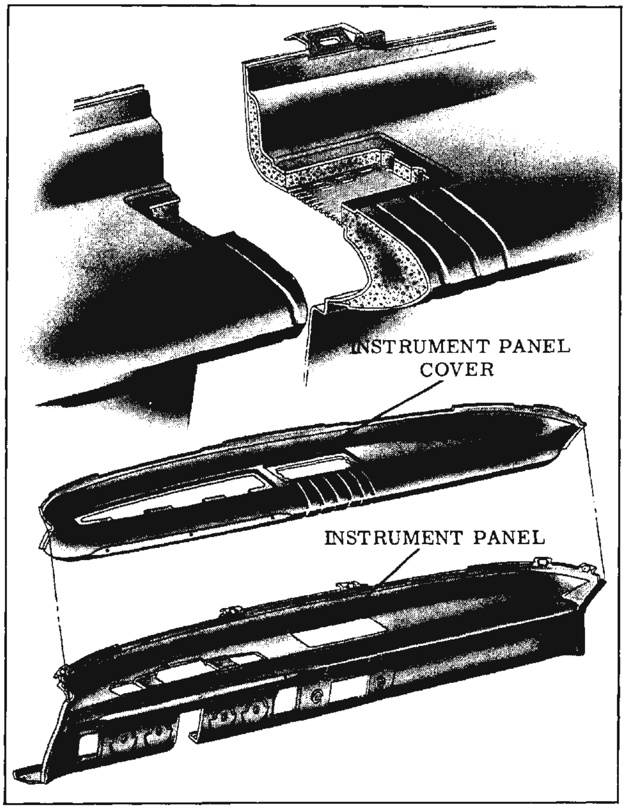


Fig. 16-224 Instrument Panel Cover

the entire outer edge and around the radio speaker grille area and by a retainer molding, on the lower part of the intrument panel. (Fig. 16-224)

The instrument panel radio speaker grille, also assists in securing the instrument panel at the grille area.

Removal

1. Place protective covering over front seat and remove or loosen necessary chassis items.

2. Remove lower windshield garnish moldings.

3. Remove radio speaker grille.

4. Remove cover retaining molding. (Fig. 16-225)

5. With a putty knife or other suitable tool, carefully loosen cemented outer edges of cover and at radio speaker grille area. Carefully remove cover assembly — exercise care so as not to bend or buckle cover at any time.

Installation

1. Clean off cemented surface on upper instrument panel.

2. Clean off cementing surfaces on cover assembly.

3. Apply a thin coat of an approved neoprene-type weatherstrip adhesive to instrument

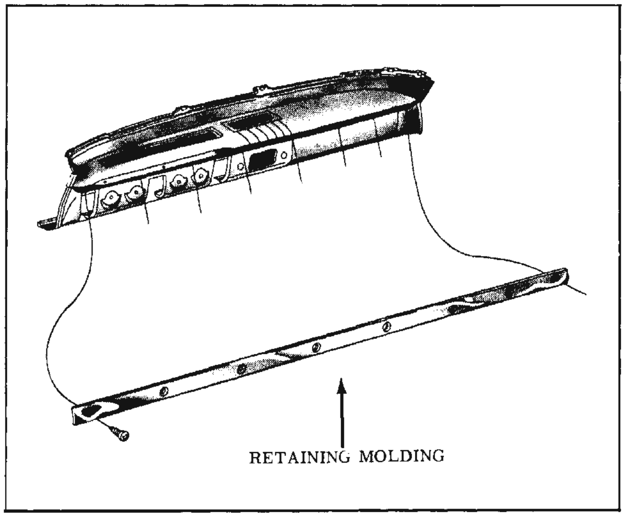


Fig. 16-225 Instrument Panel Retaining Molding

panel two inches (2") wide around the edge of the instrument panel and radio speaker grille area.

4. Apply a heavy coat of an approved neoprene-type adhesive to the outer edge of the cover assembly and radio speaker grille area 1-1/2" wide.

5. Immediately following application of adhesive, carefully position cover to instrument panel. Check alignment of cover, making certain cutouts in cover line up with holes and cutouts in instrument panel. Then, firmly and evenly press cemented areas to instrument panel.

   CAUTION: This adhesive is fast-drying; therefore, perform this operation quickly.

6. Working a small area at a time, press cover to instrument panel firmly and evenly, removing wrinkles.

7. Install all previously removed parts.

INSTRUMENT PANEL NAME PLATES

The instrument panel name plates are secured by clips, studs and/or nuts.

Removal and Installation

To remove, remove attaching nuts from underside of instrument panel and carefully pry the name plate from the instrument panel.

To install, reverse removal procedure.

VENTILATION SYSTEM

The body ventilating system incorporates the use of an air intake grille located on top of the

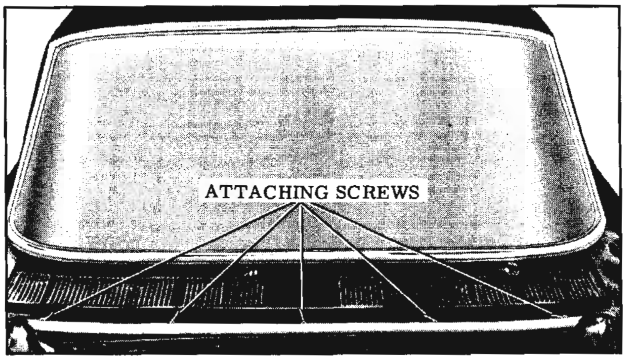


Fig. 16-226 Air Intake Grille

shroud panel. The air entering the shroud top ventilator grille flows through a duct which guides the air into the body through a shroud side duct panel air outlet assembly. The door in the outlet assembly regulates the flow of air and is adjusted by the use of a cable and knob control. Water entering the air inlet grille flows down the shroud side duct panel and is discharged through an opening in the shroud side panel.

VENTILATOR GRILLE

Removal and Installation

1. Place protective coverings over hood and fenders.
2. Remove windshield wiper arms.
3. Raise hood, remove screws securing grille to shroud. (Fig. 16-226)
4. Carefully raise front edge of grille and slide grille forward to disengage tabs along rear edge of grille from slots in shroud; then, remove grille.
5. To install, apply medium-bodied sealer around screw attaching holes and grille retaining slots.
6. Insert retaining tabs along rear edge of grille in slots in shroud panel and reverse removal procedure.

NOTE: Exercise care so that grille does not contact hood.

SHROUD SIDE FOUNDATION

Removal and Installation

1. Remove screws (Fig. 16-227) securing upper and lower end of air inlet grille.
2. Slide foundation forward to disengage rear edge of foundation from retainer and remove foundation.

AIR OUTLET

Removal and Installation

1. Remove shroud side foundation.

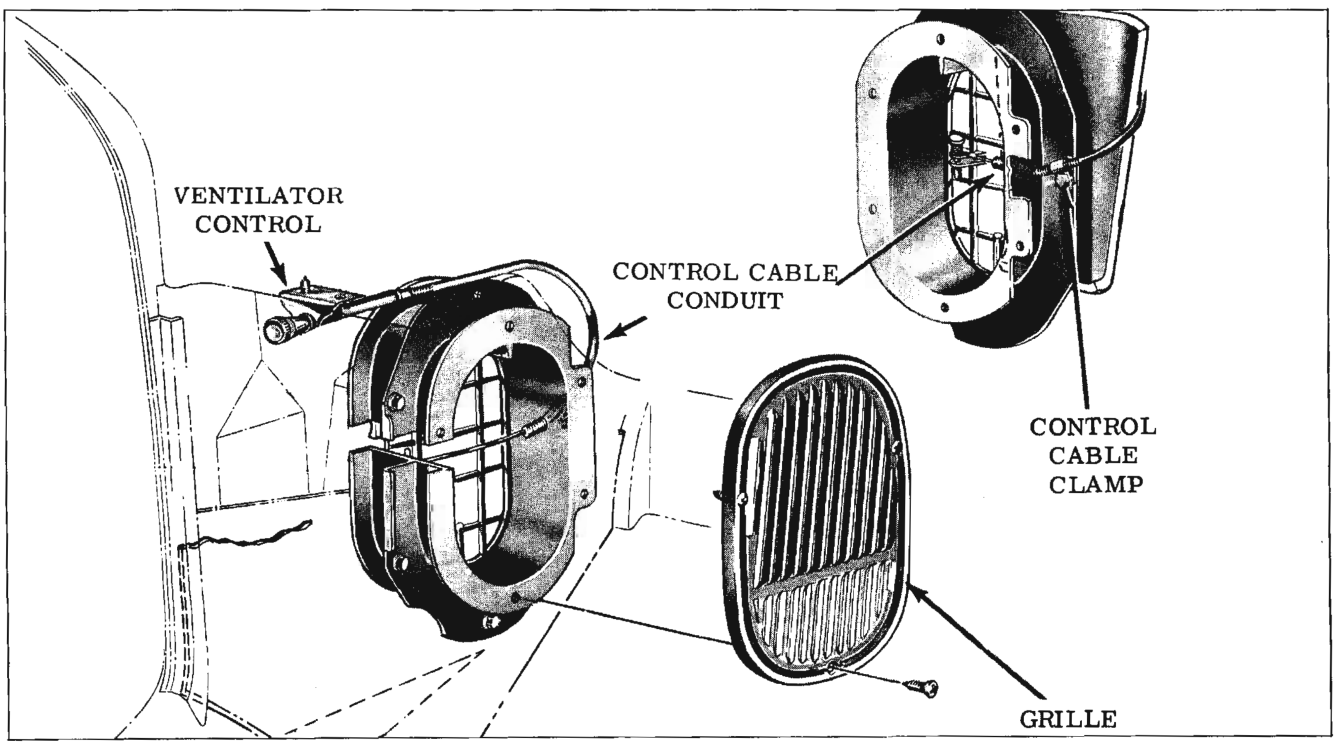


Fig. 16-227 Air Outlet Grille

2. Remove screws securing outlet to shroud panel, disengage cable from pin on door and remove outlet.

3. To install, apply a bead of medium-bodied sealer between the cowl and outlet and reverse removal procedure.

AIR OUTLET DOOR

Removal and Installation

1. Remove shroud side foundation.

2. Remove end of control cable from door pin. (Fig. 16-227)

3. Pry upper hinge pin downward and remove door.

4. To install, reverse removal procedure.

DOORS (FRONT AND REAR)

DOOR WEATHERSTRIPS (Except "47" & "67" Styles)

The door weatherstrip is a one-piece assembly, cemented into the door upper frame channel and retained by wire clips inserted into attaching clip sealing plugs for the remainder of the door.

Removal

1. With a flat-bladed tool, carefully break cement bond along door window frame assembly and at belt line.

2. Insert tip of Tool J-5757 at clip location and carefully snap clips from retaining plugs and remove weatherstrip from door. (Fig. 16-228)

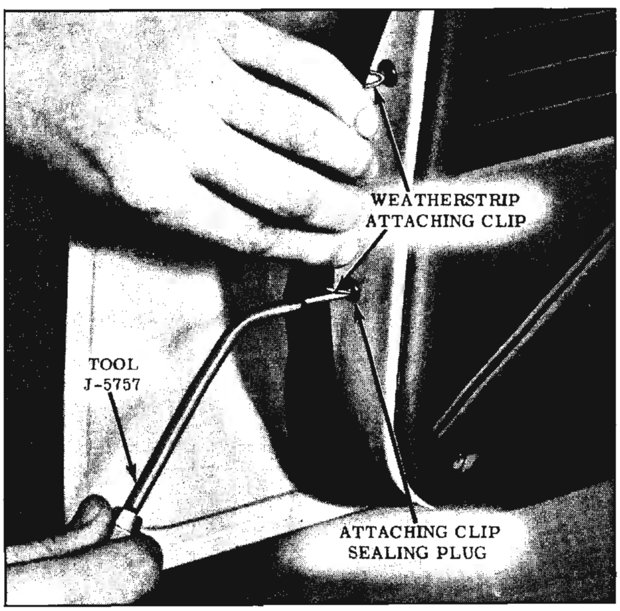


Fig. 16-228 Removing Door Weatherstrip

Installation

1. Clean off old cement from window frame and door inner panel to insure a clean cementing surface.

2. Check weatherstrip clips for proper contour and reform if necessary using Tool J-5984. (Fig. 16-229)

3. Check all attaching hole sealing plugs. If sealing plugs are loose and will not remain engaged in door inner panel, install a 1/2" x 1" piece of clothbacked waterproof body tape over sealing plug retaining hole as shown in Section "C-C" of Fig. 16-230. Make two 5/16" slits in tape to form an "X" pattern, install plug and check for a snug fit. If the plug is still loose, repeat the operation by installing a second piece of tape over the existing repair. This procedure may also be used to repair waterleaks that may develop at sealing plug locations. (Fig. 16-230 for front doors and Fig. 16-231 for rear doors.)

4. Prior to installation of weatherstrip, apply a continuous bead of an approved weatherstrip cement extending from approximately one inch below window frame at hinge pillar section (View "B" of View I) along entire outboard section of door upper frame channel (Section "A-A" of View I) to approximately one inch below lock pillar section of window frame assembly (View "C" of View I).

   NOTE: When applying weatherstrip cement, follow manufacturer's directions.

5. Starting at uppermost clip hole on either

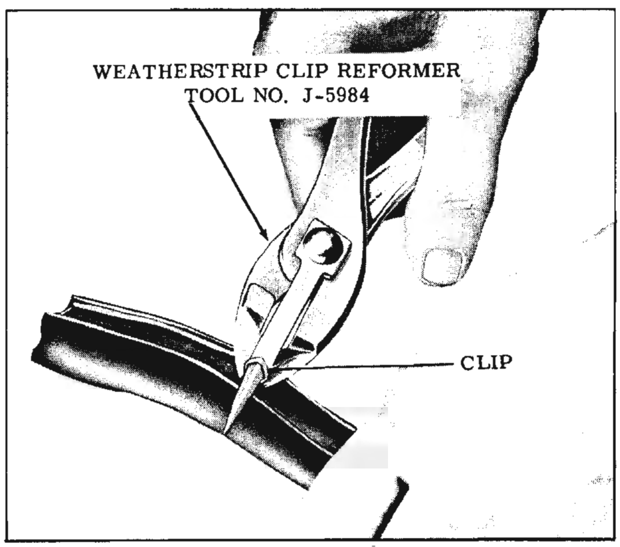


Fig. 16-229 Reforming Weatherstrip Clips With Tool J-5984

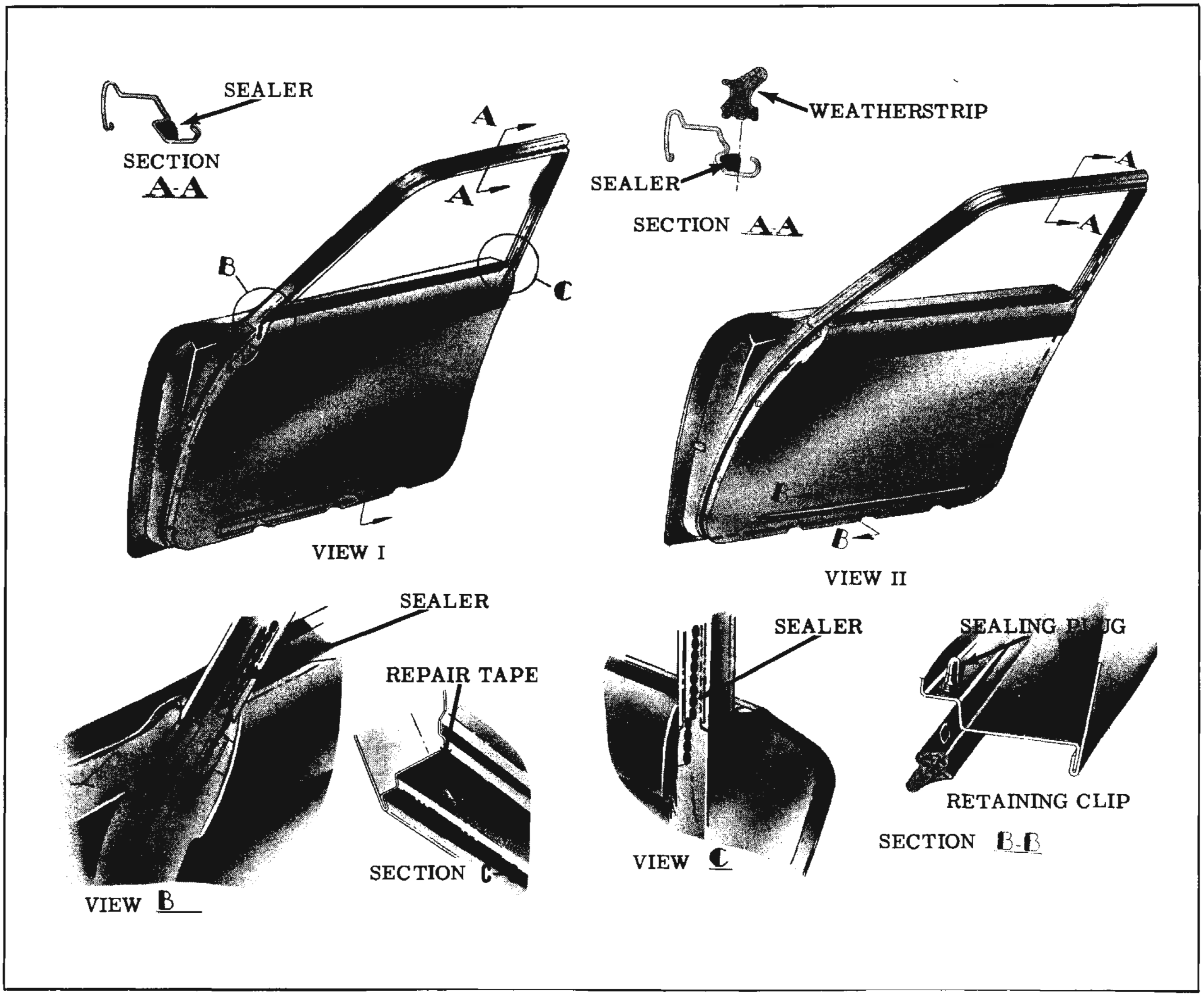


Fig. 16-230 Repairing Weatherstrip Attaching Hole Sealing Plugs

door pillar, install clips to door by placing notched end of Tool J-5757 in loop of clip and pushing clip into attaching hole sealing plug. Repeat operation along both sides and bottom of door. (Fig. 16-228 and Section "B-B")

NOTE: Do not distort attaching clips or unsatisfactory weatherstrip retention will result.

6. Using a putty knife, or other suitable flat-bladed tool, install door weatherstrip into door window frame assembly (Section "A-A").

7. Clean off all excessive weatherstrip adhesive.

NOTE: All door weatherstrips are impregnated with a silicone lubricant and additional lubrication is not required.

FRONT DOOR WEATHERSTRIPS ("47" & "67" Styles)

The door weatherstrip is a one-piece design, retained by clips inserted into attaching hole sealing plugs for the entire door and by cement along the top four inches of hinge and lock pillar panels. One weatherstrip fastener at belt line of hinge pillar and two fasteners at belt line of lock pillar also help retain weatherstrip.

Removal

1. With a screwdriver, or other suitable tool, carefully snap weatherstrip fasteners, at belt line of hinge and lock pillar panels, from door (Views "A" and "B" in Fig. 16-232).
2. With a flat-bladed tool, carefully break cement bond at hinge and lock pillar panels.
3. Insert tip of Tool J-5757 at clip locations and carefully snap clips from retaining plugs and remove weatherstrip from door (Fig. 16-228 and Section "C-C" in Fig. 16-232).

Installation

1. Clean off old cement to insure a clean cementing surface.

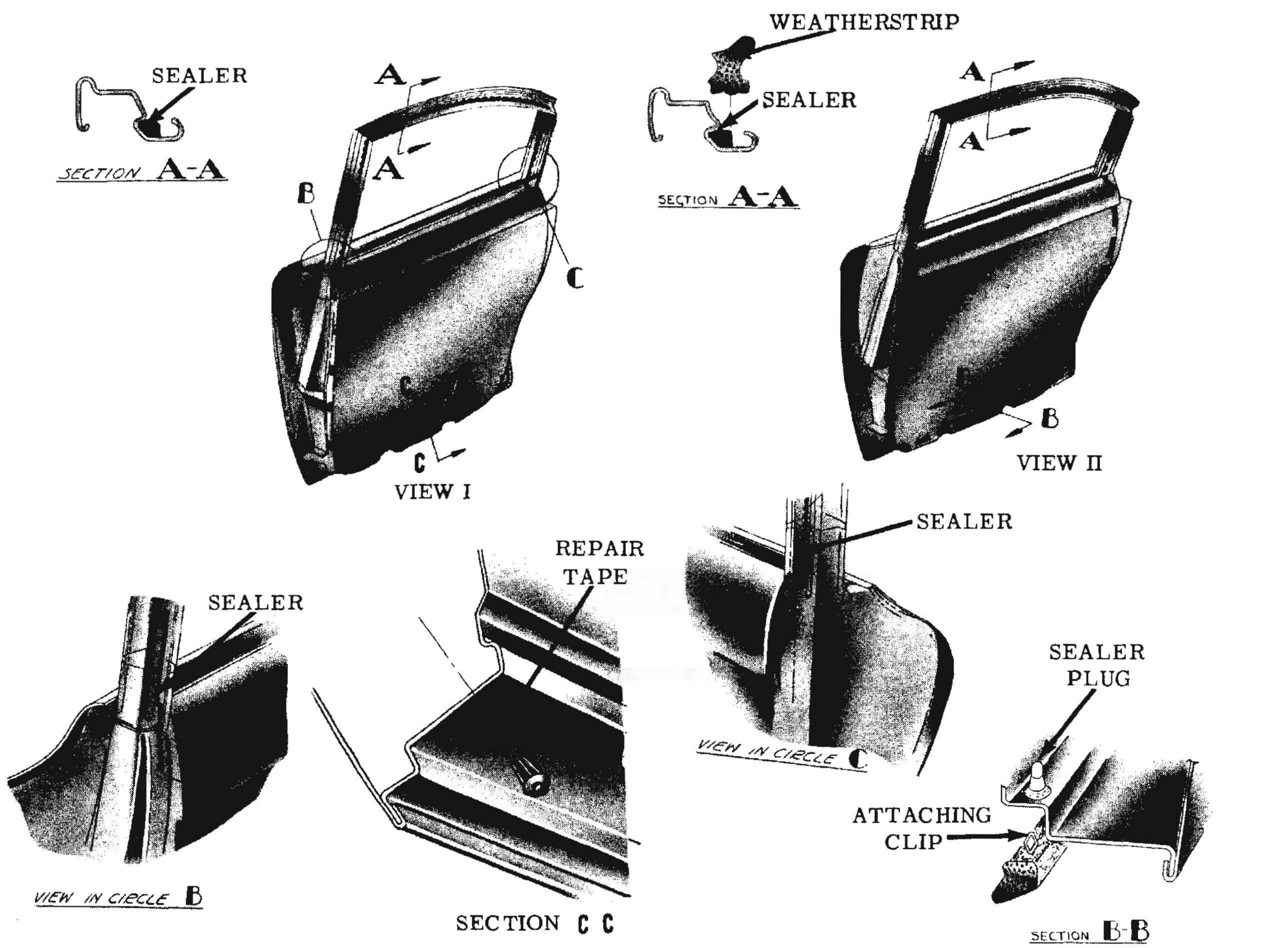


Fig. 16-231 Repairing Weatherstrip Attaching Hole Sealing Plugs

2. Check weatherstrip attaching clips for proper contour and, if necessary, reform using Tool J-5984.

3. Check all attaching hole sealing plugs. If sealing plugs are loose and will not remain engaged in door inner panel, install a 1/2" x 1" piece of cloth-backed waterproof body tape over sealing plug retaining hole as shown in Section "C-C" of Figs. 16-230 and 16-231. Make two 5/16" slits in tape to form an "X" pattern. Install plug and check for a snug fit. If plug is still loose, repeat operation by installing a second piece of tape over existing repair. This procedure may also be used to repair waterleaks that may develop at sealing plug locations.

4. Prior to installation of weatherstrip, apply a bead of weatherstrip cement at top four inches of hinge and lock pillar panels.

   NOTE: When applying weatherstrip cement, follow manufacturer's directions.

5. Starting at uppermost clip hole on either door pillar, install clips to door by placing notched end of Tool J-5757 in loop of clip and pushing clip into attaching hole sealing plug. Repeat operation along both sides and bottom of door.

   NOTE: DO NOT distort clips or unsatisfactory weatherstrip retention will result.

6. Clean off all excessive weatherstrip adhesive.

   NOTE: All door weatherstrips are impregnated with a silicone lubricant and additional lubrication is not required.

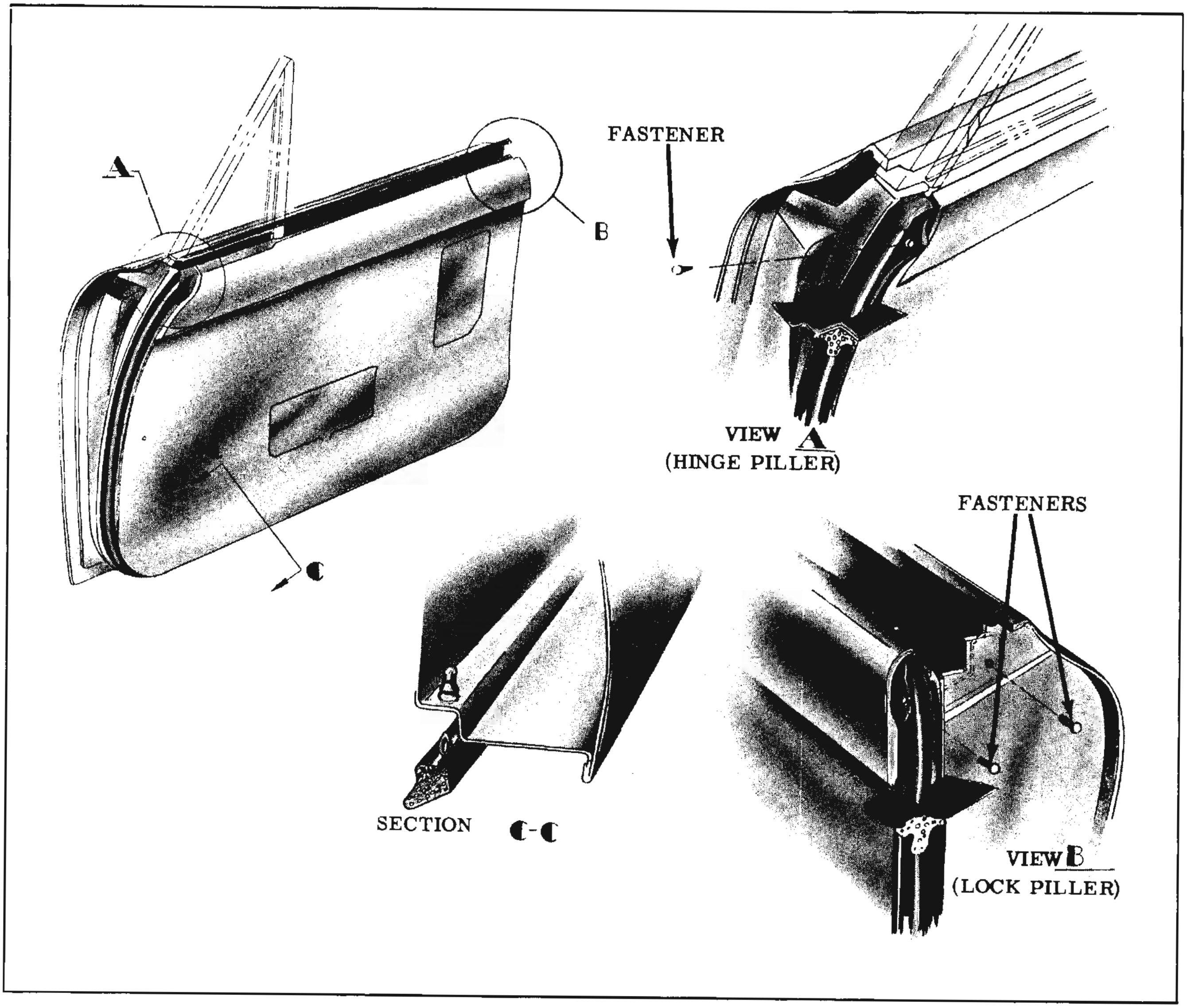


Fig. 16-232 Weatherstrip Fastening

DOOR GLASS RUN CHANNEL INNER AND OUTER STRIP ASSEMBLIES

Glass run channel strip assemblies are used on all doors on all styles incorporating a dropping window and are designed to prevent cold air and water from entering the body between the door window lower sash channel and door inner and outer panels. The inner strip assembly is constructed of a pile fabric material with a metal backing and is secured to top of door inner panel by a series of staples. The outer strip assembly is constructed of molded rubber and is secured to a metal retainer by a series of staples. On styles equipped with a door window belt reveal molding, the metal retainer is an integral part of this molding which is attached to the door outer panel by attaching clips and screws. On styles not equipped with a belt reveal molding, the outer strip assembly is attached to the door outer panel by a series of attaching clips only. On all styles, the inner strip assembly remains in a stationary position during operation of door glass. On the outer strip assembly, however, the inboard section of the sealing lip is lifted and held in position by the door window lower sash channel when door glass is raised. (Fig. 16-233)

Removal and Installation

1. Lower door window and apply masking tape over door outer panel adjacent to outer strip assembly to protect paint finish.

2. On front doors of styles equipped with a belt reveal molding, remove the front door ventilator assembly to gain access to the forward attaching screw of the belt reveal molding.

3. Remove the door window lower stop or stop bumper and lower door window as far down as possible to gain access to the outer strip assembly attaching screws.

4. Where applicable, remove the front and rear outer strip assembly attaching screws.

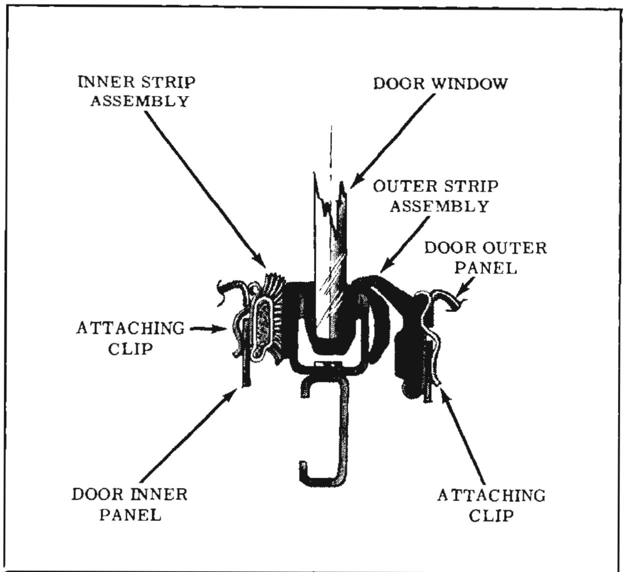


Fig. 16-233 Door Glass Inner and Outer Strip Assemblies

5. With a flat-bladed tool, gently pry inner or outer strip assembly up at the attaching clip locations (five clips each for front and rear doors on four door styles and seven clips for front doors on two door styles).

6. To install, reverse removal procedure.

ARM RESTS

All arm rests are the applied type and are secured to the door inner panel by two attaching screws which fit into self-threading metal anchor nuts which snap into the door inner panel. The anchor nuts are sealed to the door inner panel with body caulking compound and are replaceable as a service part.

Removal and Installation

1. Remove screws securing arm rest to door inner panel and remove arm rest.

2. To install, reverse removal procedure.

INSIDE HANDLES

Removal and Installation

1. On styles equipped with a paddle handle, remove door arm rest and remove handle-to-remote attaching bolt and remove handle from door. (Fig. 16-234)

2. On all other styles, depress door trim assembly at handle sufficiently to install Tool J-7797 between handle and bearing plate.

3. Push handle retaining spring out of engagement and remove handle and bearing plate from door. (Fig. 16-235)

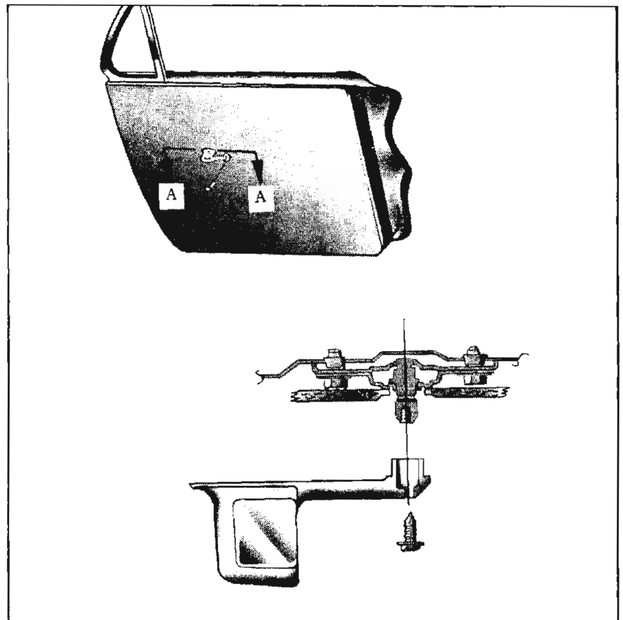


Fig. 16-234 Door Inside Remote Control "Paddle" Handles

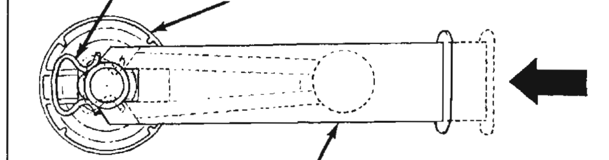


Fig. 16-235 Removing Inside Handle Retaining Spring

Installation

1. Install retaining spring on handle and bearing plate over regulator spindle.

2. Position handle on spindle at same angle as handle on opposite door, and push handle until spring is engaged.

   NOTE: Handles are installed in a horizontal position with unattached end forward when glass is in full up position.

TRIM PADS

Both the front and rear door trim assemblies are secured to the door panel (inner) by screws at the bottom of the door, and by retaining nails at the sides and top of the door. The nails are pressed or tapped into plastic retainers which fit into slots in the door inner panel.

Removal and Installation

1. Remove door inside handles and arm rest assembly.

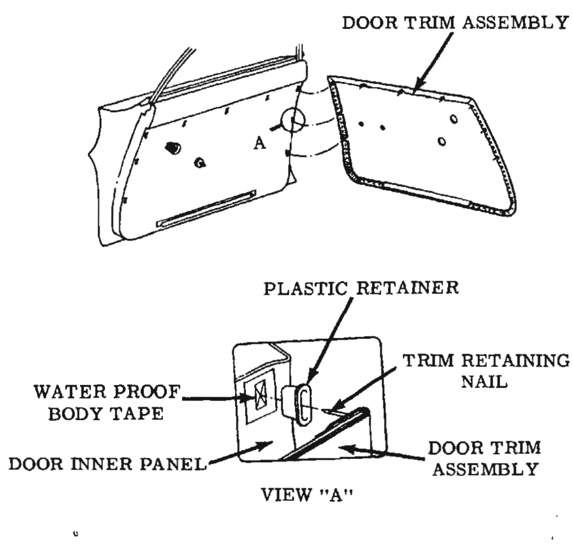


Fig. 16-236 Door Trim Installation

2. At each lower corner of trim assembly remove screw securing assembly to door inner panel.

3. With a clean rubber mallet, tap along sides and top of trim assembly to free trim nails from door inner panel.

4. Remove trim pad attaching screws located at bottom of door.

5. Starting at top of trim assembly, carefully insert Tool J-6335, or a suitable flat-bladed tool, between door trim assembly and door inner panel at retaining nail locations and disengage nails from retainers. (Fig. 16-236)

6. To install, reverse removal procedure.

   NOTE: Retaining nails must not pierce back of plastic retainers as waterleaks may develop. For this reason it is important the PROPER LENGTH repair tab nails (1/2") are used when replacing broken trim retaining nails.

7. If plastic retainers are loose and will not remain engaged in door inner panel, install a 1/2" x 3/4" piece of cloth-backed waterproof body tape over retaining hole in door inner panel. Make two slits in tape to form an "X" pattern. Check retainer for snug fit. If retainer is still loose, repeat above operation by installing a second piece of tape over existing repair. This procedure may also be used to repair waterleaks which develop around perimeter of retainer.

WATER DEFLECTORS

A waterproof paper deflector is used to seal the door inner panel and prevent entry of water into the body. The polyethylene (shiny or black) side of the deflector is placed against the inner panel. The deflector fits into a retaining slot at the bottom drain holes. The deflector is further secured by a string loaded sealing material along both front and rear edges and by the application of waterproof sealing tape at front and rear lower corners. Whenever work is performed on front or rear doors where the paper water deflector has been disturbed, the deflector must be properly sealed and taped to the inner panel to prevent serious waterleaks. It is important that all service personnel performing door hardware adjustments or sealing operations are aware of the importance of using the specified material and recommended removal and installation or replacement procedures. For service sealing, body caulking compound is recommended if additional sealing material is required.

When access to the inner panel is required to perform service operations, the deflector may be completely or partially detached from the inner panel. If the existing water deflector is damaged, so that it will not properly seal the door, replacement of the deflector is required.

The following procedure covers complete removal and installation of the water deflector. If only partial removal of the deflector is required, perform only those steps which are necessary to expose the required area of the door inner panel.

Removal

1. Remove door trim assembly.

2. Remove strips of waterproof body tape securing lower corners of water deflector. (Fig. 16-237)

3. With a putty knife, or other suitable flat-bladed tool, carefully break cement bond securing upper corners of water deflector to door inner panel. Make sure string, located within sealer, is against water deflector and carefully slide putty knife between sealer and door inner panel along both sides of door to disengage sides of water deflector from door inner panel.

4. Disengage lower edge of water deflector from retaining slot in door inner panel and remove water deflector.

Installation

1. Inspect water deflector and, where necessary, repair any tears or holes with waterproof body tape applied to both sides of deflector.

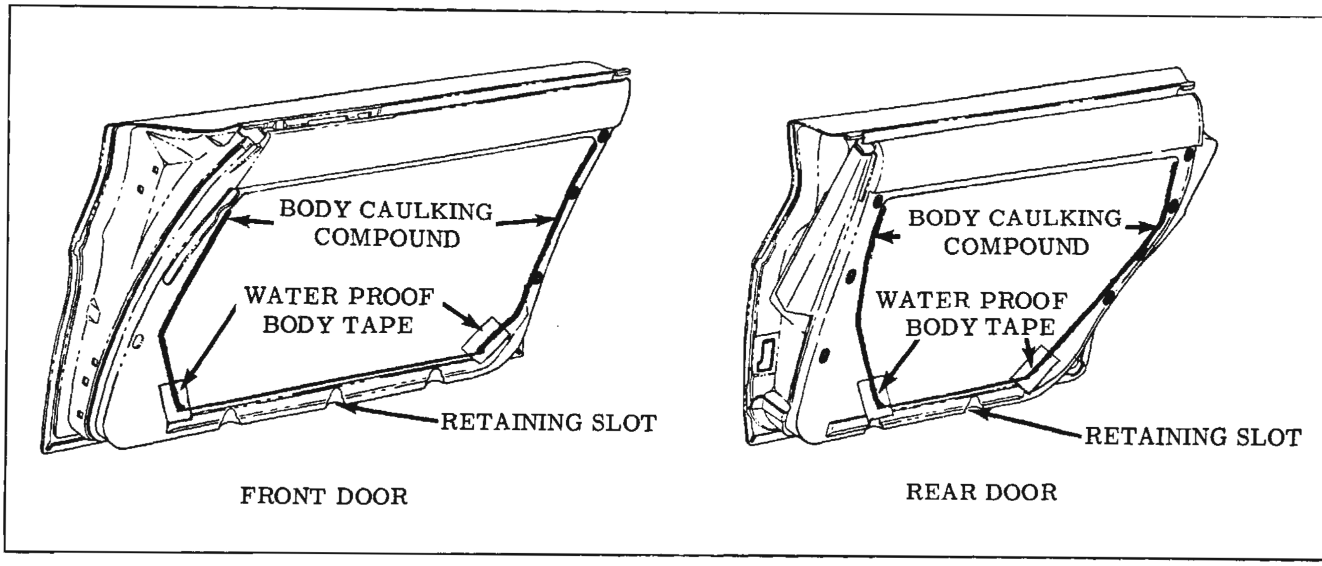


Fig. 16-237 Door Inner Panel Water Deflector Installation

In addition, if bond between polyethylene and deflector paper has been torn, cut or damaged, apply waterproof body tape to both sides of deflector over damaged area to prevent water from wicking on uncoated side of deflector.

2. If a new water deflector is to be installed, use old water deflector as a template, trim new deflector to proper size and cut holes for door inside hardware. If old sealer does not effect a satisfactory seal, apply a bead of body caulking compound (approximately 3/16" diameter) to inner panel at unsealed areas. (Fig. 16-237)

3. Position water deflector to door inner panel with polyethylene coated side of deflector against inner panel. Insert lower edge of deflector in retaining slot. Then firmly roll or press sealed areas to obtain a good bond between deflector and door inner panel.

4. Seal lower corners of deflector with 2" or 2-1/2" waterproof body sealing tape. (Fig. 16-237)

5. Clean off all excess cement or caulking compound and install previously removed door trim and inside hardware.

OUTSIDE HANDLE

Removal and Installation

1. Raise door window. Remove trim assembly and detach upper rear corner of inner panel water deflector sufficiently to gain access to door outside handle attaching screws.

2. Remove screws through inner panel. Remove door handle and gaskets from outside of body.

3. To install, reverse removal procedure.

DISASSEMBLY AND ASSEMBLY OF DOOR OUTSIDE HANDLE

1. Remove door outside handle.

2. Firmly secure handle within protected vise jaws.

3. With a flat-bladed screwdriver and hammer, rotate sheet metal retainer 1/4 turn. Remove retainer, stop washer, spring, sealing ring and push button and shaft. (Fig. 16-238)

4. To assemble, reverse disassembly procedure.

LOCK SPRING CLIPS

A spring clip is used on the door lock levers to secure the remote control connecting link and inside locking rod connecting link to the door levers. A slot in the spring clip provides for disengagement of the clip, thereby facilitating detachment of the connecting link from the lock lever.

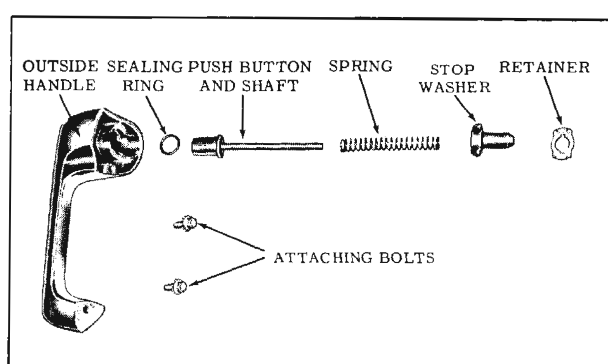


Fig. 16-238 Outside Door Handle

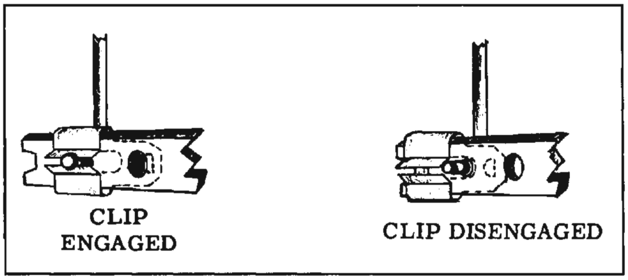


Fig. 16-239 Door Lock Spring Clip

To disengage the spring clip, use a screwdriver or other suitable tool to slide the clip out of engagement. Figure 16-239 shows the door lock spring clip engaged and disengaged.

DOOR LOCK STRIKERS

Removal and Installation

1. With a pencil, mark position of striker on body pillar.

2. Remove three door lock striker attaching screws and remove striker and adjusting plates from pillar.

3. Prior to installation, seal all striker plate attaching screw clearance holes with body caulking compound.

4. Apply a 1/8" bead of body caulking compound around entire back surface of striker plate. No skips must exist in caulking compound.

   Place striker and adjusting plates within scribe marks on pillar and install striker plate attaching screws.

   IMPORTANT: Whenever a door has been removed and installed, or realigned, the door SHOULD NOT be closed completely until a visual check is made to determine if lock extension will engage in striker notch. Where required, door lock striker emergency spacers should be installed so that the door can be closed and an accurate check made to determine emergency spacer requirements.

5. Clean off all excess caulking compound.

Adjustments

1. To adjust striker up or down or in or out, loosen striker plate attaching screws and shift striker and adjusting plates as required, and tighten screws.

DIMENSIONAL SPECIFICATIONS FOR USE OF DOOR LOCK STRIKER EMERGENCY SPACERS

1. Door(s) should be properly aligned before checking door spacer requirements.

2. To determine if door lock striker emergency spacers are required, apply modeling clay or body caulking compound in door lock striker notch where lock extension engages, and then close door to form a measurable impression in clay or caulking compound as shown in Fig. 16-240.

When dimension "A" from rear face of striker teeth to rear edge of depression in clay is less than 11/32", install emergency spacers and proper length striker attaching screws as indicated.

Dimension "A"	No. of Required Spacers
11/32" to 9/32"	1
9/32" to 7/32"	1
7/32" to 5/32"	1 (1/16" Spacer)
	1 (1/8" Spacer)
5/32" to 3/32"	2 (1/8" Spacer)

Spacer Thickness	Striker Attaching Screws*
1/16"	Original
1/8"	Emergency (1/8" longer)
3/16"	Emergency (1/8" longer)
1/4"	Emergency (1/4" longer)

NOTE: Dimension "B" in the illustration should never be less than 1/8".

*Zinc or cadmium plated flat-head cross-recess screw with countersunk washer.

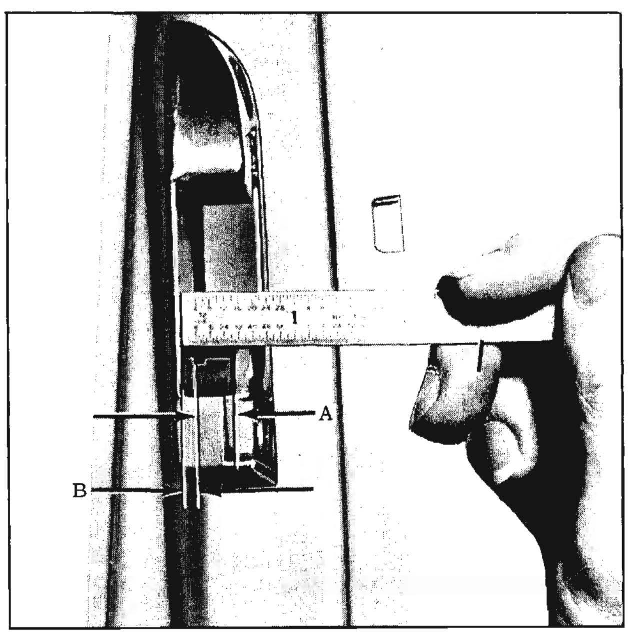


Fig. 16-240 Door Lock Striker Engagement Check

PINCHWELD FINISHING STRIPS

On all styles (except convertibles) a one-piece strip assembly of an extruded vinyl construction is used. All strip assemblies are reinforced by a full length metal insert and are retained by integral lips of the finishing strips.

Removal and Installation

1. Remove door sill plate.
2. On "19" and "35" styles, remove center pillar to roof rail finishing plate.
3. On "17", "27" and "19" styles, remove rear quarter window upper corner finishing molding.
4. On "35" styles, remove rear door upper lock pillar to roof rail finishing plate.
5. Beginning at either end of pinchweld finishing strip, carefully pull strip from pinchweld.
6. To install, reverse removal procedure.

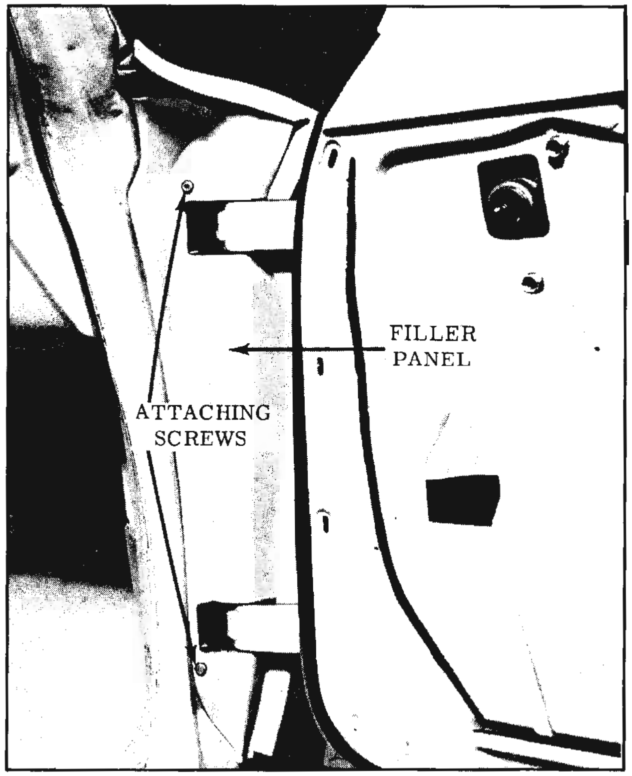


Fig. 16-241 Front Fender Filler Panel

FRONT DOORS

FRONT DOOR FENDER FILLER PANEL

The front door fender filler panel is a finishing panel to cover the front door hinges. (Fig. 16-241)

Removal and Installation

1. Remove screws securing panel and remove panel from body.
2. To install, reverse removal procedure.

HINGES

The front door assembly may be removed with or without the hinges attached.

