Cadillac

SHOP MANUAL

1954

CADILLAC

SHOP MANUAL

For 1954

Covering Cadillac 54-62, 60S, 75 Passenger Cars,

and 86 Commercial Cars

Service Department
CADILLAC MOTOR CAR DIVISION
General Motors Corporation
Detroit, Michigan

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CONTENTS

Cadillac Craftsman Code

I HEREBY pledge myself in all my work on Cadillac cars, to be thorough and exact in diagnosing trouble; to recommend only that service which is to the best interest of the owner; to perform that work for which I am responsible in accordance with Cadillac standards to the best of my ability, and in all my dealings with Cadillac owners, to be courteous, honest, and ethical; and to do everything within my power to further the owner's satisfaction and promote his good will to Cadillac and to my dealer.

GENERAL INFORMATION

Foreword

This 1954 Shop Manual has been prepared by the Cadillac Motor Car Division to aid Servicemen to render complete and accurate service for owners of 1954 Cadillac cars.

This manual is intended primarily for Servicemen who are familiar with Cadillac cars of previous years. The information contained herein includes the latest service procedures and specifications relative to the 1954 models.

The Cadillac Service Department also publishes the CADILLAC SERVICEMAN each month to keep Servicemen up-to-date on the latest service information. Read the SHOP MANUAL . . . Read the SERVICEMAN . . . Enroll in the CRAFTSMAN'S LEAGUE . . . They will help you understand your job better. They will show you various short cuts and new tools for the performance of special operations.

Arrangement of the Manual

The front page of this 1954 Shop Manual contains a rapid reference Section Index with corresponding page tabs at the beginning of each section. Each section contains a table of contents of notes within the section, a brief descriptive introduction, service adjustment and replacement procedures, diagnosis charts, concise notes, and clearly labeled illustrations. In addition, a list of the Special Tools required to perform the operations and adjustments discussed in each section, and illustrations of these tools, is provided at the end of each section, along with specification and torque tightness information.

On the final page of most sections, space is provided for personal notes and references. Here, articles from the CADILLAC SERVICEMAN should be listed along with other notes and bulletins which pertain to the material in that section.

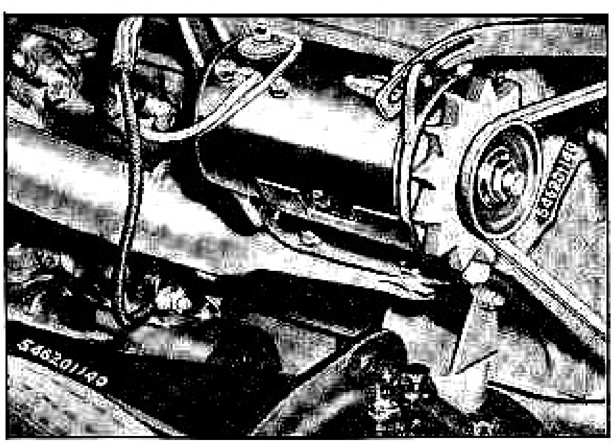


Fig. 1-1 Engine Serial Number Locations

Identification

Each Cadillac car or chassis, when shipped, carries an engine serial number and an engine unit number. The engine serial number is used in license and insurance applications and in general reference to the car. The serial number, on all 1954 Cadillac engines, is stamped on the flat machined boss cast on the upper right hand corner on the front face of the right hand cylinder block, and is at right angles to the crankshaft, the numbers starting from the bottom. Fig. 1-1. This number is also stamped on the frame right hand side bar at the rear of the engine mounting bracket, Fig. 1-1, and on a lubrication plate attached to the left front body pillar. On coupe styles this lubrication plate is located on the left door lock pillar.

The engine serial number has at least nine digits. The first two indicate the model year, the third and fourth the series, and the last six indicate the order in which the car was completed in final assembly and is commonly referred to as the "Broadcast Number" of the car.

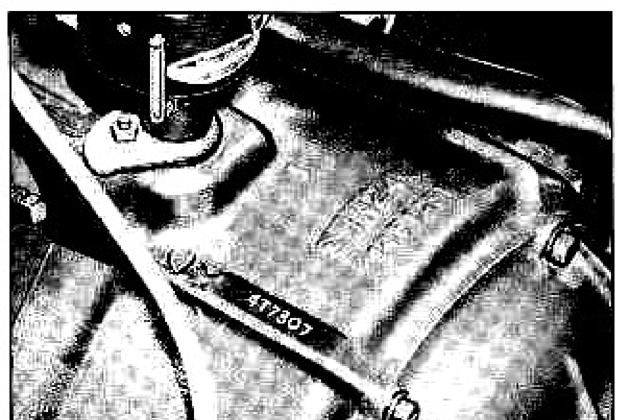


Fig. 1-2 Engine Unit Number Location

The engine unit number on all engines is stamped on the bell housing portion of the crank case behind the left hand cylinder block, directly above the cast rib, and numbered parallel with the crankshaft, the number starting from the cylinder block end of the housing, Fig. 1-2. The letters L.C. are added to the engine unit number on all engines built to low compression specifications. Engines assembled with

.010" oversized pistons may be identified by an asterisk stamped on the block ahead of the engine unit number.

ENGINE UNIT NUMBER CHART

Series	Engine Unit No.
54-62-60-75 Power Steering	4-T 00001
54-62-60-75 Power Steering and Air Conditioning	4-TK 00001
54-86 Less Power Steering and Air Conditioning	7-T 00001
54-86 Air Conditioning	7-TK 00001
54-86 Power Steering	5-T 00001
54-86 Power Steering and Air Conditioning	5-TK 00001

The body style number, body number, and paint and trim numbers are stamped on a plate attached to the right side of the cowl under the hood near the hood hinge, Fig. 1-3.

Fig. 1-3 Body Name Plate Location

The Hydra-Matic transmission also has a unit number stamped on a plate located on the right side of the transmission case, Fig. 1-4.

The gear ratio of the differential assembly may be identified by a number stamped on a flat boss on the bottom of the case, Fig. 1-5.

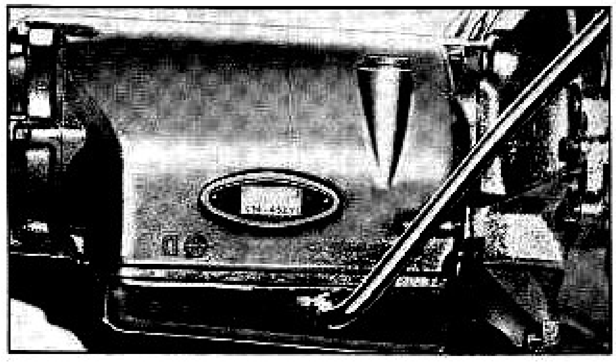


Fig. 1-4 Hydra-Matic Transmission Serial Number Location

Rear axle gear ratio applications in the various series Cadillacs and the identifying number on the rear axle case are listed below:

Series	Ratio	Ident. No.
60, 62	3.07	3
60, 62 (optional)	3.36	6
60, 62 with Air Conditioner	3.36	6
75	3.77	7
86	4.27	4

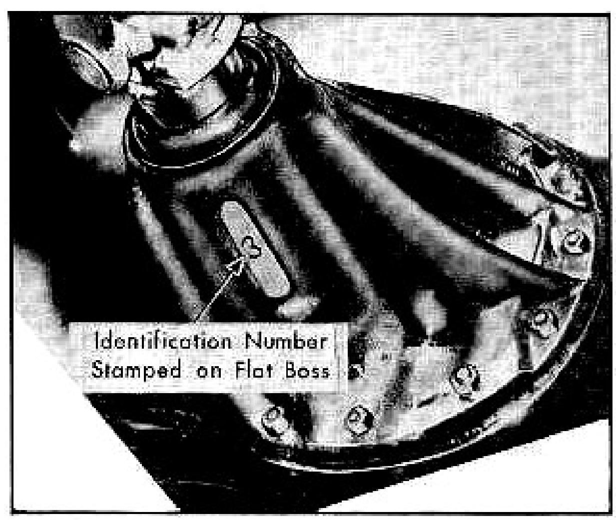


Fig. 1-5 Rear Axle Gear Ratio Identification Number

GENERAL INFORMATION

The three major components of the Air Conditioner unit, the compressor, condenser, and evaporator, each has a separate serial plate. The serial number plate for the compressor is located on the upper portion of the compressor housing between the high and low test gage connections, Fig. 1-6. The serial number plate for the condenser is located on the liquid outlet end of the condenser assembly, Fig. 1-7. The serial number plate for the evaporator is located on the top right hand end of the evaporator housing, Fig. 1-8.

The radio serial number plate is located on the bottom of the radio unit and to the left, Fig. 1-9.

The Autronic-Eye serial number plate is located on the bottom of the Photo tube unit (mounted on the left side of the instrument panel) near the top of the Photo tube mounting bracket, Fig. 1-10.

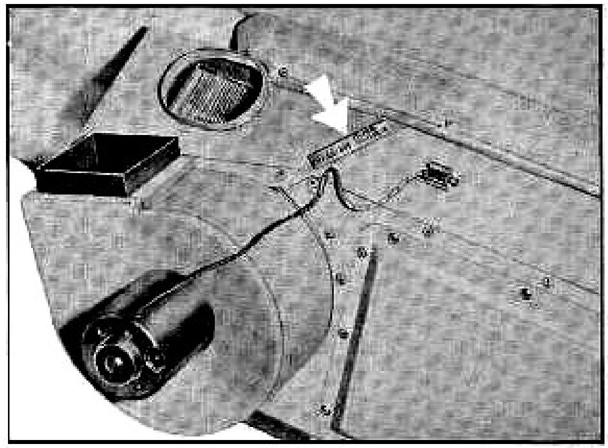


Fig. 1-8 Air Conditioner Evaporator Serial Number Location

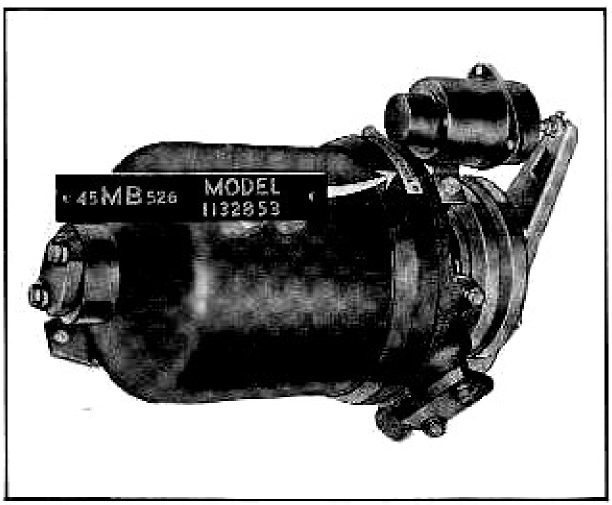


Fig. 1-6 Air Conditioner Compressor Serial Number Location

Fig. 1-9 Radio Serial Number Location

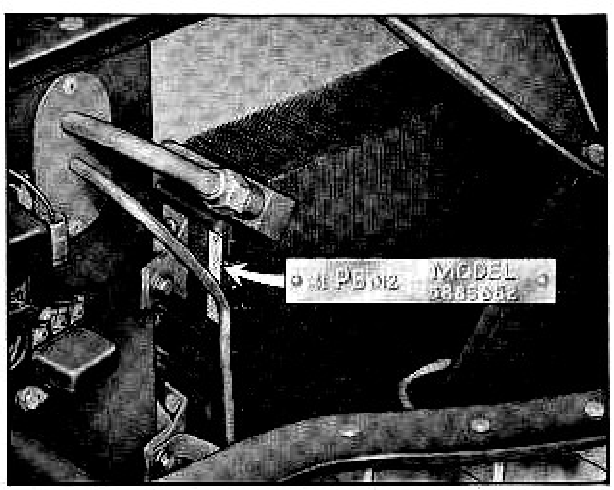


Fig. 1-7 Air Conditioner Condenser Serial Number Location

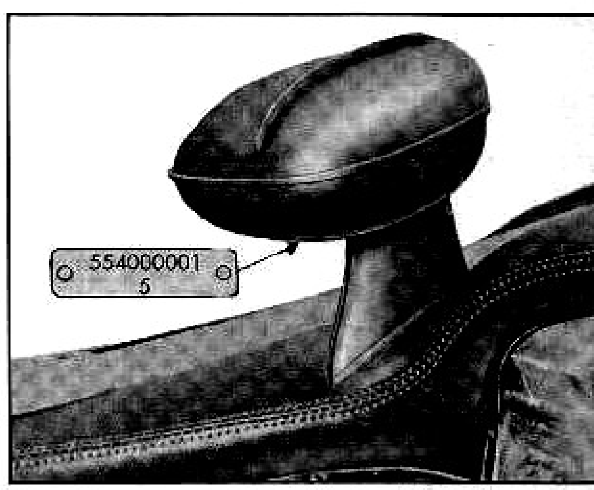


Fig. 1-10 Autronic-Eye Serial Number Location

Models Included

Information is given in this manual covering the following series cars.

Series and Models	No. of Cylinders	Bore & Stroke	Displacement	Wheel-base	Over-all Length	Starting Engine No.
54-6219	V-8	3-13/16" x 3-5/8"	331 cu. in.	129"	216-13/32"	546200001
54-6237 & 67	V-8	3-13/16" x 3-5/8"	331 cu. in.	129"	223-13/32"	546200001
54-60S	V-8	3-13/16" x 3-5/8"	331 cu. in.	133"	227-13/32"	546000001
54-75	V-8	3-13/16" x 3-5/8"	331 cu. in.	149-3/4"	237- 5/32"	547500001
54-86	V-8	3-13/16" x 3-5/8"	331 cu. in.	158"	246"	548600001

OTHER NOTES AND REFERENCES

LUBRICATION AND PREVENTIVE MAINTENANCE

TABLE OF CONTENTS

GENERAL DESCRIPTION

Thorough lubrication and preventive maintenance are necessary at regular and proper intervals, if Cadillac owners are to obtain, mile after mile and month after month, the full benefit of the trouble-free performance and rugged dependability that has been engineered into their automobiles.

Cadillac lubrication has been designed for simplicity, and the instructions for thorough lubrication are clear and concise. Authorized Service Stations and Individual Servicemen can cooperate by following the recommendations of the 1954 Cadillac Lubrication Chart, and by helping to impress owners with the necessity of lubricating their cars according to the schedule recommended by Cadillac.

THE LUBRICATION NOTICE (Fig. 2-1) is a plate on the left front door body pillar. The mileage and date at which a lubrication is performed should be posted here. On coupe styles this plate is located on the door lock pillar. The engine serial number is also printed on this plate.

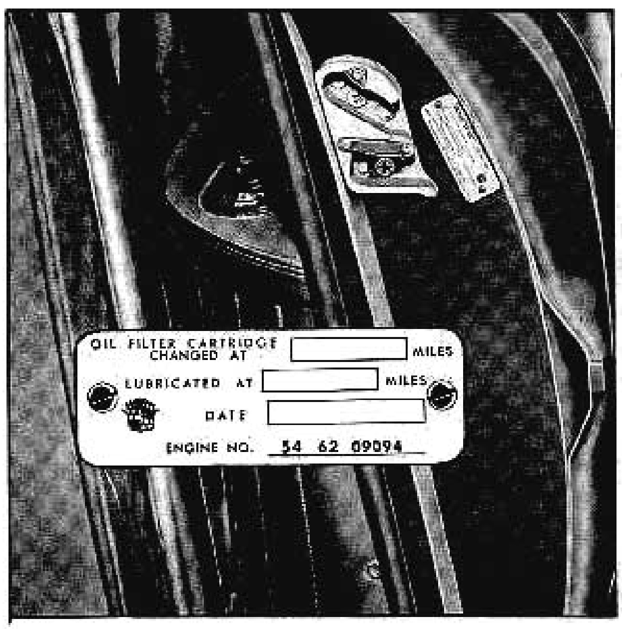


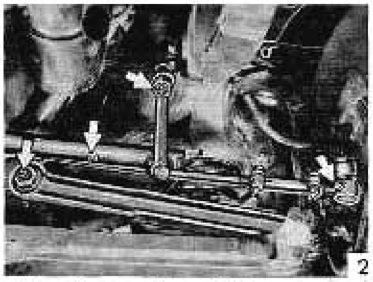
Fig. 2-1 Lubrication Notice

THE LUBRICATION CHART (Fig. 2-2) illustrates and explains briefly, each of the various points of lubrication on the car. It should be used for reference until the Serviceman is thoroughly familiar with the 1954 series cars. Complete explanations of each point are given under "Service Information" in this section of the manual.

THE LUBRICATION SCHEDULE recommended by Cadillac is based upon service at 2 month or 2000 mile intervals whichever occurs first. In cases where the car is driven less than 2000 miles in that period of time, the lubrication should be performed every two months regardless of the mileage.

THE LUBRICATION AGREEMENT is designed by Cadillac to promote thorough lubrication at scheduled intervals. The owner purchases complete lubrication for his car, including engine oil and Hydra-Matic transmission fluid changes for 12,000 miles, at a special price paid in advance. This plan assures proper lubrication and encourages owners to bring their cars in at regular intervals for a Cadillac "inspection."

LUBRICATION AND PREVENTIVE MAINTENANCE



Steering and Front Suspension

Idler Arm, Tie Rod, Drag Link, Inner Lower Suspension Arm, Right Side.

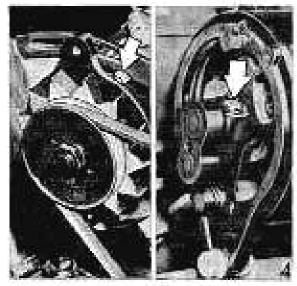
Chassis Lubricant with grease gun.

Every 2000 miles

Breather Cap

Clean copper gauze in a solvent and dip in engine oil.

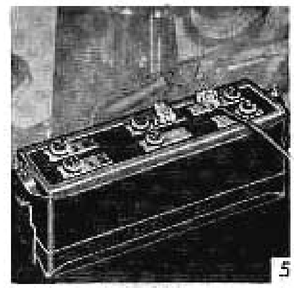
Every 2000 miles



Generator

Fill both cups with 10-W engine oil.

Every 2000 miles

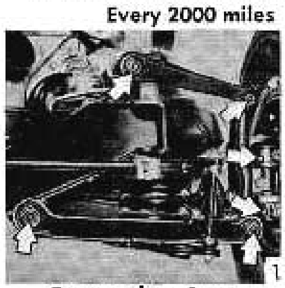


Battery

Add distilled water to bring level up to bottom of slot in well.

Every 2000 miles

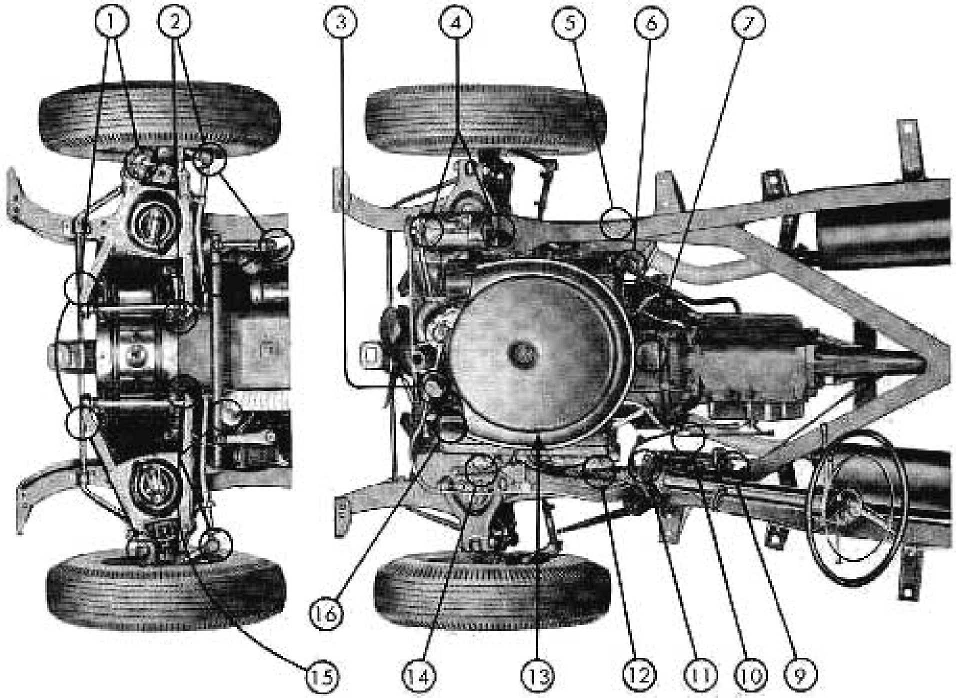
In warm weather check level every two weeks.



Suspension Arms and Steering Knuckle Assy.

Chassis Lubricant with grease gun.

Every 2000 miles

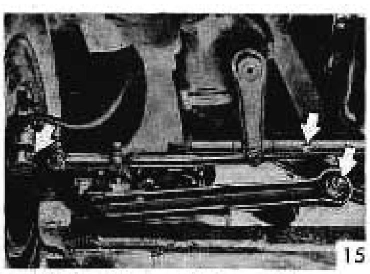


Power Steering Tank

(on cars so equipped)

Check fluid level and fill to mark on tank with AQ-ATF.

Every 2000 miles



Steering and Suspension

Tie Rod, Drag Link, Inner Lower Suspension Arm, Left Side.

Chassis Lubricant with grease gun.

Every 2000 miles

Engine Oil Filter

Replace filter cartridge

Every 6000 miles

In dusty areas replace more frequently.

Front Wheel Bearings

Remove bearings, clean and repack with wheel bearing lubricant and adjust.

Every 25,000 Miles or at Brake Reline

Rear Axle

Check level and add Multi-Purpose Type gear lubricant to bring level up to filler hole

Every 2000 miles

Drain and refill only when unit is overhauled or when temperatures are consistently below 0°F. in which case 80 SAE viscosity lubricant should be used.

Hood Release Mechanism

Apply a small amount of Lubriplate to hood lock bolt and catch.

Every 2000 miles

Radiator

Inspect radiator fluid level.

Every 2000 miles

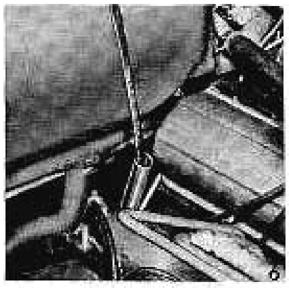
Drain, flush and refill.

Twice a Year

Key Numbers on Chassis Illustration refer to numbered detail pictures.

Fig. 2-2 Lubrication Chart - All 1954 Series

LUBRICATION AND PREVENTIVE MAINTENANCE

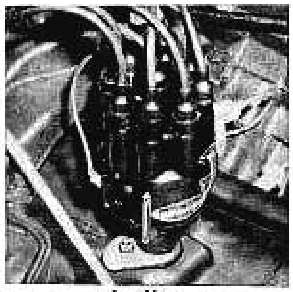


Hydra-Matic Transmission

Check level every 2000 miles.

Drain and refill.

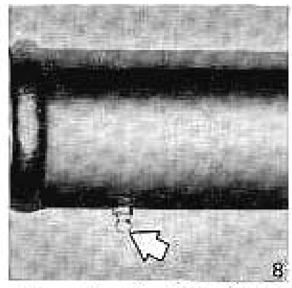
Every 25,000 miles



Distributor

Fill tube with 10-W engine oil.

Every 2000 miles

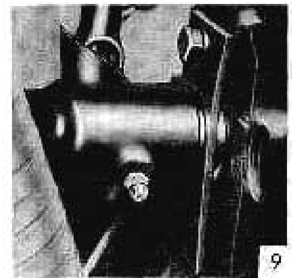


Propellor Shaft Splines

(54-75 and 86 Series Only)

Apply chassis lubricant with grease gun.

Every 2000 miles

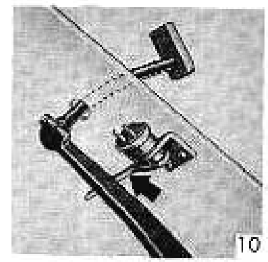


Brake Pedal

1 Fitting

Apply chassis lubricant.

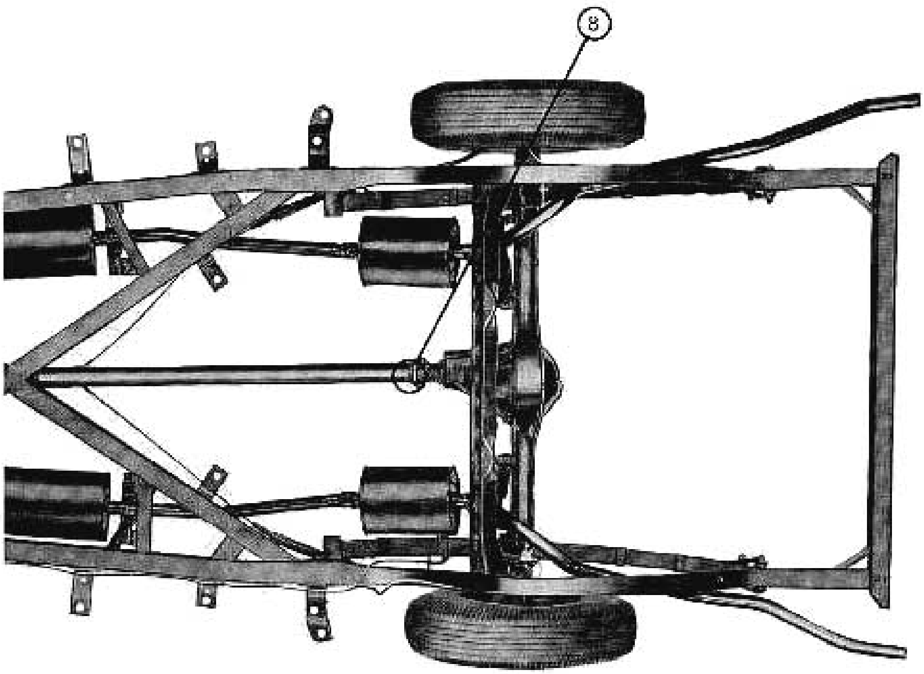
Every 2000 miles

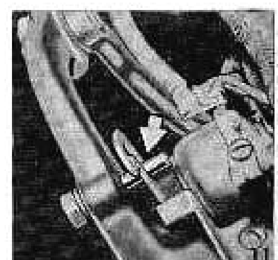


Stop Light Switch

Apply Lubriplate where indicated by arrow.

Every 2000 miles





Hydra-Matic Neutral Switch

Apply Lubriplate where indicated by arrows.

Every 2000 miles

Body Lubrication

Apply a few drops of light oil to door hinges, door checks and lock bolt rollers. Clean off dust and old lubricant from door striker plate and apply a slight amount of Lubriplate.

Apply DC-4 silicone compound to door weatherstrips, window run channels, and sealing strip owning gasket (on closed coupes)

Every 2000 miles

Apply Lubriplate to seat adjustment track sparingly.
Apply a slight amount of powdered graphite to keys and insert in lock cylinders.

Every 6000 miles

Brakes

Inspect master cylinder fluid level.

At every brake adjustment and at reline.

Lubricate brake cables, brackets, and levers with 10W engine oil.

Every 2000 miles

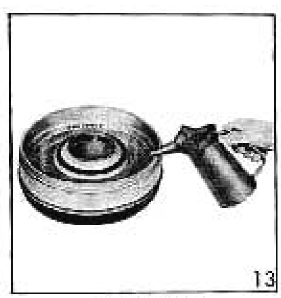
"Oil Can" Lubrication

Apply a few drops of engine oil to hood hinges, clutch linkage, and accelerator linkage.

Every 2000 miles

Tire Inflation

	54-62, 60S	*54-75*	*54-86 Comm.*
Inflate tires to....	24 lbs.	28 lbs.	24 lbs. front 30 lbs. rear



Air Cleaner

Drain, clean and refill with one pint of oil. Use SAE 40 above 32°F and SAE 20 below 32°F.

Every 2000 miles

Steering Gear

Add steering gear lubricant to bring level up to filler plug on manual and power gears.

Every 2000 miles

Key Numbers on Chassis Illustration refer to numbered detail pictures.

Fig. 2-2 Lubrication Chart – All 1954 Series

SERVICE INFORMATION

(1) Lubrication Schedule

a. Every 2000 Miles

Drain and replace engine oil.
Clean filter on crankcase breather cap.
Clean and refill carburetor air cleaner.
Oil generator oil cups.
Oil distributor.
Oil hand brake connections, levers and cables.
Lubricate chassis fittings.
Lubricate neutral switch actuating pin.
Lubricate brake stop switch actuating arm.
Lubricate body hardware.
Lubricate body weatherstrips as necessary.
Check master cylinder reservoir fluid level.
Inspect battery fluid level.
Inspect level in radiator.
Check tire inflation.
Inspect steering gear lubricant level.
Inspect transmission lubricant level.
Inspect fluid level in power steering pump reservoir.

b. Miscellaneous Lubrication Operations

Drain and refill Hydra-Matic transmission-every 25,000 miles.
Clean, repack and adjust front wheel bearings - Every 25,000 miles or at brake reline.
Remove and replace engine oil filter cartridge At least every 6,000 miles.

(2) The 2000 and 4000 Mile Inspections

When new Cadillac cars are brought in for service during the 90 Day - 4000 Mile Warranty Period, Servicemen should use the list of inspections and operations, Fig. 2-3, as a guide. Copies of this form may be obtained upon request to the Factory Service Department.

(3) Related Items

In addition to the lubrication operations, there are several regularly required maintenance items which should be brought to each owner's attention. They are as follows:

Cooling System - Flush twice a year - Spring and Fall. Add rust inhibitor and DuPont Sealer. See Section 13 for information relative to preparation of cooling system for anti-freeze.

Gasoline lines and strainers - Clean out twice a year - Spring and Fall.

Engine oil pan - Remove and clean once a year, after the "Winter" season.

Tires - Interchange every 4,000 miles (or less) as explained in Section 6.

Brake System - Clean and flush once a year.

(4) Body

a. Body Hardware

Lubrication of the body hardware is an important part of each 2000 mile lubrication operation. The following should be performed:

Apply a slight amount of petrolatum to the door wedge plates and door check mechanism. Apply a drop or two of 10W oil at the lift bolt roller and allow it to drain inside the roller. Lubricate both sides of the lock frame at the lift bolt cutout with a thin film of Lubriplate No. 630AA. Also lubricate the bottom surface of the lower guide channel in the striker with Lubriplate No. 630AA. Be sure to wipe off dust and old lubricant before applying the new, using lubricant sparingly. Apply Lubriplate to the hood lock mechanism.

The following additional operations should be performed twice a year or every 6000 miles: Apply powdered graphite to keys and insert in lock cylinders; clean dust and old lubricant off of front seat adjustment track and apply Lubriplate sparingly.

b. Body Weatherstrips

The mechanical sealing strip hinge on closed coupes should be lubricated along its entire length with Lubriplate.

The sealing strip awning gasket should be lubricated on both sides with DC-4 Silicone Compound every 2000 miles as necessary.

Apply DC-4 Silicone compound every 2000 miles, if necessary, to door and window weatherstrips and run channels to prevent squeaks. Wipe off any excess lubricant to reduce the possibility of dust sticking to the treated surface.

c. Hydro-Lectric System (Convertible Coupe Styles and Eldorado only)

On 1954 Series cars, the Hydro-Lectric system is used only for raising and lowering the top in the Eldorado and Convertible Coupe styles. The new Hydro-Lectric system is a sealed-in unit and is not vented to the atmosphere. Therefore, it is not necessary to replace hydraulic fluid periodically. The new system is "self-air bleeding." Should air become trapped in the lines due to replacement of hydraulic units, a few operational cycles of the top will expel the trapped air into the reservoir.

SUGGESTED OPERATIONS AT THE FIRST 2000 AND 4000 MILES

At 2000 Miles

1. Check with the owner concerning his experience with the car and clarify any questions he may have on controls or function of any part of the car.
2. Correct any conditions reported to you by the owner when your inspection also indicates that the car is not normal.
3. Road test the car, checking operation of the following and correct only when necessary:
   - (a) Carburetor and manifold heat control valve.
   - (b) Steering.
   - (c) Brakes.
   - (d) Instruments, all controls, and lights.
   - (e) All accessories.
   - (f) Hydra-Matic transmission.
4. Remove and inspect fuel filter element. Do not attempt to clean. Replace if necessary.
5. Lubricate and change engine oil. (This operation to be charged to the owner). The break-in engine oil should have been replaced at 500 miles.
6. Make general inspection for coolant, brake fluid, or any lubricant leaks. (Do not confuse with normal seepage).
7. Tighten radiator hoses, upper and lower. Check Heater hoses.
8. Tighten intake and exhaust manifold screws and nuts. (25 - 30 Ft. Lbs.)
9. Tighten rear spring clips and "U" bolts (45 to 52 Ft. Lbs.)
10. On Air Conditioner equipped cars, clean and wash filters.

At 4000 Miles

1. Check with the owner concerning his experience with the car and clarify any questions he may have on controls or function of any part of the car.
2. Correct any conditions reported to you by the owner when your inspection also indicates that the car is not normal.
3. Road test the car, checking operation of the following and correct only when necessary:
   - (a) Carburetor and manifold heat control valve.
   - (b) Steering.
   - (c) Brakes.
   - (d) Instruments, all controls, and lights.
   - (e) All accessories.
   - (f) Hydra-Matic transmission.
4. Lubricate and change engine oil. (This operation to be charged to the owner).
5. Suggest to owner that tires be rotated. (Owner's expense).
6. Make general inspection for coolant, brake fluid, or any lubricant leaks. (Do not confuse with normal seepage).
7. Clean and adjust points and spark plugs and reset ignition timing. (Point gap .016", plug gap .035").
8. Adjust brakes. Check fluid level and free pedal travel.
9. Adjust steering gear.
10. Check toe-in and adjust when necessary. (3/16" to 1/4 toe-in).

Fig. 2-3 Suggested Operations at 2000 and 4000 Mile Inspections

The Hydro-Lectric motor and pump assembly, on Convertible Coupe styles, is located on the trunk floor pan beneath the top well. On the Eldorado, this assembly is located in the trunk on the left side to the rear of the wheel housing. A reservoir filler plug is provided should it become necessary to add fluid. The fluid capacity of the Hydro-Lectric system is 3/4 pint.

(5) Chassis Suspension

The front wheel bearings on all series cars require repacking with wheel bearing grease and adjustment every 25,000 miles, or when brakes are relined. When lubricating these bearings, always use grease meeting the G-12 specifications.

Lubrication fittings for use with grease gun are provided where necessary on the chassis of all 54-Series cars. All of the points on the car that are provided with grease gun connections must be lubricated every 2,000 miles. The locations of these points are given in the Lubrication Chart, Fig. 2-2.

When lubricating the threaded pins and bushings of the front wheel suspension system, the front end of the car should be lifted with a jack, or hoist, bearing against the center of the front cross member so that the front suspension system is entirely relieved of weight. Application of lubricant with the weight of the car off the bushings will assure more complete lubrication. Clearance between the pins and bushings is necessary to allow space for a film of lubricant.

The rear upper control arm bushings are fitted with 90° lubrication fittings which point downward toward the opening between the frame side bar, front cross member and reinforcing brace on each side. Use of a 12" extension on the grease gun is required to reach these fittings through the bottom of this opening.

If any of the lubrication fittings are found to be broken, plugged, or missing, be sure to secure authorization for the installation of new fittings. No point should be left unlubricated.

(6) Steering Gear

Special Steering Gear Lubricant, meeting G.M. 4673-M specifications, is required in the gear housing of both the power and manual steering gear units. The lubricant level should be inspected every 2,000 miles and additional lubricant added to bring the level to the filler plug opening. Special tubes of Steering Gear Lubricant 4673-M are available at the Factory Parts Department under Part No. 146 1598. Each tube contains sufficient lubricant for one complete refill of the power steering gear. Manual gears require only two thirds of a tube.

The fluid level in the pump reservoir, on cars equipped with power steering, should be checked every 2,000 miles and filled with Automatic Transmission Fluid, type "A", to the mark on the outside of the reservoir as shown in Fig. 2-2. If the fluid level is excessively low, it is an indication of a leak in the system and should be checked as explained in Section 7.

The Hydra-Matic transmission neutral switch actuating pin, located on the shift lever attached to the lower steering column, should be lubricated every 2,000 miles with a small amount of Lubriplate to prevent undue wear at the switch arm and pin.

(7) Rear Axle

Check the lubricant level in the rear axle every 2,000 miles and add fresh lubricant if necessary. Draining and refilling of the differential is necessary, only when the unit is removed for overhaul, or when seasonal temperature changes make it necessary to use a fluid of lower viscosity. S.A.E. 90 Multi-purpose-Type Gear Lubricant should be used, except in localities where winter temperatures are consistently below 0°F. In these localities S.A.E. 80 should be used. When a replacement differential is installed, use the special "break-in" lubricant supplied with the differential.

(8) Brakes

The fluid level in the brake master cylinder should be checked every 2,000 miles and every time the brakes are relined or adjusted. Fill with Delco Super No. 11 brake fluid to 3/4" from the top of filler cap boss. Fig. 2-4. The remote filler tube is located on the left side of the cowl, near the hood hinge, in the engine compartment.

A popping noise may sometimes be heard in the brakes when they are applied in forward speed after having been applied in reverse. This is generally a result of the edge of the brake shoe hanging slightly on the bosses of the dust shield before centralizing. In such cases, the edges of the shoe should be smoothed up where they contact the bosses and lubricated slightly. A suitable lubricant for this purpose is furnished under specification number G-2 1/2-B (Lubriplate). Care should be taken in applying lubricant to make sure that none is permitted to get on the brake lining. Brake cables, brackets, and levers should be lubricated every 2,000 miles with 10-W engine oil.

On cars equipped with Power Brakes, the cylinder air filter should be cleaned every 2000 miles. This

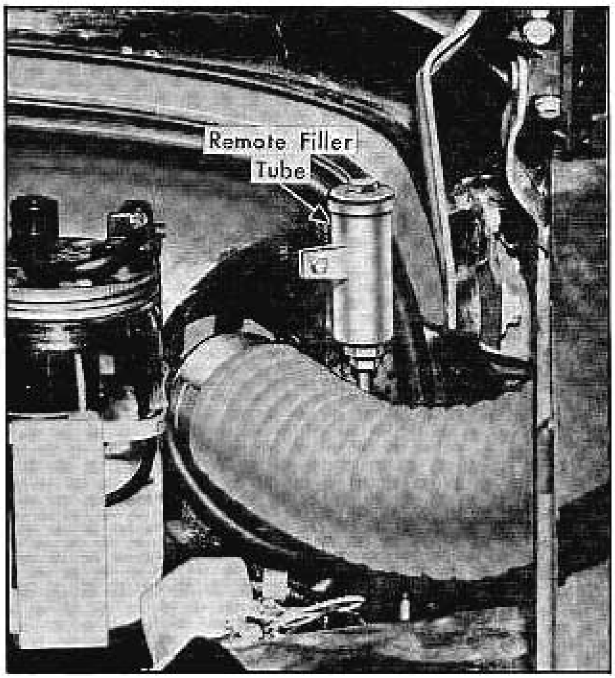


Fig. 2-4 Master Cylinder Remote Filler Tube

may be done by removing the spring type retainer, screen and filtering element (hair). Wash filtering element (hair) in solvent, shake solvent out thoroughly, and reinstall.

In addition, lubricate the vacuum piston leather once a year. This may be done by removing the pipe plug from the cylinder shell and injecting Delco Hydraulic Shock Absorber Fluid up to the point where it runs out of the filler hole.

The brake stop light switch arm, located under the brake pedal, below the floor pan, should be lubricated with Lubriplate every 2,000 miles.

NOTE: The braking system must be flushed once a year. This is particularly important on cars equipped with the Power Brake system where dirt under the ball check will affect operation of the system. Any water, moisture or condensation entering the Power Brake system will etch the master cylinder, wheel cylinder, or hydraulic cylinder in the Power Brake system, and also cause excessive wear on the rubber seals.

(9) Engine

a. Engine Oil Recommendations

Engine oils are now being classified by a system based on the detergency rating of the oil. For maximum protection of Cadillac engines under all normal driving conditions, it is recommended that oils designed for "Service MS" or "Service DG" be used in the engine.

Any field attempt to improve lubricants by adding so-called "dopes, solvents, friction reducing compounds, and other trick materials" to engine oils, Hydra-Matic transmission fluids, and differential lubricants should be avoided. The use of these materials is entirely unnecessary to the proper operation of a Cadillac car.

During the first 500 miles of operation, the oil in the crankcase when the car is shipped should be used. When it is necessary to add oil during this period, use nothing heavier than S.A.E. 10W oil in winter or 20 in summer. Change the oil at the end of 500 miles.

After the first 500 miles, the crankcase oil should be selected to give the best performance under the individual climatic and driving conditions. If the car is driven regularly at high speeds, or if the prevailing temperature averages 90° or above, S.A.E. 30 oil may be used. Recommendations for engine oil viscosities for all 1954 Cadillacs are shown in Fig. 2-5.

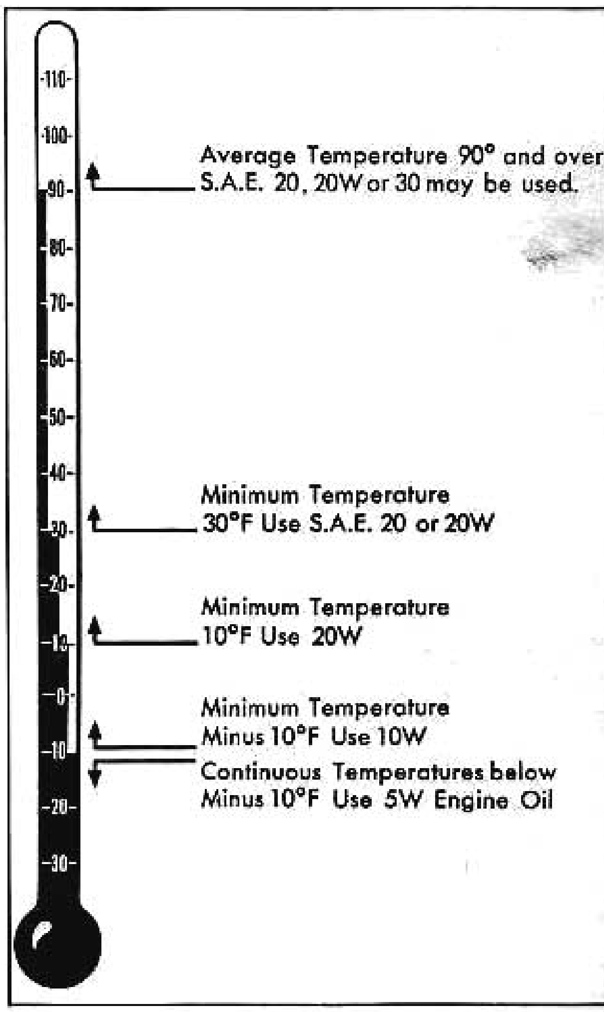


Fig. 2-5 Engine Oil Viscosity Chart

During cold weather, an oil should be used that will permit easy starting at the lowest atmospheric temperature that is likely to be encountered. When the engine crankcase is being refilled, the oil should be selected, not on the basis of the temperature at the time of the change, but on the anticipated minimum temperature for the entire period during which the oil is to be used.

When continuous temperatures are as low as minus 10°F, use the new improved 5W oil, generally identified with the American Petrolem Institute classification "For Service MS" stamped on the can. The practice of using kerosene with engine oil in an emergency should be discouraged because it is of temporary value only.

b. Adding Engine Oil

The engine oil level should be checked every time gasoline is purchased and every time the car comes into the service station. Oil should be added as required. The oil level indicator is marked to show "Add Oil" and "Full" levels. Oil should be added whenever the level falls to the "Add Oil" mark, but add only enough to bring level up to the "Full" mark, Fig. 2-6.

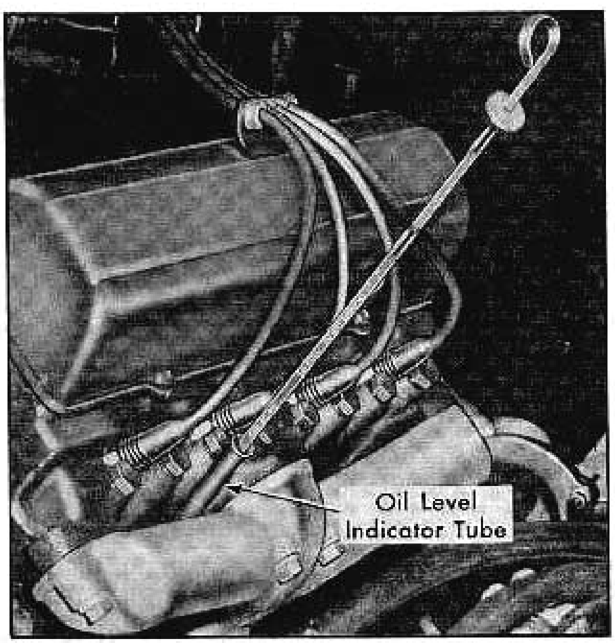


Fig. 2-6 Checking Engine Oil Level

c. Changing Engine Oil

On a new car, the oil should be changed at the end of the first 500 miles. The second change should be made when the odometer reads 2,000 miles. Then, under normal driving conditions, draining the crankcase and replacing with fresh oil at 2,000 miles or 2 month intervals, whichever first occurs, is recommended.

Under adverse driving conditions, it may become necessary to drain the crankcase oil and clean the air cleaner more frequently for reasons given below:

Driving through dust storms or on extremely dusty roads may contaminate the engine oil more quickly.

During extremely cold weather, frequent starts, low operating speeds, and short runs may contaminate the oil with water condensation inside the crankcase.

Hard driving tends to thicken oils and this may interfere with easy starting in cold weather.

Drain the crankcase only after the engine has been heated to normal operating temperature. The benefits of draining are minimized if the crankcase is drained when engine is cold, as some suspended foreign matter will cling to the sides of the oil pan and will not drain out readily with slower moving cold oil. Flushing the crankcase is not recommended. The engine oil pan should be removed and cleaned once a year, after the "Winter" season.

d. Engine Accessories

The generator has two oil cups, one at each end. These cups should be filled with 10W engine oil every 2,000 miles.

> NOTE: If the oil reservoir in the commutator end bearing becomes completely exhausted through failure to lubricate at regular intervals, the reservoir should be restored by filling the oil cup 3 times consecutively, allowing time between fillings for the oil to soak down.