Removal

1. Place a suitable protective covering over front fender at door opening to protect finish.
2. Remove front fender opening filler panel.
3. Open door and mark hinge locations on front body hinge pillar.
4. If necessary, loosen lower rear fender attaching bolt at underside of body to gain additional access to lower hinge attaching bolts.
5. On styles equipped with power operated windows, remove water deflector, disconnect wiring harness and remove wiring harness conduit.
6. With aid of a helper, to properly support door, remove bolts securing upper and lower hinges to body and remove door assembly with attached hinges from body. (Fig. 16-242)

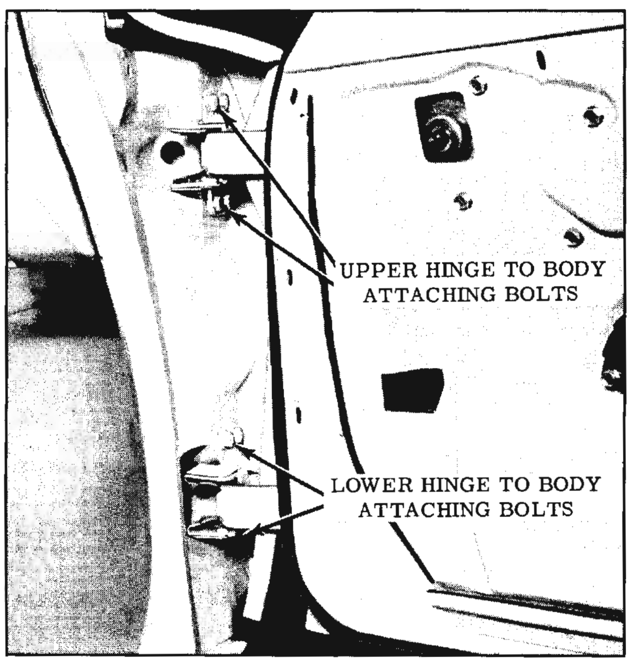


Fig. 16-242 Front Door Hinge Attachment to Cowl

Installation

1. As an anti-squeak precaution and to prevent entry of water into body at hinge attaching bolt locations, coat attaching surfaces of hinges with heavy-bodied sealer prior to installing door. Fig. 16-243 shows sealer application and detailed views of hinge to body attaching bolts. Fig. 16-244 shows sealer application and view of hinge to door attaching bolts.

2. With aid of a helper, reinstall door to body opening. Align hinges within scribe mark and tighten bolts.

3. Check door for proper operation and alignment and, where required, adjust door as described under "Front Door Adjustments".

4. Install front fender opening filler panel and remove protective covering from front fender.

Adjustments

Door adjustments are provided through the use of floating anchor plates at the door and body pillars. When checking the door for misalignment, remove the door lock striker from the body pillar to allow door to hang free on its hinges.

To adjust the door up or down and/or fore or aft at the front body hinge pillar, proceed as follows:

1. Remove front fender filler panel.

2. Mark location of hinges on front body hinge pillar.

3. Loosen hinge attaching bolts and shift door to desired position; then tighten hinge attaching bolts. (Fig. 16-242)

   NOTE: Loosen front fender lower rear attaching bolt, if necessary, to gain additional access to lower hinge attaching bolts.

4. Reinstall door lock striker and check lock extension-to-striker engagement as described under "DOOR LOCK STRIKER - ADJUSTMENTS".

To adjust door in or out and/or up or down at the door hinge pillar, proceed as follows:

1. Mark hinge locations on door.

2. Loosen hinge attaching bolts. Shift door to

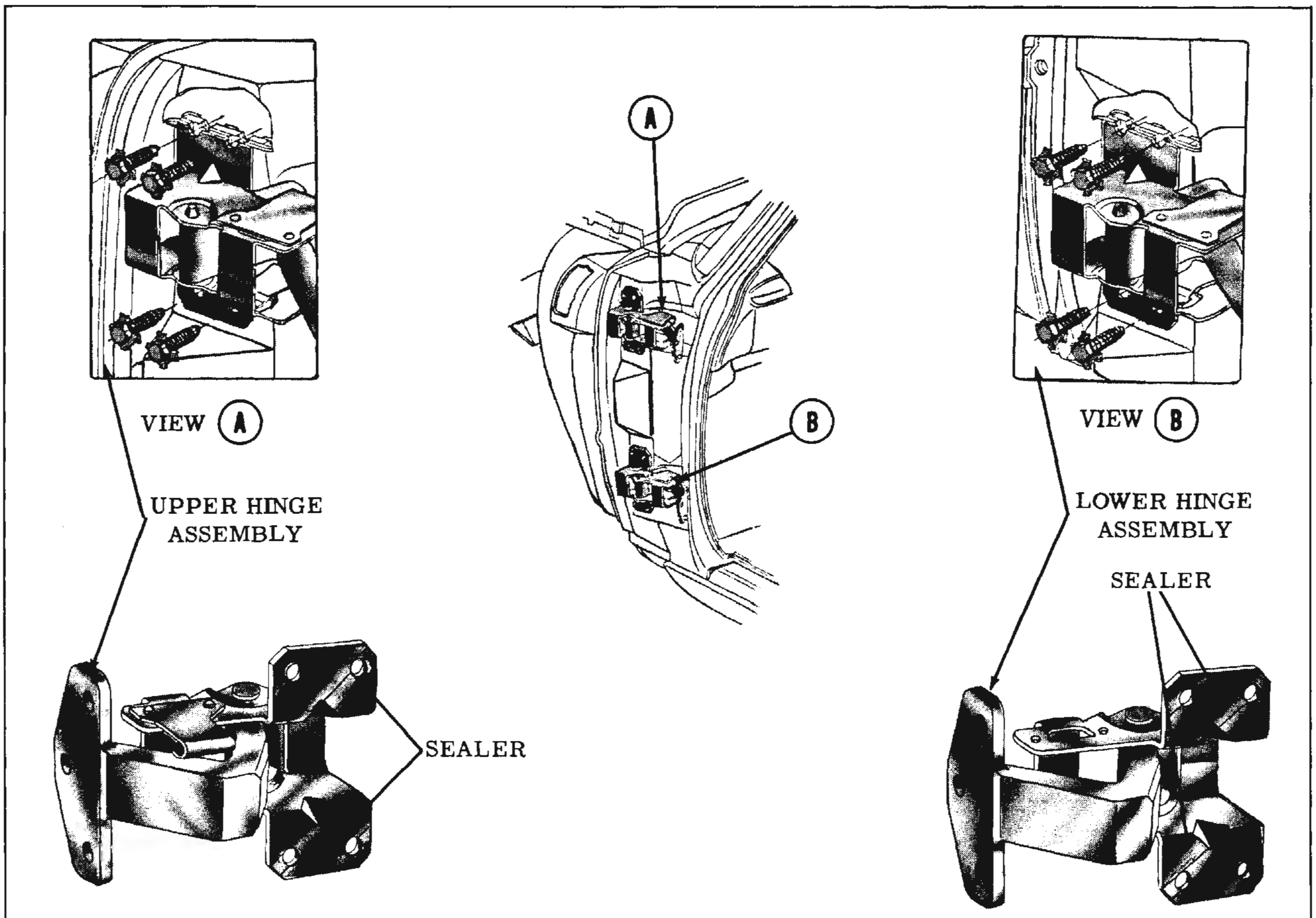


Fig. 16-243 Front Door Hinge Assembly

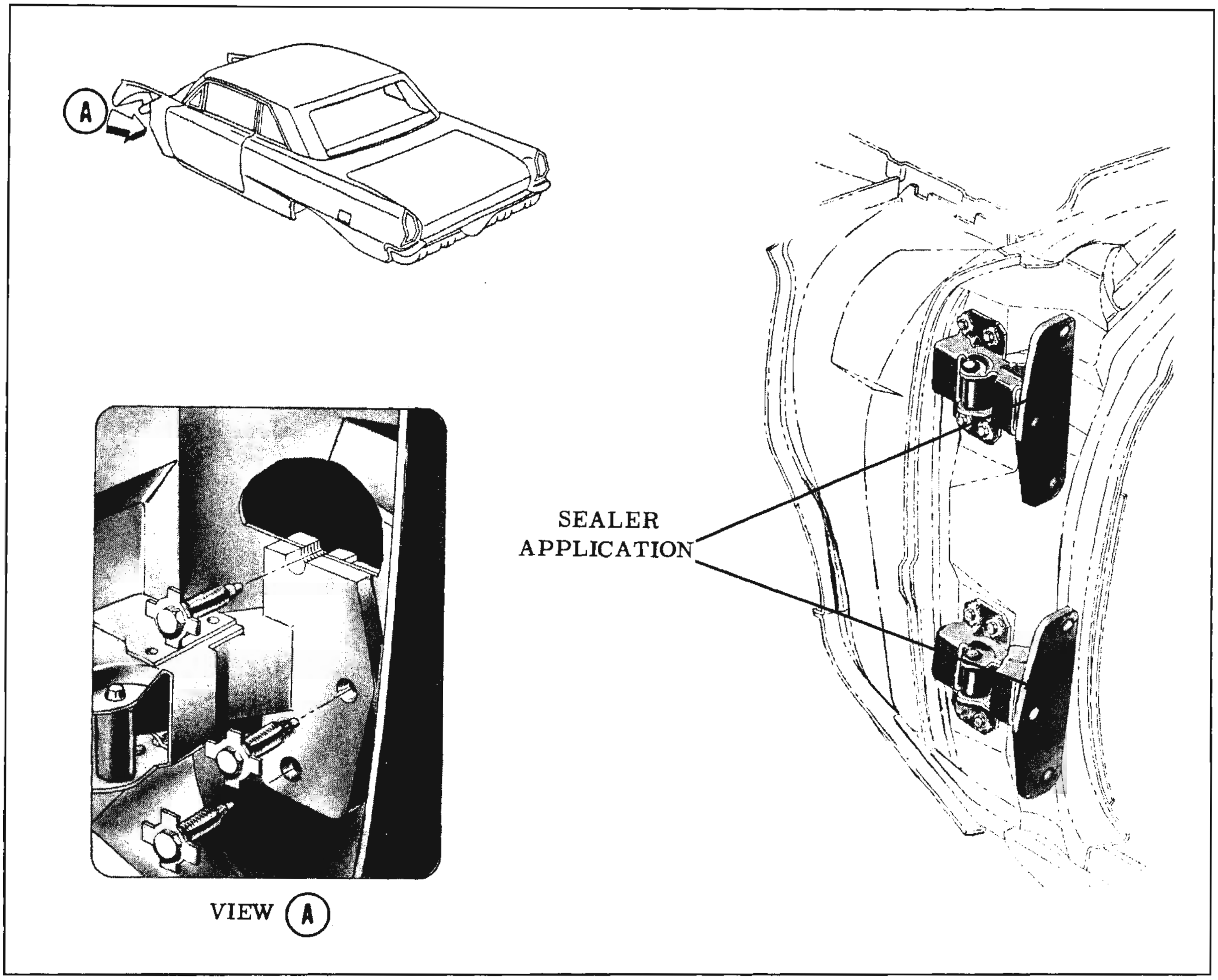


Fig. 16-244 Front Door Hinge Installation

desired position, then tighten hinge attaching bolts. (Fig. 16-245)

3. Check door for proper alignment and, where necessary, repeat Steps 1 and 2 above until desired adjustment is obtained.

VENTILATOR CASTING

The front door ventilator casting is used on all "47" and "67" styles and is secured to the front door assembly by one attaching bolt and one adjusting stud and nut. The front facing of the ventilator frame is secured to the ventilator casting by screws.

Removal and Installation

1. Remove ventilator casting to door hinge pillar panel attaching bolt and lower adjusting stud nut.

2. Remove ventilator casting to ventilator frame attaching screws and remove casting from door. (Fig. 16-246)

3. To install, reverse removal procedure.

NOTE: A slight fore and aft adjustment of the ventilator casting can be obtained at the lower adjusting stud and nut.

VENTILATOR ASSEMBLY ("47" & "67" Styles)

The front door ventilator assembly is a manually operated friction type unit. (Fig. 16-247)

Removal and Installation

1. Raise door window, remove door trim assembly and detach inner panel water deflector.

2. Remove ventilator division channel lower adjusting stud and nut.

3. Remove front door ventilator casting.

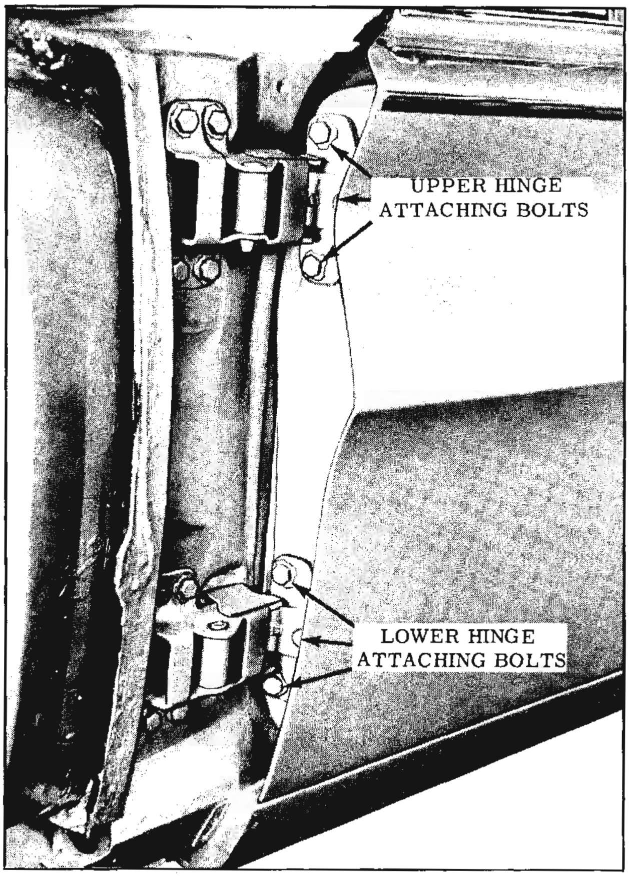


Fig. 16-245 Hinge Attachment to Door

4. Remove ventilator frame to door inner panel attaching screw.

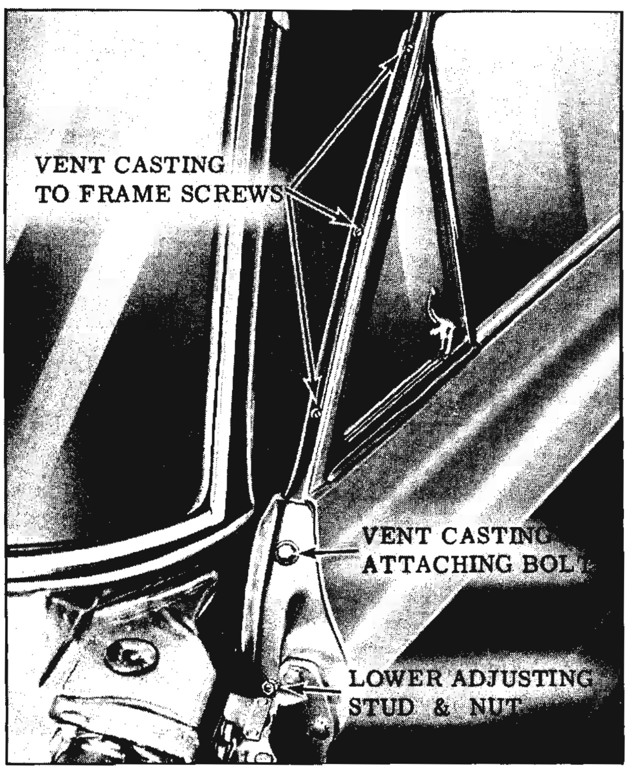


Fig. 16-246 Front Door Vent Casting

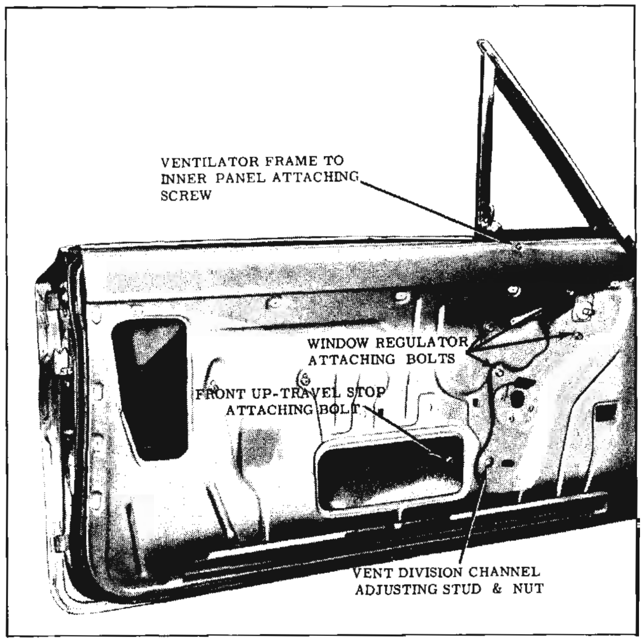


Fig. 16-247 Ventilator Attachment

5. Tilt ventilator assembly until ventilator division channel is free from front edge of door window glass and remove ventilator assembly from door.

   CAUTION: After ventilator has been removed, door glass should be held or otherwise suitably supported to prevent damage.

6. To install, reverse removal procedure. Check operation of ventilator and door window assembly and where required, adjust ventilator assembly as described under "FRONT DOOR VENTILATOR - ADJUSTMENTS".

LOCK REMOTE CONTROL ASSEMBLY AND CONNECTING LINK

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. With aid of a screwdriver, or other suitable tool, disengage end of connecting link from lock assembly. See "DOOR LOCK SPRING CLIP".

3. Remove screws securing remote control assembly to door inner panel. Pull remote control away from door inner panel; then rotate remote control assembly one quarter turn to disengage connecting link from remote control assembly. Remove remote control assembly and connecting link from door. (Fig. 16-248)

4. To install, reverse removal procedure. Check operation of door lock before installing inner panel water deflector.

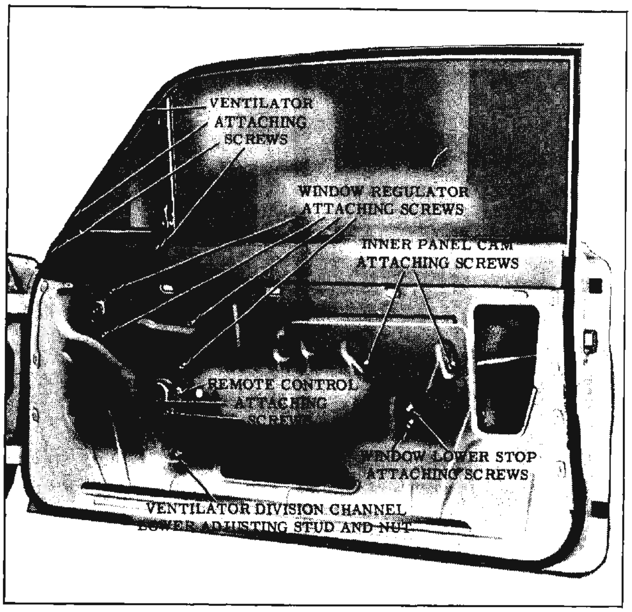


Fig. 16-248 Front Door Hardware

VENTILATOR ASSEMBLY (All Except "47" & "67" Styles)

Removal and Installation

1. Raise door window, remove door trim assembly and detach inner panel water deflector.

2. Remove door lock remote control assembly and connecting link.

3. Remove door window lower stop and ventilator division channel lower adjusting stud and nut.

4. Carefully lower door window to extreme down position. Remove door window frame to ventilator attaching screws and one inner panel to ventilator attaching screw. (Fig. 16-248)

5. Disengage upper front corner of glass run channel from window frame assembly.

6. Carefully tilt ventilator assembly rearward until clear of window frame assembly; then lift ventilator inboard and upward and remove from door.

   CAUTION: After ventilator has been removed, door glass should be held or firmly supported to prevent damage to door glass.

7. To install, reverse removal procedure. Check operation of ventilator and door window assembly and, where required, adjust ventilator assembly as described under "FRONT DOOR VENTILATOR ADJUSTMENTS".

Adjustments

1. To adjust ventilator division channel in or out or fore or aft, remove door trim assembly and detach inner panel water defector sufficiently to loosen division channel lower adjusting stud nut. Adjust stud in or out as required or position channel fore or aft as required; then tighten stud nut. Seal water deflector and install door trim and inside hardware. (Fig. 16-248)

2. The effort required to open or close the ventilator may be increased or decreased by straightening washer tab and tightening or loosening the adjusting nut. (Fig. 16-249)

   Tightening the adjusting nut will increase effort required to open and close ventilator, loosening adjusting nut will decrease opening and closing effort. When desired adjustment has been obtained, bend down washer tab to lock nut in position.

   NOTE: This adjustment should be performed as a bench operation.

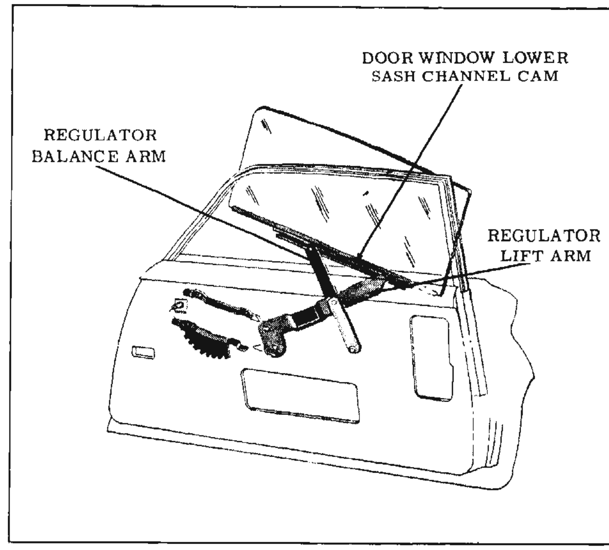


Fig. 16-249 Door Window Removal

INNER PANEL CAM (All Except "19" & "35" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector sufficiently to gain access to inner panel cam attaching bolts.

2. Remove two inner panel cam attaching bolts. (Fig. 16-248)

3. Slide cam rearward to disengage nylon roller of window regulator balance arm and remove cam through large access hole in door inner panel.

4. To install, reverse removal procedure. Prior

to installation, lubricate entire length of inner panel cam with 630 AAW Lubriplate or equivalent.

WINDOW ASSEMBLY (All Except "47" & "67" Styles)

The front door glass is a solid tempered safety plate glass. The glass fits into a lower sash channel assembly which incorporates a welded-on lower sash channel cam. With this type of design, the door glass, lower sash channel and sash channel cam are removed from the door as a unit.

CAUTION: Care should be exercised to make certain glass does not strike body metal during removal or installation procedures as edge chips can cause solid tempered safety plate glass to shatter. DO NOT attempt to grind glass.

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.
2. Remove front door ventilator assembly.

   CAUTION: After ventilator assembly has been removed, door window should be held or or otherwise supported to prevent damage to door glass.
3. On "17" and "27" styles, remove inner panel cam.
4. Carefully lift window assembly upward and forward to disengage regulator arm(s) from lower sash channel cam and remove window from door on outboard side of door upper frame. Figure 16-249 shows window removal on "17" and "27" styles and is typical of "19" and "35" styles.
5. To install, reverse removal procedure. After installation of window assembly, lubricate lower sash channel cam along entire length of cam with 630 AAW Lubriplate or its equivalent.

Adjustments

1. To adjust the lower portion of the ventilator division channel in or out or fore or aft, lower door window and loosen ventilator division channel adjusting stud nut. Turn adjusting stud in or out or position lower end of channel fore or aft as required, and tighten stud nut.
2. A slight up or down adjustment of the door window, in the lowered position, can be obtained by adjusting the door window lower stop assembly.
3. A slightly rotated or cocked front door window on "17" or "27" styles can be corrected by adjustment of the inner panel cam.

WINDOW ASSEMBLY ("47" & "67" Styles)

The front door glass is a solid tempered safety plate glass. The glass fits into a lower sash channel assembly which incorporates a welded-on lower sash channel cam. With this type of design, the door glass, upper, side and lower sash channel and sash channel cam are removed from the door as a unit.

CAUTION: Care should be exercised to make certain glass does not strike body metal during removal or installation procedures as edge chips can cause solid tempered safety plate glass to shatter. DO NOT attempt to grind glass.

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.
2. Lower door window and remove front up-travel stop. (Fig. 16-247)
3. Remove front door ventilator casting and front door ventilator assembly.
4. With window in a fully lowered position, through large access hole, slide glass forward to disengage regulator lift arm from window lower sash channel cam.
5. Carefully raise window to full up position.
6. Tilt front edge of glass upward to disengage balance arm from window lower sash channel cam.
7. Lower regulator to avoid interference when removing window and remove window from door.
8. To install, reverse removal procedure. After installation of window assembly, lubricate entire length of lower sash channel cam and inner panel cam with 630AAW Lubriplate or its equivalent.

Adjustments

1. To adjust the window in or out or fore or aft at front section, lower door window and loosen ventilator division channel lower adjusting stud and nut. Turn adjusting stud in or out or position lower end of channel fore or aft as required and tighten stud nut.
2. To adjust the window in or out at rear section,

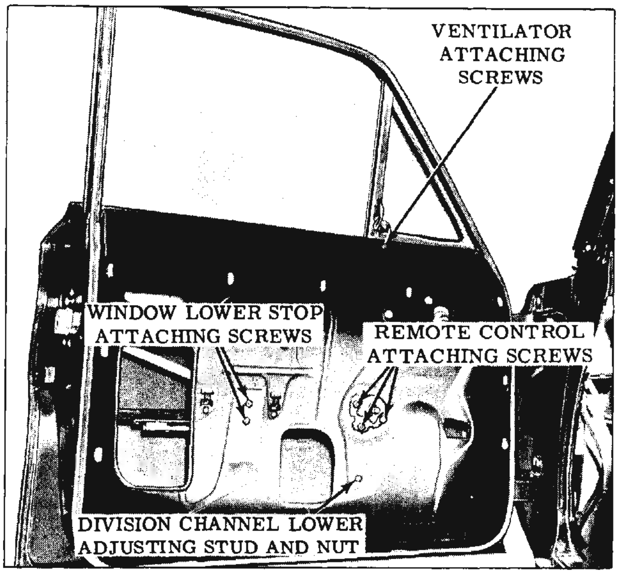


Fig. 16-250 Ventilator and Remote Control Attachment

loosen rear run channel lower attaching nut, adjust as required, and tighten nut. (Fig. 16-250)

3. Up or down adjustment is available at the front up-travel stops.

4. A condition of a rotated (cocked) door window can be corrected by adjusting the inner panel cam and up stops.

WINDOW REGULATOR ASSEMBLY (All Except "47" & "67" Styles)

1. Remove door trim assembly and detach inner panel water deflector.

2. On "17" and "27" styles, remove inner panel cam.

3. Raise door window. Place a protective piece of paper over window frame assembly and door weatherstrip to protect paint and weatherstrip from damage. Then secure window in full up position by installing a twelve to fifteen inch piece of body tape (2" or 2-1/2" in width) over window frame and firmly press tape to both sides of glass. This is necessary to positively hold glass in the up position during removal of the window regulator.

4. Remove remote control assembly and ventilator division channel lower adjusting stud and nut.

5. Remove window regulator attaching screws and work window regulator rearward to disengage arm from window lower sash channel cam and remove regulator from door. (Fig. 16-248)

6. To install, reverse removal procedure. Cycle window several times to insure proper operation before installing water deflector.

REGULATOR ASSEMBLY ("47" & "67" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.

2. Remove inner panel cam.

3. Remove remote control assembly.

4. On power operated windows, remove front door ventilator and front door window.

5. Remove ventilator division channel lower adjusting stud and nut.

6. Prop window in a full up position and remove all regulator attaching bolts.

7. Slide regulator forward to disengage regulator lift arm from window lower sash channel cam and then rearward to disengage regulator balance arm from window lower sash channel cam and remove assembly through large access hole.

8. To install, reverse removal procedure. Cycle window several times, to insure proper operation before installing water deflector and door trim pad.

POWER WINDOW REGULATOR ASSEMBLY

The electric motor assembly which powers the window regulator on electrically operated windows, is a twelve volt, reversible direction motor with a built-in-circuit breaker and a self-locking gear drive. The motor is secured to the regulator assembly by screws.

The removal and installation procedures are the same for manual or electric window regulators; however, to remove the electric motor assembly from its respective regulator, proceed as follows:

Removal and Installation

1. Remove front door electric motor and regulator assembly and clamp unit in a vise.

CAUTION: Be sure to perform Step 2 and 3 below before attempting to remove motor from regulator. The regulator lift arm, which is under tension from the counterbalance spring, can cause serious injury if motor assembly is removed without locking the sector in position with a nut and bolt.

2. Drill a 1/4" hole through back plate and sector gear, at location dependent upon position of lift arm. Do not drill into motor housing.

3. Insert a 3/16" bolt through hole in back plate and sector and install nut to bolt. Do not tighten nut.

4. Remove motor attaching bolts and remove motor from regulator.

   NOTE: Clean off any steel chips or filings from regulator sector and motor pinion gears.

5. To install, reverse removal procedure. Be sure to remove temporary nut and bolt from regulator before installing same to door.

LOCK CYLINDER ASSEMBLY

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. With a suitable tool, through inner panel access hole, slide lock cylinder retaining clip forward sufficiently to allow removal of cylinder, then remove cylinder and gasket. (Fig. 16-251)

3. To install, reverse removal procedure. Using key, check operation of lock cylinder assembly before installing door trim and inside hardware.

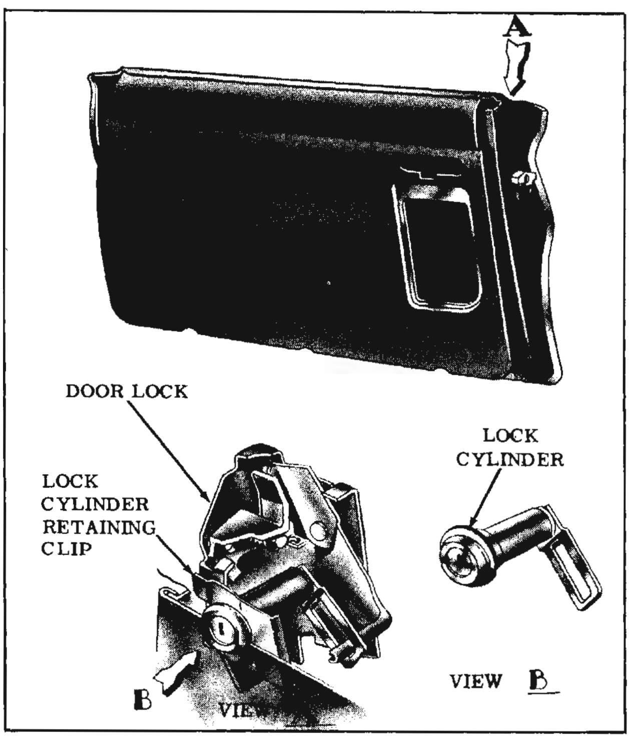


Fig. 16-251 Front Door Lock Cylinder Removal

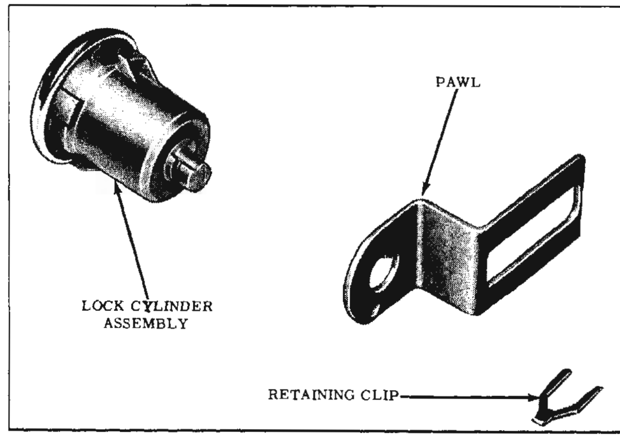


Fig. 16-252 Door Lock Cylinder

Disassembly and Assembly

1. Remove cylinder assembly from door as previously described.

2. With a suitable tool, remove retainer and pawl. (Fig. 16-252)

3. To assemble, reverse disassembly procedure.

   NOTE: The lock cylinder housing scalp used in production is usually damaged when removed and must be replaced by a new scalp available as a service part. The service lock cylinder housing scalp is secured by tabs.

LOCK ASSEMBLY

All locks are the rotary bolt-type lock with the safety interlock feature. With the safety interlock feature, it is very important that the lock extension engages properly in the door lock striker notch and that, where necessary, striker emergency spacers of the proper thickness are used to obtain proper engagement.

Removal and Installation

1. Raise door window, remove door trim assembly and detach inner panel water deflector.

2. With a screwdriver, or other suitable tool, disengage remote control connecting rod from door lock assembly.

3. Remove door lock attaching screws and remove lock assembly through inner panel access hole. (Fig. 16-253)

4. To install, reverse removal procedure. Check all operations of lock assembly before installing inner panel water deflector.

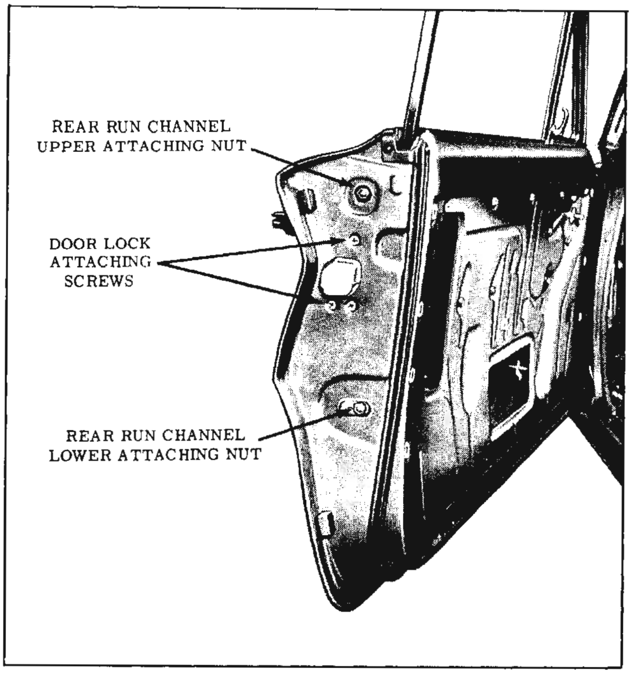


Fig. 16-253 Run Channel and Lock Attachment

WINDOW GLASS RUN CHANNELS ("47" and "67" Styles)

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.
2. Remove door ventilator casting and door ventilator assembly.
3. Remove inner panel cam and door window assembly.

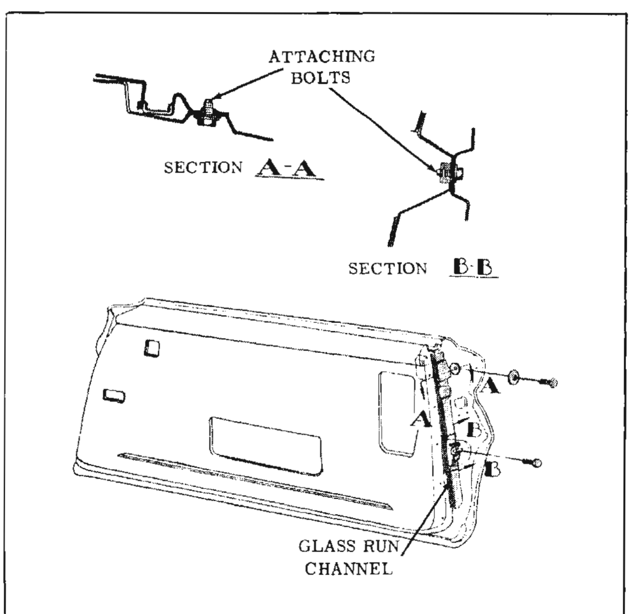


Fig. 16-254 Front Door Glass Run Channel (47 and 67 Styles)

4. Remove bolts securing run channel to lock pillar panel and remove run channel from door. (Fig. 16-254)
5. To install, reverse removal procedure.

WINDOW GLASS RUN CHANNELS (All Except "47" & "67" Styles)

Removal and Installation

1. Remove door trim pad and detach inner panel water deflector.
2. Remove front door window.
3. Press (finger pressure) sides of run channel together and remove assembly from door upper frame. (Fig. 16-255)
4. To install, reverse removal procedure.

REAR DOORS

The rear door assembly is attached to the body center pillar with butt-type hinges. The upper hinge on all styles is secured with screws to an anchor plate at the door hinge pillar and bolts to an upper hinge support at the center pillar. The lower hinge on all styles incorporates an integral type door check and hold-open and is secured with screws to an anchor plate at both the door hinge pillar and center pillar. The rear door assembly may be removed with or without the hinges attached.

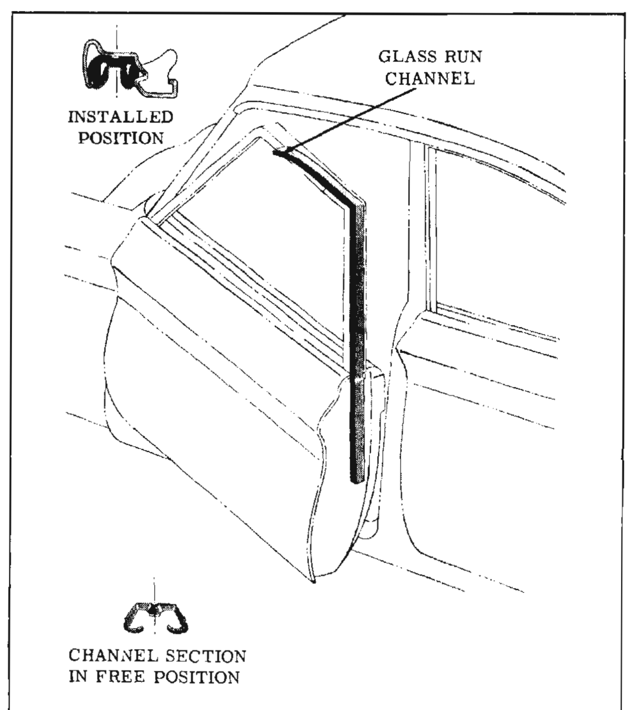


Fig. 16-255 Front Door Glass Run Channel (Except 47 and 67 Styles)

Removal

1. Mark hinge locations on door hinge pillar or center pillar, depending on method of removal being used.

2. With door properly supported, remove upper and lower hinge attaching screws at door hinge pillar or screws and bolts at center pillar, depending on method of removal being used.

3. With aid of a helper, remove door from body opening.

Installation

1. Carefully clean off old sealing compound at hinge areas.

2. As an anti-squeak precaution and to prevent entry of water at hinge attaching locations, apply a coat of heavy bodied sealer to attaching surfaces of hinges. Fig. 16-256 shows location of rear door hinges on center pillar and the necessary sealer application.

3. With the aid of a helper, lift door into position. Attach hinges loosely and align straps within marks on pillar and tighten screws and/or bolts and check door for proper alignment.

Adjustments

The in and out adjustments on the rear door are provided at the door hinge pillar while the up and down or fore and aft adjustments are provided at center pillar. When checking the door for alignment, remove the door lock striker from body pillar to allow door to hang free on its hinges.

1. For in and out adjustment, loosen hinge to door pillar attaching screws. Adjust door as required and tighten screws.

2. To adjust door up or down or fore or aft, loosen hinge to center pillar attaching bolts

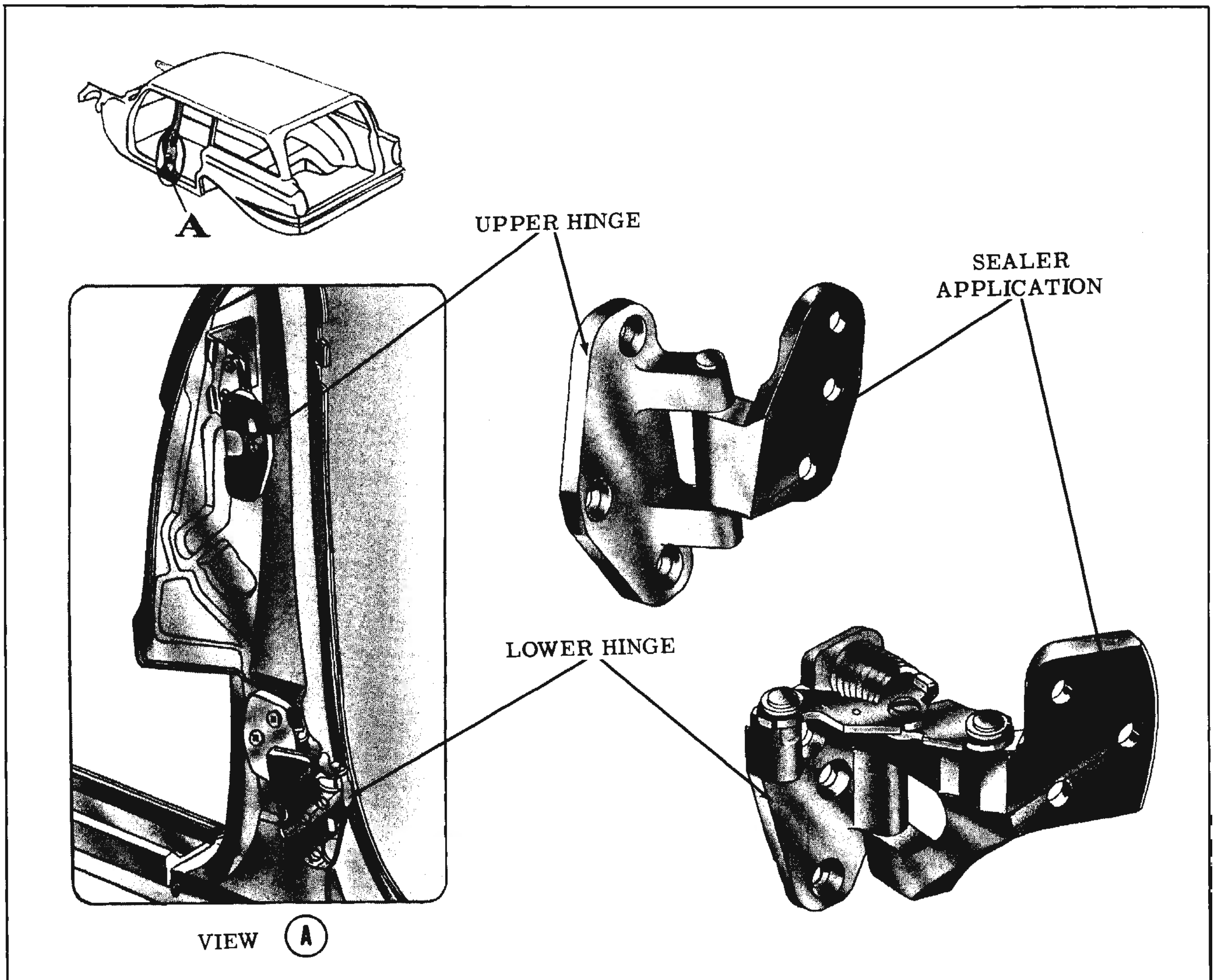


Fig. 16-256 Rear Door Hinge Assemblies

and screws. Adjust door up or down or fore or aft as required and tighten attaching bolts and screws.

NOTE: When performing fore or aft adjustments, adjust one hinge at a time so that the up and down adjustment of door is maintained. After completing any fore or aft adjustments, the rear door upper hinge may have to be adjusted in or out due to the design of the center pillar hinge support.

3. Reinstall door lock striker and check lock extension to striker engagement as described under "Door Lock Striker" - Adjustments.

CAUTION: Use only the recommended procedures for adjusting rear doors. Both the upper and lower hinge assemblies are constructed of die cast aluminum and will break under strain of bending in an attempt to short cut adjustments.

GLASS RUN CHANNEL REAR RETAINER

Removal and Installation

1. Raise rear door window. Remove door trim assembly and detach inner panel water deflector.

2. Remove rear door window glass run channel, rear retainer assembly lower attaching bolt from lock pillar facing of door. (Fig. 16-257)

3. Inside of door, disengage end of window glass run channel from retainer. Then lower retainer to disengage upper end from rear door window frame and remove retainer from door.

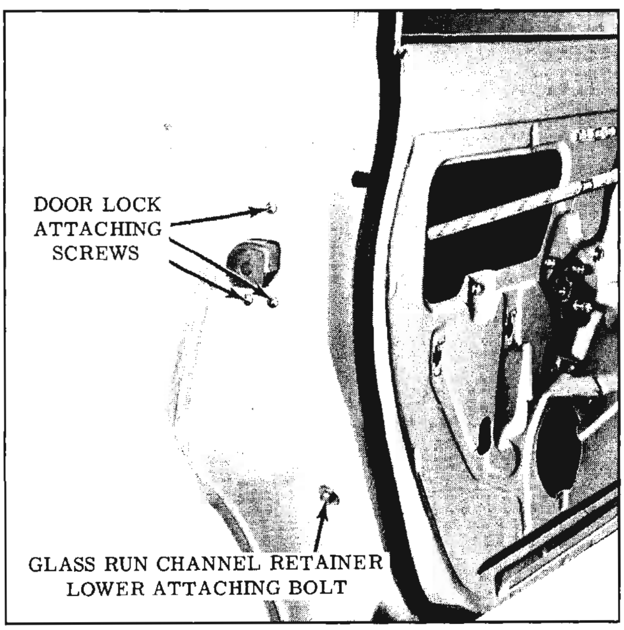


Fig. 16-257 Rear Door Lock and Glass Channel Retainer Attachment

4. To install, reverse removal procedure. Check operation of window assembly and, if required, adjust rear retainer as outlined under "Rear Door Window" - Adjustments.

LOCK ASSEMBLY

Locks are the rotary bolt-type with the safety interlock feature. With the interlock feature it is very important that the lock extension engages properly in the door lock striker notch and that, where necessary, striker emergency spacers of the proper thickness be used to obtain proper engagement.

Removal and Installation

1. Raise rear door window. Remove door trim assembly and detach inner panel water deflector sufficiently to gain access to door lock.

2. Remove rear door window glass run channel retainer assembly.

3. With a screwdriver, or other suitable tool, disengage spring clips and detach inside lock connecting rod and remote control connecting rod from door lock. See "Door Lock Spring Clips".

4. At lock pillar facing, remove door lock attaching screws and remove lock assembly through access hole. (Fig. 16-257)

5. To install door lock, reverse removal procedure. Check all operations of door lock before installing door trim and inside hardware.

REAR DOOR REMOTE CONTROL ASSEMBLY AND CONNECTING ROD

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector sufficiently to gain access to remote control attaching screws. (Fig. 16-258)

2. Remove screws securing remote control assembly to door inner panel and detach remote control from remote control-to-lock connecting rod.

3. Through access hole, disengage rod from lock, see "Door Lock Spring Clips".

4. To install remote control and connecting rod, reverse removal procedure. Position remote control rearward sufficiently to take up slack in linkage so that all clearances are taken out of linkage in a rearward position. Check lock for proper operation before installing inner panel water deflector.

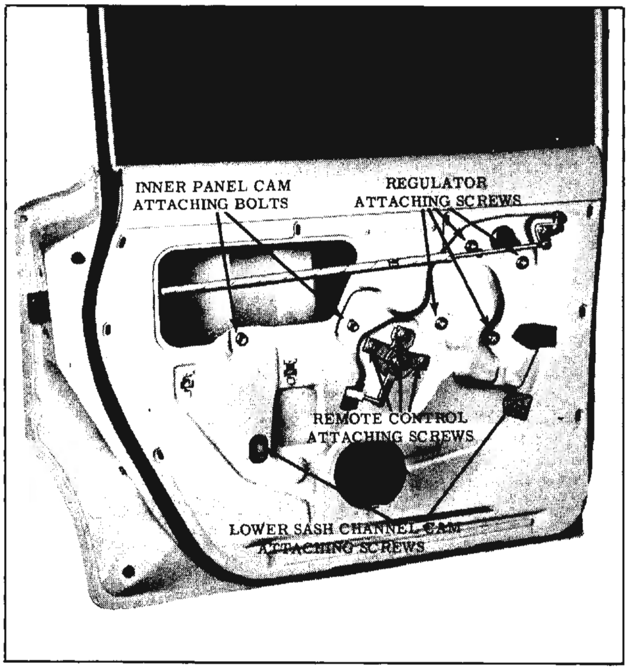


Fig. 16-258 Rear Door Hardware

INSIDE LOCKING ROD

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.
2. Remove locking rod knob from rod.
3. Remove inside locking rod assembly attaching screw and washer and detach connecting rod from clip on inner panel. (Fig. 16-258)
4. Through access hole, disengage spring clip securing inside lock connecting rod from door lock and disengage rod from lock, then remove inside locking rod assembly from door.
5. To install, reverse removal procedure. Check operation of inside locking rod assembly before installing door inner panel water deflector.

INNER PANEL CAM

Removal and Installation

1. Raise door window, remove door trim pad and detach inner panel water deflector sufficiently to expose inner panel cam attaching screws. (Fig. 16-259)
2. Remove cam attaching screws; then disengage cam from window regulator arm roller and remove from door.
3. To install, reverse removal procedure. Prior to installation of inner panel cam, lubricate entire length of cam with 630 AAW Lubriplate or equivalent.

WINDOW LOWER SASH CHANNEL CAM

Removal and Installation

1. Remove door trim assembly and detach inner panel water deflector.
2. Lower door window sufficiently to gain access to sash channel cam attaching screws, through access holes in door inner panel, and remove screws. (Fig. 16-259)
3. While supporting window by hand, carefully disengage cam from window lower sash channel and rollers on window regulator arms and remove from door. Then carefully lower window.
4. To install, reverse removal procedure. Prior to installation, lubricate entire length of window lower sash channel cam with 630 AAW Lubriplate or equivalent. Check operation of window prior to installing inner panel water deflector.

WINDOW ASSEMBLY

The rear door glass is a solid tempered safety plate glass. The glass fits into a lower sash channel assembly which incorporates a screwed-on lower sash channel cam.

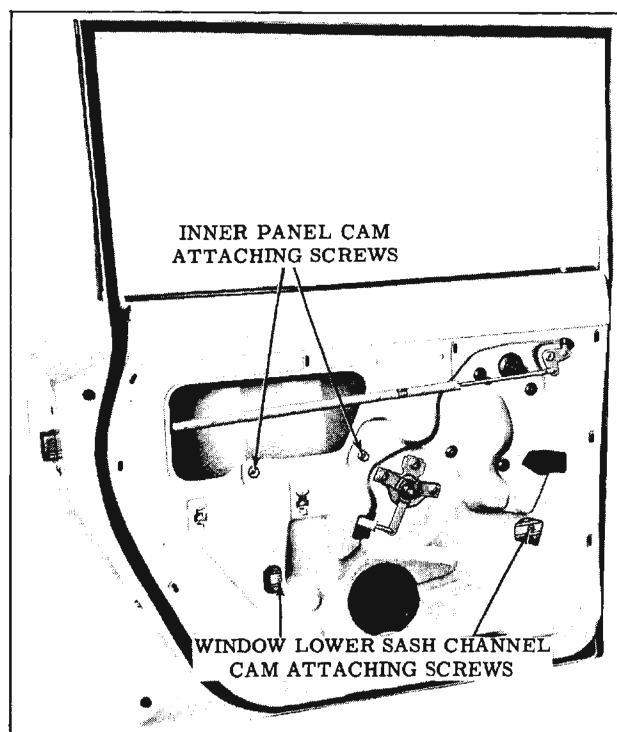


Fig. 16-259 Inner Panel Cam and Window Lower Sash Channel Cam Attachment

CAUTION: Care should be exercised to make certain glass does not strike body metal during installation procedure as edge chips can cause tempered plate glass to shatter. DO NOT attempt to grind glass.

Removal and Installation

1. Raise door window. Remove door trim assembly and detach inner panel water deflector.

2. Remove rear door window glass run channel rear retainer assembly.

3. Carefully lower door window. Through access holes in door inner panel, remove screws securing window lower sash channel cam to window lower sash channel. (Fig. 16-259)

   NOTE: Exercise care when lowering window since rear guide is not present.

4. While supporting window by hand, carefully disengage lower sash channel and window regulator arm rollers and remove cam from door. Disengage spring clips and detach inside lock connecting rod and remote control connecting rod from door lock.

5. Completely lower door window assembly. Tilt front edge of glass upward and carefully lift window upward and outboard to clear window frame and remove from door.

   NOTE: On station wagon styles, tilt rear edge of glass upward and lift window upward and outboard to remove from door.

6. To install, reverse removal procedure. Prior to installation of water deflector, lubricate lower sash channel cam and inner panel cam with 630 AAW Lubriplate or equivalent. Check operation of window and, where required, adjust window assembly as described under "Adjustments".

Adjustments

1. To adjust rear door window in or out, lower door window. Loosen rear glass run channel retainer assembly attaching screw and adjust guide assembly as required and tighten screw. (Fig. 16-257)

2. To correct a condition where the glass is cocked in the glass run channel, loosen door window inner panel cam front and/or rear attaching screw(s), adjust cam as required and tighten screws. (Fig. 16-259)

WINDOW REGULATOR ASSEMBLY

Removal and Installation

1. Remove door trim pad and detach inner panel water deflector.

2. Remove door window lower sash channel cam.

3. Carefully raise door window. Place a protective piece of paper over window frame assembly and door weatherstrip to protect paint and weatherstrip from damage and secure window in the full up position by installing a twelve to fifteen inch piece of body tape (2" or 2-1/2" in width) over window frame and firmly press tape to both sides of glass. This is necessary to positively hold glass in the up position during removal of the window regulator.

4. Remove window regulator attaching screws. Carefully move regulator assembly rearward to disengage regulator arm roller from inner panel cam; then remove regulator from door. (Fig. 16-260)

5. To install, reverse removal procedure. Lubricat cams with 630 AAW Lubriplate or equivalent and check window operation prior to installing water deflector.

REAR DOOR WINDOW GLASS RUN CHANNEL

Removal and Installation

1. Remove rear door trim pad and detach inner panel water deflector.

2. Remove rear door window.

3. With finger pressure, squeeze run channel together at rear end and gently pull run channel out of rear door upper frame. (Fig. 16-261)

4. To install, reverse removal procedure.

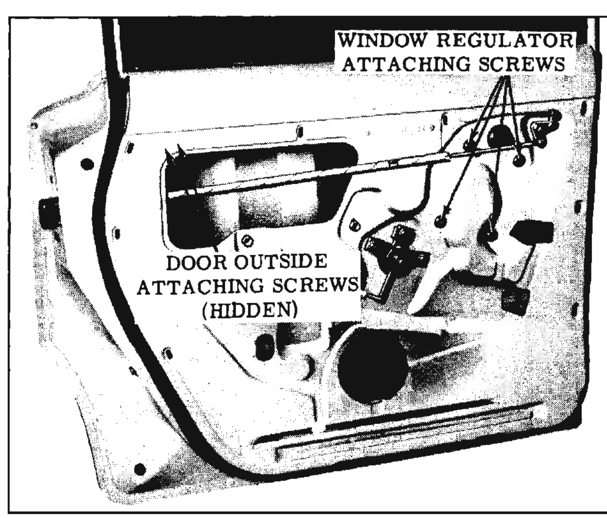


Fig. 16-260 Window Regulator and Outside Handle Attachment

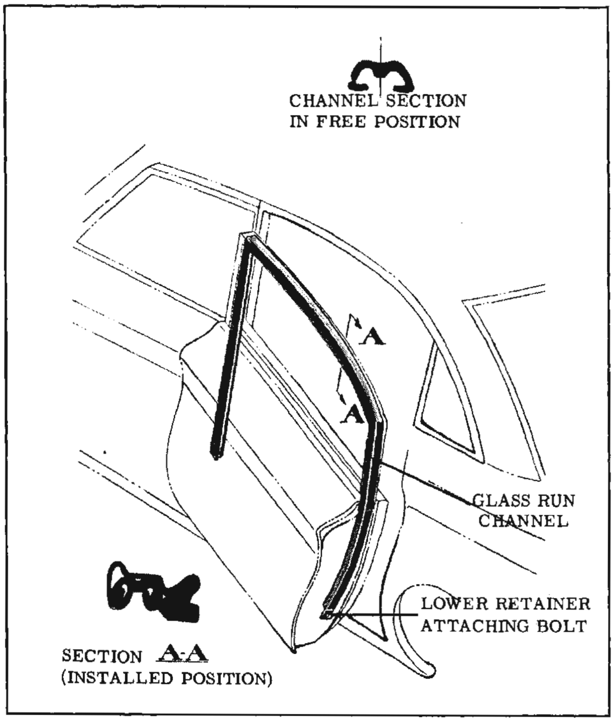


Fig. 16-261 Rear Door Window Glass Run Channel Assembly

IMPORTANT: The glass run channel must be properly seated and conform to shape of door upper frame to achieve proper glass operations.

SIDE ROOF RAIL WEATHERSTRIP ("47" Styles)

The side roof rail weatherstrip assembly is a one-piece type which is secured to the front body hinge pillar. The remainder of the weatherstrip is secured to the side roof rail by a weatherstrip retainer and reveal molding.

Removal

1. Remove snap fastener securing weatherstrip at front body hinge pillar.
2. Carefully disengage inner lip of weatherstrip from retainer. Using a flat-bladed tool, carefully break cement bond between weatherstrip and side roof rail weatherstrip retainer and reveal molding.
3. Remove weatherstrip assembly from body.

Installation

1. Clean off old cement from side roof rail weatherstrip and weatherstrip retainer to insure a clean cementing surface.

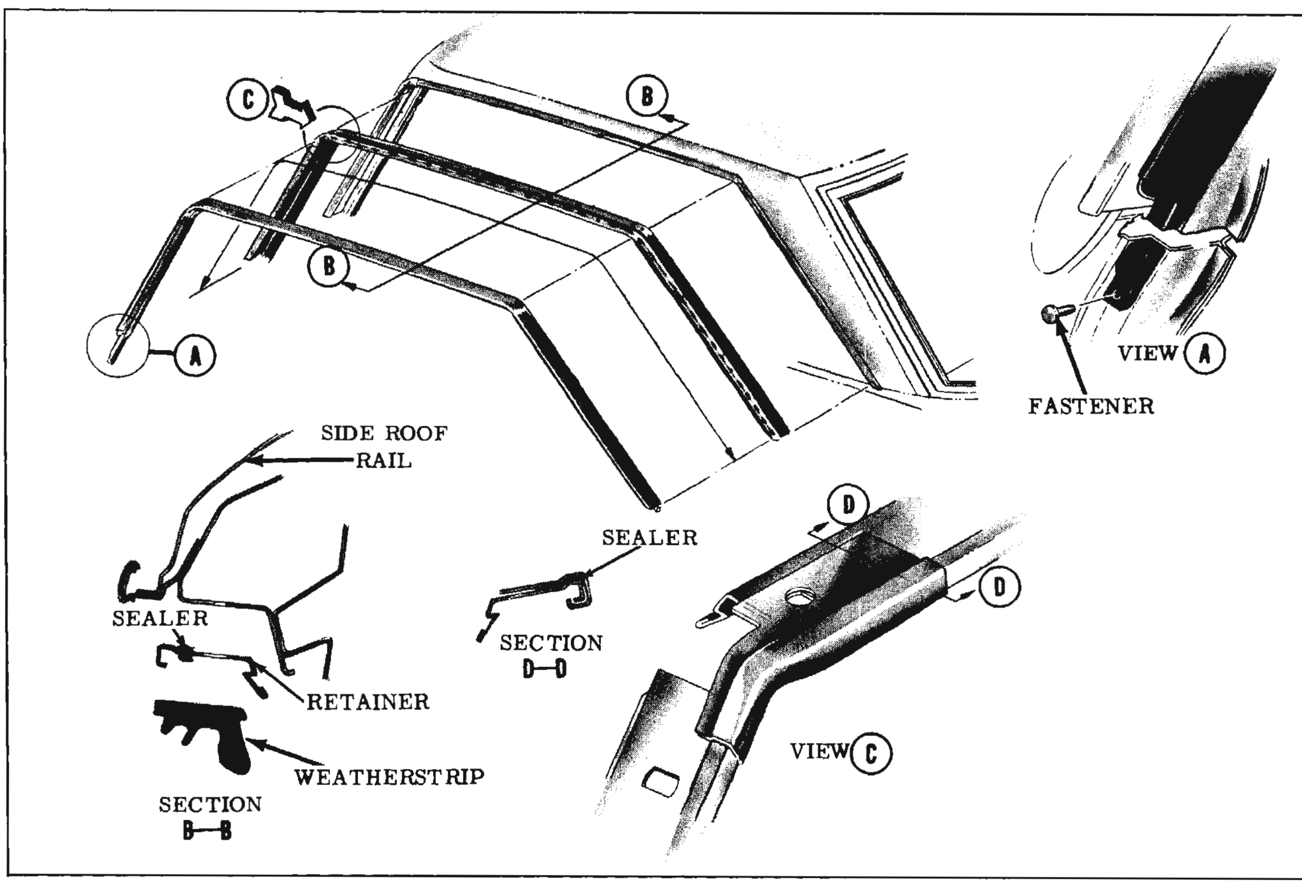


Fig. 16-262 Side Roof Rail Weatherstrip (47 Styles)

2. Apply weatherstrip cement at section joint in retainer as shown in view "C" of Fig. 16-262.

3. Apply a continuous bead (approximately 3/16" diameter) of weatherstrip adhesive along entire outboard surface of side roof rail weatherstrip retainer (section "B-B" in Fig. 16-262).

4. Start at rear end of weatherstrip and carefully engage inboard edge of weatherstrip into weatherstrip retainer. Using a flat-bladed tool, install outboard edge of weatherstrip into weatherstrip retainer.

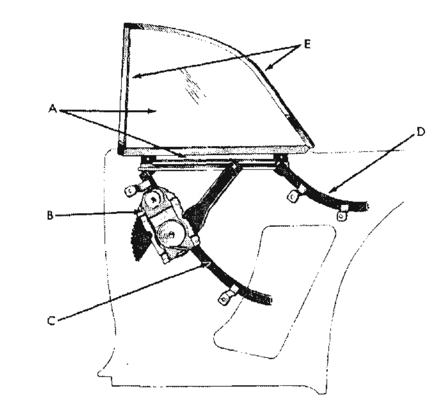
5. Install snap fastener at front body hinge pillar.

Adjustments

With doors and windows closed, front door window upper frame should make an even continuous contact with the side roof rail weatherstrip. If necessary, adjust weatherstrip, ventilator, front door or rear quarter windows to obtain proper weatherstrip contact.

The attaching holes in the side roof rail weatherstrip retainer are elongated allowing "in and out" adjustment of the side roof rail weatherstrip. However, the amount of adjustment is small and is not intended to correct improper ventilator or door window alignment. It is necessary to remove the weatherstrip to adjust the retainer.

IMPORTANT: Before attempting to adjust the side roof rail weatherstrip, first check that the ventilator, front door and rear quarter windows are properly aligned and, where necessary, adjust for proper alignment as directed under ADJUSTMENT OF THE VENTILATOR AND FRONT DOOR WINDOW OR QUARTER WINDOW.



A. REAR QUARTER WINDOW ASSEMBLY (INCLUDES LOWER SASH CHANNEL CAM)
B. REAR QUARTER WINDOW REGULATOR
C. REAR QUARTER WINDOW FRONT GUIDE
D. REAR QUARTER WINDOW REAR GUIDE
E. REAR QUARTER WINDOW GLASS RUN CHANNEL

Fig. 16-263 Rear Quarter Window (17 & 27 Styles)

1. To adjust side roof rail weatherstrip in or out first determine and mark retainer at area or areas to be adjusted.

2. Remove side roof rail weatherstrip.

3. Loosen retainer attaching screws slightly in area to be adjusted and adjust retainer in or out as required.

4. Tighten retainer attaching screws and install side roof rail weatherstrip.

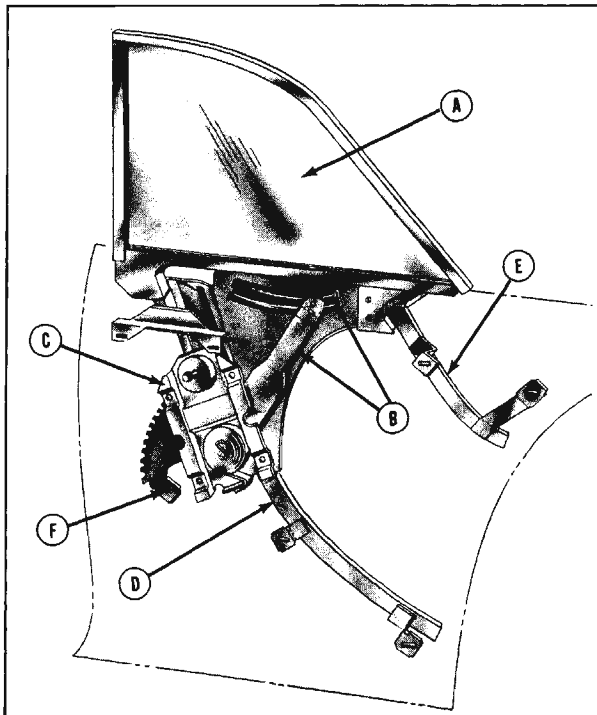
REAR QUARTER

Figures 16-263, 16-264 and 16-265 identify and show the relationship of major components of the rear quarter hardware of "17", "27", "47" and "67" style bodies, which are the only styles incorporating a "dropping" rear quarter window.

TRIM ASSEMBLY ("27" Styles)

Removal and Installation

1. Remove rear seat cushion and back



A. REAR QUARTER WINDOW ASSEMBLY
B. REAR QUARTER WINDOW LOWER SUPPORT ASSEMBLY (INCLUDES LOWER SASH CHANNEL CAM)
C. REAR QUARTER WINDOW REGULATOR
D. REAR QUARTER WINDOW FRONT GUIDE
E. REAR QUARTER WINDOW REAR GUIDE
F. REAR QUARTER WINDOW UP TRAVEL STOP

Fig. 16-264 Rear Quarter Window (47 Styles)

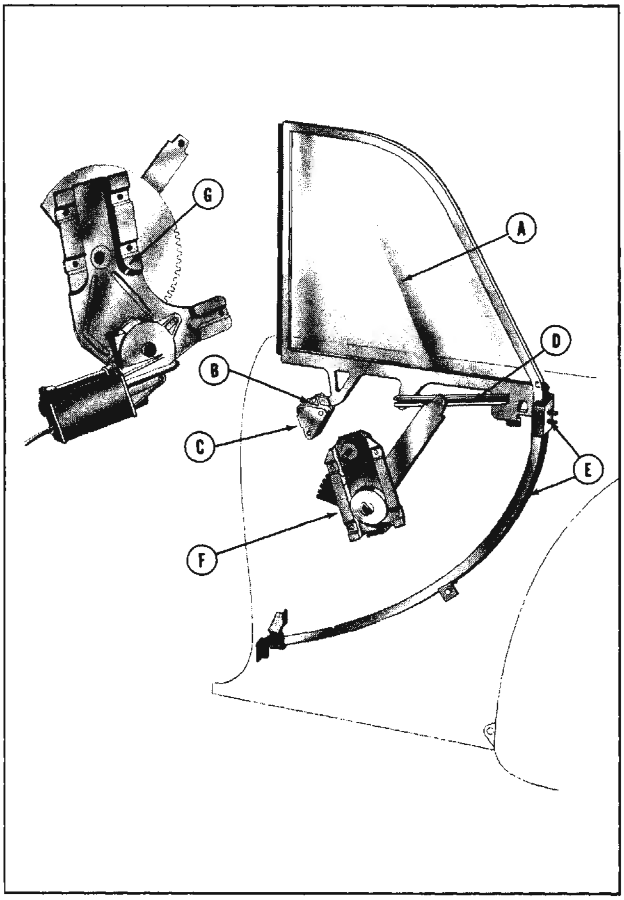


Fig. 16-265 Rear Quarter Window (67 Styles)

assemblies. Remove window regulator handle. Where present, remove arm rest assembly.

2. Remove (2) most rearward screws from rear

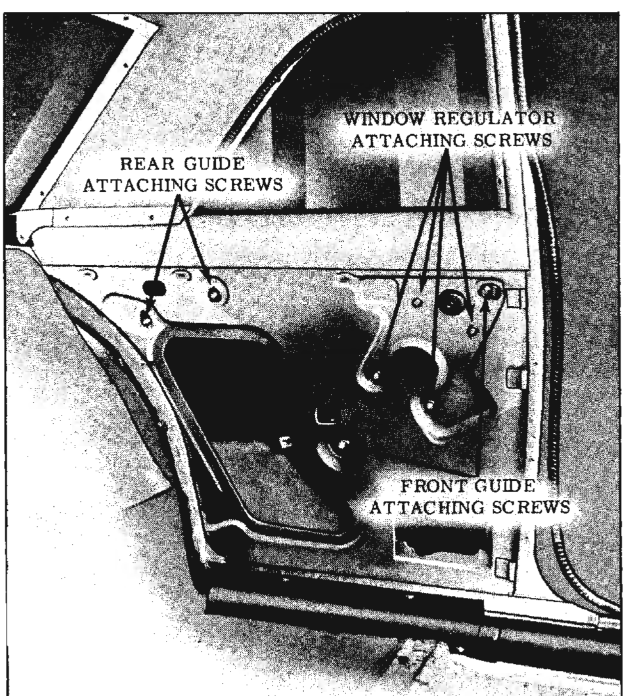


Fig. 16-266 Rear Quarter Hardware (17 & 27 Styles)

section of door sill plate. Disengage pinchweld finishing strip from beneath door sill plate and pinchweld flange to a point above belt line (Fig. 16-266)

3. Using trim pad removing Tool J-6335, disengage trim pad retaining nails from inner panel along upper edge of trim assembly.

   NOTE: Protect paint on adjacent surfaces.

4. Pivot trim assembly forward using forward edge, which overlaps pinchweld flange and is cemented to pinchweld outboard face, as a hinge.

5. By carefully pressing outboard, break cement bond between trim assembly forward edge and pinchweld flange. Remove trim assembly from body.

6. To install, reverse removal procedure. Prior to installation of pinchweld finishing strip, recement overlapping forward edge of trim assembly to pinchweld flange outboard surface.

TRIM ASSEMBLY ("17" Styles)

Removal and Installation

1. Remove rear seat cushion and back assemblies. On styles equipped with manual windows, remove window regulator handle.

2. Remove seat back filler panel and arm rest assembly attaching screws and remove assemblies from body.

3. Disengage pinchweld finishing strip from pinchweld flange immediately adjacent to trim assembly upper section.

4. Using trim pad removing tool J-6335, disengage trim assembly retaining nails from inner panel along upper edge of trim assembly.

   NOTE: Protect paint on adjacent surfaces.

5. Pivot trim assembly forward using forward edge, which overlaps pinchweld flange and is cemented to pinchweld outboard surface, as a hinge.

6. By carefully pressing outboard, break cement bond between trim assembly forward edge and pinchweld flange. Remove trim assembly from body.

7. To install, reverse removal procedure. Prior to installation of pinchweld finishing strip, recement overlapping edge of trim assembly to pinchweld flange outboard surface.

REAR QUARTER WINDOW ("17" & "27" Styles)

Removal and Installation

1. Remove rear quarter trim assembly and inner panel access hole cover. Remove rear quarter window inner sealing strip.

2. With window in up position, remove rear quarter window rear guide attaching screws (Fig. 16-266) and remove rear guide.

3. Lower rear quarter window sufficiently to tilt window rearward to disengage roller on window regulator lift arm from lower sash channel cam.

4. Lift rear quarter window upward and inboard to disengage roller on window lower sash channel from front guide. Remove rear quarter window from body.

5. To install, reverse removal procedure. Prior to installation, lubricate channel of lower sash channel cam with Lubriplate or its equivalent.

Adjust rear quarter window for proper alignment as described under "Rear Quarter Window Adjustments" for "17" and "27" styles.

Seal large access hole and hardware attaching locations as specified under "Rear Quarter Inner Panel Sealing" for "17" and "27" styles.

WINDOW ADJUSTMENTS ("17" & "27" Styles)

Both the rear quarter window front and rear guides are adjustable to provide proper seating of the window in the glass run channel and to provide proper operation of the window. When performing adjustments, make certain window and guides are as far forward and upward as possible to prevent front edge of window from coming out of run channel during "down" cycle.

To adjust rear quarter window, remove rear quarter trim assembly. Loosen both front and rear guide attaching screws (Fig. 16-266). Operate window to full up position, making sure window is all the way forward and up into the run channels. Install wrench on front guide upper attaching screw and tighten screw while forcing screw and guide as far forward as possible. Repeat procedure on lower attaching screw. Install wrench to forward attaching screw of rear guide and tighten screw while forcing screw and guide as far upward as possible. Lower window to full down position and tighten rear attaching screw.

NOTE: After performing window adjustments, seal all hardware attaching screw locations which have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "17" and "27" styles.

WINDOW REGULATOR ("17" & "27" Styles)

Removal and Installation

1. Remove rear quarter window assembly.

2. Loosen rear quarter window front guide upper attaching bolt (Fig. 16-266).

   NOTE: On styles equipped with electric window regulators, disconnect feed wire connector from regulator motor.

3. Remove window regulator attaching screws (Fig. 16-266) and remove regulator through access hole.

4. To install, reverse removal procedure. Seal all hardware attaching locations that have been disturbed as specified under "Rear Quarter Inner Panel Sealing" for "17" and "27" styles.

WINDOW REGULATOR ELECTRIC MOTOR ASSEMBLY ("17", "47" & "67" Styles)

Removal and Installation

1. Remove rear quarter window regulator as specified under "Rear Quarter Window Regulator - Removal and Installation".

2. Place regulator in a vise as shown in Fig. 16-267 for "17" and "47" styles, Fig. 16-268 for "67" styles.

   CAUTION: Be sure to perform steps 3 and 4 before attempting to remove motor from regulator. The regulator lift arm, which is under tension from the counter balance spring, can cause serious injury if the motor is removed before the sector is secured in position.

3. Drill a 1/4 inch hole through regulator backplate and sector in approximately one of the locations indicated by crosses. (Fig. 16-267 for "17" and "47" styles; Fig. 16-268 for "67" styles).

   NOTE: Do not locate hole less than 1/2 inch away from edge of backplate, sector or holes in backplate and sector. Do not use holes in backplate and sector as they are too large and locking bolt can slip out.

4. Insert a 3/16 inch bolt through hole drilled in backplate and sector and loosely install nut to bolt.

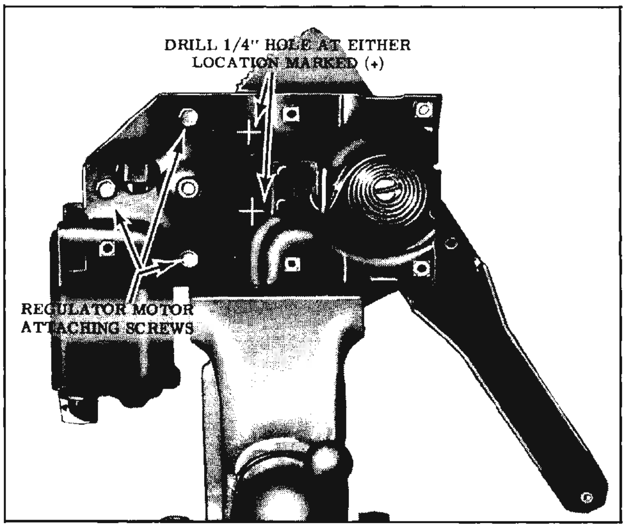


Fig. 16-267 Electric Window Regulator (17 & 47 Styles)

5. Remove motor attaching bolts and remove motor assembly from regulator.

   NOTE: Clean off steel chips from regulator sector and motor pinion gear after drilling operation.

6. To install regulator motor assembly, reverse removal procedure.

   NOTE: Be sure to remove nut and bolt locking sector to backplate after motor is installed to regulator.

WINDOW FRONT GUIDE ("17" & "27" Styles)

Removal and Installation

1. Raise window to full up position. Remove

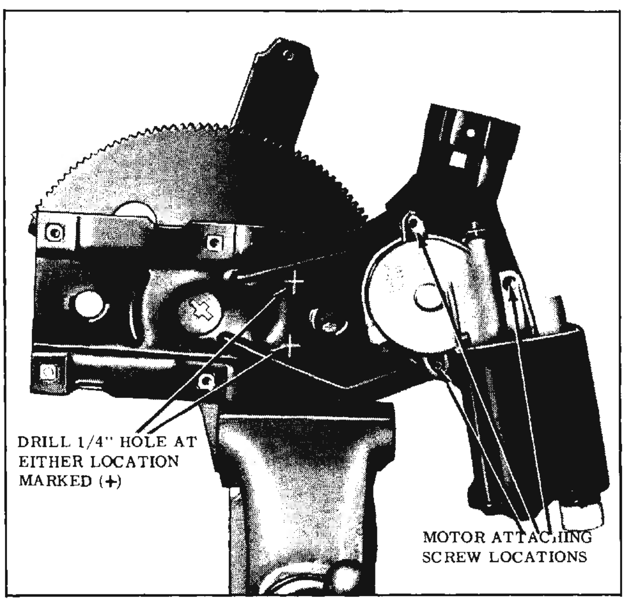


Fig. 16-268 Electric Window Regulator (67 Style)

rear quarter trim assembly and inner panel access hole cover.

2. Remove rear quarter window front guide attaching bolts (Fig. 16-266). Disengage guide from roller on window lower sash channel and remove guide through access hole.

3. To install, reverse removal procedure. Prior to installation, lubricate channel portion of guide with Lubriplate or its equivalent.

Seal all hardware attaching locations, which have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "17" and "27" styles.

WINDOW REAR GUIDE ("17" & "27" Styles)

Removal and Installation

1. Raise window to full up position. Remove rear quarter trim assembly and inner panel access hole cover.

2. Remove rear quarter window rear guide attaching bolts. (Fig. 16-266) Disengage guide from roller on window lower sash channel cam and remove guide through access hole.

3. To install, reverse removal procedure. Prior to installation, lubricate channel portion of guide with Lubriplate or its equivalent.

Seal all hardware attaching locations, which have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "17" and "27" styles.

WINDOW GLASS RUN CHANNEL ("17" & "27" Styles)

Removal and Installation

1. Lower rear quarter window. Remove rear quarter window front and upper garnish moldings.

2. Carefully pry glass run channel to disengage plastic snap-in-type fasteners from upper body lock pillar and inner side roof rail. Remove channel from window opening.

3. To install, reverse removal procedure. Prior to installation, apply a continuous bead of body caulking compound to rabbet of body lock pillar upper and side roof rail flanges to effect a weathertight seal.

REAR QUARTER WINDOW INNER AND OUTER SEALING STRIPS ("17" & "27" Styles)

The rear quarter window sealing strips are secured by integral clips inserted in slots in the rear quarter inner and outer panel return flanges.

To remove either the inner or outer strip, insert a thin hooked tool (Reveal Molding Tool J-7898-01) between the rear quarter panel return flange and the sealing strip. (Fig. 16-269) Engage point of tool with clip and lift upward to disengage clip from slot. Repeat procedure at each clip location and remove strip assembly.

To install, reverse removal procedure.

NOTE: Use care not to damage painted surfaces or rear quarter window glass. Prior to removal place protective covering over adjacent painted surfaces.

REAR QUARTER ARM REST ASSEMBLY ("47" Styles)

Removal and Installation

1. Remove rear seat cushion and seat back assemblies. Remove seat back filler panel.
2. Remove arm rest assembly front and rear attaching screws and remove arm rest assembly from body.

To install, reverse removal procedure.

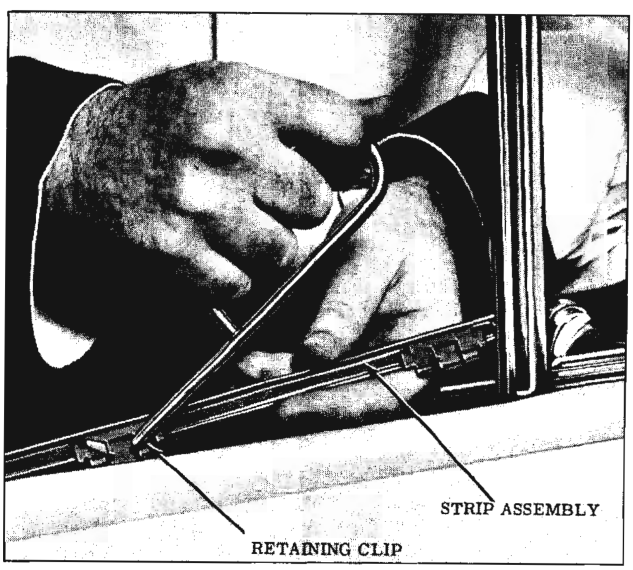


Fig. 16-269 Door Window Glass Run Channel Inner and Outer Strip Assemblies (Outer Strip Shown - Inner Typical)

REAR QUARTER TRIM ASSEMBLY ("47" Styles)

Removal and Installation

1. Remove rear quarter arm rest assembly as previously described.
2. Disengage pinchweld finishing strip from pinchweld flange adjacent to trim assembly.
3. Using trim pad removing tool J-6335, disengage trim assembly retaining nails from inner panel along trim assembly upper edge.

   NOTE: Prior to removal, apply masking tape to adjacent surfaces to protect paint.

4. Pivot trim assembly forward using forward edge, which overlaps pinchweld and is cemented to pinchweld flange outboard surface, as a hinge (View "A", Fig. 16-270)
5. Carefully break cement bond between trim assembly forward edge and pinchweld flange by gently pressing trim outboard. Remove trim assembly from body.
6. To install, reverse removal procedure. Prior to installation of pinchweld finishing strip, re-cement overlapping forward edge of trim assembly to pinchweld flange outboard surface.

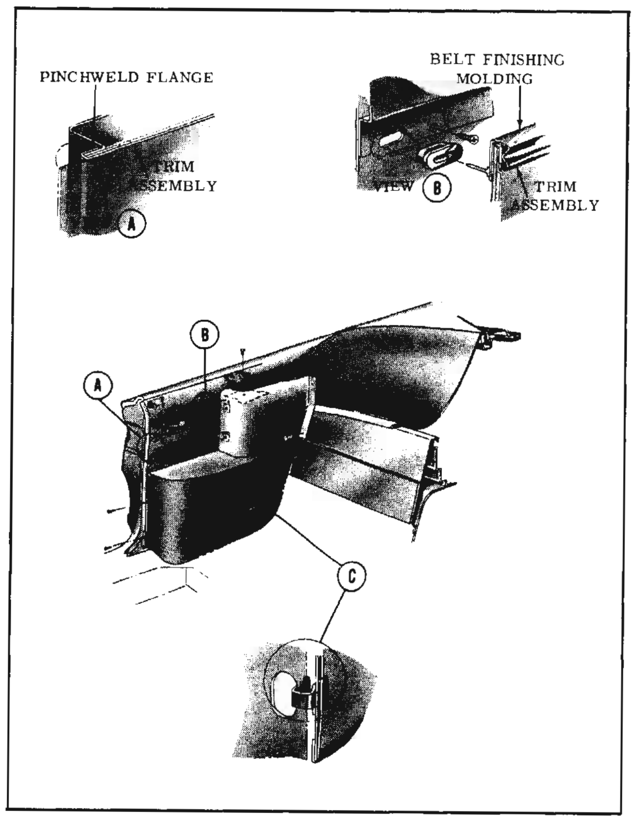


Fig. 16-270 Rear Quarter Trim Assemblies

REAR QUARTER WINDOW ("47" Styles)

Removal and Installation

1. Remove rear quarter trim assembly. Remove large inner panel access hole cover.

2. Operate window to almost full down position. Remove window lower sash channel-to-lower support assembly attaching screws. (Fig. 16-271)

3. Operate window to half up position. Disengage window assembly from lower support assembly and lift window from between the panels.

4. To install, reverse removal procedure.

REAR QUARTER WINDOW ADJUSTMENTS ("47" Styles)

Both the rear quarter window front and rear guides are adjustable to provide proper seating of the window in the glass run channel and to provide proper operation of the window.

To adjust rear quarter window fore or aft, loosen front guide adjusting stud nuts and rear guide attaching screws. (Fig. 16-271) Position window assembly fore or aft as desired, then tighten the nuts and screws.

To adjust rear quarter window in or out, loosen front guide adjusting stud nuts. (Fig. 16-271) Adjust studs in or out, as required, then tighten stud nuts.

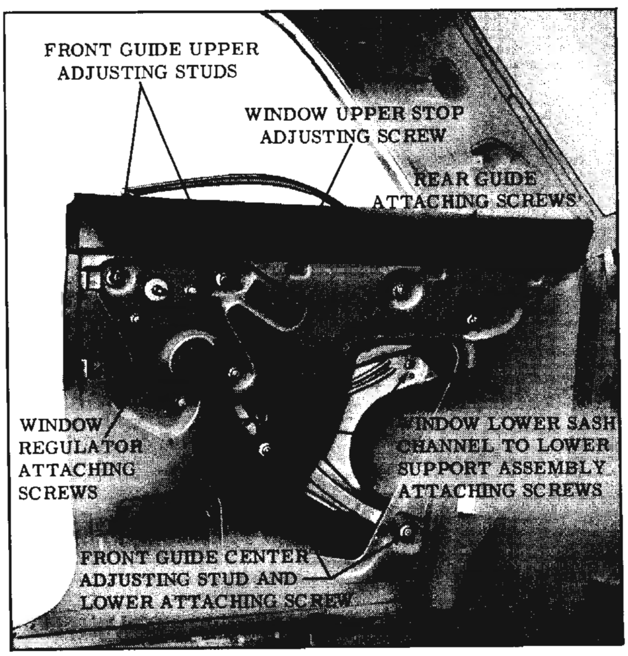


Fig. 16-271 Rear Quarter Hardware (47 Styles)

To adjust top of rear quarter window in or out, loosen front guide center adjusting stud nut. (Fig. 16-271) Adjust stud in or out as required, then tighten stud nut.

To limit the forward and upward travel of the rear quarter window, adjust the window regulator up travel stop.

To relieve a "bind" between the guides, loosen front guide adjusting stud nuts and rear guide attaching screws. (Fig. 16-271) Operate window to full up position and tighten front guide upper adjusting stud nuts and rear guide forward attaching screw. Operate window to full down position and tighten remaining stud nuts and screws.

NOTE: After performing window adjustments, seal hardware attaching locations, which have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "47" styles.

REAR QUARTER WINDOW LOWER SUPPORT ASSEMBLY OR FRONT GUIDE ("47" Styles)

Removal and Installation

1. Remove rear quarter trim assembly and inner panel access hole cover.

2. Remove rear quarter window and rear quarter window rear guide. (Fig. 16-271)

3. Remove front guide adjusting stud nuts and disengage front guide and lower support assembly plate, as an assembly, from inner panel.

4. Disengage roller on regulator lift arm from cam on lower support assembly. Still working between the panels, disengage lower support assembly from front guide by running support plate rollers out at top of guide. Remove lower support assembly or front guide through access hole.

5. To install, reverse removal procedure. Prior to installation, lubricate channel portion of sash channel cam and front guide with Lubriplate or its equivalent. Seal all hardware attaching locations, which have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "47" styles.

REAR QUARTER WINDOW REAR GUIDE ("47" Styles)

Removal and Installation

1. Remove rear quarter trim assembly and inner panel access hole cover.

2. Remove rear quarter window rear guide attaching screws. (Fig. 16-271) Disengage guide from roller on lower support assembly and remove guide through access hole.

3. To install, reverse removal procedure. Prior to installation, lubricate channel portion of guide with Lubriplate or its equivalent.

Seal all hardware attaching locations, which have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "47" styles.

REAR QUARTER WINDOW REGULATOR ("47" Styles)

Removal and Installation

1. Remove rear quarter trim assembly and inner panel access hole cover.

2. Remove rear quarter window and rear quarter window rear guide.

3. Remove front guide adjusting stud nuts (Fig. 16-271) and disengage front guide and lower support assembly, as an assembly, from inner panel.

   Disengage roller on regulator lift arm from cam on lower support assembly.

   NOTE: On styles equipped with electric window regulators, disconnect wire harness connector from regulator motor.

4. Remove window regulator attaching screws (Fig. 16-271) and remove regulator through access hole.

5. To install, reverse removal procedure. Seal all hardware attaching locations that have been disturbed as specified under "Rear Quarter Inner Panel Sealing" for "47" styles.

FOLDING TOP COMPARTMENT SIDE TRIM PANEL ASSEMBLY ("67" Styles)

Removal and Installation

1. Remove rear seat cushion and back assemblies. Remove window regulator handle.

2. Remove screws securing folding top compartment side trim panel assembly. (Fig. 16-270) Disengage side trim panel assembly retainer from folding top compartment brace. Disconnect electrical leads, where present, and remove side trim panel assembly.

3. Disengage pinchweld finishing strip from pinchweld flange immediately adjacent to trim assembly upper section. Using trim pad removing tool J-6335, disengage trim assembly retaining nails from inner panel along upper edge of trim assembly (View "B", Fig. 16-270).

4. Pivot rear edge of trim assembly forward, using forward edge, which overlaps pinchweld and is cemented to pinchweld flange outboard surface, as a hinge (View "A", Fig. 16-270).

5. Carefully break cement bond between trim assembly forward edge and pinchweld flange by gently pressing trim assembly forward edge outward. Remove trim assembly upper section from body.

6. To install, reverse removal procedure. Prior to installation of pinchweld finishing strip, recement overlapping forward edge of trim assembly to pinchweld flange outboard surface.

REAR QUARTER WINDOW ASSEMBLY ("67" Styles)

Removal and Installation

1. Lower folding top and operate rear quarter window to half-down position. Remove rear seat cushion and back assemblies. Remove folding top compartment side trim panel and rear quarter trim assemblies.

2. Remove window pivot bolt (Fig. 16-272).

   Disengage window male hinge from female hinge plate, then raise window to disengage

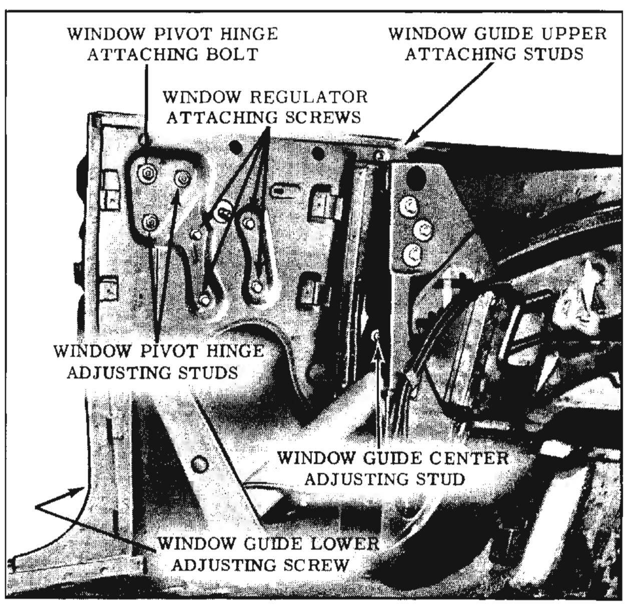


Fig. 16-272 Rear Quarter Hardware (67 Styles)

lower sash channel cam from roller on window regulator lift arm and remove window.

3. To install, reverse removal procedure. Prior to installation, lubricate pivot hinge and lower sash channel cam, with Lubriplate or its equivalent.

REAR QUARTER WINDOW ADJUSTMENTS

To adjust the forward travel and up travel of the rear quarter window, loosen the window guide upper attaching stud nuts. (Fig. 16-272) Adjust upper stop to desired position and tighten guide attaching screws.

To adjust the rear quarter window up or down, fore or aft or the top or the rear of the window in or out, the rear quarter trim assemblies must be removed to gain access to the pivot bolt and adjusting studs.

1. Up or down or fore or aft adjustment: Loosen pivot bolt and both adjusting stud nuts. (Fig. 16-272) Position window, as required, and tighten pivot bolt and stud nuts.

2. Top of window in or out adjustment: Loosen lower adjusting stud nut and slightly loosen rear stud nut. (Fig. 16-272) Adjust lower stud in or out, as required, then tighten both stud nuts.

3. Rear of window in or out adjustment: Loosen pivot hinge rear adjusting stud nut and slightly loosen lower adjusting stud nut. (Fig. 16-272) Loosen window guide upper and center attaching screws. Adjust rear adjusting stud in or out, as required, then tighten both stud nuts. Adjust window guide for proper alignment with window and tighten guide upper and center attaching screws.

   NOTE: After performing window adjustments, seal all hardware attaching locations that have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "67" styles.

REAR QUARTER WINDOW REGULATOR ("67" Styles)

Removal and Installation

1. Remove rear seat cushion and back assemblies and rear quarter trim assemblies.

2. Remove rear quarter inner panel access hole cover. Operate window to full up and prop in that position.

3. Remove window regulator attaching screws. (Fig. 16-272) Disengage roller on regulator lift arm from window lower sash channel cam and remove regulator through access hole.

4. To install, reverse removal procedure.

Lubricate regulator sector, window cam, and pivot hinge with Lubriplate or its equivalent.

Seal all hardware attaching locations that have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "67" Styles.

REAR QUARTER WINDOW GUIDE ("67" Styles)

Removal and Installation

1. Remove rear quarter window assembly. Remove window outer sealing strip and access hole cover.

2. Remove window guide upper, center, and lower attaching stud nuts and screws. (Fig. 16-272)

3. Remove window guide from body by working it out from between the panels at the belt line. To clear guide center support at belt, rotate guide so that lower end protrudes through access hole.

4. To install, reverse removal procedure. Adjust window guide for proper window alignment as specified in "Rear Quarter Window Adjustments for "67" Styles.

Seal all hardware attaching locations that have been disturbed, as specified under "Rear Quarter Inner Panel Sealing" for "67" styles.

REAR QUARTER INNER PANEL SEALING

Whenever the rear quarter inner panel seals have been disturbed, the area must be resealed before the rear quarter trim is reinstalled. Following are the rear quarter inner panel openings and hardware attaching locations that must be sealed to prevent water leakage and possible trim damage.

NOTE: When body caulking compound is used, work compound firmly to metal surfaces and feather-edge out to obtain good adhesion.

The number references in Figures 16-273 and 16-274 correspond to the following item numbers:

1. Large and Small Access Hole Covers:
   Prior to installation of access hole cover apply a bead of body caulking compound (approximately 1/8" in diameter) across top and down sides of quarter inner panel along flange

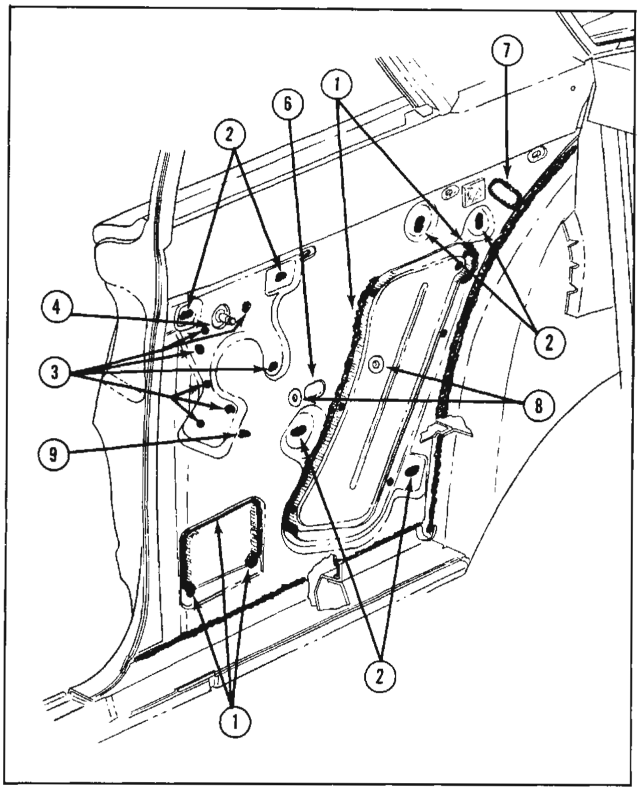


Fig. 16-273 Inner Panel Sealing (17, 27 & 47 Styles)

contacted by cover. After installation of cover, apply another bead of body caulking compound down the sides sealing cover to inner panel. Make certain to seal cover attaching screw locations and where cover flange transition to inside of quarter panel occurs.

2. Window Guide Attaching Screws:
Apply body caulking compound over window guide attaching screws and holes. Firmly press compound to assure a good bond and watertight seal.

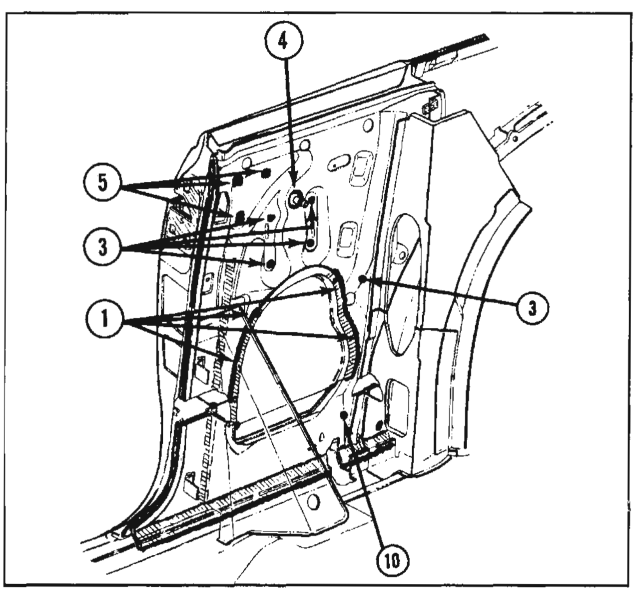


Fig. 16-274 Inner Panel Sealing (67 Styles)

3. Window Regulator Attaching Screws:
Apply neoprene type weatherstrip adhesive (yellow) over attaching screws. On both manual and electric windows apply body caulking compound to unused regulator attaching screw holes.

4. Window Regulator Spindle Hole:
   a. On manual styles apply neoprene type weatherstrip adhesive over exposed surface of spindle hole sealing washer to seal pores of sponge rubber and joint between washer and inner panel.

   b. On all styles with electric windows, apply neoprene type weatherstrip adhesive around spindle hole. Apply a piece of waterproof body tape over adhesive and spindle hole to effect a watertight seal. On "17", "27" and "47" styles with electric windows, apply a bead of black weatherstrip adhesive to bottom edge of tape and window switch protector cover to affect a watertight seal.

5. Window Hinge Attaching Screws ("67" Style Only):
Apply body caulking compound over hinge attaching screws. Press compound firmly to assure a good bond and watertight seal.

6. Sash Channel Cam Attaching Screw Access Hole:
Apply 3" piece of waterproof body tape over hole. Pull or roll out tape to remove wrinkles and assure a good bond.

7. Welding Inspection Hole Sealing Plug:
Apply neoprene weatherstrip adhesive (yellow) around edges of sealing plug to effect a watertight seal.

8. Arm Rest Anchor Nut:
Apply body caulking compound over anchor nut and hole to effect a seal around anchor nut, hole, and attaching screw when arm rest is installed.

9. Window Regulator Lift Arm Up Travel Stop Attaching Screw:
Apply waterproof body tape over lower half of up travel stop to channel any moisture into drain slot directly below stop.

10. Wire Harness and Grommet Hole (Styles with Electrically Operated Windows):
Apply black weatherstrip adhesive around the grommet and wire to effect a seal between wire and grommet and between grommet and inner panel.

REAR QUARTER WINDOW ("19" & "35" Styles)

Removal and Installation

1. On sedan styles, remove rear seat cushion and back. On station wagon styles, remove back body opening upper finishing panel. On all styles remove rear quarter window garnish moldings and belt finishing moldings.

2. Remove retainers securing glass and rubber channel, then from outside of body carefully push glass and rubber channel assembly from body opening. Remove rubber channel from glass.

3. To install rear quarter window, first clean off all old sealer from rubber channel and window opening rabbet. Install rubber channel to window. Apply a bead of medium-bodied sealer to wall of window opening rabbet, completely around window opening to effect a seal between body and rubber channel ("1" in Fig. 16-275 for "19" styles, and Fig. 16-276 for "35" styles).