At each 2000 mile lubrication, 10W engine oil should be added to the filler tube (located at the front of distributor) until the oil level is brought up to the top of the filler tube.

When the distributor points are adjusted, cleaned, or replaced, the distributor breaker plate bushing, felt, pivot pin, and distributor cam wick should be lubricated with 1 or 2 drops of No. 10W oil. Lubricate the distributor cam at this time using Delco-Remy Cam and Bearing Lubricant (M-31 Lubrico).

Whenever the crankcase oil is changed, the copper gauze in the filler cap should be cleaned in a solvent and dipped in engine oil. This operation of oiling the cap should also be performed when conditioning a new car for delivery. The carburetor air cleaner should also be cleaned and oiled as follows:

1. Loosen wing nut on top of air cleaner and remove shroud filter element and reservoir as an assembly from the carburetor.

2. Remove shroud from air cleaner assembly.

3. Lift filter element off of reservoir and pour oil out of reservoir.

4. Wash all parts in solvent.

5. Fill reservoir to correct level, as indicated on inside of reservoir, with proper grade of oil. Use S.A.E. 40 oil when average temperature is above 32°F and S.A.E. 20 oil when average temperature is below 32°F.

6. Inspect reservoir to carburetor gasket; replace if damaged or full contact is not observed.

7. Place filter element and shroud on reservoir, and install air cleaner assembly on carburetor.

8. Tighten wing nut finger tight.

It is recommended that the engine oil filter cartridge be replaced every 6,000 miles under normal car usage.

If the car has been subject to severe driving conditions, such as constant travel over dusty roads or excessive stop-and-go driving in cold weather, more frequent replacement of the filter cartridge will be necessary.

Remove the filter cover screw, cover, and gasket, and remove the cartridge. Remove any oil which may be in the housing, and be sure all sludge is cleaned out completely.

Install cartridge, cover with new gasket, and tighten cover screw. Check for leaks at the cover gasket with engine running at fast idle. After engine has run for 3 or 4 minutes, stop engine and check oil level. Add oil to bring level to the "Full" mark.

(10) Hydra-Matic Transmission

The dipstick and filler tube for the Hydra-Matic transmission are located under the hood at the right rear side of the engine on all 1954 Cadillac cars for convenience in checking and filling. The fluid level should be checked every 2,000 miles and fluid added to bring the level to the "Full" mark on the dipstick. Run engine with selector lever in "N" (neutral) position, at 800 R.P.M. for approximately 1-1/2 minutes. The oil level is always checked after the engine has been running to be sure the fluid coupling is full in order to obtain an accurate reading. Reduce the engine speed to slow idle, remove and wipe dipstick, and check fluid level. With the engine still running, add fluid through the dipstick tube to bring level up to "Full" mark on the dipstick. ("Low" to "Full" marking is 1 quart.)

(11) Air Conditioner

Frigidaire 525 viscosity oil is used in the Air Conditioner unit. For information concerning the checking and adding of oil at the compressor, see Air Conditioning, Section 16A.

(12) Commercial Chassis

Instructions for lubrication of 1954 series 75 and 86 Cadillac commercial chassis are included in the Lubrication Chart, Fig. 2-2. The only difference is in the addition of a lubrication fitting at the splined joint at the rear of the rear propeller shaft.

(13) Points Requiring No Lubrication

No lubrication is required at the engine fan bearing, water pump, the rear wheel bearings, or the universal joints, as all of these bearings are packed at assembly.

No lubrication of the rear springs is required, as the shackles are rubber mounted, and the spring leaves are fitted with waxed interliners. It is important that no lubrication be attempted at these points as lubricant is harmful to the proper functioning of the springs.

(14) Approved Lubricants

Nine different types of lubricants, excluding oils or fluids, are required for satisfactory lubrication of 1954 series Cadillac Cars.

Specification No.	Lubricant
A-9-HL	Multipurpose-Type Gear Lubricant
4673-M	Steering Gear Lubricant (Part No. 1461598)
G-2-1/2-B	Lubriplate
630-AA	Lubriplate
G-11	Chassis Lubricant
G-12	Wheel Bearing Grease
G-19	Petrolatum
1172-M	Delco Remy Cam and Bearing Lubricant
DC-4	Silicone Compound

(15) Capacities

Unit	1954 Series 62, 60S	75	86 Comm.
Rear Axle	5 pints	5 pints	5 pints
Engine Crankcase	5 quarts	5 quarts	5 quarts
(When Filter Element is Replaced) add	1 quart	1 quart	1 quart
Cooling System			
With Heater	22 quarts	24-1/2 quarts	22 quarts
Without Heater	19-3/4 quarts	19-3/4 quarts	19-3/4 quarts
Gasoline Tank	20 gallons	20 gallons	20 gallons
Tire Pressure			
Front	24 lbs.	28 lbs.	24 lbs.
Rear	24 lbs.	28 lbs.	30 lbs.
Air Conditioner			
Freon 12	7 lbs.	7 lbs.	7 lbs.
Frigidaire #525 Oil Dry	22 ozs.	22 ozs.	22 ozs.
Refill	16 ozs.	16 ozs.	16 ozs.
Hydra-Matic Transmission			
Dry	11 quarts	11 quarts	11 quarts
Refill	10 quarts	10 quarts	10 quarts

OTHER NOTES AND REFERENCES

BODY

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GENERAL DESCRIPTION

The 1954 line of Cadillac cars consists of four different series and eight body styles as described in the body specifications at the end of this section. Chassis for commercial bodies are available in the 1954-86 series.

Body style number, body number, body trim code number, paint combination number, and accessory group number are indicated on the body name plate located on the right side of the cowl, near the hood hinge.

All 1954 styles feature a completely new instrument panel, consisting of a lower section and an upper section which is readily removed from the lower section. Convenient access to the windshield wiper transmission, wiper auxiliary drive pulleys, lower and side reveal molding wing nuts, and instruments is obtained by removing the upper section of the instrument panel.

Electrical control of windows and front seats is standard equipment on all styles except the 6219 and 6237; electrical controls for these styles are optional. Vertical adjustment of the front seat may be obtained as an accessory on all cars having electrical controls, except the 75 series.

Controls for operation of the windows and the front seat are connected through the ignition switch which must be ON or at the ACCESSORY position to permit operation.

Each window regulator is operated by a twelve (12) volt reversible type motor with a built in circuit breaker and self locking gear drive. When the motor is actuated, the motor pinion gear, which is meshed with the rack portion of the regulator sector, rotates. This action provides the up and down movement of the regulator lift arm. A newly designed rear quarter window regulator on coupe styles, manually or electrically operated, moves the window both rearward and down. The principles of operation are similar to past models.

A wider wrap-around windshield glass provides an increase in visibility without obstruction from the windshield pillars. The windshield header is of a more sturdy construction to offer increased reinforcement around the larger windshield opening. On sedan styles, this header extends from the roof panel and serves as a sunshade.

The 1954 windshield washer, standard equipment on all series but the 86, is connected with the windshield wiper so that when the windshield washer is operating, the wiper motor automatically operates to clean the windshield. The complete cycle of operation is accomplished by momentarily depressing the windshield washer switch button on the dash. When the cycle of operation is completed, the washer and wiper motor will cease to operate. The duration of wiper motor operation may be regulated by adjusting the coordinator adjustment screw. A new feature of the windshield wiper transmission is an integral tensioner that quickly and automatically achieves the proper auxiliary-drive-to-transmission cable tension.

All outside air for ventilation and heating enters the car through the cowl-width grille below the windshield. With the air intake in this location, an adequate supply of fresh air is assured and the possibility of exhaust fumes entering the car is minimized. A newly designed duct system, comprised of a cowl side heater duct, door heater duct, and a connecting hose located between the door inner and outer panel, is used to direct the air from each side heater to the rear compartment.

Front door ventilator assemblies are rectangular in design and the division channel is an integral part of the ventilator assembly. This assembly is secured to the door with screws at the ventilator frame and an adjusting stud and nut at the lower end of the division channel. The assembly is also anchored to the ventilator regulator by two (2) screws at the top of the regulator and one (1) screw at the pivot shaft.

On convertible coupe styles, a door pillar and wing assembly takes the place of the door ventilator assembly used on other styles. This assembly is comprised of a door window upper frame, a glass run channel retainer, glass run channel, and a wing assembly (wind deflector).

The front door upper hinge and the rear door lower hinge have a spring loaded door check and a hold open and assist assembly. These are integral with the hinge assembly. This newly designed hinge permits either the front or rear door to be held open at any desired angle.

Front door weatherstrips are redesigned, having only one cementing surface. The front door weatherstrips are in two sections; the rear door weatherstrip is in one section on cars not equipped with electric powered window regulators. On cars with electrically operated window regulators, the rear door weatherstrip is in two sections. Each door has two (2) sealing strips, one over each drain hole, which allow water to drain out and prevent dust from entering the door inner construction.

A one-piece weatherstrip is used between the deck lid opening and the deck lid. This weatherstrip is primarily secured around the entire deck lid using the gutter as a mechanical retainer. A bead of weatherstrip cement is applied to the base of the gutter, before installing the weatherstrip, to effect a satisfactory seal.

All deck lid hinges employ adjustable torque rods as a counterbalance and hold-open for the lid. These torque rods may be adjusted to any one of three positions to obtain the desired effort in opening and closing the trunk lid. The trunk opening gutter is redesigned for the new uniform section deck lid weatherstrip.

The door outside handles are restyled with the push button located below the handle to offer greater protection from the weather. The handle is clip retained and, on the front doors, is a part of the push button assembly. Door lock strikers have a nylon roller on the door lock lift bolt.

The rear seat center arm rest is integral with the rear seat back assembly, being attached directly to the rear seat back frame.

The folding top of convertible styles is operated hydraulically by a new sealed Hydro-Lectric unit. It is not necessary, therefore, to replace hydraulic fluid periodically in this sealed-in unit. The motor and pump assembly is located behind the rear seat back under the fabric folding top compartment bag.

The back window reveal moldings on coupe styles are completely new in design and method of attachment. Retaining clips are employed for attaching the back window upper reveal molding, whereas the lower reveal molding incorporates attaching clips as a permanent part of the molding. These clips are embedded in the back window glass rubber channel.

SERVICE INFORMATION

(1) Instrument Panel Upper Section Removal and Installation

a. Removal

1. Remove side and lower windshield garnish molding screws and moldings.

CAUTION: Extreme care must be exercised when removing the side garnish moldings to be sure that the lower end of the molding does not scratch the cover material. Inserting a thin piece of metal between the garnish molding and the instrument panel cover when removing or installing the molding will eliminate the possibility of damaging the cover material.

2. Remove shoulder-head machine screws and spacers from forward edge of instrument panel cover. Fig. 3-1.

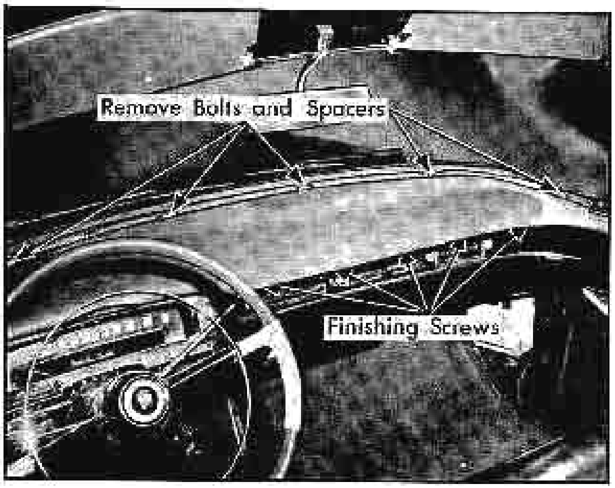

Fig. 3-1 Instrument Panel Upper Section Removal

3. Remove oval-head finishing screws from rearward edge of instrument panel cover, below overhang.

4. Remove screw from each end of instrument panel.

5. Carefully remove instrument panel cover. On cars with an Automatic Headlamp Beam Control, disconnect both phototube lead-in wires under the instrument panel before removing cover.

b. Installation

1. To install upper section of instrument panel, reverse removal procedure.

2. Be sure rubber grommets are properly positioned at the bolt holes below windshield.

3. Connect Automatic Headlamp Beam Phototube lead-in wires, on cars so equipped, and adjust the unit with Leveling Device, as explained in Section 16D, Note 2.

(2) Instrument Panel Upper Section Cover Removal and Installation

a. Removal

1. Remove upper section of instrument panel as described in Note 1, and place on a clean, protected bench.

2. Remove tacks securing cover across front edge of panel.

3. Detach cemented edge of cover from rear edge and both rear corners of panel; remove cover.

NOTE: Do not disturb wadding pad or rubber filler.

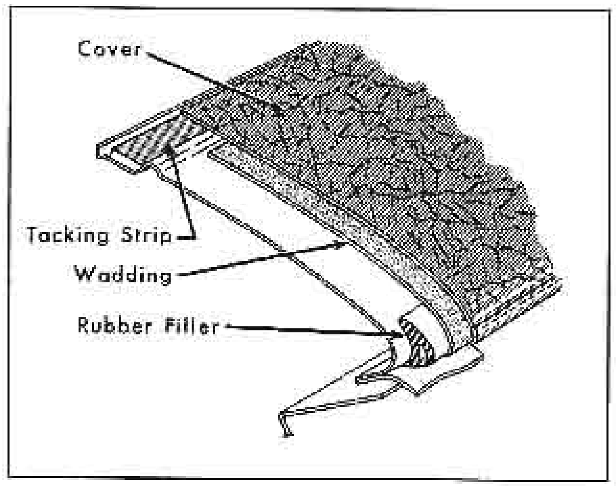

Fig. 3-2 Instrument Panel Upper Section Cover

b. Installation

1. Clean and thoroughly dry cementing surfaces on panel.

2. Be sure tacking strips are securely attached to panel. If tacking strips are loose, resecure using drive nails. If tacking strips are damaged, install new strips.

3. Wadding pad must be smooth and even. Add additional padding if necessary.

4. Position cover on panel and apply trim cement to rear edge and rear corners of panel, also to the corresponding surfaces of cover. Allow cement to become tacky.

5. Press cemented surfaces together firmly and evenly, making sure that cover seam is straight across the entire rear roll of panel. Allow to set approximately five minutes.

6. Stay-tack cover to tacking strips across front of panel, removing any draws or wrinkles during stay-tacking operation; then, permanently tack cover to tacking strips and trim edges where necessary, Fig. 3-2.

7. Reinstall upper section of instrument panel, Note 1.

(3) Glove Box Door Adjustment, Removal and Installation

a. Adjustment

1. The screw holes in the glove box door side of the hinge are elongated and oversized, permitting vertical and lateral adjustments when attaching screws are loosened.

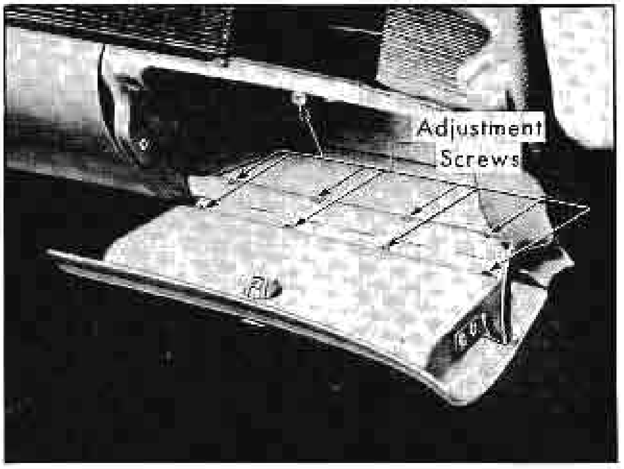

Fig. 3-3 Glove Box Door Adjustment

2. The screw holes in the instrument panel side of the hinge are elongated and oversized, permitting in and out adjustment at the bottom of the door plus lateral adjustment when attaching screws are loosened. Fig. 3-3.

3. For in or out adjustment at top of door, turn striker adjusting screw in or out.

b. Removal and Installation

1. Open glove box door and scribe position of the door hinge on the door.

2. Remove two screws which hold door stop to glove box, and slide door off stop.

3. Remove four (4) screws securing glove box door to hinge and remove door from instrument panel.

4. To install, reverse removal procedure, aligning door scribe marks with hinge before tightening attaching screws.

(4) Glove Box Removal and Installation

a. Removal

1. Remove glove box door. Note 3b.

2. Disconnect fresh air intake cable at right side air intake grille.

3. Remove fresh air intake grille screws and grille.

4. Disconnect lower defroster hose from defroster adapter and remove hose from bottom of glove box.

5. Remove glove box attaching screws and remove glove box.

b. Installation

1. Reverse above procedure.

2. Adjust glove box door as outlined in Note 3a.

(5) Windshield Wiper Cable Tension Adjustment

Tight cables cause slow operating wiper action. Loose cables cause blade slap or overtravel at end of stroke. If either of these conditions exist, readjust cable tension as follows:

1. Remove windshield wiper blade and arm assemblies.

2. Hold serrated transmission shaft, and loosen screw in end of shaft as shown in Fig. 3-4.

3. Tap screw lightly with butt of screwdriver. Spring loaded transmission pulleys will automatically adjust cables to proper tension.

4. Check position of cables on auxiliary drive pulleys, and adjust position if necessary.

5. Tighten screw in end of transmission shaft.

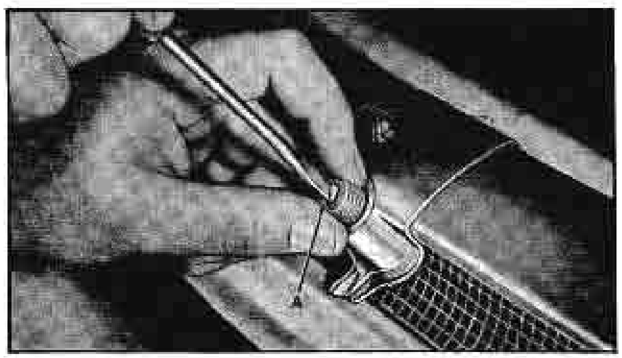

Fig. 3-4 Windshield Wiper Cable Tension Adjustment

(6) Windshield Wiper Transmission Removal

1. Remove wiper blade and arm assemblies and loosen screw in end of transmission shaft, as shown in Fig. 3-4.

2. Remove upper section of instrument panel as described in Note 1.

3. Carefully pull transmission cables to obtain slack; and, while holding cables, retighten screw, shown in Fig. 3-4, to lock cables in slack position.

4. Observe attachment of transmission cables at

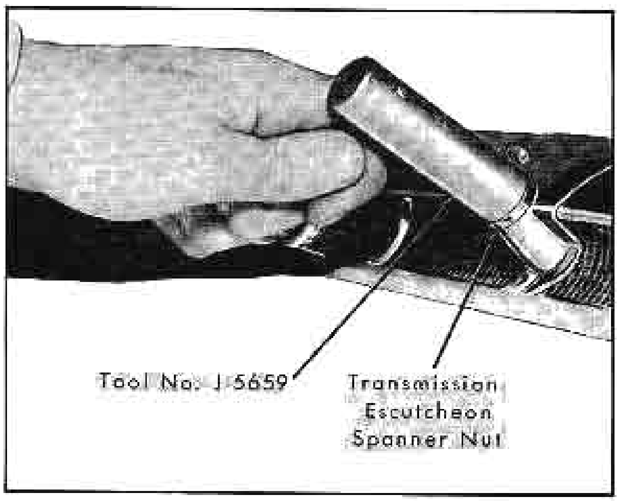

Fig. 3-5 Removing Transmission Escutcheon Spanner Nut

auxiliary drive pulleys to assure proper reassembly and disconnect cables from auxiliary drive pulleys.

5. Remove transmission escutcheon spanner nut, Fig. 3-5, transmission escutcheon and reveal molding clip.

6. Remove transmission support, retained by bolts "A", shown in Fig 3-6, Remove rubber gasket and gasket retainer plate nuts "B". Disconnect windshield washer hose, and carefully pull transmission down through duct panel and remove from body.

(7) Windshield Wiper Transmission Installation

1. Before installation, seal areas indicated at 1 and 2 with medium bodied sealer, Fig. 3-7.

Apply sealer to surface of cowl ventilator duct panel contacted by wiper transmission gasket.

Seal transmission gasket to transmission and

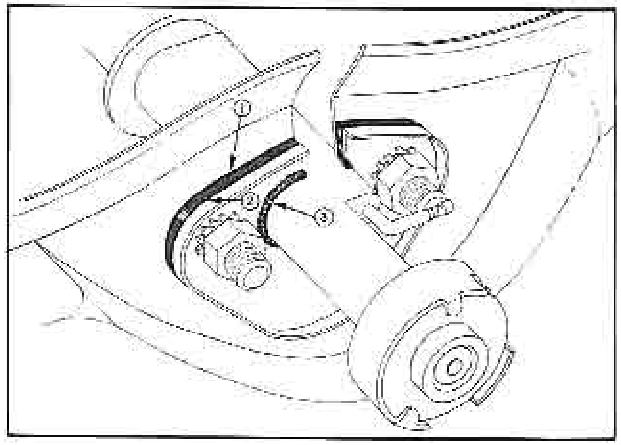

Fig. 3-7 Sealing Windshield Wiper Transmission Shaft

apply sealer to transmission housing.

After installation seal area indicated at 3, Fig. 3-7.

Apply a bead of sealer around the shaft housing at the hole in gasket.

2. Position transmission assembly up through opening in cowl top duct panel and install transmission escutcheon and spanner nut.

IMPORTANT: Tighten spanner nut securely before proceeding further.

3. Carefully position rubber gasket and retainer plate so that gasket fits uniformly around transmission housing. Tighten retainer nuts evenly to maintain position of retainer and gasket.

4. Apply a bead of sealer around the shaft housing

5. Install transmission support and adjust so support is snug against transmission housing; then tighten support bolts.

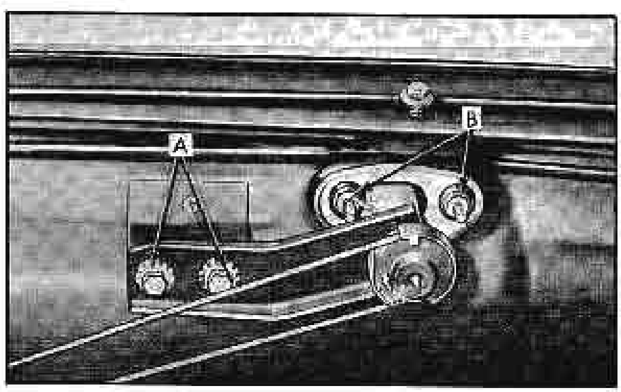

Fig. 3-6 Removal of Windshield Wiper Transmission Support

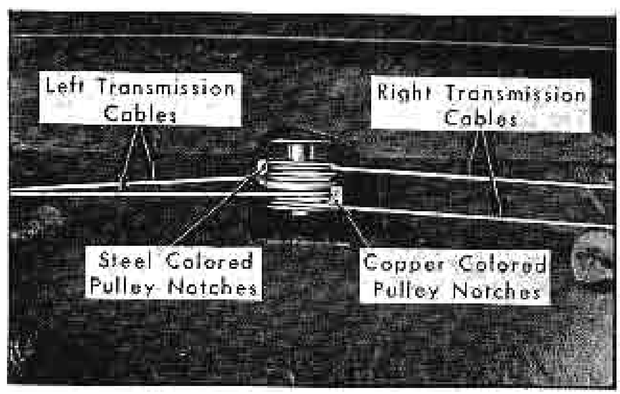

Fig. 3-8 Transmission Cable to Auxiliary Drive Pulley Attachment

6. Attach transmission cables to auxiliary drive pulley, as shown in Fig. 3-8.

IMPORTANT: Copper colored cable ends must be installed to copper colored pulley notches and steel colored cable ends to steel colored pulley notches as indicated in Fig. 3-8.

7. Adjust cable tension as described in Note 5.

8. Operate wiper motor and check operation of transmission.

9. Install upper section of instrument panel and windshield wiper blade and arm assemblies.

(8) Windshield Wiper Motor Removal and Installation

1. Disconnect vacuum hoses from wiper motor and coordinator.

2. Disconnect wiper motor control cable at wiper motor. Fig. 3-9.

3. Remove two wiper motor to support screws with washers and disengage motor from pulley drive mechanism.

4. To reinstall assembly, reverse above procedure.

(9) Windshield Washer Coordinator Adjustment, Removal and Installation

a. Adjustment

1. Turn adjustment screw, Fig. 3-9, clockwise to prolong wiper motor operation and counterclockwise to shorten wiper motor operation period after the washer button has been pressed.

b. Removal and Installation

1. Disconnect vacuum hose from coordinator.

2. Remove screws "A" and "B", Fig. 3-9, from wiper motor.

3. Slide coordinator out of slot in wiper motor housing.

4. To reinstall coordinator, reverse above procedure and check operation of wiper motor and coordinator.

(10) Removal of Windshield Glass

1. Place suitable covers over hood, front fenders, and front seat.

2. Remove windshield wiper blade and arm assemblies, escutcheon spanner nuts, escutcheons, and reveal molding spring clips.

3. Remove windshield garnish moldings and rear view mirror support.

4. Remove upper section of instrument panel as described in Note 1.

5. Remove three side reveal molding to vertical windshield pillar screws, Fig. 3-10.

6. On sedan styles, under the roof panel exten-

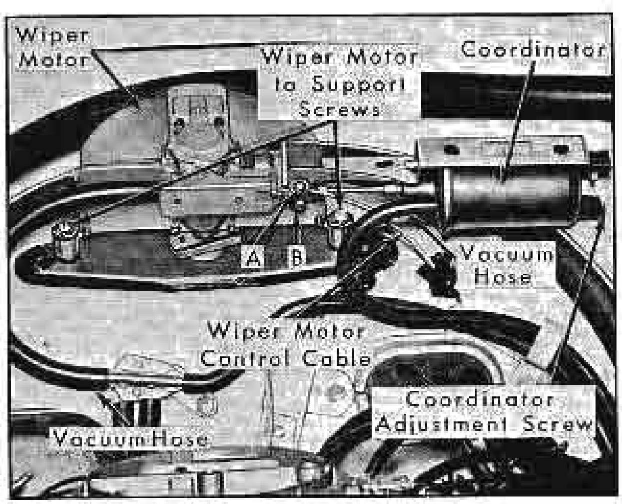

Fig. 3-9 Windshield Wiper Motor Assembly

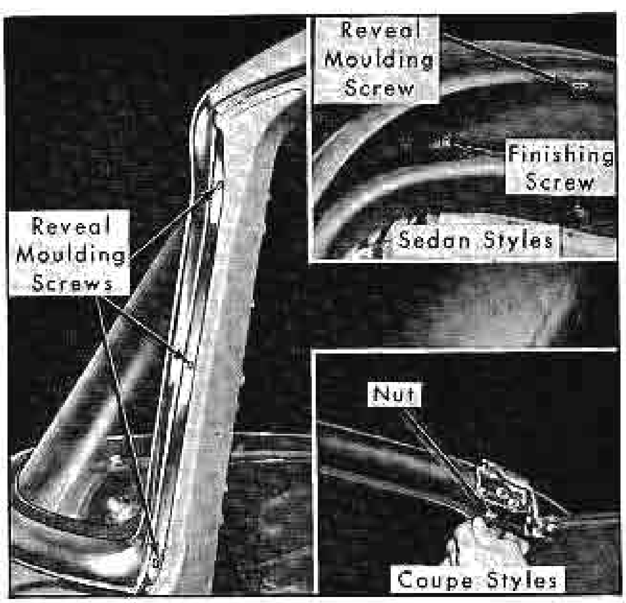

Fig. 3-10 Windshield Side Reveal Molding Removal

sion, remove side reveal molding screw at windshield pillar and upper corner finishing molding screw and remove side reveal molding. Fig.3-10.

7. On convertible and closed coupes, remove nut from under lip of rubber channel, Fig. 3-10, and remove windshield side reveal molding from body.

8. Remove wing nuts and washers and remove three windshield lower reveal moldings.

9. Using putty knife, or suitable tool, carefully loosen the seal between the rubber channel and the body pinchweld flange completely around inside of windshield.

10. With the aid of a helper, start at either inside lower corner, and with palm of hand carefully push windshield assembly forward along bottom and sides to free channel from body pinchweld flange along top of windshield opening and remove windshield assembly from body.

11. Place windshield assembly on a protected bench and remove channel from glass.

(11) Installation of Windshield Glass

1. Clean off old sealer from windshield body opening and rubber channel.

2. Inspect body pinchweld flange for any uneveness or high spots, and correct before installing glass.

3. Check windshield drain gutter and both right and left gutter drain hose openings, making sure they are free of any obstructions.

4. Install rubber channel on windshield glass.

NOTE: A mild soap solution applied to the reveal molding groove in the rubber channel will facilitate installation and allow molding to be centered after installation.

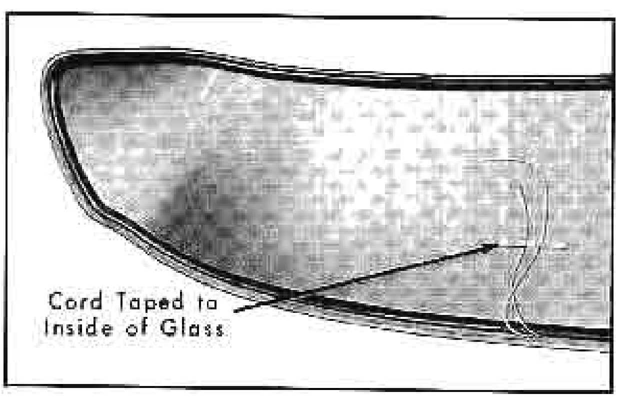

Fig. 3-11 Installing Cord on Rubber Channel

5. On special sport coupes and convertibles, install windshield upper reveal molding on rubber channel.

6. Insert a strong cord into pinchweld cavity of rubber channel, completely around windshield with loose ends taped to inside of glass at bottom center. Fig. 3-11.

7. Apply a ribbon of medium bodied sealer around base of rubber channel.

8. With the aid of a helper, place windshield assembly into windshield opening. While pressing firmly from outside, have helper on inside slowly pull cord from lower center to lower corners to seal lip of rubber channel over body pinchweld flange along bottom of windshield opening. Then pull cord up one side, across top and down other side to complete operation.

9. Inspect all areas of assembly for proper installation, and clean up excess sealer, and check to make certain sealer is not obstructing windshield drain gutter or gutter drain hose openings.

10. Reinstall windshield lower reveal molding assemblies, windshield side reveal moldings, upper section of instrument panel and all remaining hardware.

NOTE: When installing windshield wiper transmission escutcheons, care should be taken that the countersunk windshield washer hole seats properly over rubber nipple on transmission.

(12) Door Inside Handle Removal and Installation

1. Depress escutcheon and insert spring removing tool between nylon anti-friction washer and base of handle to grip handle retaining spring.

2. Carefully remove spring, handle, washer and escutcheon.

3. Install in reverse order of removal. Door and window handles on opposite doors should be at same angle. Ventilator regulator handle should point toward front of car on left door and toward rear of car on right door with ventilator closed.

(13) Window Control Switch Removal and Installation

1. Remove door inside handles and screws

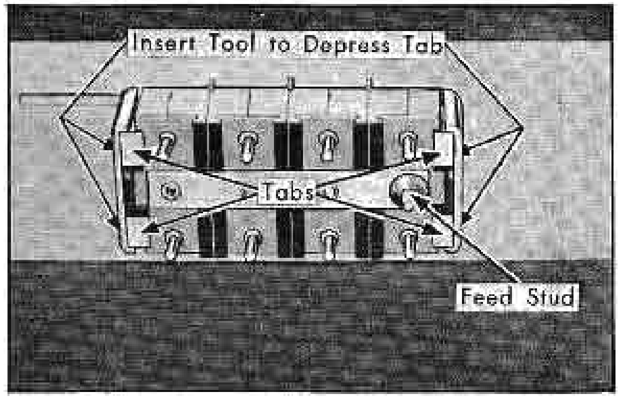

Fig. 3-12 Master Window Control Switch

securing belt finishing insert molding. Remove insert molding. On rear doors, remove door garnish molding. On rear quarters, remove rear quarter arm rest ash tray assembly.

2. Disconnect terminal block from master control switch assembly by carefully pulling block to disengage it from switch studs.

3. To remove switch from belt finishing insert molding or ash tray, depress tabs with pointed tool inserted through holes indicated in Fig. 3-12; pry tabs free and remove switch.

4. To install, reverse removal procedure.

NOTE: The "feed" stud of the master control switch assembly should point toward the front of the car when installed in insert molding. Check operation of switch before completing reinstallation of parts.

(14) Front Door Heater Duct and Connecting Hose Removal and Installation

1. Operate door window-glass to up position and remove door trim pad.

2. Remove attaching screws indicated in Fig. 3-13, and remove heater duct and attached grille.

3. Remove larger loading hole cover and screws securing smaller loading hole cover.

4. Working through larger loading hole, disconnect hose from smaller loading hole cover and remove cover from door. Fig. 3-14 shows the connecting hose and inlet and outlet assembly removed from the door.

5. If necessary, remove the outlet assembly to door inner panel attaching screws, and remove outlet with connecting hose from between the door panels through the larger loading hole.

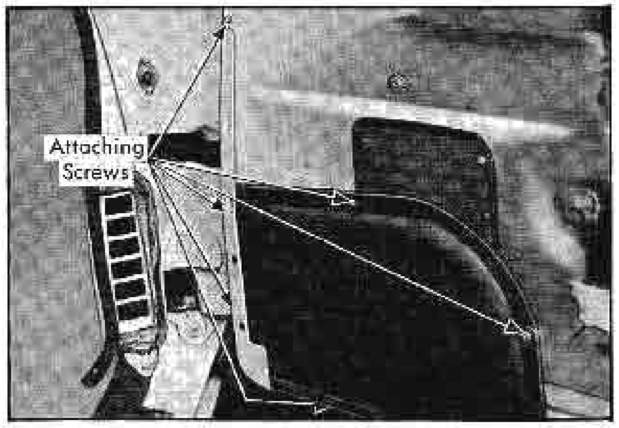

Fig. 3-13 Removal of Front Door Heater Duct

6. To install, reverse removal procedure. Seal outlet assembly and smaller loading hole cover as follows:

Apply a ribbon of medium-bodied sealer along contacting surface of door inner panel completely around access hole.

Prior to assembly of the door heater duct, apply a ribbon of medium bodied sealer completely around surface of outlet duct gasket contacting door inner panel, to effect a seal between gasket and door inner panel.

Seal larger loading hole cover as specified in Note 15.

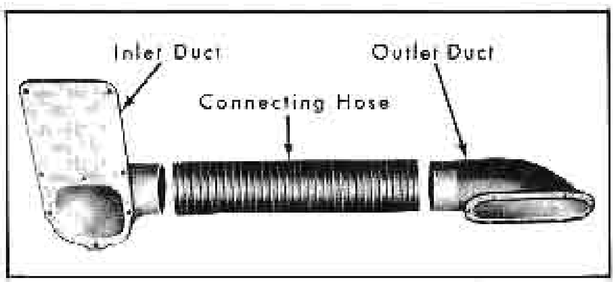

Fig. 3-14 Door Heater Duct Assembly

(15) Door Inner Panel Sealing

NOTE: The following procedure applies in particular to coupe style front doors. It is applicable in general to all doors for all series cars.

When following the procedure, refer to Fig. 3-15, in which the areas to be sealed are numbered to conform to the numbered steps in the procedure.

1. Apply ribbon of medium-bodied sealer across top and down side flanges of loading hole opening, so as to provide a seal between cover plate and door inner panel.

BODY

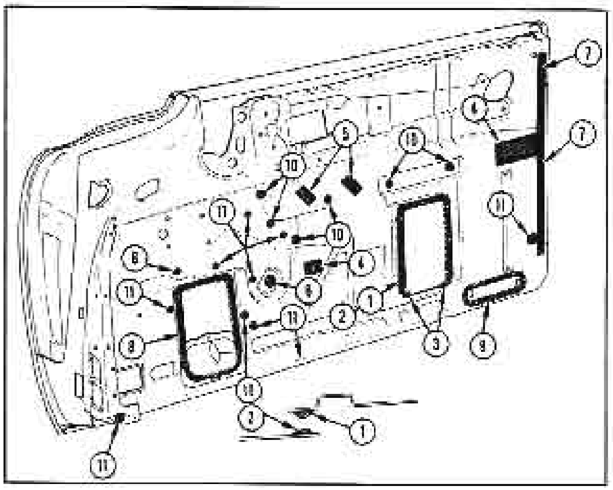

Fig. 3-15 Door Inner Panel Sealing

2. Apply ribbon of medium-bodied sealer to lower side flanges of loading hole cover before it is installed. This seal should extend upward approximately three (3) inches.

3. After loading hole cover is installed, seal lower corners of plate at offset with medium-bodied sealer. Fig. 3-15.

4. Apply water-proof tape over welding access holes.

5. Apply water-proof tape over cam access holes.

6. Seal ventilator division channel lower attaching hole with body caulking compound.

7. Apply water-proof tape over trim pad nail attaching slots in inner panel on the lock pillar side of the door.

8. Apply a ribbon of medium-bodied sealer along the contacting surface of door inner panel completely around access hole.

9. Prior to assembly of door heater outlet duct, apply a ribbon of medium-bodied sealer completely around surface of outlet duct gasket contacting door inner panel.

10. On sedans, proceed as follows:

Apply body caulking compound to seal heater duct attaching holes.

Apply caulking compound to wiring clip, stationary cam and regulator rear attaching holes.

Apply tape over arm rest attaching holes.

Apply tape over trim pad nail slots at door lock pillar.

11. On coupes, proceed as follows:

Apply caulking compound to window regulator, heater duct, wiring clip and stationary cam attaching screws.

Apply water-proof tape over arm rest attaching holes, lower gage hole at lock pillar and trim pad nail slots.

(16) Removal and Installation of Front Door Assembly

a. Removal

1. The door and hinges may be removed as an assembly from the front body hinge pillar, or the door may be removed from the hinge straps.

2. Place suitable protective covering over front fender at door opening to protect finish.

3. Remove door trim pad and door heater duct.

NOTE: The above step does not have to be performed if door and hinges are being removed and body is not equipped with powered regulators.

4. Scribe hinge box locations on front body hinge pillar or hinge strap locations on door, depending on what method of removal is being used.

5. If door and hinge are being removed, remove hinge cover attaching screw and door attaching bolt, Fig. 3-16, from upper hinge and remove cover.

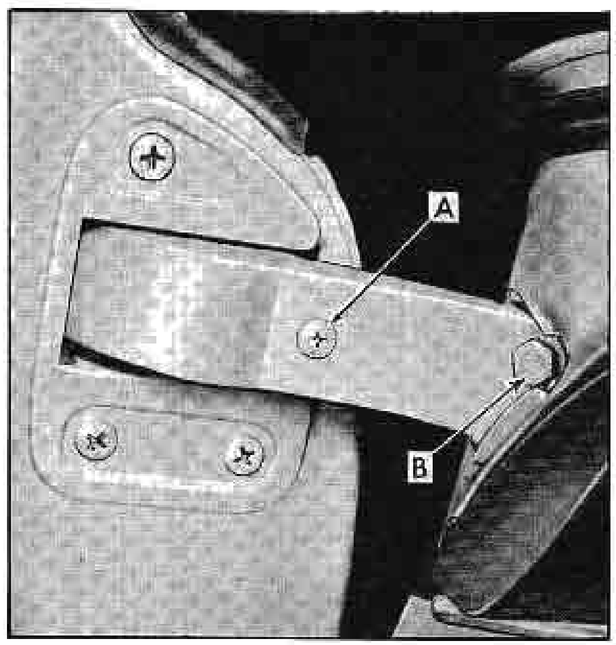

Fig. 3-16 Removing Door Hinge Cover

BODY

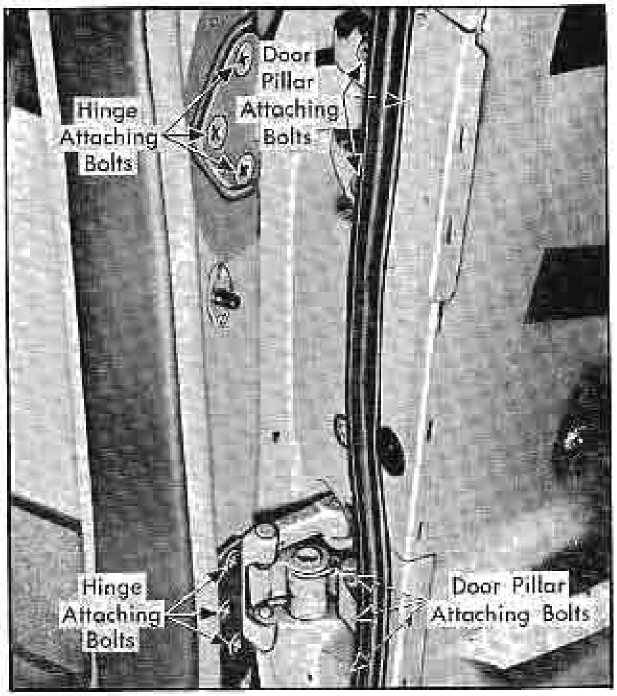

Fig. 3-17 Front Door Hinge Removal

6. On bodies equipped with powered regulators, proceed as follows:

a. On four (4) door styles, remove smaller loading hole cover. On two (2) door styles, remove both loading hole covers.

b. Remove two (2) screws securing electrical conduit and slide conduit toward front body hinge pillar to expose wiring harness.

c. Loosen clips securing wiring harness to door inner panel and disconnect motor lead wires from the wiring harness. Then, carefully pull wiring harness from between door panels through cutout in door hinge pillar.

7. With door properly supported, remove door attaching bolts securing upper and lower hinge to front body hinge pillar or bolts securing door to hinge straps, Fig. 3-17, depending on what method of removal is being used.

8. With aid of helper, remove door assembly from body opening.

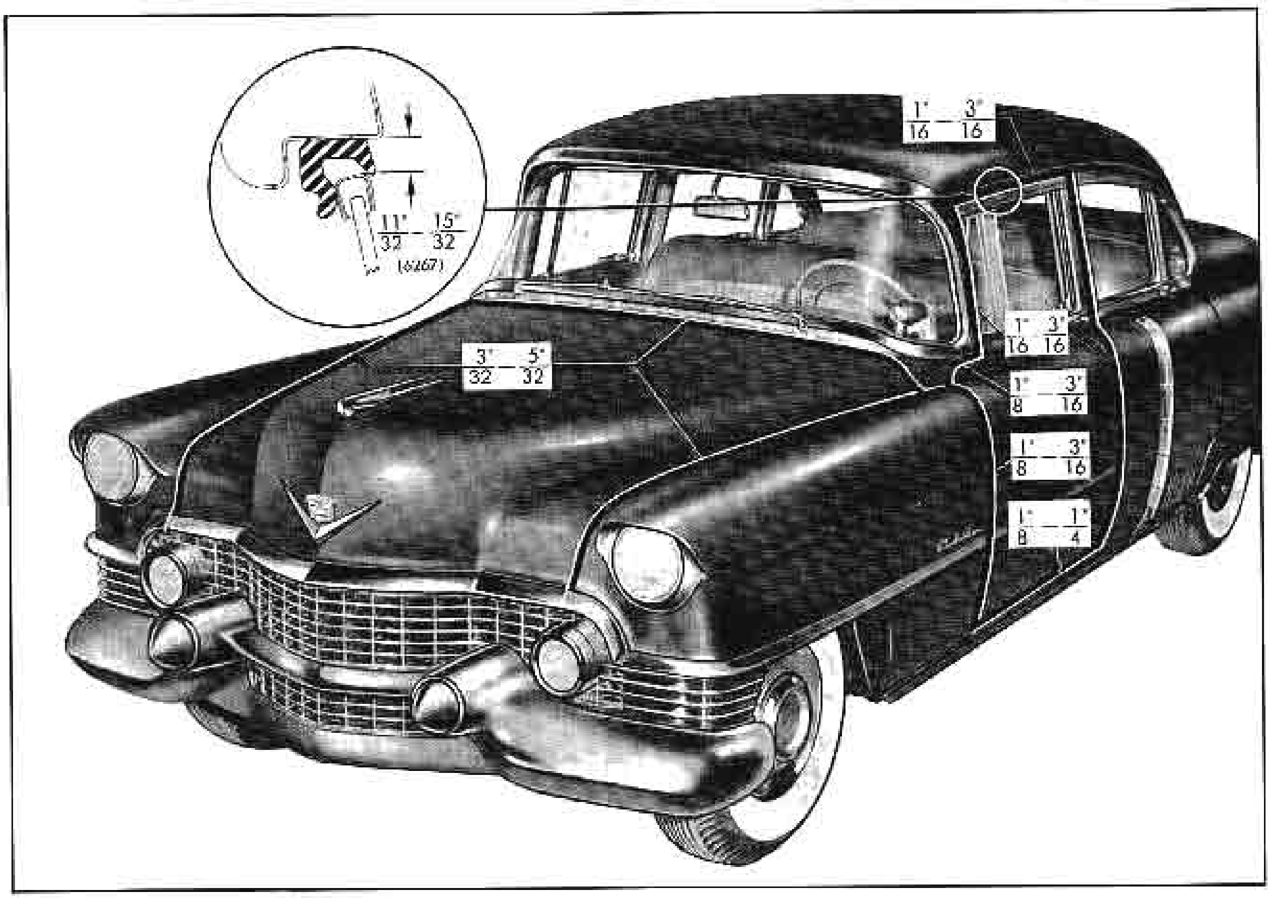

Fig. 3-18 Body Sheet Metal Clearances-Front

b. Installation

1. As an anti-squeak precaution, before installation of door, coat all attaching surfaces of hinges with medium-bodied sealer.

2. If door assembly has been removed from front body hinge pillar, reinstall door assembly with aid of helper and align hinge boxes within scribe marks on front body hinge pillar. Install and tighten hinge bolts; check door for proper alignment. See Fig. 3-18.

3. If door has been removed from hinge straps, reinstall door with aid of helper and align hinge straps within scribe marks made on the door. Install and tighten hinge bolts; check door for proper alignment.

4. On bodies equipped with powered regulators, proceed as follows:

a. Reinstall wiring.

IMPORTANT: Check wiring for proper installation before proceeding further.

b. Reinstall conduit and loading hole cover plate. Seal door inner panel as specified in Note 15.

c. Reinstall door heater duct, door trim pad and remaining door hardware.