4. Position window assembly into opening and loosely install window retainers. Using a pressure type applicator, apply weatherstrip adhesive (black) between rubber channel and outside surface of glass ("2" in Fig. 16-275 for "19" styles and Fig. 16-276 for "35" styles).

5. Tighten retainers and clean off excess sealer. Install previously removed parts.

QUARTER TRIM PANELS—FRONT AND REAR ("35" Styles)

Removal and Installation—Front Trim Panel

1. Remove rear quarter window front garnish molding and rear trim panel front attaching screw.

2. Remove front trim panel attaching screws and remove panel.

3. To install front trim panel, reverse removal procedure.

Removal and Installation—Rear Trim Panel

1. Loosen rear quarter window front garnish molding rear attaching screw and remove rear garnish molding.

2. Remove rear trim panel attaching screws and remove panel.

3. To install rear trim panel, reverse removal procedure.

REAR WHEELHOUSE TRIM ("35" Styles)

Removal and Installation

1. Remove rear quarter front and rear trim assemblies.

2. Remove screw securing rear floor filler panel to rear compartment floor panel and fold filler panel forward.

3. Remove rear compartment floor panel, spare tire cover panel, and floor compartment side panel (See "Folding Seat Back and Rear Compartment Floor Panels" in Seat Section).

4. Carefully detach wheelhouse trim from cemented areas of quarter panel, wheelhouse, and floor pan; then remove trim.

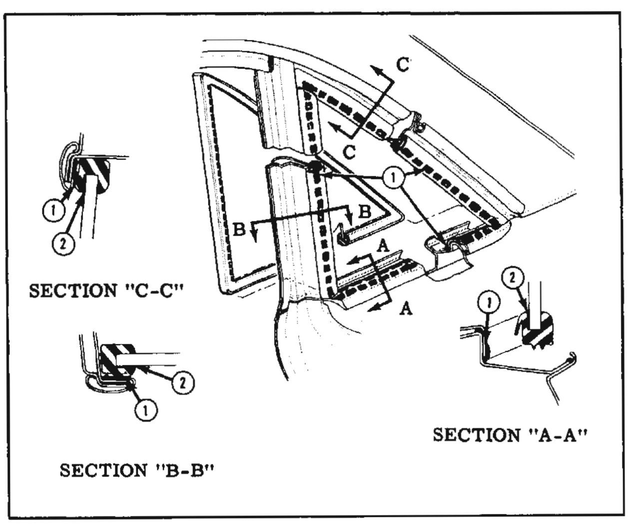


Fig. 16-275 Rear Quarter Window Sealing

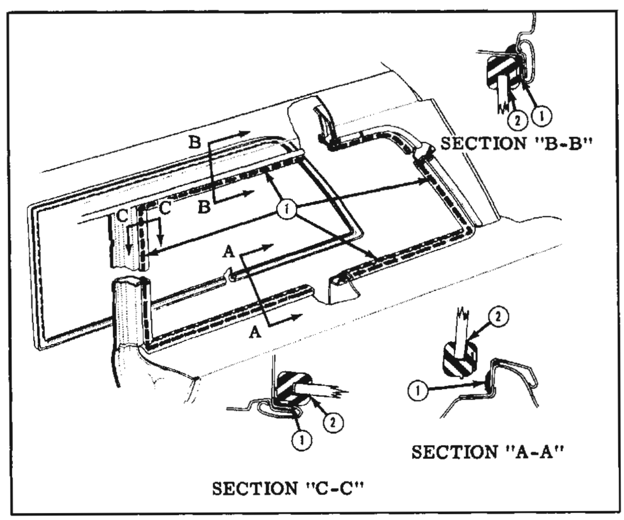


Fig. 16-276 Quarter Window Sealing (35 Style)

5. To install rear wheelhouse trim, apply trim cement to contacting surfaces of trim and body panels; then install trim to wheelhouse, making sure trim is properly positioned and free of wrinkles. Install previously removed parts.

POWER OPERATED WINDOWS

DESCRIPTION

The wiring harness for the electrically operated windows consists of four (4) major sections.

FRONT CROSS-OVER HARNESS

The two (2) piece harness is installed beneath the instrument panel and completes the circuit from the right door to the left door windows and has a multiple connector located in the center. The front harness also includes the wiring for the rear quarter windows. (Fig. 16-277)

To remove the cross-over harness, disconnect the multiple connector and remove each section from its respective side.

REAR QUARTER WINDOW HARNESS

A separate harness controls the operation of the right and left rear quarter windows. The right and left harnesses are connected to the cross-over harness beneath the outer ends of the instrument panel. (Fig. 16-278)

The power windows are operated by a rectangular shaped 12 volt series wound motor with an internal circuit breaker and a self-locking rubber-coupled gear drive. The harness-to-window motor connector is designed with a locking embossment to insure a positive connection. When disengaging the harness connector from the motor, it is necessary to depress the thumb release. When installing the harness, the thumb release must be held depressed until the embossment on the female connector is locked in the hole of the motor connector.

The power window electrical circuit is protected by a 40 ampere circuit breaker located on the right side of the engine compartment.

In addition to the circuit breaker, a relay is used in the circuit and installed at the left shroud. The relay prevents the operation of the power windows until the ignition switch is turned "on".

POWER WINDOW CIRCUIT CHECKING PROCEDURES

Failures in a circuit are usually caused by short circuits or open circuits. Open circuits are usually caused by breaks in the wiring, faulty connection or mechanical failure in a component such as a switch or circuit breaker. Short circuits are usually caused by wires from different

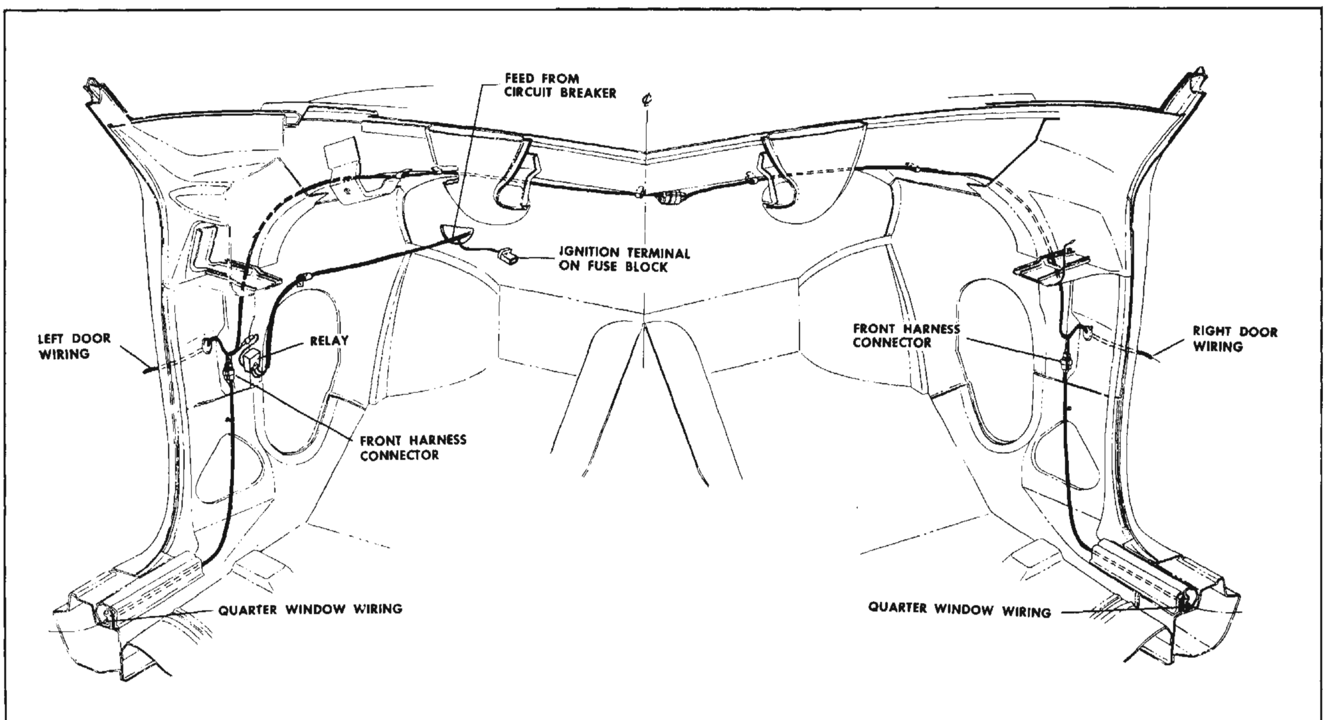


Fig. 16-277 Power Window Wiring

components of the circuit contacting one another or by a wire or component grounding to the metal of the body due to a screw through the wire, insulation cut through by sharp metal edge, etc.

It may be necessary to use only one or all of the procedures outlined to locate an electrical failure in the circuit. If the location of the failure is evident, follow only the steps required to check the affected wire or component. If the location of the failure is not evident, follow the procedure as outlined. Be sure to check the harness connectors beneath the outer ends of the instrument panel for proper engagement.

A. Checking Feed Circuit Continuity at Circuit Breaker

1. Connect one light tester lead to battery side of circuit breaker and ground other lead. If tester does not light, there is an open or short circuit in feed circuit to breaker.

2. To check circuit breaker, disconnect the output feed wire (the wire opposite the power source feed to the breaker) from the breaker and with light tester, check terminal from which wire was disconnected. If tester does not light, circuit breaker is inoperative.

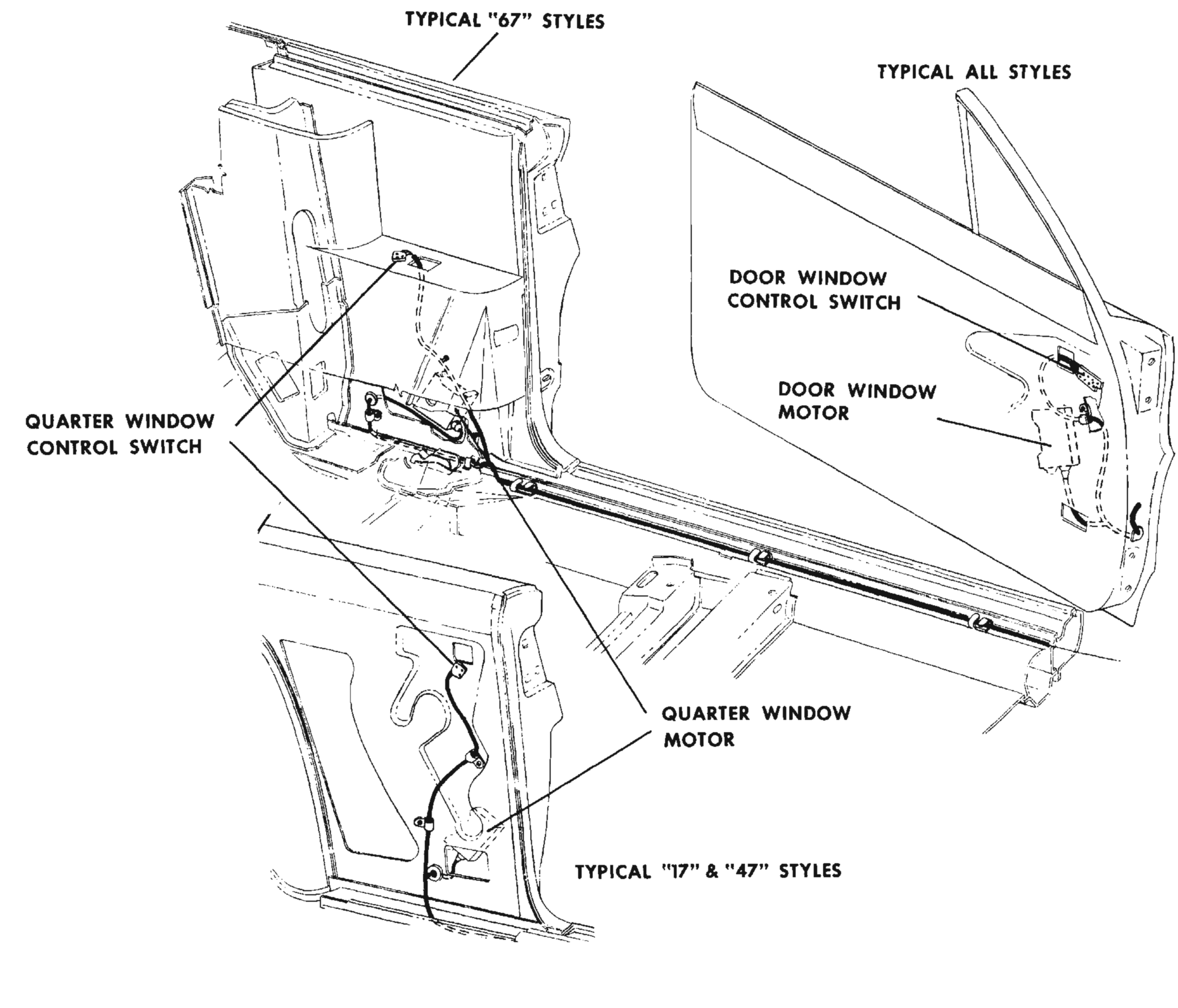


Fig. 16-278 Checking for Current at Window Control Switch

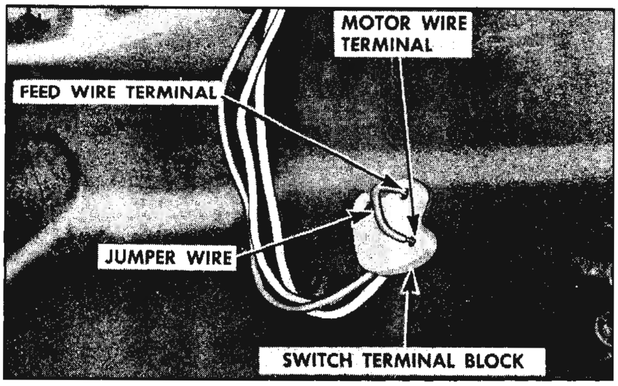


Fig. 16-279 Checking Window Control Switch

B. Checking Relay Assembly at Shroud

1. With light tester, check relay feed (dark blue wire terminal). If tester does not light, there is an open or short circuit between relay and circuit breaker.

2. Turn ignition switch on and with light tester check output terminal of relay (red wire terminal). If tester does not light, the relay is inoperative or there is a short or open circuit between ignition switch (white wire) and relay assembly. (Check fuse at dash panel.)

C. Checking Feed Circuit Continuity at Window Control Switch

1. Connect one light tester lead to feed terminal of switch block and ground other tester lead to body metal. (Fig. 16-278)

2. If tester does not light, there is an open or short circuit between switch and power source.

D. Checking Window Control Switch

1. Insert one end of a #12 gauge jumper wire to the switch feed terminal and the other end to one of the motor lead terminals in the switch block. Repeat this check on the remaining motor lead terminal. (Fig. 16-279)

2. If the motor operates with the jumper wire, but does not operate with the switch, the switch is defective.

E. Checking Wires Between Window Switch and Window Motor

1. Disengage harness connector from window motor connector. The thumb release on the harness connector must be depressed before it can be disengaged from the motor.

2. Insert one end of a #12 gauge jumper wire to the switch feed terminal and the other end to one of the motor lead terminals in the switch block. (Fig. 16-279)

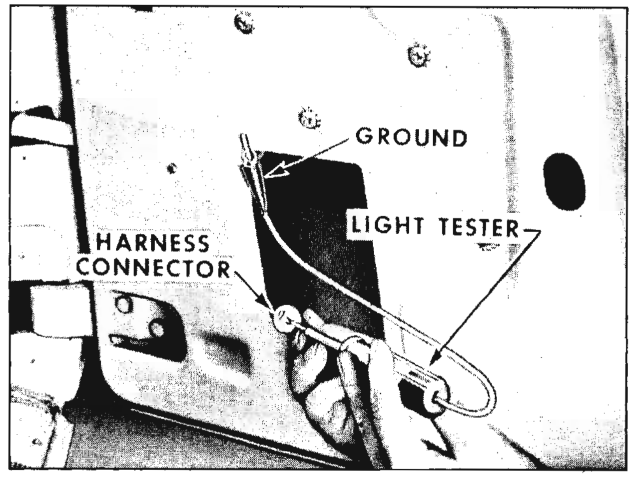


Fig. 16-280 Checking Wiring Between Switch and Motor

3. With light tester check for current at terminal being checked. If tester does not light, there is an open or short circuit in the harness between the control switch and motor connector. (Fig. 16-280)

F. Checking Window Motor

1. Check window regulator and channels for possible mechanical bind of window.

2. Check attachment of window motor to inner panel to insure an effective ground.

3. Connect one end of a #12 gauge jumper wire to the power source and the other end to one of the terminals on the window motor.

4. If the motor fails to operate with a jumper wire, the motor is defective and should be repaired or replaced as required. Check the other motor lead in the same manner.

TYPICAL FAILURES OF POWER WINDOWS

The following typical failures and corrections have been listed as an aid for eliminating electrical failures in the power window electrical circuit. It should be noted that multiple failures in the circuit may lead to a combination of conditions, each of which must be checked separately. (Fig. 16-281)

TYPICAL FAILURES OF POWER WINDOWS

CONDITION	CAUSE	CORRECTION
1. None of the windows will operate.	Short or open circuit in power feed circuit.	A. Check circuit breaker operation. B. Check relay operation at left cowl. C. Check feed connector to power harness beneath instrument panel. D. Check the feed circuit wires for possible short or open circuits.
2. Right rear quarter window does not operate from master control switch on left front door or from control switch on right rear quarter. Left door window operates.	A. Short or open circuit between right rear quarter harness and power window front harness. B. Short or open circuit in affected window control switch or window motor circuit. C. Possible mechanical failure or bind in window channels. D. Defective window motor.	A. Check harness connector beneath outer end of instrument panel for proper installation. B. Check wires in power window front cross-over harness for possible short or open circuit. C. Check operation of rear quarter window control switch. D. Check circuit from window control switch to window motor for short or open circuit. E. Check window regulator and channels for possible mechanical failure or bind. F. Check operation of motor.
3. Right door and quarter windows will operate from left door master control switch but will not operate from right door and quarter control switches. Left door and quarter windows operate.	A. Open or short circuit in front harness feed wire circuit.	A. Follow up feed wire in front harness for possible short or open circuit.

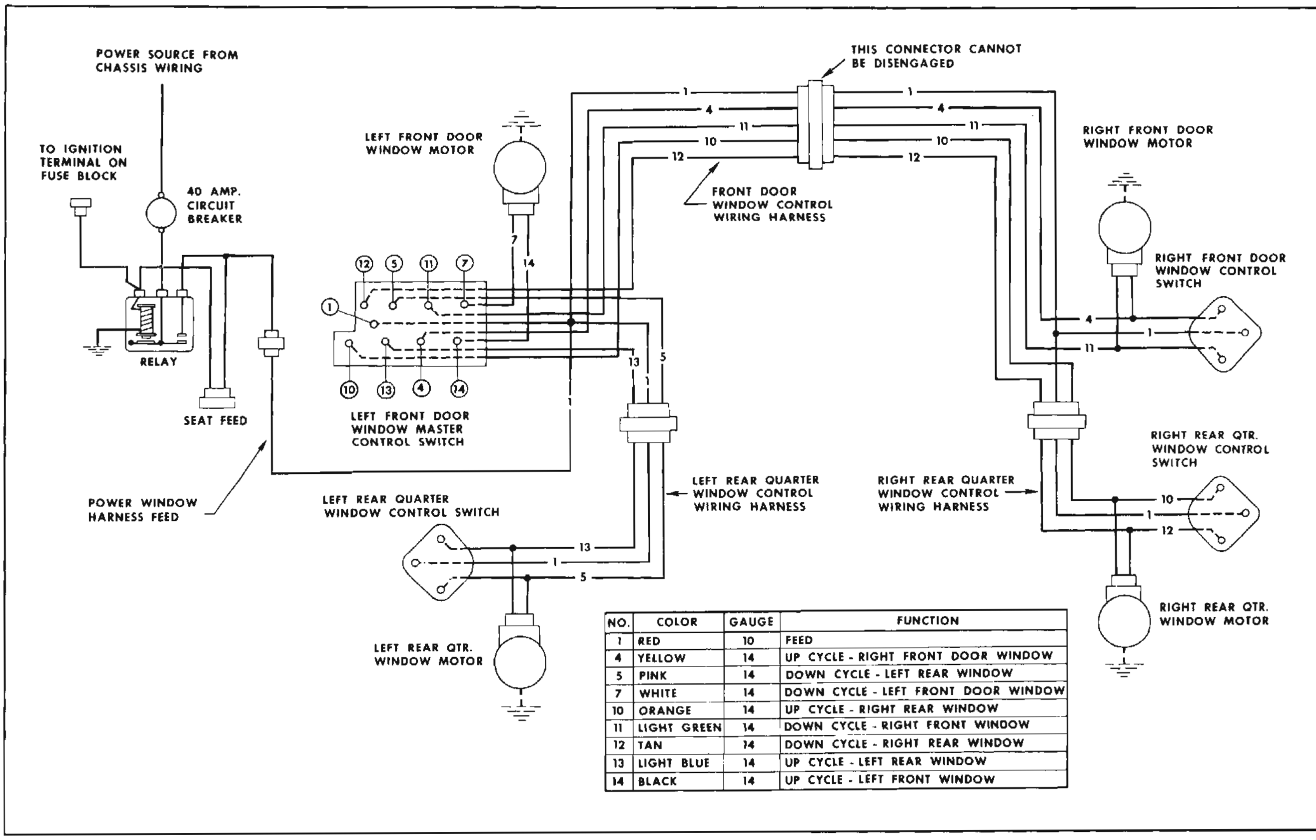
BACK DOOR ASSEMBLY STATION WAGON

Removal and Installation

1. Open door and mark location of hinge strap on door inner panel to facilitate installation in same location.
2. With aid of helper to hold back door, remove hinge-to-back door attaching bolts. (Fig. 16-282)
3. To install back door assembly, first, as an anti-squeak precaution, apply a coat of heavy-bodied sealer to attaching surfaces of both hinges. (Fig. 16-283) Then, reverse removal procedure. Align back door with previously made hinge marks.
4. Where required, adjust back door as described under "BACK DOOR ADJUSTMENTS".

Adjustments

1. To adjust up or down or sideways in the back body opening, remove door lock striker and



NO.	COLOR	GAUGE	FUNCTION
1	RED	10	FEED
4	YELLOW	14	UP CYCLE - RIGHT FRONT DOOR WINDOW
5	PINK	14	DOWN CYCLE - LEFT REAR WINDOW
7	WHITE	14	DOWN CYCLE - LEFT FRONT DOOR WINDOW
10	ORANGE	14	UP CYCLE - RIGHT REAR WINDOW
11	LIGHT GREEN	14	DOWN CYCLE - RIGHT FRONT WINDOW
12	TAN	14	DOWN CYCLE - RIGHT REAR WINDOW
13	LIGHT BLUE	14	UP CYCLE - LEFT REAR WINDOW
14	BLACK	14	UP CYCLE - LEFT FRONT WINDOW

Fig. 16-281 Power Window Circuit

loosen both right and left hinge-to-back door attaching bolts. Shift door to desired position on hinges; then, tighten hinge attaching bolts and install back door lock striker.

2. To adjust the upper portion of the back door in or out proceed as follows:

   a. Remove back door opening upper finishing panels.

   b. Mark position of torque rod retainers (Fig. 16-282) at both right and left hinges to facilitate repositioning of retainers in same fore and aft position.

   c. Using a suitable length of pipe over end of torque rod, release tension of torque rod from retainer. While tension of torque rod is released from retainer, loosen retainer attaching bolts, (Fig. 16-284); then, release torque rod. Loosen the two remaining hinge attaching bolts. Perform this operation at both right and left hinges.

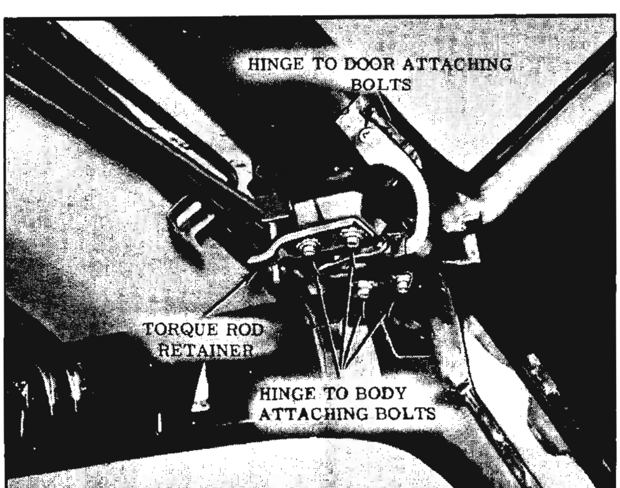


Fig. 16-282 Back Door Hinge

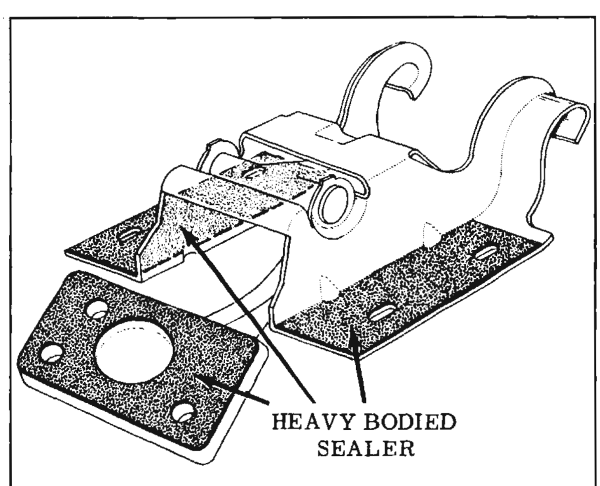


Fig. 16-283 Back Door Hinge (Anti-Squeak)

d. Shift the hinges and back door assembly to desired position; then, tighten hinge attaching bolts making sure torque rod retainers are aligned with previously made marks. Install back door opening upper finishing panels.

3. To adjust the lower portion of the door in or out, see "BACK DOOR LOCK STRIKER ADJUSTMENTS".

HINGE ASSEMBLY

Removal

1. Raise door and remove both right and left back body opening upper finishing panels.

2. Prop the back door in the open position on the side from which hinge is being removed.

   NOTE: If removing both hinges, remove the back door assembly from the hinges.

3. Mark position of torque rod retainer to facilitate installation in same fore and aft position. Remove retainer front attaching bolt.

4. Using a suitable length of pipe over end of torque rod, release tension of torque rod from retainer. While tension of torque rod is released from retainer, loosen (no more than 2 turns) retainer rear attaching bolt; then, swing front end of retainer towards inside of body and release torque rod. (Fig. 16-284)

5. Remove hinge to back door attaching bolts and hinge to body attaching bolts; then, disengage hinge from torque rod and remove hinge from body.

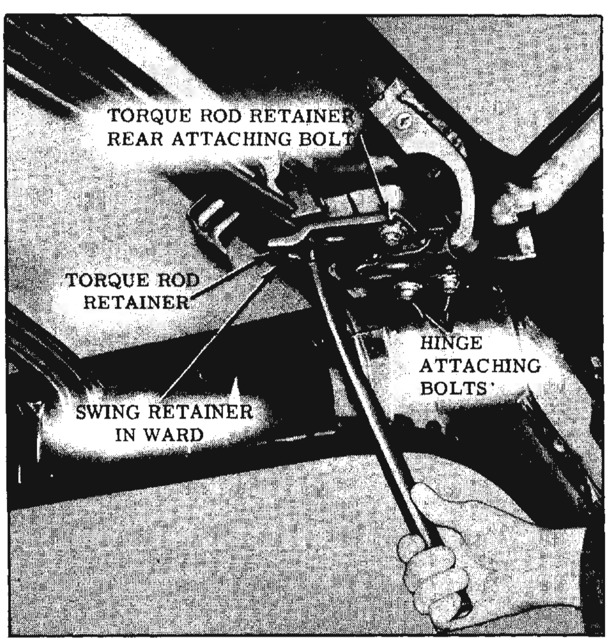


Fig. 16-284 Back Door Hinge and Torque Rod

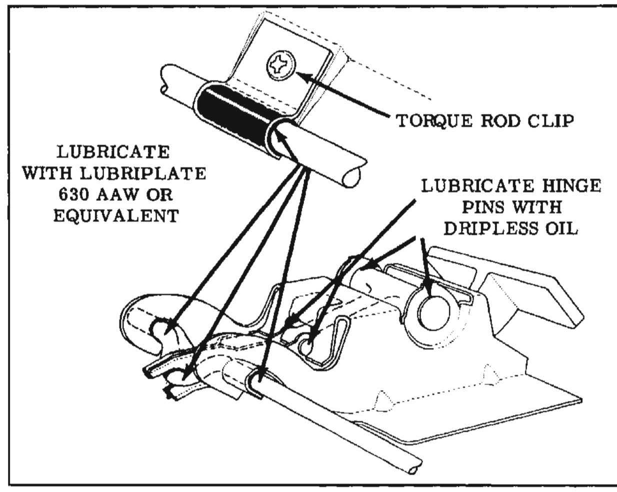


Fig. 16-285 Back Door Hinge and Torque Rod Lubrication

Installation

1. Lubricate both right and left hinge pivot pins with an approved dripless oil. (Fig. 16-285)

2. As an anti-squeak precaution, apply a coat of heavy-bodied sealer to surfaces of hinge which contact body and back door. (Fig. 16-283)

3. To install back door hinge assembly, reverse removal procedure.

   NOTE: When installing hinge, make certain torque rod is properly engaged with hinge (Fig. 16-285) and align torque rod retainer with previously made marks.

4. After installation of torque rods, lubricate torque rod frictional surfaces on both right and left hinges and frictional surfaces of both torque rod clips with Lubriplate #630 AAW or equivalent.

5. Where required, adjust back door as described under "BACK DOOR ADJUSTMENTS".

HINGE TORQUE ROD

Removal

1. Raise back door and remove both right and left back body opening upper finishing panels.

2. Prop back door in the open position.

3. Mark position of both right and left torque rod retainers to facilitate installation in the same fore and aft position. Remove retainer front attaching bolt. (Fig. 16-282)

4. Using a suitable length of pipe over end of torque rod, release tension of torque rod from retainer. While tension of torque rod is released from retainer, loosen (no more than

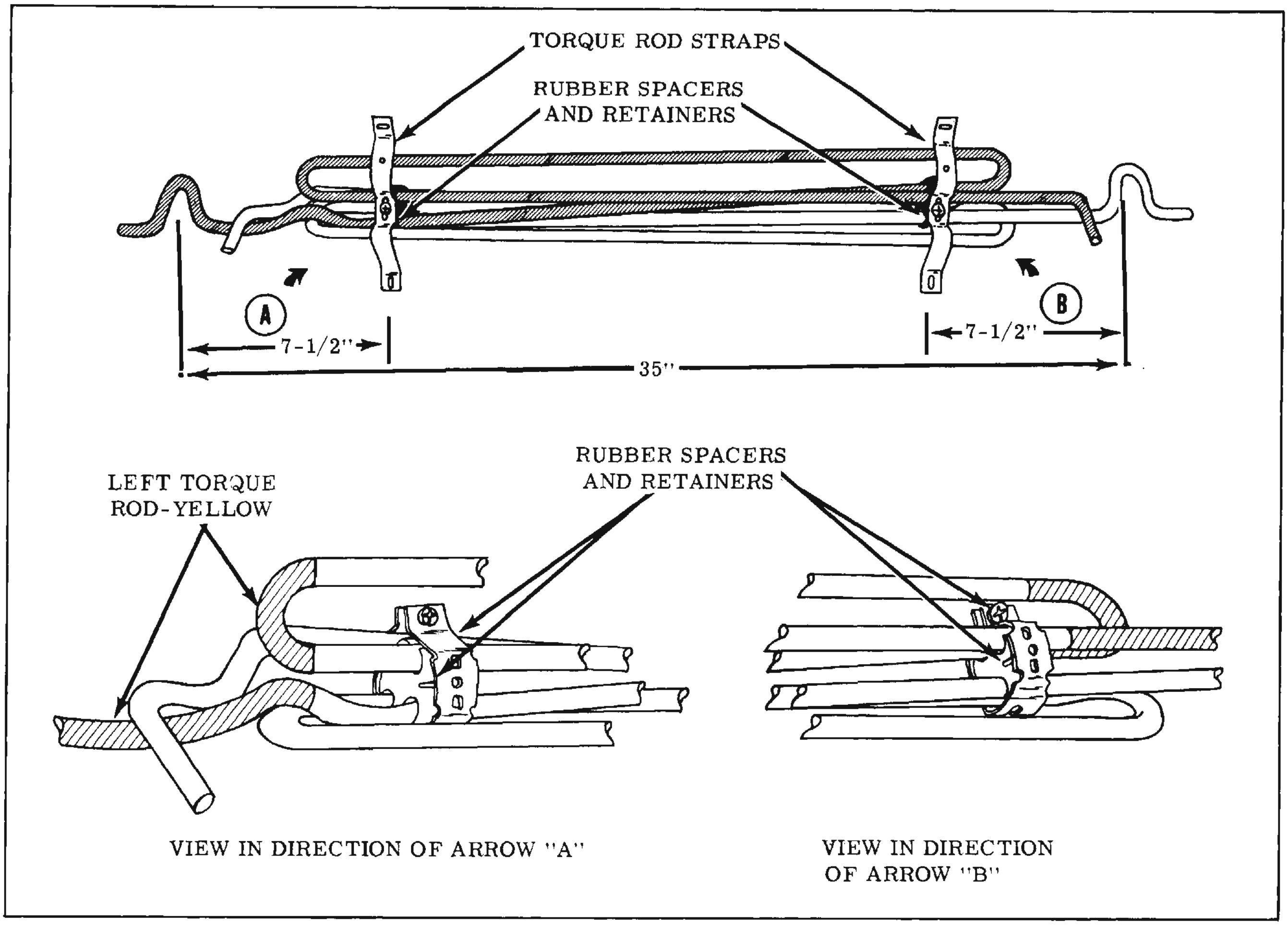


Fig. 16-286 Back Door Hinge Torque Rod

2 turns) retainer rear attaching bolt; then, swing front end of retainer towards inside of body and release torque rod. (Fig. 16-284) Perform this operation at both right and left torque rod retainers.

5. Remove screws securing both torque rod straps to body.

6. Disengage torque rod assembly from both right and left hinges and remove torque rod assembly from body.

Disassembly

1. Remove both torque rod strap attaching screws and remove torque rod straps.

2. Remove both torque rod rubber spacer retainers (Fig. 16-286); then, disengage torque rods from rubber spacers.

Assembly

1. Assemble torque rods, as shown in Fig. 16-286. Both ends of the left torque rod are color coded (yellow).

IMPORTANT: Dimensions, shown in Fig. 16-286, between hinge attachment locations of torque rod assembly (35 inches) and between rubber spacer and hinge attachment location of torque rod (7-1/2 in.) must be maintained to assure that assembly will align with hinges in body and torque strap attachment holes in body.

Installation

1. Check that torque rods are properly assembled, as shown in Fig. 16-286. Lubricate both right and left hinge pivot pins with an approved dripless oil. (Fig. 16-285)

2. Position torque rod assembly in body position, making sure that left torque rod loop (color coded - yellow) is installed at left hinge. (Fig. 16-287)

3. Engage loop ends of torque rod assembly with hinges. (Fig. 16-287)

4. Using a suitable length of pipe over end of torque rod, engage torque rod in torque rod retainer at both right and left hinge by re-

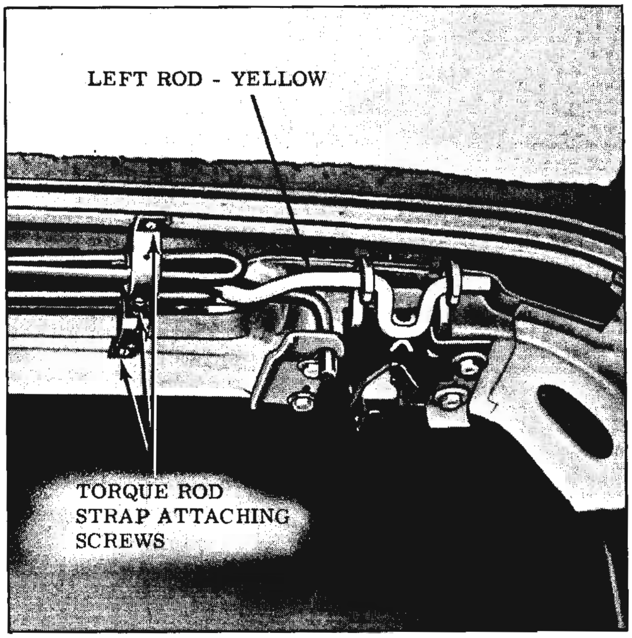


Fig. 16-287 Left Torque Rod

versing procedure used to disengage rods from retainers. Install both right and left torque rod retainer front attaching bolts.

5. Install torque rod strap-to-body attaching screws.

6. Lubricate torque rod surfaces at locations where they contact each other during operation with Lubriplate 630AAW or equivalent. Adjust tension of back door torque rods as described under "TORQUE ROD ADJUSTMENT".

7. Install both right and left back body opening finishing panels.

TORQUE ROD ADJUSTMENTS

The amount of effort required to open and close the back door is determined by the forward and rearward position of the right and left torque rod retainers. If both torque rod retainers are adjusted to the full forward position, the amount of effort to raise the lid is the greatest and the amount of effort to close the lid is the least. If both torque rod retainers are adjusted to the full rearward position, the amount of effort to raise the lid is the least and the amount of effort to close the lid is the greatest.

NOTE: It is not necessary to adjust both right and left torque rod retainers at the same time or to the same final position.

1. Raise door and remove both right and left back body opening upper finishing panels.

2. Prop back door in the open position.

3. Mark location of retainer to facilitate adjustment from original position.

4. Using a length of pipe over end of torque rod, remove tension of torque rod from retainer. While tension of torque rod is removed from retainer, loosen retainer attaching bolts, adjust retainer forward or rearward, as required; then, tighten retainer attaching bolts.

5. Lubricate both right and left hinge pivot pins with an approved dripless oil. Lubricate torque rod frictional surfaces on both hinges and frictional surfaces of both torque rod clips with Lubriplate #630 AAW or equivalent.

6. Install back body opening upper finishing panels.

INNER COVER PANEL

Removal and Installation

1. Remove window regulator handle. Remove screws securing back door inner cover panel and remove panel from door.

2. To install back door inner cover panel, reverse removal procedure.

LOCK ASSEMBLY

Removal and Installation

1. Operate door window to full up position. Remove back door inner cover panel.

2. Remove remote control attaching screws. (Fig. 16-288) Disengage locking rods from remote control and remove remote control from back door.

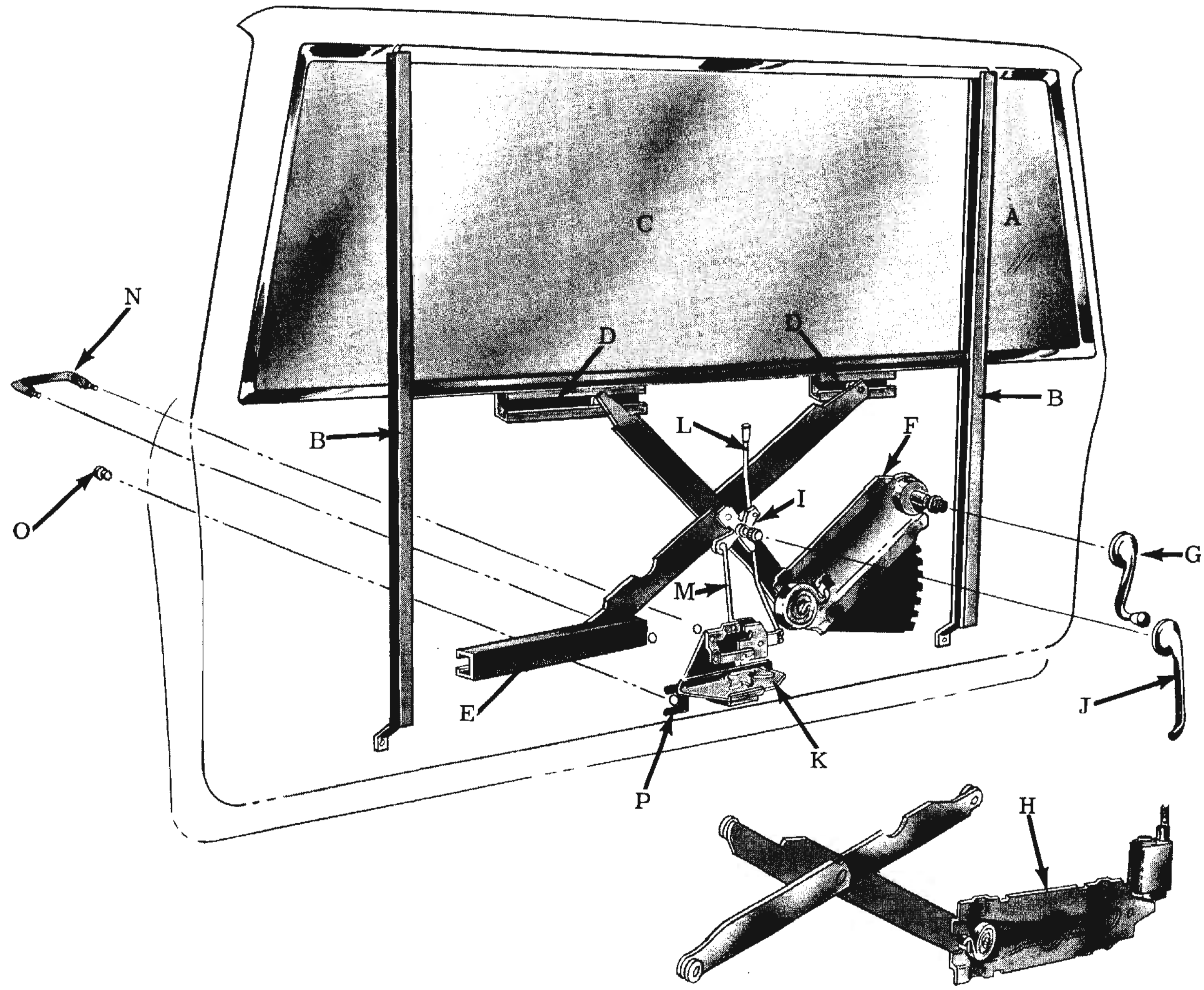
3. Remove remote control support plate attaching screws. Move support plate towards right side of door to disengage inner panel cam from regulator arm roller and remove support plate.

4. Remove three back door lock attaching screws from face of lock pillar (Fig. 16-289) and remove lock through hole in door inner panel.

5. To install, reverse removal procedure.

LOCK STRIKER ADJUSTMENTS

1. To adjust the back door lock striker forward or rearward to obtain in or out adjustment of the lower portion of the door, or to adjust the striker sideways to obtain proper alignment with the back door lock rotary bolt, loosen striker attaching screws, shift striker to desired position and tighten screws.



A. STATIONARY WINDOW - RT & LT
B. STATIONARY WINDOW DIVISION POST
C. DROPPING WINDOW
D. WINDOW LOWER SASH CHANNEL CAM
E. INNER PANEL CAM
F. WINDOW REGULATOR (MANUAL)
G. WINDOW REGULATOR HANDLE
H. WINDOW REGULATOR (ELECTRIC)
I. LOCK INSIDE REMOTE CONTROL
J. LOCK INSIDE REMOTE CONTROL HANDLE
K. LOCK
L. LOCK INSIDE LOCKING ROD
M. LOCK-TO-REMOTE CONTROL ROD
N. OUTSIDE HANDLE
O. LOCK CYLINDER
P. LOCK CYLINDER RETAINER

Fig. 16-288 Back Door Window Mechanism

2. Lock striker emergency spacer requirements.

   a. The back door assembly should be properly aligned in the body opening before checking spacer requirements.

   b. To determine if lock striker emergency spacers are required, apply modeling clay or body caulking compound in the lock striker notch where the lock extension engages; then, close the back door to form a measurable impression in the clay or caulking compound. (Fig. 16-290)

When dimension "A" from inside face of striker teeth is less than 3/16", install one or more 1/16" emergency spacers to bring dimension "A" to the specified 3/16". If two or three spacers are required, install 1/8" longer striker attaching screws. If three or four spacers are required, install 1/4" longer striker attaching screws.

NOTE: Dimension "B" from center of lock extension to inside face of striker should never be less than 1/8".

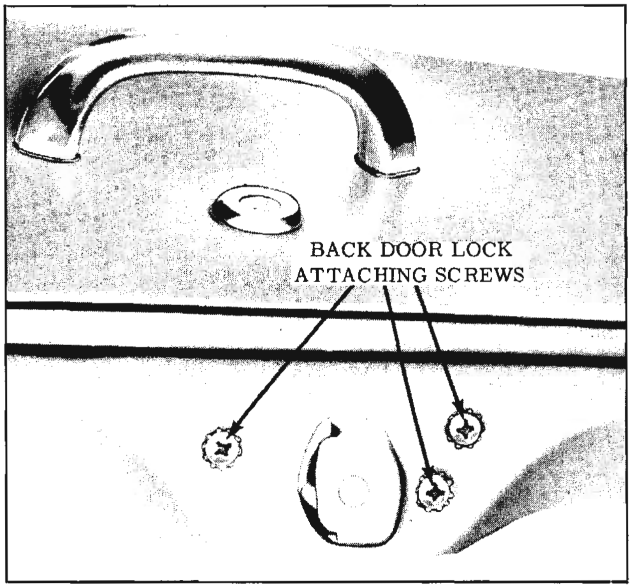


Fig. 16-289 Back Door Lock

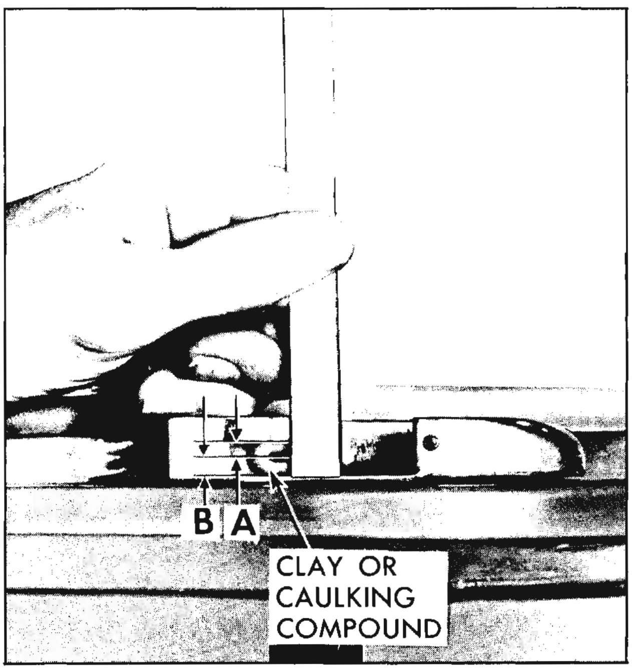


Fig. 16-290 Lock Striker Engagement Check

OUTSIDE HANDLE

Removal and Installation

1. Operate back door window to full up position. Remove back door inner panel cover.

2. Remove remote control attaching screws. Disconnect remote control from connecting rod and remove remote control.

3. Remove remote control support plate attaching screws. Move support plate towards right side of door to disengage inner panel cam from regulator arm roller and remove support plate.

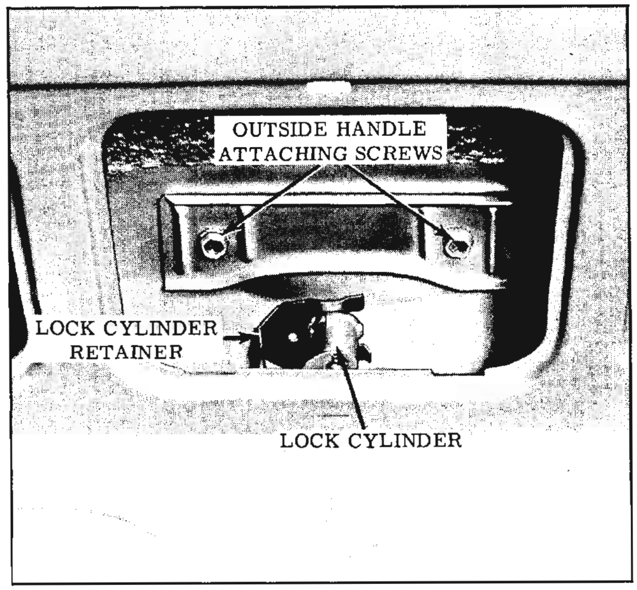


Fig. 16-291 Back Door Outside Handle & Lock Cylinder

4. Remove screws securing outside handle (Fig. 16-291) and remove handle and gaskets.

5. To install back door outside handle, first cement handle gaskets to handle with weatherstrip adhesive (black) and apply a coat of adhesive to surface of gaskets which contact door outer panel, then reverse removal procedure.

LOCK CYLINDER

Removal and Installation

1. Operate back door window to full up position. Remove back door inner cover panel.

2. Using a hooked tool or other suitable tool through access holes in door inner panel, pry out lock cylinder retaining clip sufficiently to allow removal of lock cylinder and gasket from outer panel.

3. To install lock cylinder assembly, reverse removal procedure. Apply weatherstrip adhesive (black) on both contacting surfaces of lock cylinder gasket. Check operation of lock cylinder and lock before installing inside trim.

WEATHERSTRIP

Removal

1. With a flat-bladed tool, carefully break cement bond securing butt ends of weatherstrip at bottom center of door and cement bond securing weatherstrip to door for a distance of approximately 2 inches on both sides of butt joint.

2. Starting at bottom center of door, insert tip of weatherstrip clip inserting Tool J-5757 or

other suitable tool at the first clip and carefully snap clip from retaining hole. Then, using a flat-bladed tool, carefully break cement bond securing weatherstrip in corner of rabbet to the next clip. Perform the alternate operations of snapping clip out of retaining hole, and breaking cement bond to the next clip completely around door; then, remove weatherstrip.