(17) Rear Door Assembly Removal and Installation

a. Removal

1. The door and hinges may be removed as an assembly from the center hinge pillar, or the door may be removed from the hinge straps.

2. If door is being removed from hinge straps, loosen weatherstrip along door hinge pillar. On bodies not equipped with electric powered regulators, loosen door trim pad at upper hinge area sufficiently to allow removal of hinge cover plate.

3. Remove hinge cover plates from door or center hinge pillar, depending on method of removal being used.

NOTE: On bodies equipped with electric powered regulators, the upper hinge cover plate on door hinge pillar can be removed readily after trim pad is removed.

4. Clean off excess sealer from around edges of hinge strap; then scribe location of hinge strap on hinge pillar.

5. On bodies equipped with electric powered regulators, proceed as follows:

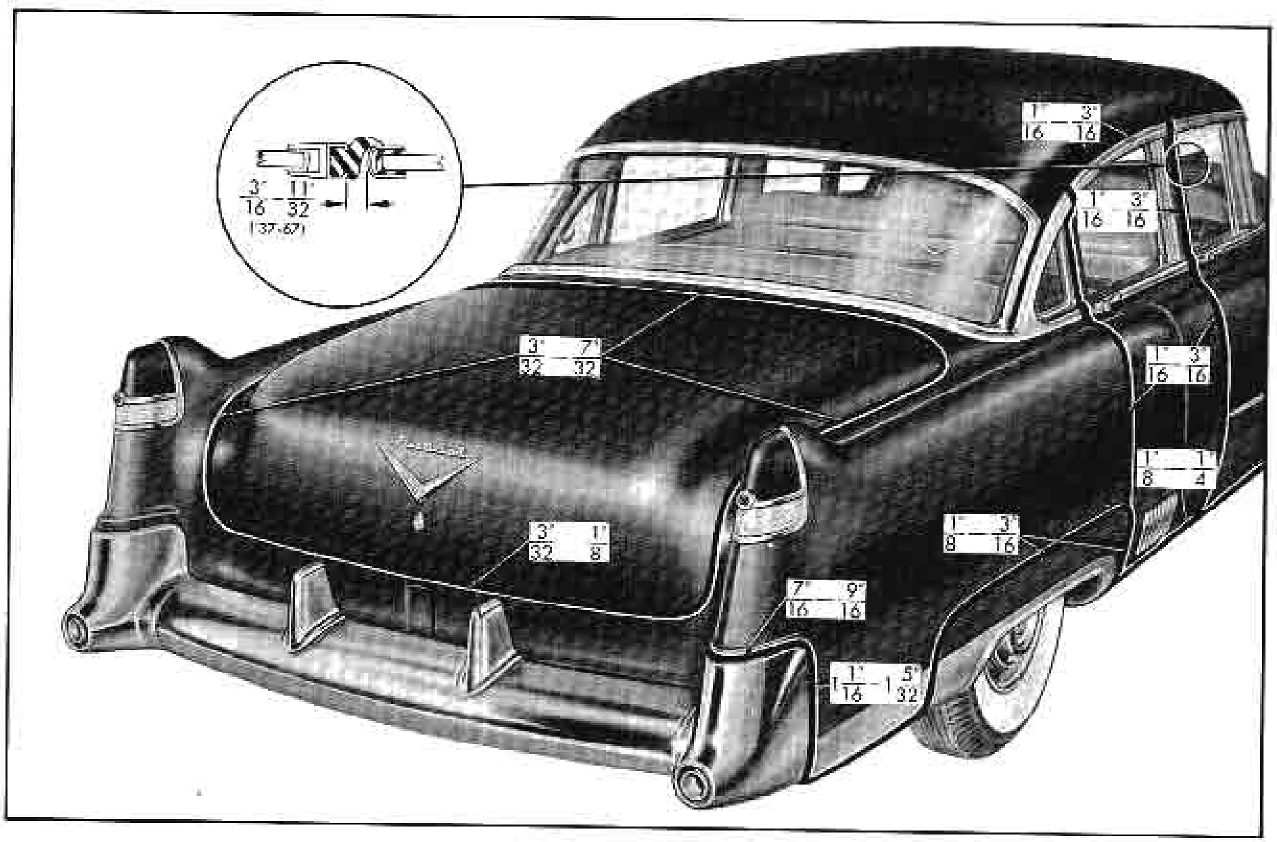

Fig. 3-19 Body Sheet Metal Clearances-Rear

Remove two (2) screws securing electrical conduit to center body pillar; then slide conduit toward door hinge pillar so that wiring harness is exposed.

Remove door trim pad and loading hole cover.

Remove upper hinge cover plate at door hinge pillar side, if door is being removed from hinge straps.

Loosen clips securing wiring harness to door inner panel and disconnect motor leads from harness.

Remove wiring from between door panels by carefully pulling harness through cutout in rear door hinge pillar.

6. With door properly supported, remove hinge attaching bolts at center hinge pillar or bolts at door hinge pillar, depending on method of removal being used.

7. With helper, remove door from body opening.

b. Installation

1. With scraper and mineral spirits, clean off old sealing compound at hinge areas. This operation should be performed carefully to avoid possibility of soiling adjacent trim material.

2. Apply coat of medium-bodied sealer to attaching surfaces of hinge straps or corresponding surfaces of door hinge pillar or center hinge pillar.

3. With helper, lift door into position. Install bolts loosely; then align hinge straps within scribe marks on pillar and tighten bolts. Check door for alignment, Fig. 3-19.

4. Before hinge cover plates are installed, door hinges must be weathersealed with medium-bodied sealer or caulking compound as outlined below.

At top and bottom of hinge, use sufficient sealer to obtain flush condition with top of hinge and surface of pillar, completely filling opening in the area.

To underside of hinge cover plates (body side), across both top and bottom and extending along outer edge.

To underside of door hinge cover plates.

5. Install hinge cover plates and clean off excess sealer.

6. On bodies equipped with electric powered regulators, proceed as follows:

Reinstall wiring harness and connect to motor. Check harness for proper installation before proceeding further.

Reinstall conduit and loading hole cover. Seal inner panel as specified in door inner panel sealing, Note 15.

7. Reinstall door trim pad and remaining door hardware.

8. Recement door weatherstrips if previously loosened.

(18) Front Door Alignment

a. Adjustment at Hinge Pillar

1. The front door may be adjusted vertically, and in and out at the front body hinge pillar.

2. Remove the door lock striker from the body pillar to allow the door to hang freely on its hinges. See Note 20.

3. Check the spacing at the sides, bottom and top of door. See Fig. 3-18 for tolerances.

4. Scribe location of hinge boxes on the pillar.

5. Remove upper hinge cover.

6. Loosen screws indicated in Fig. 3-20.

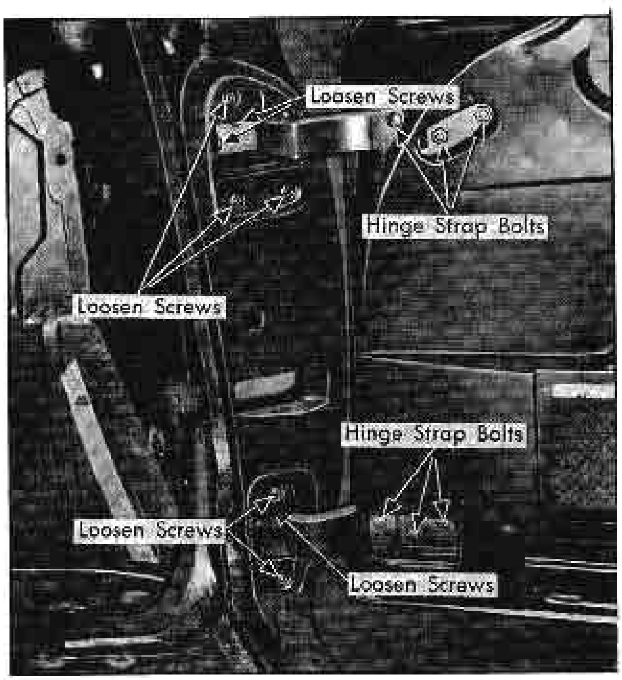

Fig. 3-20 Front Door Hinge Attaching Bolts

7. Shift door as required and tighten bolts. Recheck tolerances shown in Fig. 3-18.

8. Install upper hinge cover.

9. Install door lock striker. Note 20.

b. Adjustment at Hinge Strap

1. The front door may be adjusted vertically, and fore and aft, at the door attaching side of the hinge strap.

2. Follow Steps 2 and 3 above.

3. Remove door trim pad and front door heater duct.

4. Scribe location of hinge straps on door.

5. Loosen hinge strap bolts indicated in Fig. 3-20, and shift door as required.

6. Tighten bolts and install door heater duct and trim pad.

NOTE: The frictional areas of the door hinge hold-open clips, which are contacted by the hinge straps, must be lubricated periodically for ease of operation and prevention of frictional noises.

7. Install door lock striker as described in Note 20.

(19) Rear Door Alignment

a. Adjustment at Door Pillar

1. The door may be adjusted vertically at the rear door pillar.

2. Follow Steps 2 and 3 of Note 18 above.

3. Remove hinge cover plates from door hinge pillars and scribe location of door hinge pillar on door.

4. Loosen door hinge pillar to door attaching bolts, Fig. 3-21, and shift door vertically as required.

5. Tighten attaching bolts and check tolerances shown in Fig. 3-19.

6. Install hinge covers and door lock striker.

b. Adjustment at Center Pillar

1. In and out, and fore and aft adjustment may be made at the center pillar.

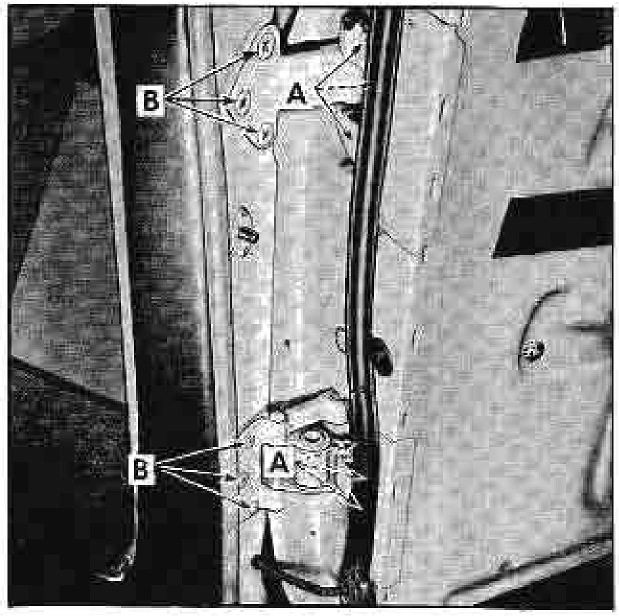

Fig. 3-21 Rear Door Hinge Attaching Bolts

2. Follow Steps 2 and 3 of Note 18 above.

3. Remove hinge cover plates and scribe location of hinge straps on center pillar.

4. For rearward adjustment, place box under door to support it while performing next step.

5. Remove either upper or lower hinge to center pillar bolts, Fig. 3-21. It is easier to adjust one hinge at a time.

6. Cement a full waterproof shim to hinge straps and install bolts.

7. For forward adjustment, loosen hinge strap to center pillar bolts and install a partial water proof shim at inner edge of hinge strap and tighten bolts.

8. Install hinge cover plate, door lock striker, and recheck tolerances.

(20) Door Lock Striker Adjustment, Removal and Installation

a. Adjustment

1. The oversized attaching holes and the movable anchor plate allow the striker to be adjusted vertically, and in or out, to improve door closing or door alignment.

2. Scribe location of striker on pillar.

3. For vertical and in or out adjustment, loosen

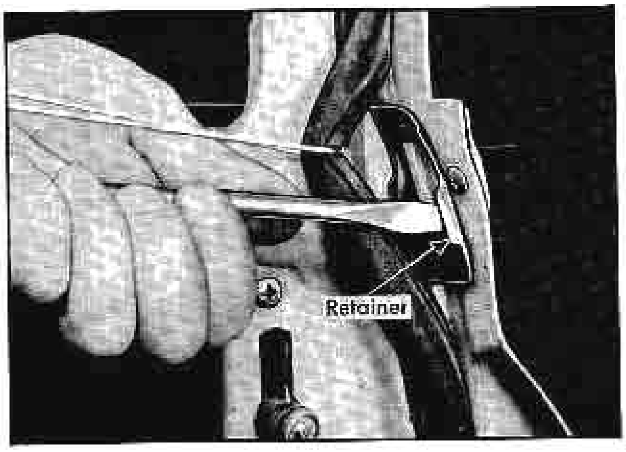

Fig. 3-22 Removing Door Lock Handle Retainer

striker attaching screws and locate striker to desired position, tighten screws.

4. For forward adjustment of striker, to obtain the required 1/4" to 3/8" striker lock bolt overlap, remove striker and install a spacer between striker and pillar.

b. Removal and Installation

1. Scribe location of striker on center or rear body pillar.

2. Remove two striker attaching screws, and remove striker from pillar.

3. To install, align striker with scribe marks on pillar and tighten attaching screws.

(21) Door Outside Handle Assembly Removal

1. Loosen weatherstrip at lock pillar to expose door lock handle retainer access hole cover.

2. Remove access hole cover.

3. With a suitable tool, pull retainer out until handle and gasket can be removed, Fig. 3-22. After the handle is removed, the retainer can also be removed by pulling it from slot in pillar facing.

NOTE: Rear door outside handle push button shaft is designed with an offset. The position of this shaft should be noted for installation purposes.

(22) Door Lock Cylinder Removal and Installation

1. Remove door outside handle assembly from door as described in Note 21.

2. With suitable tool, remove retaining snap ring in Fig. 3-23, and carefully remove stop washer,

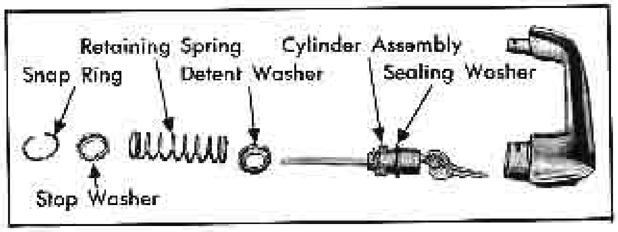

Fig. 3-23 Door Handle Assembly

retaining spring and detent washer from push button shaft.

NOTE: During this removal operation, note relative position of stop washer, detent washer, and retaining spring to insure proper reinstallation.

3. Remove cylinder assembly with sealing washer from door handle, Fig. 3-23.

4. To install, reverse removal procedure.

(23) Door Lock Cylinder Disassembly and Assembly

a. Disassembly

1. Remove door lock handle, Note 21, and remove door lock cylinder from door lock handle, Note 22.

2. Cut retaining washer, Fig. 3-24, with snips and remove push button shaft.

3. Bend cap retainer open, and remove cap from cylinder sleeve.

4. Remove cylinder from sleeve.

b. Assembly

1. Install cylinder into sleeve; assemble cap and bend tabs to secure cap and cylinder to sleeve.

2. Obtain new retaining washer and spring ring Fig. 3-24.

3. Assemble shaft to cylinder, and install retaining washer and spring ring.

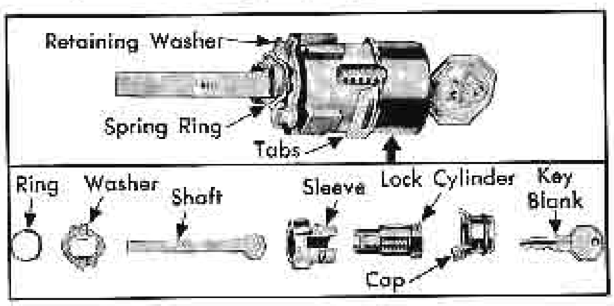

Fig. 3-24 Door Lock Cylinder Assembly

NOTE: Washer, shaft, and spring ring are available as service parts.

4. Install cylinder into door handle. See Note 22.

(24) Keys and Locks

Door and ignition locks on all 1954 Cadillac cars are equipped with a matched set of tumblers and the hexagon headed key used for the ignition will also unlock the doors. The deck lid and glove compartment locks are also equipped with a matched set of tumbler locks and, therefore, both can be unlocked with the oval headed key. Key numbers are stamped on metal slugs in the key head and should be knocked out after they have been recorded by the owner. Door and ignition lock key numbers are also stamped on the shank of the door locking handles, which must be removed to locate the numbers.

Glove compartment and trunk lock key numbers are stamped on the trunk lock cylinder. From these key numbers, the lock tumbler code can be determined by the use of a key decoder or Briggs and Stratton Code List.

Four types of tumblers are used to make all the various lock tumbler combinations and each is coded according to its color as follows:

C--Copper	B--Black
N--Nickel	Y--Yellow

Tumblers are all shaped exactly alike, with the exception of the position of a notch on one side. As the key is inserted in the lock cylinder, each tumbler is raised to the correct height, so that the notches on each cylinder are on the same level. When the notches on all six tumblers line up, the locking bar is pushed into the notches by two small springs, allowing the cylinder to turn in its bore.

a. Cutting Keys

After the special code has been determined, either from the code list or the key Decoder, Fig. 3-25, place a blank key in key cutting machine, adjust machine to cut key to proper height for each of the six positions, and check the key if a Key Decoder is available. The new key should lift the tumblers in the decoder to agree with the original code shown in the Briggs and Stratton list.

b. Assembling Cylinder Locks

New lock cylinders for duplicating any 1954 Cadillac locks are available from the Factory Parts Department with the lock cylinder and

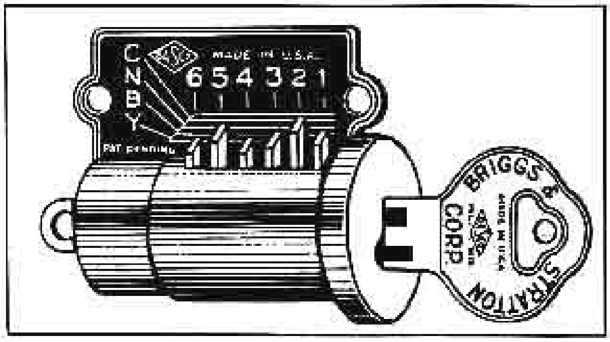

Fig. 3-25 Key Decoder

locking bar staked in place, less tumblers. Tumblers are also available and must be assembled into the cylinder according to the special code.

When it is necessary to assemble a new lock cylinder to agree with a key code number, install the proper tumblers into their respective slots, as indicated by Key Decoder or Briggs and Stratton Code list, starting at the key end of the cylinder and proceeding to the inner end, with notches to the right as viewed from the key end of the cylinder.

After the tumblers have been installed, insert a small coil spring over the tip at the upper end of each tumbler, place the coil spring retainer in position, and press retainer tabs into the cylinder barrel. Stake retainer securely in place by staking the cylinder metal over both edges of the retainer ends from the outside.

(25) Door Outside Handle Push Button Shaft Replacement

In the service replacement of a door lock or a door outside handle, a condition may be encountered where the push button shaft is not long enough to trip the door lock bolt adequately when the push button is depressed. To correct such a condition, a new push button shaft, retaining washer and spring ring should be installed on the lock cylinder as explained in Note 23. The door handle with the new shaft may then be installed in the door as follows:

1. After the new shaft and the cylinder assembly have been installed in the door handle, see Note 22, insert the door handle into its opening in the door. Carefully guide the shaft into the lock.

2. As a check to make sure the shaft is engaged in the lock properly, raise the lift bolt by hand.

3. Holding the handle firmly, depress the push button. If the bolt snaps down, the push button shaft is in the correct position.

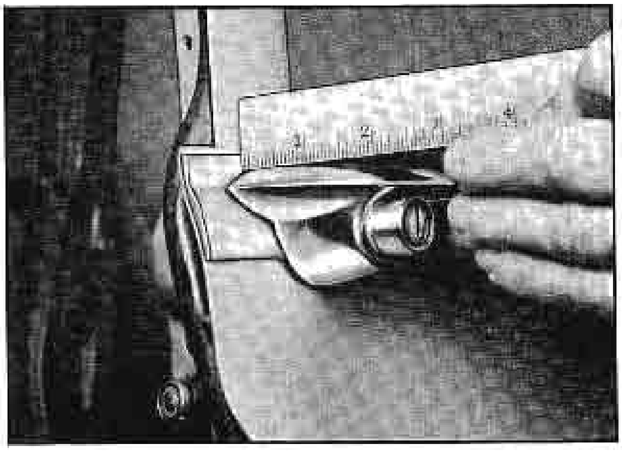

Fig. 3-26 Measuring Push Button Shaft Length

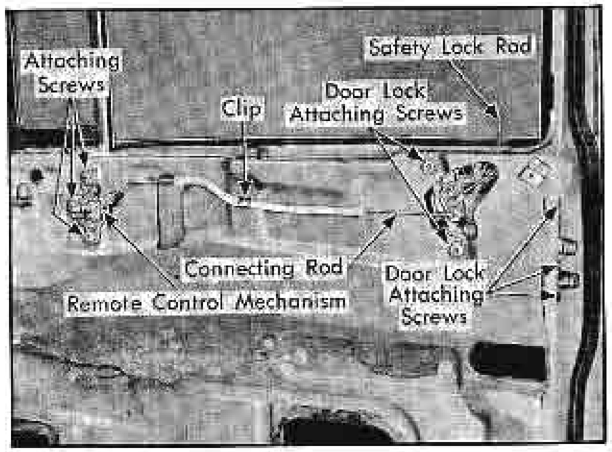

Fig. 3-27 Door Lock and Remote Control Assembly

4. Still holding the handle in place so the shaft is just making contact in the lock, measure the distance between the door outer panel and lock handle as shown in Fig. 3-26. When making this measurement, be sure the handle is held in the same relative position--at the same angle--as when it is installed on the door.

5. Remove handle from door and cut off end of shaft the distance measured in Step 4, plus one-thirty-second (1/32) of an inch. The additional 1/32" is to permit free travel of the push button before contacting the lock mechanism. After cutting shaft, file off any burrs on the end of the shaft.

6. Install the handle on the door, see Note 26, and thoroughly check the operation of the lock cylinder assembly with the door lock in locked and unlocked positions.

(26) Door Outside Handle Assembly Installation

1. Cock lock bolt by pushing to "up" position.

2. Depress push button on door handle, and install handle with gasket to door. When the shaft of door lock cylinder is properly engaged in door lock, lock bolt will snap down.

3. Push retainer to full "in" position.

4. After installation, check push button action.

5. Apply medium bodied sealer to retainer access hole, and install access hole cover.

6. Install weatherstrip in original position, using weatherstrip cement.

NOTE: When a new push button shaft has been installed on the door handle lock cylinder, the shaft must be cut to proper length as described in Note 25.

(27) Door Lock Remote Control Assembly Adjustment, Removal and Installation

a. Adjustment

1. Remove door window garnish molding.

2. Loosen three remote control assembly attaching screws, Fig. 3-27.

NOTE: The remote control mechanism can be adjusted fore or aft to obtain proper door lock operation by the remote control handle. A forward adjustment will decrease the travel required of the remote control handle to release the lock bolt, while a rearward adjustment will increase the travel required.

3. Adjust control fore or aft, as required, and tighten attaching screws.

b. Removal and Installation

1. Remove door window garnish molding.

2. On front doors, disengage remote control connecting rod clip from door inner panel.

3. Remove three remote control assembly attaching screws, Fig. 3-27, and disengage remote control from connecting rod and connecting rod from door lock.

4. On rear doors, to remove the inside locking control connecting rod, remove the lever attaching screw, and disengage anti-rattle clip from door inner panel.

5. Swing lever with attached rod away from door to disengage lever from door lock.

6. To install reverse removal procedure.

(28) Door Lock Removal and Installation

1. Operate door glass to up position and remove door trim pad and loading hole cover.

NOTE: Larger loading hole cover should be removed on front doors.

2. Remove door outside handle. See Note 21.

3. Remove door lock remote control assembly. See Note 27.

4. Remove nut securing lower end of glass run channel at door lock pillar.

5. Remove five door lock attaching screws, Fig. 3-27, lower lock to clear glass run channel and remove lock through loading hole.

NOTE: On front doors, the inside locking rod can be detached from the lock after the lock is removed from the door.

6. To install, reverse removal procedure. Check operation of door lock using door outside handle and inside remote control handle. Seal door inner panel. See Note 15.

NOTE: Do not attempt to close door with lock lift bolt in "up" position.

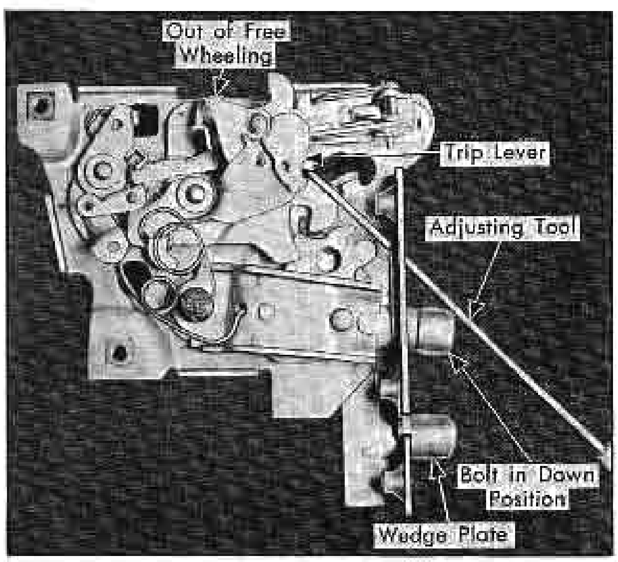

Fig. 3-28 Adjusting Rear Door Lock to Free Wheeling

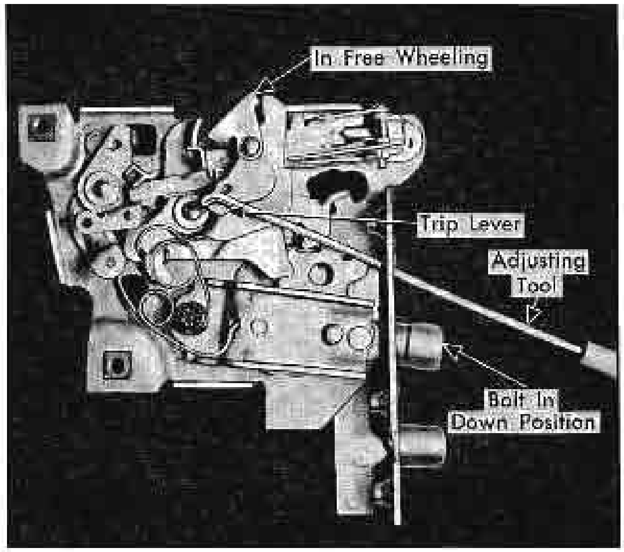

Fig. 3-29 Adjusting Rear Door Lock Out of Free Wheeling

(29) Adjustment of Rear Door Lock Free Wheeling Mechanism

1. Pull rear door inside safety locking rod knob to the "up" position.

2. Insert adjusting tool through the lock bolt slot, with the bolt at the bottom of the slot, and engage trip lever.

NOTE: The tool required to perform the adjustment can be made from a piece of wire seven inches in length, approximately 1/8" in diameter, with a right angle hook 3/8" long at one end.

3. To adjust lock "in" free-wheeling, engage trip lever and push lever forward. Fig. 3-28.

4. To adjust lock from free-wheeling to normal, pull lever rearward. Fig. 3-29.

(30) Front Door Ventilator Assembly Adjustments

a. Wing Assembly Adjustment (6267)

1. To adjust the effort required to rotate the wing assembly, loosen or tighten screw "C", Fig. 3-30, until desired tension is obtained.

2. To adjust the assembly in or out, remove the garnish molding, door trim pad, and loosen two bolts and adjusting stud nuts. Fig. 3-31. Turn studs in or out with a screwdriver to obtain desired alignment.

3. With the attaching bolts loose, the complete assembly may be tilted fore or aft.

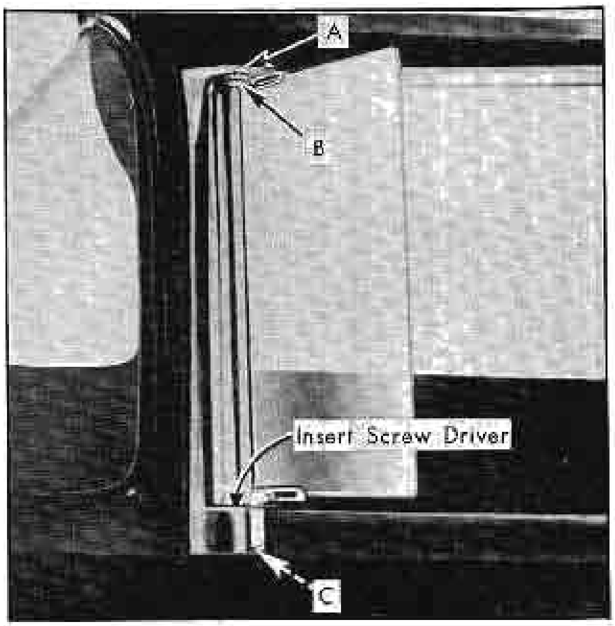

Fig. 3-30 Wing Assembly Adjustment

4. When adjustments are completed, tighten attaching bolts and adjusting screw lock nuts.

5. Seal door inner panel and reinstall trim pad and garnish molding.

b. Ventilator Regulator Adjustment (60S, 6219, 6237)

1. Excessive play (flutter) of the ventilator at the pivot shaft when the ventilator is open, may be eliminated by tightening the screw which mounts the ventilator "Tee" shaft to the regulator. Fig. 3-32. Tighten carefully to avoid stripping threads in spiral gear shaft.

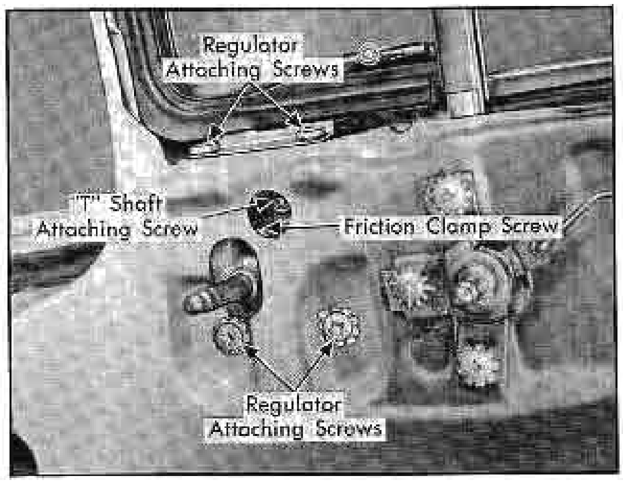

Fig. 3-32 Ventilator Regulator Attaching Screws

2. The operating effort required to open or close the ventilator can be slightly increased or decreased by adjusting the friction clamp screw. Fig. 3-32.

c. Ventilator Adjustment (60S, 6219)

The lower end of the ventilator division channel may be adjusted for alignment with the door glass, by loosening adjusting stud nut shown in Fig. 3-33, and turning the screw in or out and positioning channel fore or aft, as required. Tighten stud lock nut.

d. Ventilator Assembly Adjustment (6237)

1. The complete assembly can be adjusted in or out, or tilted fore or aft for alignment with windshield frame or door window glass. To adjust assembly, remove door trim pad.

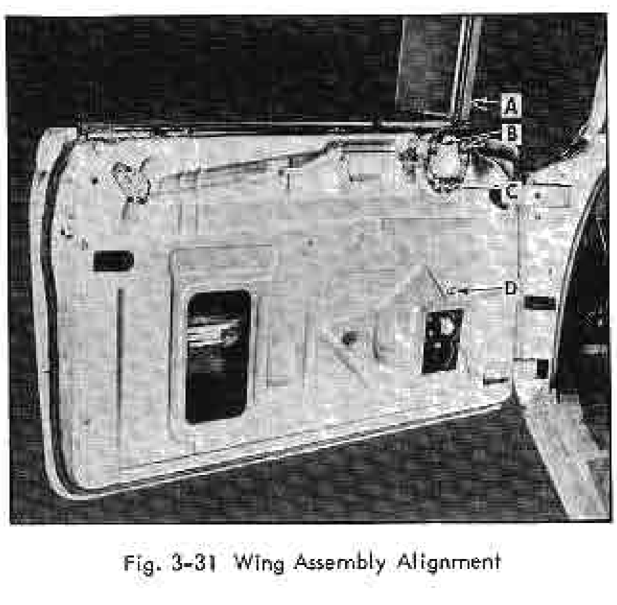

Fig. 3-31 Wing Assembly Alignment

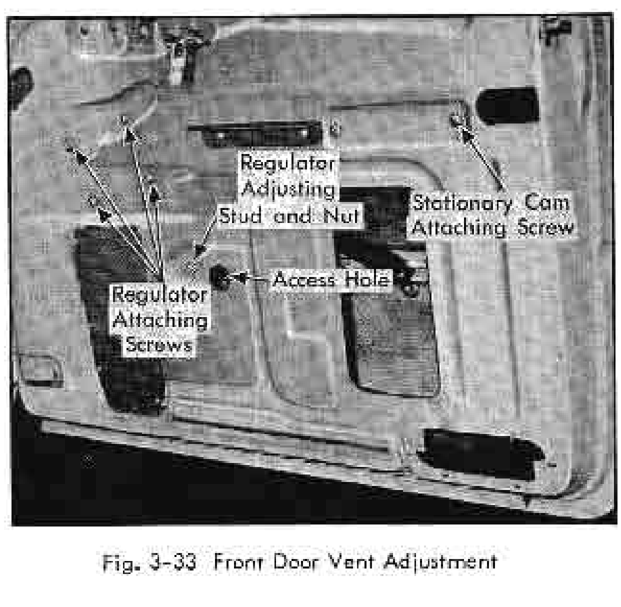

Fig. 3-33 Front Door Vent Adjustment

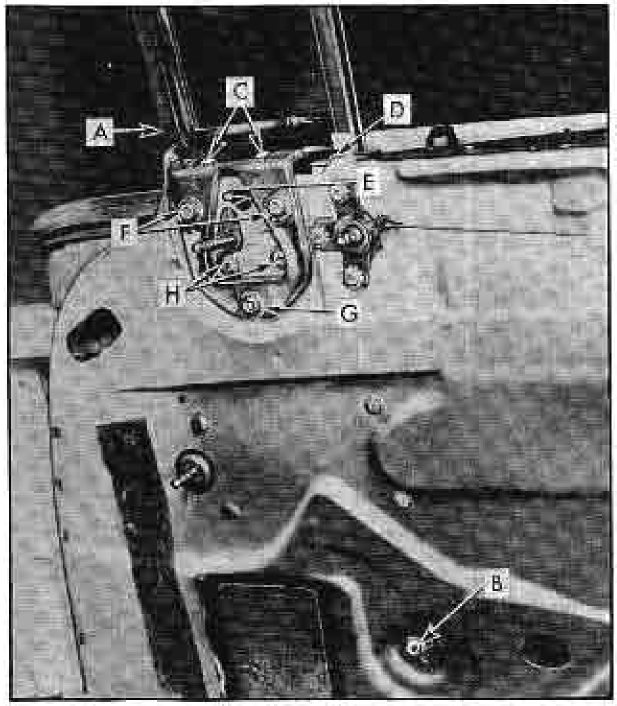

Fig. 3-34 Ventilator Assembly Adjustment (6237)

2. To adjust assembly in or out, loosen adjusting stud nuts "B" and "G" and attaching bolts "F", Fig. 3-34. With screw driver, turn adjusting studs in or out depending on adjustment desired. When adjustment is completed, tighten nuts and bolts.

3. To tilt assembly fore or aft, loosen nuts "B" and "G", bolts "F", and ventilator regulator attaching screws "H". Remove attaching nuts and bolts and relocate, if necessary, and install screw "D".

4. When all adjustments are completed, seal door inner panel as specified in door inner panel sealing procedure, Note 15, and reinstall previously removed parts.

5. For additional adjustment, refer to the door ventilator regulator write-up, Note 30b.

(31) Door Ventilator Regulator Removal and Installation

a. 6237

1. Remove door trim pad, door heater duct and both loading hole covers.

2. Remove the regulator attaching screws Fig. 3-35.

3. Remove the ventilator "Tee" shaft to regulator attaching screw, Fig. 3-35.

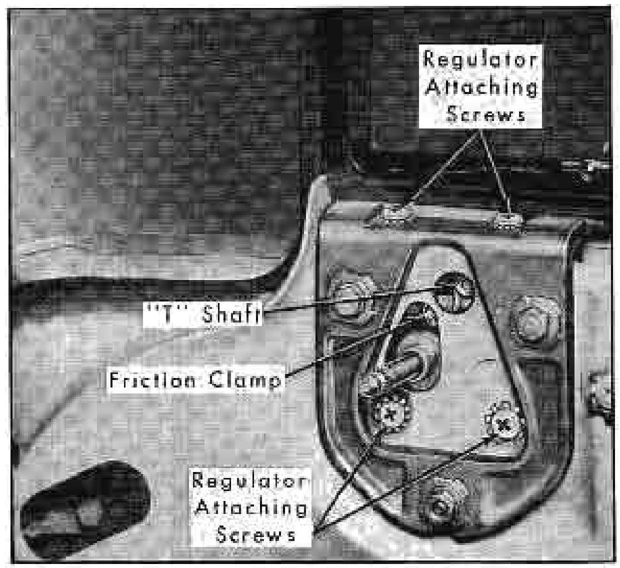

Fig. 3-35 Ventilator Regulator Removal (6237)

4. Disengage regulator from ventilator and remove through smaller loading hole.

NOTE: In some cases, it may be necessary to loosen the complete ventilator assembly and lift the assembly upward sufficiently to allow disengagement of "Tee" shaft from regulator.

5. To install, reverse removal procedure.

b. 6219, 60S

1. Remove door garnish or belt finishing molding, trim pad and front door heater duct.

2. Remove screws Fig. 3-32, securing regulator to door inner panel and to ventilator assembly.

3. Remove both loading hole covers.

4. Remove screw which secures ventilator "Tee" shaft to regulator.

5. Disengage regulator from ventilator "Tee" shaft, and remove regulator from between door panels.

6. To install, reverse the removal procedure. Seal door inner panel as specified in Note 15.

(32) Front Door Ventilator Removal and Installation

a. 6219, 60S

1. Lower door glass and remove door trim pad.

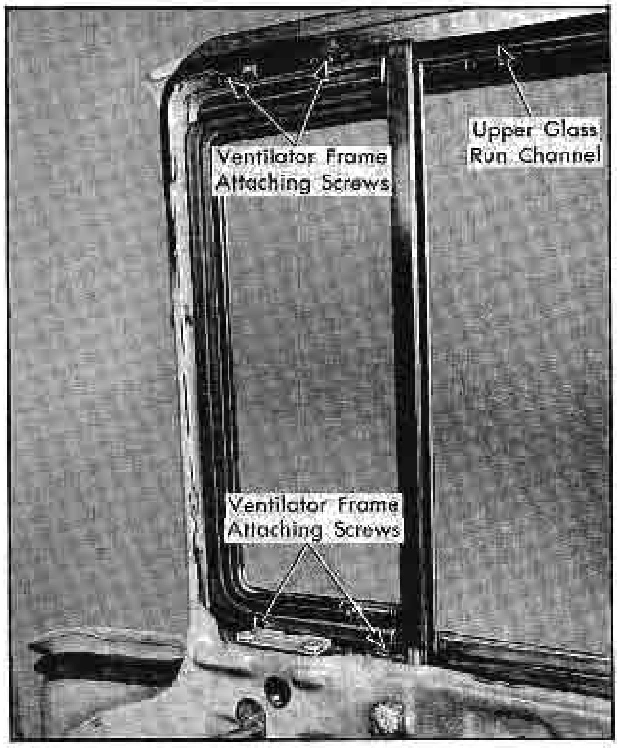

Fig. 3-36 Ventilator Regulator Removal (6219, 60S)

2. Remove front door heater duct, loading hole covers and ventilator division channel adjusting stud and nut.

3. Remove ventilator regulator as described in Note 31.

4. Remove upper section of glass run channel. See Fig. 3-36.

5. Remove ventilator frame to door attaching screws, Fig. 3-36, and remove ventilator from door.

6. To install, reverse removal procedure. Seal door inner panel as specified in Note 15.

b. 6237

1. Break seal of upper and lower hinge pillar weatherstrips at butt joint "A", Fig. 3-34. Loosen remainder of lower hinge pillar weatherstrip from ventilator frame.

2. Remove door trim pad, heater duct and both loading hole covers.

3. Remove ventilator division channel lower adjusting stud and nut "B".

4. Remove screws indicated at "C" and "D".

5. Remove ventilator "TEE" shaft to regulator attaching screw "E".

6. Remove two bolts "F" and adjusting stud nut "G"

7. Lift ventilator assembly upward, tilting support bracket to clear regulator spindle.

8. To install, reverse removal procedure. Seal door inner panel as specified in Note 15.

c. 6267

1. Remove door trim pad and front door heater duct. See Note 14.

2. Break seal at butt joint of upper and lower hinge pillar weatherstrips. Loosen remainder of lower hinge pillar weatherstrip from casting.

3. Remove two bolts "B" and adjusting stud nut "C", shown in Fig. 3-31.

4. Remove smaller loading hole cover and lower adjusting stud nut "D".

5. With door glass in down position, lift pillar and wing assembly up from between door panels and place on covered bench to prevent damage to plated surfaces.

6. To install, seal door panel as specified in Note 15, and reverse removal procedure.

d. 6267 (Wing Removal)

1. Remove complete door pillar and wing assembly from between door panels and place on covered bench.

2. Loosen set screw at upper pivot and remove attaching screws "B" and "C" Fig. 3-31. Note relative position of all washers so that they can be reinstalled properly.

3. Lift wing assembly upward and remove from door pillar frame.

4. To install, reverse removal procedure.

(33) Front Door Window Glass Adjustment

a. 6219, 60S

1. Loosen stationary cam channel rear attaching screw, Fig. 3-37, and adjust rear end of cam channel up or down as required; then, tighten screw. This will correct a condition where the

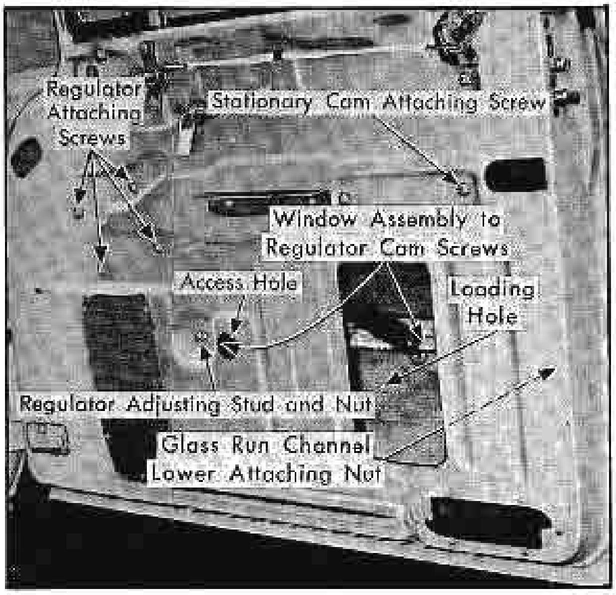

Fig. 3-37 Door Window Assembly (Sedan)

door glass is "cocked" in the glass run channels.

2. Loosen the ventilator division channel lower adjusting stud, Fig. 3-37, move channel fore or aft, whichever is required.

3. Loosen the glass run channel lower attaching nut, Fig. 3-37, and position channel in or out as required.

b. 6237, 6267

If the door glass does not fit properly at the side roof rail sealing strip on closed coupe styles or weatherstrip on Convertible; or the door glass does not travel up or down properly because of misalignment with the glass run channels, perform the adjustments outlined below:

NOTE: It may take one, or a combination of adjustments outlined below to correct a misaligned door glass. In addition, it may be necessary to adjust the door pillar and wing assembly on convertibles, or the door ventilator assembly on closed coupes.

1. To adjust upward limit of glass travel, remove door belt finishing molding, loosen nut and turn stop "C", Fig. 3-38 up or down as required; then tighten nut.

NOTE: The adjusting plate with attached stop can be adjusted in or out to adjust stop to window lower sash channel.

2. To adjust door glass in or out, or to align glass run channel with door glass, proceed as

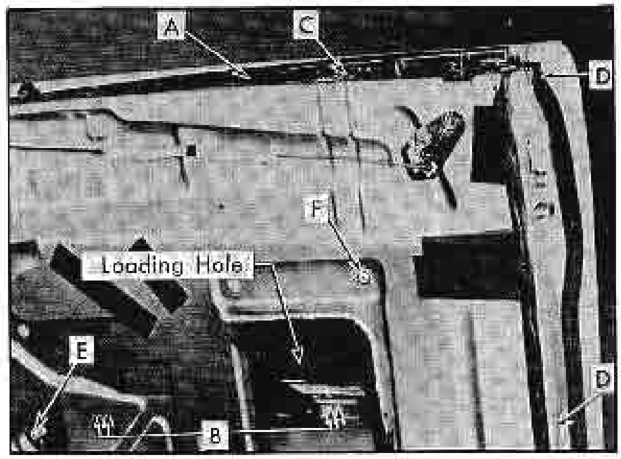

Fig. 3-38 Door Window Assembly (Coupe)

follows:

NOTE: To perform this and the following adjustment, the door trim pad will have to be removed.

Loosen glass run channel attaching screws "D" at the door lock pillar. Fig. 3-38.

Loosen adjusting stud nut.

Turn adjusting stud "E" and position glass run channel at door lock pillar as required; then tighten screws and nut.

3. To correct a condition where the door glass is cocked in the glass run channels, loosen stationary cam rear attaching screw "F" and raise or lower rear end of cam as required; then tighten screw.

4. Operate door glass up or down to check adjustment; then seal door inner panel as specified in Note 15, and reinstall previously removed parts.

(34) Front Door Window Glass Removal and Installation

a. 6219, 60S

1. Lower door glass and remove door trim pad.

2. On bodies equipped with powered regulators, disconnect positive battery cable to prevent accidental operation of window regulator with master control switch.

3. Remove larger loading hole cover, and tape from access hole, Fig. 3-37.

4. Remove front door ventilator assembly.

5. Remove four screws securing window assembly to regulator cam. Fig. 3-37.

6. Disengage window assembly from regulator cam, raise glass to an almost closed position, then, tilt inward and remove from door.

CAUTION: On bodies equipped with electrically powered window regulators, DO NOT OPERATE REGULATOR MOTOR after the window assembly is disengaged from the regulator, or on a bench operation, after the regulator is removed from the door. Operation of the motor with the load removed may damage the unit and make it inoperative.