Installation

1. Clean off old cement from back door to provide a clean cementing surface.
2. Check weatherstrip clips for proper contour and reform clips, where required, using clip reforming Tool J-5984.
3. For distance of 2 inches on both sides of the butt joint location (bottom center of door), apply weatherstrip adhesive (neoprene type) to the door panel surface contacted by weatherstrip (View "A", Fig. 16-292).
4. Apply a bead of weatherstrip adhesive (black) in the corner of the rabbet ("2" in Sections "B-B" and "C-C") completely around door.
5. For a distance of 2 inches on both ends of weatherstrip, apply a coat of weatherstrip adhesive (neoprene type) to the weatherstrip surface which contacts the door panel. ("3" in View "A")
6. Starting with ends of weatherstrip at bottom center of door, install weatherstrip clips into retaining holes completely around door using weatherstrip clip inserting Tool J-5757. Press or roll weatherstrip completely around door to assure a good cement bond.
7. Apply weatherstrip adhesive (neoprene type) to butt ends of weatherstrip and cement ends together to form an even butt joint. (See View "A").

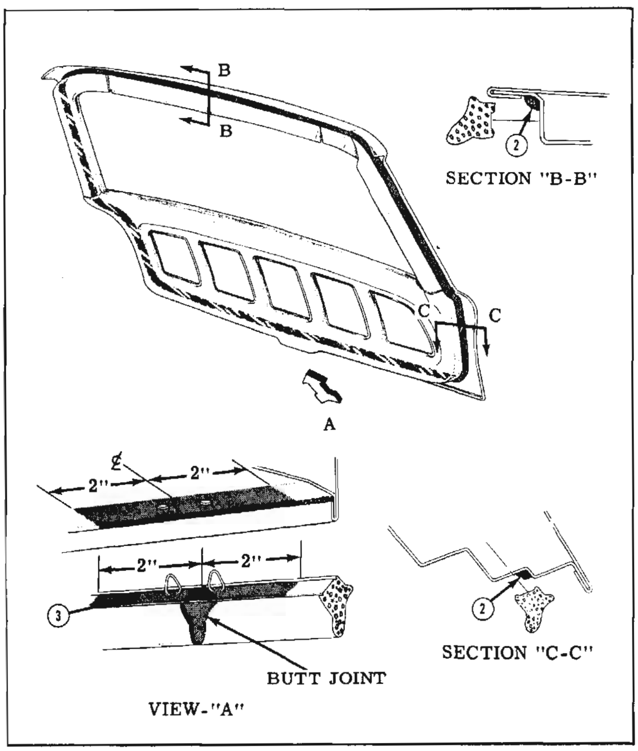


Fig. 16-292 Back Door Weatherstrip Installation

STATIONARY SIDE WINDOW AND RUBBER CHANNEL

Removal

1. Lower back door dropping window and remove upper, lower and side garnish molding.
2. Disengage rubber channel filler strip from stationary window rubber channel by pulling filler strip inboard. (Fig. 16-293)
3. Remove dropping window upper glass run channel attaching screws and remove glass run channel from door.
4. Remove division post assembly upper and lower (at belt) attaching screws. (Fig. 16-293) Using normal hand pressure, move division post towards center of door to provide glass clearance.
5. Remove glass from rubber channel by placing hand on outside of glass forcing outboard edge of glass inward. Support glass on inboard side with other hand as glass tends to "pop out" once it is free of channel.

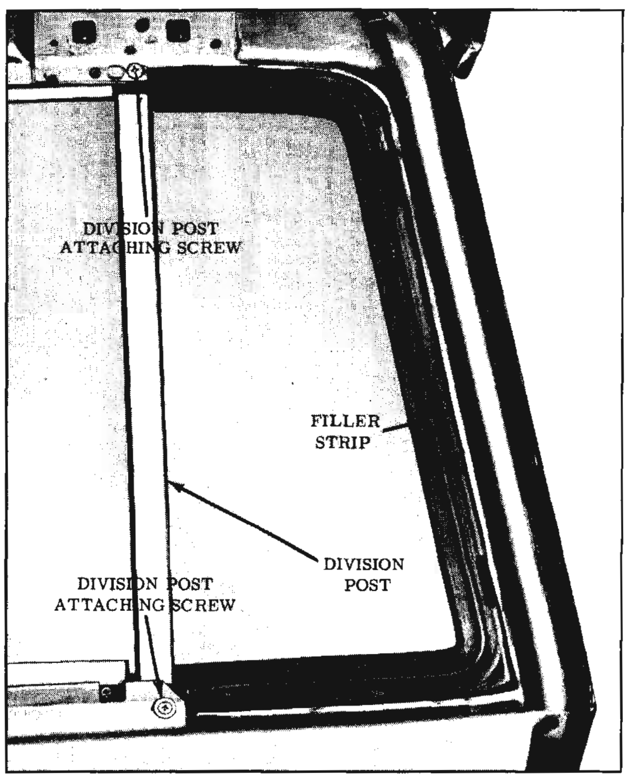


Fig. 16-293 Back Door Stationary Side Window

6. If rubber channel is to be removed, disengage it from pinchweld flange and division post by pulling each edge towards center of glass opening.

Installation

1. If rubber channel was removed, reinstall it in opening.

2. Lubricate inner circumference of rubber channel with liquid soap and water solution to facilitate glass installation.

3. Begin installation of glass by inserting division post edge of glass into rubber channel making certain to engage the corners of the glass into the rubber channel.

4. Work remainder of glass into channel inserting top, side and bottom of glass in that order.

   NOTE: If hand pressure does not prove sufficient, pry glass into channel using a prying tool made of wood or plastic.

5. Position division post against edge of dropping glass and install upper and lower division post attaching screws. (Fig. 16-293)

6. Apply a bead of body caulking compound to retaining flange of dropping window upper glass run channel (Fig. 16-294, View 1) and install channel.

7. Apply a bead of body caulking compound under inner lip of rubber channel across top, down outer edge, and across bottom to effect a weathertight seal between rubber channel and pinchweld flange. (Fig. 16-294, View 2)

8. Lubricate filler strip cavity in rubber channel with liquid soap solution and install filler strip with finger pressure.

9. Apply body caulking compound over division post lower attaching screw and opening at belt line to effect a seal. (Fig. 16-294, View 3)

10. Reinstall garnish moldings and clean up.

DROPPING WINDOW (MANUAL OR ELECTRIC)

Removal and Installation

1. Remove right side stationary window, rubber channel, and back door inner panel cover. Operate window to full up position.

2. Remove right side division post lower adjusting stud nut and disengage adjusting stud from slot. Lower division post to clear door header; then, remove division post from door at belt line.

3. Lower dropping window slightly (one inch). From inside of door, move dropping window towards right side to disengage rollers on regulator from window lower sash channel cams.

4. When rollers are free of cams, lift window assembly from between the panels and remove it from body.

5. To install, reverse removal procedure. Prior to installation, lubricate entire length of sash channel cams with Lubriplate or its equivalent.

DROPPING WINDOW REGULATOR (MANUAL)

Removal and Installation

1. Remove back door inner panel cover and window lower garnish molding.

2. Remove remote control attaching screws. (Fig. 16-288) Disconnect remote control from connecting rod and remove remote control.

3. Remove screws securing remote control support plate. (Fig. 16-288) Move support plate towards right side of door to disengage inner panel cam from regulator arm roller and remove support plate.

4. Remove regulator attaching screws (Fig. 16-288) and remove regulator by moving it to right to disengage it from window lower sash channel cams.

5. To install, reverse removal procedure. Prior to installation, lubricate inner panel cam and regulator sector teeth with Lubriplate or its equivalent.

DROPPING WINDOW REGULATOR (ELECTRIC)

Removal and Installation

1. Remove left side stationary window assembly and dropping window, as previously described. Disconnect wire harness connector from regulator.

   IMPORTANT: Do not operate regulator motor after window assembly is removed. Operation of motor with load removed may damage unit.

2. Remove back door lock inside handle remote control attaching screws. (Fig. 16-288) Disconnect remote control from connecting rod and remove remote control.

3. Remove screws securing inside handle remote control support plate (Fig. 16-288); then, move

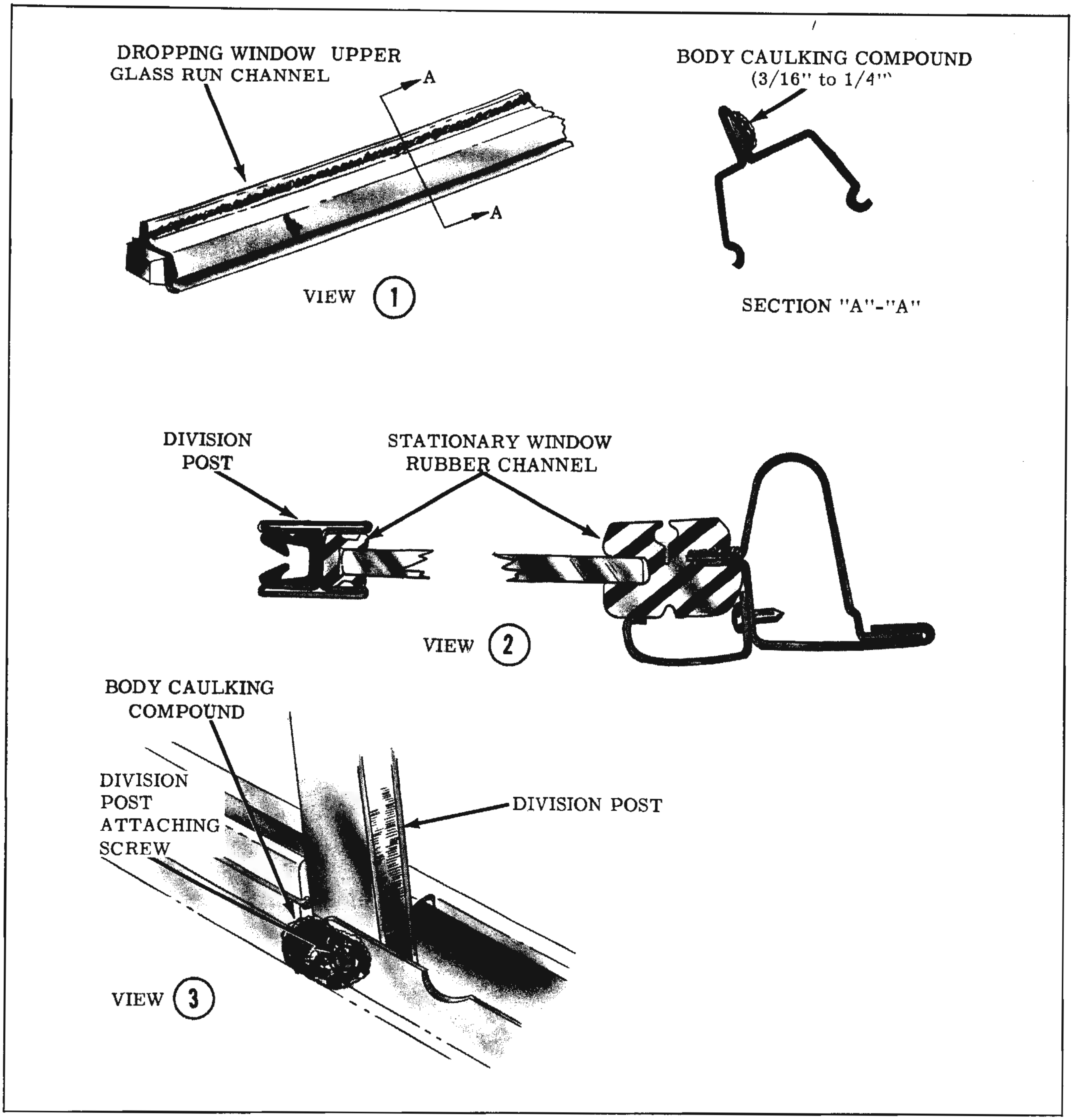


Fig. 16-294 Sealing Stationary Side Window

support plate towards right side of door to disengage inner panel cam from regulator arm roller and remove support plate.

4. Remove regulator attaching screws (Fig. 16-288) and remove regulator.

NOTE: To remove motor from regulator assembly, see "WINDOW REGULATOR MOTOR".

5. To install, first lubricate window lower sash channel cams and inner panel cams with Lubriplate or its equivalent; then, reverse removal procedure.

WINDOW REGULATOR MOTOR

Removal and Installation

1. Remove window regulator as described under "DROPPING WINDOW REGULATOR (ELECTRIC)", Removal and Installation.

IMPORTANT: Be sure to perform Steps 2 and 3 before attempting to remove motor

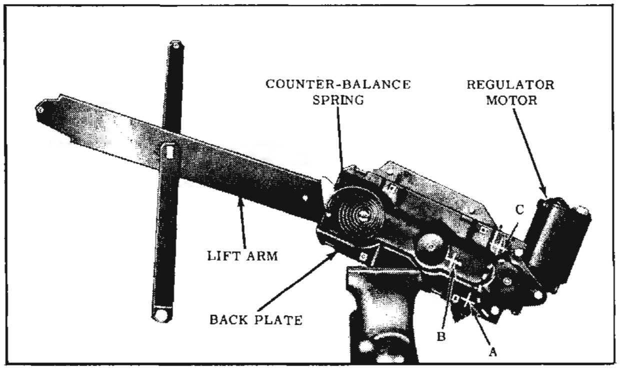


Fig. 16-295 Back Door Electric Window Regulator

from regulator. The regulator lift arm is under tension from the counterbalance spring and can cause serious injury if the motor is removed without locking the sector in place with a nut and bolt.

2. Place regulator and motor assembly in a vise. (Fig. 16-295) Drill a 1/4" hole through back plate and sector at location indicated at either A, B, or C (Fig. 16-295) depending on position of lift arm.

   NOTE: Do not drill into motor housing, part of which is indicated by dotted line. Also, do not locate hole less than 1/2" from edge of back plate or sector.

3. Insert a 3/16" bolt through hole in back plate and sector and install nut to bolt. Do not tighten nut.

4. Remove motor attaching bolts (Fig. 16-295) and remove motor from regulator.

   NOTE: Clean off steel chips from regulator sector and motor pinion gear.

5. To install regulator motor, reverse removal procedure. If difficulty is encountered when trying to line up motor attaching holes, the regulator lift arm may be moved up or down manually so that motor pinion gear will mesh with teeth on regulator sector and regulator attaching holes will line up.

   Lubricate regulator sector teeth and all frictional points with Lubriplate or equivalent.

   NOTE: Be sure to remove temporary nut and bolt from regulator before installing regulator in door.

REVEAL MOLDINGS

The back door window reveal moldings, consisting of an upper, lower and a right and left side molding are secured to the back door by concealed screws in the window openings.

UPPER REVEAL MOLDINGS

Removal and Installation

Remove both right and left stationary side windows as described under "STATIONARY SIDE WINDOWS". Disengage upper portion of both right and left side window rubber channels sufficiently to gain access to upper reveal molding attaching screws. Remove upper reveal molding attaching screws and remove molding. To install, reverse removal procedure.

LOWER REVEAL MOLDING

Removal and Installation

Remove dropping window, as described under "BACK DOOR DROPPING WINDOW - Removal and Installation". Remove back door stationary side windows, as described under "STATIONARY SIDE WINDOWS - Removal and Installation". Disengage lower portion of both right and left side window rubber channels sufficiently to gain access to lower reveal molding attaching screws. Remove lower reveal molding and outer sealing strip attaching screws and remove molding and sealing strip. To install, reverse removal procedure.

SIDE REVEAL MOLDING (RIGHT OR LEFT)

Removal and Installation

Remove back door stationary side window and rubber channel from side on which reveal molding is being removed. Remove side reveal molding attaching screws. Remove lower reveal molding end attaching screw; then remove side reveal molding. To install, reverse removal procedure.

BACK WINDOW ASSEMBLY

The back window is retained in the body opening by a conventional rubber channel. The channel is designed with a cavity to hold the glass when the back window is installed and another cavity that overlaps the pinchweld flange of the body opening to retain the back window and rubber channel assembly in the opening. Some rubber channels incorporate a third cavity to retain the back window reveal moldings. On these styles, it is necessary to remove the back window and rubber channel assembly to remove the back window reveal moldings. Other styles use clip retained reveal moldings where it is necessary to remove the reveal moldings before the back window assembly can be removed.

Although the reveal moldings may vary, all back windows are solid tempered safety plate glass and are installed and sealed in basically the same manner.

Following are the procedures for servicing the reveal moldings and back window assembly:

REVEAL MOLDINGS (3019 & 3027)

The back window reveal moldings are equipped with an "L" shaped retaining flange that is secured in a similar shaped cavity in the back window rubber channel. To remove the reveal moldings, it is necessary to first remove the back window and rubber channel assembly, then the moldings can be removed as a bench operation.

REVEAL MOLDING RETAINING CLIP (3117, "19" & "47" Styles)

The reveal molding retaining clip is the most common type of back window reveal molding retention. Whenever it is necessary to remove or install a molding using this type of retention, refer to the following procedure covering the engagement and disengagement of reveal moldings from retaining clips.

DISENGAGEMENT AND ENGAGEMENT OF REVEAL MOLDING FROM RETAINING CLIP

Reveal molding retaining clips are snapped over the back window pinchweld or retaining flange and are secured to the reveal molding by means of barbed prongs. To disengage the reveal molding from the clip, requires the use of reveal molding removal Tool J-7898-01. Insert end of tool between back window rubber channel and reveal molding. Engage point of tool between retaining clip and molding, then swing tool slightly (Fig. 16-296) to disengage prongs of clip from molding and lift molding free of clip.

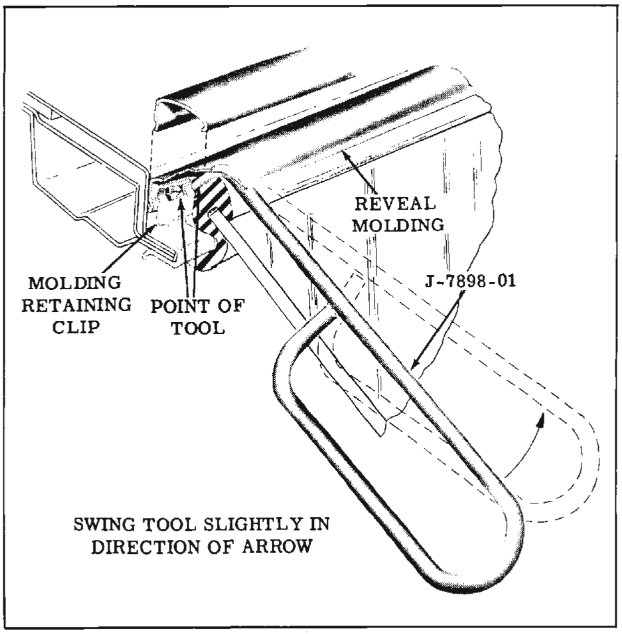


Fig. 16-296 Back Window Reveal Molding Removal Tool

IMPORTANT: Do not lift excessively on molding. If clip is disengaged, molding will easily lift free of clip. If clip is not disengaged, any excessive pull on molding will cause prongs of clip to "bite" harder on molding; thereby making it more difficult to disengage clip from molding. If difficulty is being encountered in disengaging clip, push molding at clip location to relieve pressure of clip prongs on molding while using tool to disengage clip.

An occasional application of a silicone lubricant on end of tool will facilitate inserting tool between reveal molding and rubber channel and sliding tool to engage with clip.

To install moldings, position molding so that flange of molding is between body metal and clip, then carefully push molding at retaining clip locations until molding is properly secured by retaining clips.

UPPER REVEAL MOLDING (Fig. 16-297)

From under the lip of the back window rubber channel, remove nuts from bolt and clip assemblies at locations "B". From outside body, disengage moldings from retaining clips "A" and remove molding from body.

To install, position molding to body and engage molding with retaining clips, then install bolt and clip assembly nut.

SIDE REVEAL MOLDING (Fig. 16-297)

From inside of body, remove nut from upper reveal molding bolt and clip assembly at location "B" on side from which molding is being removed. Disengage side reveal molding from retaining clips at locations "A" and remove molding from body.

To install, position molding to body and engage molding flange with retaining clips, then install upper reveal molding bolt and clip assembly nut.

LOWER REVEAL MOLDING (Fig. 16-297)

From outside of body, disengage lower reveal molding from retaining clips at locations "A" and remove molding from body.

To install, position molding to body and engage molding flange with retaining clips.

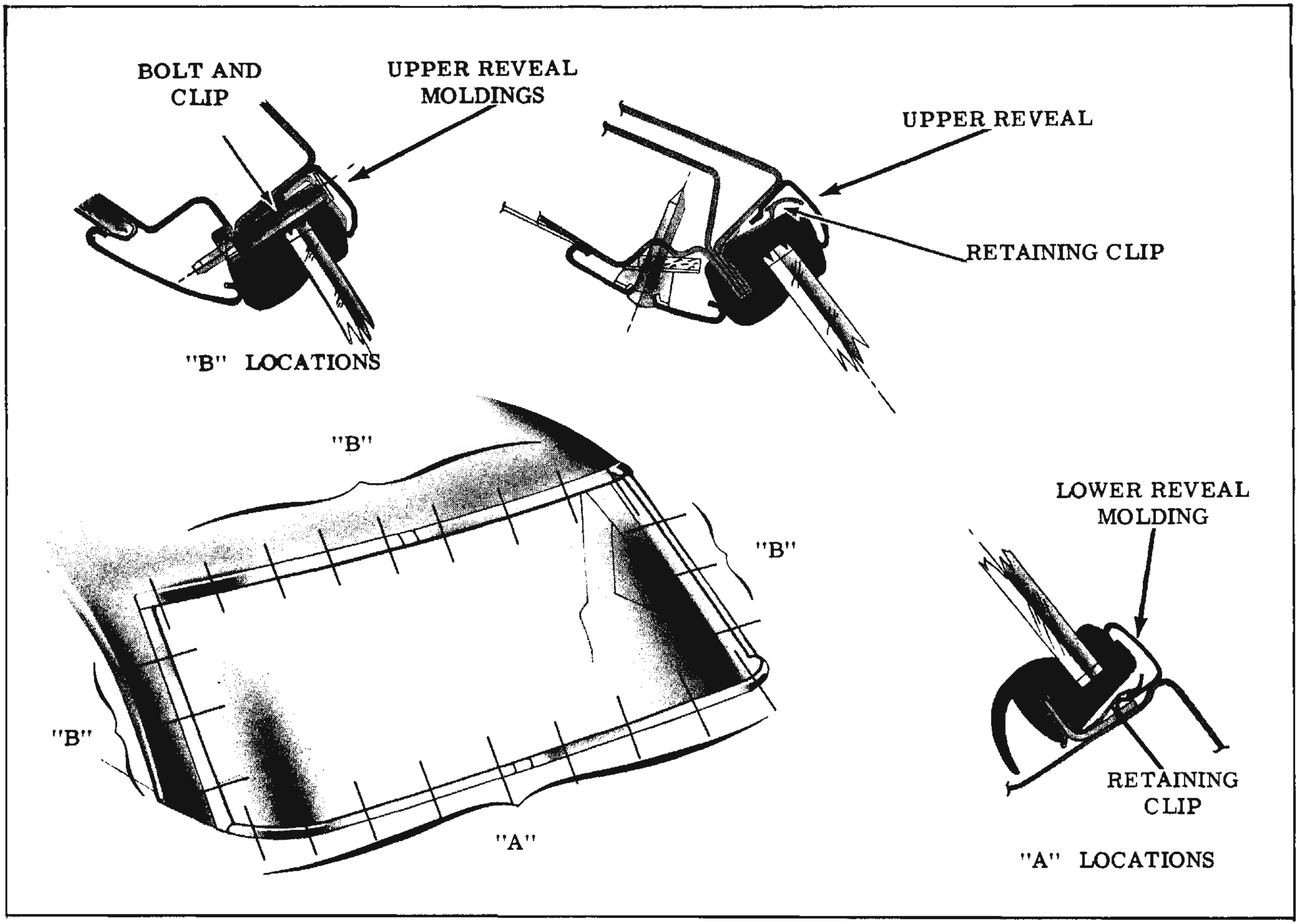


Fig. 16-297 Back Window Reveal Moldings (19 Styles)

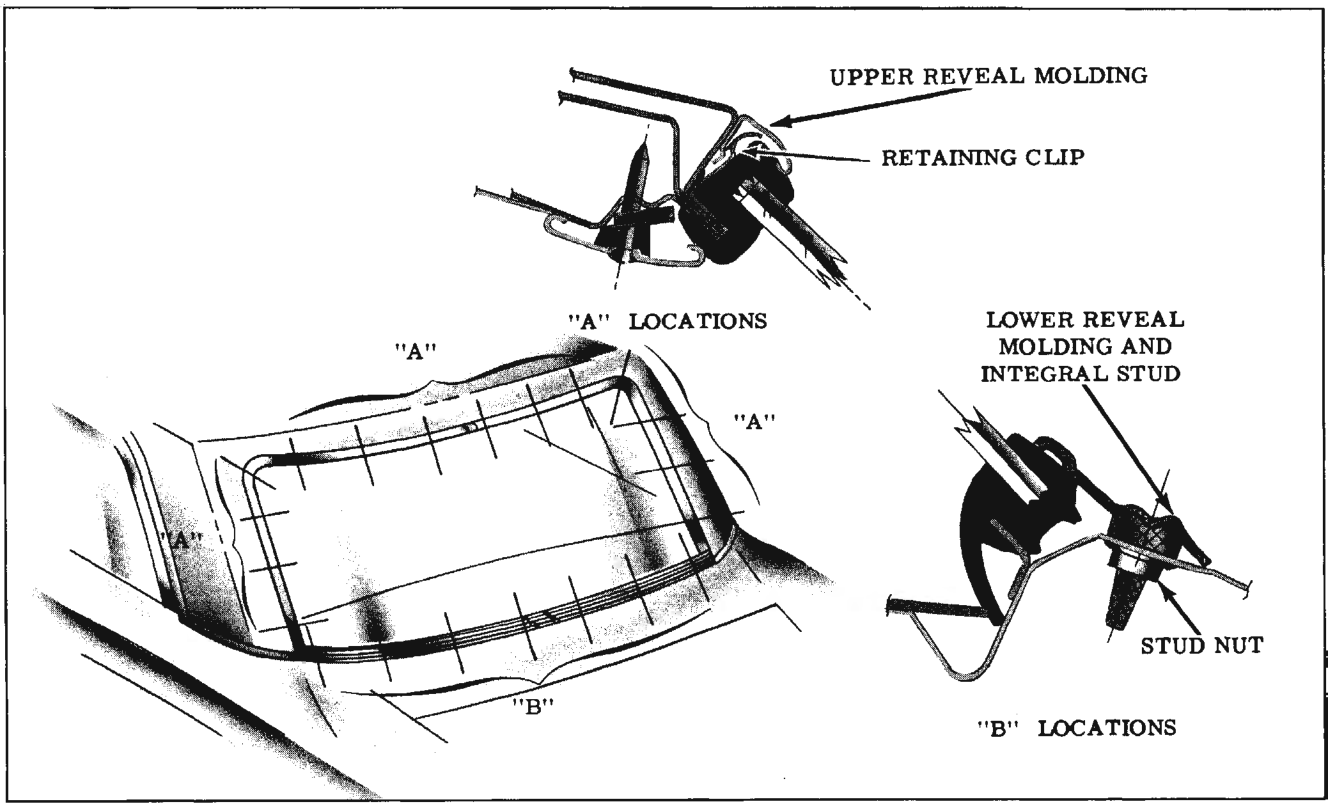


Fig. 16-298 Back Window Reveal Moldings (17 Styles)

LOWER REVEAL MOLDING (Fig. 16-298)

The back window lower reveal molding is retained by integral studs and sealing nuts.

To remove the molding, remove the sealing nuts from the molding studs under the rear compartment front and shelf panel. These are accessible through the rear compartment, then remove the molding.

To install, first replace any sealing nuts and washers which will not effect a good seal, then reverse removal procedure.

UPPER REVEAL MOLDING (Fig. 16-298)

When removing the right upper reveal molding, disengage the molding from the retaining clips along the top. Remove the molding by sliding it upwards from under the lower reveal molding and off the remaining clips along the side of the molding.

Perform the same operation when removing the left molding except, disengage enough of the right upper reveal molding to allow removal of the left side molding.

To install, insert lower end of molding behind lower reveal molding. Then engage molding with retaining clips.

BACK WINDOW ASSEMBLY (All Except "35" Styles)

Removal

1. Place protective coverings over rear seat cushion and back assemblies, over parcel shelf trim, and over painted surfaces. On styles equipped with fabric roof cover, place protective covering over roof cover adjacent to the back window.

2. Remove back window garnish moldings and, where present, clip and stud retained back window reveal moldings.

3. From inside of body, use a hooked or other suitable tool to carefully break seal between lip of rubber channel and pinchweld flange completely around perimeter of glass.

4. Carefully push back window and rubber channel assembly outward until lip of rubber channel is disengaged from pinchweld and retaining flange.

5. With the aid of a helper, lift complete assembly from body opening and place on a protected surface. On styles with reveal moldings, secured in the rubber channel, remove moldings.

Installation

IMPORTANT: Use care to make certain glass does not strike body metal during installation as edge chips can cause solid tempered safety plate glass to shatter. Do not attempt to grind glass.

1. Clean original sealer from back window body opening and rubber channel and install rubber channel to glass.

2. Check back window body opening and pinchweld flange for any irregularities and correct where necessary. Mark center of back window and body opening.

3. On styles using clip retained reveal moldings, check retaining clips and replace damaged or defective clips. Prior to installing clips, apply a continuous ribbon of medium-bodied sealer (approximately 1/4 inch thick) along the pinchweld and retaining flange ("1" in Fig. 16-299) completely around the opening.

4. Apply a second continuous ribbon of medium-bodied sealer (approximately 1/4 inch thick) along outer wall of back window opening ("2" in Fig. 16-299) completely around opening.

5. Install rubber channel to glass and insert a strong cord into pinchweld cavity of rubber channel. Tie ends of cord together at bottom

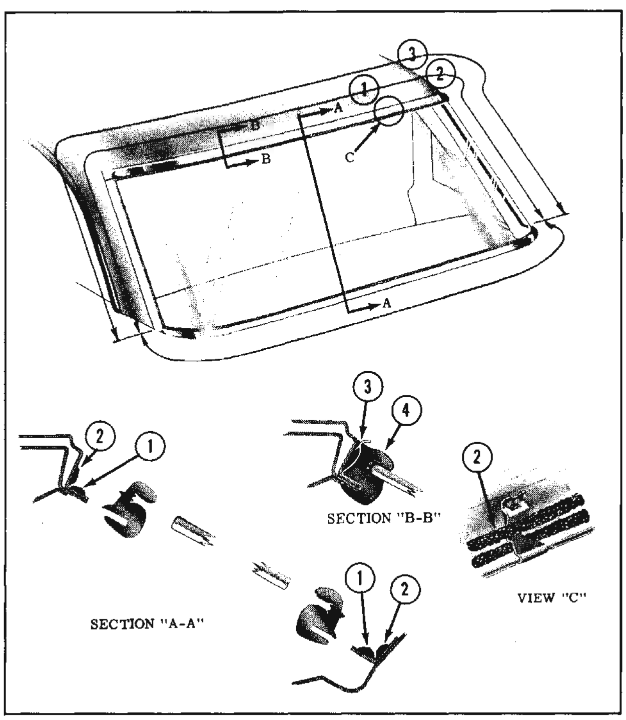


Fig. 16-299 Back Window Sealing

center and tape ends to inside surface of glass. On styles where the reveal moldings are retained in the rubber channel, install moldings and, where necessary, tie moldings to glass and rubber channel assembly. Make certain moldings are positioned properly as it is difficult to reposition them after installation of the back window.

6. With the aid of a helper, position back window and rubber channel assembly into body opening. While helper is applying hand pressure to outside surface of glass, carefully pull ends of cord across bottom, up sides and across top of window opening to seat lip of rubber channel over pinchweld and retaining flange, completely around back window.

7. On styles with clip retained reveal moldings, apply sufficient medium-bodied sealer to fill void between rubber channel and body opening, up sides and across top of window ("3" in Fig. 16-299).

8. Using a pressure type applicator, apply an approved weatherstrip adhesive (black) between outer lip of rubber channel and glass ("4" in Fig. 16-299) completely around rubber channel.

9. Install previously removed parts and clean off excess sealer and cement. Remove protective coverings.

REAR COMPARTMENT LID

Removal and Installation

1. Open lid and place protective covering along edges of rear compartment opening to prevent damage to painted surfaces.

2. Scribe location of hinge straps on lid inner panel.

3. With aid of a helper to hold lid, remove lid attaching bolts "A" and "B" (Fig. 16-300) at both hinge straps and remove rear compartment lid.

4. To install rear compartment lid, first, as an anti-squeak precaution, apply a coat of heavy-bodied sealer on the surface of the compartment lid hinge which contacts the rear compartment lid, then reverse removal procedure.

REAR COMPARTMENT LID ADJUSTMENTS

1. To adjust compartment lid forward or rearward or from side to side in body opening, loosen hinge strap attaching bolts "A" and "B" (Fig. 16-300) on both sides of lid, adjust lid as required, then tighten bolts.

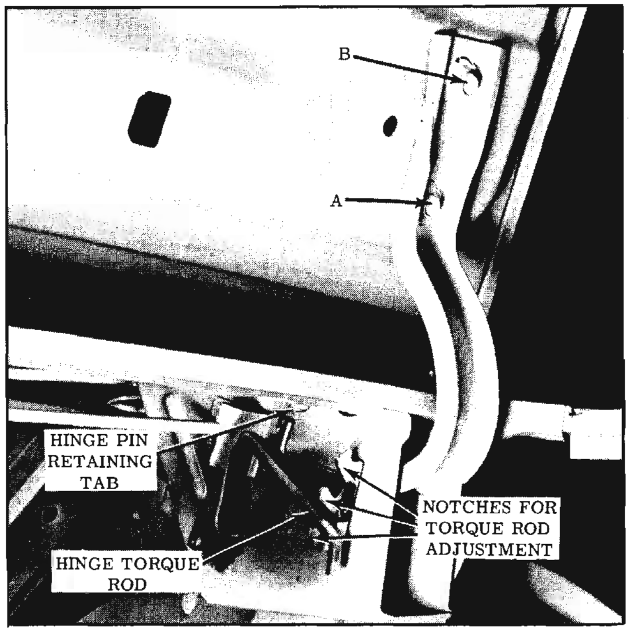


Fig. 16-300 Back Door Hinge and Torque Rod

2. To adjust front of compartment lid up or down, install shims between lid inner panel and hinge strap as follows:

   a. To raise front edge of lid, place shim(s) between lid inner panel and forward portion of one or both hinge straps at "A". (Fig. 16-300)

   b. To lower front edge of lid, place shim(s) between lid inner panel and rear portion of one or both hinge straps at "B". (Fig. 16-300)

3. To check lid lock bolt engagement with lock striker, see "REAR COMPARTMENT LID LOCK STRIKER ENGAGEMENT CHECK".

TORQUE ROD ADJUSTMENTS

The amount of effort required to open and close the rear compartment lid is determined by the position of the torque rods in the notches on the inboard face of the hinge boxes. (Fig. 16-300) If the torque rod is located in the lowest notch, the effort required to open the lid is the greatest and the amount of effort required to close the lid is the least. If the torque rod is located in the top notch, the amount of effort required to open the lid is the least and the amount of effort to close the lid is the greatest.

The torque rods can be disengaged and engaged in the notches by using a suitable length of pipe over the end of the torque rod.

NOTE: It is not necessary to adjust the left and right torque rods at the same time or to the same final position (notch).

REAR COMPARTMENT LID HINGE

Removal

1. Open lid and place protective covering along edges of rear compartment opening to prevent damage to painted surfaces. Provide support for lid on side where hinge is to be removed.

2. Remove rear compartment side trim foundation at hinge area.

3. Scribe location of hinge strap on lid inner panel and remove bolts "A" and "B" (Fig. 16-300) securing hinge strap to lid.

4. With a suitable length of pipe, disengage torque rod from notched retainer on inboard face of opposite hinge boss.

5. Bend up hinge pin retaining tab on inboard face of hinge box and remove hinge pin, then remove hinge from box.

Installation

1. Position hinge in box and install hinge pin. Bend over retaining tab to secure hinge pin.

2. Install "U" shaped end of torque rod to hinge box making certain outer end of rod is engaged in hole in outboard face of hinge box.

3. Engage torque rod in notch of hinge strap lever; then, engage other end of rod to correct retaining notch on inboard face of opposite hinge box.

4. As an anti-squeak precaution, apply a coat of heavy-bodied sealer to surface of hinge strap which contacts the rear compartment lid.

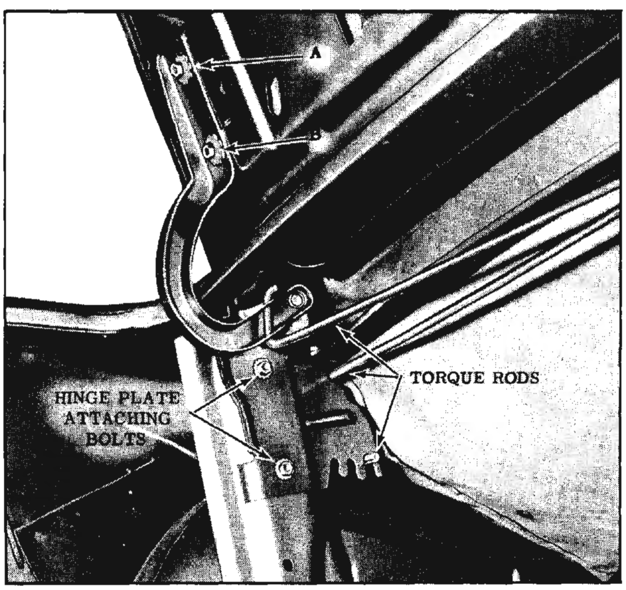


Fig. 16-301 Deck Lid Hinge and Torque Rod (67 Style)

5. Position hinge strap within scribe marks on lid inner panel and install attaching bolts.

6. Check alignment of rear compartment lid and make any necessary adjustments.

7. Replace all previously removed trim.

REAR COMPARTMENT LID ADJUSTMENTS ("67' Styles)

1. To adjust compartment lid forward or rearward, or from side to side in body opening, loosen hinge strap attaching bolts "A" and "B" (Fig. 16-301) on both sides of lid; adjust lid as desired, then tighten bolts.

2. To adjust front of compartment lid up or down loosen hinge plate attaching bolts (Fig. 16-301), adjust lid up or down as desired and tighten bolts.

3. To check lid lock bolt engagement with lock striker, see "REAR COMPARTMENT LID LOCK STRIKER ENGAGEMENT CHECK".

TORQUE ROD ADJUSTMENTS ("67" Styles)

The amount of effort required to open and close the rear compartment lid is determined by the position of the torque rods in the notches on the hinge mounting plate (Fig. 16-301). If the torque rod is located in the most forward notch, the effort required to open the lid is the greatest and the effort required to close the lid is the least. If the torque rod is located in the most rearward position, the effort required to open the lid is the least and the amount of effort required to close the lid is the greatest. Figure 16-302 illustrates how to use Tool J-9554 to perform these adjustments.

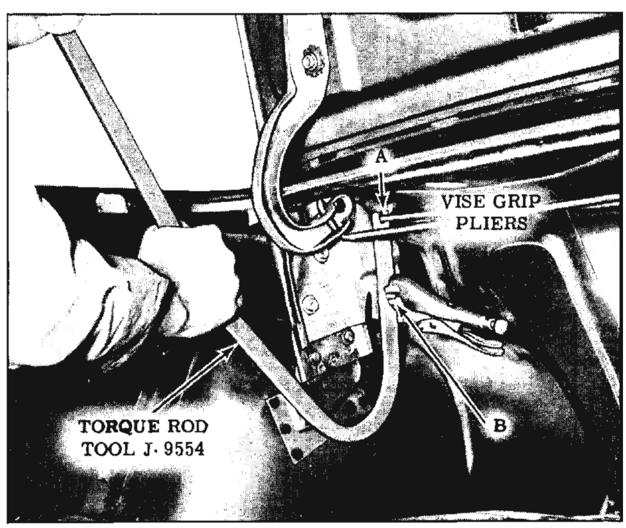


Fig. 16-302 Deck Lid Torque Rod Adjustment

1. Open rear compartment lid and provide support to hold it in full open position.

2. Engage notch in end of Tool J-9554 with torque rod to be adjusted ("A", Fig. 16-302) Engage hole in tool with "return crank end" of same torque rod. ("B", Fig. 16-302)

3. Firmly clamp vise grip pliers to end of torque rod at point "B" to prevent tool from sliding off torque rod.

4. Disengage torque rod from hinge plate by raising tool with one hand and holding it firmly against hinge plate with other hand. (Fig. 16-302) Adjust torque rod to desired position, or remove rod completely.

NOTE: Use extreme caution when disengaging torque rod from hinge plate. Torque rod is under great tension when it is engaged and careless handling of rod during disengagement can cause injury to operator.

REAR COMPARTMENT LID HINGE ("67" Styles)

Removal and Installation

1. Open rear compartment lid and place protective coverings along edges of lid opening to protect painted surfaces. Provide support for lid on side where hinge is to be removed.

2. Scribe location of hinge strap on lid inner panel and remove bolts "A" and "B" (Fig. 16-301) securing hinge strap to lid.

3. Disengage torque rods from hinge mounting plates using torque rod removing Tool J-9554. Scribe location of hinge plate on hinge brace. Remove hinge plate attaching bolts (Fig. 16-301) and remove hinge from body.

4. To install, reverse removal procedure. Check for proper lid alignment and make any necessary adjustments.

NOTE: When installing torque rods, engage hinge strap end first, then engage other end in proper notch in hinge plate.

REAR COMPARTMENT LID LOCK CYLINDER

Removal and Installation

1. Open rear compartment lid.

2. Remove lid lock cylinder retainer attaching screws which are located between lid hemming flange and lid lock. (Fig. 16-302)

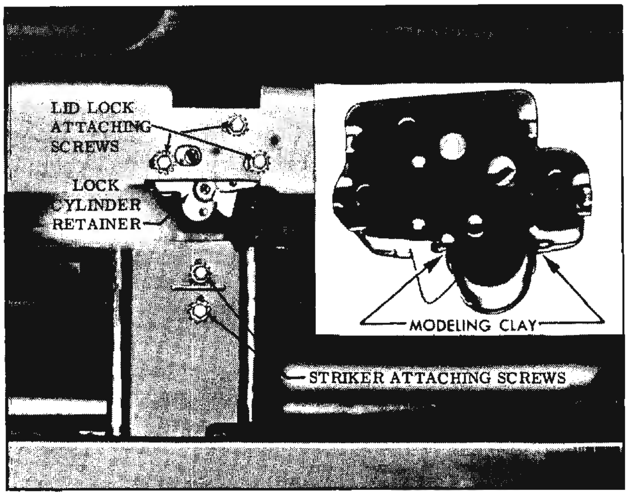


Fig. 16-303 Deck Lid Lock and Striker

3. Disengage retainer from lock cylinder and remove lock cylinder and gasket from rear compartment lid.

4. To install, reverse removal procedure. Prior to installation, inspect condition of gasket and replace, if necessary.

REAR COMPARTMENT LID LOCK

Removal and Installation

1. Remove rear compartment lid lock cylinder.

2. Remove rear compartment lock attaching screws (Fig. 16-303) and remove lock.

3. To install rear compartment lid lock, reverse removal procedure.

LID LOCK STRIKER

Removal and Installation

1. Mark a line on striker to indicate elevation of striker in relation to striker support; then, remove striker attaching bolts and remove striker. (Fig. 16-303)

2. To install striker, position striker and retaining plate within scribe marks and install attaching bolts and washers.

LID LOCK STRIKER ENGAGEMENT CHECK

IMPORTANT: Make sure rear compartment lid is properly positioned to body opening before performing striker engagement check.

To check for proper engagement of rear compartment lid lock striker with lock bolt, use the following procedure:

1. Place a small amount of modeling clay or body caulking compound on frame of lock at both sides of the lock bolt. (Fig. 16-303) Close lid with moderate force.

2. Open lid and check amount of engagement of striker with lock frame, as indicated by the compression of the clay. The striker impressions in the clay should be even on both sides of the lock frame. (Fig. 16-303) Where required, loosen striker attaching screws; adjust striker sideways or up or down to obtain proper engagement, then tighten screws.

WEATHERSTRIP

Removal

1. Separate "butt" ends of weatherstrip at rear of compartment opening.

2. Using a flat-bladed tool, carefully disengage weatherstrip from its cemented foundation in gutter around entire perimeter of rear compartment and remove weatherstrip.

Installation

1. Clean out gutter around entire rear compartment opening to provide a clean cementing surface.

2. Apply (brush) a continuous coat of weatherstrip cement (neoprene type) along the lower and outer surfaces of the rear compartment gutter ("1" in Fig. 16-304) around full length of gutter.

3. Using a flat-bladed tool such as a putty knife, or headlining inserting tool, insert weatherstrip into gutter starting with one end of weatherstrip at rear center of gutter and working completely around gutter.

4. If installing new weatherstrip, trim end of weatherstrip to form a butt joint at rear center of opening. Brush weatherstrip adhesive (black) on both ends of weatherstrip and secure ends together to form a butt joint.

5. Using a pressure type applicator, apply weatherstrip cement (neoprene type) between weatherstrip and outer surface of gutter ("2" in Fig. 16-304) completely around gutter to assure a watertight seal.

6. Roll or press weatherstrip to aid in obtaining a good cement bond and proper retention of the weatherstrip. Allow sufficient time for cement to set before closing rear compartment lid.

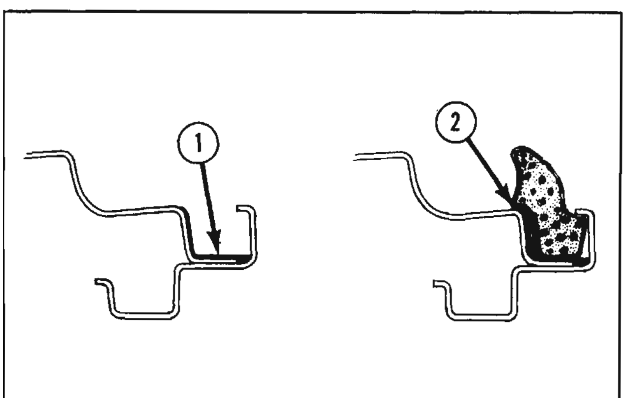


Fig. 16-304 Rear Compartment Gutter and Weatherstrip

EXTERIOR MOLDINGS

The exterior moldings in Figs. 16-305 and 16-306 are secured to the body by any one or a combination of the following attachments:

a. Attaching screws

b. Bolt and clip assemblies with attaching nuts

c. Integral studs with attaching nuts

d. Bath-tub type snap-on clips

e. Snap-in studs to pre-installed retainers

f. Snap-in clips

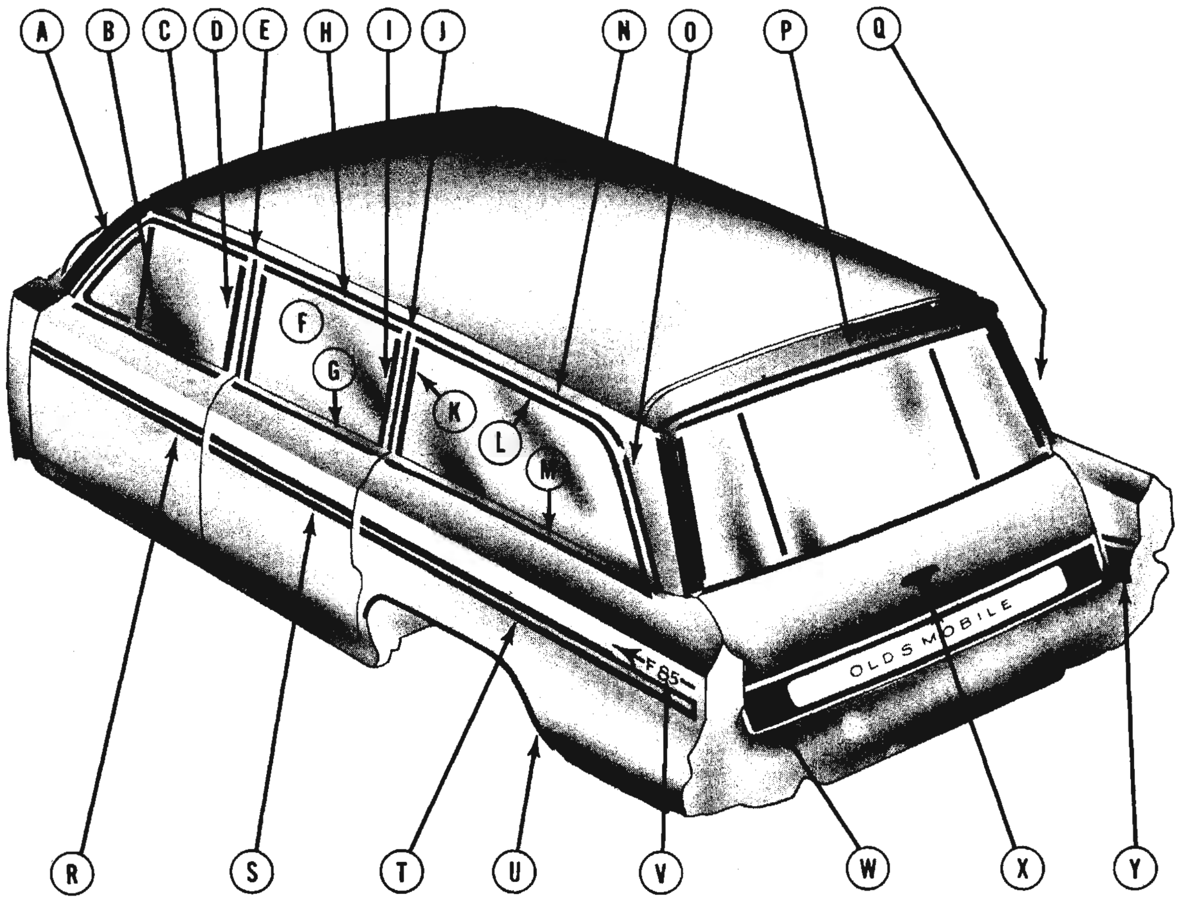
SEALING OPERATION

Although detailed sealing operations for each individual molding are not described on the "Molding Removal Chart", the following information is given to permit a satisfactory sealing operation.

Medium-bodied sealer or body caulking compound are the sealers most frequently used to provide a watertight seal or for anti-rattle measures.

Holes in body panels for screws, bolts, or clips that would permit water to enter the interior of the body should be sealed with body caulking compound or presealed screws, nuts or clips.

Drip moldings require a 1/4" bead of medium-bodied sealer along the full length of the inner attaching surface. Door window scalps and center pillar scalps require a 1/8" x 1/4" x 1/4" bead of caulking compound at 5" intervals for anti-rattle purposes. Pinchwelds require medium-bodied sealer on both sides when pinchweld clips are used. The exception is the rear quarter pinchweld on convertible styles which requires water proof tape over the entire pinchweld, prior to clip installation.



A. WINDSHIELD PILLAR DRIP MOLDING
B. FRONT DOOR WINDOW REVEAL MOLDING
C. FRONT DOOR WINDOW FRAME UPPER SCALP MOLDING
D. WINDOW FRAME REAR VERTICAL SCALP MOLDING
E. CENTER PILLAR VERTICAL SCALP MOLDING
F. WINDOW FRAME FRONT VERTICAL SCALP MOLDING
G. REAR DOOR WINDOW REVEAL MOLDING
H. REAR DOOR WINDOW FRAME UPPER SCALP MOLDING
I. WINDOW FRAME REAR VERTICAL SCALP MOLDING
J. REAR BODY LOCK PILLAR SCALP MOLDING
K. QUARTER WINDOW FRONT REVEAL MOLDING
L. QUARTER WINDOW UPPER REVEAL MOLDING
M. QUARTER WINDOW LOWER REVEAL MOLDING
N. ROOF DRIP MOLDING FRONT SCALP
O. ROOF DRIP MOLDING REAR SCALP
P. OUTER PANEL PINCHWELD FINISHING MOLDING
Q. SIDE UPPER PINCHWELD FINISHING MOLDING
R. FRONT DOOR OUTER PANEL LOWER MOLDING
S. REAR DOOR OUTER PANEL LOWER MOLDING
T. REAR FENDER LOWER MOLDING
U. REAR WHEEL OPENING MOLDING
V. REAR FENDER NAME PLATE
W. BACK DOOR OUTER PANEL MOLDING ASSEMBLY
X. BACK DOOR EMBLEM
Y. REAR OF REAR FENDER MOLDING

Fig. 16-305 Exterior Moldings (35 Style)

EXTERIOR MOLDINGS

Molding Name	Styles	Method of Retention: Screws	Spring (Self-Retained)	Snap-On Clips or Retainers On Panel	Snap-on Clips On Molding	Studs With Attaching Nuts	Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
Roof Drip Molding Scalp	3117,47 Opt.3027	-	x	-	-	-	-	-	Front Lower Edge
Roof Drip Molding Front Scalp	3135 Opt.3035	-	x	-	-	-	-	-	Front Lower Edge
Roof Drip Molding Rear Scalp	3135 Opt.3035	-	x	-	-	-	Roof Drip Molding Front Scalp	-	Front Lower Edge
Windshield Pillar Finish	3117,47	x	-	-	-	-	Windshield Pillar Drip	Windshield	-
	67 Styles	x	-	-	-	-	-	-	-
Windshield Pillar Drip	17,19,27 35,47	x	-	-	-	-	Roof Drip Molding Front Scalp	Windshield Pillar Weather-strip on 17 & 47	-
Front Door Window Frame Upper Scalp	3117,19,35 Opt. 3019,27,35	-	x	-	-	-	-	-	Rear Lower Edge
Front Door Window Frame Rear Vertical Scalp	3117,19,35 Opt. 3019,27,35	-	x	-	-	-	Front Door Window Frame Upper Scalp	-	Upper Inner Edge
Front Door Window Reveal	All 3100	x	-	-	x View C	-	-	Door Vent	-
Front Door Outer Panel Lower	3117,19, 35,67	x	-	x View A	-	-	-	-	-
	3147,3027	x	-	x View B	-	-	-	-	-

EXTERIOR MOLDINGS (Cont'd.)

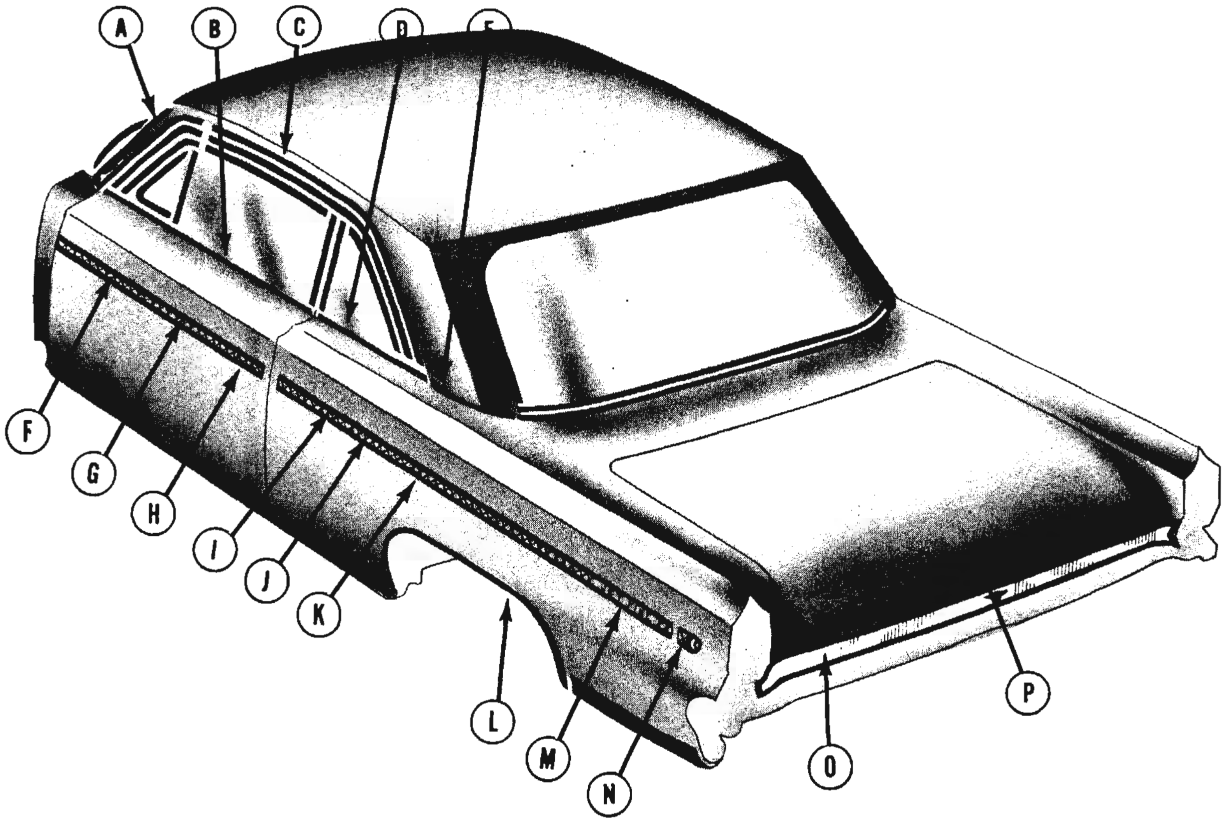
Molding Name	Styles	Method of Retention					Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
		Screws	Spring (Self-Retained)	Snap-On Clips or Retainers On Panel	Snap-On Clips On Molding	Studs With Attaching Nuts			
Front Door Outer Panel Upper	3147	x	-	x View B	-	-	-	-	-
Front Door Outer Panel Insert	3147	x	-	-	-	-	Front Door Outer Panel Upper and Lower	-	-
Center Pillar Vertical Scalp	3119-35	x	-	-	-	-	-	-	-
Rear Door Window Frame Upper Scalp	3119-35	-	x	-	-	-	-	-	Front Lower Edge
Rear Door Window Frame Front Vertical Scalp	3119-35	-	x	-	-	-	Rear Door Window Frame Upper Scalp	-	Upper Inner Edge
Rear Door Window Frame Rear Vertical Scalp	3119-35	-	x	-	-	-	Rear Door Window Frame Upper Scalp	-	Upper Inner Edge
Rear Door Window Reveal	3119-35	x	-	-	x	-	-	-	-
Rear Body Lock Pillar Scalp	3135 Opt.3035	x	-	-	-	-	-	-	-
Rear Door Outer Panel Lower	3119-35	x	-	x View A	-	x	-	-	-
	3019-35	x	-	x View B	-	-	-	-	-
Quarter Window Front Reveal	3117,19,35 Opt. 3027,19, 35	-	-	x	-	-	Quarter Window Upper Reveal	-	-

EXTERIOR MOLDINGS (Cont'd.)

Molding Name	Styles	Method of Retention					Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
		Screws	Spring (Self-Retained)	Snap-On Clips or Retainers On Panel	Snap-On Clips On Molding	Studs With Attaching Nuts			
Quarter Window Upper Reveal	Opt. 3019-27-35 3117-19-35	-	-	x	-	-	-	Quarter Window	-
Quarter Window Lower Reveal	3147 3117	-	-	x	-	-	-	-	-
Quarter Window Lower Reveal	3119-35	x	-	-	-	-	Quarter Window Upper and Front Reveal	Quarter Window	-
Quarter Belt Reveal	3117 3147	-	-	-	x View D	-	Back Window Lower Reveal	-	-
Quarter Pinchweld Finishing	3167	x	-	x	-	-	-	Lower Top to relieve tension of back curtain	At Radius
Roof Extension Panel Emblem	3117	-	-	-	-	x	-	Quarter Courtesy Lamps	-
Rear Fender Name Plate	All Styles Except 3000	-	-	-	-	x	Rear Fender Insert 3147	-	-
Rear Fender Insert	3147	x	-	-	-	-	Rear Fender Upper, Lower and Emblem Assembly	-	-
Rear Fender Upper	3147	-	-	-	x View B	x	Rear Fender Emblem Assembly	-	-
Rear Fender Lower	3019,27, 35-3117, 19,35,67	-	-	x View A	-	x	-	-	-
	3147	-	-	-	x View B	x	Rear Fender Emblem	-	-

EXTERIOR MOLDINGS (Cont'd.)

Molding Name	Styles	Method of Retention					Engages With Other Moldings	Remove Hardware Or Trim	Starting Location
		Screws	Spring (Self-Retained)	Snap-On Clips or Retainers On Panel	Snap-On Clips On Molding	Studs With Attaching Nuts			
Rear Fender Emblem Assembly	3147	-	-	-	-	x	Rear Fender Upper and Lower	-	-
Shield - Emblem	3000	-	-	-	-	x	-	-	-
Rear Compartment Lid Outer Panel Name Plate	3019-27 3117-19-67-47	-	-	x View F	-	-	-	-	-
Back Door Outer Panel Emblem	3035 3135	-	-	-	-	x	-	Back Door Trim Panel	-
Back Door Name Plate	3035	-	-	x View F	-	-	-	-	-
Rear End Panel Emblem	3019,27 3117,19, 47,67	-	-	-	-	x	-	-	-
Rear End Panel	3117,19 47,67	-	-	-	-	x	-	-	-
Back Body Opening Side Upper Pinch-weld Finishing	35	-	-	x	-	-	-	-	-
Back Door Outer Panel Pinchweld Finishing	35	x	-	x	-	-	-	-	-
Back Door Outer Panel Lower	3035	-	-	-	-	x	-	Back Door Inner Panel	-
	3135	x	-	x View E	-	x	-	-	-
Rear of Rear Fender	3135	-	-	x View E	-	x	-	Quarter Trim-Left Side - Spare Tire Cover	-



A. WINDSHIELD PILLAR DRIP MOLDING
B. DOOR WINDOW REVEAL MOLDING
C. ROOF DRIP MOLDING SCALP
D. QUARTER WINDOW LOWER REVEAL MOLDING
E. QUARTER BELT REVEAL MOLDING
F. DOOR OUTER PANEL UPPER MOLDING
G. DOOR OUTER PANEL INSERT MOLDING
H. DOOR OUTER PANEL LOWER MOLDING
I. REAR FENDER UPPER MOLDING
J. REAR FENDER INSERT MOLDING
K. REAR FENDER LOWER MOLDING
L. REAR WHEEL OPENING MOLDING
M. REAR FENDER NAME PLATE
N. REAR FENDER EMBLEM ASSEMBLY
O. REAR END OUTER PANEL MOLDING
P. REAR COMPARTMENT LID NAME PLATE

Fig. 16-306 Exterior Moldings (47 Style)

TOOLS AND CARE

For ease of molding removal, it is sometimes important to start the removal at a particular location which is generally the "front" or "rear" of the molding. Masking tape should be used on adjacent panels to prevent damage to the finish. This position is indicated when necessary in the "Starting Location" column of the molding chart. Figure 16-307 illustrates various attachments.

The following groups of moldings are listed with the name or description of the tool which is suitable for molding removal.

Roof Drip Scalps - pointed hook tool

Door Window Scalps - thin flat-bladed tool (putty knife)

Snap-on Clips - thin flat-bladed tool (putty knife)

If it is necessary to replace a damaged "bathtub" molding clip, insert edge of putty knife under edge of clip and hammer knife until base of clip is cut approximately half-way through (Fig. 16-308), then disengage clip from hole.

NOTE: In some cases, it may be necessary to cut clip at opposite end of base also.

No special tool is needed to install new plastic clip.

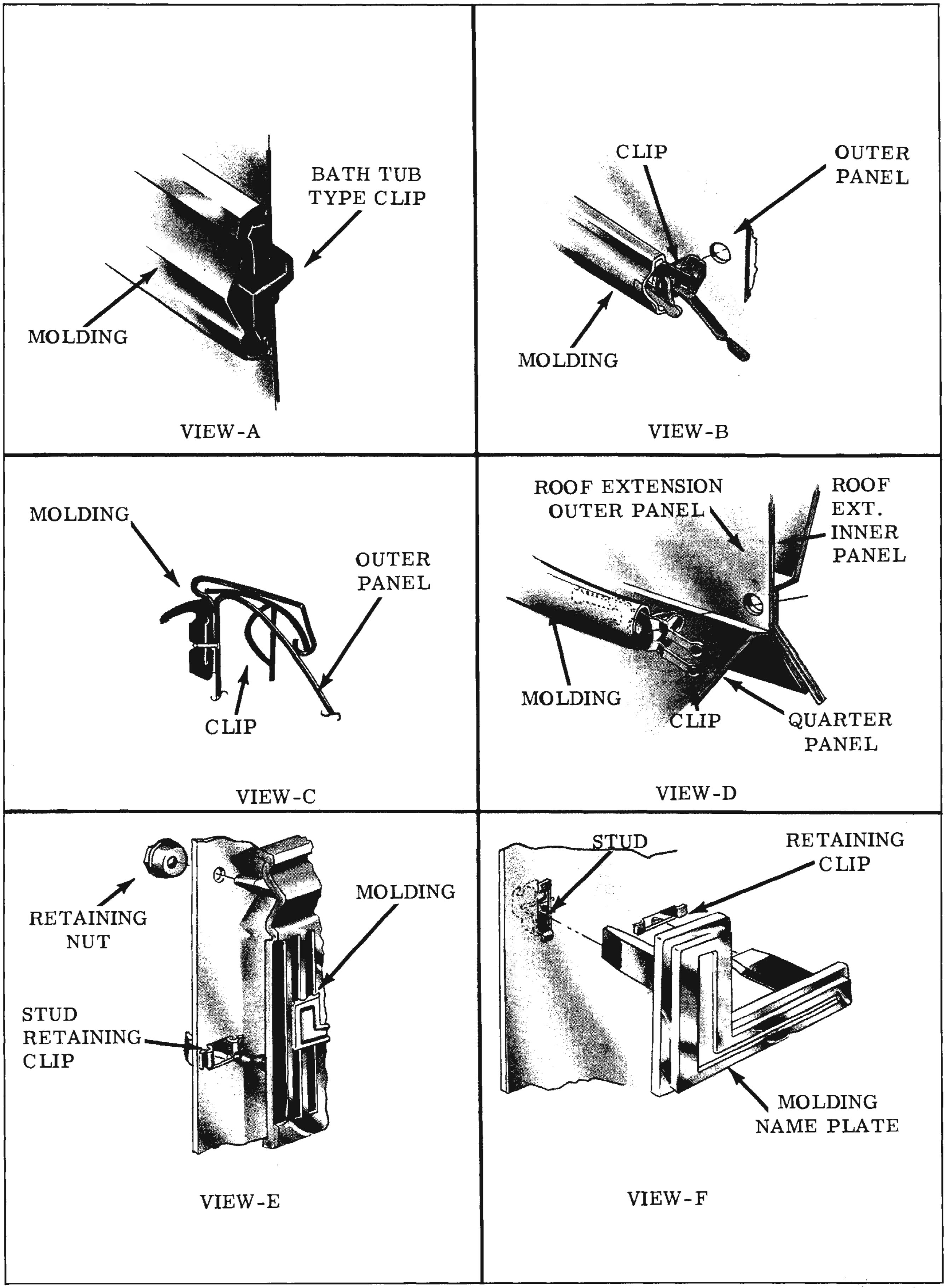


Fig. 16-307 Exterior Molding Attachment

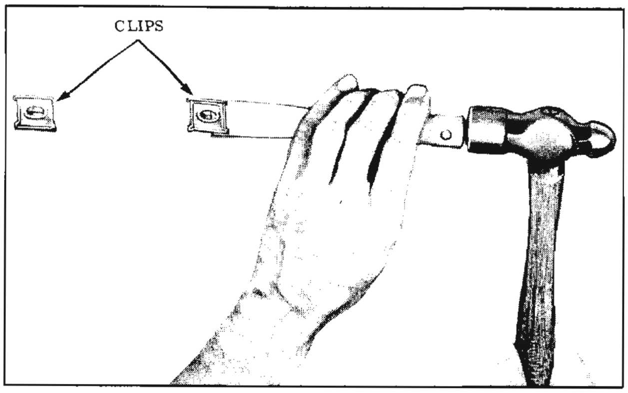


Fig. 16-308 Removing a Bath-Tube Type Clip

SEATS

FRONT SEAT ASSEMBLY (FULL WIDTH)

Manually operated front seat adjusters provide fore and aft movement of the seat. When the lever at the left seat adjuster is raised, the seat adjusters unlock, permitting horizontal travel of the seat. When the seat is in the desired position, the lever is released and the seat is locked.

FRONT SEAT ASSEMBLY WITH SEAT ADJUSTERS ATTACHED

Removal and Installation

1. Turn back carpeting to expose seat adjuster-to-seat support attaching bolts.

2. Scribe location of rear end of adjuster on front seat rear support and remove adjuster rear attaching bolts.

3. With aid of helper, tilt seat assembly forward; then, slide seat assembly rearward to disengage front legs of adjusters from retainers. Remove seat assembly from body.

4. To install, reverse removal procedure.

   NOTE: Make certain front legs of adjusters are completely engaged under retainers or under retaining bolts and adjusters are aligned within scribe marks before installing or tightening attaching bolts.

FRONT SEAT ADJUSTERS

Removal and Installation

1. Remove front seat assembly, with adjusters attached, from body and place it upside down on a clean, protected bench.

2. Remove seat adjuster counterbalance spring attached to seat adjuster front support and seat bottom frame as shown in Fig. 16-309.

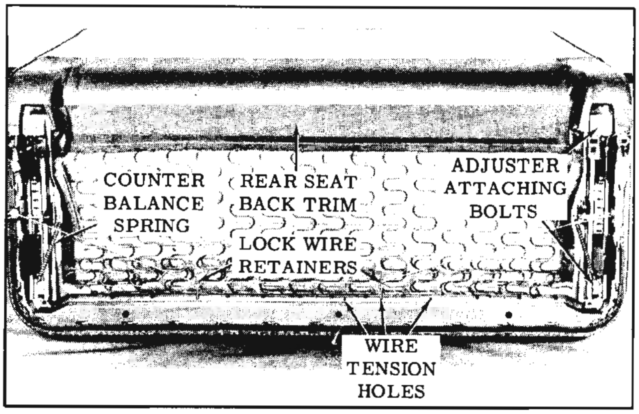


Fig. 16-309 Front Seat Adjuster Removal

3. Operate adjusters so that both front and rear attaching bolts are accessible.

4. Squeeze hooked end of seat adjuster locking wire together and slide retaining spring back over hump in locking wire and remove locking wire from adjuster.

5. Remove adjuster-to-seat bottom frame front and rear attaching bolts and remove seat adjuster from seat assembly.

6. To install, reverse removal procedure. Check seat assembly for proper operation prior to installing seat assembly.

   NOTE: The right and left seat adjuster sliding mechanisms should be in same relative position when attaching adjuster to seat bottom frame.

7. If right adjuster does not lock or unlock satisfactorily when control handle on left adjuster is operated, disengage locking wire retainer on right side of seat from hole in seat bottom frame and engage retainer in one of adjacent holes to obtain proper tension in wire. (Fig. 16-309)

FRONT SEAT BACK ASSEMBLY

Removal and Installation

1. Remove front seat assembly from body and place it upside down on a clean, protected bench.

2. Remove hog rings securing central portion of lower rear edge of seat back trim from front seat cushion spring assembly. (Fig. 16-309)

3. Raise trim and remove cardboard breakover foundation to expose seat cushion spring attachment to seat back frame along rear of seat and hog rings securing ends of seat back trim to seat bottom frame. (Fig. 16-310)

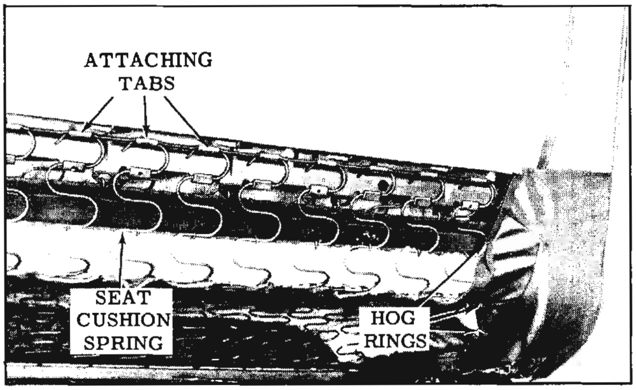


Fig. 16-310 Front Seat Cushion Spring Attachment

4. At each end of seat, remove hog rings securing lower edge of seat back trim from seat bottom frame. Then raise seat back trim to expose bolts securing seat back reinforcement to seat bottom frame. (Fig. 16-311)

5. Bend open tabs securing seat cushion spring assembly to seat back frame and carefully disengage springs from tabs. (Fig. 16-310)

6. Place seat assembly in upright position. Then with a helper, holding seat back assembly, remove seat back reinforcement-to-seat bottom frame attaching bolts on each side of seat and remove seat back assembly.

To install, reverse removal procedure.

NOTE: Make certain rear edge of seat cushion spring assembly is properly engaged to seat back frame and cardboard breakover foundation is properly positioned prior to hog ringing central portion of trim in place.

Fig. 16-311 Front Seat Back Attachment

FRONT SEAT SIDE PROTECTOR COVER

Removal and Installation

1. Turn back floor covering along outboard side at front seat adjuster sufficiently to expose protector cover.

2. Remove screws securing cover to floor pan and remove cover. (Fig. 16-312)

3. To install, reverse removal procedure.

REAR SEAT CUSHION ASSEMBLY

Removal

1. Push lower forward edge of cushion rearward and pull cushion upward until protrusions on seat bottom frame disengage from floor pan stops.

2. Pull cushion forward and carefully remove from body.

Installation

1. Carefully lift cushion into body to avoid damaging adjacent trim.

2. Position rear edge of cushion under rear seat back assembly.

3. Center protrusions on seat bottom frame with stops on floor pan assembly.

IMPORTANT: If seat bottom frame protrusions are not properly centered in relation to floor pan stops, proper engagement and

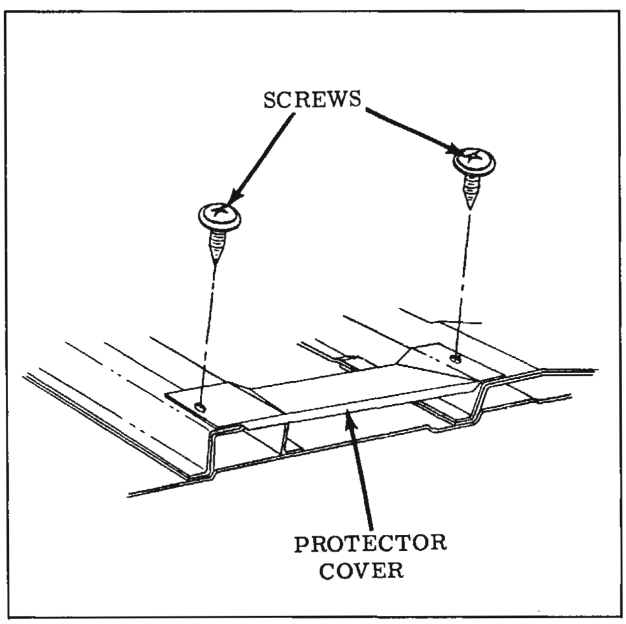


Fig. 16-312 Front Seat Side Protector Cover

placement of cushion will be extremely difficult.

4. Push forward edge of cushion rearward and downward until protrusions are properly engaged behind floor pan stops.

REAR SEAT BACK ASSEMBLY

Removal and Installation

1. Remove rear seat cushion assembly.

2. At bottom of the seat back on all styles except convertibles, bend out the two (2) tabs that secure the seat back to the floor panel. On convertibles, remove the two (2) screws securing the seat back to the floor panel and at back of seat remove screws securing folding top compartment side trim panels to seat back assembly.

3. Pull seat back assembly out at bottom until seat back clears body tabs; then, raise seat back upward until disengaged from hangers on the seat back panel support.

4. Remove seat back assembly from body.

5. To install, reverse removal procedure, making certain that all attaching body tabs and hangers have industrial body tape applied to them to act as an anti-squeak.

BUCKET TYPE FRONT SEATS

DESCRIPTION

All seat adjusters and stationary supports are bolted to the seat bottom frame; however, a combination of bolts and/or nuts are used to retain the adjusters or stationary supports to the floor pan assembly.

The four-way (tilt) seat adjusters are actuated by a 12 volt, reversible shunt wound motor with a built-in circuit breaker.

The seat adjuster operating mechanism incorporates a transmission assembly which includes two solenoids and two drive cables leading to the seat adjusters. One solenoid controls the vertical movement of the seat while the other solenoid controls the horizontal movement of the seat. When the control switch is actuated, the motor and one of the solenoids are energized simultaneously. Then the solenoid plunger engages with the driving gear dog. The driving gear rotates the drive cables and operates both adjusters. When the adjusters reach their limit of travel, the drive cables stop their rotating action and torque is absorbed by the rubber coupler connecting the motor and transmission. When the switch contacts are opened, a return spring returns the solenoid plunger to its original position disengaging it from the driving gear dog.

SEAT ASSEMBLY (EITHER SIDE—MANUAL OR POWER)

Removal and Installation

1. Turn back floor carpeting to expose seat adjuster to floor pan attaching nuts or bolts.

2. Operate seat assembly to rearward position.

3. Loosen adjuster to floor pan attaching nuts or bolts.

4. Operate seat assembly to full forward position.

5. At rear of seat, remove adjuster to floor pan attaching nuts or bolts.

6. If power-operated, disconnect wiring harness from seat control switch and from actuator motor.

7. Carefully slide seat assembly rearward until front adjusters are removed from under front attaching nuts or bolts.

8. With aid of helper, remove seat assembly with attached adjusters from body.

9. To install, reverse removal procedure. Be sure adjusters are properly engaged under front attaching nuts or bolts prior to installing rear attaching bolts. Check seat adjusters for proper operation.

PASSENGER SEAT (STATIONARY) (3167 Styles)

Removal and Installation

1. Turn back floor carpeting to expose stationary support-to-floor pan nuts or bolts.

2. Scribe location of seat supports on floor pan.

3. At front of seat, loosen seat support to floor pan attaching nuts or bolts.

4. At rear of seat, remove seat support to floor pan attaching nuts or bolts.

5. Carefully slide seat assembly rearward until front supports are removed from under front attaching nuts or bolts.

6. With aid of helper, remove seat assembly with attached supports from body.

7. To install, reverse removal procedure. Be

sure supports are properly engaged under front attaching nuts or bolts and aligned within scribe marks prior to installing rear attaching bolts.

FRONT SEAT ADJUSTERS (EITHER SIDE—MANUAL)

Removal and Installation

1. Remove front seat assembly and place upside down on a clean, protected surface.
2. If adjuster to be replaced is equipped with an assist spring, remove spring from adjuster.
3. Operate adjuster so that both front and rear attaching bolts are accessible.
4. Remove adjuster to seat bottom frame front and rear attaching bolts and remove adjuster from seat assembly.
5. To install, reverse removal procedure.

FRONT SEAT ADJUSTER (POWER)

Removal and Installation

1. Operate seat assembly to fully raised and midway horizontal position.
2. Remove bucket seat assembly from body with attached adjusters, motor and transmission and place upside down on a clean protected surface.
3. If power-operated outboard adjuster is being removed, disconnect power drive cable from vertical gear nut and horizontal actuator.
4. Remove adjuster to seat bottom frame front and rear attaching bolts.
5. Remove nuts securing motor and transmission support to adjuster assembly. (Fig. 16-313 for outboard adjuster and Fig. 16-314 for inboard adjuster)
6. Carefully disengage adjuster from support and torque tube assembly; then remove adjuster from seat.
7. To install, reverse removal procedure. Check seat adjusters for proper operation.

FRONT SEAT STATIONARY SUPPORTS (PASSENGER SEAT ONLY) (3167 Style)

Removal and Installation

1. Remove front seat assembly and place upside

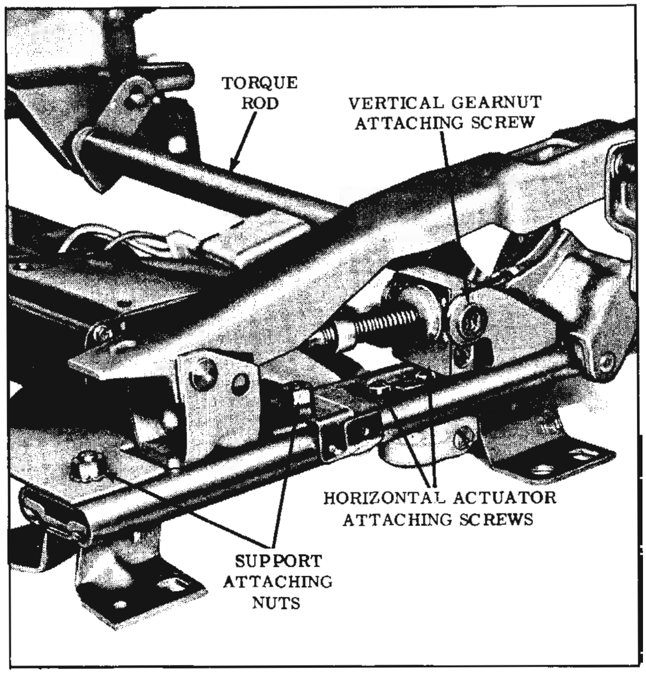


Fig. 16-313 Outboard Bucket Seat Adjuster

down on a clean protected surface.

2. Scribe location of support to be removed on seat bottom frame.
3. Remove bolt securing affected support to seat bottom frame (Fig. 16-315) and remove support from seat assembly.
4. To install, reverse removal procedure.

FRONT SEAT BACK ASSEMBLY

1. Using a flat-bladed tool, carefully remove retainer from outer hinge pin. (Fig. 16-316)
2. Tilt seat back forward and remove retainer from inner hinge pin.
3. Disengage front seat back outer hinge arm from pin.

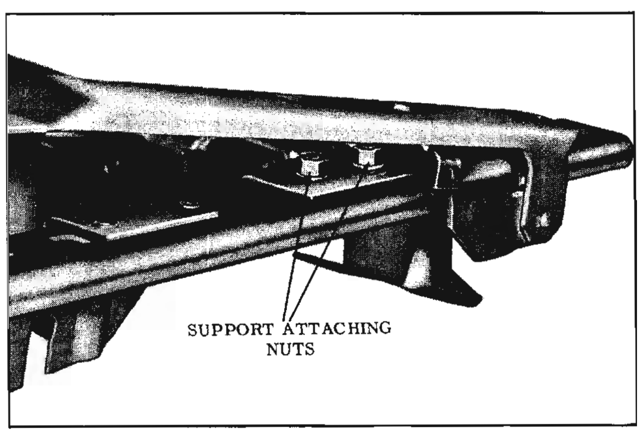


Fig. 16-314 Inboard Bucket Seat Adjuster

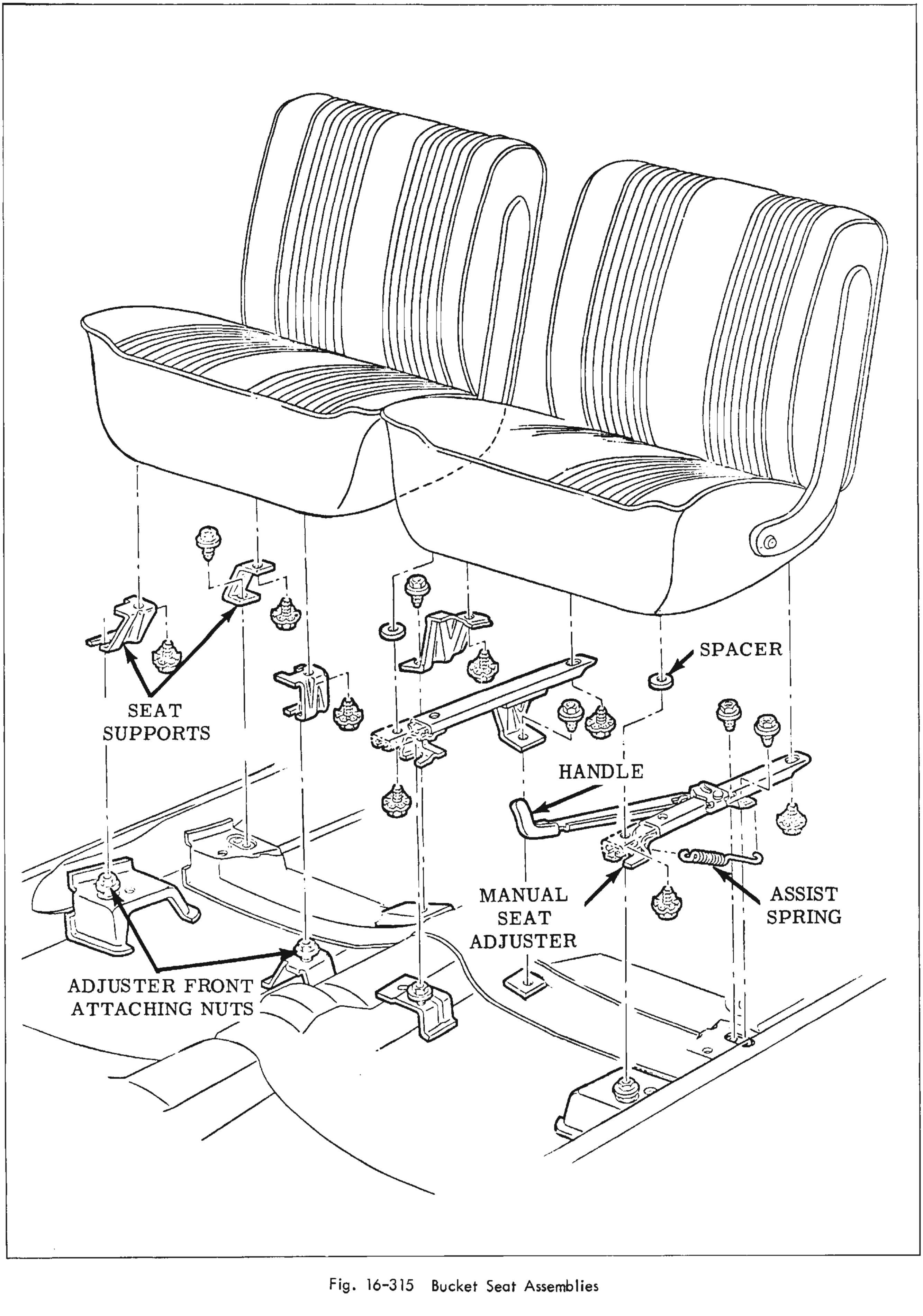


Fig. 16-315 Bucket Seat Assemblies

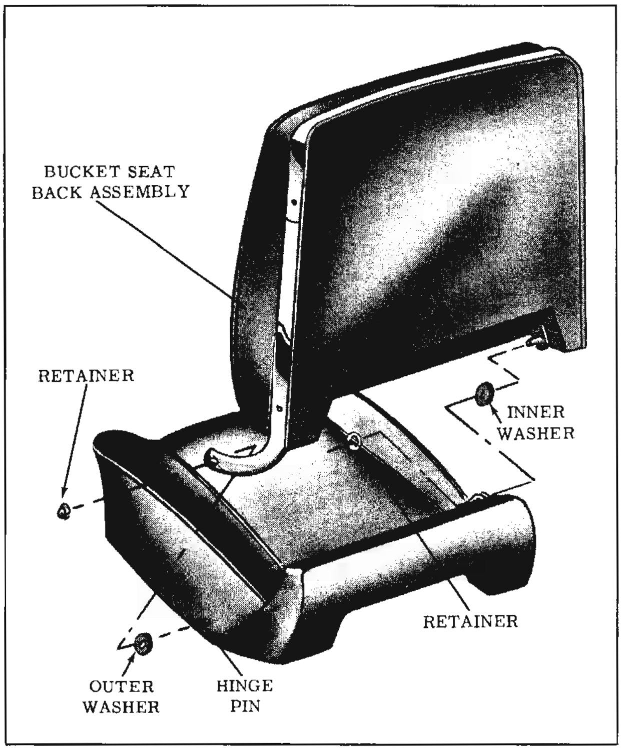


Fig. 16-316 Bucket Seat Back Removal

4. Move entire seat back assembly inboard until inner hinge pin is disengaged from extension on seat assembly; then remove seat back from body.

5. To install, reverse removal procedure. Prior to installation of back assembly, be sure inner and outer washers are installed over the hinge pins.

REPOSITIONING SEAT ASSEMBLY (3167 Style)

The seats may be repositioned one inch forward as follows:

1. Remove seat assembly and turn upside down on a clean protected surface.

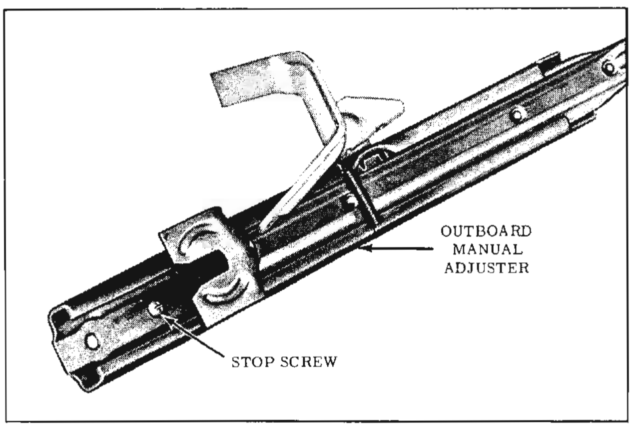


Fig. 16-317 Repositioning Front Seat

2. As a safety precaution, disengage assist spring from outboard adjuster.

3. Operate outboard adjuster lower track forward sufficiently to remove stop screw from rear of adjuster upper track.

4. Operate outboard adjuster lower track rearward sufficiently to install stop screw at front of adjuster upper track. (Fig. 16-317)

5. Install assist spring and install seat assembly into body.

6. Operate seat assembly several times to full forward position. Cycling of seat assembly will allow inboard adjuster upper track to skid over rollers between upper and lower track thus allowing both adjusters to become "in phase".

ADJUSTER GEAR NUT (POWER)

Removal and Installation

1. Operate seat assembly to fully raised and midway horizontal position.

2. Remove front seat assembly and place upside down on a clean protected surface.

3. Using a clutch type screwdriver, remove shoulder screws securing linkage to vertical gear nut. (Fig. 16-318)

4. Remove jackscrew "down" stop from jackscrew. (Fig. 16-318)

5. Using a portable power source, actuate vertical gear nut until gear nut is disengaged from jackscrew.

NOTE: It may be necessary to manually raise or lower upper rear portion of adjuster

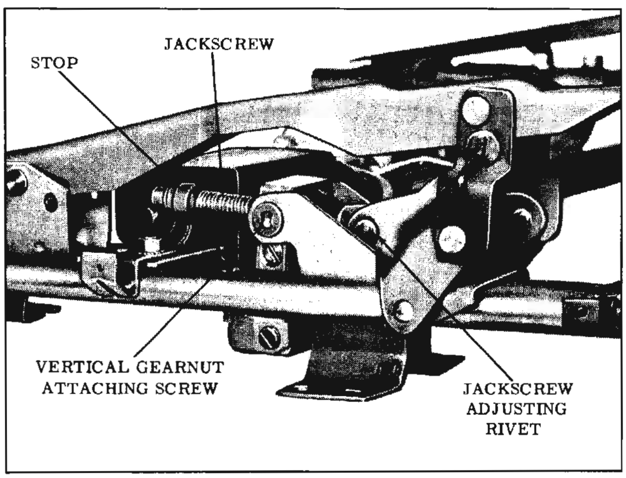


Fig. 16-318 Outboard Bucket Seat Adjuster

to gain clearance for removal of gear nut.

6. Disconnect drive cable from gear nut.

7. To install, reverse removal procedure. Check seat adjusters for proper operation.

ADJUSTER JACKSCREW (POWER)

Removal and Installation

1. Remove adjuster gear nut.

2. Remove seat adjuster to seat bottom frame front and rear attaching bolts.

3. As a bench operation, remove jackscrew-to-adjuster linkage attaching rivet and remove jackscrew from adjuster assembly (Fig. 16-318)

   NOTE: It may be necessary to manually raise or lower upper rear portion of adjuster to gain access to jackscrew attaching rivet.

4. To install, reverse removal procedure. Use new rivet to attach jackscrew-to-adjuster linkage. Check seat adjusters for proper operation.

ADJUSTER HORIZONTAL ACTUATOR (POWER)

Removal and Installation

1. Remove front seat assembly and place upside down on a clean protected surface.

2. Using a clutch type screwdriver, remove shoulder screws securing linkage to vertical gear nut. (Fig. 16-313)

3. Using a portable power source, actuate vertical gear nut until gear nut is against "down" stop on jackscrew assembly.

4. Disconnect drive cable from actuator assembly.

5. Remove screws securing horizontal actuator assembly to adjuster lower track; then remove actuator from adjuster assembly. (Fig. 16-313)

6. To install, reverse removal procedure.

   NOTE: When installing horizontal actuator, adjust actuator so that drive gear is fully engaged with teeth on lower channel. When horizontal actuator attaching screws are tightened, there should be no free motion between upper and lower channels. Check seat adjusters for proper operation.

ADJUSTER MOTOR

Removal and Installation

1. Remove front seat assembly.

2. Disconnect wire harness from motor relay.

3. Remove motor-to-motor support attaching screws and remove motor from support.

4. To install, reverse removal procedure making sure rubber coupler is properly engaged at both motor and transmission ends.

ADJUSTER CABLES (POWER)

Removal and Installation

1. Remove front seat assembly with adjusters, motor and transmission attached and place upside down on a clean protected surface.

2. Detach both horizontal and vertical cables from seat adjuster.

3. Remove screws securing horizontal and vertical cable end plate on side of transmission from which cables are being removed and remove cables from seat assembly.

4. To remove one cable from end plate for service replacement, place end plate in a vise and with a suitable tool, remove knock-out plug located adjacent to cable hole. This will allow cable to be removed from end plate and a new service replacement cable installed.

5. To install horizontal and vertical cable, reverse removal procedure.

ADJUSTER TRANSMISSION (POWER)

Removal and Installation

1. Remove front seat assembly from body with adjusters, motor and transmission attached and place upside down on a clean protected surface.

2. Disconnect wire harness connector from transmission.

3. Remove screws securing horizontal and vertical cable end plate on both sides of transmission and detach cables from transmission.

4. Remove transmission to support attaching bolts; then, disengage transmission from rubber coupler and remove transmission from seat assembly.

5. To install, reverse removal procedure.

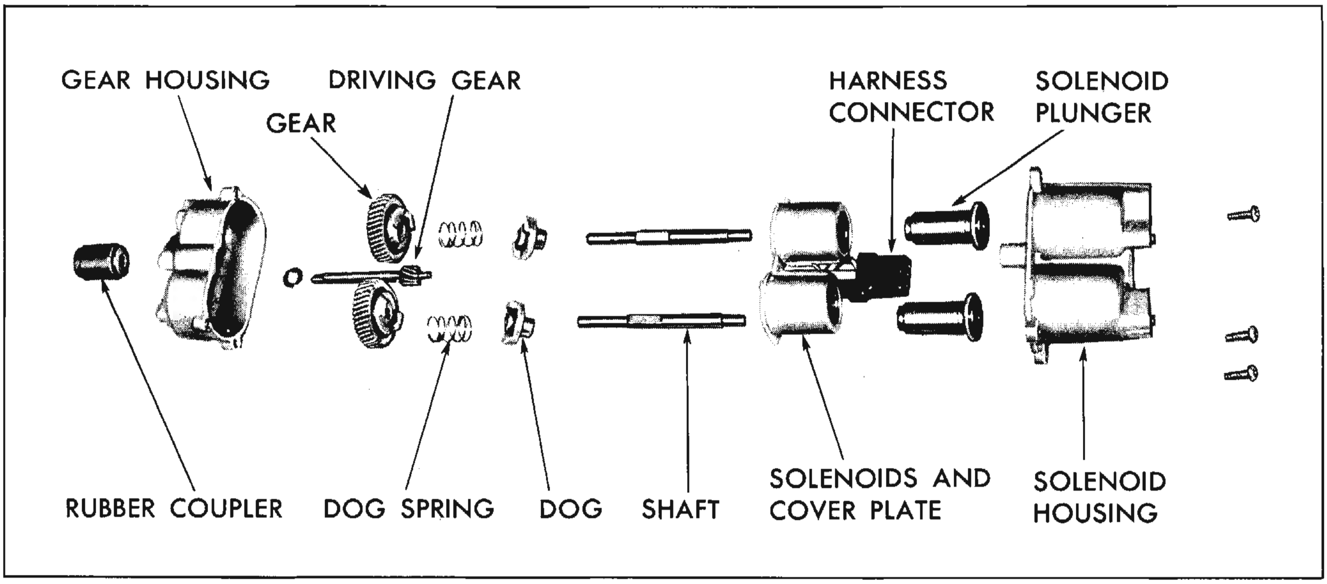


Fig. 16-319 Seat Transmission

Disassembly and Assembly

1. Remove front seat adjuster transmission from seat assembly.

2. Remove screws securing gear and solenoid housings together; then, carefully separate housings and remove component parts of transmission assembly. (Fig. 16-319)

3. To assemble transmission, reverse removal procedure.

IMPORTANT: Prior to or during installation, lubricate frictional surfaces of driving gear thrust washer, gears, dog washers, shaft and solenoid plungers with "Lubriplate".

TORQUE TUBE ASSEMBLY (POWER)

Removal and Installation

1. Remove front seat assembly.

2. Remove adjuster to seat bottom frame front and rear attaching bolts.

3. Remove nuts securing motor and transmission support to inboard adjuster (Fig. 16-314).

4. Carefully disengage adjuster from support and torque tube assembly; then, remove adjuster from seat.

5. Disengage torque tube from opposite adjuster and remove tube from seat assembly.

6. To install, reverse removal procedure. Check seat adjuster for proper operation.

MOTOR AND TRANSMISSION SUPPORT (POWER)

Removal and Installation

1. Remove front seat assembly.

2. Remove nuts securing support to both adjusters. (Fig. 16-313 for outboard adjuster and Fig. 16-314 for inboard adjuster).

3. Carefully remove support from adjusters with attached motor, transmission and relay assembly.

4. If replacing support, transfer motor, transmission and relay assembly to new part.

5. To install, reverse removal procedure. Check seat adjusters for proper operation.

MOTOR RELAY (POWER)

Removal and Installation

1. Remove front seat assembly.

2. Disconnect motor-to-motor relay wire harness.

3. Remove nut securing relay to support and remove relay from seat assembly.

4. To install, reverse removal procedure.

CHECKING PROCEDURE

It may be necessary to use only one or all of the procedures outlined to locate an electrical failure in the circuit. If the location of the failure is evident, follow only the steps required to check the affected wire or component. If the location of the failure is not evident, follow the procedures as outlined. Before performing any extensive check procedures, check the seat adjuster drive cables for proper attachment. In addition, study the seat circuit diagrams to become familiar with the seat circuit.

1. Checking for Current at Circuit Breaker

   A. Connect one light tester lead to battery side of circuit breaker and ground other lead. If tester does not light, there is no current at battery side of circuit breaker.

   B. To check circuit breaker, disconnect switch feed wire from breaker, and with a light tester, check for current at switch side of circuit breaker. If tester does not light, there is no current flowing through circuit breaker.

2. Checking the Circuit Relay Assembly

   A. With light tester, check for current at circuit breaker side of relay. If tester does not light, there is a short or open circuit between circuit breaker and relay assembly.

   B. Turn ignition switch on and with a light tester, check for current at output side of relay. If tester does not light, the relay is defective or there is a short or open circuit between ignition switch and relay assembly. Check wires before replacing relay.

   NOTE: Ignition switch must be on for performing the remainder of checking procedure.