7. To install, reverse above procedure and seal door inner panel.

b. 6237, 6267

1. Remove the door belt finishing molding and door trim pad.

2. Remove the inner draft strip assembly "A", Fig. 3-38, with attached window stop.

NOTE: Door glass should be in half raised position to allow removal of draft strip assembly.

3. Operate door glass to full down position and remove larger loading hole cover, and tape covering circular access hole.

4. On bodies equipped with electrically powered window regulators, disconnect positive battery cable to prevent accidental operation of window regulator with master control switch.

5. Remove the four screws "B", Fig. 3-38, securing window assembly to regulator cam.

6. Disengage window assembly from regulator cam and lift door glass upward to clear top of ventilator on closed coupe, or door pillar on convertible and remove from door.

CAUTION: On bodies equipped with electrically powered window regulators, DO NOT OPERATE REGULATOR MOTOR after the window assembly is disengaged from the regulator, or as a bench operation, after the regulator is removed from the door. Operation of the motor, with the load removed, may damage the unit and make it inoperative.

7. To install, reverse removal procedure and seal door inner panel.

(35) Front Door Window Regulator Removal and Installation (Manual and Electric)

a. 6219, 60S

1. Lower door glass, and remove door trim pad.

2. Remove front door heater duct, both loading hole covers, and tape that covers access hole. On cars equipped with electrically powered window regulators, disconnect motor leads from wiring harness.

3. Remove four screws securing window assembly to regulator cam. Fig. 3-37.

4. Disengage window assembly from regulator cam channel and prop glass in up position.

CAUTION: On cars equipped with electrically powered window regulators: DO NOT OPERATE REGULATOR MOTOR after the window assembly is disengaged from the regulator, or as a bench operation, after the regulator is removed from the door. Operation of the motor with the load removed may damage the unit and make it inoperative.

5. Remove ventilator division channel lower adjusting stud and nut. Fig. 3-37.

6. Remove stationary cam attaching screw Fig. 3-37, and remove cam.

7. Disengage cam from regulator, and remove cam from between door panels.

8. Remove regulator attaching screws, Fig. 3-37, and carefully remove regulator from between door panels.

CAUTION: To remove motor assembly from window regulator, carefully read and follow instructions in Note 36.

9. To install, reverse removal procedure. Seal door inner panel as described in Note 15.

NOTE: The regulator lift arm should be in the down position when installing regulator in door.

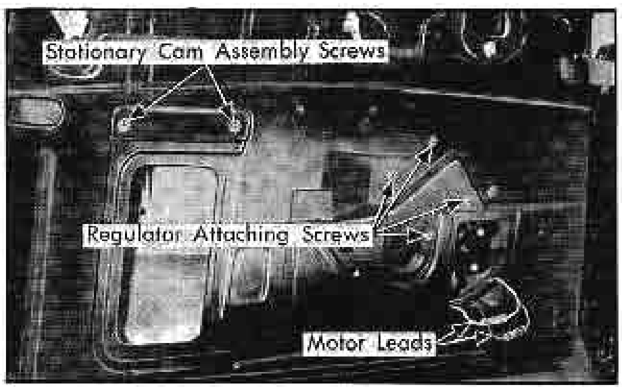

Fig. 3-39 Door Window Regulator Removal – Coupes

b. 6237, 6267

1. Remove door trim pad, heater duct, and both loading hole covers.

2. Remove door window glass. See Note 32b.

CAUTION: On bodies equipped with electrically powered window regulators, DO NOT OPERATE REGULATOR MOTOR after the window assembly is disengaged from the regulator, or as a bench operation after the regulator is removed from the door. Operation of the motor, with the load removed, may damage the unit and make it inoperative.

3. On bodies equipped with electrically powered window regulators, disconnect motor leads indicated in Fig. 39.

4. On closed coupes, remove the ventilator division channel lower adjusting stud nut "B". Fig. 3-34.

5. Remove two screws securing stationary cam to door inner panel and remove cam. Fig. 3-39.

6. Remove regulator cam from regulator.

7. Remove regulator to door inner panel attaching screws. Fig. 3-39.

8. Carefully work regulator assembly with attached motor through larger loading hole and remove from door.

NOTE: The instructions for removing the motor from the regulator assembly are outlined in Note 36.

9. To install, reverse removal procedure. Seal door inner panel as specified in Note 15.

(36) Window Regulator Electric Motor Assembly Removal and Installation

1. Remove electric window regulator assembly from door and clamp securely in vise.

NOTE: The position of the regulator clamped in the vise will vary with the type of regulator and position of the lift arm.

CAUTION: BE SURE TO PERFORM STEPS 2 and 3 BEFORE ATTEMPTING TO REMOVE THE MOTOR ASSEMBLY FROM THE REGULATOR. The regulator lift arm, which is under tension from the counter-balance spring can cause serious injury, if the motor assembly

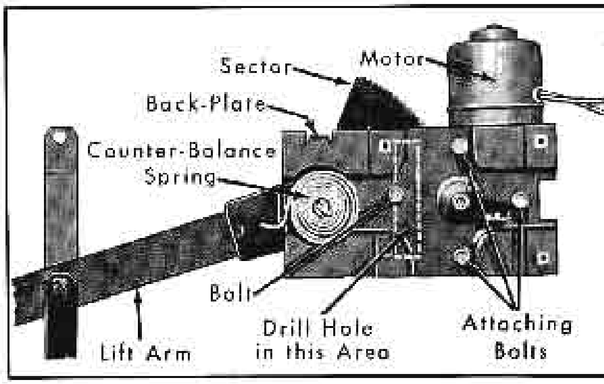

Fig. 3-40 Electric Window Regulator

is removed without locking the sector in position.

2. Drill 1/4" hole through backplate and sector within area indicated in Fig. 3-40, depending on position of lift arm.

NOTE: Do not drill into motor housing, part of which is indicated by the dotted lines. In addition, locate hole not less than 3/4" away from edge of backplate or sector.

3. Insert 1/4" bolt through holes in backplate and sector and install nut to bolt.

4. Remove the three (3) attaching bolts Fig. 3-40, and remove motor assembly from regulator.

NOTE: Clean steel chips off the regulator sector and motor pinion gear.

5. To install, reverse removal procedure.

NOTE: Be sure to remove nut and bolt before reinstalling regulator.

(37) Door Glass Run Channel Removal and Installation

a. 6219, 605

NOTE: The glass run channels are secured to the door with rosebud clips, Fig. 3-41, which are snapped into holes in the window frame. In addition, the lower ends of the channels which extend along the lock pillar are secured by a nut installed to a stud support. The lower end of the channel which extends along the rear door hinge pillar is secured with a screw.

The channel assembly on the front door consists of two sections: an upper, which extends along the door header, and a lower, which extends along the door lock pillar.

The channel assembly on the rear door consists

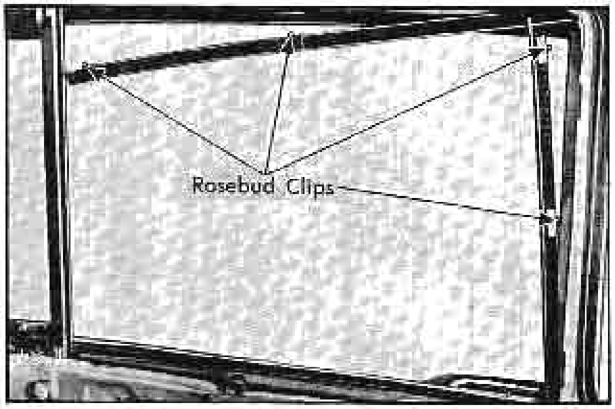

Fig. 3-41 Glass Run Channel Clips

of three sections: an upper extending along the door header, and a lower rear and lower front which extend along the door lock and hinge pillars, respectively. Removal and installation of front and rear door glass run channels is identical except where indicated otherwise.

1. Remove door trim pad and loading hole cover. On front doors, remove larger loading hole cover.

2. Working through loading hole, remove nut securing lower end of glass run channel at lock pillar side.

3. To remove rear door glass run channel at hinge pillar side, remove glass run channel attaching screw from outside of pillar.

4. Lower glass; then with a suitable tool, disengage upper channel with attached clips from window frame.

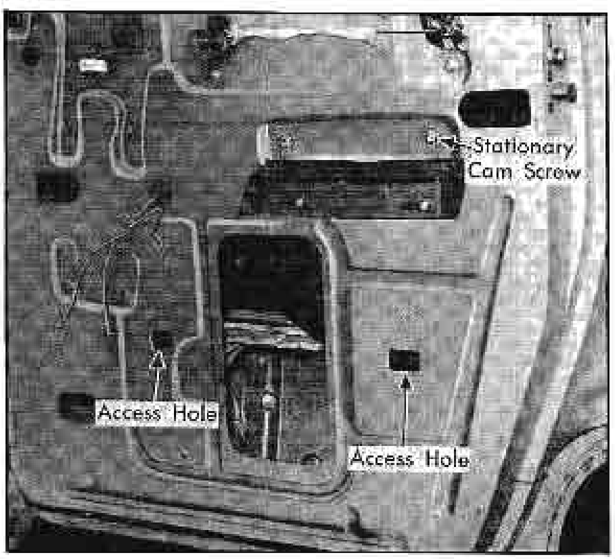

Fig. 3-42 Rear Door Assembly

5. Remove glass run channel from pillar portion of door by disengaging rosebud clips and lifting channel assembly upward.

6. To install, reverse above procedure.

b. 6237, 6267

1. Remove the door trim pad and door window glass.

2. Remove the glass run channel attaching screws "D" at door lock pillar. Fig. 3-38.

3. Remove the glass run channel from the door through the loading hole.

4. To install, reverse the removal procedure.

(38) Rear Door Window Glass Adjustment, Removal and Installation

a. Adjustment

1. To correct a condition where the door glass is "cocked" in the glass run channels, loosen stationary cam screw. Fig. 3-42, and adjust rear end of stationary cam up or down as required and tighten screw.

2. To correct a condition where the door glass is "binding" because of improper glass run channel alignment, loosen the lock pillar glass run channel lower attaching nut and adjust lower end of channel in or out as required then tighten nut.

NOTE: The attaching nut is located in between the door panels.

b. Removal and Installation

1. Lower door glass and remove door trim pad.

2. On bodies equipped with power regulators, disconnect positive battery cable to prevent accidental operation of window regulator with master control switch.

3. Remove loading hole cover and tape covering access holes.

4. Remove upper and side sections of glass run channel.

5. Through access holes, Fig. 3-42, remove four screws securing window assembly to regulator cam.

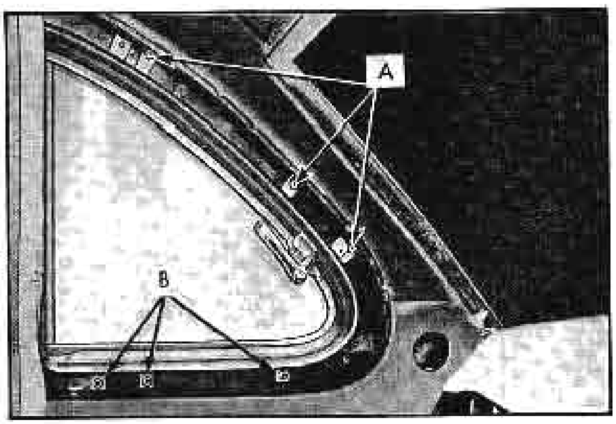

Fig. 3-43 Rear Quarter Vent Removal

CAUTION: On bodies equipped with electrically powered window regulators do not operate regulator motor after the window assembly is disengaged from the regulator or as a bench operation, after the regulator is removed from the door. Operation of the motor with the load removed may damage the unit and make it inoperative.

6. To install, reverse removal procedure and seal door inner panel.

(39) Rear Quarter Ventilator Removal and Installation

a. Removal

1. Remove rear seat cushion and seat back. See Note 60c.

2. Remove rear quarter ventilator garnish molding.

3. Loosen rear quarter side trim panel at the upper rear corner and swing out of position.

4. Loosen headlining sufficiently over ventilator to permit access to the ventilator upper support screws.

5. Remove three ventilator to side roof rail screws "A". Fig. 3-43.

6. Remove three ventilator to rear quarter inner panel screws "B". Fig. 3-43. Carefully loosen rubber weatherstrip from sealer on wall of rabbet around window opening and push glass from the outside, removing the entire assembly from inside the body.

b. Installation

1. Clean old sealer from around ventilator opening and lip of rubber weatherstrip.

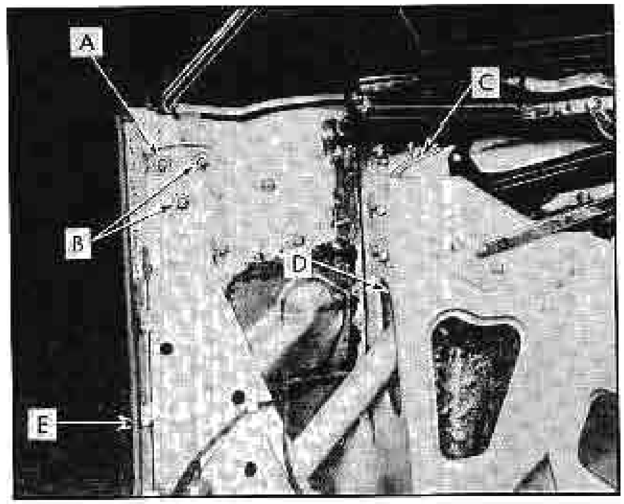

Fig. 3-44 Rear Quarter Window Assembly (6267)

2. Apply a bead of weatherstrip cement to outer lips of rubber weatherstrip and place assembly into body opening from inside of the body.

3. Install three upper and three lower retaining screws, Fig. 3-43, and place headlining back into position.

4. Install upper rear quarter trim pad and rear quarter ventilator garnish molding.

5. Install seat back and seat cushion.

(40) Rear Quarter Window Adjustment

a. 6267

1. Lower folding top, remove rear seat cushion and back.

2. Lower window half-way down then disconnect positive battery cable to prevent accidental operation of window from master switch.

3. Remove rear quarter belt molding, disengage window switch, remove arm rest, remove rear quarter window upper stop.

4. Turn trim panel away from inner panel to gain access to pivot bolt "A". Fig. 3-44.

5. To adjust the rear quarter window in or out, loosen the pivot bolt and the adjusting stud nuts "B". Fig. 3-44. Turn the studs in or out until the desired position of the window is attained. Retighten stud nuts and pivot bolt.

6. To adjust the rear quarter window up or down or fore or aft, loosen the pivot bolt and adjusting

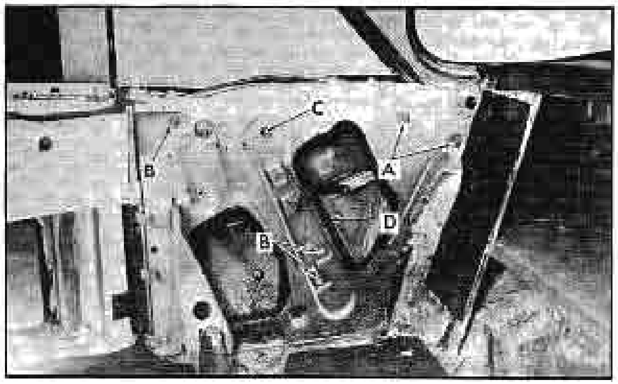

Fig. 3-45 Rear Quarter Window Assembly (6237)

stud nuts. Position the window where desired and retighten pivot bolt and adjusting stud nut.

7. The up travel of the window can be adjusted by loosening the stop attaching screws "C", Fig. 3-44, and moving the stop up or down as desired. Retighten screws when adjustment is completed.

8. In connection with the preceding adjustments, it may be necessary to adjust the rear quarter window guide channel. To adjust the guide channel, loosen screw "E" at lock pillar and adjusting stud nut "D". Fig. 3-44. Position the guide channel to the desired location and retighten screw and stud nut.

b. 6237

1. Remove rear seat cushion and seat back.

2. Remove rear quarter arm rest, trim panel, hardware, and loading hole cover.

3. To adjust the rear quarter window fore and aft, loosen the rear guide channel screws "A" and the front guide channel screws "B". Fig. 3-45. Then the rear quarter window can be moved fore or aft in the elongated front and rear guide channel attaching screw holes in the inner panel. When the desired position is obtained, retighten the guide channel attaching screws.

4. To adjust the rear quarter window in or out at the lock pillar, loosen the upper front guide channel attaching stud nut and turn the adjusting stud in or out to the desired location. Retighten adjusting stud nut.

5. The up travel of the rear quarter window can be adjusted by loosening the rear quarter window stop attaching screw "C" and sliding the stop to the desired location.

6. The down travel of the rear quarter window can be adjusted by loosening the down stop attaching screw "D" on the front guide channel. This stop may be set in any location along the front guide channel.

(41) Removal and Installation of Rear Quarter Window

a. 6267

1. Lower the folding top and remove rear seat cushion and rear seat back.

2. Actuate the window so that it is in the half-down position. Then disconnect positive battery cable to prevent accidental operation of the quarter window from the master switch.

3. Remove rear quarter belt finishing molding, disengage rear quarter window switch, remove rear quarter arm rest and rear quarter window upper stop.

4. Turn trim panel away from the inner panel to gain access to pivot bolt "A". Then remove pivot bolt and disengage the rear quarter window male hinge from the female hinge plate. Fig. 3-44.

5. Energize the power supply in order that the window regulator can be carefully operated upward until the window regulator arm is in such a position that the window cam channel can be disengaged from it.

6. Remove the rear quarter window from the body and disconnect the positive battery terminal.

7. To install, reverse the removal procedure.

b. 6237 (Manual)

1. Remove rear seat cushion and rear seat back.

2. Remove rear quarter hardware, arm rest and trim panel. See Note 40. Then remove rear loading hole cover.

3. With rear quarter window in the up position, remove two rear quarter window rear guide attaching screws "A" and remove rear guide from body. Fig. 3-45.

4. Carefully lower the rear quarter window to a point where the regulator roller can be disengaged from the rear quarter window channel.

5. Disengage rear quarter window front roller from the rear quarter window front guide channel and remove the rear quarter window from the body.

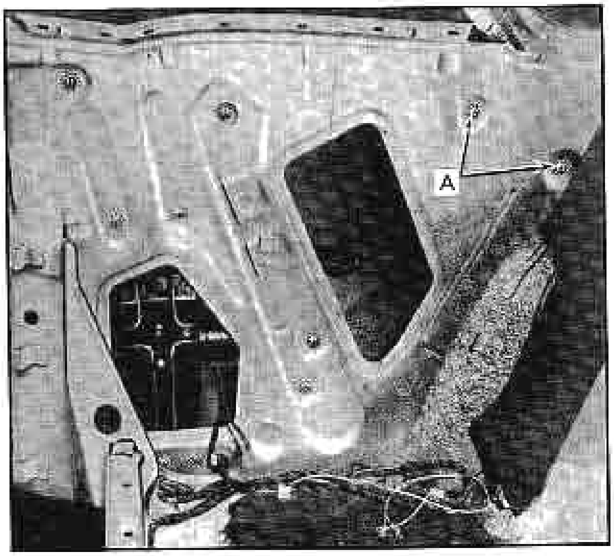

Fig. 3-46 Rear Quarter Window Assembly (6237X)

6. To install the rear quarter window, reverse the removal procedure.

c. 6237 (Electrical)

1. Remove rear seat cushion and rear seat back.

2. Remove rear quarter hardware, arm rest and trim panel.

NOTE: When removing the rear quarter arm rest, the switch must be carefully disengaged from the switch terminal block.

3. Disconnect positive battery cable; then remove the rear loading hole cover.

4. With the rear quarter window in the up position, remove two rear quarter window rear guide attaching screws "A", Fig. 3-46, and remove rear guide from body.

5. Energize the power supply so that the regulator can be actuated.

6. Carefully lower the rear quarter window to a point where the regulator roller can be disengaged from the rear quarter window channel.

7. Disconnect positive battery cable.

8. Disengage the rear quarter window front roller from the rear quarter window front guide channel and remove the rear quarter window from the body.

9. To install the rear quarter window, reverse the removal procedure.

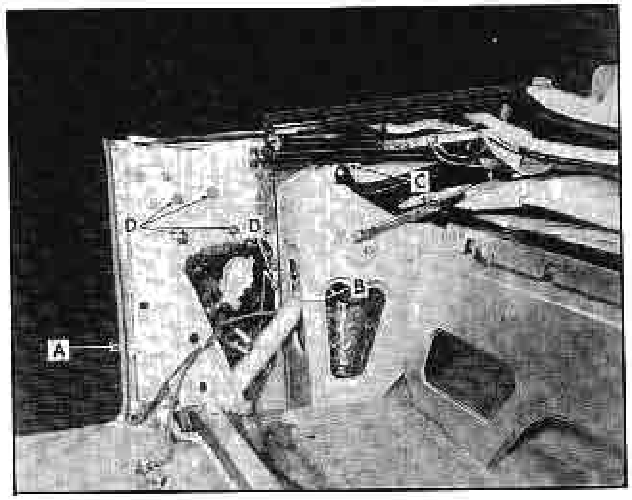

Fig. 3-47 Rear Quarter Window Guide Removal (6267)

(42) Rear Quarter Window Guide, Removal and Installation (6237)

a. Rear Guide

1. Remove rear seat cushion and back.

2. Remove quarter hardware and trim assemblies.

3. Remove access hole covers.

4. With the rear quarter window in the "UP" position, remove the rear quarter rear guide attaching screws, "A", Fig. 3-45.

NOTE: The rear quarter window front and rear guide may be adjusted fore and aft due to elongated attaching holes in the rear quarter inner panel.

5. Disengage the rear guide from the rear quarter window roller and remove the guide from the body.

6. To install, reverse the removal procedure.

b. Front Guide (6237)

1. Remove the rear quarter window and rear quarter window regulator. See Notes 41 and 43.

2. Remove the rear quarter window front guide attaching screws, "B", Fig. 3-45, and carefully remove the front guide from the body, working it through the rear access hole.

3. To install, reverse the removal procedure.

c. 6267

1. Remove rear quarter window. See Note 41a.

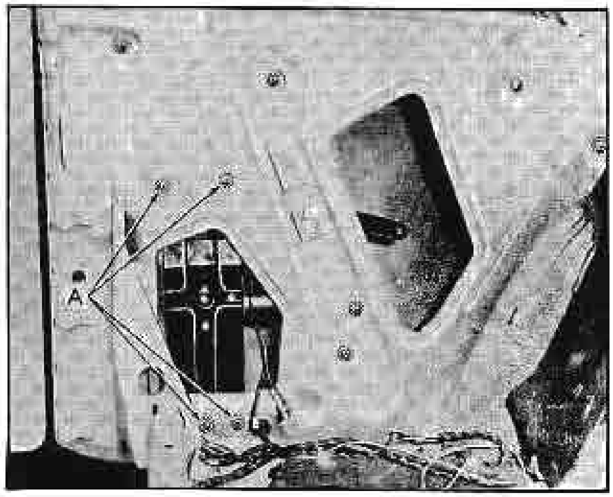

Fig. 3-48 Rear Quarter Window Regulator Removal (6237)

2. Remove the guide assembly front attaching screw "A", at the lower face of the lock pillar. Fig. 3-47.

3. Remove the upper attaching screw "C", at the rear end of the guide assembly, after first removing the folding top compartment side panel weatherstrip assembly.

4. Remove the center attaching stud nut and washer, "B".

5. Remove the guide assembly from the window opening between the rear quarter outer and inner panels and remove the guide assembly from the body.

6. To install, reverse the removal procedure.

7. To adjust guide, See Note 40a.

(43) Rear Quarter Window Regulator Removal and Installation

a. 6237

1. Remove rear quarter window as described in Note 41.

2. Disconnect regulator motor wires (on cars so equipped) and remove regulator attaching screws "A", Fig. 3-48.

3. Remove the rear quarter window regulator (and motor) assembly through the access hole in the rear quarter inner panel.

4. To install, apply medium-bodied sealer around the regulator attaching holes on the quarter inner panel side of the regulator and reverse the removal procedure.

b. 6267

1. Remove rear quarter window. See Note 41.

2. Remove the rear quarter window regulator attaching screws, "D", and remove the regulator from the body, working through the access hole. Fig. 3-47.

3. To install, apply medium-bodied sealer around the attaching holes on the quarter inner panel side of the regulator and reverse the removal procedure.

(44) Rear Quarter Window Sealing Strip Removal and Installation

a. Removal

1. Lower rear quarter window to full down position and remove the rear seat cushion, rear seat back and rear quarter belt finishing molding.

2. Apply a strip of masking tape along the rear quarter window upper reveal molding to protect the finish.

3. Remove the side roof rail mechanical sealing outer weatherstrip, rear.

4. Remove the sealing strip attaching screws.

5. With a suitable tool, inserted between front end of sealing strip and roof rail, carefully pry sealing strip downward.

6. When sealing strip flange is completely disengaged from reveal molding clips, carefully pull sealing strip forward to remove from body.

7. To remove escutcheon, disengage escutcheon flange from reveal molding clips and remove from body.

b. Installation

1. Install sealing strip escutcheon to roof rail by inserting escutcheon flange between reveal molding and clip.

2. Insert rear end of sealing strip in between rear quarter outer and inner panel and slide rear end over retaining clip.

3. Align front end of sealing strip with rear end of side roof rail mechanical sealing strip.

4. Position sealing strip flange between reveal

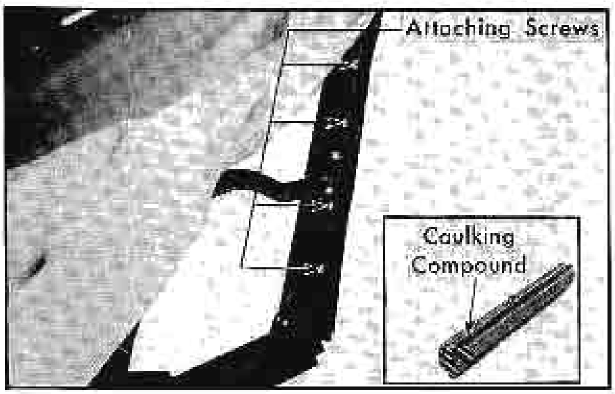

Fig. 3-49 Side Roof Rail Mechanical Sealing Strip (6257)

molding and attaching clips, and press sealing strip upward.

5. Reinstall sealing strip attaching screws and side roof rail mechanical sealing outer weatherstrip rear.

6. Reinstall belt finishing molding, rear seat cushion and back, and remove masking tape.

7. The attaching screw holes in the sealing strip are slotted fore and aft to facilitate assembly and to adjust sealing strip in proper relation to the side roof rail mechanical sealing strip.

(45) Side Roof Rail Weatherstrip, Adjustment, Removal and Installation (6267)

a. Adjustment

1. The side roof rail weatherstrips, together with the sealing strips, may be adjusted in or out. To adjust, remove attaching screws, loosen attaching nuts and adjust as required; then tighten nuts and reinstall screws.

NOTE: The side roof rail weatherstrip front section may also be adjusted fore or aft.

2. The side roof rail weatherstrips may also be adjusted downward. To adjust, loosen weatherstrip as required and insert water-proof shim between weatherstrip and side roof rail. Reseal if necessary, and tighten weatherstrip attaching nuts.

b. Removal and Installation

1. Lower top halfway.

2. Remove weatherstrip attaching screws and nuts and washers, Fig. 3-49; then remove weatherstrip.

NOTE: It is necessary to loosen the front roof rail weatherstrip retainer when removing side roof rail weatherstrip front section.

3. To install, reverse removal procedure. Apply a ribbon of body caulking compound to attaching surface of front and center side roof rail weatherstrips along entire length of parts as indicated in Fig. 3-49. Clean off excess sealer.

(46) Front Roof Rail Weatherstrip, Removal and Installation (6267)

1. The front roof rail weatherstrips consist of a front roof rail weatherstrip and a front roof rail weatherstrip front.

2. The weatherstrips are cemented and secured in place by a two piece retainer. To remove or install weatherstrip, remove retainer and follow directions outlined in Note 48.

(47) Side Roof Rail Mechanical Sealing Strip, Adjustment, Removal and Installation (6237)

a. Adjustment

1. The attaching screw holes in the mechanical sealing strip are slotted laterally for alignment with the top of the door window and door ventilator.

2. Loosen sealing strip attaching screws.

3. Adjust strip in or out as required; then tighten screws.

4. In cases where the action of the outer sealing strip is retarded due to friction with lip (awning) of the rubber gasket, apply a sparing amount of a silicone rubber lubricant to the inner lip of the gasket, along its entire length.

b. Removal

1. Remove the two screws, one securing the front and one securing the rear end weatherstrip, and remove the weatherstrips, Fig. 3-50, B and C.

2. Remove the remaining sealing strip attaching screws and remove strip with attached gasket from body.

3. If necessary, remove the gasket from the sealing strip.

c. Installation

1. Clean original sealer from side roof rail and gasket. If the gasket was removed, remove the

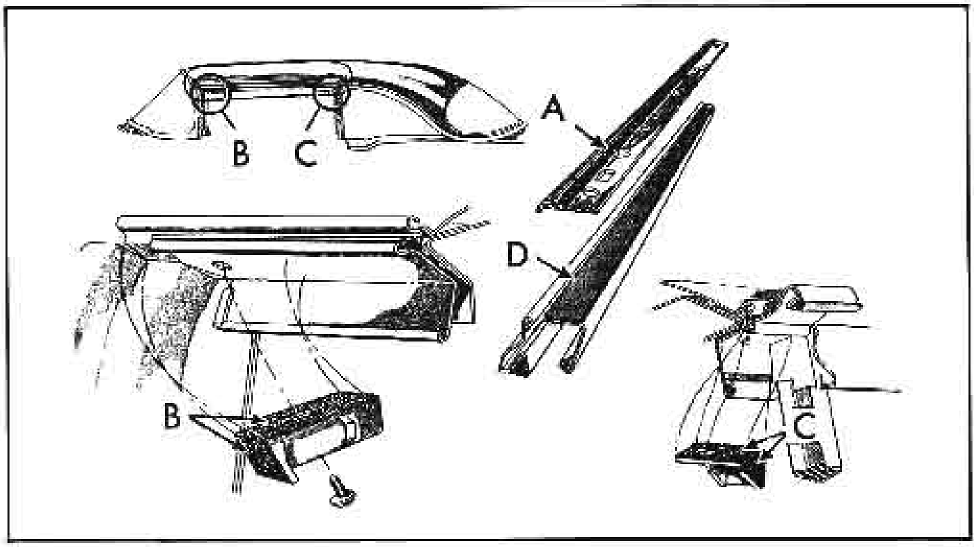

Fig. 3-50 Side Roof Rail Mechanical Sealing Strip (6237)

double coated adhesive tape from the sealing strip.

NOTE: The tape is used in the production installation of the gasket to the sealing strip.

2. Tape the outer sealing strip to the inner strip so that outer strip is in the closed position for installation of the rubber gasket "D", Fig. 3-50.

3. Assemble the gasket to the sealing strip with a good weatherstrip cement, following carefully the manufacturer's directions for cement application and observing the following precautions:

Do not apply cement to lip (awning) of gasket.

Do not apply cement so that it could enter the hinge portion or attaching holes of the sealing strip.

Assemble gasket to sealing strip so that lip (awning) is over the outside radius of the hinge throughout its entire length.

Cement gasket to sealing strip flat (without puckers).

4. Apply a 1/8" diameter ribbon of caulking compound along outside edge of gasket as shown in "A" in Fig. 3-50.

NOTE: Compound used should compress easily so as not to interfere with the installation and operation of the sealing strip.

5. Install sealing strip to side roof rail. Bring screws to snug fit.

6. Apply a medium-bodied sealer to the front and rear outer weatherstrips as indicated at "B" and "C", Fig. 3-50, and install weatherstrip.

7. Align sealing strip with top of door window and ventilator, and tighten screws. Wipe off excessive sealer.

NOTE: Sealing strip attaching screws must be drawn to uniform tightness.

(48) Door Weatherstrip Removal and Installation

a. Removal

1. Bend back tabs of weatherstrip retainer along bottom of door.

2. On sedan bodies equipped with electric window regulators, cut the rear door hinge pillar bottom weatherstrip at the electrical conduit to permit removal of weatherstrip from around holes. On closed coupes, remove screw and retainer at top of ventilator frame. On convertible coupes, remove screw and washer at upper end of door pillar frame.

3. Using a suitable tool, carefully break seal between door and weatherstrip and remove weatherstrip. Door bottom drain hole sealing strips may be removed at this time, if necessary.

b. Installation

1. Clean off old adhesive from door cementing surface and from weatherstrip to provide a clean surface for weatherstrip installation.

2. With brush, apply a thin coat of adhesive to

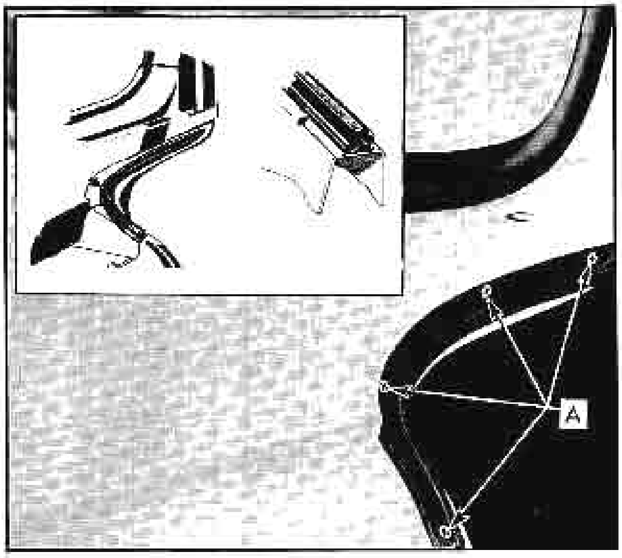

Fig. 3-51 Cowl Side to Door Weatherstrip Installation

cementing surface of door and weatherstrip and to ends of weatherstrip which must be cemented together to form butt joint.

NOTE: Cement should not extend more than 1/8" beyond edge of weatherstrip.

3. If drain hole sealing strips were removed from bottom of door they can be cemented into position at this time. Apply cement to sealing strips only.

4. Install weatherstrip to door, pressing it firmly and evenly in place. Do not stretch weatherstrip around corners.

5. After installation, bend up tabs of retainer along door bottom to secure weatherstrip in this area. Clean off excess cement.

6. On coupes, reinstall washers and screws which were removed.

(49) Cowl Side to Door Weatherstrip, Removal and Installation

1. Remove four screws, indicated in Fig. 3-51; break seal between weatherstrip and cowl and remove weatherstrip.

2. To install, clean original sealer from cowl and apply a ribbon of medium-bodied sealer as indicated in insert, Figure 3-51. Install screws and clean off excessive sealer.

(50) Deck Lid Weatherstrip Removal and Installation

1. Separate the butts ends of the weatherstrip at the bottom of compartment opening and carefully disengage weatherstrip from gutter foundation, using a flat tool.

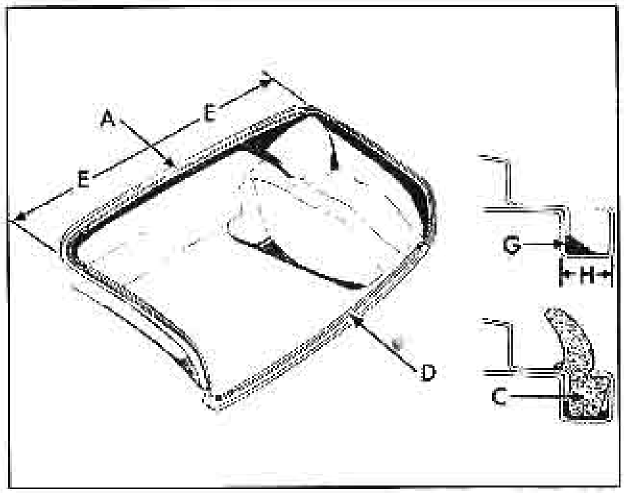

Fig. 3-52 Deck Lid Weatherstrip Installation

2. Check the gutter around the rear compartment opening to make sure that the surface is clean for cementing.

3. Using a pressure-type gun, flow a bead of weatherstrip cement into the gutter to seal the welded joint where the small "U"-shaped gutter is attached to the rear compartment opening, shown in Fig. 3-52 "G".

4. Using a brush, apply a coat of weatherstrip cement to the bottom portion of the rear compartment gutter shown at "H".

5. Position and center the weatherstrip at point "A", using the color identification mark at the center of the weatherstrip as the starting point.

6. Using a flat-bladed tool such as a putty knife with rounded corners and edges or a headlining inserting tool, Fig. 3-53, insert the

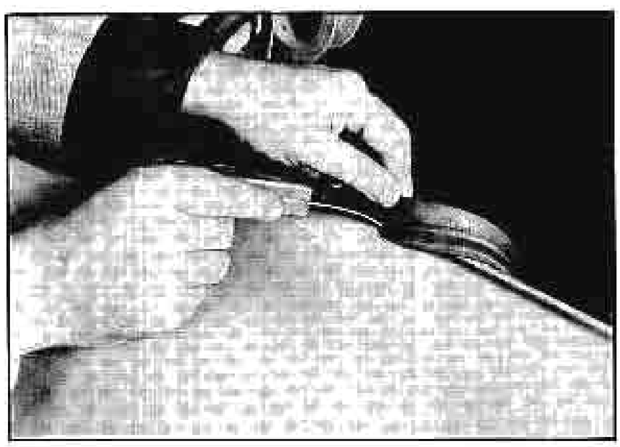

Fig. 3-53 Installing Deck Lid Weatherstrip

weatherstrip into the top of the gutter along that portion of the gutter marked "E", in Fig. 3-52.

7. For best results, when inserting the weatherstrip along the sides and bottom of the gutter, position edge "C" of the weatherstrip into the gutter before using the inserting tool.

8. Trim the ends of the weatherstrip to form a butt joint, and cement them together at "D".

(51) Seat Switch and Escutcheon Assembly Removal and Installation

a. Switch with Escutcheon

1. Detach switch and escutcheon assembly from front seat left side panel by removing escutcheon retaining screws.

2. Pull switch assembly away from seat side panel and detach regulator switch block and wires from switch. Fig. 3-54.

3. Remove switch and escutcheon from seat panel.

4. To install, reverse above procedure.

b. Switch

1. Unscrew switch knob and remove knob and lock washer from switch.

2. Through escutcheon hole "A", Fig. 3-54, depress tab of clip "B" sufficiently to permit clip to be removed. Repeat this on three remaining clips and remove switch from escutcheon.

3. To install switch in escutcheon, reverse above procedure.

(52) Front Seat Side Panel Removal and Installation

a. 6237, 6267

1. On manual control seats, remove seat adjuster control handle.

2. Remove two screws and washers at front of panel, two screws and washers at rear of panel and one screw and washer at rear inside edge of panel.

3. Disengage panel from front of seat assembly and from center support by raising panel and pulling outward. Move panel toward rear, then, and remove from seat assembly.

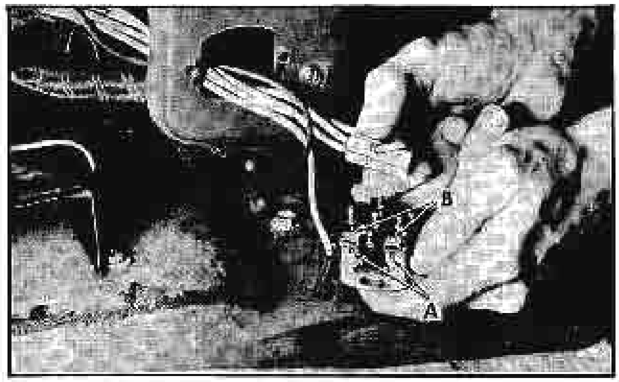

Fig. 3-54 Removing Seat Switch Assembly

4. On electrically operated seats, disconnect terminal block and wire connecters from adjuster control switches.

5. To reinstall, reverse removal procedure.

b. 6219, 60S

1. On 6219 series, remove seat adjuster control handle.

2. Remove two screws and washers from front of panel and one screw and washer at lower rear of panel.

3. At the upper rear of panel on 6219 styles, remove robe cord escutcheon screws; on 6019 styles, remove single screw and washer.

4. Remove side panel from seat.

5. On styles with electrically operated seats, detach switch block and wires from switch terminal post.

6. To reinstall, reverse above procedure.

(53) Front Seat Assembly Removal and Installation

a. Seat and Manual Adjusters

1. Remove front seat side panels as outlined in Note 52.

2. On sedan models, disconnect lighter feed wire and remove wire from clips on floor pan.

3. Remove seat adjuster to floor pan screws, Fig. 3-55, and remove seat assembly from car.

4. To install, reverse removal procedure. Connect cigar lighter feed wire and install ground wire under seat adjuster bolt on sedan models.

BODY

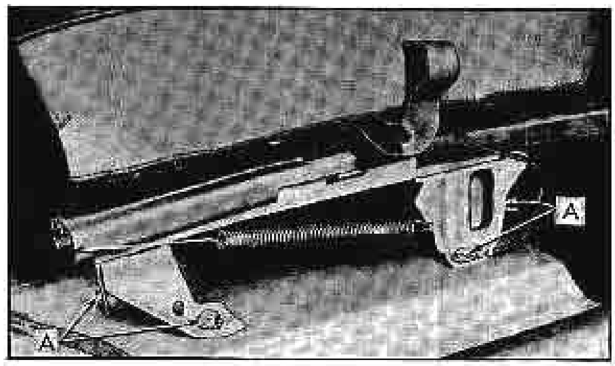

Fig. 3-55 Front Seat Assembly Removal

b. Seat Including Adjusters and Electric Regulators

1. Operate seat to a raised and forward position. Remove seat side panels and detach switch wire harness from left side of seat frame and detach tension spring from equalizer rod. On sedan models, disconnect seat back cigar lighter wire and detach wire from clip on floor pan.

2. Place a wood block at each seat adjuster between floor plate and upper section of adjuster as shown in Fig. 3-56.

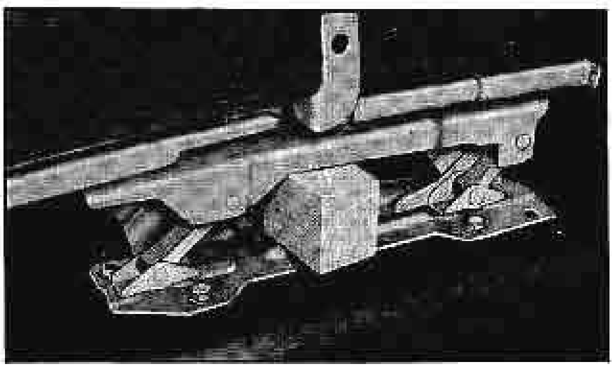

Fig. 3-56 Floor Plate to Adjuster Support

3. Disconnect horizontal and vertical regulator lead wires at connectors.

4. Under rear of seat, remove horizontal regulator floor pan support cover, Fig. 3-57, and remove support screws; then tie regulator to vertical equalizing rod.

5 Under front of seat, remove vertical regulator support screws and tie regulator to the horizontal equalizing rod as shown in inset, Fig. 3-58.

6. Remove seat adjuster to floor pan screws and carefully remove seat assembly with regulators from car.

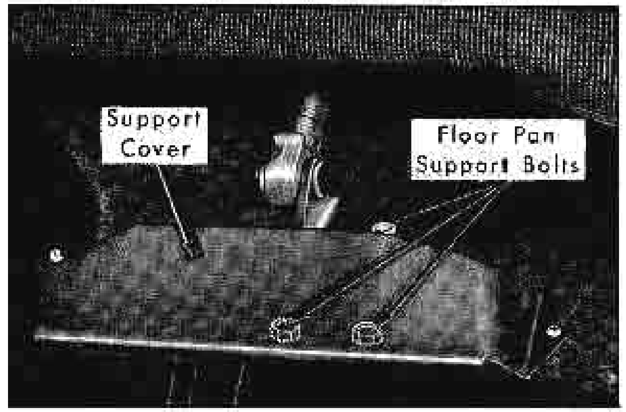

Fig. 3-57 Horizontal Regulator Floor Pan Support Cover

7. To reinstall assembly, reverse removal procedure being sure that regulator ground wire and cigar lighter ground wire on sedan models are secured under support and adjuster screws.

c. Seat (Less Adjusters and Regulators)

1. Operate seat to raised position and remove seat side panels.

2. Detach switch wire harness from seat frame, and detach tensioner spring from equalizer rod. On sedan models, on 6219 styles disconnect cigar lighter feed wire and remove wire from clip and floor pan. Detach ground wire from right adjuster front screw.

3. On sedan models, remove center and rear attaching bolts, Fig. 3-59, from both adjusters. On coupe styles remove screws "A" and "B", Fig. 3-60.

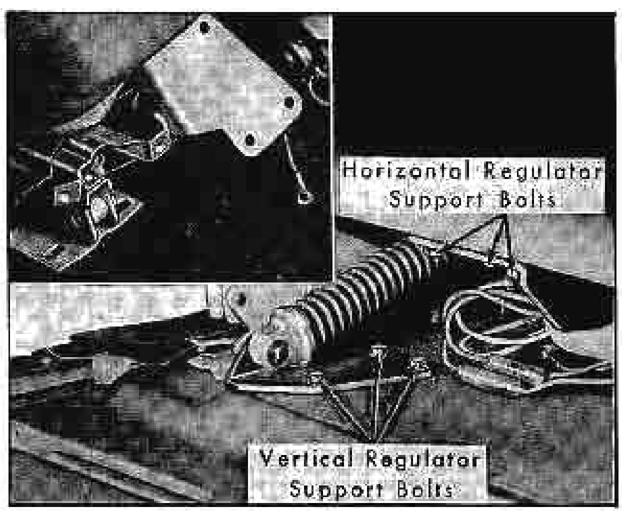

Fig. 3-58 Detaching Vertical Regulator Support

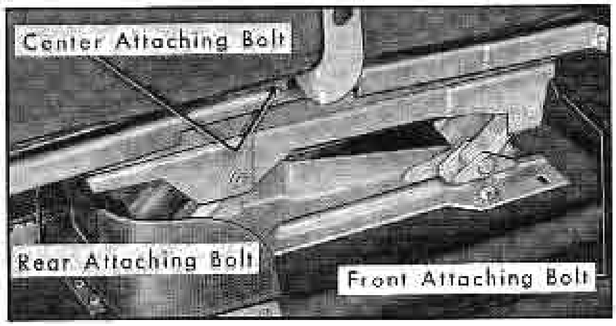

Fig. 3-59 Detaching Seat Assembly from Adjusters (Sedans)

5. On sedan models, move seat to forward position and remove retaining ring, Fig. 3-61, and washer from both seat adjuster horizontal equalizing rod links and detach links from rod arms.

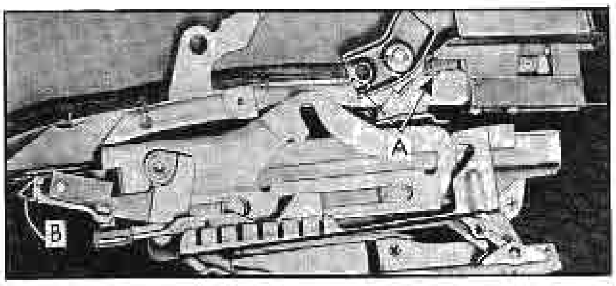

Fig. 3-60 Detaching Seat Assembly from Adjusters (Coupes)

6. On sedan models, remove front attaching bolt and washer indicated in Fig. 3-59.

7. Remove seat assembly from car.

8. To reinstall seat assembly, reverse above procedure.

Fig. 3-61 Detaching Horizontal Equalizing Rod Links (Sedans)

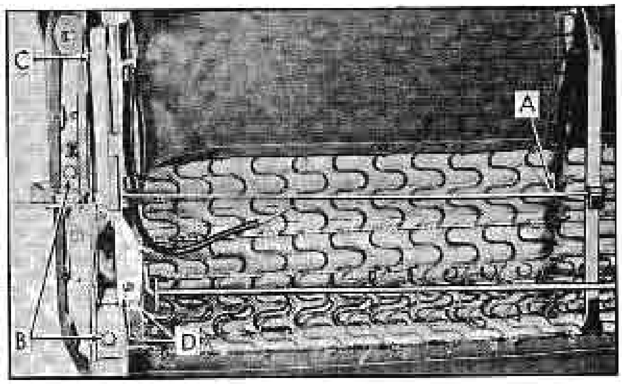

Fig. 3-62 Removal of Seat Adjuster from Seat Assembly

(54) Seat Adjuster Removal and Installation

a. Manual

1. Remove front seat assembly as described in Note 53a.

2. Detach locking rod "A", shown in Fig. 3-62, from seat frame.

3. Remove seat adjuster-to-seat frame screws "B". Move adjuster track forward and remove screw indicated at "C".

4. Disengage seat adjuster from locking rod and remove adjuster.

b. Electrical

1. Remove the seat assembly as described in Note 53c.

2. Remove horizontal equalizing rod retaining ring "A", Fig. 3-63. Remove retaining ring "B"

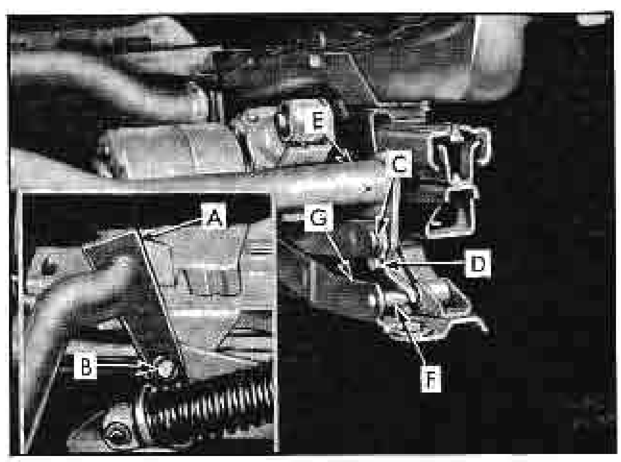

Fig. 3-63 Removal of Electrical Seat Adjuster

and disengage link from equalizing rod. Place a support under equalizing rod.

3. Remove retaining ring "C" and detach crank link from pin.

4. When removing right adjuster, remove bolt "D" from rear link of right adjuster.

5. Remove seat adjuster to floor pan screws.

6. Pull adjuster outward to disengage link pin "E" from vertical equalizing rod end plate, then raise equalizing rod to disengage it from link pin "F" and to clear floor plate flange "G". Remove adjuster.

7. To install adjuster, reverse removal procedure. Be sure that rubber washer is installed on end of horizontal equalizing rod, between rod and rod support. When installing adjuster to floor pan screws, do not tighten screws until seat bottom frame has been secured to seat adjusters.

(55) Horizontal Electric Regulator Removal and Installation

1. Operate seat to a raised and forward position.

2. Disconnect horizontal regulator lead wires at connectors. Under left side of seat on sedan models, detach tensioner spring from equalizing rod.

3. Turn back carpet, remove regulator floor pan support cover "A", Fig. 3-64, and remove support screws "B".

4. On sedan models, detach horizontal regulator seat frame support at front of seat, retained by bolts "A" (inset of Fig. 3-64). On coupes, remove support screws "A", Fig. 3-65, retaining ring "B", (seat removed for illustrative purposes only) and remove regulator.

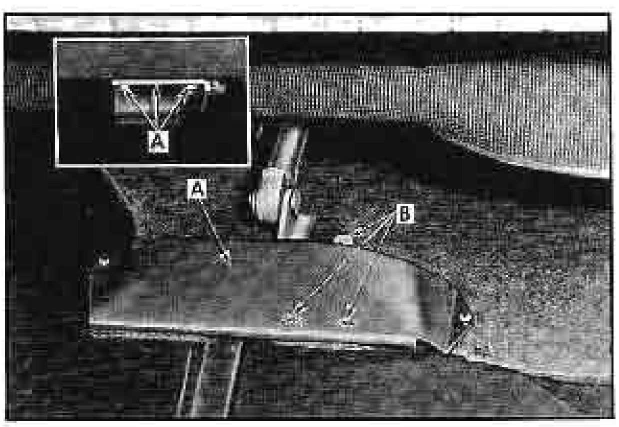

Fig. 3-64 Horizontal Electric Regulator Removal (Sedans)

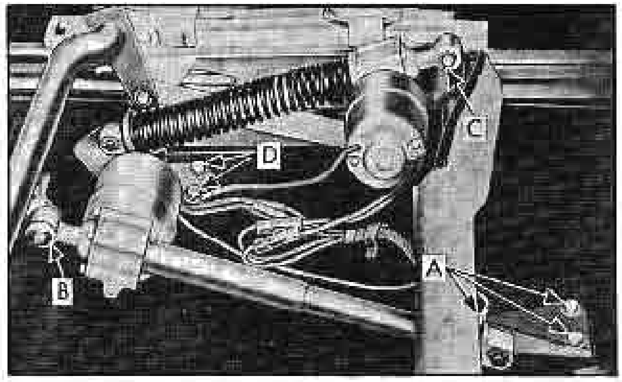

Fig. 3-65 Horizontal Electric Regulator Removal (Coupes)

5. As a bench operation, remove regulator to support pin retaining rings and washers. Remove supports from regulator.

6. To install, reverse above procedure.

(56) Vertical Electric Regulator Removal and Installation

1. Operate seat to a raised and forward position.

2. From under rear of seat, remove retaining ring, Fig. 3-66.

3. Lower seat and detach vertical regulator lead wire connectors and ground wire.

4. Under front of seat remove vertical regulator floor pan support screws "A", Fig. 3-67, then carefully remove regulator from support pin at rear of seat (See "C" and "D", Fig. 3-65).

5. Remove assembly from car and remove

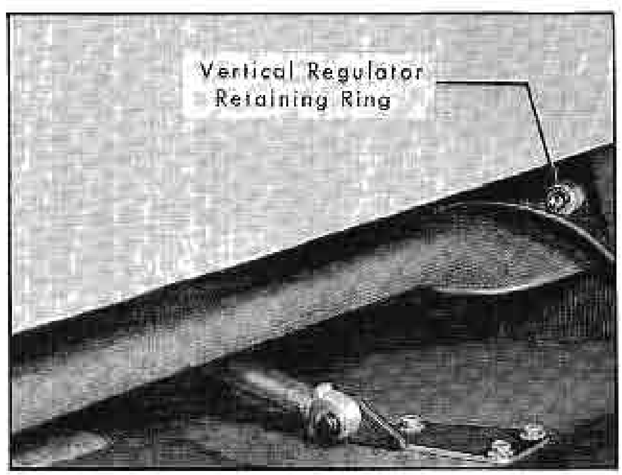

Fig. 3-66 Vertical Regulator Retaining Ring

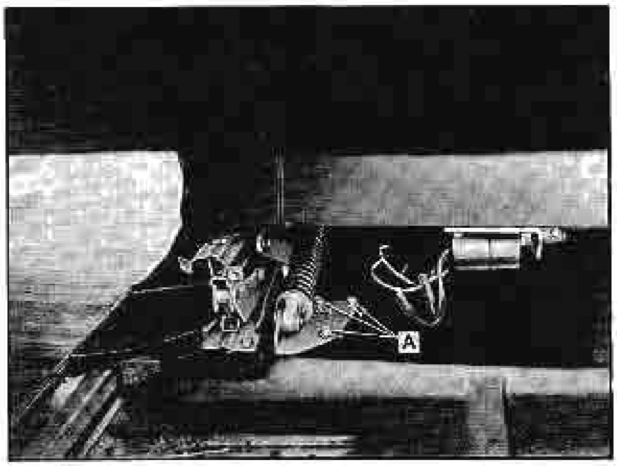

Fig. 3-67 Vertical Regulator Support Screws

regulator-to-floor pan support ring and washer from regulator and remove support.

6. To install vertical regulator, reverse removal procedure.

(57) Front Seat Back Panel Removal and Installation

a. 6219

1. Remove front seat side panels as described in Note 52b.

2. Remove ash tray and disconnect lighter wires.

3. Remove panel to seat frame retaining screws from both lower and upper corners of panel.

4. Lower panel to detach from ash tray support flange and from tab at lower center.

5. To install, reverse removal procedure.

b. 6019

1. Remove front seat side panels as described in Note 52b.

2. Remove screw and washer from both lower corners of panel and at lower center of panel.

3. Remove screw and washer from both sides of upper portion of panel, retaining panel to seat back frame.

4. Lift panel upward to disengage tabs at inside top of panel from seat back frame and remove panel from seat.

5. To install, reverse removal procedure.

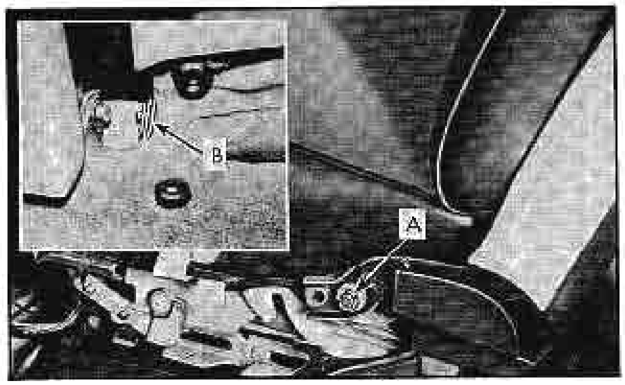

Fig. 3-68 Front Seat Back Removal (Coupe)

(58) Front Seat Back Removal and Installation

a. 6237, 6267

1. Remove seat side panel.

2. Remove cotter pin and cup-washer from seat back outer hinge pin, indicated at "A" in Fig. 3-68.

3. Pull seat back toward outside of car sufficiently to disengage outside support arm from hinge pin, indicated at "A".

4. Swing seat back forward and lift upward to disengage hooked end of center hinge pin from hole in hinge pin support and remove seat back.

5. Remove fiber-washer indicated at "B" in inset of Fig. 3-68.

6. To reinstall, reverse removal procedure. Be sure spacer is on outside hinge pin before installing seat back.

b. 6219

1. Remove front seat side panels and seat back panel as described in Notes 52b and 57a.

2. Disconnect lighter lead wire under left side of seat and detach wire from clip at floor pan and two clips at seat bottom frame.

3. Remove front seat back by removing four screws from both lower sides of seat back frame.

4. To install, reverse removal procedure.

c. 6019

1. Remove front seat side panels as described in Note 52b.

2. Remove screw and washer from both lower corners of seat back panel and at lower center of panel.

3. Behind lower corners of seat back panel remove four seat back attaching screws from both lower sides of seat back frame, and remove seat back.

4. To install, reverse removal procedure.

(59) Robe Cord Removal and Installation

a. 6219

1. Remove both seat side panels as described in Note 52b.

2. At both ends of robe cord, remove pin retaining robe cord to spring retainer and remove robe cord from seat back.

3. To install, reverse removal procedure.

b. 6019

1. Remove the front seat back panel as described in Note 58c.

2. Remove two assist handle screws.

3. Pull assist handle away from finish panel, and detach robe cord from spring.

4. Repeat steps 2 and 3 to remove opposite assist handle and other end of robe cord.

5. To install, reverse this procedure.

(60) Rear Seat Back Removal and Installation

a. 6237

1. Remove rear seat cushion.

2. Working through the rear compartment opening, remove the rear compartment front trim foundation.

3. Bend down the rear seat back upper retaining tabs.

4. Place the center arm rest in the half-down position and disengage the upper ends of the center arm rest filler panel behind the rear seat back.

5. Working through the seat back center arm rest opening remove the two center arm rest hanger plate to seat back support attaching bolts.

6. Disengage the top of the seat from under the rear seat back valance and lift the seat back from the retaining hooks along the bottom.

7. To install, reverse the removal procedure making certain that all attaching tabs and hooks have industrial tape applied to them to act as an anti-squeak.

b. 6267

1. Remove rear seat cushion.

2. Remove the lower seat back retaining screws and washers.

3. Lift the rear seat back from the retaining hooks and remove seat back from the body.

4. To install, reverse above procedure, using industrial tape on tabs and hooks to act as a anti-squeak.

c. 6219, 6019

1. Remove rear seat cushion.

2. Place the center arm rest in the half-down position and disengage the upper ends of the center arm rest filler panel from behind the rear seat back.

3. Remove the two center arm rest hanger plate to seat back support attaching bolts, working through the center arm rest opening.

4. Straighten the attaching tabs.

5. Disengage the rear seat back from the attaching tabs and lift the seat back to disengage it from hooks.

6. To install, reverse the removal procedure making certain that all attaching tabs and hooks have industrial tape applied to them to act as an anti-squeak.

(61) Rear Seat Center Arm Rest Removal and Installation

1. Remove rear seat back, Note 60.

2. Remove the four center arm rest hanger plate to seat back frame attaching screws and remove the arm assembly.

3. To install, reverse the removal procedure.

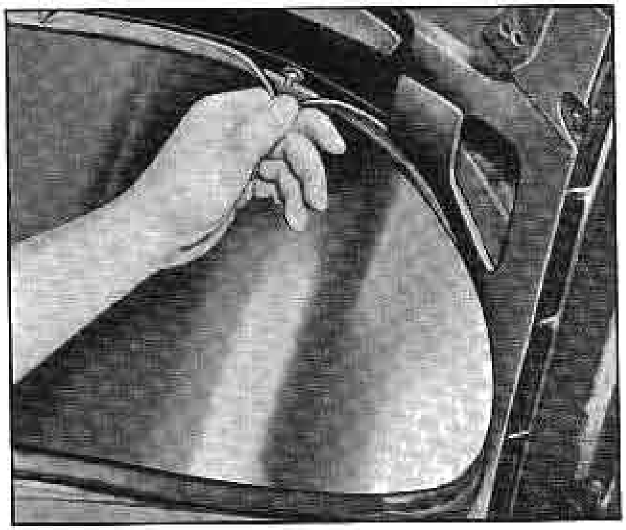

Fig. 3-69 Removal of Back Window Reveal Moldings

(62) Back Window Glass Removal

1 Place a protective covering over the painted body surfaces below the back window. Apply masking tape around window opening to protect exposed body finish.

2. On special coupe styles, remove the rear seat cushion, rear seat back and rear quarter belt finishing moldings.

3. Place a protective covering over the panel shelf and cover the rear seat back and cushion.

4. Remove back window garnish moldings.

5. Turn back inner lip of rubber channel, Fig. 3-69, and remove back window side reveal molding attaching nuts and washers.

6. On sedans, proceed as follows:

a. Working through the rear compartment, remove the rear end right reveal molding attaching nuts and washers.

b. Carefully slide the rear end right reveal molding from under the rear quarter reveal molding and remove the molding.

c. Carefully remove the rear end left molding as described above.

d. Remove back window lower reveal molding by removing the attaching screws.

7. On coupe styles, detach the back window side reveal moldings.

8. On sedans, using a suitable tool, pry back window side reveal molding from the retaining clips attached to the pinchweld flange.

9. Using a suitable tool, pry back window upper reveal molding from the retaining clips attached to the pinchweld flange.

10. With a putty knife, loosen seal between the rubber channel and pinchweld flange around the perimeter of the back window opening.

11. From inside the car, carefully push top of the glass outward with the palm of the hand until it is released from window opening.

12. Assisted by a helper, lift the glass assembly from the car and place on a covered bench.

13. On sedan styles, remove the rubber channel from the glass.

14. On coupe styles, remove the back window lower reveal moldings from the rubber channel, and remove the rubber channel from the glass.

(63) Back Window Glass Installation

1. Clean off all old sealer from the pinchweld flange around the back window opening. Check the flange for any irregularities and correct before installing the back windows.

2. Install rubber channel around edges of back window glass.

3. Insert a heavy cord into the pinchweld cavity of the rubber channel, and bring both ends around to the bottom center of the glass. Tie ends of cord together, and tape to the glass as shown in Fig. 3-70.

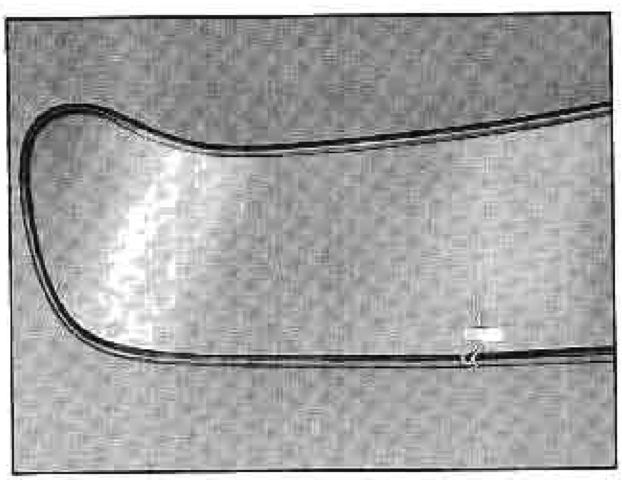

Fig. 3-70 Cord Attachment to Rubber Channel

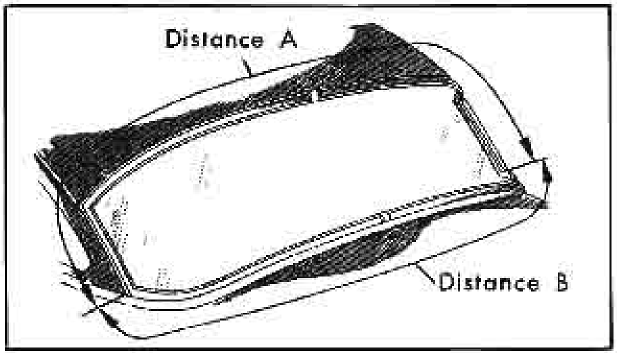

Fig. 3-71 Sealing Rear Window

4. On coupe styles, apply medium-bodied sealer to the back window lower reveal molding clips and assemble lower reveal moldings to the rubber channel.

NOTE: The right back window lower reveal molding overlaps the left back window lower reveal molding at the center of the back window.

5. Apply a bead of medium-bodied sealer to the base of the rubber channel completely around its perimeter. On coupe styles, this sealer is to bridge the lower reveal molding clips.

6. On coupe styles, apply a strip of waterproof tape over the gap between the rear quarter outer panel and outer panel extension in the area contacted by the back window glass channel.

7. Apply a 3/16" bead of medium-bodied sealer to the corner of the back window opening rabbet across the top and down the sides of the back window opening, as indicated by line "A", Fig. 3-71, On coupe styles, extend this bead of sealer completely around the back window opening rabbet as indicated by lines "A" and "B".

NOTE: In cases where the upper reveal molding retaining clips are replaced, install a 3/16" bead of medium-bodied sealer in the corner of the clip and connect this bead of sealer with the sealer previously applied to the corner of the back window opening rabbet.

8. With the aid of a helper, place the back window assembly into the body opening.

9. From inside of the body, carefully pull the cord from the pinchweld cavity of the rubber channel making sure that the lip of the channel is properly engaging the pinchweld flange.

10. Apply medium-bodied sealer around the holes into which the side reveal molding screws are inserted, and install the side reveal moldings.

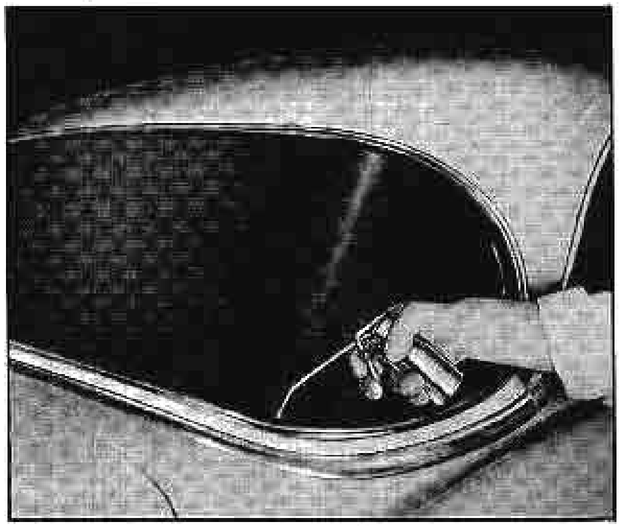

Fig. 3-72 Sealing Rear Window Rubber Channel

11. On sedan styles, apply medium-bodied sealer around the upper reveal molding end attaching screw holes. Install back reveal molding on retaining clips and install the attaching screw at each end of the upper reveal molding.

12. On sedan styles, apply medium-bodied sealer around the rear end reveal molding attaching screw holes. Carefully insert the forward edge of the rear end left reveal molding under the rear quarter reveal molding and install the attaching nuts and washers. Install right end reveal molding in the same manner.

13. Install back window garnish moldings.

14. Apply a bead of weatherstrip cement between the outer lip of the rubber channel and the glass, around the perimeter of the back window, Fig. 3-72.

15. Clean off all excess sealer and remove protective covers and masking tape.

(64) Headlining Removal

a. 6237

1. Remove the following hardware and trim assemblies:

- Rear seat cushion and back
- Garnish moldings from windshield and back window
- Coat hooks
- Sunshade assemblies
- Dome lamp
- Rear quarter belt finishing moldings
- Rear view mirror support

BODY

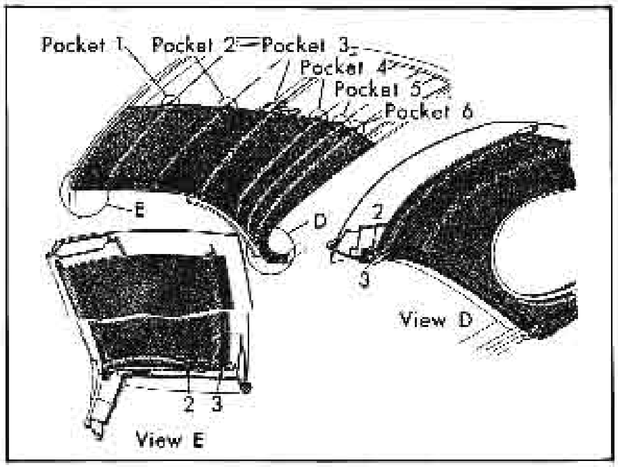

Fig. 3-73 Headlining Removal - (6237)

2. Unfold wire-on lace along the side roof rails to expose headlining attaching tacks. View "E" 2, Fig. 3-73.

3. Carefully remove all headlining attaching tacks; that is, along the side roof rails, windshield opening and back window opening. View "E" 3.

4. Detach the headlining front support wire by pulling the wire out of the metal thimbles which are inserted in the holes of the right and left side roof rails. View "B", Fig. 3-74.

5. Loosen the headlining listing wire attaching clips along the right side of the body. View "C" 4, Fig. 3-74.

6. Carefully disengage the cemented edges of the headlining in the windshield opening, back window opening and rear quarter area.

7. Beginning at the front and proceeding to the rear, disconnect the headlining support wires from the right and left side roof rails. The support wires may be detached from the right side roof rail retaining clips without removing the loosened clips.

NOTE: The left end of each support wire is formed with an offset, over which a rubber is placed prior to inserting into a slot in the left side roof rail. View "D" 2, Fig. 3-74.

8. Bend down the metal tabs of the center roof bow to disengage the support wire at the center roof bow location. Roll headlining with support wires on outside to keep material clean.

9. Remove the entire headlining, with support wires attached to it, from the body.

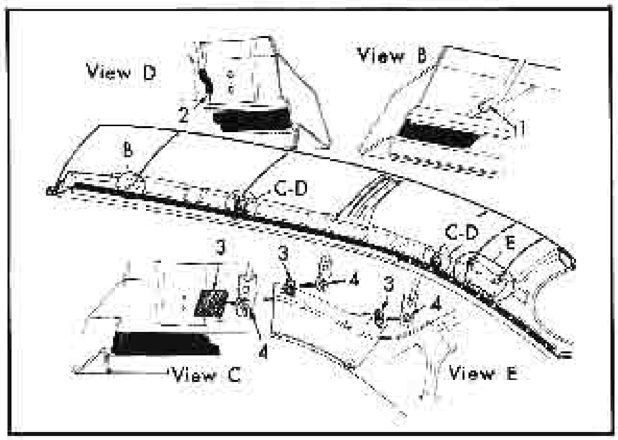

Fig. 3-74 Removal of Headlining Support Wires - (6237)

b. 6237 DX

1. Remove the following hardware and trim assemblies:

Rear seat cushion and back
Rear view mirror support
Windshield and back window garnish moldings
Rear quarter belt finishing moldings
Coat hooks
Side roof rail lamp assemblies
Sunshade assemblies.

2. Remove side roof rail upper front and rear moldings.

3. Carefully remove all headlining attaching tacks; that is, along the side roof rails, windshield opening and back window opening. View "E" and "D" at 4, Fig. 3-75.

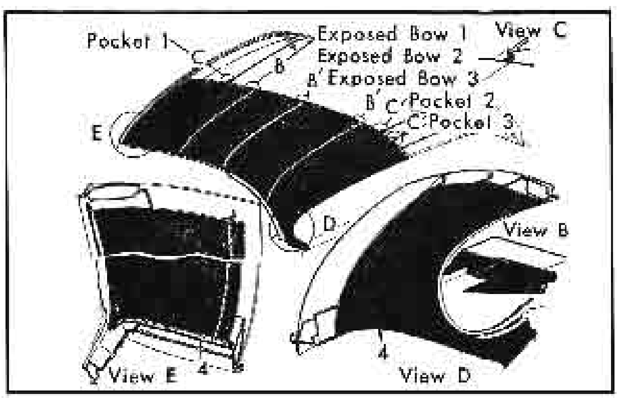

Fig. 3-75 Headlining Removal - (6237DX)

4. Detach the headlining front support wire by pulling the wire out of the metal thimbles which are inserted in the holes of the right and left side of roof rails. View "B", Fig. 3-76.

BODY

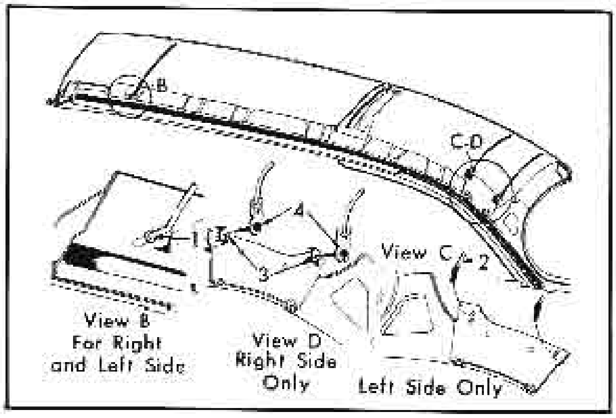

Fig. 3-76 Removing Headlining Support Wire (6237DX)

5. Detach the two (2) headlining rear support wires by loosening the two (2) clips along the right side roof rail and lifting the support wires from the clips. Then lift the support wires out of the holes in the left side roof rail. View "C" and "D", at 2, 3, 4, Fig. 3-76.

6. Remove chrome roof bow attaching screws at the right and left side roof rails and remove headlining from the body with support wires and roof bows attached.

7. Place headlining on a clean bench and if necessary detach roof bows and support wires from the headlining.

c. 6219, 6019

1. Before removing the headlining, the following hardware and trim assemblies must be removed:

   Rear seat cushion and rear seat back
   Rear view mirror
   Sunshade assemblies
   Windshield and back window garnish moldings
   Rear quarter window garnish molding
   Dome lamp assembly
   Coat hook

2. Loosen windshield pillar trim (both sides) from its cemented position on the windshield pillar.

3. Remove tacks or staples from the headlining over the windshield opening, View "C" 3, Fig. 3-77, and carefully disengage the cemented edge of the headlining.

4. Loosen the edges of the parcel shelf trim to gain access to the headlining in the rear quarter area.

5. Remove tacks or staples from the headlining around the rear quarter window (both sides) and across the back window opening. Then carefully

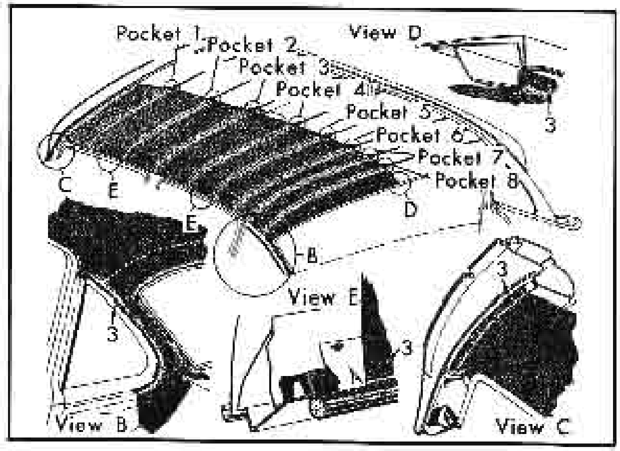

Fig. 3-77 Removing Headlining (6219, 6019)

disengage the cemented ends of the headlining. View "B" and "D" 3, Fig. 3-77.

6. Carefully disengage the headlining from the metal retainer tabs along both side roof rails. View "E" 3, Fig. 3-77.

7. Loosen all headlining support wire attaching screws along the right side roof rail. View "B" 3, Fig. 3-78.

   NOTE: The left end of each support wire is formed with an offset over which a rubber thimble is placed prior to inserting into a slot in the left side roof rail. View "C" 1, Fig. 3-78.

8. Beginning at the front and proceeding to the rear, disconnect headlining support wires from the right and left side roof rails. The support wires may be detached from the right roof rail retaining clips without removing the loosened clips.

9. Bend down the metal tabs of the center roof bow to disengage the support wire at the center roof bow location. Roll headlining with support wires on outside to keep material clean.

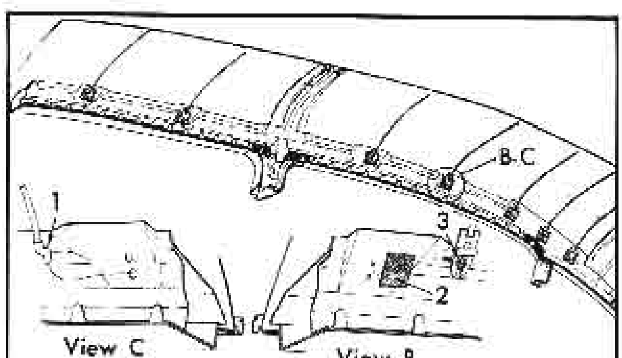

Fig. 3-78 Removing Headlining Support Wires (6219, 6019)

10. Remove the entire headlining assembly, with support wires attached to it, from the body.

(65) Headlining Installation

a. 6237

1. Lift the headlining assembly into the body. Then starting at the rear and working toward the center roof bow, install the ends of the support wires into the support wire holes, along the left side roof rail and the retaining clips along the right side roof rail. Tighten the retaining clip attaching screws.

2. Center and align headlining relative to the back window, rear quarter windows, coat hook locations and dome lamp opening. Then install headlining support wire with the retaining tabs at the front of the center roof bow.

3. Working from the center roof bow toward the front of the body, install the ends of the remaining support wires to the right and left side roof rails. View "C" and "E" at 3 and 4, Fig. 3-74.

4. Cement and stay tack the headlining material to the tacking area of the back window and windshield, using trim cement as the adhesive. Make sure that the sunshade openings in the headlining are aligned with the sunshade attaching screw holes.

5. Remove all fullness and wrinkles from the material, working from front to rear of the body. Then permanently tack or staple headlining around the window openings.

6. Stay tack the headlining to the side roof rail tacking areas and adjust the support wires, if necessary, to obtain proper tension on the headlining to fill out the material.

7. Permanently tack the headlining to the side roof rail tacking areas and fold the wire-on-lace over the exposed tacks.

8. Install the following hardware and trim assemblies:

- Dome lamp
- Rear quarter belt finishing moldings
- Windshield and back window garnish moldings
- Rear view mirror support
- Coat hooks
- Sunshade assemblies
- Rear seat back and cushion

b. 6237 DX

1. Install support wires in listing pockets and roof bows to headlining. Use extreme care when inserting cardboard foundation strips into grooves of roof bows to prevent damage to headlining material.

2. Lift entire headlining assembly into body. Loosely attach ends of each roof bow to the side roof rails. Install ends of each support wire into the hole in the left side roof rail and to the clips at the right side roof rail.

3. Temporarily tighten, in full down position, both ends of the center roof bow.

4. Center and align headlining relative to the windshield opening, back window opening, coat hook locations and sunshade attaching locations.

5. Starting at the windshield opening, carefully pull headlining tight and cement and stay tack headlining along the windshield opening. Perform the same operation along the back window opening.

6. Stay-tack the headlining along both side roof rails.

7. After headlining is free of all fullness and wrinkles, permanently tack all areas previously stay tacked.

8. Adjust all roof bows and the two rear support wires to proper tension on headlining to fill out the material. Tighten all roof bows and support wire attaching screws.

9. Install side roof rail upper front and rear moldings.

10. Install the following hardware and trim assemblies:

- Sunshade assemblies
- Side roof rail lamp assemblies
- Coat hooks
- Windshield and back window garnish moldings
- Rear quarter belt finishing moldings
- Rear view mirror support
- Rear seat back and cushion

c. 6219, 6019

1. Lift the headlining assembly into the body. Then, starting at the rear and working toward the center roof bow, install the ends of the support wires into the support wire holes along the left side roof rail and to the retaining clips along the right side roof rail. Tighten the retaining clip attaching screws.

2. Center and align headlining relative to the back window, rear quarter windows, coat hook

location, dome lamp opening and rear door openings. Then install headlining support wire with the retaining tabs at the front of the roof bow.

3. Working from the roof bow toward the front of the body, install the ends of the remaining support wires to the right and left side roof rails.

4. Cement and stay-tack the headlining material to the tacking area of the back window, quarter window header areas and windshield, using trim cement as the adhesive. Make sure that sunshade openings in headlining are aligned with sunshade attaching screw holes.

5. Remove all fullness and wrinkles from the material, working from front to rear of the body. Then permanently tack or staple the headlining around the window opening.

6. Using a headlining inserting tool or similar wide-bladed tool, carefully tuck the edges of the headlining under the retainer tabs of the side roof rails.

7. Install the windshield pillar trim and parcel shelf trim.

8. Install the following hardware and trim assemblies:

Dome lamp assembly
Rear quarter window garnish moldings
Windshield and back window garnish moldings
Sunshade assemblies
Rear view mirror
Rear seat back and rear seat cushion
Coat hook

(66) Deck Lid Adjustment, Removal and Installation

a. Adjustments

1. The rear compartment lid can be adjusted forward or rearward and from side to side in the rear compartment lid body opening through the use of elongated bolt holes in the hinge straps and movable bolt attaching plates in the lid. To adjust, loosen hinge strap retaining bolts "A", Fig. 3-79, shift lid to required position and tighten bolts.

2. Shimming between the hinge strap and rear compartment lid inner panel may also be used to raise or lower the hinge area of the lid.

a. To raise lid at hinge area, place a thin shim under forward edge of one or both hinge straps at "B", to obtain desired adjustment. Fig. 3-79.

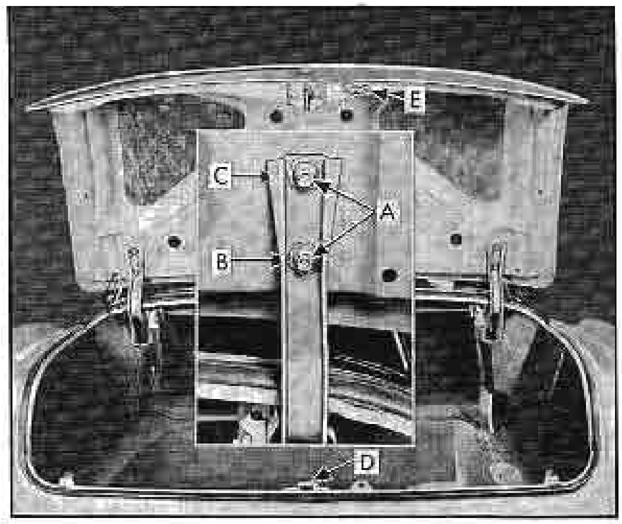

Fig. 3-79 Deck Lid Adjustment

b. To lower lid at hinge area, place shims under rear end of lid hinge straps at "C", to obtain the desired adjustment. Fig. 3-79.

3. Two screws "E" provide adjustment for alignment of rear compartment lid locating dowel pin.

b. Removal and Installation

1. Open lid and place protective covers around the edges of the rear compartment opening to prevent damage to the paint surface.

2. Disconnect light wire at connector and pull wire from lid.

3. Scribe around the hinge straps located on the lid inner panel to mark correct position of hinge straps on lid.

4. Remove the two bolts at each hinge strap at "A", Fig. 3-79, and with the aid of a helper remove rear compartment lid.

5. To install the rear compartment lid, reverse the removal procedure, making sure that the hinge straps line up with the scribe marks on the lid inner panel.

6. Check specifications for deck lid sheet metal tolerances shown in Fig. 3-19, and adjust lid as required.

(67) Deck Lid Hinge Adjustment, Removal and Installation

a. Adjustment

1. The torque rods on the deck lid hinge

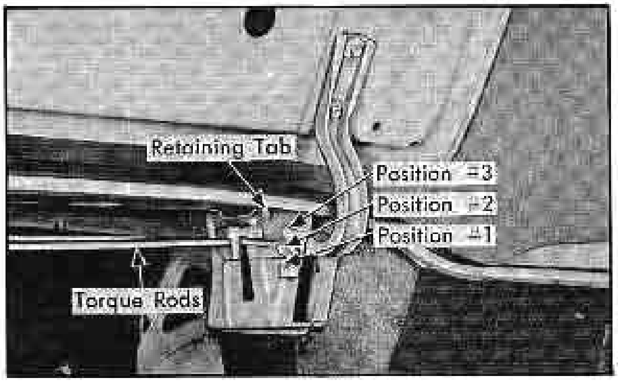

Fig. 3-80 Deck Lid Torsion Rod Adjustment

assemblies can be adjusted to obtain the desired effort required to open and close the lid.

2. With the torque rods set in position 1, Fig. 3-80, a decrease in the effort required to open the lid can be had by adjusting the torque rod to positions 2 or 3. A corresponding increase in the effort required to close the lid results from this adjustment.

3. With the torque rod set in position 3, a decrease in the effort required to close the lid can be had by adjusting the torque rod to positions 2 or 1. A corresponding increase in the effort required to open the lid results from this adjustment.

4. It is NOT necessary to adjust the left and right hand torque rods at the same time or to the same final position of adjustment.

b. Removal

1. Protect body finish around upper portion of the rim of the rear compartment opening with a suitable covering and provide a support for the lid on the side where the hinge is to be removed.

2. Scribe location of the hinge strap on the rear compartment lid inner panel and remove two bolts "A", securing the lid to the hinge strap. Fig. 3-81.

3. At center of shelf panel, disengage the torque rods from the torque rod support.

4. Using a suitable length of pipe, disengage the torque rod for the hinge to be removed from the retaining notches located at the inboard face of the opposite hinge box. Fig. 3-81.

NOTE: Suitably mark the notch from which the torque rod is disengaged.

5. Disengage the torque rod from the lower

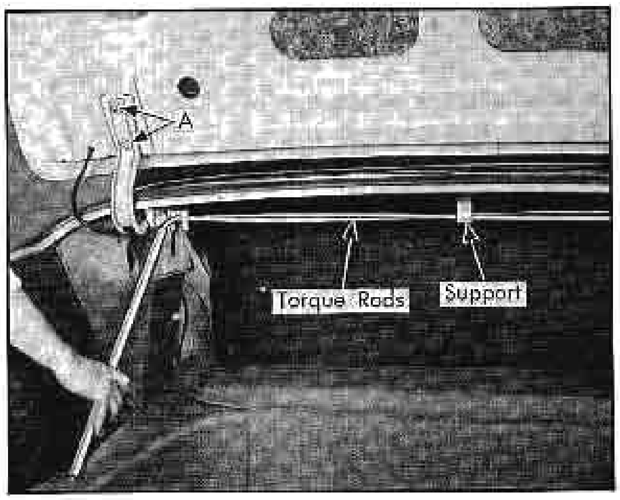

Fig. 3-81 Disengaging Deck Lid Torque Rod

movable portion of the hinge strap and remove the torque rod. Fig. 3-82.

6. Bend up retaining tab on hinge box at retaining pin and remove pin. Fig. 3-80.

7. Remove hinge from the hinge box.

c. Installation

1. Position hinge in the hinge box and install the hinge pin.

2. Bend down the hinge box tab to retain the hinge pin.

3. Install the two hinge straps to lid inner panel attaching bolts when the hinge strap is aligned to the previously scribed location.

4. Install the "U-shaped" end of the torque rod to the hinge box, making certain that the outer end of the rod is engaged in the hole on the outboard

Fig. 3-82 Deck Lid Torque Rod Removal

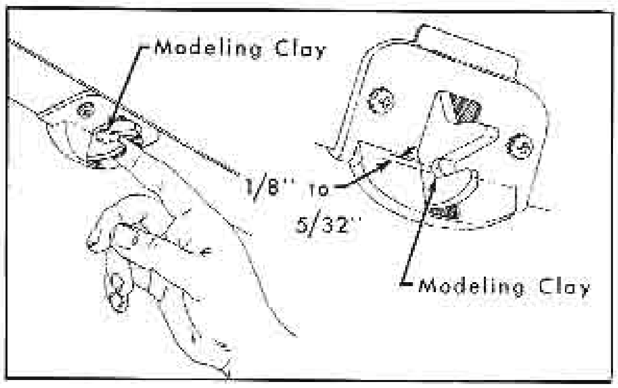

Fig. 3-83 Checking Deck Lid Lock Adjustment

5. Engage the torque rod to the lower movable portion of the hinge strap and engage the other end of the rod to the previously marked notch on the inboard side of the opposite hinge box.

6. Engage the torque rods to the torque rod support at the center of the shelf panel.

7. Check the alignment of the rear compartment lid, Fig. 3-19, and remove the protective covering.

(68) Deck Lid Lock Adjustment, Removal and Installation

a. Adjustment of Lock Bolt and Striker

1. Check the engagement of the deck lid lock with the lock striker by inserting a small amount of modeling clay at the bolt slot, Fig. 3-83, and closing the lid with a moderate pressure.

2. Open lid and check the amount of engagement as indicated by the compression of the clay. Measure the distance between the base of the "U" in the clay to the base of the "U" in the lock bolt. This dimension should be 1/8" to 5/32".

3. Adjust striker as necessary and use a spacer which is available for extreme adjustment requirements. Tighten all attaching screws.

b. Lock Cylinder and Lock Removal

1. Through the opening in rear compartment lid inner panel, Fig. 3-84, insert a suitable hooked tool to pull the lock cylinder retainer away from the lock cylinder.

2. Remove the lock cylinder and gasket from the outer panel of the rear compartment lid.

3. Remove three lid lock to lid inner panel screws.

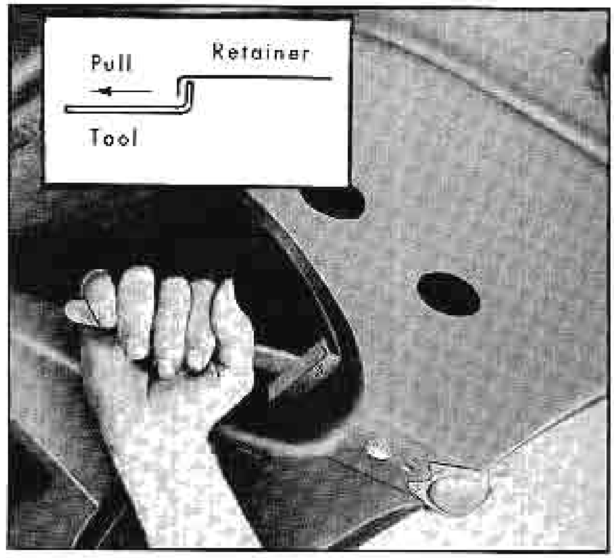

Fig. 3-84 Removing Deck Lid Lock Cylinder Retainer

4. Remove two cover plate to lid inner panel screws and remove the complete lock and cover plate assembly.

5. To install, reverse above procedure.

(69) Body Molding Removal and Installation

a. Sedans

1. Front and Rear Door Window Upper Reveal Molding --- Remove door window garnish molding Fig. 3-85 and upper section of glass run channel. Remove molding attaching screws and lower molding from door. To install, reverse removal procedure and apply a bead of medium-bodied sealer to molding as shown in Fig. 3-86 before assembling molding to door.