3. Checking Feed Circuit Continuity at Relay on Seat Motor

   A. Disengage three-way connector body from the seat motor relay.

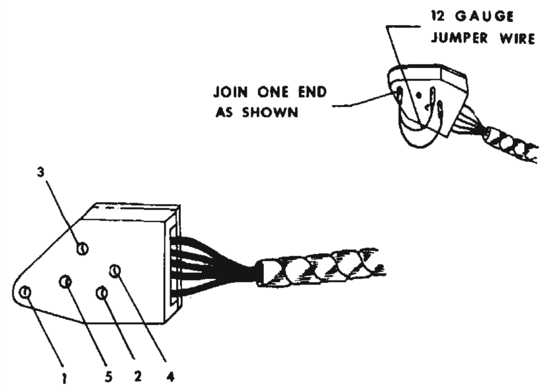
   B. Insert one light tester lead into the relay power feed (red wire) connector slot on the harness, and ground other tester lead.

   C. If tester does not light, there is no current at end of feed wire. Failure is caused by an open or short circuit in feed circuit.

4. Checking for Current at Seat Control Switch

   A. Connect one light tester lead to feed terminal of switch block and ground other light tester lead to body metal.

   B. If tester does not light, there is no current at switch block. Failure is caused by an open or short circuit between switch block and power source.



LOCATION	WIRE COLOR	FUNCTION
1	WHITE	SWITCH FEED
2	YELLOW	FIELD FEED-REARWARD & UP CYCLE
3	DARK BLUE	SOLENOID-HORIZONTAL MOVEMENT
4	PINK	FIELD FEED-FORWARD & DOWN CYCLE
5	DARK GREEN	SOLENOID-VERTICAL MOVEMENT

Fig. 16-320 Seat Switch Block

5. Checking the Seat Control Switch

   In the following operations which specify the seat control switch to be actuated, a switch that has been checked for proper operation may be connected to the switch block. If a switch is not available, a three-way jumper wire can be made to perform the switch function. The method of making the jumper wire and the switch locations to be connected to obtain a specific movement of the seat is shown in Fig. 16-320. If a jumper wire is used, number the locations on the switch block as indicated in the illustration.

   NOTE: To make jumper wire, obtain two (2) pieces of #12 gauge wire, each 4 1/2" long. Join one end of each wire as shown in diagram. The joined end can be inserted in the feed location in the switch block; one of the remaining ends can be inserted into one of the solenoid locations.

   A. Obtain switch or jumper wire and connect to switch block.

   B. Operate switch if used. If adjusters operate with new switch or jumper wire, but did not operate with original switch, the original switch is defective or connector block was not sufficiently engaged.

   IMPORTANT: To obtain a seat movement using a three-way jumper wire at the switch block, the switch feed location, one of the motor field wire locations and one of the solenoid locations have to be connected simultaneously.

The switch locations to be connected to obtain a specific seat movement are outlined as follows:

(1) To raise seat, place jumper wire in locations 1, 2 and 5.

(2) To lower seat, place jumper wire in locations 1, 4 and 5.

(3) To operate seat forward, place jumper wire in locations 1, 3 and 4.

(4) To operate seat rearward, place jumper wire in locations 1, 2 and 3.

6. Checking Wires Between Control Switch and Motor Relay

   A. Disengage three-wire harness connector from relay at motor.

   B. Insert one light tester lead into the motor field connector slot on harness and ground other lead.

   C. Actuate seat switch to energize field wire being tested.

   D. If tester does not light, there is no current at end of wire. Failure is caused by an open or short circuit between end of wire and switch. Check other motor field wire in the same manner.

7. Checking the Relay Assembly

   A. Disconnect three (3) leads from relay assembly. These are the wires leading from the motor to the relay.

   B. Connect one end of a jumper wire to one of the motor field feed studs on the relay and ground the other end of the jumper wire.

   C. Connect one light tester lead to motor armature feed stud on relay and ground other tester lead.

   D. With jumper wire, energize the field stud which is not grounded.

   CAUTION: Do not energize grounded side. If tester does not light, the relay is defective.

8. Checking the Motor Assembly

   A. Disconnect motor field feed wires from motor.

   B. Connect one end of a #12 gauge jumper wire to battery positive pole and other end to one of the motor field and the armature wires.

   C. If motor does not operate, motor is defective. Check the remaining motor field wire in the same manner.

9. Checking Wires Between Switch and Solenoids

   A. Disconnect harness connector from transmission assembly.

   B. Connect one light tester lead to one terminal of power feed and ground other light tester lead to body metal.

   C. Operate switch to wire being tested. If tester does not light, there is no current at the end of harness wire. Failure is caused by an open or short circuit between end of wire and switch or defective switch.

   D. Check other wire in same manner.

   NOTE: One wire in connector is a blank. Check wiring diagram for colors of wires actually used.

10. Checking the Solenoid

   A. Check solenoid ground strap attachment for proper ground.

   B. Connect one end of a #12 gauge jumper wire to the battery positive pole and the other end to the lead of the solenoid being checked.

   CAUTION: To prevent damaging the solenoid, do not energize solenoid for more than one minute.

   C. Operate switch to actuate adjuster motor and solenoid being checked.

   D. If adjusters do not operate and there is no mechanical failure of the adjusters, the solenoid is defective.

   NOTE: If solenoid is functioning properly, a "click" may be heard when solenoid plunger operates.

TYPICAL ELECTRICAL FAILURES OF POWER SEATS

CONDITION	CAUSE	CORRECTION
Seat adjuster motor does not operate.	Short or open circuit between power source or switch and motor.	Check circuit from power source and switch to motor to locate failure.
	Defective motor relay.	Replace relay.
	Defective motor.	Check motor. If defective repair or replace as required.
	Defective switch.	Replace switch.
	Defective circuit breaker.	Replace circuit breaker.
Seat adjuster motor operates in both directions but seat adjusters are not actuated.	Short or open circuit between switch and affected solenoid.	Check circuit from switch to solenoid to locate failure.
	Defective solenoid.	Check solenoid. If defective, repair or replace as required.
	Defective switch.	Replace switch.
Seat Adjuster motor operates in one direction only, seat moves down and forward, but does not move up and rearward.	Short or open circuit between one of the motor relay wires and seat control switch.	Check circuit between affected motor relay wire and seat switch.
	Defective field coil in motor.	Check motor. If defective repair or replace as required.
	Defective switch.	Replace switch.

FOLDING REAR SEAT CUSHION

Removal and Installation

1. Lift up front edge of folding rear seat cushion assembly to disengage retainers in seat bottom frame from slots in rear seat support and remove cushion assembly.
2. To install, reverse removal procedure. Make certain that protrusions are fully engaged in rear seat support.

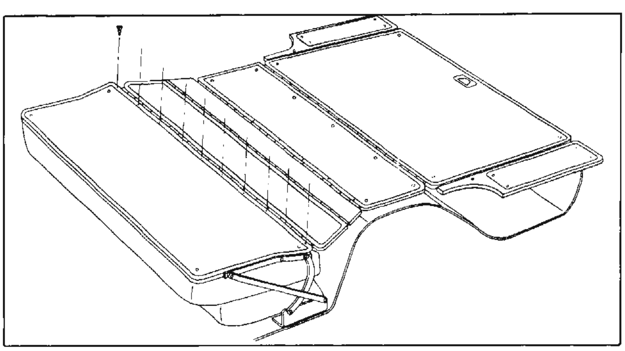


Fig. 16-321 Folding Rear Seat Back Assembly

FOLDING REAR SEAT BACK ASSEMBLY

Removal and Installation

1. Fold rear seat back assembly to down position.
2. Remove rear floor filler panel to folding seat back panel attaching screws as shown in Fig. 16-321.
3. At each side of seat, remove screws securing mounting support link assembly to folding seat back assembly. (Fig. 16-322)
4. With aid of helper, carefully remove folding seat back assembly from body and place it on clean, protected bench.
5. To install, reverse removal procedure.

FOLDING REAR SEAT BACK MOUNTING SUPPORT LINK ASSEMBLY

Removal and Installation

1. Release rear seat cushion and slide cushion forward.

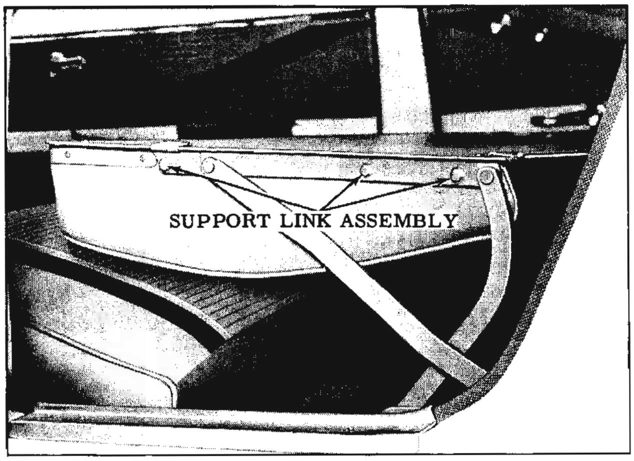


Fig. 16-322 Support Link Assembly

2. Turn back rear floor carpet sufficiently to expose mounting support link to floor pan anchor plate attaching screws and remove screws.

3. Fold rear seat back assembly to down position.

4. Remove mounting support to folding seat back attaching screws as shown in Fig. 16-322, and remove mounting support link assembly from body.

5. To install, reverse removal procedure. Check operation of folding rear seat back and filler panel assembly. Where required, loosen mounting support to anchor plate attaching screws. Adjust mounting support fore or aft as required for proper folding seat back operation.

FOLDING REAR FLOOR FILLER PANEL ASSEMBLY

Removal and Installation

1. Fold rear seat back assembly to down position.

2. Remove filler panel to folding seat back attaching screws, and filler panel to rear seat pan attaching screws as shown in Fig. 16-323 and remove filler panel from body.

4. To install, reverse removal procedure.

Adjustments

To adjust folding rear floor filler panel assembly, proceed as follows:

1. At each side of seat, loosen mounting support to floor pan anchor plate attaching screws.

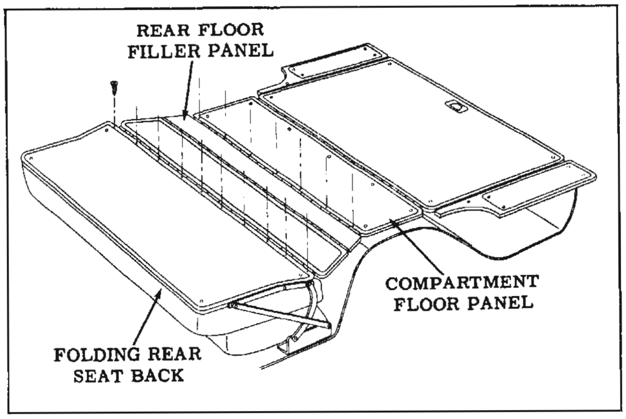


Fig. 16-323 Folding Rear Floor Filler Panel Assembly

2. Adjust mounting supports fore or aft as required and tighten screws.

3. Check operation of folding seat back and filler panel assembly. When the seat back is in the down or folded position, the back and rear floor filler panel should form a level floor surface. Where necessary, readjust mounting supports as required for proper seat back and filler panel operation.

COMPARTMENT FLOOR PANEL ASSEMBLY (AT KICK-UP)

Removal and Installation

1. Lower folding rear seat back assembly.

2. Remove rear floor filler panel to rear seat pan attaching screws as shown at "A" in Fig. 16-324.

3. Fold rear floor filler panel forward sufficiently to gain access to compartment floor panel to rear seat pan attaching screws and remove screws from panel.

NOTE: Attaching screws are located at each end of panel. (See HIDDEN ATTACHING SCREWS, Fig. 16-324)

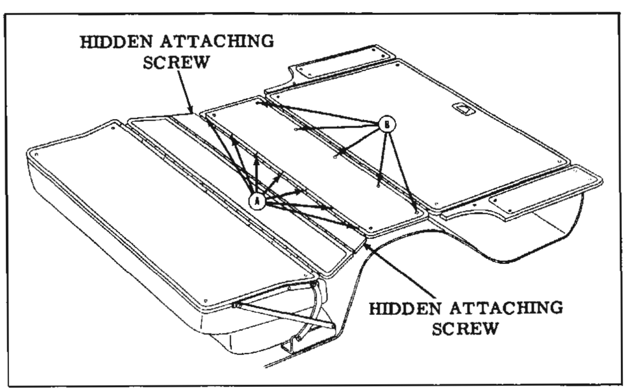


Fig. 16-324 Compartment Floor Panel Assembly

4. Remove floor panel to spare tire cover hinge support panel attaching screws, shown at "B", Fig. 16-324, and remove compartment floor panel assembly from body.

5. To install, reverse removal procedure.

SPARE TIRE COVER PANEL ASSEMBLY

Removal and Installation

1. Remove compartment floor panel assembly as previously described.

2. Remove screws securing spare tire cover panel hinge to hinge support.

3. Using spare tire cover handle, lift panel upward and remove spare tire cover panel assembly from body.

4. To install, reverse removal procedure.

COMPARTMENT FLOOR SIDE PANEL ASSEMBLY (RIGHT OR LEFT SIDE)

Removal and Installation

1. Remove compartment floor panel assembly as previously described.

2. Remove screws securing compartment floor side panel to side panel support as shown at "A", Fig. 16-325, and remove panel assembly from body.

3. To install, reverse removal procedure.

FOLDING REAR SEAT BACK BUMPER, RETAINER AND SUPPORT (RIGHT OR LEFT SIDE)

Removal and Installation

1. With folding rear seat back in down position, remove screw shown in View "A", Fig. 16-326, and remove bumper and retainer from wheelhouse support.

2. Remove 3 screws shown in View "A", Fig. 16-326 and remove support from wheelhouse assembly.

3. To install, reverse removal procedure.

NOTE: The folding rear seat back retainer is adjustable inboard or outboard. To adjust retainer, raise folding rear seat back to up position and check retainer tension. Lower folding seat back and loosen retainer attaching screw. Adjust retainer inboard or outboard as required, then tighten attaching

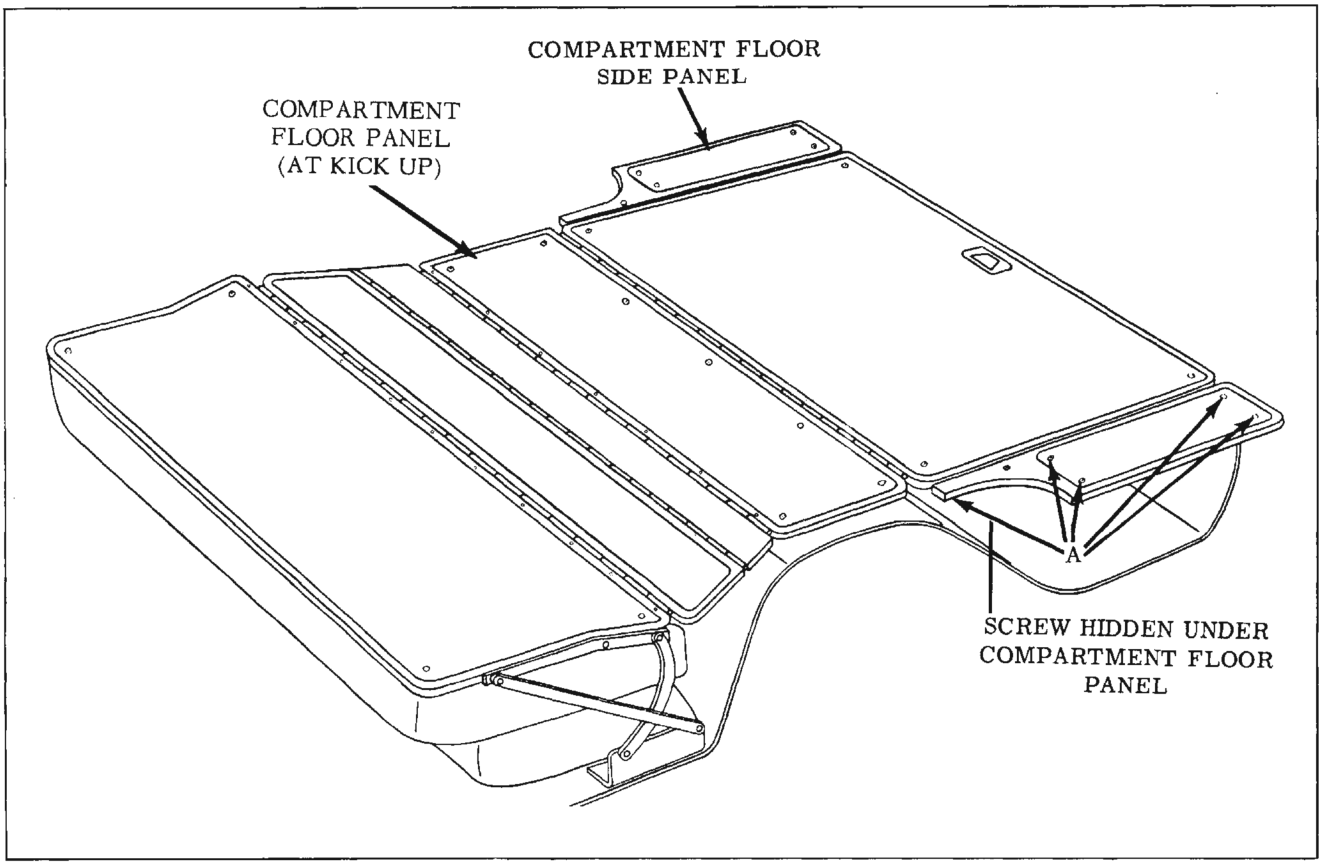


Fig. 16-325 Compartment Floor Side Panel Assembly

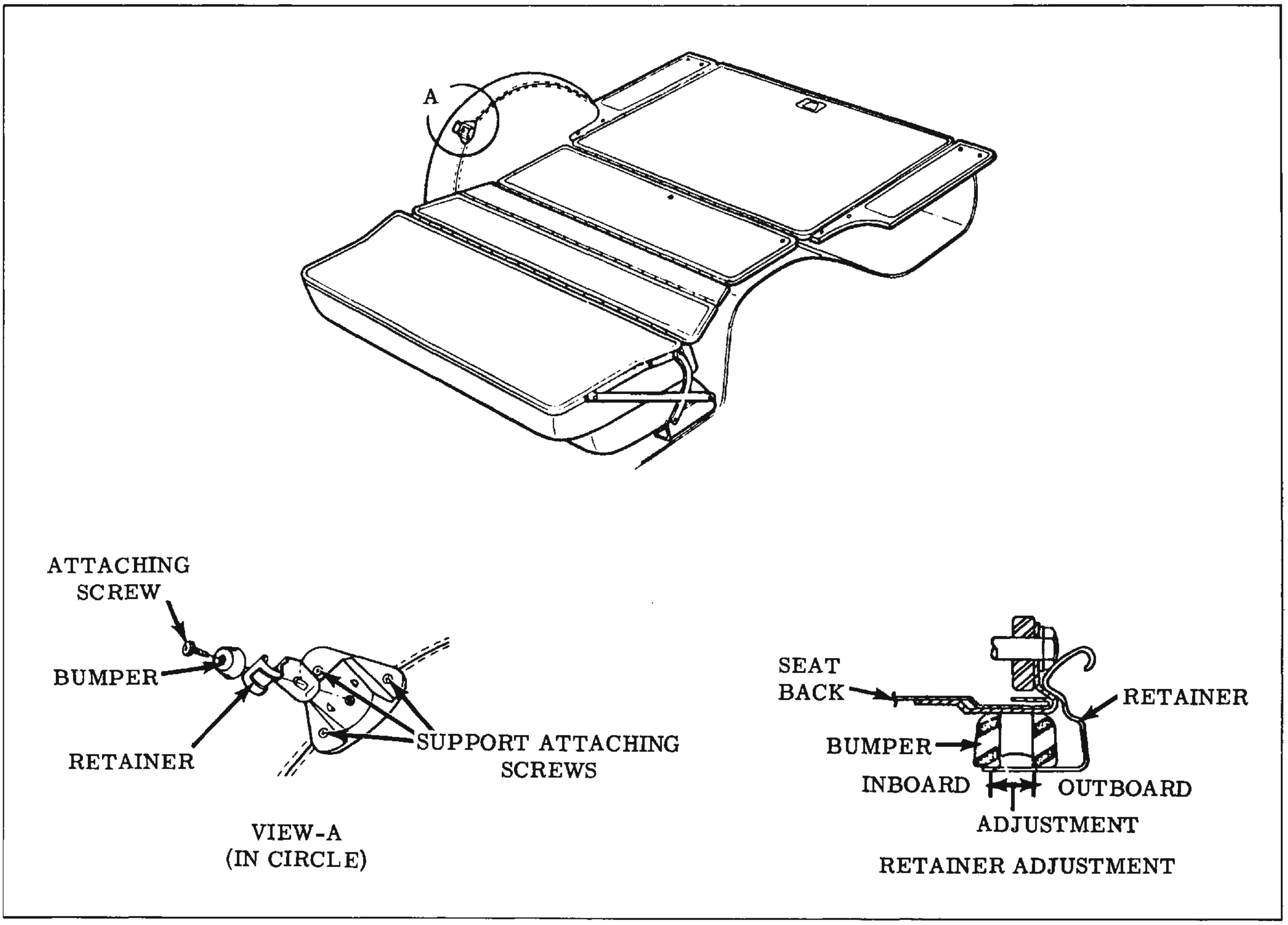


Fig. 16-326 Folding Rear Seat Back Bumper, Retainer and Support

screw. Recheck folding seat back assembly. Where required, readjust retainer until desired seat back retention has been obtained.

SPARE TIRE COVER HANDLE ASSEMBLY

Removal and Installation

1. Remove 4 screws securing handle to spare tire cover panel and remove handle assembly from panel.
2. To install, reverse removal procedure.

HEADLINING ASSEMBLY

The headlining assembly is formed to the contour of the roof panel by concealed listing wires. The ends of the listing wires are installed into holes in the side roof rails.

The headlining assembly is secured at the windshield and back window or back door opening by cement and tacks or staples. Along the side roof rails, the headlining is cemented around the pinchweld flange of the side roof rail assembly.

CAUTION: Clean hands and tools are essential when working with headlining material.

Removal

1. Place protective coverings over seat cushions and backs.
2. Prior to removing headlining, remove following hardware and trim assemblies:
   a. Sunshade support assembly(s).
   b. Rear view mirror support.
   c. Windshield upper garnish moldings.
   d. Center pillar-to-roof rail finishing plates.
   e. Coat hooks (where present).
   f. Back window garnish moldings.
   g. Dome lamp assembly or rear quarter courtesy lamps.
   h. Front and rear door opening pinchweld finishing strip along top of each door opening sufficiently to expose edge of headlining ("19" and "35" styles).

i. Front door and rear quarter window pinchweld finishing strip sufficiently to expose edge of headlining ("17", "27", and "47" styles).

j. Body lock pillar to roof rail finishing plates ("35" styles).

k. Back body opening upper finishing panels ("35" styles).

l. Rear quarter upper pinchweld finishing strips ("35" styles).

m. Quarter belt finishing moldings ("17", "27", and "47" styles).

n. Center pillar to roof rail finishing plates ("19", and "35" styles).

3. Carefully detach cemented edge of headlining along each side roof inner rail including rear quarter windows on station wagon styles.

4. Carefully remove tacks or staples securing headlining at windshield opening (View A, Fig. 16-327 and Fig. 16-328).

5. Carefully remove tacks or staples securing headlining at back window or back body opening (Views J and H, Fig. 16-328 and Views B and C, Fig. 16-327) Then carefully detach cemented edges of headlining.

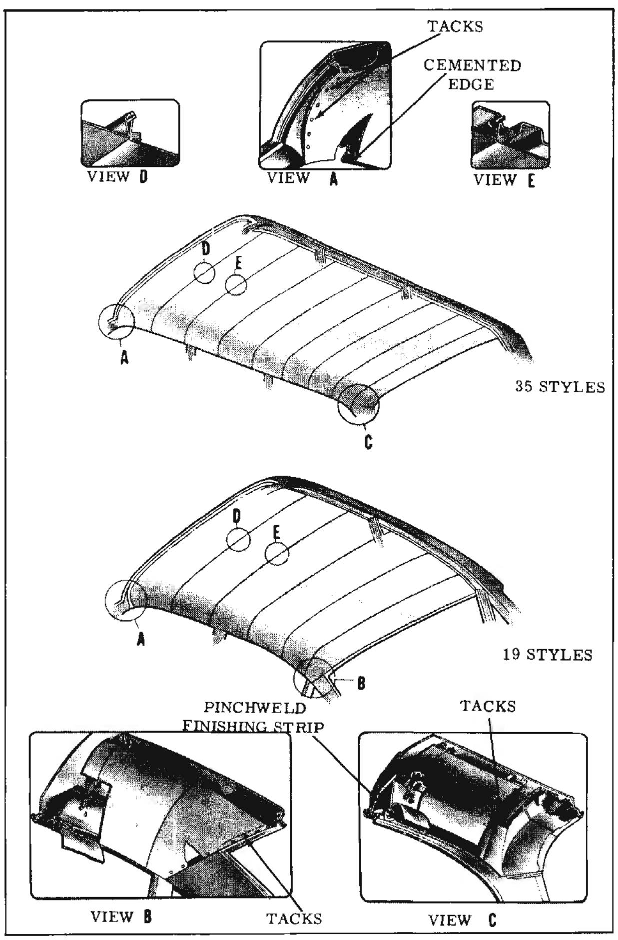


Fig. 16-327 Headlining Installation

6. On "17", "27", and "47" styles, remove tacks or staples at quarter belt trim stick (Views J and H, Fig. 16-328).

7. Working from front to rear of body, disengage headlining listing wires from holes in side roof inner rails. Gather or roll headlining with listing wires on outside to keep headlining clean.

IMPORTANT: Note in which holes ends of listing wires are installed in side roof inner rails. Listing wires should be placed in same holes when replacing headlining.

8. At front roof bow, bend down metal tabs (View E, Fig. 16-327 and Fig. 16-328). On "27" styles, bend down metal tab supporting center of rear listing wire (View G, Fig. 16-328). On "17" and "47" styles, three metal tabs are used to support rear listing wire. (Views G and J, Fig. 16-328).

9. Disengage rear listing wire from clips in roof extension area on "17", "27", and "47" styles (Views J and H, Fig. 16-328).

10. Remove headlining from body.

11. If replacing headlining, remove listing wires from pockets of headlining.

IMPORTANT: Listing wires removed from old headlining must be installed in corresponding pockets of new headlining.

Installation

1. If previously removed, install listing wires into pockets of new headlining assembly.

2. Apply approved trim cement to headlining attaching surfaces at windshield, side roof inner rails, and back window or back door opening.

3. Lift entire headlining assembly into body, then install rear listing wire. Make certain rear listing wire is properly inserted into clips at roof extension area on "17", "27", and "47" styles (View J and H, Fig. 16-328).

4. Bend up metal tabs supporting rear listing wire where present. Center and align headlining in relation to back window or back body opening and side roof rails. Working forward, install ends of listing wires into listing wire holes in side roof rails.

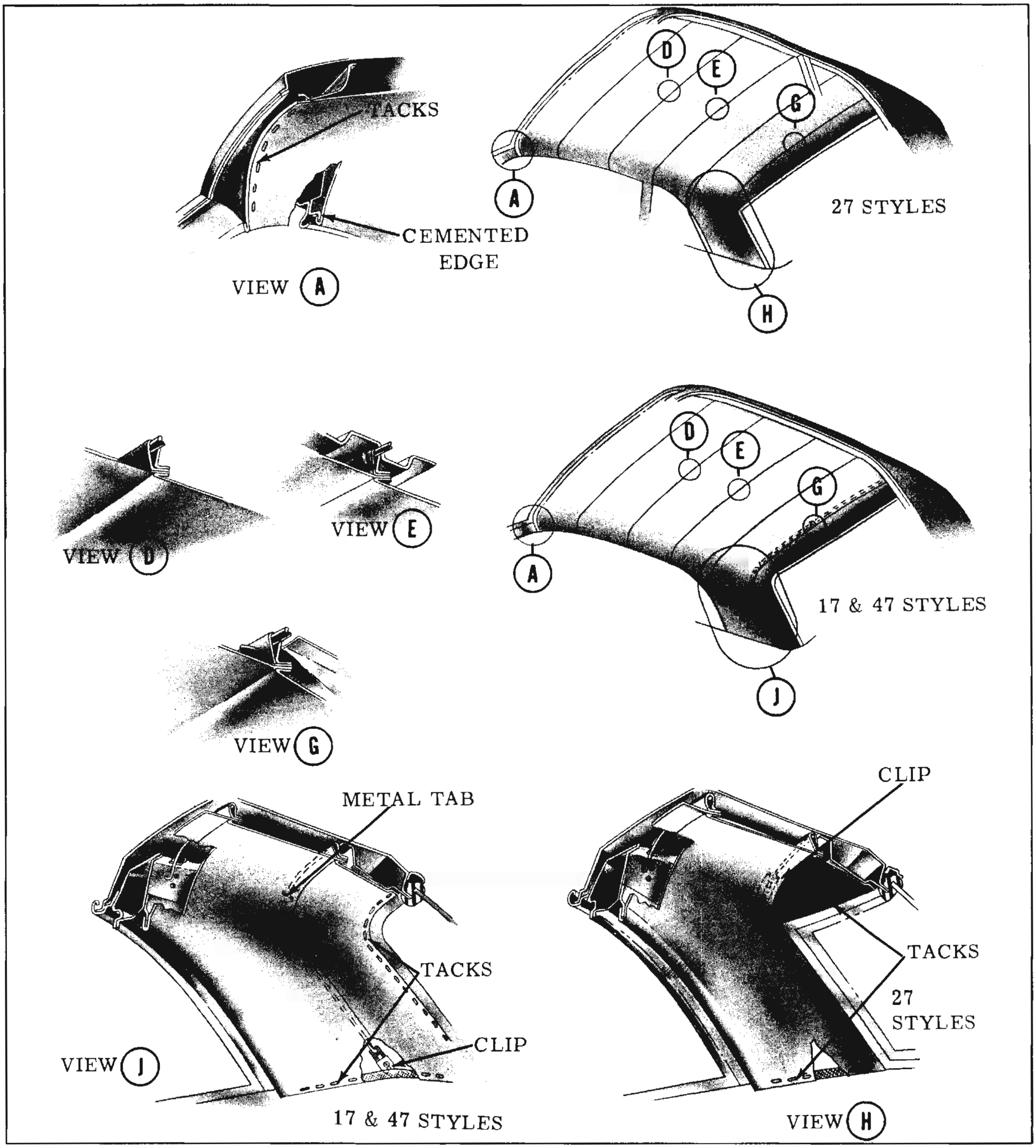


Fig. 16-328 Headlining Installation

NOTE: Each listing wire SHOULD rest against roof deadener after it is installed. Listing wires may be adjusted up or down by placing in appropriate holes in side roof inner rails. Clips on rear listing wires may be also adjusted by loosening screw.

5. Install headlining listing wire over metal tabs on front roof bow. Bend up metal tabs so that listing wire is securely fastened to roof bow (View E, Fig. 16-327 and Fig. 16-328).

6. Install remaining listing wire.

7. Stretch and stay tack headlining along entire windshield and back window or back door opening. Also tack at quarter belt trim stick on "17", "27", and "47" styles.

8. Apply trim cement to side edges of headlining assembly.

9. Carefully secure headlining at cemented areas

making certain to remove all "fullness" and "draws" from material.

10. Remove any "fullness" and "draws" in headlining material at windshield and back window or back door openings and permanently tack headlining to tacking strips.

11. Using headlining inserting tool, permanently install edge of headlining around side roof rail pinchweld (View A, Fig. 16-327 and Fig. 16-328).

12. Trim excess material from edge of headlining around entire perimeter.

13. Install door opening and/or rear quarter upper pinchweld finishing strips and all other previously removed hardware.

ROOF PANEL FABRIC COVER

The roof panel fabric cover is a vinyl coated fabric covering applied to the metal roof panel. The fabric covering is made of three parts with dielectrically joined center section to side section seams.

The roof cover is attached at the windshield and back window openings by drive nails. Screws (or drive nails) are used at the belt line of the rear quarter area. A flexible retainer secures the fabric cover inside the right and left drip moldings. In addition, the roof panel fabric cover is cemented to the entire surface of the roof panel with a nitrile type non-staining cement.

Removal

1. The following parts must be removed prior to removing the fabric roof cover:

   a. Windshield assembly.

   b. Back window assembly.

   c. Windshield pillar finishing moldings.

   d. Roof drip scalp moldings.

   e. Rear quarter reveal moldings (at belt).

   f. Roof extension panel emblem and/or plate assembly.

2. Clean off all excess sealer from windshield and back window openings.

3. Remove drive nails from edge of fabric cover at windshield and back window opening. At roof panel extension (at belt) remove screws or drive nails.

   NOTE: Drive nails can best be removed by first driving a screwdriver or suitable tool under the heads of the nails to loosen them. Diagonal cutters or similar tool can be used to grasp nails and twist them out. Unnecessary enlargement of holes in roof panel should be avoided.

4. Removal of flexible retainer securing fabric cover inside right and left drip moldings can best be completed by inserting tip of a flat-bladed body spoon or similar tool under inboard lip of retainer. (View "A" in Fig. 16-329). Rotate lip of retainer upward, disengaging fingers of retainer from side roof rail drip molding flange. Continue above operation until retainer can be removed from body.

   NOTE: If retainers are damaged during removal procedure, retainers should be replaced with new parts.

5. Prior to removing fabric roof cover, application of heat in rear quarter areas will permit easier loosening of the cemented edges.

6. Loosen cemented edges of fabric roof cover at windshield, side roof rails, back window, and rear quarter areas; then carefully remove fabric cover from remaining cemented area of roof panel.

Installation

1. Check all cementing surfaces on body to insure a smooth surface. Cementing surface

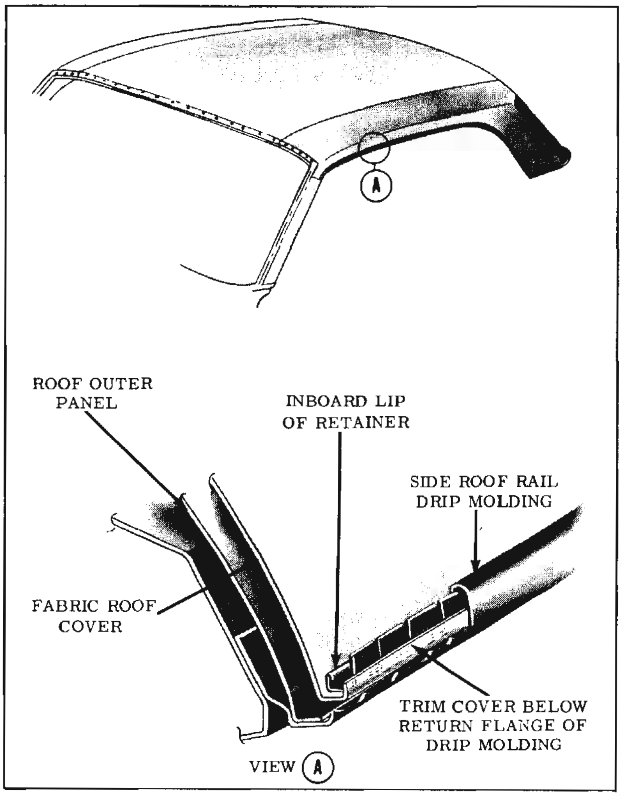


Fig. 16-329 Fabric Roof Cover at Side Rail

must be smooth to prevent "highlighting" of excess cement through fabric cover after new cover has been installed. Clean off old cement as required.

NOTE: A cleaner such as 3M Adhesive Cleaner or equivalent, should be used to remove or smooth out excess old cement. Apply solvent and allow to soak before rubbing.

CAUTION: Be certain to follow manufacturer's directions when using cleaner.

2. To permit easier fitting and removing of wrinkles from new cover assembly, where possible, install new cover at room temperature (approximately 72°).

   NOTE: Where new cover is installed at temperatures below 72°, pliers fabricated as shown in Fig. 16-330 will aid in removing wrinkles.

3. Determine centerline of roof panel by marking center points on windshield and back window openings with chalk or equivalent.

4. Fold cover lengthwise, precisely at center location. Mark center location at front and rear of cover.

5. Lay cover on roof panel and align to correspond with centerline of roof panel. Determine proper material overhang at windshield and back window openings.

6. Fold fabric cover on centerline and lay on right side of roof panel, allowing proper material overhang at windshield and back window opening.

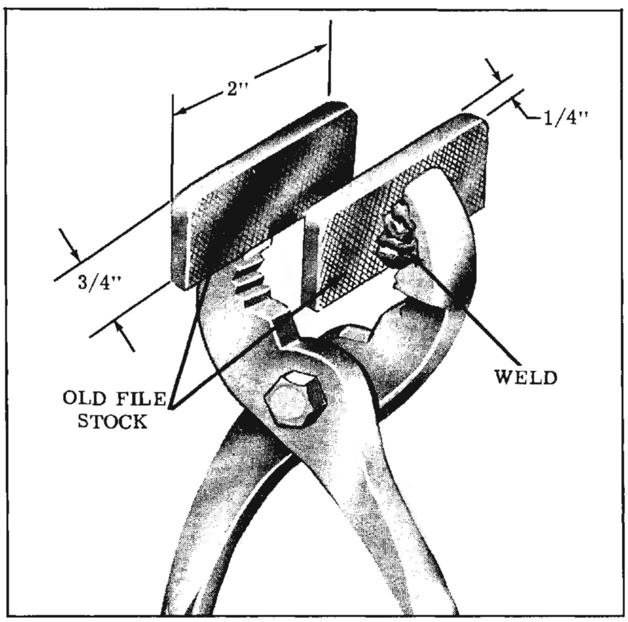


Fig. 16-330 Fabric Pliers

7. Apply approximately an 8" wide strip of nitrile non-staining vinyl trim adhesive such as 3M Vinyl Trim Adhesive or Permalastic Vinyl Trim Adhesive or equivalent along exposed inner layer of fabric cover adjacent to centerline. (Fig. 16-331).

   If nitrile non-staining cement is not available, use neoprene type non-staining weatherstrip cement such as 3M Super Weatherstrip Cement or equivalent.

   NOTE: When using nitrile non-staining cement, it may be necessary to apply two coats to fabric cover.

   IMPORTANT: Exercise care when applying cement on inner layer of cover so cement does not come in contact with outer layer.

8. Apply cement to corresponding area of roof panel, which is to left of centerline of roof panel.

9. At front and rear of fabric cover, grasp edge of material at seam and centerline locations. Slide folded cover to centerline of roof panel. Securely hold cover at centerline location at windshield opening. Pull cover at rear, making certain centerline of folded fabric cover corresponds to centerline of roof panel. Securely hold fabric cover at back window opening. Turn folded left half of fabric cover over and fasten cover to cemented portion of roof panel.

   NOTE: This operation should center fabric cover on roof panel. Center marks on windshield and back window openings must correspond to center marks on fabric cover.

10. Once 8" strip of fabric cover is cemented to roof panel, fold over uncemented left side portion of fabric cover. Apply cement on

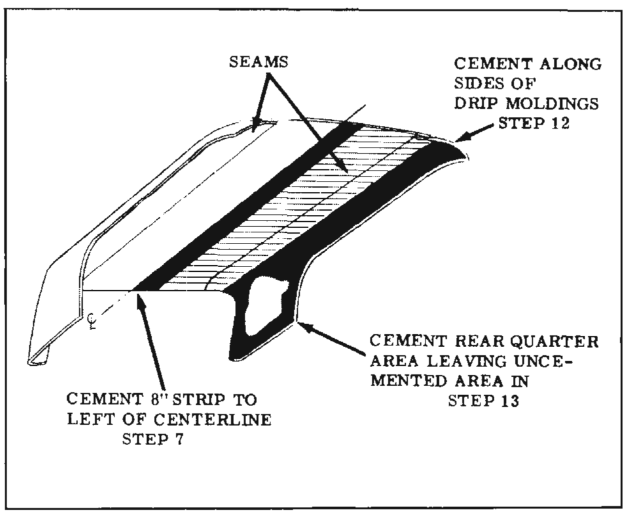


Fig. 16-331 Cementing Fabric Cover

inner layer of fabric cover to extend approximately 1" beyond dielectric seam. Apply cement to corresponding area of body (Fig. 16-331).

IMPORTANT: Application of cement should not overlap with previously cemented area, as "highlighting" of excess cement through fabric cover will result.

11. Cement prepared portion of fabric cover to roof panel making certain dielectric seam is straight.

12. Fold over fabric cover and apply cement to remaining portion of fabric cover and roof panel and drip molding. Cement cover to roof panel and drip molding. (Fig. 16-331)

    NOTE: When installing fabric cover to inside of drip molding, a small thin-edged piece of plastic, or similar material, may be used to insert cover in place inside drip molding. Exercise care so damage will not occur to cover when performing this operation.

13. Cement perimeter of fabric cover in rear quarter area. Be certain fabric cover is cemented at emblem or plate assembly attaching locations. This type of cement application will permit easier fitting of cover in rear quarter area. (Fig. 16-331)

14. Repeat Steps 10, 11, 12 and 13 on right side.

15. At windshield and back window openings, cement cover into opening as shown in View "A", Fig. 16-332. Apply extra bead of cement to each side of dielectric seam between fabric cover and roof panel at windshield and back window openings. (View "A", Fig. 16-332)

16. Install drive nails at windshield and back window openings.

    NOTE: When installing drive nails, it is best to first use an awl or similar tool to initiate a hole in metal. Strike drive nails only hard enough to seat them. Installation of drive nails should also be as low as possible in windshield and back window opening. This will aid in preventing cutting edge of fabric cover due to a missed hammer blow when drive nails are installed.

17. Install screws (or drive nails) at belt line of rear quarter area. (Fig. 16-332)

18. Trim off material at windshield, back window, and rear quarters. View "A", Fig. 16-132 shows where trimmed edge should occur in openings.

    NOTE: Install fabric cover at windshield pillar area in same manner as original installation.

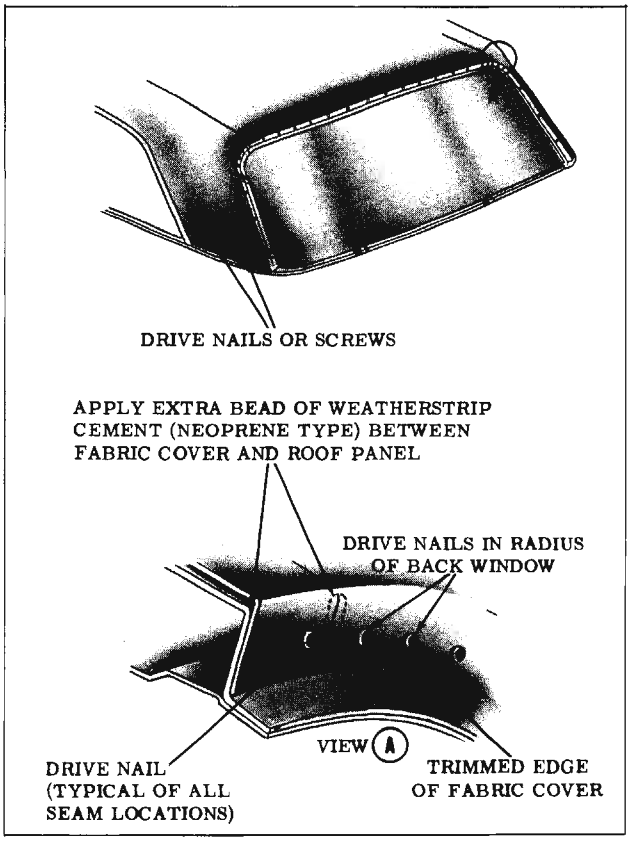


Fig. 16-332 Drive Nail Installation

19. Using fabric cover trimming Tool J-21092, or suitable small knife, trim fabric cover just under lip of roof drip molding. (View "A", Fig. 16-329) A tool may be fabricated to trim material along side roof rail moldings as illustrated in Fig. 16-333.

20. Prior to installing flexible retainers in side roof rail drip moldings, spread them slightly to insure a tight fit.

21. Install flexible retainer starting at radius area above rear quarter window. Working toward rear of body, carefully drive retainer downward with a blunt-edged tool. Working toward front of body, install remaining portion of retainer. Retainer fingers should be seated in flange of drip molding. (View "A", Fig. 16-329)

22. Install all previously removed moldings and assemblies.

NOTE: If, after cover installation is completed, creases or fold marks are still visible, they may be removed by applying heat to area affected. Care must be exercised so that material is not over heated as loss of design pattern embossed in cover will result. Normally creases or fold marks will gradually disappear after cover assembly has been exposed to the elements.

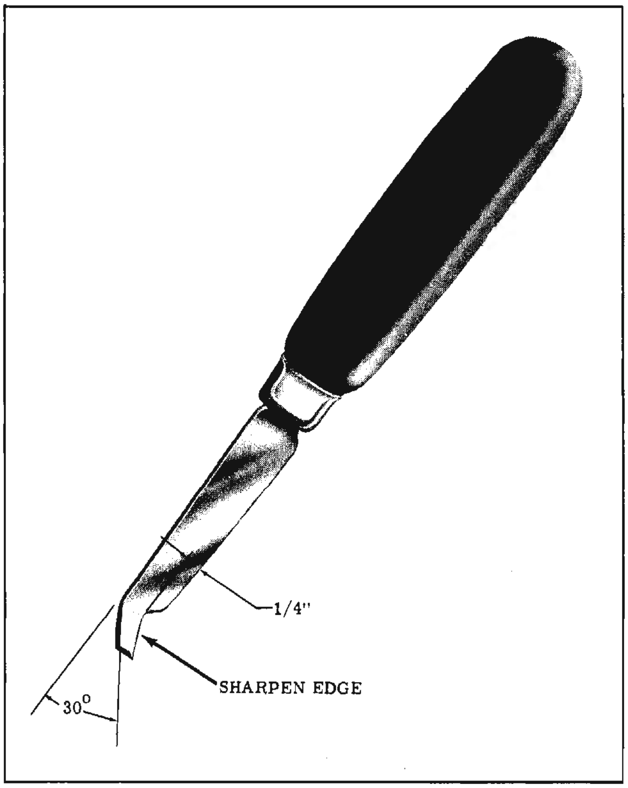


Fig. 16-333 Fabric Covering Trimming Knife

FOLDING TOP TRIM ASSEMBLY (COMPLETE)

For service procedures, refer to the 88, S88 and 98 Body section of this manual with the following exceptions:

REMOVAL OF FOLDING TOP AND BACK CURTAIN ASSEMBLY

Step 14. 18-3/4" for F-85

INSTALLATION OF FOLDING TOP AND BACK CURTAIN ASSEMBLY

Refer to Figs. 16-334, 16-335 and 16-336.

Refer to the 88, S88 and 98 Body Section of this manual for servicing the following:

FOLDING TOP TRIM (LESS BACK CURTAIN)

BACK CURTAIN TRIM

BACK CURTAIN VINYL (INCLUDES EXTENSION)

HYDRO-LECTRIC SYSTEM

For service procedures, refer to the 88, S88 and 98 Body section of this manual with the following exception:

REMOVAL OF TOP LIFT CYLINDER

1. Remove rear seat cushion and seat back.
2. Remove top compartment side trim panels.
3. With top in raised position, remove attaching nut, bolt, bushing and washer from upper end of cylinder. (Fig. 16-337)
4. Remove cotter pin, spacers and clevis pin securing lower end of cylinder to lift cylinder lower support.
5. Move cylinder to gain access to lower hydraulic hose connection.
6. Disconnect and cap hydraulic connections on cylinder and on each hose; remove cylinder.

   CAUTION: Before disconnecting hydraulic connections, place suitable wiping rags under connections to absorb any loss of hydraulic fluid. Also, disconnect battery cable to prevent accidental operation of motor and pump while hydraulic hoses are disconnected.

7. To install cylinder, reverse removal procedure with following exceptions: To aid in connection of cylinder piston rod to folding ing top linkage, use power to raise piston rod to extended position. Operate top down and up several times, then check and correct level of hydraulic fluid in reservoir. See 88, S88 and 98 Body section of this manual for "FILLING OF HYDRO-LECTRIC RESERVOIR".

FOLDING TOP ADJUSTMENTS

The folding top linkage consists of three sections of right and left side roof rails and a front roof rail connected by bolts, hinges, and a series of connecting links and bows. The top linkage is attached to the body at the rear quarter area by a male hinge attached directly to the quarter panel brace. The front roof rail is locked at the windshield header by two hook type locks which are an integral part of the two locking handles.

The following information outlines and illustrates procedures which may be used to correct misaligned folding top linkage. To correct some top variations, only a single adjustment is required; other top variations require a combination of adjustments. In conjunction with adjustment of the folding top, it may be necessary to adjust the door, door glass, rear quarter glass, trim sticks or side roof rail weatherstrips.