2. Front and Rear Door Window Lower Reveal Molding --- Remove door trim pad and loading hole

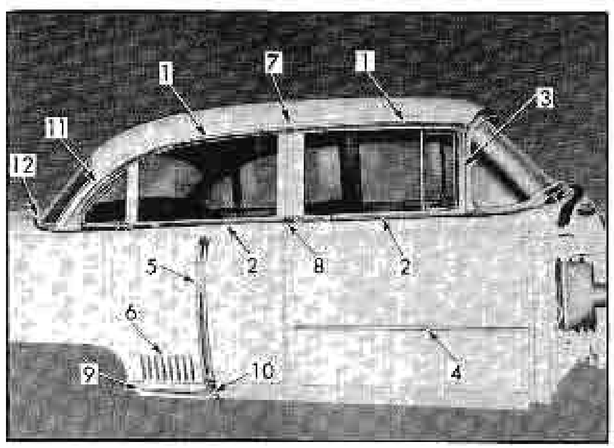

Fig. 3-85 Sedan Body Moldings

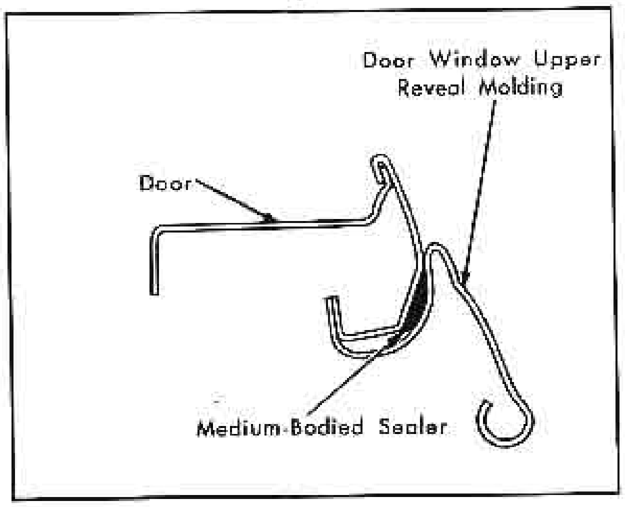

Fig. 3-86 Sealing Upper Reveal Molding

cover. Disengage glass from regulator cam and lower glass to expose attaching screws. Remove door outside handle and molding attaching screws then remove molding. Reverse above procedure to install.

3. Front Door Window Front Reveal Molding --- Remove front door trim pad, door ventilator and upper reveal molding. Remove molding attaching screws and remove molding. To install, reverse the removal procedure.

4. Front Door Lower Molding --- Remove door trim pad and loading hole cover. Remove screw at hemming flange and remove nuts and washers at door panel then remove molding. Reverse above procedure to install.

5. Rear Door Fender Shield --- Remove door trim pad, loading hole cover, and attaching nuts. Reverse above procedure, to install, being sure to install the rubber washers between outer panel and molding at attaching studs.

6. Rear Door Lower Moldings (60S) --- Remove door trim pad, loading hole cover, and two attaching nuts from each molding. To install, reverse removal procedure.

7. Center Pillar Upper Reveal Molding --- Loosen headlining and upper portion of center pillar trim sufficiently to allow removal of nut, then remove molding. To install, assemble filler and sealing washer to molding and reverse above removal procedure.

8. Center Pillar Lower Reveal Molding --- Remove screw from side of pillar and remove molding. Reverse procedure to install.

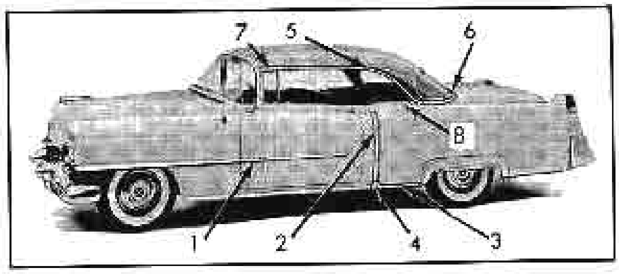

Fig. 3-87 Coupe Body Moldings

9. Fender Shield Molding Extension, Rear -- Remove two screws which hold lower edge of molding to rocker sill and lift molding up to disengage it from the retainer. When installing, apply a medium bodied sealer around attaching screw holes.

10. Fender Shield Molding Extension, Front --- Remove rear molding extension, and four front molding extension attaching screws. Reverse removal procedure to install.

11. Rear Quarter Window Reveal Molding --- Remove rear quarter window garnish molding, rear quarter window, and molding attaching screws and nuts. To install, reverse removal procedure.

12. Rear End Reveal Molding --- Loosen rear compartment side foundation, remove molding attaching nuts and washers, then carefully disengage front end of molding from under rear quarter window reveal molding. Reverse removal procedure to install.

b. Coupe Styles

1. Door Lower Molding --- Remove door trim pad and loading hole cover. Remove screw at hemming flange and attaching nuts and washers at door panel then remove molding. Reverse above procedure to install. Fig. 3-87.

2. Rear Fender Shield --- Remove rear quarter arm rest and loading hole cover. Remove molding attaching nuts and washers then remove molding. Reverse procedure to install.

3. Fender Shield Extension, Rear --- Remove two screws which hold lower edge of molding to fender and disengage molding from retainer at upper edge. Install by reversing above procedure, applying sealer around attaching screw holes first.

4. Rear Fender Extension Shield, Front --- Remove fender shield and rear extension then remove four attaching screws. Reinstall, using medium-bodied sealer around screw attaching holes and reversing above procedure.

BODY

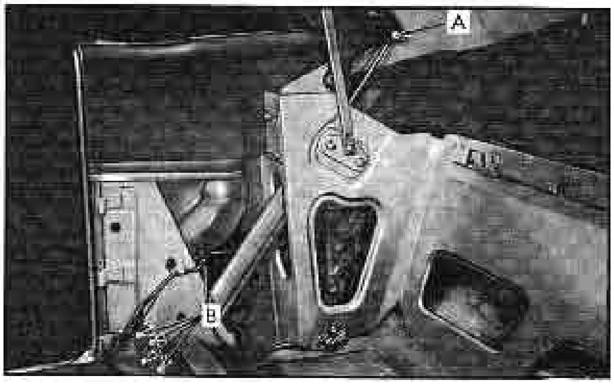

Fig. 3-88 Removal of Folding Top Lift Cylinder

5. Rear Quarter Window Upper Reveal Molding Remove rear quarter window sealing strip and molding attaching nuts and washers. To install, reverse removal procedure.

6. Rear End Reveal Molding --- Remove rear quarter window upper reveal molding and attaching screws and nuts from rear end reveal molding. To install, apply a medium-bodied sealer around screw holes and reverse above procedure.

7. Drip Molding Scalp --- Using a flat bladed tool, carefully pry scalp from drip molding. To install, position scalp on drip molding and snap molding into place with palm of hand.

8. "Coupe de Ville" Rear Quarter Ornament --- To remove, apply a strip of masking tape on body to protect finish and carefully pry ornament from panel. To install, apply sealer around clip holes, replace damaged clips, and snap ornament into place.

9. Windshield Header Molding --- To remove, lower top and remove rear view mirror support, upper sections of windshield garnish moldings, sunshade rod supports, sunshade supports, escutcheon at center and screw at end of each molding. Carefully disengage molding from under windshield reveal molding and remove from body. To install, reverse above procedure.

10. "El Dorado" Door Belt Molding --- To remove, apply a strip of masking tape above and below molding, remove attaching nut, and pry molding with attached clips from door. Apply sealer around clip attaching holes and install molding.

11. "El Dorado" Door Handle Escutcheon --- To remove, first remove door handle, door trim pad, and loading hole cover. Disengage glass from regulator cam and lower it to gain access to escutcheon attaching screw. Remove screws and slide escutcheon from under belt molding. Reverse above procedure to install.

12. Convertible Rear Quarter and Rear End Pinchweld Finishing Molding --- To remove, apply tape on panel below molding to protect finish. On inside of body, detach front edge of folding top compartment bag from rear seat back panel, and detach trim stick to gain access to screw at each end of each rear quarter molding. Pry molding from retaining clips and pinchweld. To install, reverse above procedure, replacing waterproof tape over pinchweld flange and applying a bead of sealer in crown of molding.

(70) Folding Top Lift Cylinder Removal and Installation

1. Raise the folding top to the full "up" position.

2. Disconnect the positive battery cable.

3. Remove rear seat cushion, rear seat back, and rear quarter arm rest assembly.

4. Remove nut and bolt "A" connecting lift cylinder piston rod to top linkage. Fig. 3-88.

5. Push cylinder rod down to bottom limit of its travel.

6. Remove retainers securing hydraulic tubing.

7. Remove four screws "B" securing folding top lift cylinder support to the body lock pillar-to-floor-pan upper brace.

8. Remove filler cap on the top of the reservoir to vent system to atmosphere.

9. Lift cylinder to gain access to fittings, then disconnect tubing from cylinder and cap fittings to prevent leakage of fluid.

10. Remove cylinder through hole in top compartment-to-floor-pan brace.

11. To install, reverse the removal procedure. Apply high pressure sealing compound to all male fittings before connecting the lines. Check the hydraulic fluid level in the reservoir and add fluid if necessary.

(71) Hydro-Lectric Motor and Pump Removal and Installation

1. Raise the folding top to the full "up" position.

2. Disconnect the positive battery cable.

3. Remove rear seat cushion and back.

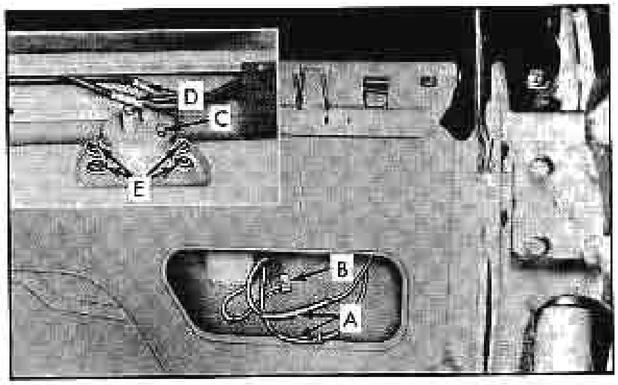

Fig. 3-89 Removal of Hydro-Lectric Motor and Pump

4. From inside of body, disconnect motor wires at "A" and ground wire at "B", Fig. 3-89.

5. Through the rear compartment opening, remove the four screws securing the motor and pump shield.

6. Remove filler cap at "C", inset of Fig. 3-89, to vent the reservoir, thus avoiding the possibility of forcing the fluid from disconnected lines.

7. Disconnect the hydraulic lines "D" and cap open fittings to prevent leakage of fluid.

8. Loosen grommets at "E" and lift motor and pump assembly from position.

9. To install, reverse above procedure. Seal hydraulic fittings by applying a good high pressure sealing compound to the threads of all male fittings prior to connecting the lines. Check and fill hydraulic fluid level in reservoir.

(72) Trouble Diagnosis

a. Window and Seat Electrical Circuits

NOTE: Door windows and seat adjusters are operated by individual, reversible-direction motors. Each motor has an internal circuit breaker to prevent overloading of the motor when it has completed a cycle of operation. Other components of the circuits are protected by a circuit breaker in the feed wire circuit. As the window and seat control circuits are connected through the ignition switch, these units will not operate until the ignition switch is turned "ON". When the ignition switch is turned on, current flows to a solenoid in the relay, located near the left front body pillar under the instrument panel. This solenoid closes the contacts between the power source and the feed wire to door window and seat adjuster switches, Fig. 3-90.

Checking for Current at a Door Window Switch--

1. Connect a light tester to the center terminal of the switch terminal block.

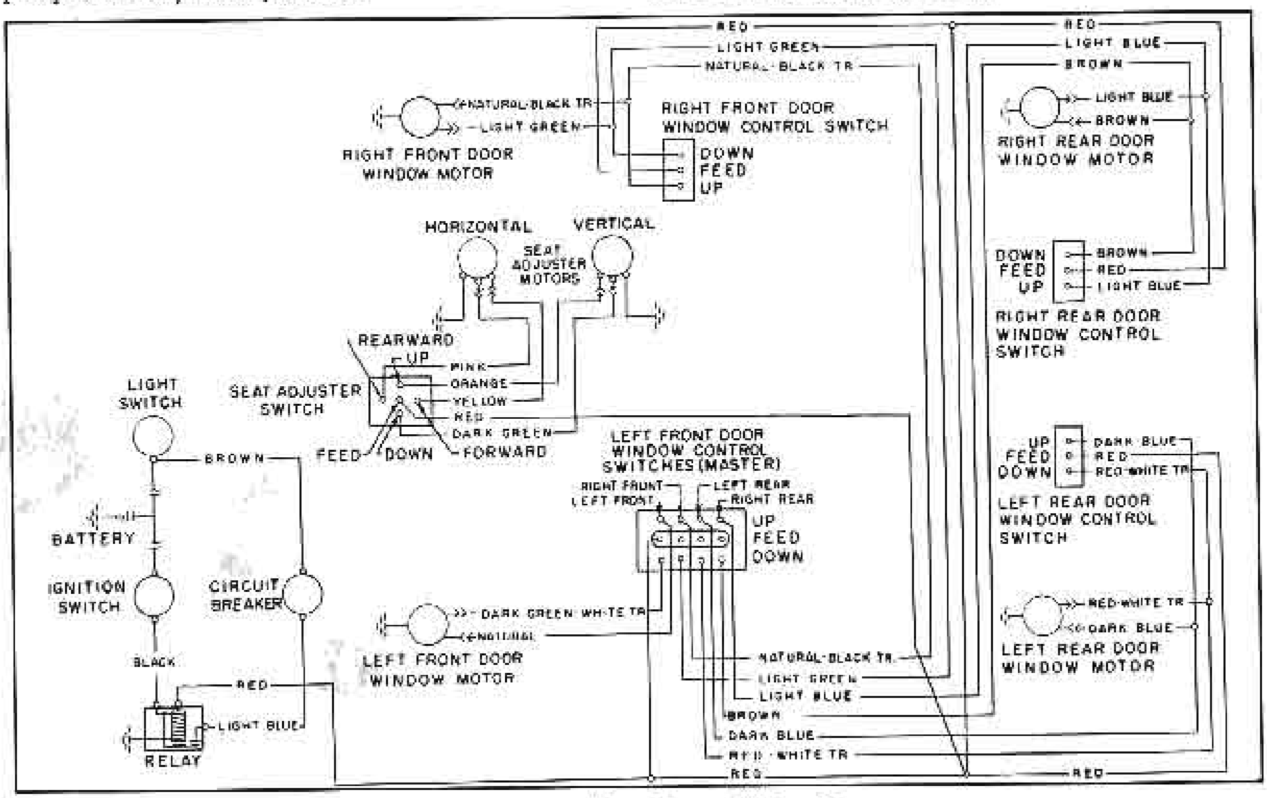

Fig. 3-90 Window and Seat Control Wiring Diagram

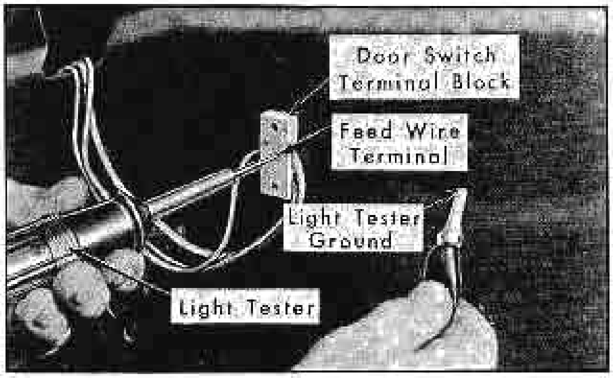

Fig. 3-91 Checking Door Window Switch Current

2. Ground the light tester ground lead to the body. Fig. 3-91.

3. If tester does not light, there is no current at the terminal block.

Checking a Door Window Switch-----

1. Place a #12 jumper wire on the switch terminal block between the center terminal (feed) and one of the two motor wire terminals Fig. 3-92. If motor operates the switch is defective.

Checking the Wire Between a Door Window Switch and Motor-----

1. Place a #12 jumper wire on the switch terminal block between the center terminal and the terminal of the motor wire to be checked.

2. Disconnect the end of the motor wire "A", Fig. 3-93, from the motor lead and connect wire "A" to the light tester.

3. Ground the light tester ground lead to the body. If tester does not light, there is no current at the wire "A" terminal contacting light tester.

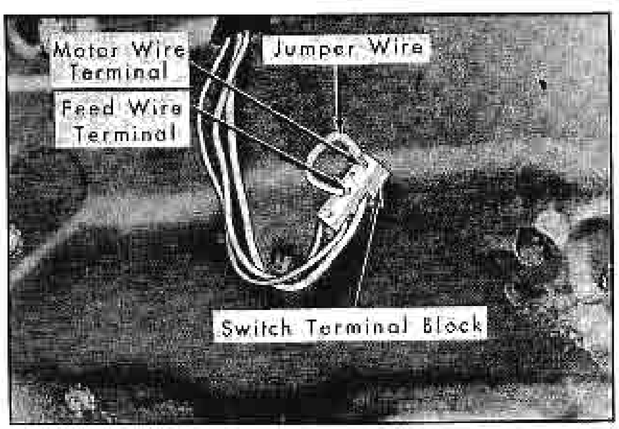

Fig. 3-92 Checking Door Window Switch Operation

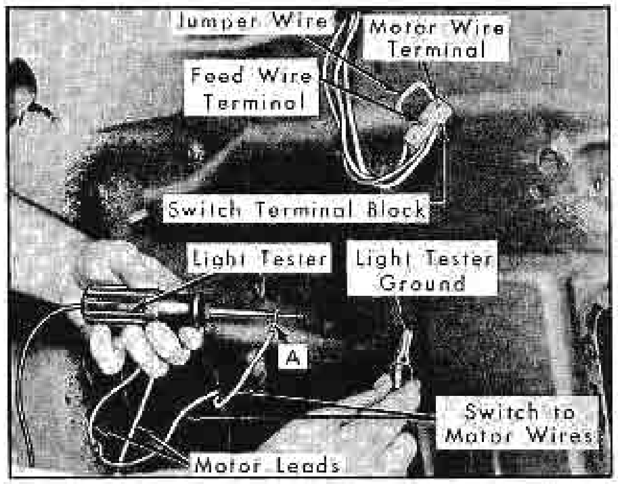

Fig. 3-93 Check Window Switch Lead Wire

Checking a Door Window Motor-----

1. Check the ground of the motor. Motor is grounded to door inner panel through regulator frame attaching screws.

2. Connect one end of a #12 jumper wire to battery positive pole and the other end to the lowering cycle motor lead terminal, Fig. 3-94. If motor fails to operate, motor unit is defective or a mechanical bind exists in the window assembly.

3. Repeat above check with jumper wire connected to the raising cycle motor lead terminal. If motor does not operate, motor unit is defective or a mechanical bind exists in the window assembly.

b. Hydro-Lectric Hydraulic System

NOTE: Failures in the hydraulic system can be caused by lack of hydraulic fluid, leaks in the system, obstructions or kinks in the tubing or hoses, or faulty operation of cylinder or pump.

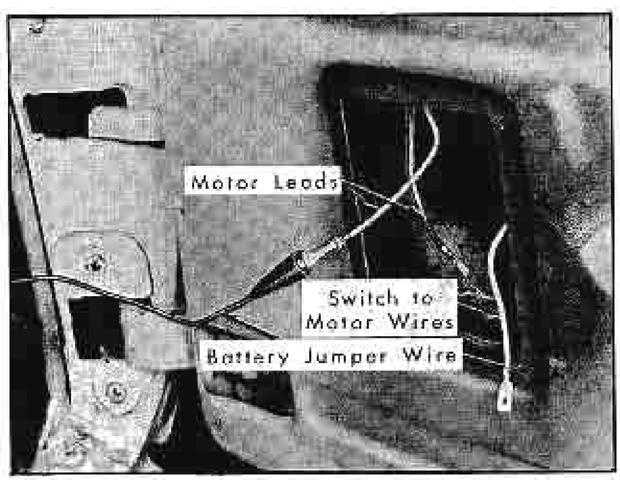

Fig. 3-94 Checking Door Window Motor

BODY

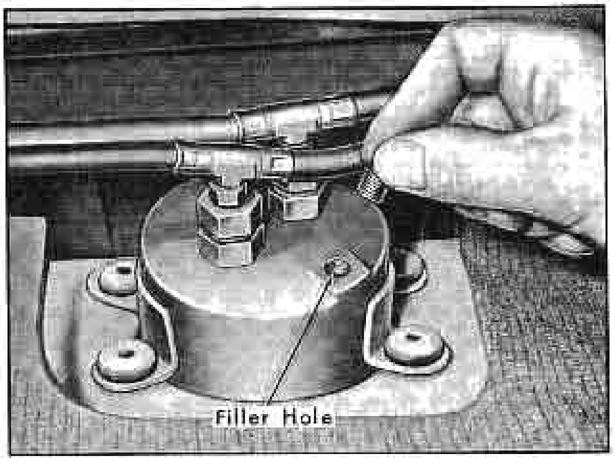

Fig. 3-95 Checking Hydraulic Pump Reservoir Fluid Level

Checking Hydraulic Fluid Level in Reservoir---

1. With top in the raised position, remove the hydraulic motor and pump assembly shield from the rear compartment.

2. Remove the filler plug from the pump reservoir, Fig. 3-95, and check the fluid level, using a suitable dipstick.

3. Fluid level should be 2" from the top of the reservoir. Add Delco #11 Brake Fluid to bring to specified level.

Checking Operation of Lift Cylinders-----

1. Remove the rear seat cushion and rear quarter side trim.

2. Operate the folding top control switch and observe the operation of the lift cylinders during the "Up" and "Down" cycles.

3. If operation is sluggish or causes binding of the top linkage, one of the cylinders may be inoperative or operating too slowly. This condition may be caused by either a defective cylinder or a clogged or kinked line. If lift cylinders do not operate or operate slowly, the pressure at the pump should be checked.

Checking the Pressure to the Cylinders-----

1. Remove the filler plug from top of reservoir.

2. Install a standard pressure gage between the pump port and "T" of the hydraulic lines leading to the bottom of the cylinders, Fig. 3-96.

3. Reinstall filler plug into top of reservoir.

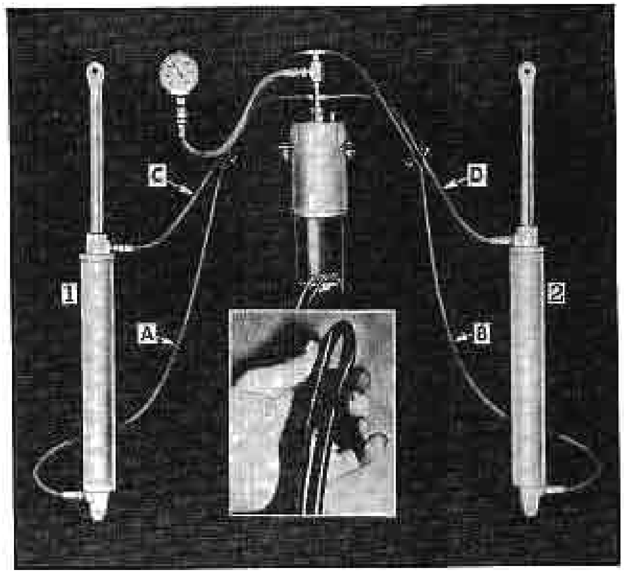

Fig. 3-96 Checking and Adjusting Hydraulic Pump Pressure

4. With the top in the full up position, push control knob in and hold for a few seconds. The pressure should read between 240 and 280 psi. If pressure is below this range, the pump is not delivering the proper pressure or there is fluid leakage past the piston in one or both cylinders.

5. Connect pressure gage between pump port and "T" of lines leading to top of cylinders. With top "UP" and locked, pull control knob out and hold for a few seconds.

Checking and Adjusting Hydro-Lectric Pump Pressure-----

1. Install pressure gauge in hydraulic lines leading to the bottom of the lift cylinders as shown in the illustration below.

2. Kink tubing "A" and "B", as shown in Fig. 3-96, to shut off fluid flow to the bottom of each cylinder.

3. Push control knob "in" and hold a few seconds. The pressure should be between 240 and 280 psi. The pressure may be adjusted as follows: Remove filler plug and place screw driver in position on the adjusting screw, Fig. 3-97.

Kink hydraulic tubing "A" and "B" to shut off fluid flow.

Push control knob "In".

With motor operating, adjust pressure relief valve for between 240 and 280 psi by turning ad-

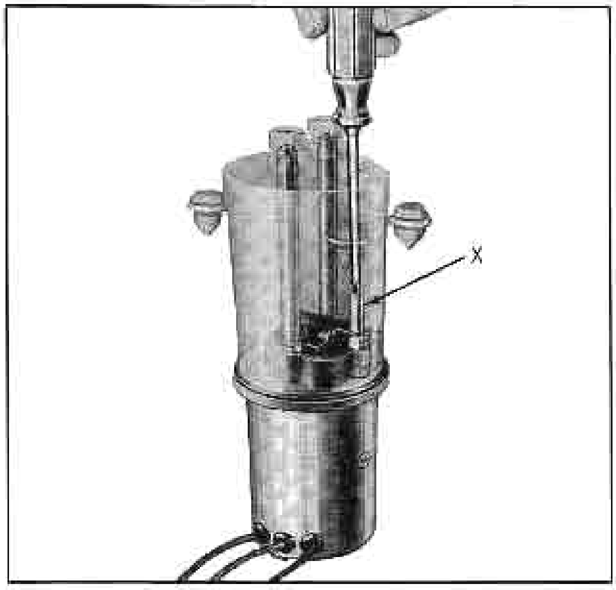

Fig. 3-97 Adjusting Pressure Relief Valve

justing screw "X" shown in Fig. 3-97, clockwise to increase pressure and counterclockwise to decrease pressure.

NOTE: The adjusting stud should not have to be turned more than two turns in either direction to obtain prescribed pressure.

4. Install pressure gauge in hydraulic lines leading to the top of the lift cylinders.

5. Kink tubing "C" and "D" to completely shut off fluid flow to the top of each cylinder.

6. Pull control knob "out" and hold a few seconds. The pressure should be between 240 and 280 psi. If pressure does not read within this range, it should be adjusted with tubing "C" and "D" kinked and the control knob pulled "out".

NOTE: A difference in pressure readings may exist between the pressure port for the bottom of the cylinders and the pressure port for the top of the cylinders. This is acceptable if both readings are within the limits of 240 to 280 psi.

7. If pressure cannot be adjusted within the limits, the trouble lies within the pump unit.

8. If pressure reads within the limits but the top does not operate or operates slowly, the fluid may be leaking past the piston in one or both of the lift cylinders.

c. Hydro-Lectric Electric Circuit

Checking for Current At the Folding Top Control Switch-----

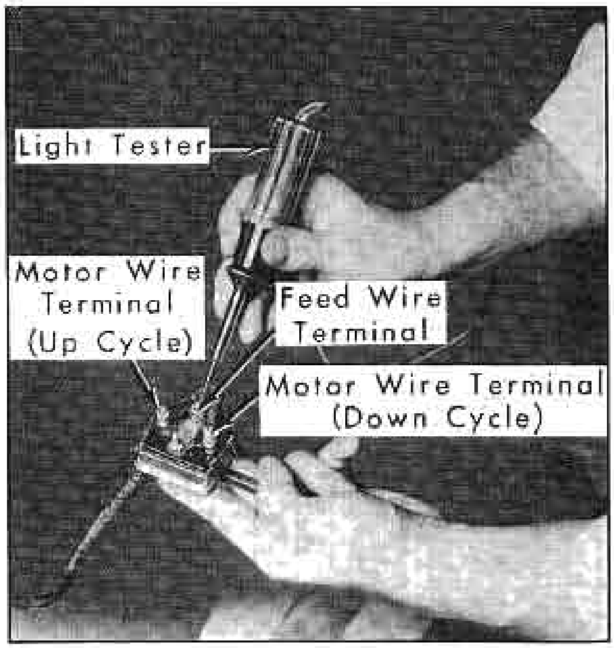

Fig. 3-98 Checking Switch to Motor Lead Wires

1. Connect a light tester to the feed wire terminal of the control switch. Fig. 3-98.

2. Ground the light tester ground lead to the body metal.

3. If light tester does not light, there is an open or a short circuit between the battery and the switch.

Checking the Folding Top Control Switch-----

NOTE: If there is current at the feed wire terminal of the switch, the operation of the switch can be checked as follows:

1. Disconnect the switch to pump motor wires from the switch terminals.

2. Connect a light tester to the "up cycle" pump motor terminal of the switch.

3. Ground the light tester ground lead to the body metal.

4. Push the control knob forward. If tester does not light, switch is defective.

5. Connect the light tester to the "down cycle" motor wire terminal of the switch.

6. Pull the control knob rearward. If tester does not light, switch is defective.

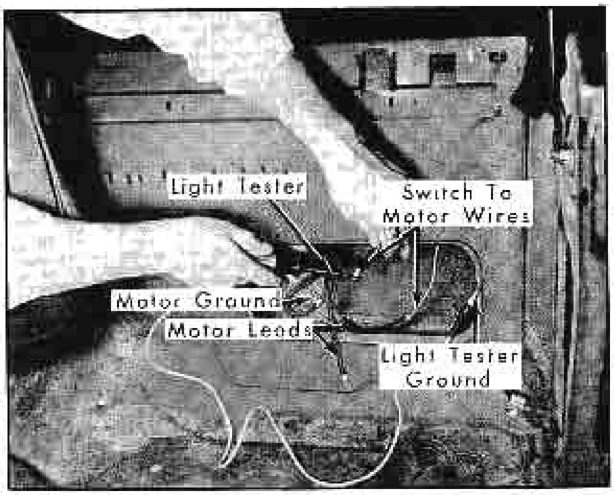

Fig. 3-99 Checking Folding Top Control Switch

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:

1. Disconnect the green-white tracer, switch-to-motor wire from the motor lead.

2. Connect a light tester to the green-white tracer, switch to motor wire terminal, Fig. 3-99.

3. Ground the light tester ground lead to the body metal.

4. Pull the switch control knob rearward. If tester does not light, there is an open or a short circuit in the wire.

5. Disconnect the red, switch-to-motor wire from the motor lead.

6. Connect the light tester to the red, switch-to-motor wire terminal.

7. Push the switch control knob forward. If tester does not light, there is an open or a short circuit in the wire.

(73) Convertible Top Adjustment

a. Adjustment of Top at Front Roof Rail Corner Brace

NOTE: If the top, when in a raised position, is too far forward or does not move forward enough to allow the guide studs on the front roof rail to enter the holes in the sunshade supports, adjust as outlined below.

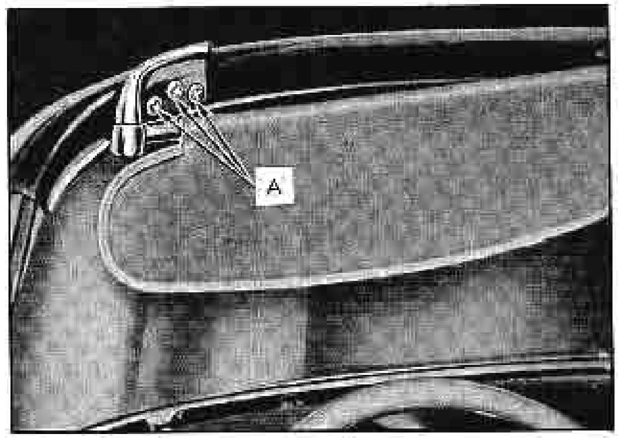

Fig. 3-100 Adjustment of Top at Sunshade Supports

1. Unlatch top and raise it above windshield header. Remove screw from groove of side roof rail weatherstrip at front corner.

2. Loosen corner brace attaching bolts and adjust front roof rail fore or aft as required. Repeat on opposite side if necessary.

NOTE: If additional adjustment is required, it can be made at the folding top male hinge. Note 73c, below.

b. Adjustment of Top at Sunshade Supports

NOTE: If a difficult locking action, caused by misalignment of the sunshade supports, is encountered at the front roof rail or if a closer fit of the front roof rail to the windshield header is desired, proceed as follows.

1. Unlatch top and raise it above windshield header.

2. Loosen screws, Fig. 3-100, and adjust sunshade support up or down or from side to side.

c. Adjustment of Top at Male Hinge

NOTE: If there is an excessive opening between the side roof rail rear weatherstrip and the rear quarter window, or if the front roof rail is too far forward or rearward, proceed as follows:

1. Loosen four male hinge attaching bolts "D" Fig. 3-101.

2. Move hinge fore or aft, as required; then tighten bolts.

3. Check side roof rail alignment and readjust if necessary.

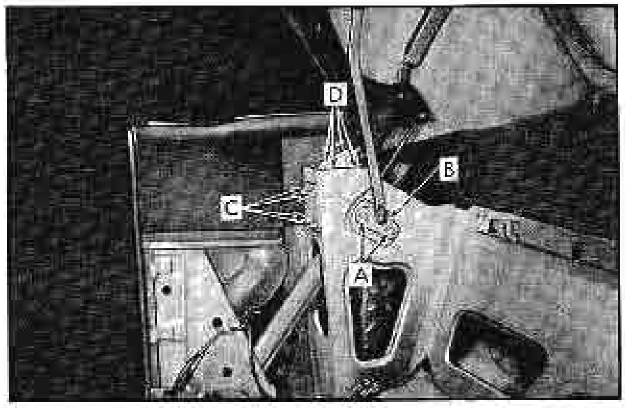

Fig. 3-101 Adjustment of Top at Rear Quarter

d. Adjustment of Top at Control Link Adjusting Plate

NOTE: Slotted holes are provided in the adjusting plate and support for an up or down and forward or rearward movement of the plate. When performing adjustments, keep adjusting plate at installed angle so that serrations of adjusting plate and support mesh.

1. If the side roof rail is too high or too low at the top of the door glass, proceed as follows:

Lower top approximately halfway.

Loosen two control link adjusting plate nuts, "A", Fig. 3-101.

Without any change in the fore or aft location of the adjusting plate "B", move adjusting plate up or down as required. To lower side roof rail, move adjusting plate "UP"; to raise side roof rail, move adjusting plate "DOWN".

2. If the top linkage does not touch the bumper when the top is in its lowered position, proceed as follows:

Lower top.

Loosen control link adjusting plate nuts and move adjusting plate directly rearward; then tighten nuts.

NOTE: This adjustment will lower the top into its compartment, and improve the fit of the top boot.

e. Adjustment of Top at Male Hinge Support

NOTE: If the side roof rail is too high or too low at the rear quarter window area, proceed as follows:

1. Loosen make hinge support attaching bolts "C", Fig. 3-101.

NOTE: In addition to the bolts, the support is secured firmly in place by serrations on the contacting surfaces of support and brace.

2. Adjust support up or down as required; then tighten bolts.

3. Check side roof rail alignment and readjust if necessary.

(74) Folding Top Trim Removal

1. Place protective covers on all exposed panels to protect finish.

2. Remove the following trim and hardware items:

Rear seat cushion and seat back.

Folding top compartment side trim.

Side roof rail rear weatherstrip.

3. Detach the folding top compartment bag from the rear seat back panel and pin it to the top, thus exposing the trim stick attaching screws.

4. Remove the trim stick screws, detach top material from short sticks and lift the assembly up from the body opening, Fig. 3-102.

5. Remove the wire-on-binding from the rear roof bow and detach the top material, back curtain and quarter stay pads from the center trim sticks and rear bow.

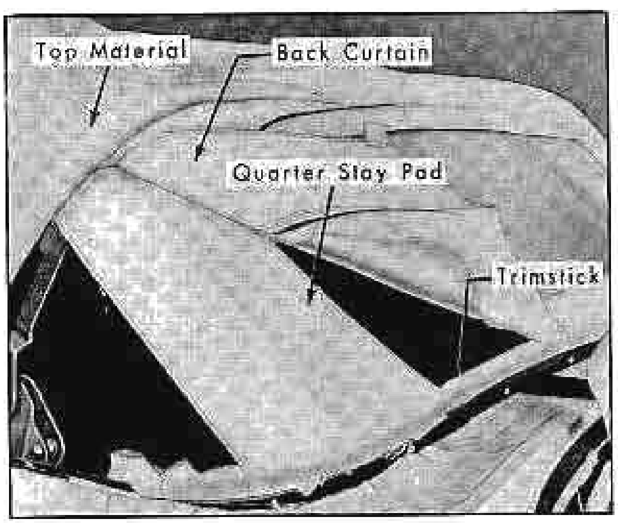

Fig. 3-102 Trim Stick Location

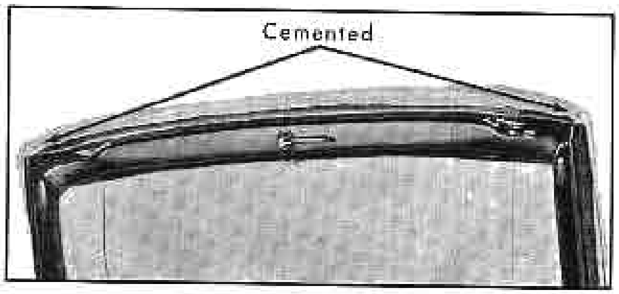

Fig. 3-103 Front Roof Rail Tacking Surface

NOTE: The trim sticks, with attached top compartment bag, can now be removed from the body, and placed on a clean bench.

6. At the front of the body, raise the front roof rail; remove the retainers and weatherstrip; and detach the top material from the rail. In Fig. 3-103 the weatherstrip has been removed to expose the tacking surface on the front roof rail.

7. Loosen the front end of the side roof rail front weatherstrip sufficiently to detach the top material flap which is cemented to the rail.

8. Detach the top material flap which is cemented to the side roof rail at the quarter window, and remove the top material and back curtain.

9. Remove the side stay pads which are attached to the front roof rail and rear bow with tacks and to the front and center bows with screws.

10. Lock front roof rail to windshield header and position the rear roof bow for proper top installation by installing spacer sticks as shown in Fig. 3-104. Note that sticks are placed 36 inches apart, each being 18 inches from the centerline of the body. The stick length is approximately 17-1/2 inches, measured from the chrome belt molding to the lowest edge on the rear roof bow.

(75) Convertible Top Trim Installation

a. Complete Top Trim

1. As a bench operation, tack the rear quarter stay pads to the large trim stick, see Fig. 3-105. Note that inner edges of pad are 26-1/4 inches from the center of the trim stick. The lower edges of the pads are set flush with the lower edge of the trim stick for positive location.

NOTE: On the left pad, leave wire harness pocket free of tacks for installation of dome light wire.

2. Center and tack the back curtain to the trim

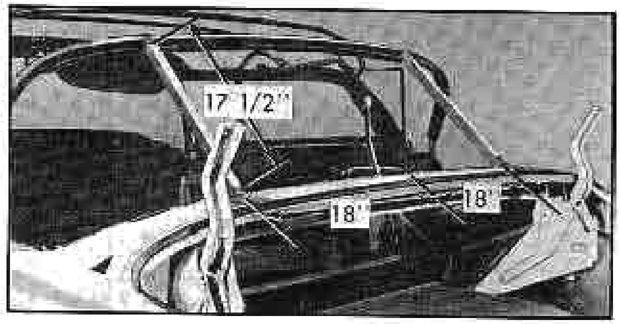

Fig. 3-104 Installing Spacer Sticks on Rear Roof Bow

stick as shown in the upper portion of Fig. 3-106. Lower edge of curtain should be set flush with lower edge of trim stick as shown in the lower portion of Fig. 3-106. Tack curtain to a point opposite outer edges of window and leave outer ends of curtain loose. Tacks should be placed close to each side of every screw hole in trim stick. Then pierce back curtain for each screw.

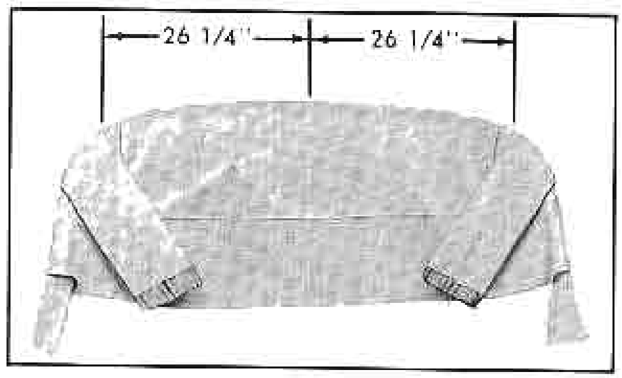

Fig. 3-105 Tacking Rear Quarter Stay Pads to Trim Stick

3. Inspect rubber trim stick fillers which are cemented to the body in the locations shown in Fig. 3-107. Re-cement if necessary and check to

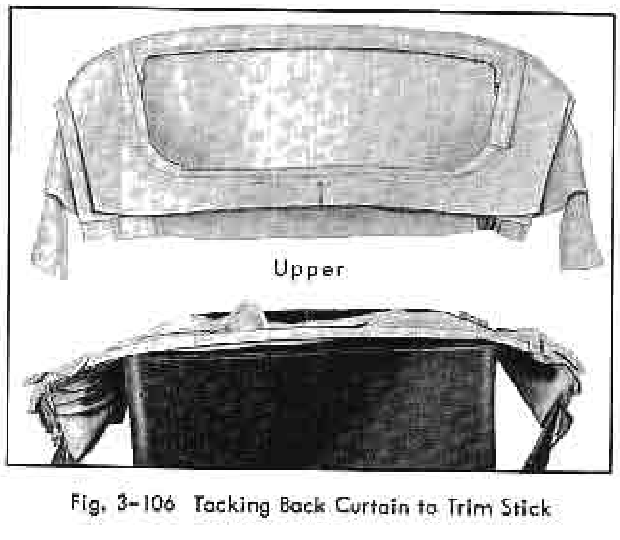

Fig. 3-106 Tacking Back Curtain to Trim Stick

BODY

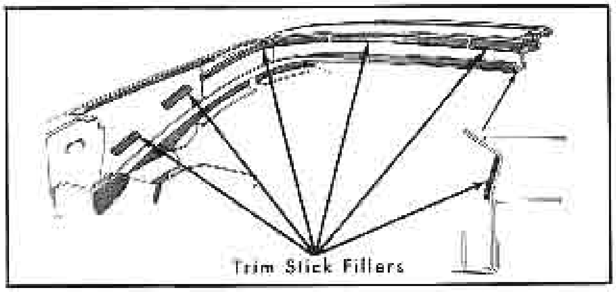

Fig. 3-107 Location of Trim Stick Fillers

insure proper spaces are present between the section of rubber. These spaces are necessary for drainage into the metal gutter located below the fillers.

4. Install the center trim stick, with pads and curtain attached, in the body and slip dome light wire through left stay pad. Secure the back curtain with one tack in the rear bow to prevent damage to the plastic sheet. Attach the trim stick with screws at each end, at the sharp bends and at the center. Make sure that each screw is driven completely in.

5. Tack the quarter stay pads to the rear bow with the inner edges 23-1/4 inches from the center of the bow, as indicated in Fig. 3-108. Trim off excess material at rear bow.

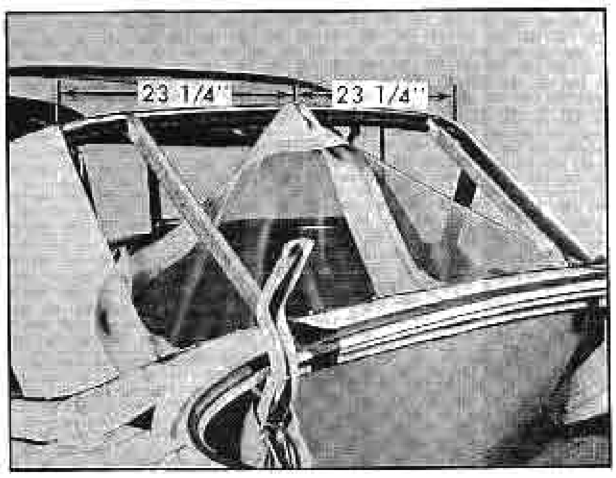

Fig. 3-108 Tacking Quarter Stay Pads to Rear Bow

6. Install side stay pads in the conventional manner. Set center bow as indicated by dimension in Fig. 3-109. This dimension is approximately 19-1/8 inches from the rear bow and is measured from the center of each bow at the inner edge of the pad.

7. Remove spacer sticks when side pads have been installed.

8. Then, tack back curtain to rear bow as shown

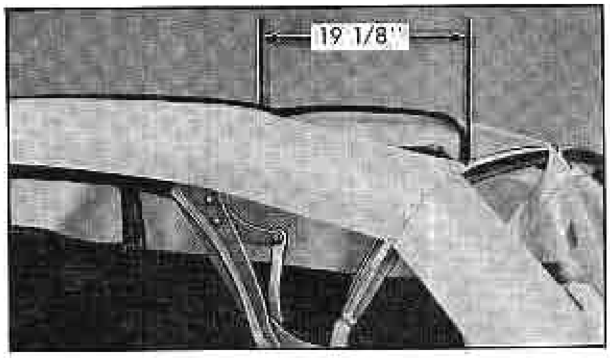

Fig. 3-109 Locating Center Bow

in Fig. 3-110. Make sure all fullness has been drawn from curtain before trimming off excess at rear bow.

NOTE: It may be necessary to install additional trim stick screws to check the fit of the curtain along the belt line.

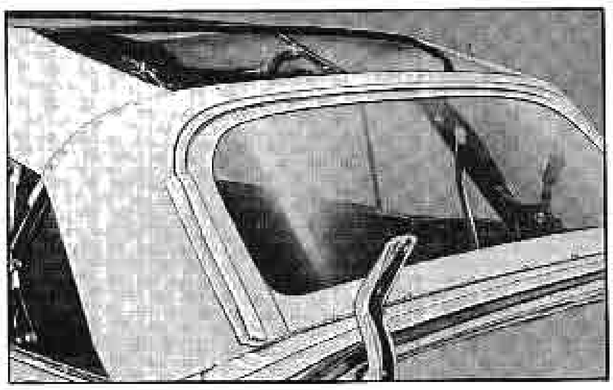

Fig. 3-110 Tacking Back Curtain to Rear Bow

9. Position the top trim on the framework and center the assembly both fore and aft and side to side. Positively locate top by engaging the weather flaps at the back curtain and by cementing the quarter flaps to the side roof rails, Fig. 3-111.