ADJUSTMENT OF TOP AT FRONT ROOF RAIL CORNER BRACE

If the top, when in a raised position, is too far

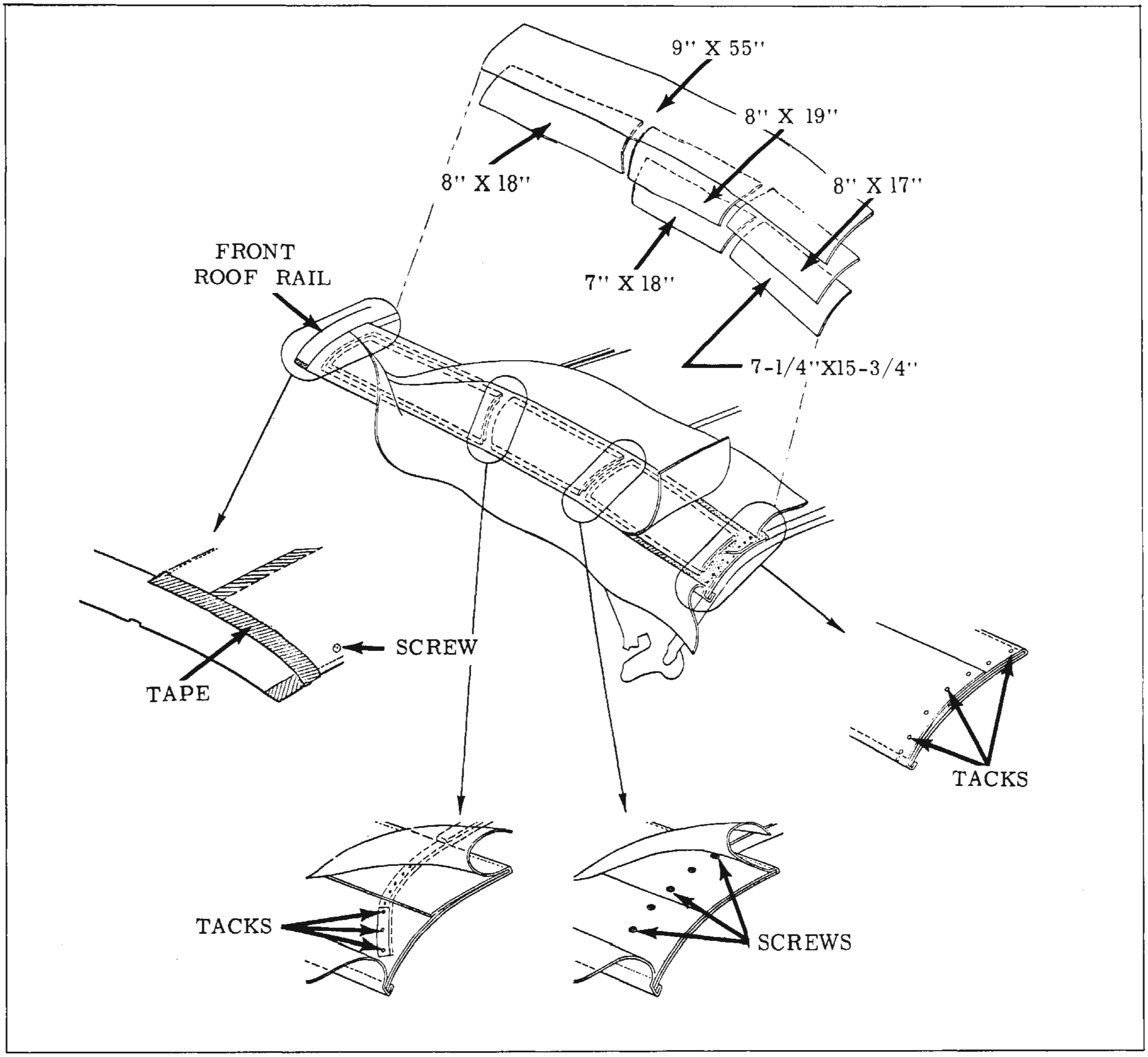


Fig. 16-334 Installation of Side Stay Pads

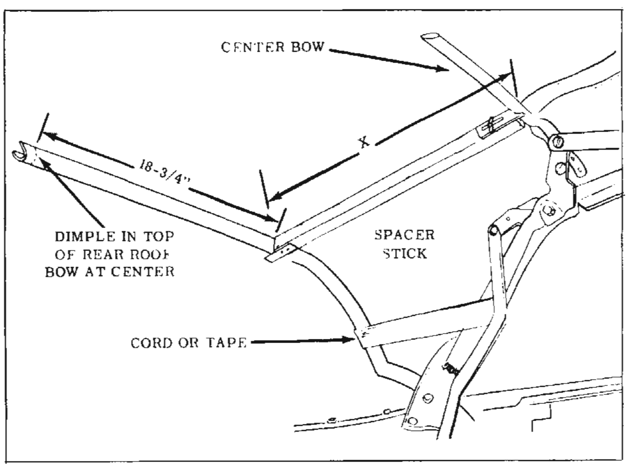


Fig. 16-335 Installation of Spacer Sticks

forward or does not move forward enough to allow the guide studs on the front roof rail to enter holes in the striker assemblies, proceed as follows:

1. Unlatch top and raise it above windshield header. Remove side roof rail weatherstrip front attaching screws.

2. Loosen corner brace attaching bolts and adjust front roof rail fore or aft as required. Repeat on opposite side if necessary. (Fig. 16-338)

   NOTE: This adjustment is limited. If additional adjustment is required, it can be made at the folding top male hinge.

3. When front roof rail corner brace is properly

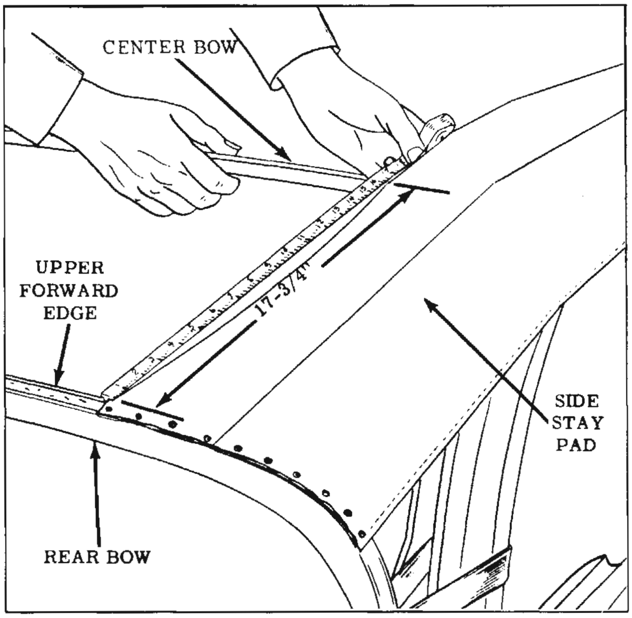


Fig. 16-336 Position of Rear Bow

adjusted, tighten attaching bolts and reinstall side roof rail front weatherstrip attaching screws. Check forward section of weatherstrip and reseal if necessary.

ADJUSTMENT OF TOP AT SUNSHADE AND STRIKER SUPPORT ASSEMBLY

If a difficult locking action, caused by misalignment of the sunshade and striker support assembly is encountered at the front roof rail or if a closer fit of the front roof rail to windshield header is desired, proceed as follows:

1. Unlatch top and raise it above windshield header.
2. Loosen striker support attaching screws and adjust striker as required; then tighten attaching screws.

If, after adjusting the striker support, the locking action of top is still unsatisfactory, the hook lever on the front roof rail lock assembly may be adjusted as follows:

1. To tighten locking action of top, turn hook lever clockwise.
2. To reduce locking action of top, turn hook lever counterclockwise.

NOTE: Hook lever may be adjusted with finger pressure, no tools are required.

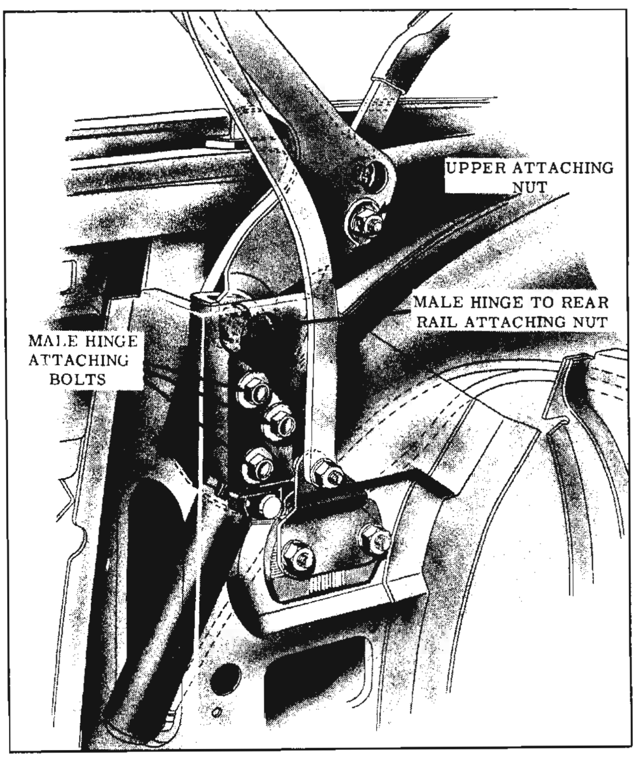


Fig. 16-337 Lift Cylinder Removal

ADJUSTMENT OF TOP CONTROL LINK ADJUSTING PLATE (Fig. 16-338)

1. With top in up position, if joint between front and center side roof rail is too high or too low, proceed as follows:
   a. Remove folding top compartment side trim panel.
   b. Scribe location of control link adjusting plate on folding top compartment brace.
   c. Loosen two bolts securing control link adjusting plate sufficiently to permit adjustment of plate.
   d. Without changing fore and aft location of adjusting plate, adjust side roof rail up or down allowing adjusting plate to move up or down over serrations on support as required; then tighten bolts.
2. If top assembly does not stack properly when top is in down position, proceed as follows:
   a. Scribe location of control link adjusting plate on folding top compartment brace.
   b. Loosen bolts securing control link adjusting plate sufficiently to permit adjustment of plate.
   c. Without changing the up or down location of adjusting plate, move adjusting plate forward or rearward (horizontally) over serrations as required to obtain desired height; then tighten bolts.

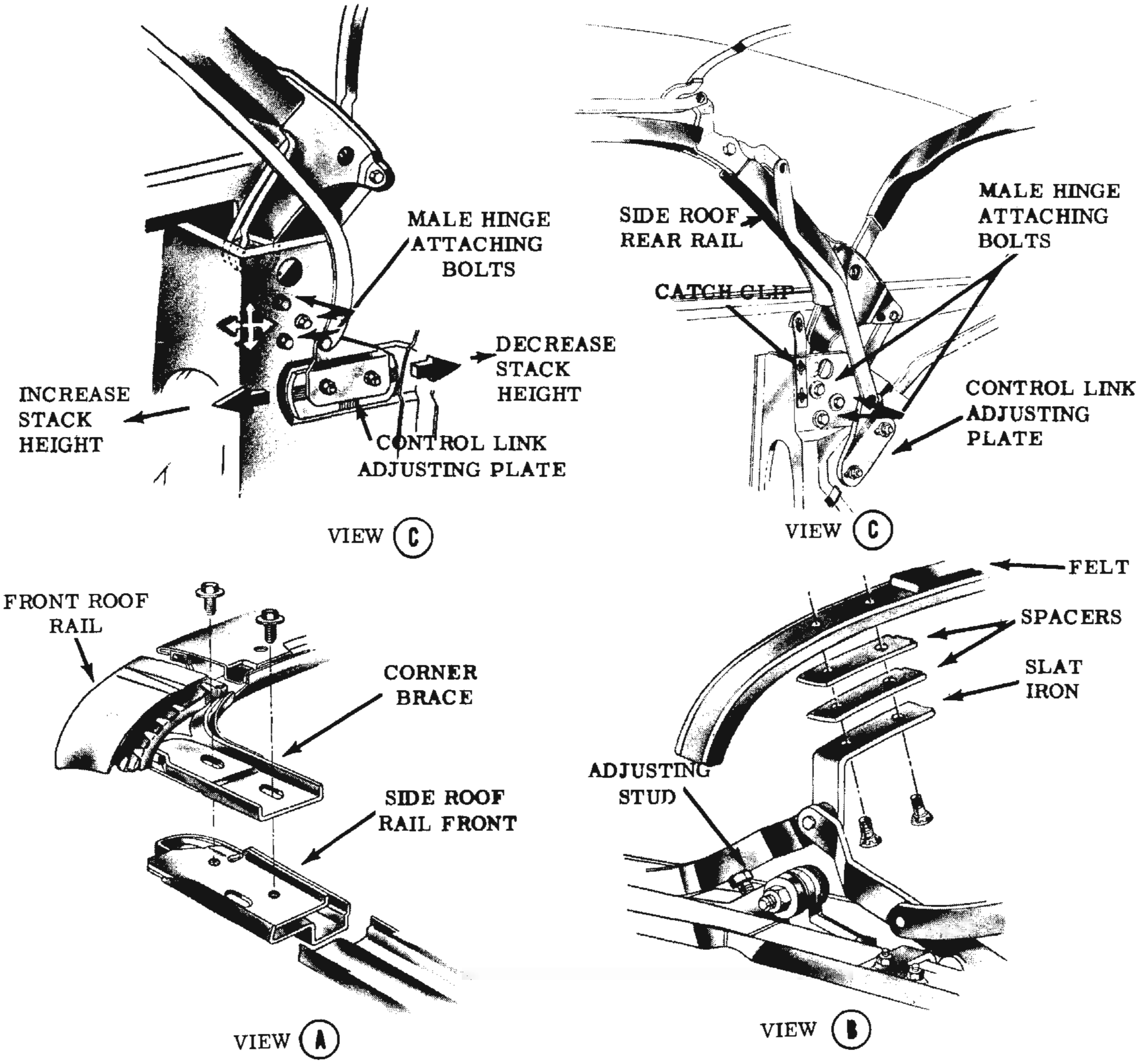


Fig. 16-338 Folding Top Adjustments

ADJUSTMENT OF TOP AT MALE HINGE SUPPORT

Prior to making any adjustment of top linkage at male hinge, loosen two bolts securing folding top rear quarter trim stick to rear quarter panel. This will prevent any possible damage to top when it is raised after adjustment. After making an adjustment at male hinge, check folding top at rear quarter area for proper fit and, if necessary, adjust trim stick assembly.

1. If there is an excessive opening between side roof rail rear weatherstrip and rear of rear quarter window, or if front roof rail is too far forward or rearward, proceed as follows:

   a. Scribe location of male hinge attaching bolt washers on folding top compartment brace.

   b. Loosen three male hinge assembly attaching bolts. (Fig. 16-338)

   c. Move hinge fore or aft as required to obtain proper alignment between side roof rail rear weatherstrip and rear quarter window; then tighten bolts.

   d. Lock front roof rail to windshield, (where required, adjust front roof rail corner brace as previously described), and check fit of top material at rear quarter trim stick area. If necessary, adjust trim stick; then tighten trim stick attaching bolts.

2. If side roof rail is too high or too low at rear quarter window area, proceed as follows:

   a. Scribe location of male hinge attaching bolt washers on folding top compartment brace to maintain proper fore and aft relation of the two parts.

   b. Loosen male hinge assembly attaching bolts. (Fig. 16-338)

   c. Without changing fore and aft location of male hinge, adjust male hinge up or down as required to obtain proper alignment between side roof rails and rear quarter windows.

   d. Tighten attaching bolts, while maintaining proper alignment of scribe marks.

   e. Check fit of top material at rear quarter trim stick area and, if necessary, adjust trim stick. If adjustment is not necessary, tighten trim stick attaching bolts.

ALIGNMENT CONDITIONS

CONDITION	APPARENT CAUSE	CORRECTION
Difficult locking action at front roof rail.	Sunshade support misaligned.	Adjust sunshade support laterally.
	Lock hook lever improperly adjusted.	Adjust lock hook lever counterclockwise.
	Misaligned front roof rail front weatherstrip.	Loosen, realign and retack front roof rail front weatherstrip.
	Front roof rail misaligned.	Adjust front roof rail.
Top does not lock tight enough to windshield header.	Sunshade support misaligned.	Adjust sunshade support laterally.
	Lock hook lever improperly adjusted.	Adjust lock hook lever clockwise.
	Misaligned front roof rail front weatherstrip.	Loosen, realign and retack front roof rail front weatherstrip.
	Front roof rail misaligned.	Adjust front roof rail.
Top travels too far forward.	Front roof rail misaligned.	Adjust front roof rail rearward.
	Male hinge assembly misaligned.	Adjust male hinge assembly rearward.

ALIGNMENT CONDITIONS Cont.

CONDITION	APPARENT CAUSE	CORRECTION
Top does not travel forward far enough.	Front roof rail misaligned.	Adjust front roof rail forward.
	Male hinge assembly misaligned.	Adjust male hinge assembly forward.
	Improper spacing between rear trim stick and body metal.	Install an additional spacer between rear trim stick and body metal at each attaching bolt location.
Side roof rail rear weatherstrip too tight against rear of rear quarter window.	Male hinge assembly misaligned.	Adjust male hinge assembly rearward.
Gap between side roof rail rear weatherstrip and rear of rear quarter window.	Male hinge assembly misaligned.	Adjust male hinge assembly forward and/or shim side roof rail rear weatherstrip forward as required.
Side roof rail rear weatherstrip too tight against top of rear quarter window.	Male hinge misaligned.	Adjust male hinge upward.
Gap between side roof rail rear weatherstrip and top of rear quarter window.	Male hinge misaligned.	Adjust male hinge downward.
Sag at front to center side roof rail joint.	Control link adjusting plate misaligned.	Adjust control link adjusting plate downward.
Front and center side roof rails bow upward at hinge joint.	Control link adjusting plate misaligned.	Adjust control link adjusting plate upward.
Folding top dust boot is difficult to install.	Improper stack height due to misaligned control link adjusting plate.	Adjust control link plate rearward or forward as required.
	Misaligned folding top dust boot female fastener.	Where possible, align female with male fastener.
	Rear seat back assembly is too far forward.	Relocate rear seat back panel rearward until dimension between upper rear edge of rear seat back to forward edge of pinchweld finishing molding is 17-1/8 inches ± 1/16". The dimension is measured at approximate center line of body.
	Excessive build-up of padding in side roof rail stay pads.	Repair side stay pads as required.
Folding top dust boot fits too loosely.	Improper stack height due to misaligned control link adjusting plate.	Adjust control link plate forward.
	Rear seat back assembly is too far rearward.	Relocate rear seat back panel forward until dimension between upper rear edge of rear seat back to forward edge of pinchweld finishing molding is

ALIGNMENT CONDITIONS (Cont'd.)

CONDITION	APPARENT CAUSE	CORRECTION
		17-1/8 inches ± 1/16". The dimension is measured at approximate center line of body.
Top material is too low over windows or side roof rails.	Excessive width in top material.	If top is too large, detach binding along affected area, trim off excessive material along side binding as required; then hand sew binding to top material.
Top material has wrinkles or draws.	Rear quarter trim stick improperly adjusted.	Adjust rear quarter trim stick on side affected.
	Top material improperly installed to center or rear quarter trim stick.	Retack top materials as required.
Wind whistle or waterleak along front roof rail.	Top does not lock tight enough to windshield header.	Adjust sunshade support laterally and/or adjust lock hook lever clockwise.
	Misaligned front roof rail front weatherstrip.	Retack front weatherstrip to front roof rail.
	Front roof rail contour does not conform to windshield header.	Contour of front roof rail may be changed slightly by reforming rail.

ELECTRICAL

BODY WIRING

The current for all of the electrical circuits is provided by a twelve volt battery. The installation of the body wiring includes the dome lamp, stop and back-up lights, and tail lights. (Fig. 16-339, 16-340, 16-341, 16-342 & 16-343) The body wiring consists of a front and rear harness which is joined by a multiple connector located at the left side of the rear compartment. The front end of the front harness is designed with a multiple connector which joins the chassis wiring at the left shroud.

Failures in a circuit are usually caused by short circuits or open circuits. Open circuits are usually caused by breaks in the wiring, faulty connections or mechanical failure in a component such as a switch. Short circuits are usually caused by wires from different components of the circuit contacting one another or by a wire or component grounding to the metal of the body due to a screw driven through the wire, insulation cut through by sharp metal edge, etc.

If a failure is encountered in one of the body circuits, the circuit diagram should be thoroughly reviewed to become familiar with the circuit before performing the cause and location of the failure.

1. If a major portion of the electrical circuit becomes inoperative simultaneously, the failure may be due to improper connections between the front and rear harness, or between the front harness and the chassis wiring connector.

2. If only one of the circuits is inoperative, the failure is due to an open circuit or short in the affected circuit. Short circuits usually result in blown fuses.

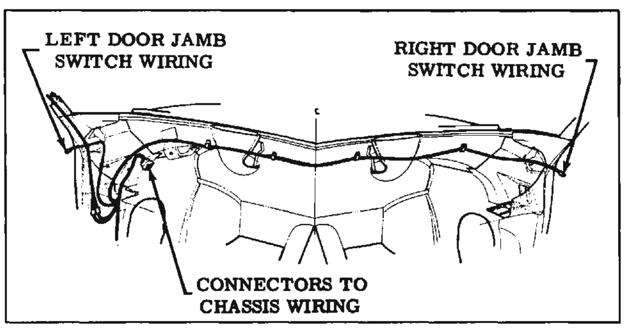


Fig. 16-339 3100 Series Front End Wiring

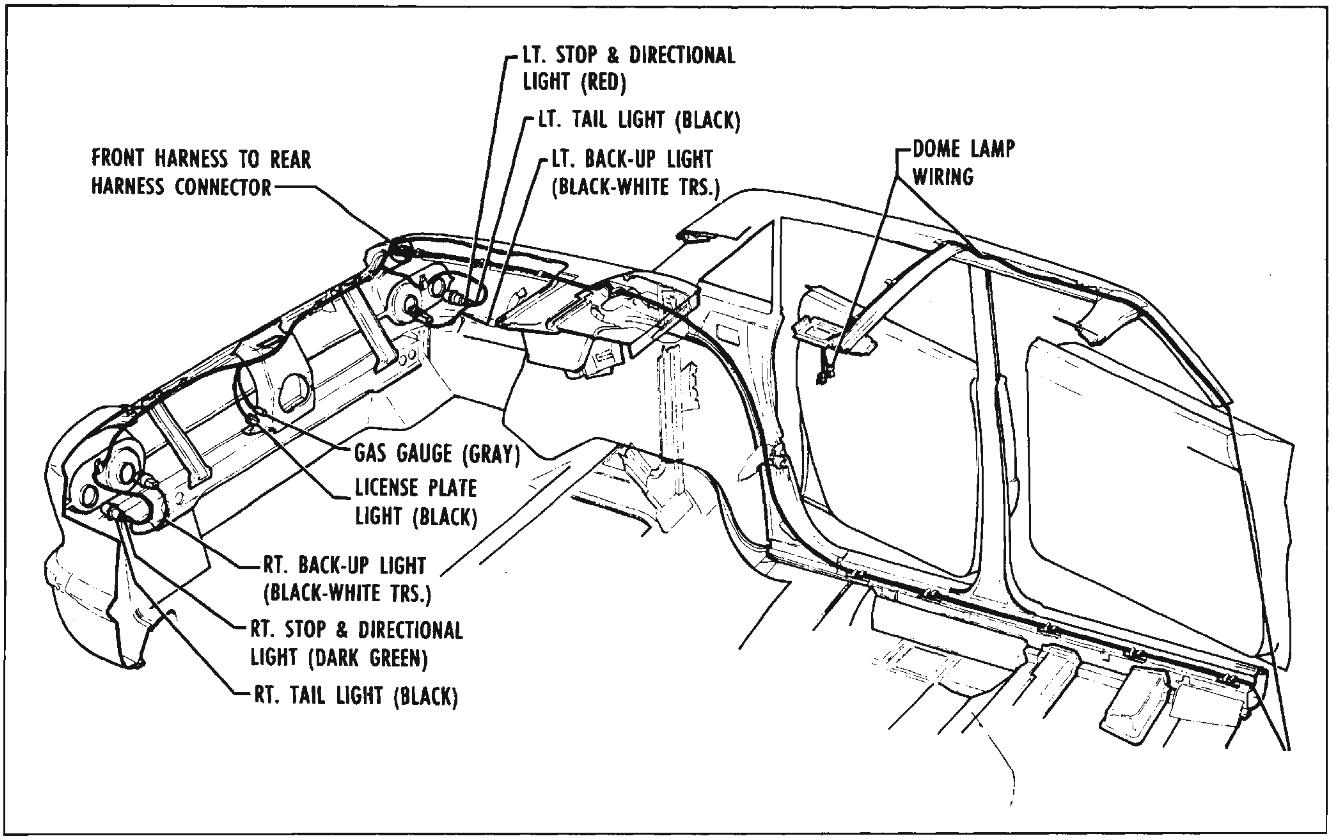


Fig. 16-340 Sedan Body Wiring

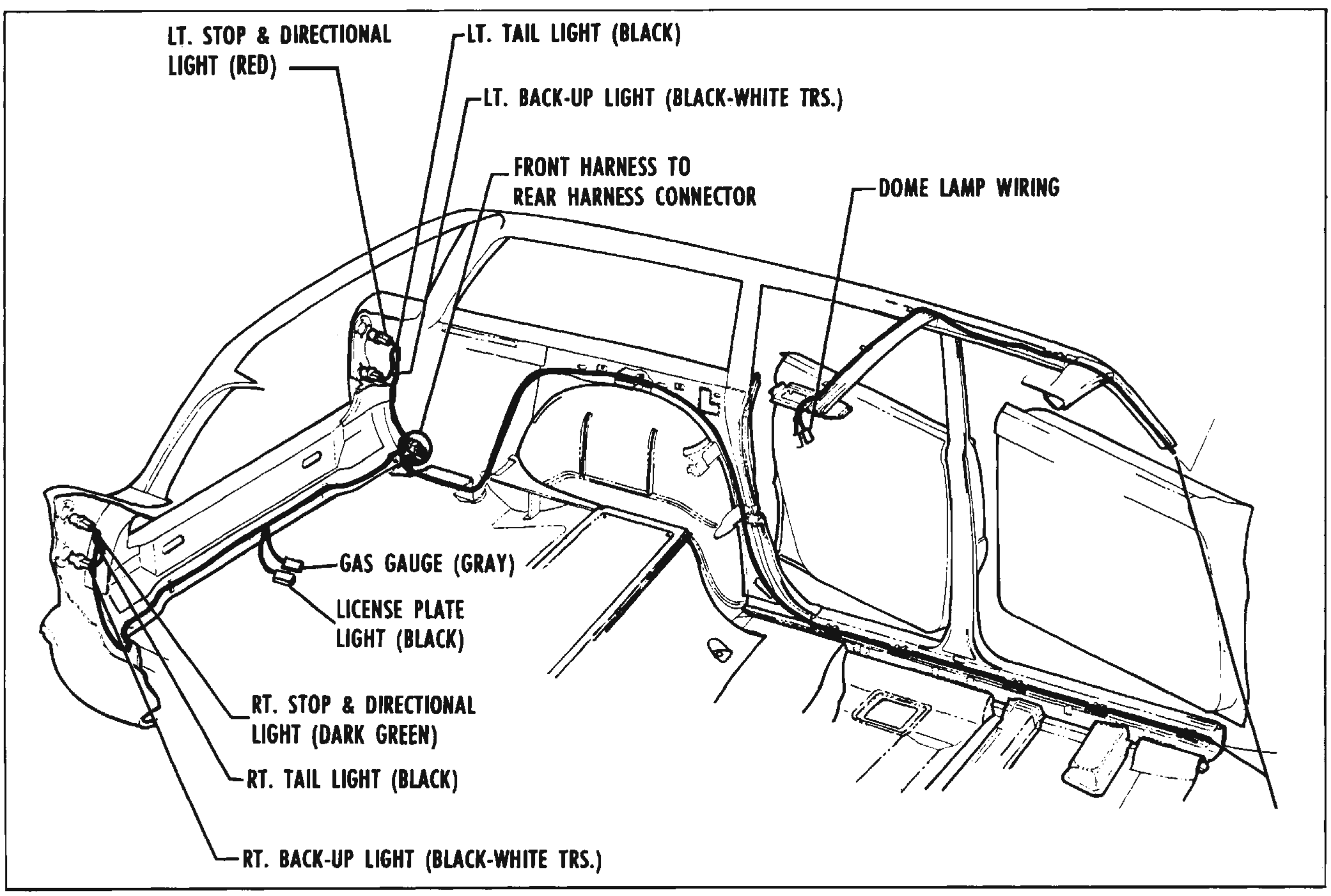


Fig. 16-341 Station Wagon Body Wiring

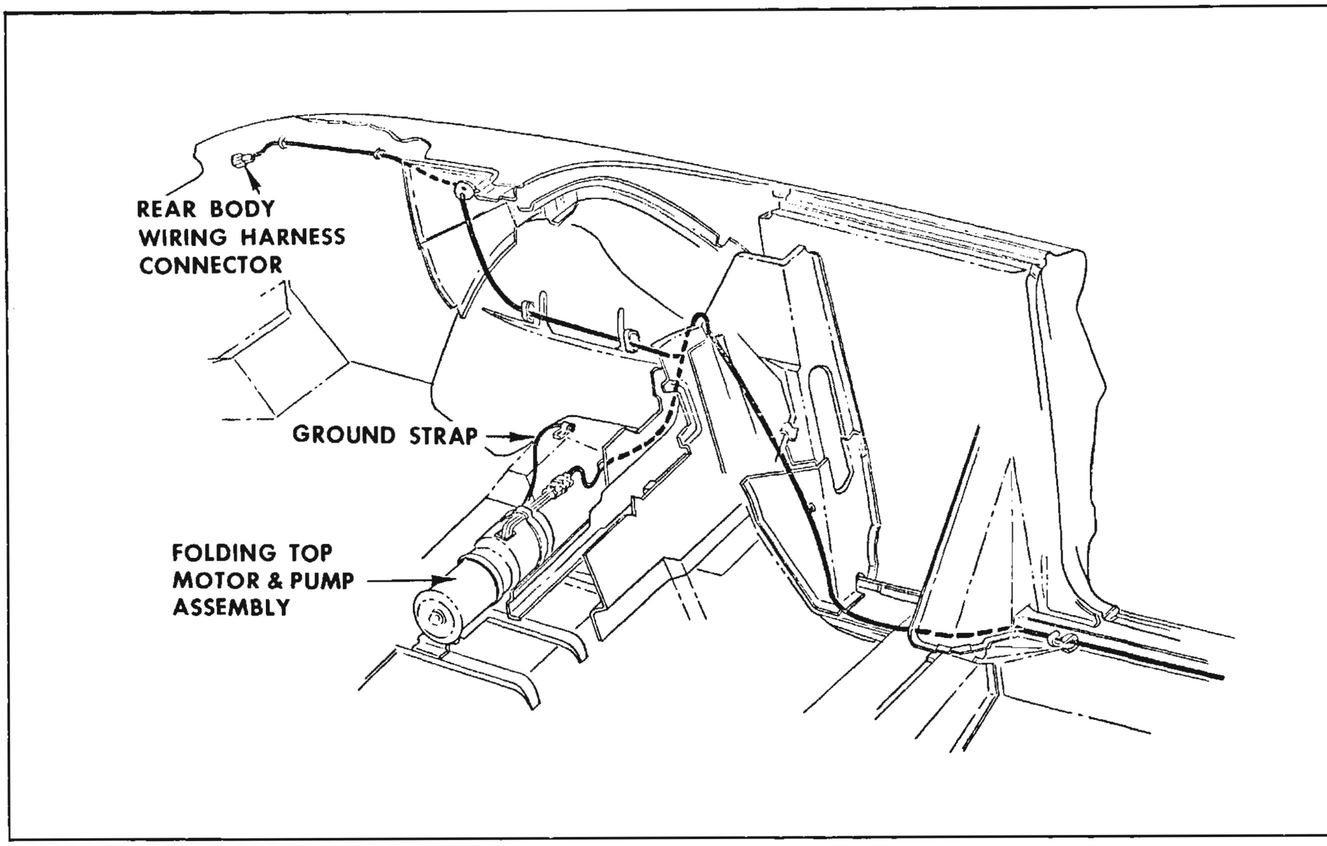


Fig. 16-342 Left Side Body Wiring (67 Style)

If the fuse is not blown and the circuit affected is a lamp circuit, check the bulb before proceeding with any checking procedures.

3. The dome lamp is designed so that the switches are in the "ground" side of the circuit. If a condition is encountered where the lamps remain "on" even though the jamb switches are not actuated, the failure is probably due to defective switches, or to the wire leading to the switches being grounded.

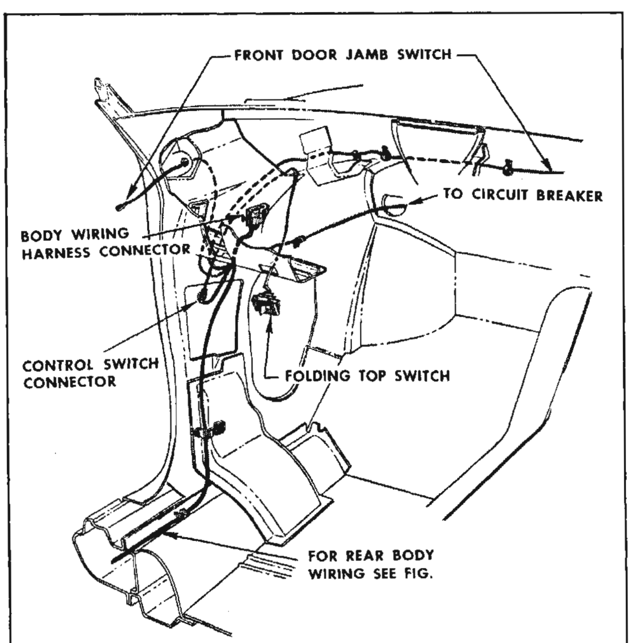


Fig. 16-343 Front Body Wiring (67 Style)

ELECTRIC BACK DOOR DROPPING WINDOW

The station wagon power operated back door dropping window is controlled by a 12 volt D.C. series wound reversible motor. This motor contains an internal circuit breaker and a self-locking gear drive. The current for the motor is obtained through a 40 amp. circuit breaker located at the right side of the engine compartment. (Fig. 16-345)

The back door window is lowered from control switches located at the left side of the instrument panel or from the left rear quarter panel. (Fig. 16-346)

The back door window harness is separate from the body wiring harness and runs along the left side of the body.

Electrical contact between body wire harness and back door is made through open double contact plates located at the left back body opening side panel and the mating surface on the back door side facing. (Fig. 16-347)

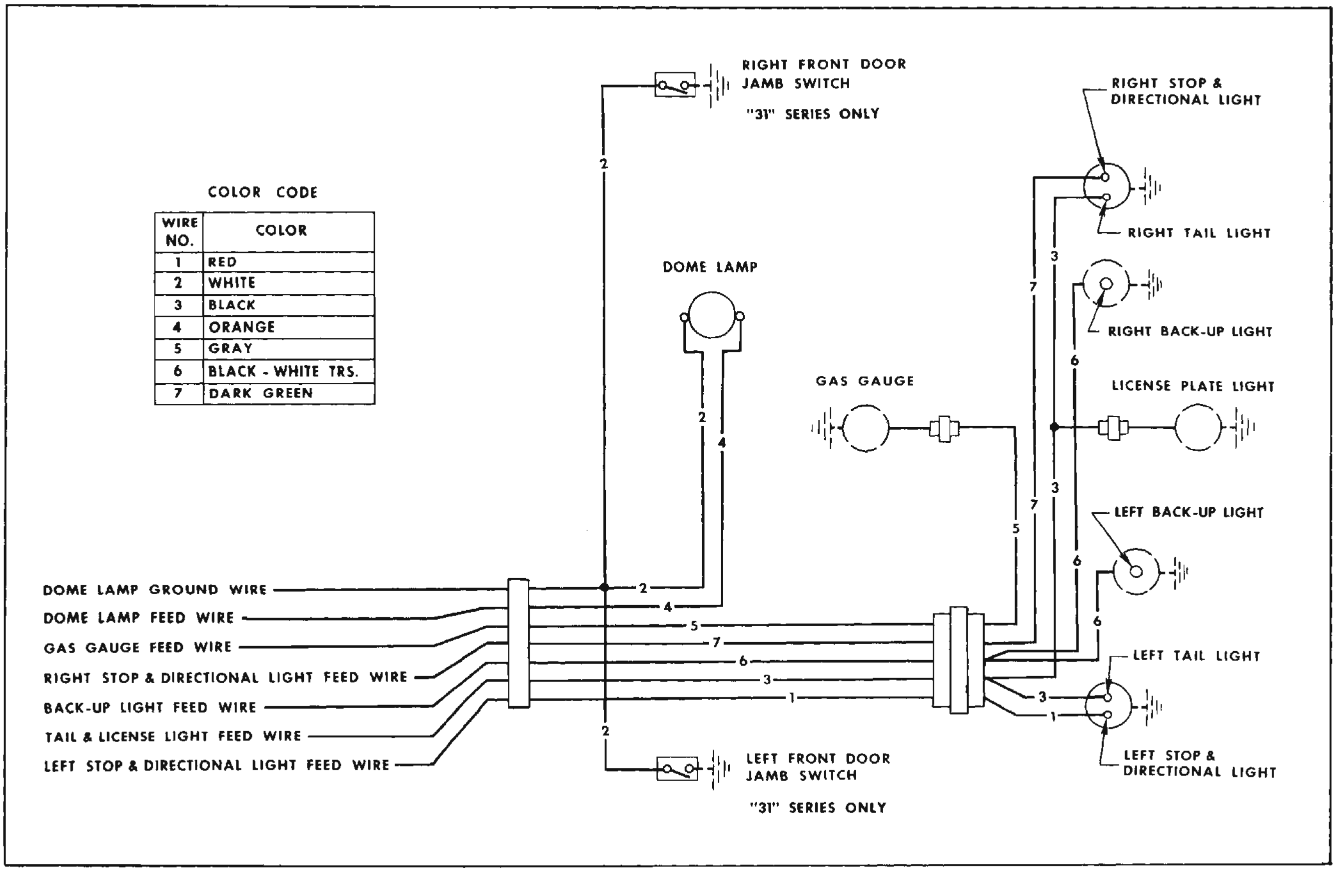


Fig. 16-344 Body Wiring

Checking Procedures

Before performing an intensive checking procedure to determine the failure in the circuit, check all connections to insure proper installation and contact.

A. Check Feed Circuit Current at Circuit Breaker

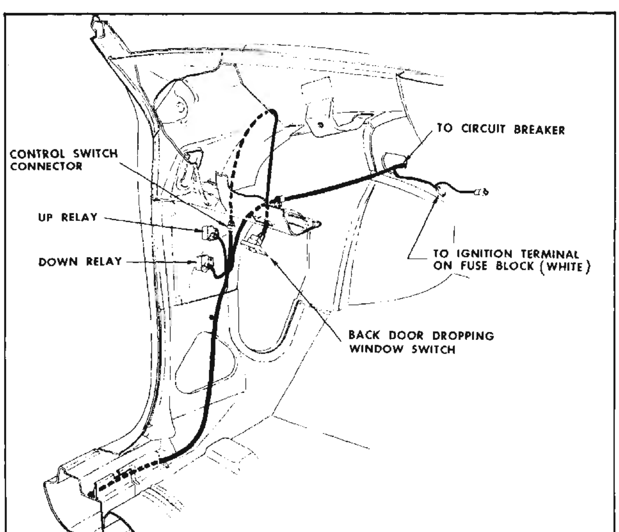


Fig. 16-345 Front End Wiring for Electric Back Door Dropping Window

1. Connect one light tester lead to battery side of circuit breaker and ground other lead. Circuit breaker is located at the right side of the engine compartment. If tester does not light, there is an open or short circuit in feed circuit from battery to circuit breaker.

2. To check the circuit breaker, disconnect output side of circuit breaker. Connect one light tester lead to the output side of circuit breaker and ground other lead. If tester does not light, the circuit breaker is inoperative.

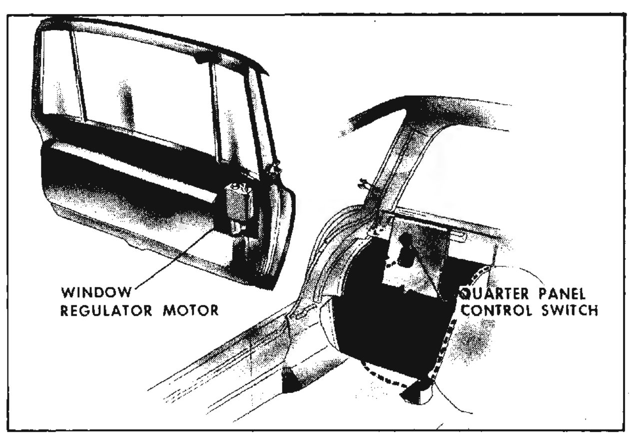


Fig. 16-346 Back Door Window Control

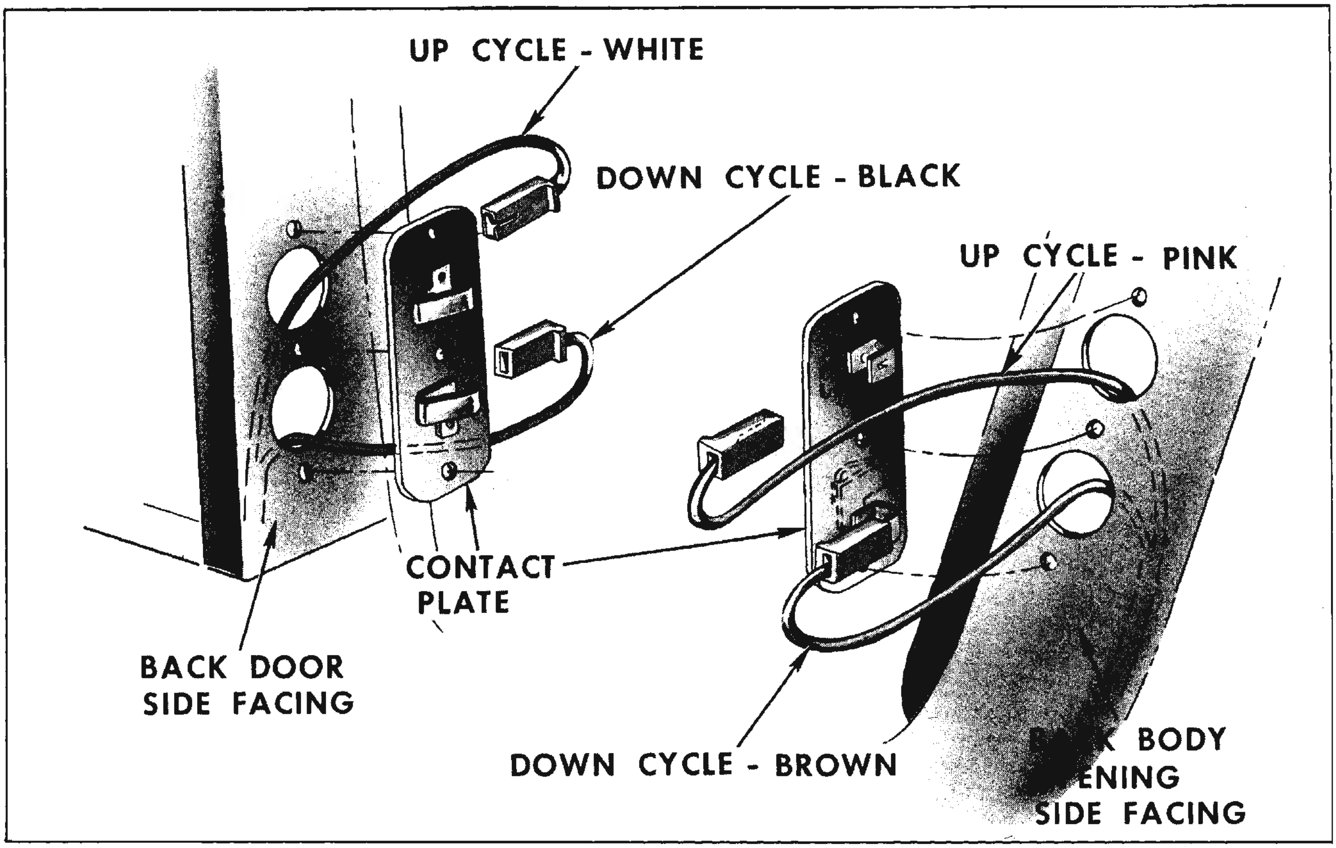


Fig. 16-347 Wiring - Back Door Dropping Window

B. Check Current of Feed Wire at the Instrument Panel Control Switch Connector

1. With ignition switch on, disengage connector and place one light tester lead at the feed terminal (white wire) on the feed side of the connector and ground other lead. If tester does not light, there is an open or short circuit between the ignition switch fuse block and the switch connector.

C. Checking Instrument Panel Control Switch

1. Disengage harness connector from switch.

2. Using a #12 gauge jumper wire, insert one end into the feed terminal and the other end into one of the other terminals. Back door window should operate.

3. Repeat procedure for other terminal.

If the back door operates with the jumper wire, but does not operate with control switch, the switch is defective.

D. Check Quarter Panel Control Switch

First determine if current is present at feed terminal and use same method as described for the instrument panel control switch.

E. Check Relay Assembly

1. Check current of feed wire at relays. Disengage relay connector at left shroud and connect one light tester lead to feed terminal (red wire) and ground other lead. If tester does not light, there is an open or short circuit between the circuit breaker and relay terminal.

Repeat procedure with other relay.

2. Check switch terminal at relay. Connect one test lead to the yellow wire (up relay) and ground other lead. Turn ignition switch on and actuate the up cycle of the instrument panel switch. If test light does not light, there is an open or short between the control switch and relay.

3. Checking relay - Engage relay connector and connect light tester lead to motor terminal of relay (pink wire). Turn ignition switch on and actuate control switch to up cycle. If tester does not light, relay is defective. Repeat check on down relay (brown wire).

F. Check Current at Rear Body Opening Side Facing Contact Plate

1. At battery side of window control switch connector, place #12 gauge jumper wire

from the feed terminal to the up cycle terminal. Turn ignition switch on.

2. With back door open, place one lead of the light tester on up terminal of the rear body opening contact and ground other lead. If tester does not light, there is an open or short circuit between switch connector and rear body opening contact plate.

3. Repeat Steps 1 and 2 using down cycle terminal.

G. Check Current at Window Motor Harness Connector

NOTE: To perform the following check, it will be necessary to remove sufficient parts to lower the regulator motor to gain access to motor connector. The proper sequence is described in the back door dropping window write-up.

1. Disengage window motor harness connector from motor.

2. Place #12 gauge jumper wire in the battery side of the window control switch connector from the feed terminal to the up cycle terminal.

3. From inside and with the back door closed, place one light tester lead on the up cycle terminal (white wire) and ground the other lead. If tester does not light, there is an open or short circuit between the back door contact and the motor connector.

4. Repeat Steps 3 and 4, changing connections to the down cycle wires. If motor does not operate at this point, it is defective and should be removed.

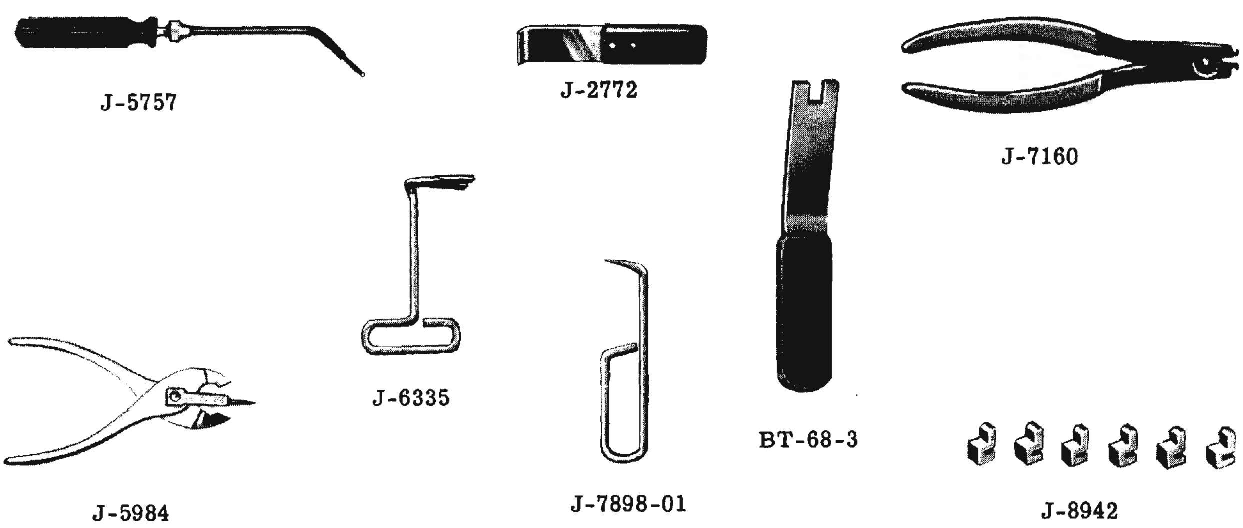


Fig. 16-348 Tools

1963 PAINT SERVICE NUMBERS

EXTERIOR COLORS

Comb. Code	Color Name	R.M. Stock No.	DuPont Stock No.
A	Ebony Black	A-946	88-L
C	Provincial White	A-1199	4024-L
D	Sheffied Mist	A-1477	4247-L
F	Wedgewood Mist	A-1481	4250-L
H	Cirrus Blue	A-1480	4249-L
J	Willow Mist	A-1485	4255-L
K	Barktone Mist	A-1535	4393-L
L	Regal Mist	A-1536R	4389-LH
P	Pacific Mist	A-1476	4253-L
R	Sand Beige	A-1486	4256-L
S	Saddle Mist	A-1537	4392-L
T	Sahara Mist	A-1478	4257-L
V	Holiday Red	A-1538R	4387-LH
W	Midnight Mist	A-1539	4395-L
X	Antique Rose	A-1540	4388-L

INSTRUMENT PANEL AND INTERIOR LACQUER COLORS

Color	Rinshed-Mason Stock No.	DuPont Stock No.
	GLOSS	
Silver	62011	95552
Light Fawn	62T82	77991
Light Pink	62B72	95560-H
Medium Saddle	62C82	95562
Medium Green	62034	95481
Medium Blue	62024	95480
Medium Fawn	62082	95478
Medium Aqua	62036	95479
Medium Red (Maroon)	62053M	4066-H
Medium Gray (S.W. Floor)	62012	95554
Dark Gray	62013	95553
Dark Green	62032	95556
Dark Blue	63022	95892
Dark Fawn	62083	95561
Dark Aqua	62031	95559
Dark Red (Maroon)	62051M	94969-H
Dark Saddle	63082	96222
Black	400	44
	FLAT	
Dark Fawn	62084	4435-L
Dark Saddle	63081	4436-L
Dark Green	62035	4434-L
Dark Blue	63021	4430-L
Dark Gray	62013	4433-L
Dark Aqua	62031	4429-LH
Dark Red (Maroon)	62051	4431-LH
Black	400	4428-L