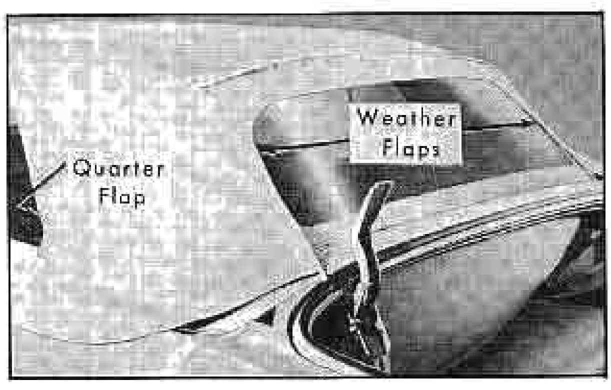

Fig. 3-111 Positioning Top Trim on Framework

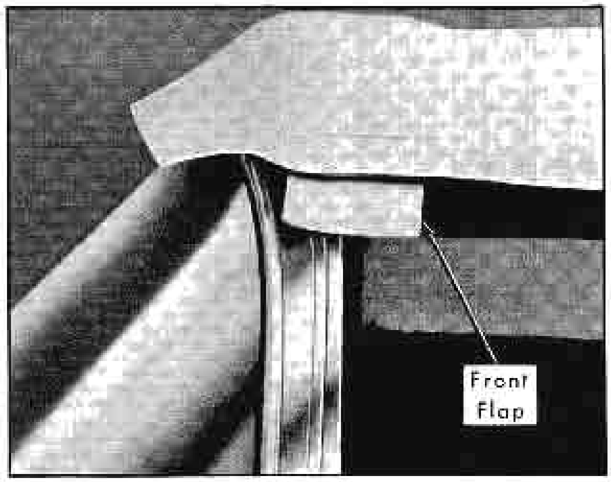

Fig. 3-112 Cementing Front Flap to Side Roof Rail

10. Stay-tack the top of the rear bow, as shown in Fig. 3-111, and align and stay-tack the seams on the outer ends of the rear bow.

11. At the front roof rail, pull top material forward (do not stretch excessively tight), and cement the front flaps to the side roof rail. Install side roof rail front weatherstrips. See Fig. 3-112.

12. In the rear quarter area, remove center trim stick screws and install the top material into the body. Trim stick screws beneath the back window must hold trim stick in position during the following operation.

13. Inside the body, draw down the outer ends of the back curtain (see Step 2) and the top material. When it has been determined that the back curtain and top material are fitting properly together and to the chrome belt molding, mark the curtain and top as shown in Fig. 3-113, and install enough trim stick screws to maintain position.

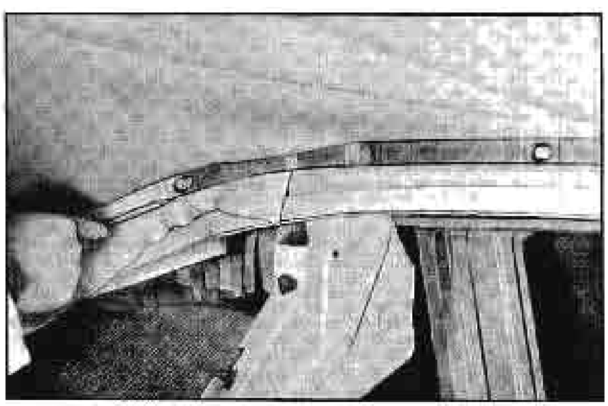

Fig. 3-113 Marking Position of Back Curtain and Top

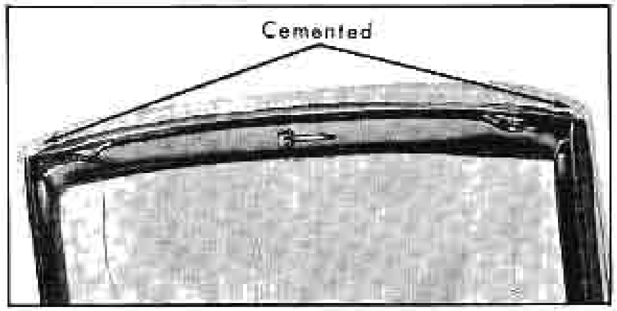

Fig. 3-114 Cementing Top Material to Front Roof Rail

14. At the front of the body, draw the top material forward across the front roof rail which must be locked to the windshield header. When most of the fullness has been removed, mark the under side of the top material opposite the front edge of the rail.

15. Unlock the roof rail and apply a good trim cement to the lower side of the rail and to the top material which will contact this portion of the rail.

16. Align and cement the top material to the front roof rail, lock the top and check fit of top material. Make any necessary alterations in the position of the top material at this time.

17. Next, unlock the top and tack the material to the rail. Fig. 3-114. Note the mitered folds at the outer seams.

18. Install the front roof rail weatherstrip and retainers and lock front roof rail.

19. Recheck final marked position of back curtain outer ends and top material at trim stick (see Step 13), draw top material to desired tension (not "drum" tight) and tack top material to rear bow, Fig. 3-115.

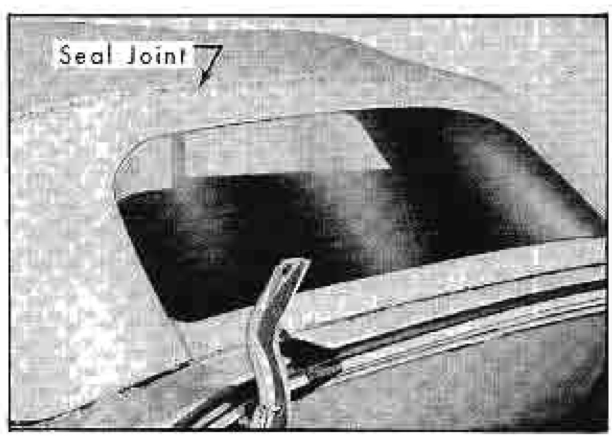

Fig. 3-115 Sealing Top Material to Rear Bow Joint

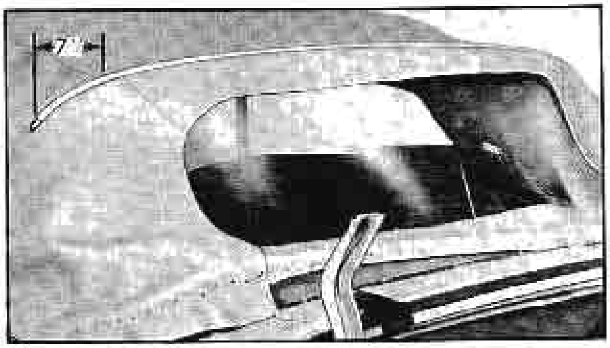

Fig. 3-116 Limit of Tacking Surface-Top Material to Rear Bow

CAUTION: This tacked joint must be sealed with a good convertible top fabric sealer.

The tacks outboard from the seams should be restricted to a distance not to exceed 7 inches, which is the length the wire-on binding extends past the seam.

20. Detach trim stick and tack outer ends of back curtain and top material to stick, as shown in Fig. 3-116. Use marked line as locating reference.

21. Install trim stick with all screws and install wire-on binding.

22. Inside the body, draw quarter section of top to desired position, with short trim stick held in place by hand. While holding material to trim stick, roll stick to expose tacking surface, and tack top material to trim stick. Then install trim sticks with metal screws. The finished installation is illustrated in Fig. 3-117.

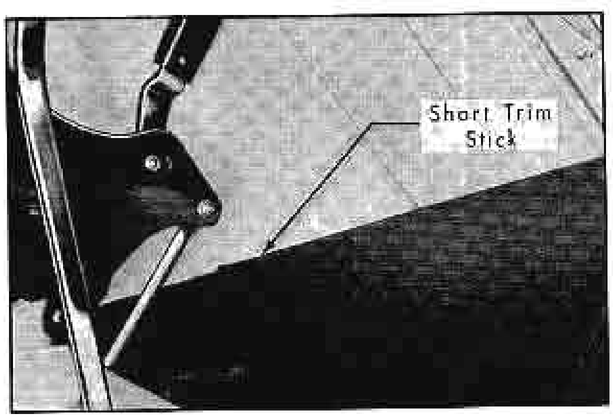

Fig. 3-117 Top Quarter Section Final Assembly

23. When completed, the folding top should be free of wrinkles and draws. Check the operation and locking action of the top. Following the operational check, trim off excess material below large trim stick.

24. Install all previously removed trim and hardware, and clean any soilage from top material, back curtain or pads.

b. External Top Material Only

To install the external top material only, remove the material without disturbing the back curtain or stay pads. Then, install the replacement top trim as outlined in the preceding installation procedure, beginning with Step 9.

c. Back Curtain Only

To install a replacement back curtain it is necessary to detach the top material from the rear belt trim sticks and from the rear bow. By making reference marks on the folding top trim and on protective tape along the belt molding, the top material may be returned to its original position with a minimum of re-fitting.

(76) Cleaning the Back Window

1. To remove road dust, use a soft cloth moistened with water and wipe crosswise of the window to remove superficial dust.

Do not use a dry cloth or paper cleaning tissue.

2. To clean the back window use cold or tepid (not hot) water and a mild (not caustic) neutral soap suds. After washing, rinse with clean water and wipe with a slightly moistened damp cloth.

CAUTION: Never use cleaners of alcoholic or chemical content as they may have a deteriorating effect on the plastic or may spot the Duco finish below the window, if spilled.

3. Do not use a scraper to remove frost, ice or snow from the plastic back window. Warm water may be used in an emergency.

BODY SPECIFICATIONS

Series 54-62, 129" Wheelbase, Fisher Bodies

54-6237 . . . . 5 Pass. Sport Coupe
Electric controls optional.

54-6237D . . . . . . 5 Pass. Special Sport Coupe
Electric control of front seat, door and quarter windows. (Coupe de Ville)

54-6267 . . . . 5 Pass. Convertible Coupe
Fabric top with Hydro-Lectric control of top. Electric control of front seat, front door and quarter windows.

BODY

54-6267 . . . . . 5 Pass. Special Sport Conv. Cpe.
Fabric top with plastic covered top well. Hydro-Lectric control of top. Electric control of front seat, front door and quarter windows (El Dorado)

54-6219 . . . . 5 Pass. 4-Door Sedan
Electric window and seat controls optional.

Series 54-60S, 133" Wheelbase, Fleetwood Bodies

54-6019 . . . . 5 Pass. 4-Door Sedan
Electric control of front seat and door windows.

Series 54-75, 149-3/4" Wheelbase, Fleetwood Bodies

54-7523
Two auxiliary seats, sliding quarter window and electric control of front seat and door windows.

54-7533 . . . . . 8 Pass. 4-Door Imperial Sedan
Two auxiliary seats, sliding quarter window and electric control of front seat and door windows and divisional glass.

Series 54-86, 158" Wheelbase, Commercial Chassis

Bodies manufactured by:

The Meteor Motor Car Co., Piqua, Ohio
The A. J. Miller Co., Bellefontaine, Ohio
The Eureka Co., Rock Falls, Illinois
The Hess & Eisenhardt Co., Rossmoyne, Ohio
Superior Coach Corp., Lima, Ohio

NOTE: Vertical front seat adjustment is optional on all models with electric control equipment except the 75 Series: vertical seat adjustment is not available for the 54-75 Series cars.

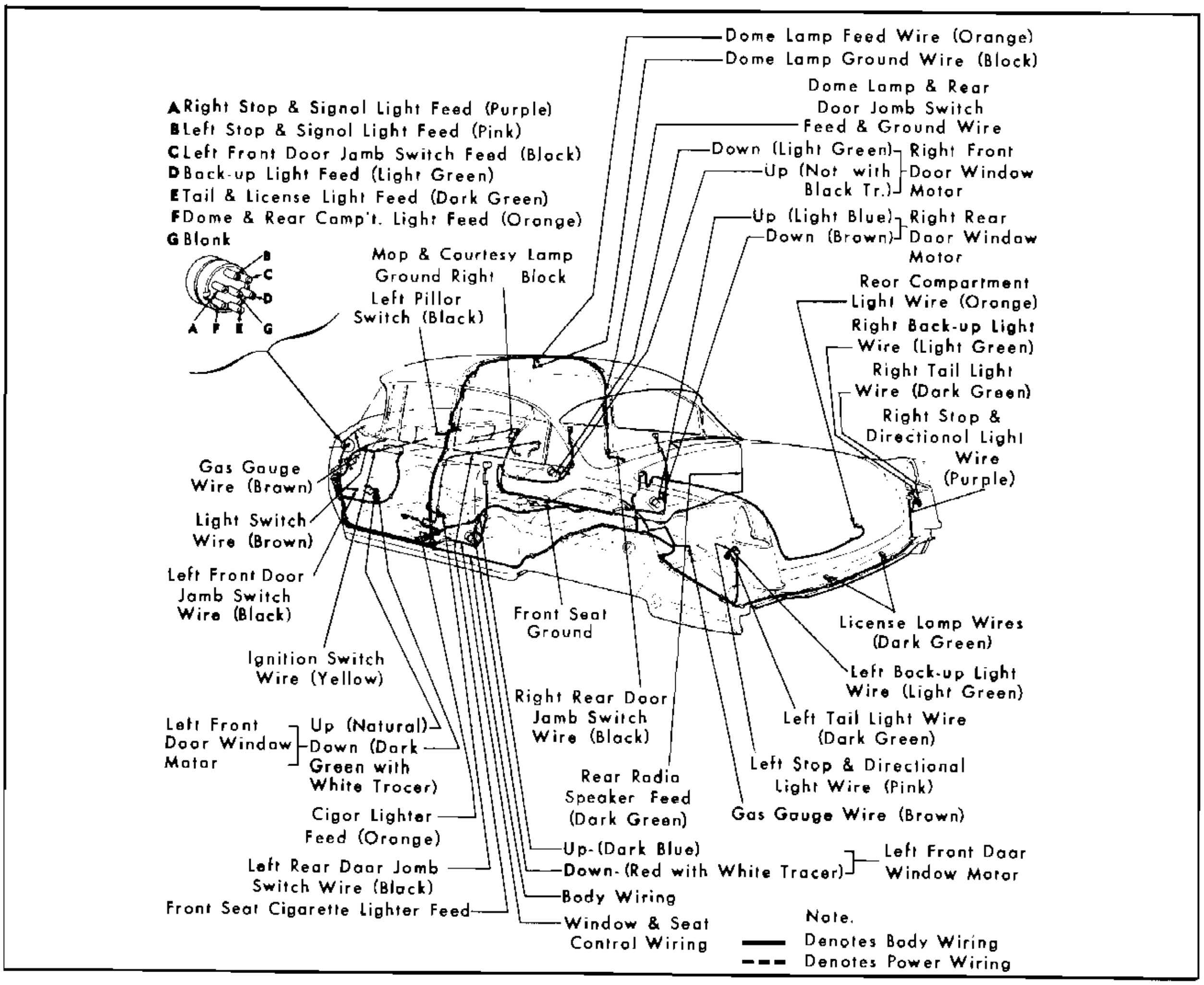

Fig. 3-118 Body Wiring - 60S and 6219 Sedans

BODY

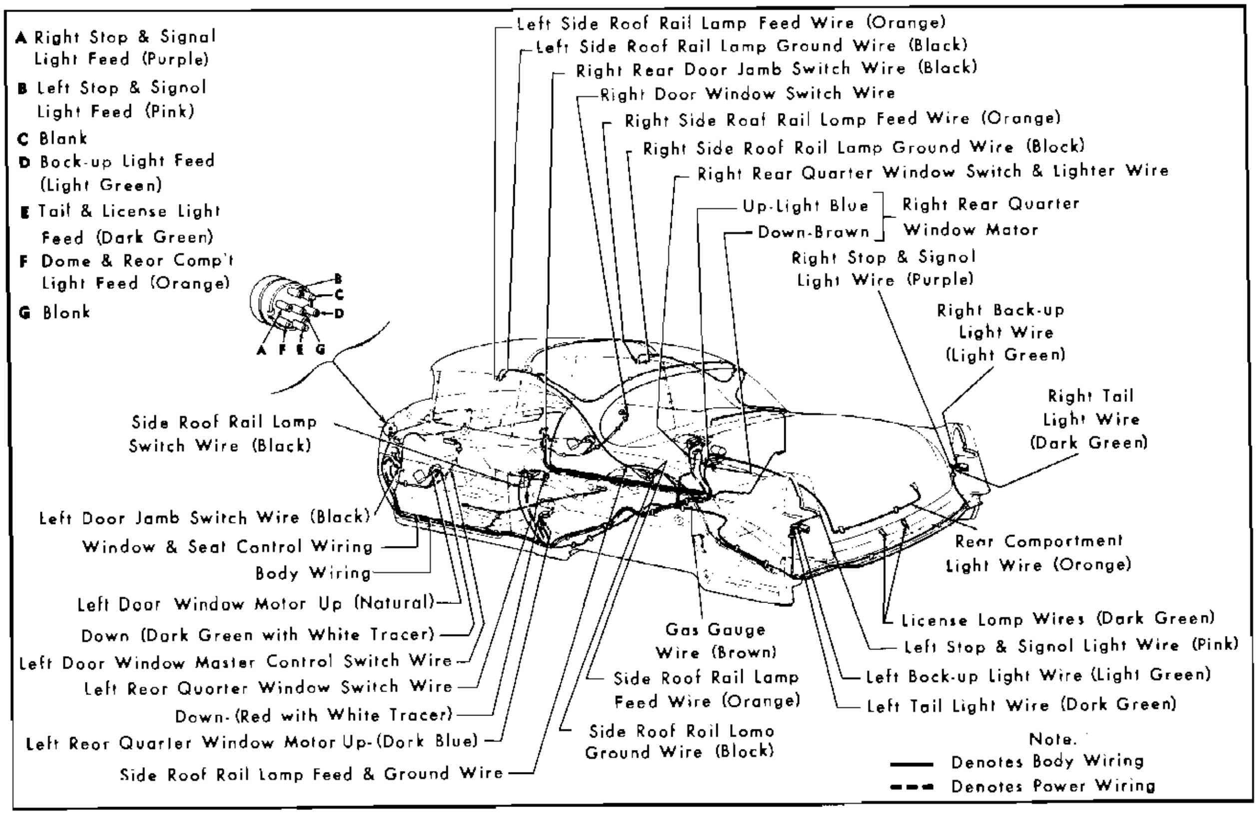

Fig. 3-119 Body Wiring - Closed Coupes

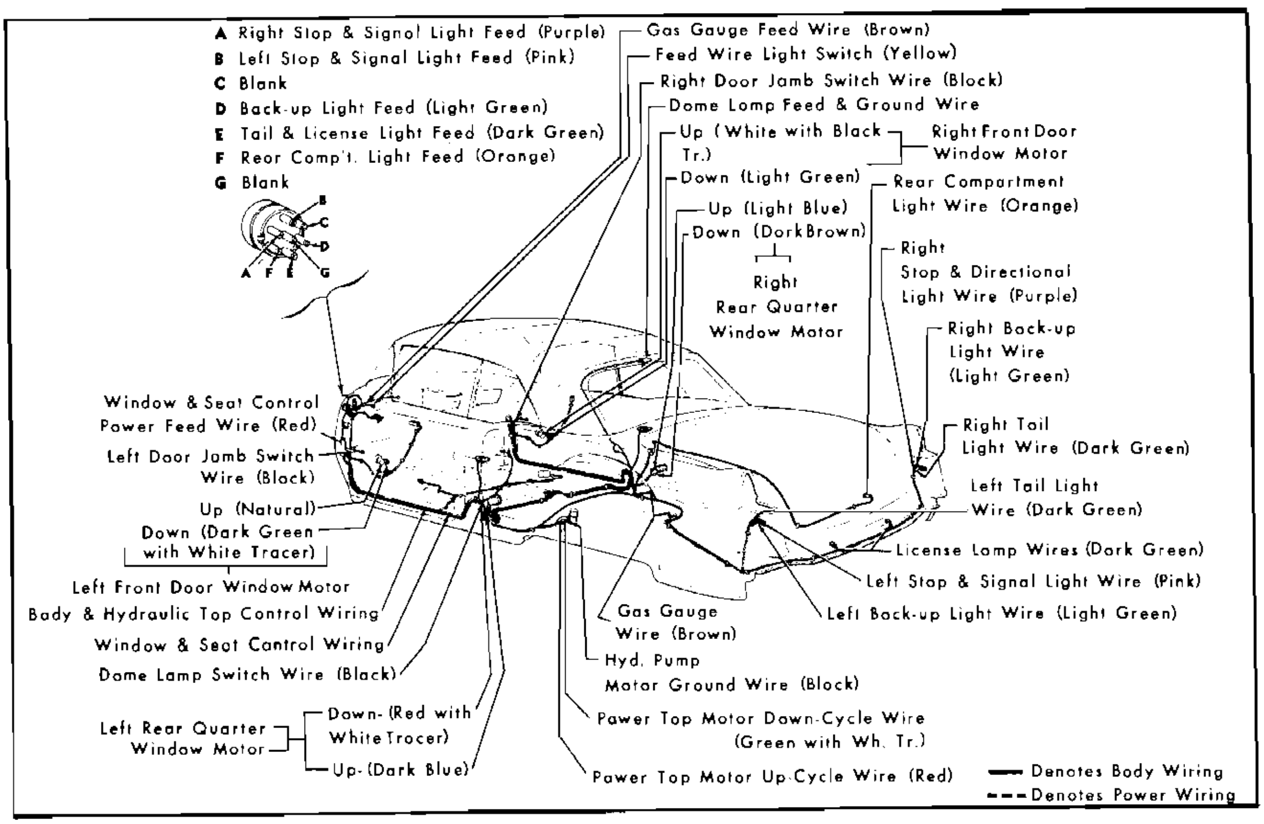

Fig. 3-120 Body Wiring - Convertible Coupes

BODY

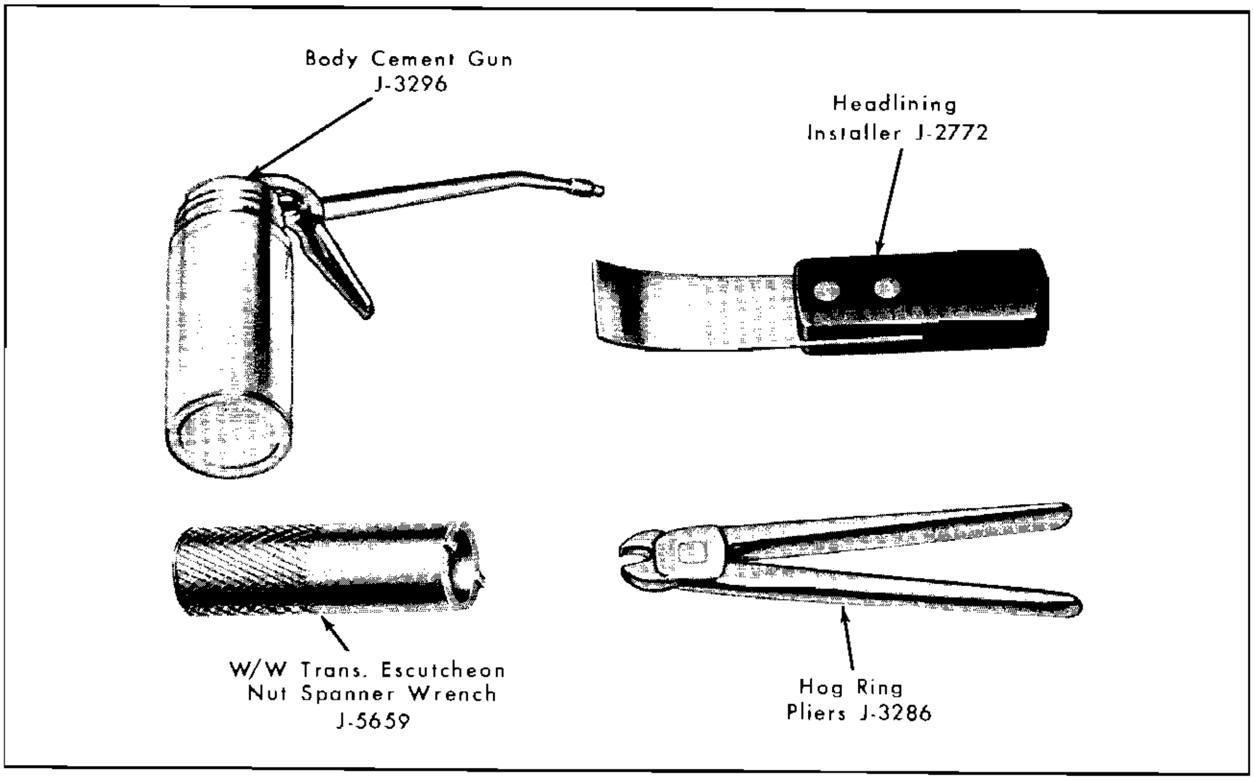

Fig. 121 Special Tools

OTHER NOTES AND REFERENCES

CHASSIS SHEET METAL

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GENERAL DESCRIPTION

The hood top panel on 1954 Cadillac cars is hinged at the cowl and opens from the front. The hood lock pilot and safety catch are located on the hood lock plate which is attached to the radiator support; the safety latch and hood lock are located on the front hood reinforcement. The hood is unlocked by pulling a release lever which is accessible through the radiator grille opening just to the left of center. The lever first releases the pilot lock, then the safety latch, permitting the hood to be raised.

The front bumper assembly consists of four bolted-together sections; the outer impact bars, a center impact bar, and a bumper guard tie bar. The rear bumper assembly consists of three bolted-together sections. With this design, replacement of any one section may be made on either the front or rear bumper in case of damage.

The radiator grille assembly, consisting of closely spaced horizontal and vertical fins, is removable as an assembly with the front bumper. Horizontal or vertical fins may be replaced individually.

SERVICE INFORMATION

(1) Adjustment of the Hood Lock Mechansim

The hood lock catch plate is attached to the radiator support and center baffle by five mounting screws. Two elongated holes at the radiator support permit fore and aft adjustment of the hood lock catch plate. Fig. 4-1. The pilot lock plate on the front hood reinforcement has elongated holes for side to side adjustment. Fig. 4-2. The hood lock pilot is adjusted vertically by loosening the pilot locking nut, screwing the pilot up or down as required, and tightening the nut. In any case where the hood lock assembly or hood lock catch plate has been removed, the mounting screws loosened or the hood alignment changed, be sure the proper adjustment has been obtained before tightening the hood lock, hood lock plate mounting screws, and the pilot bolt.

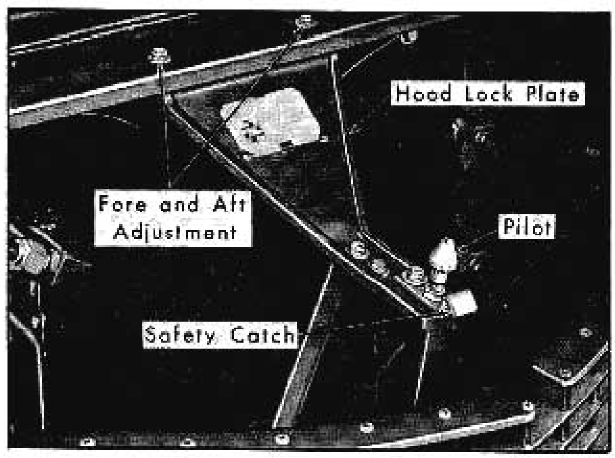

Fig. 4-1 Hood Lock Plate

(2) Removal of Hood Panel

1. Scribe hinge location on hood to aid in repositioning hood on installation.

2. Remove nut and bolt holding center of hood hinge assembly to hood panel guide.

3. Remove three screws holding each side of

hood hinge assembly to hood panel. Do not attempt to hold hood open beyond its counter-balancing point during removal.

4. Remove hood, being careful not to damage finish.

(3) Installation of Hood Panel

1. Place hood in position on hood hinge assembly and install three screws on each side loosely.

2. Position hood so that hinge lines up with scribe marks and tighten screws on each side.

3. Install nut and bolt holding center of hinge to hood panel guide.

4. Close hood and check alignment of hood at cowl fender, and grille openings.

5. Align hood to cowl if necessary, as explained in Note 4.

6. Up and down alignment of the front of the hood panel, in relation to fenders, may be adjusted by regulating height of hood rubber bumpers, fastened to fender front mounting bracket.

(4) Hood Adjustment

a. Hood Panel to Cowl Adjustment

1. Loosen hinge to cowl mounting screws, install a short 3/8" diameter pin in hole in hinge, and move hinge until pin will also enter hole in cowl. This will hold hinge in position at this point. Fig. 4-3.

2. Rotate hinge assembly upward and rearward around pin as far as possible and tighten screws.

3. Loosen three hinge to hood panel attaching screws at each side. Elongated holes provide fore, aft, and side to side adjustment of the hood.

4. Loosen the hinge reinforcement to hood center moulding attaching nut.

5. Move hood forward or rearward until clearance between rear edge of hood panel and body cowl ledge is equal on both sides. See Fig. 3-18, in the Body Section.

6. Position rubber bumpers in channel along the top of the cowl ledge so that hood is 1/16 inch below cowl from center of car to 25 inches from centerline. From this point outward, the hood should taper from 1/16 inch to flush in relation to the cowl. Fig. 4-4.

NOTE: Variable thickness rubber bumpers are available from the Factory Parts Department.

7. Adjust hood rear guide, if necessary, to prevent hood from binding when opening, by loosening guide attaching nut and moving guide rearward or forward as required.

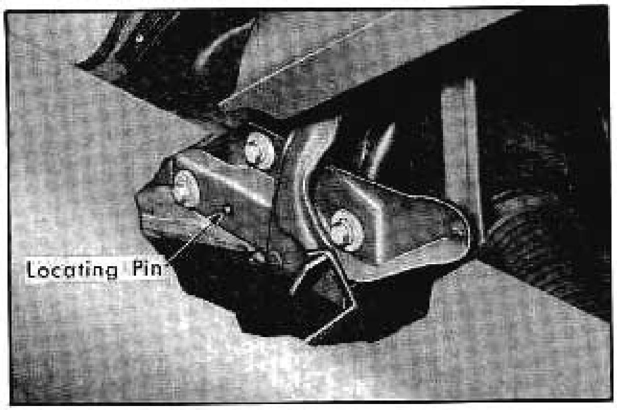

Fig. 4-3 Hood Hinge Adjustment

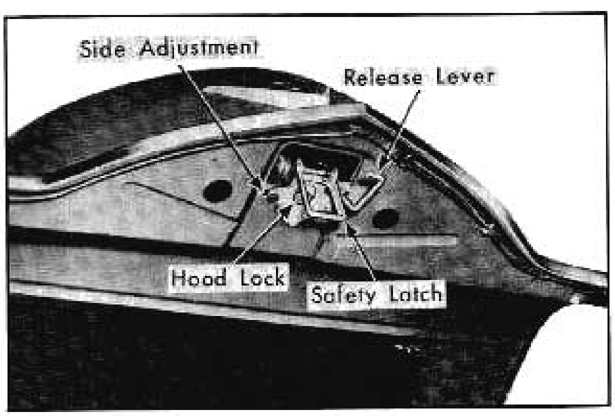

Fig. 4-2 Hood Lock

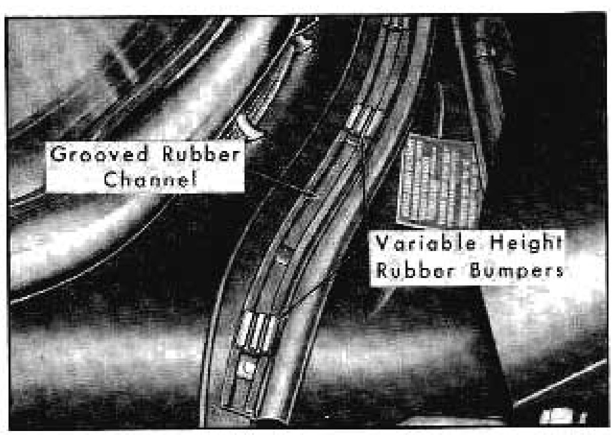

Fig. 4-4 Adjusting Hood to Cowl with Rubber Bumpers

8. Felt pads may be cemented in position between hood reinforcement and hood panel to prevent rumble or looseness of hood.

9. Tighten hinge to hood screws on both sides and hinge reinforcement to center molding nut.

10. Loosen hinge to cowl screws on both sides and, with pins in locating holes, revolve hinges downward slightly, just enough to secure the tightness or "wrap" of the hood panel while maintaining an even spacing between cowl and rear edge of hood.

11. Tighten hinge to cowl screws.

12. Three notches in hood spring lower bracket provide additional adjustment of hood tightness or wrap at the cowl when the hood is closed. The notch closest to the front door gives the greatest tightness of the hood at the cowl. If hood is too tight in this position, the spring should be moved to the center or front notch, depending upon the fit desired.

b. Adjustment of Fenders to Hood and Doors

1. Loosen fender mounting screws at frame, radiator support, and cowl.

2. Position fender so that space between fenders and hood is equal at front and rear and that the hood and fender are at the same height in the area where the fender is attached to radiator support.

NOTE: The clearance between the door and fender at the top and bottom should also be checked and adjusted at the same time to prevent interference.

3. Tighten fender mounting screws.

4. Check the wedge shaped rubber bumpers attached to the fenders to see that they are supporting the hood when it is in a closed position to prevent metal to metal contact.

(5) Removal and Installation of Hood Spring

1. Open hood and prop as high as possible.

2. Using a pry bar of sufficient length to provide ease of leverage, and a strong wire or hook attached to the bar as shown in Fig. 4-5, place bar under frame, below hood spring, and engage hook or wire on lower loop of hood spring.

3. Disengage lower spring loop from bracket and release pressure on pry bar slowly, until spring is loose, then unhook upper end of spring from hinge.

4. To install spring, engage upper end in position on hinge and reverse above steps.

(6) Removal of Radiator Grille and Front Bumper Assembly

1. Disconnect parking or fog lamp wires at junction block on fender support brackets.

2. From under side of front fenders, remove radiator grille extension to front fender hanger screws.

3. Remove four bumper mounting bar to frame bolts. Note the number of shims, if any, between the mounting bar and the frame so that the same number may be reinstalled.

4. Remove bumper and radiator grille assembly from the car, and place it upon a suitable padded covering.

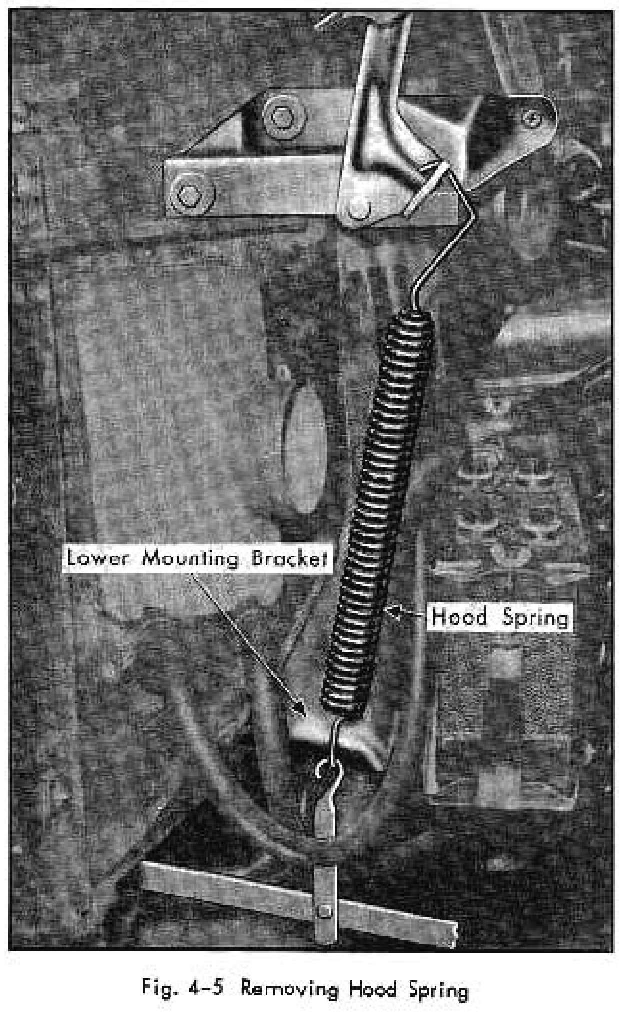

Fig. 4-5 Removing Hood Spring

(7) Removal of Radiator Grille From Front Bumper

1. Remove two bolts attaching vertical fin to bumper guards.

2. Remove three vertical fin to bumper guard tie bar bolts.

3. Remove two bolts attaching vertical fin to center impact bar.

4. Remove two vertical fin to outer impact bar bolts.

5. Remove two grille extension support bracket to bumper mounting bar bolts.

6. Remove four grille extension to outer impact bar bolts.

7. Remove grille assembly from bumper assembly.

(8) Disassembly of Radiator Grille

1. Remove two grille extension support bracket to extension bolts from each side of the assembly.

2. Remove grille extension to horizontal fin screws, six each side, and remove grille extensions.

3. Remove parking lamp or fog lamp attaching bolts and remove lamps from grille.

4. Remove vertical fin retainer by removing nineteen attaching screws.

5. Individual vertical or horizontal fins may be removed from the grille by releasing the horizontal fin from the two tangs at each vertical fin.

(9) Disassembly and Assembly of Front Bumper

1. Remove bumper guard tie bar to bumper guard bolts, two each side, and remove tie bar.

2. Remove outer impact bar to center impact bar bolts, three each side, and remove center impact bar. .

3. Remove bumper mounting bar to outer impact bar bolts and remove mounting bars.

4. Remove bolt from bumper guard cap and remove cap.

5. To assemble front bumper, reverse above steps. See the end of this section for proper torque tightness for installing bolts.

(10) Removal of Radiator Support Assembly

1. Remove radiator grille and front bumper assembly as explained in Note 6.

2. On Air Conditioned equipped cars, proceed as follows:

a. Drain "Freon" from the system as described in Section 16A.

b. Disconnect and remove the condenser to receiver line, and the receiver to the sight glass line.

c. Disconnect and remove the condenser to compressor line.

3. Drain cooling system and remove radiator core assembly as explained in Section 13, Note 16.

4. Remove attaching screws from strut which extends from bracket to radiator support; remove both struts.

5. Disconnect battery cable, horn wire to horns and to horn relay; disconnect wires from voltage regulator.

6. Bend down clip securing wiring harness to hood lock catch plate, and remove harness from wiring holes in radiator support assembly.

7. Remove two radiator support to hood lock catch plate screws, and center baffle to air deflector screws.

8. Remove four air deflector screws, and remove air deflector with horns, hood lock catch plate and center baffle. On Air Conditioned cars, the receiver will still be mounted to the deflector.

9. On Air Conditioned equipped cars, remove condenser from radiator support.

10. Remove fender bracket to radiator support screws, two each side.

11. Remove right front fender as explained in Note 17.

12. Remove radiator support to frame bolt and note the number of shims removed so that the same number may be reinstalled.

13. Remove radiator support assembly.

(11) Installation of Radiator Support Assembly

1. Position radiator support on frame bracket and left fender bracket.

2. Install radiator support to frame bracket anchor bolt and nut making sure the same number of shims are installed as were removed.

3. Install two fender bracket to radiator support screws on left side of car.

4. Install right front fender as outlined in Note 17.

5. Install radiator core assembly. See Section 13, Note 16b.

6. On Air Conditioned equipped cars, install condenser to radiator support.

7. Position air deflector and install four mounting screws.

8. Install two radiator support to hood plate screws, and center baffle to air deflector screws.

9. Install wiring harness through harness holes in radiator support, and secure harness with clip on the hood lock plate.

10. Connect wire to horn relay and voltage regulator.

11. Connect wires to horn and connect battery cable.

12. Install struts from fender bracket to radiator support.

13. On Air Conditioned equipped cars, proceed as follows:

a. Install and connect the condenser to compressor line.

b. Install and connect the condenser to receiver line, and the receiver to the sight glass line.

c. Evacuate and charge the system. Section 16A.

14. Install radiator grille and bumper assembly as described in Note 14.

15. Adjust hood lock. See Note 1.

(12) Assembly of Radiator Grille

1. Insert vertical fins into horizontal fins.

2. Position vertical fin retainer on grille and install nineteen screws.

3. Install parking or fog lamps in grille.

4. Position grille extension with fins inserted in ends of horizontal grille fins and install six attaching screws. Install opposite grille extension.

5. Install grille extension support bracket on each side of extension assembly.

(13) Installation of Radiator Grille On Front Bumper

1. Position grille assembly on bumper, and install grille extension support bracket to bumper mounting bar.

2. Install vertical fin bolts to outer impact bars, center impact bar, bumper guard tie bar, and bumper guards.

3. Install grille extension to outer impact bar bolts, two each side.

(14) Installation of Radiator Grille and Front Bumper Assembly

1. Place assembly in position, and install the four bumper mounting bar to frame bolts, making certain the same number of shims are installed between the frame and bumper mounting bar as were removed. Do not tighten these bolts all the way until the next step in the procedure is performed.

2. Adjust assembly horizontally, vertically, and fore and aft as follows:

a. Bumper mounting bars are slotted horizontally for horizontal adjustment.

b. Assembly may be adjusted vertically by means of vertical slots in the frame.

c. Fore and aft adjustment is obtained by placing various thicknesses of shims between the frame and the bumper mounting bars.

3. Use any combination of the above methods until over-all alignment is obtained.

4. From under side of fenders, install grille extension to front fender screws.

5. Tighten bolts to 110 - 120 lbs.

6. Connect parking or fog lamp wires to junction on fender brackets.

(15) Removal of Left Front Fender

1. Disconnect positive battery cable.

2. Disconnect wire at junction block on fender bracket and remove harness from block on bracket.

3. Remove junction block by removing two attaching screws.

4. Disconnect wire from blower motor.

5. Disconnect ventilator flexible hoses from blower to air duct and blower to heater.

6. Remove two fender to radiator support strut bolts, and remove strut.

7. Remove radiator support and air deflector to fender screws.

8. Remove fender attaching screws at cowl.

9. Jack up car, and remove left front wheel.

10. Disconnect antenna lead from antenna on cars so equipped.

11. Working from the under side of fender, remove four screws which attach the Autronic Eye amplifier to the fender dust shield.

12. Working from top side of fender, remove Autronic Eye amplifier.

13. Disconnect wires from Autronic Eye Power relay.

14. Remove wire harness from retainer clips on fender, and move harness away from fender.

15. Working from under side of fender, remove grille extension to fender hanger screw.

16. Remove two bolts at rocker panel extension.

17. Remove rocker sill molding.

18. Remove three dust shield to frame bolts.

19. Remove two fender bracket to radiator support bolts.

20. Apply masking tape to front edge of door in order to avoid scratching finish when removing fender.

21. Remove fender from car by moving fender backward slightly and then upward and out.

(16) Installation of Left Front Fender

1. Place fender in position, and install fender to cowl attaching screw loosely.

2. Install two fender bracket to radiator support bolts loosely.

3. Install three dust shield to frame bolts loosely.

4. Install two fender to rocker panel extension bolts loosely.

5. Install air baffle and air deflector to fender bolts loosely.

6. Align fender to door, cowl, and hood, and tighten all bolts.

NOTE: Fender bolt holes are elongated to allow for alignment. To raise or lower the fender for alignment to hood or door, install or remove shims from fender tie bar support to radiator cradle bolts, or fender to cowl bolt as necessary.

7. Install rocker sill molding.

8. Connect antenna lead to antenna.

9. Install radiator grille extension to fender hanger screw.

10. Install Autronic Eye amplifier and power relay to fender dust shield.

11. Install left front wheel and lower car.

12. Connect ventilator flexible air hoses from blower to air duct and blower to heater.

13. Connect blower wire to blower motor.

14. Connect wires to Autronic Eye power relay.

15. Install junction block on fender bracket.

16. Install wire harness behind clip on fender, and insert loose end of harness through radiator support opening.

17. Connect all wires at junction block.

18. Install fender to radiator support strut.

19. Remove masking tape from edge of door.

20. Connect positive battery cable.

(17) Removal and Installation of Right Front Fender

The removal and installation procedure for the right fender is identical to the left, except for removing the wire harness from the fender, removing the Autronic Eye amplifier and relay, and disconnecting the Antenna lead. However, it will be necessary to remove the battery and battery mounting bracket in order to remove the right front fender. On cars equipped with Air Conditioning, remove the clip securing the line to the fender dust shield.

(18) Rear Bumper Removal and Installation

1. Remove tail pipe ends from tail pipes through openings in outer impact bars.

2. Disconnect license plate lamp wires.

3. Remove four bumper mounting bar to frame bolts and nuts and, with the aid of a helper, remove bumper assembly from car.

4. To install, reverse above procedure, being certain that bumper assembly is aligned with fenders.

(19) Rear Bumper Disassembly and Assembly

1. Remove two bumper mounting bar to bumper impact bar bracket bolts and nuts.

2. Remove mounting bar to impact bar bracket nut and remove mounting bar.

3. Remove three bumper impact bar to impact bar bracket bolts and nuts, then remove bracket.

4. Remove one outer impact bar to center impact bar bolt and nut, then remove outer impact bar.

5. Remove bolt and nut holding strut to bumper bar end.

6. Remove three tail pipe hanger to bumper bar end screws and remove hanger.

7. Remove bumper guards from center impact bar.

8. Remove license plate bracket.

9. To assemble, reverse above procedure.

TORQUE TIGHTNESS

	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Bumper guard to support	1/2-20	35	45
Front bumper to frame	9/16-18	110	120
Hood crest	--	3	4 in. lbs.
Hood hinge to side of cowl	7/16-14	45	50
Impact bar to mounting bar	1/2-20	80	90
Rear bumper to frame	9/16-18	110	120

OTHER NOTES AND REFERENCES

CHASSIS SHEET METAL

OTHER NOTES AND REFERENCES

FRAME

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GENERAL DESCRIPTION

The frames used on the 1954 Series Cadillac cars are of the familiar X-type construction, with side bars which are curved at the front and partially enclose the helical front springs. The frames of all series are similar in design, although there are differences in dimensions and other details, due to wheelbase length and body requirements. The front cross member is designed to accomodate the parallel upper and lower suspension arm shafts. The rear frame cross member is attached to the ends of the frame side bars.

The commercial car frame is similar to the Series 75 passenger car frame, but with heavier construction features to accomodate the difference in length.

SERVICE INFORMATION

(1) Checking Frame Dimensions

The easiest and most accurate method of checking frame dimensions is by the use of tram gauges. When using tram gauges, be sure to keep the cross-bar level in order to insure accuracy when making all measurements.

The "plumb bob" method may be used for measuring frame dimensions if tram gauges are not available. Using this method, it is only necessary to have a piece of cord attached to an ordinary surveyor's plumb bob. When measuring the distance between two points, the free end of the cord should be placed at one of the points and a mark made on the floor exactly under the plumb bob. This operation should be repeated at the other point, and the distance between chalk marks on the floor may be easily measured.

It is essential, when using either method of checking frame dimensions, to have the car on a flat, level floor to obtain any degree of accuracy in the measurements.

(2) Checking Frame for Twist

1. Place car on section of level floor; inflate tires to proper pressure.

2. Measure distance from bottom of extreme front end of left side bar to floor. Repeat measurement for right side bar.

3. If front ends of right and left side bars are not same distance from floor, raise the lower side bar with a jack until the distances are equal.

4. Measure distance from extreme rear end of bottom of left side bar to floor. Repeat measurement for right side bar.

5. Any difference in these dimensions, greater than 1/2 inch, is an indication of a twisted frame.

6. If frame is found to be twisted, after checking overall dimensions, measure distance from similar points on each side bar to floor, starting from front of frame. The twist is between the first point where a difference in measurement is found and the last equal points measured. See Frame Checking Dimensions, Fig. 5-2.

(3) Replacement of Front Cross Member

a. Removal

1. Raise front end of car, and place jack stands under frame side members at rear of engine.

FRAME

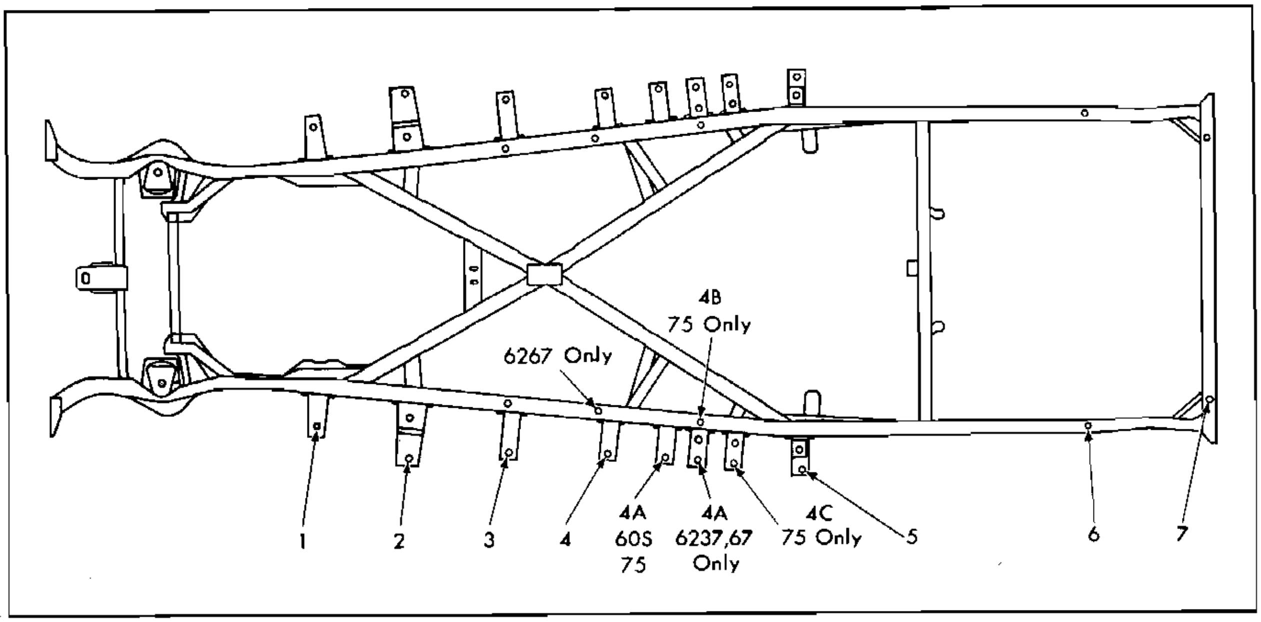


Fig. 5-1 Body Bolt Locations

1954 BODY BOLT LOCATIONS

KEY

(x)--Bolts Installed
(-)--Bolts Omitted

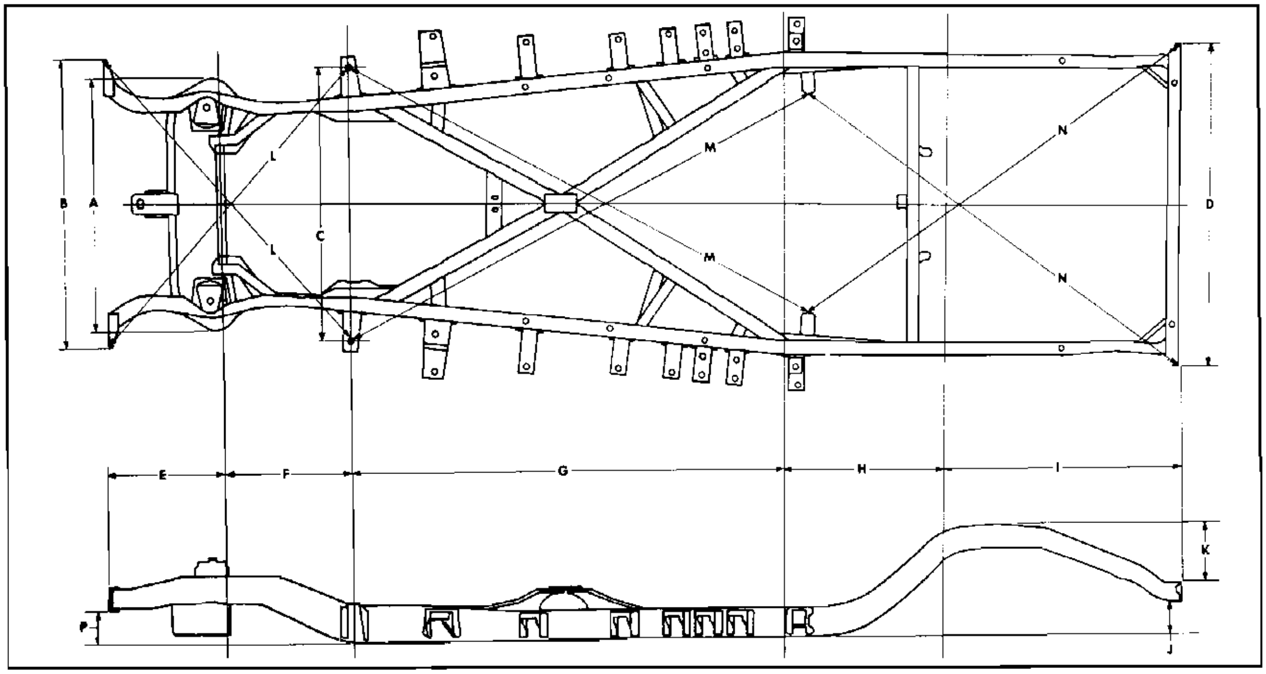
1954	OUTER BODY BOLTS NUMBERS										INNER BODY BOLT NUMBERS						
Body Style	1	2	3	4	4A	4B	4C	5	6	7	2	3	4	4A	4B	4C	5
6219	x	x	x	x	-	-	-	x	x	x	x	-	-	-	-	-	x
6019	x	x	x	x	x	-	-	x	x	x	x	-	-	-	-	-	x
6237, 6237D	x	x	x	x	x	-	-	x	x	x	x	-	-	x	-	-	x
6267, 6267S	x	x	x	x	x	-	-	x	x	x	x	x	x	x	-	-	x
7523, 7533	x	x	x	x	x	x	x	x	x	x	x	-	-	-	-	x	x

TORQUE TIGHTNESS

All body bolts on all series except the Convertible. . . . . 20 to 35 ft. lbs.

All body bolts on the Convertible . . . . 40 to 55 ft. lbs.

FRAME



Dimen-sion	Sedan 54-62	Conv. 54-62	Coupe 54-62	Sedan 54-60S	Sedan 54-75	Comm'l. 54-86
A	42-1/2"	42-17/32"	42-17/32"	42-17/32"	42-17/32"	42-17/32"
B	48"	48"	48"	48"	48"	48"
C	45-3/4"	45-25/32"	45-25/32"	45-25/32"	45-25/32"	45-25/32"
D	54-1/4"	54-1/4"	54-1/4"	54-1/4"	54-1/4"	56-1/4"
E	19-13-32"	19-13/32"	19-13/32"	19-13/32"	19-13/32"	19-13/32"
F	23-1/2"	23-1/2"	23-1/2"	23-1/2"	23-1/2"	23-1/2"
G	80-13/32"	80-13/32"	80-13/32"	84-13/32"	101-5/32"	109-13/32"
H	25-3/32"	25-3/32"	25-3/32"	25-3/32"	25-3/32"	25-3/32"
I	40-1/4"	47-1/4"	47-1/4"	47-1/4"	40-1/4"	40-1/4"
J	5-9/32"	5-9/32"	5-9/32"	5-9/32"	5-9/32"	5-9/32"
K	10-3/16"	10-3/16"	10-3/16"	10-3/16"	10-3/16"	10-3/16"
L	63-17/32"	63-17/32"	63-17/32"	63-17/32"	63-17/32"	63-17/32"
M	90-13/32"	90-13/32"	90-13/32"	94"	109-9/32"	116-31/32"
N	79-5/8"	85-15/32"	85-15/32"	85-15/32"	79-5/8"	80-7/32"
P	5-21/32"	5-21/32"	5-21/32"	5-21/32"	5-21/32"	5-21/32"

Fig. 5-2 Frame Checking Dimensions

A. Maximum spread of frame at front cross member.
B. Outside of front end of left front bumper bracket to outside front end of right front bumper bracket.
C. Left front body bolt to right front body bolt.
D. Over-all rear cross member.
E. Outside face of front bumper bracket to center line of front wheels.
F. Front wheels to front body bolts.
G. Front body bolts to rear spring front pin.
H. Inner end of rear spring front pin to center line of rear wheels.
I. Rear wheels to rear end of bumper bracket.
J. Bottom of bumper bracket at rear end to normal bottom of side bar.
K. Top of side bar at rear to top of side bar at rear wheels.
L. Outside of front end of left front bumper bracket to right front body bolt and vice versa.
M. Left front body bolt to inner end of right rear spring front pin and vice versa.
N. Inner end of left rear spring front pin to outside rear corner of rear cross member and vice versa.
P. Bottom of front bumper bracket to normal bottom of side bar.

CHASSIS SUSPENSION

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GENERAL DESCRIPTION

All 1954 series Cadillac cars utilize the independently sprung front wheel suspension system. This design permits either front wheel to follow the irregularties of the road without appreciably affecting the other front wheel or transferring road shocks to the steering system.

The front wheels are controlled in their up and down movement by coil springs and direct acting, permanently sealed shock absorbers. The springs are insulated at the upper and lower ends by rubber insulators, which prevent metal to metal contact of the spring with the frame and the resultant transfer of noise, due to spring movement, to the frame. The shock absorbers are located in the center of the coil springs and are attached, at the upper end, to the spring seat tower and, at the lower end to the spring seat in the lower control arm.

The upper and lower control arms are pivoted at their inner ends on parallel solid shafts bolted to the upper and lower sides of the front frame cross member. Each end of both the upper and lower inner shafts has a threaded steel bushing, permitting motion of the suspension arms, Fig. 6-1.

The steering knuckle supports are pivoted at the outer ends of the upper and lower control arms. The pivot at the lower arm is on a plain threaded bushing; while at the upper arm, the pivot is on an eccentric threaded bushing which provides adjustment for caster and camber.

CHASSIS SUSPENSION

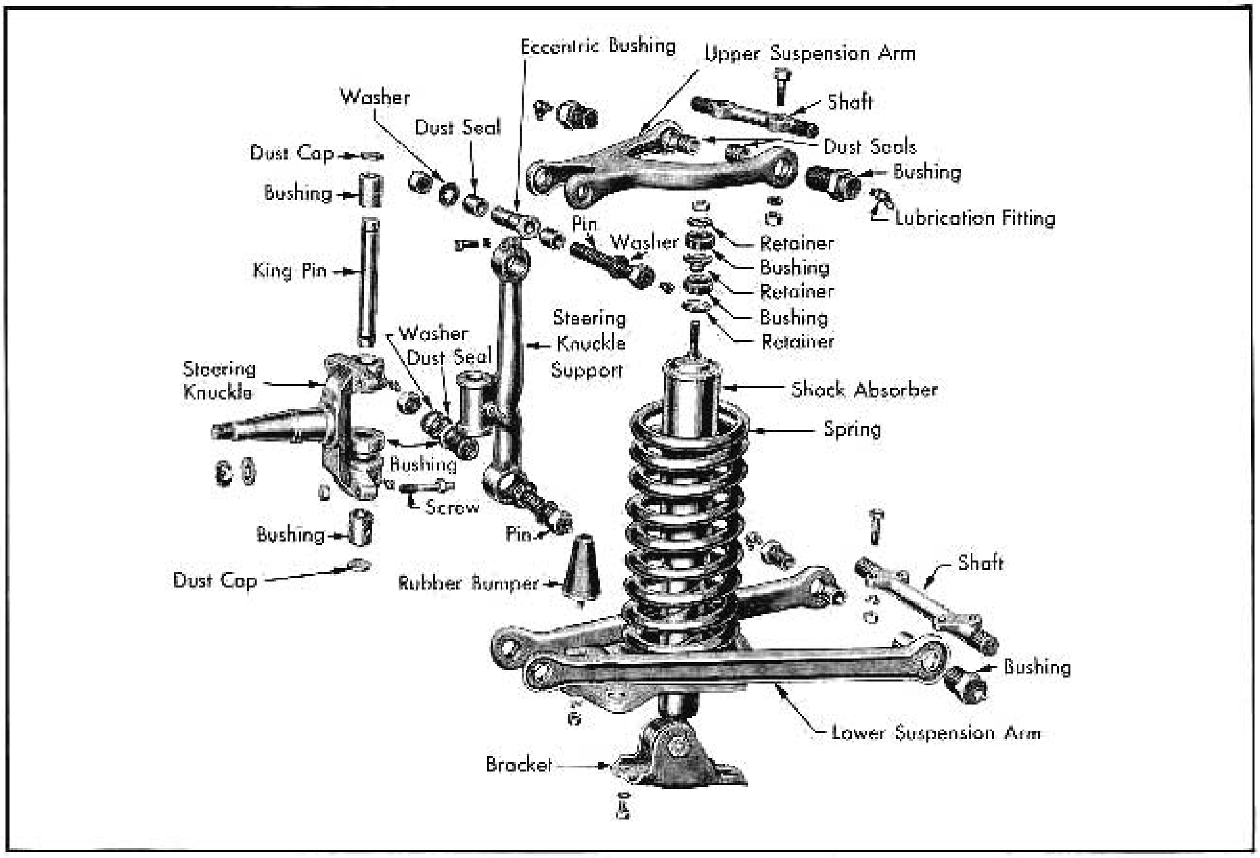


Fig. 6-1 Front Suspension - Disassembled

Synthetic rubber seals are used to protect all bushings against road dirt and other foreign material. A rubber bumper on the lower suspension arm is used to cushion the extreme travel of the upper and lower suspension arms.

The steering knuckle is mounted on the steering knuckle support on a harnened steel knuckle pin (king pin) which rotates in bronze bushings in the upper and lower part of the steering knuckle. The vertical thrust is taken by a bearing located between the lower face of the knuckle support and the steering knuckle.

A front end stabilizer bar is used in connection with the independent suspension system to provide steering stability and to control body roll. The stabilizer bar is mounted ahead of the suspension arms, on the frame side bars and is connected to the coil spring seats on the lower control arms by steel links which are completely cushioned at each end by rubber bushings.

The direct acting type rear shock absorbers are secured at the bottom by anchor bolts in the rear spring "U" bolt plates and at the top through brackets welded to the rear intermediate frame cross member. This "sea-leg" type of mounting of the rear shock absorbers gives them the double function of minimizing transverse roll and absorbing road shocks.

The rear springs are of the semi-elliptical leaf type with waxed full length liners between the leaves to provide the correct interleaf friction and prevent squeaking throughout the life of the springs. The springs are cushioned at each end by rubber bushings and at the spring seat on the axle housing by a rubber insulating pad.

The wheels on 1954-62 and 60S are 15 inches in diameter, with 6-inch rims, and use 8.00 x 15-4 ply black tires, optional with 8.20 x 15 white wall tires. The 1954-75 wheels are 15 inches in diameter and use 8.20 x 15 6 ply tires. All rims are of the drop center type. Wheels on the 1954-75 and 86 cars are the same as on 60 and 62 Series except for heavier stock thickness and may be identified by a 3/16" hole in the spider of the wheel. Also, a letter "H" is stamped on the outside of the rim adjacent to the valve stem hole. Wire wheels are standard equipment on Eldorado Style convertible coupes and are available as an accessory for all 62 and 60S series cars. Wire wheels are not recommended for installation on 75 and 86 series.

CHASSIS SUSPENSION

SERVICE INFORMATION

(1) Front Wheel Alignment Procedure

Correct wheel alignment is necessary to keep the front wheels in the true running position and is essential for easy steering. Tire wear is affected, as far as front end alignment is concerned, only by incorrect toe-in. Caster or camber does not affect tire wear.

The following operations should be performed in the order listed whenever the front wheel alignment is checked and adjusted:

Check tire pressure (Note 2).

Check adjustment of front wheel bearings (Note 3).

Check trueness and tracking of front and rear wheels (Notes 4 and 5).

Check spring heights (Note 6, a and b).

Check condition of all bushings and bearings.

Check for looseness in steering gear and connections.

Check caster and camber angle.

Check toe-in and straight ahead position of steering wheel.

(2) Checking Tire Pressure

Checking and inflating tires to the proper pressure is the first step when performing any wheel alignment job. Correct tire pressures are essential for securing correct measurements of other alignment factors. Following are the recommended tire pressures for 1954 series cars:

62, 60S	- 24 lbs. front and rear.
75	- 28 lbs. front and rear.
86	- 24 lbs. front.
	- 30 lbs. rear.

It is recommended that tires be checked and inflated at least once a month including the spare tire.

Tire pressure should always be checked when the tires are cold, preferabley in the morning or after standing in a cool place, and never after a high speed trip. Heat developed on fast runs or from hot pavements increases the pressures and they decrease again when the tires cool.

Tires should not be inflated to lower pressures in summer or bled to compensate for the increase in pressure due to heat. The recommended pressures are minimum pressures when the tires are cold for normal driving.

For sustained speeds above 75 miles per hour, tire pressure should be increased four pounds over specifications when checked cold.

When checking tires, the valve stem caps should be reinstalled. These caps provide an essential function in keeping dirt out of the valves, and in reducing the possibility of slow leaks.

(3) Wheel Bearing Adjustment

In adjusting the front wheel bearings, first make sure that the wheel is all the way on the spindle. Tighten the adjusting nut to 16 to 17 ft. lbs. torque to be sure all parts are properly seated and the threads are free, then back off nut and retighten to approximately 4 ft. lbs. torque. If the cotter key cannot be installed in this position, loosen the adjusting nut until it can be installed.

CAUTION: When adjusting the front wheel bearings, care should be taken not to mistake play in the knuckle pin bushings for play in the wheel bearings.

The rear wheel bearings on all series cars are of the sealed type and require no adjustment or lubrication.

(4) Wheel Runout and Eccentricity

Lateral runout of a wheel and tire together should not exceed 1/16". The lateral runout of the disc wheel, as measured on the side of the rim at the base of the tire, should not exceed 3/64".

Radial runout, or eccentricity, of the disc wheel and tire together or disc wheel alone should not exceed 3/64". Eccentricity of the wheel should be measured on the tire bead seat of the rim with the tire removed. Both lateral and radial runout of the wheel and tire may be minimized by changing the tire location on the wheel until the least amount of runout is obtained.

Runout specifications for both wire and disc wheels are the same. However, wire wheels may become distorted if subjected to abuse by sharply hitting curbs when parking or by hitting chuck holes in the road at higher rates of speed. This can distort wire wheels to such an extent that serious vibration would result.

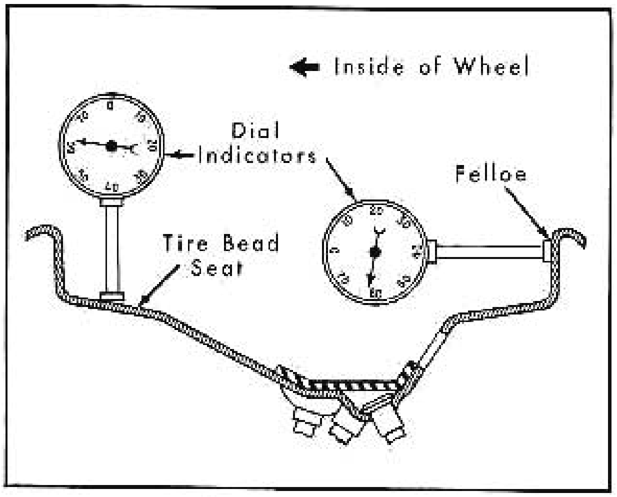


Fig. 6-2 Arrangement of Dial Indicators

Wire wheels may be checked on a fixture similar to a hub and drum mounted on a spindle. The wheel mounting face of the fixture should be exactly at right angles to the axis of rotation and the mounting studs should be equidistant from that axis.

Check runout with dial indicators placed on both bead seats and against the inside face of the outer fellow band, Fig. 6-3. Mark the outside of the rim at the point of greatest radial runout. Install tire on wheel so that point of greatest runout of the tire and wheel assembly is opposite the point of maximum runout of the wheel.

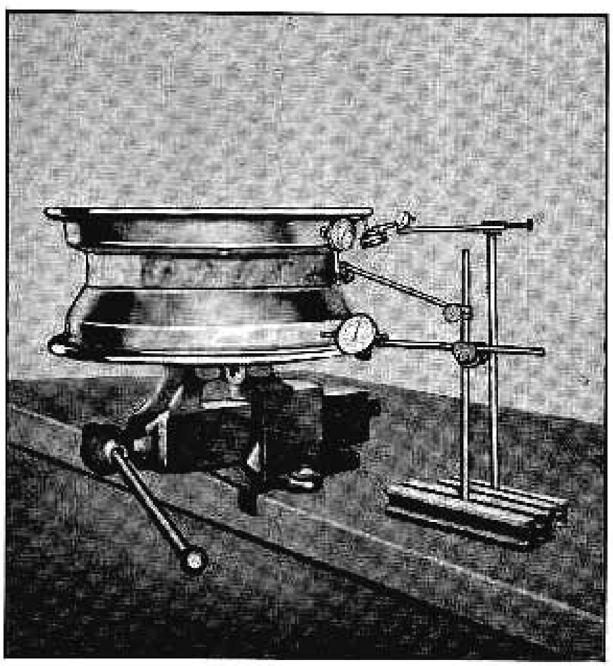


Fig. 6-3 Checking Runout

(5) Balancing Wheels and Tires

A wheel and tire assembly may lose its original balance due to irregular tread wear, tube or tire repair, or toe-in misalignment. Consequently, if front end instability develops, the tire and wheel assembly should be checked for both static and dynamic balance in addition to steering gear adjustment. The assembly should also be checked for balance whenever tires are replaced, and especially in cases where non-standard tire equipment, such as puncture proof tubes or heavier ply casings, are installed.

a. Static Balance (Stationary Balance)

This is the equal distribution of weight of the wheel and tire assembly about the axis of rotation so that the assembly has no tendency to rotate by itself. Static unbalance causes the pounding action on the front wheels that is called "tramp".

b. Correction of Static Unbalance (Special Equipment Not Available)

1. Remove wheel and hub from spindle as a unit.

2. Clean all grease from wheel bearings and races.

3. Clamp a clean spindle in a bench vise, or if spindle on car must be used, clean it carefully.

4. Mount wheel on spindle and adjust bearings loosely so that wheel is just held in position and is practically frictionless.

5. Make sure that tire is inflated to correct pressure.

6. Start wheel in motion and allow it to stop by itself. If it continually stops in the same position, the heavy side will be at the bottom and the assembly is not in static balance.

7. Mark heaviest point and also upper-most, or lightest point.

8. Install a weight at lightest point on the inside fellow band of the wheel, which will compensate for the out of balance condition.

> NOTE: If only a very slight unbalance is indicated, it may be necessary to use the following procedure to obtain correct balance, installing the smallest weights available. -- Avoid "hanging-on" more weights than are necessary.

(a) Install two balancing weights on inside of rim opposite each other and 90° away from the light and heavy points.

(b) Move these weights equally toward light side until wheel is in balance.

9. Repack wheel bearing with grease, install wheel, and adjust bearing as explained in Note 3.

c. Dynamic Balance (Running Balance)

Dynamic balance requires not only that the wheel be in static balance, but also that it run smoothly at all speeds on an axis which runs through the center of the wheel spindle. Dynamic unbalance sets up forces which cause the wheel to "wobble" or "shimmy".

The quickest and best methods of testing and correcting dynamic unbalance are by use of the precision balancing equipment. Follow equipment manufacturer's instruction for correct placement of balancing weights. The best balancing is done with the least amount of weight.

(6) Checking Spring Heights

Before checking spring height, be sure that trunk is empty and that there is a full tank of gas, as all alignment specifications are based on curb weight. Normalize position of the springs by working the bumper up and down and release slowly, permitting the car to assume its normal position.

NOTE: New springs settle considerably during the first 2,000 miles and therefore the springs should not be replaced due to excessive height before this time.

a. Front Springs

Measure the distance from the top of the lower control arm to the center of the rubber bumper bracket front lower rivet on the frame, Fig. 6-4. The spring height should be equal on both sides of the car within 3/8". If heights are unequal, the low side may be adjusted by the addition of shims, available from the Factory Parts Department, between the bottom of the spring and the spring seat on the lower suspension arm.

b. Rear Springs

Measure the distance from the top of the spring "U" bolt to a hole in the frame side bar directly above the "U" bolt, Fig. 6-5. The rear spring height should be equal within 1/2" on both sides of car.

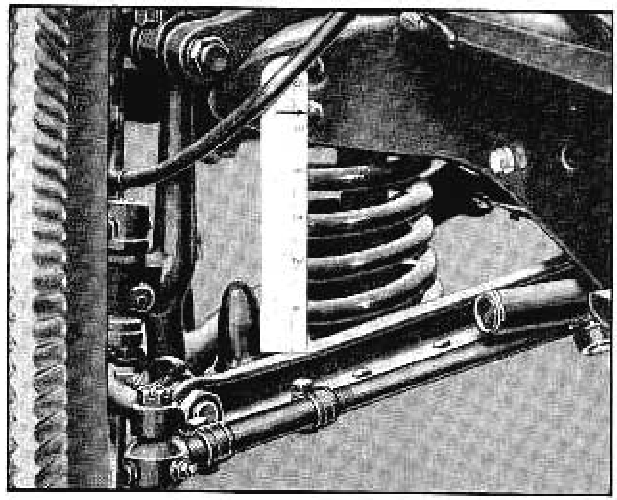


Fig. 6-4 Measuring Front Spring Height

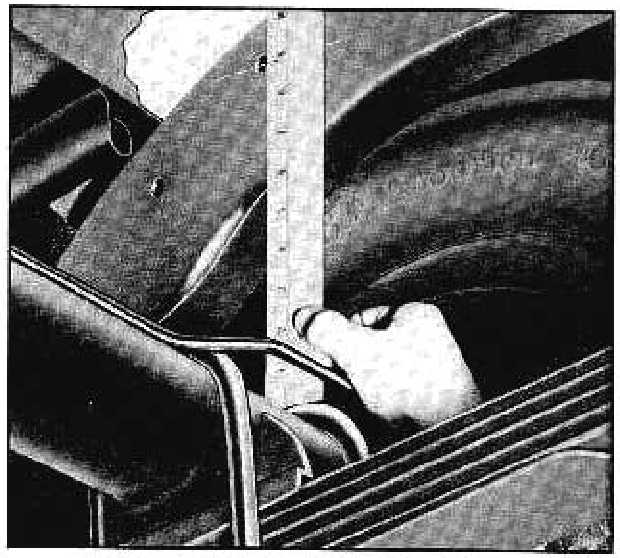


Fig. 6-5 Measuring Rear Spring Height

The spring heights should be:

Model	Weight* Front	Weight* Rear	Front Spring Height in Inches	Rear Spring Height in Inches
6019	2455	2250	4-1/2 to 5-1/4	8-3/4 to 9-1/2
6237	2390	2170	4-1/2 to 5-1/4	8-3/4 to 9-1/2
6237D	2410	2215	4-1/2 to 5-1/4	8-3/4 to 9-1/2
6267	2510	2335	4-1/2 to 5-1/4	8-3/4 to 9-1/2
6219	2390	2180	4-1/2 to 5-1/4	8-3/4 to 9-1/2
7523-33	2700	2500	5-3/8 to 6-1/8	10 to 10-3/4
86 Comm. (approx.)	2550	3040	5-1/2 to 6-1/4	9-5/8 to 10-3/8

*Car weight with full tank of gasoline, heater, radio, and wheel discs.

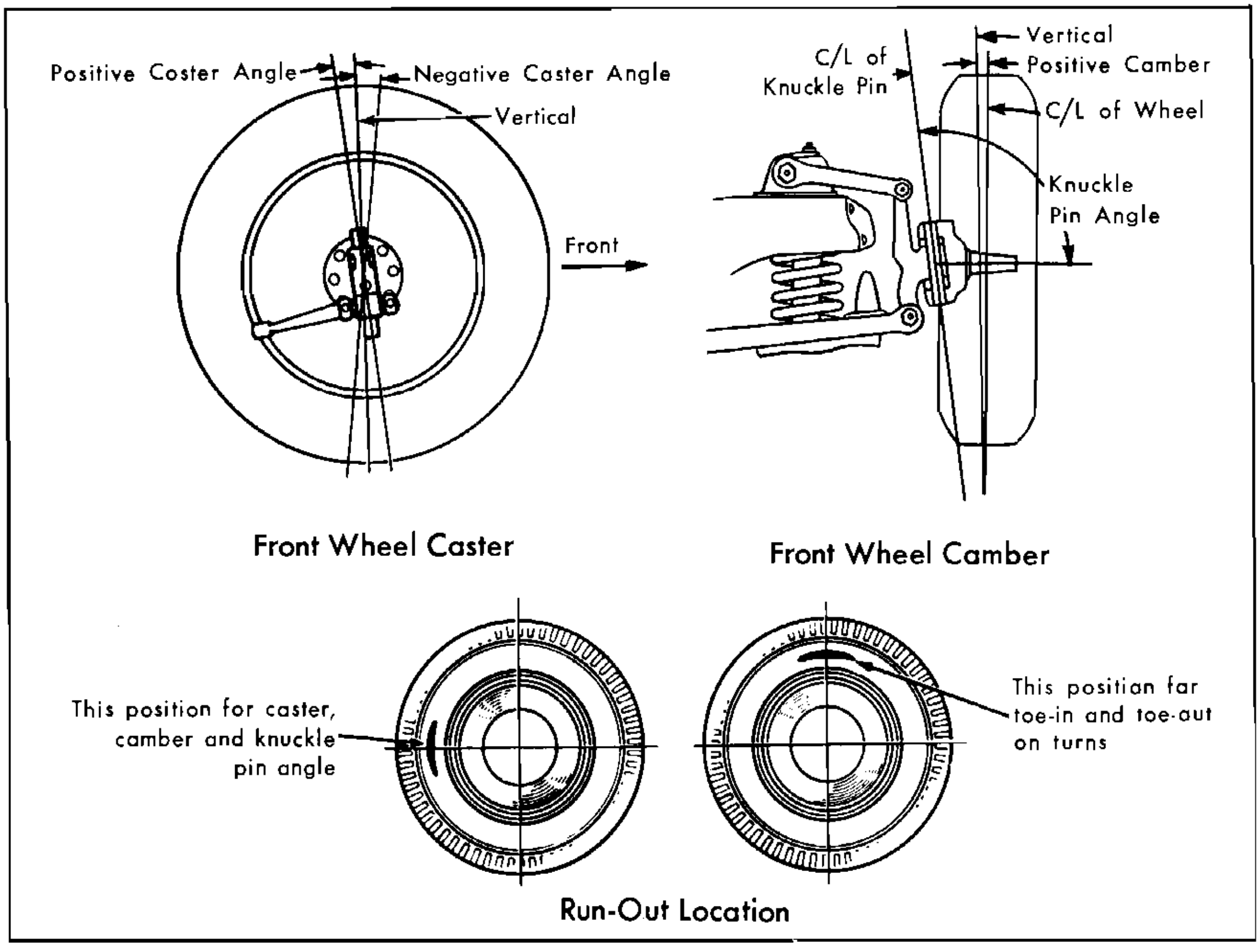


Fig. 6-6 Elements of Front Wheel Alignment

(7) Wheel Alignment Measuring Methods

All wheel alignment equipment manufacturers provide detailed instructions for checking equipment accuracy and measurement of alignment factors that should be followed exactly.

In addition to the manufacturers' instructions, be sure to observe the following general recommendations:

1. Check to see that there is no excess weight in the car.

2. Align the car on the moveable plates of the alignment machine carefully so that the wheels are in the center of the plates. In addition, the car should be square with the plates.

3. Inflate tires to proper pressure.

4. Block both rear wheels, in addition to setting the hand brake, to prevent any slight movement of the car.

5. Raise the front end and check the runout on the outer surface of the tire. Mark the spot where maximum runout occurs.

6. Place the maximum runout either to the front or rear as shown in Fig. 6-6. (This neutralizes the effect of runout on caster or camber.) Lower the wheels.

7. Normalize the position of front spring by working the bumper up and down to get normal height of front spring.

8. Caster and camber may now be checked.

9. Raise front wheels and set maximum runout at top or bottom to neutralize effect on toe-in and toe-out. Fig. 6-6.

10. Lower car, normalize springs and check toe-in.

11. If any of the measurements are beyond the recommended limits, make the necessary adjustments as outlined in Notes 8, 9, and 10.

(8) Caster Adjustment

1. Loosen clamp screw at upper end of steering knuckle support.

2. Turn eccentric bushing with Caster and Camber Adjusting Tool No. J-5343 in complete turns only until correct caster angle is obtained, Fig. 6-7. (0° to -1°, $-1/2^\circ$ preferred) - Adjustment readings (left and right) must be within $1/2^\circ$ or less.

If it is necessary to secure a greater range of adjustment than is provided, remove the inboard lower suspension arm mounting shaft from frame and turn shaft so that threaded ends move entire suspension arm assembly forward or rearward as required. Screwing shaft rearward moves the suspension arms forward and increases the amount of positive caster.

3. Tighten clamp screw on steering knuckle support.

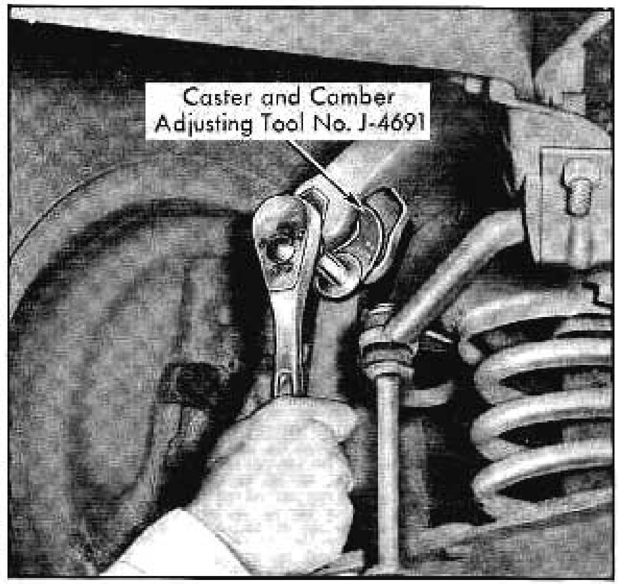


Fig. 6-7 Caster and Camber Adjustment

(9) Camber Adjustment

1. Loosen clamp screw at upper end of steering knuckle support.

2. Rotate eccentric bushing using Caster and Camber Adjusting Tool No. J-5343 to give correct camber setting at each front wheel, Fig. 6-7. The limits for this adjustment are 0° to $-3/8^\circ$ (0° preferred) and not to exceed $1/2^\circ$ difference from one side of car to the other with never more positive camber on the right wheel than the left.

NOTE: In order to avoid pulling to the left on high crowned roads it is recommended to set the camber so that the left wheel has $1/4^\circ$ more positive camber than the right. Do not rotate bushing more than 1/2 turn as this will give maximum camber adjustment possible at the eccentric pin; any additional turning will affect the caster adjustment.

If correct camber adjustment cannot be obtained, the angle of the steering knuckle pin should be checked. This should be 95° 51'. An incorrect angle indicates damaged suspension arms or a bent steering knuckle support. Any damaged parts should be replaced.

3. After adjustment has been made, tighten clamp screw and recheck.

NOTE: It is adviseable after making a camber adjustment to change the tires, putting the front ones on corresponding rear wheels and rear tires on opposite front wheels to provide a normal tire contact.

(10) Toe-In Adjustment

The setting or adjustment of the front wheels where the distance between them is less at the front than at the rear is called "toe-in". The purpose of toe-in is to counteract the forces that tend to make the front wheels toe out while traveling forward.

Toe-in should be measured at the wheel rim with equipment that is used while the car is at rest. The correct setting should be between 3/16 and 1/4 inch toe-in.

When checking toe-in, the readings should be taken only when the front wheels are in a straight ahead position and with steering gear on its high spot. Maximum tire runout should be in a vertical plane, as shown in Fig. 6-6.

Toe-in adjustment is made by turning the tie rod adjusters at the outer ends of each tie rod after loosening clamp screws. Turning the adjusters in the direction the wheels revolve when the car moves forward, decreases toe-in. Be sure to turn both adjusters an equal amount when adjusting toe-in so that the relation of steering gear high spot to the straight ahead position of the front wheels will not be changed.

When adjustment has been completed according to recommended specifications, tighten all clamp screws.

NOTE: Be sure open side of clamp is over open side of adjuster before tightening clamp.

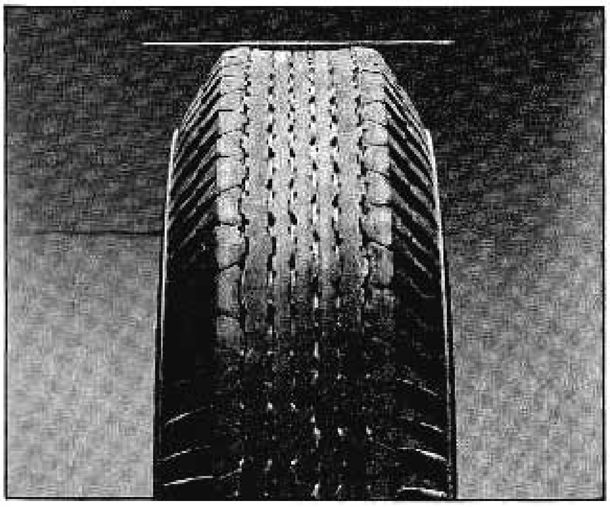


Fig. 6-8 Underinflation Wear

(11) Excessive Tire Wear— Causes and Corrections

a. Improper Tire Inflation

When tires do not carry the proper pressures as specified in Note 2, certain sections of the tread surface will be worn away more rapidly than others. Two kinds of uneven tire wear will result.

Underinflation causes the center section to scuff and wear away more rapidly than the side sections, due to lighter contact of this center section with the road, Fig. 6-8. In addition, soft, underinflated tires suffer from continual flexing, causing high internal temperatures and cracking of the sidewalls.

Overinflation causes the center section of the tires surface to receive too much driving and braking strain and the center tread is worn more than the outer tread and shoulders, Fig. 6-9. An overinflated, rigid, tire is more liable to get breaks in the fabric from severe impacts and is more easily cut or punctured.

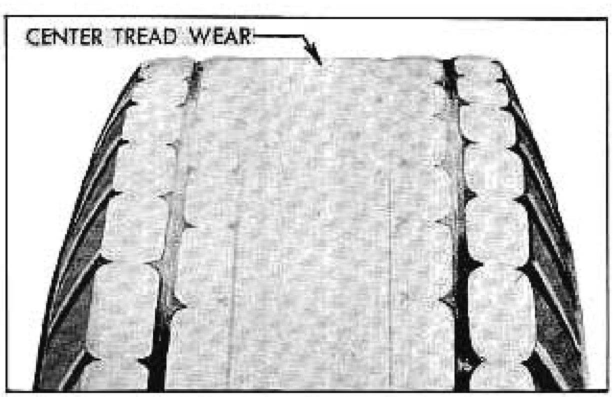


Fig. 6-9 Overinflation Wear

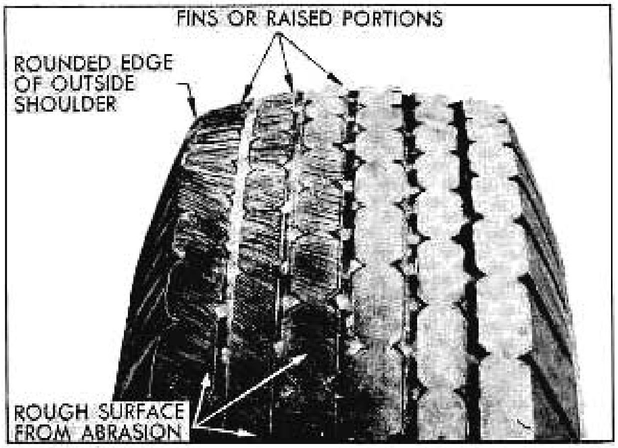


Fig. 6-10 Cornering Wear

b. Wear Caused by Owner Driving Habits

Modern engineering improvements, resulting in greater car handling ease, high engine torque and more efficient brakes permit owners to accelerate faster, drive around curves at higher speeds, and stop quicker than they could with older cars. Owners 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 outside shoulder of the tire and small rough abrasions and fins raised by "cornering" friction against the road, Fig. 6-10.

Rear Tire Inside Wear is caused by rapid acceleration, where the axle bends slightly in a horizontal plane to toe-in the rear tires. This results in excessive wear on the inner shoulder of the rear tires, Fig. 6-11.

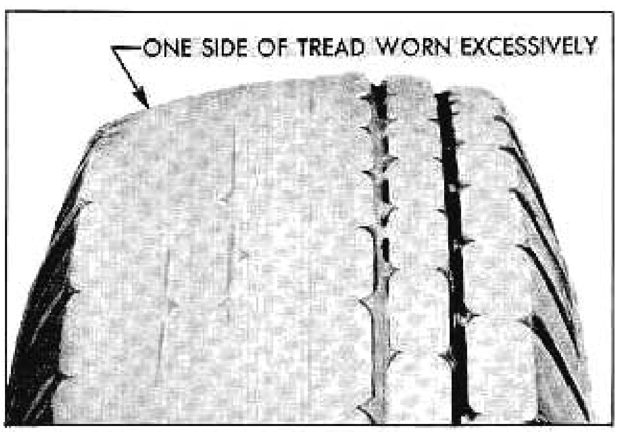


Fig. 6-11 Rear Tire Inside Wear

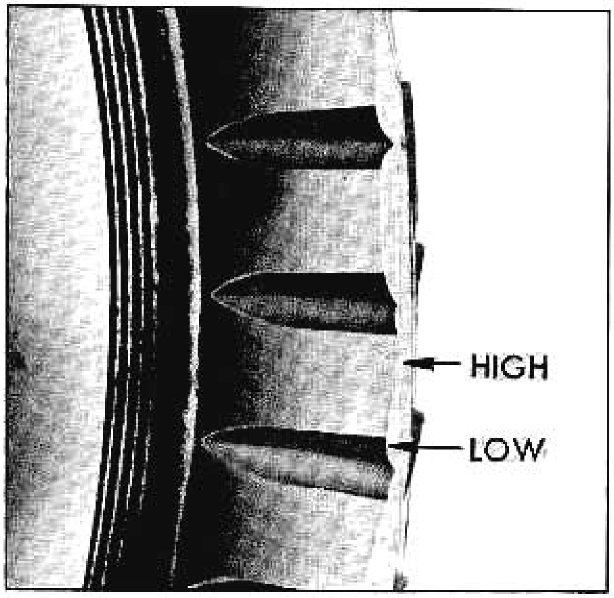


Fig. 6-12 Front Tire Heel and Toe Wear

Front Tire Heel and Toe Wear is caused by excessive high speed driving and braking. This is evident in the uneven wear of individual tread blocks, with the wear at the end of the block which first grips the road, Fig. 6-12.

If the above types of wear are noticed, they should be brought to the owners attention and tire criss-crossing recommended to compensate for the uneven wear - in addition to more considerate car handling by owner.

c. Front End Looseness or Camber Adjustment

A certain amount of "cupping", due to the independent front wheel suspension design, is normal

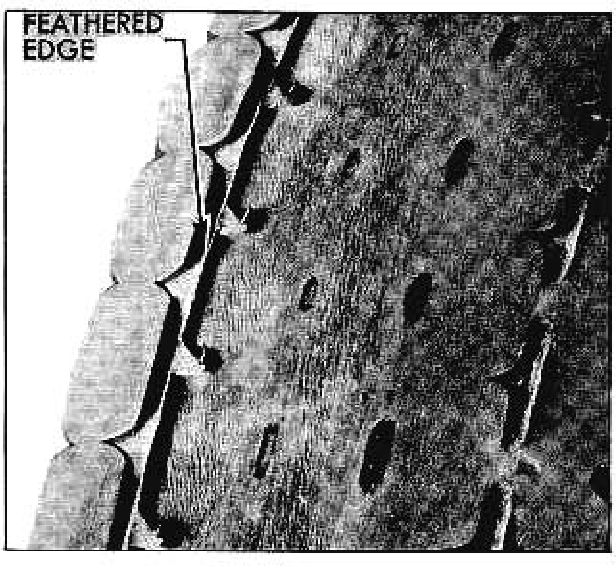


Fig. 6-13 Toe In or Toe Out Wear

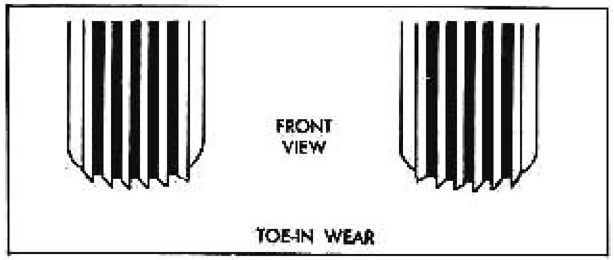


Fig. 6-14 Toe In Wear

and will wear the tires unevenly if they are not rotated regularly. If extreme cupping is noticed, the front end bushings should be checked for looseness, the drag link height should be checked according to specifications, and the wheels, tires, or brake drums checked for out of balance, and the camber adjustment should also be checked.

d. Toe-in and Toe-out Adjustment

Excessive toe-in or toe-out has the effect of dragging the tires sideways down the road, scraping the tread and feathering ribbed sections, Fig. 6-13.

Improper toe-in is indicated by feather edges on the inside of tire ribs, Fig. 6-14. Toe-out is indicated by feather edges on the outside of tire ribs, Fig. 6-15. Toe-in should be 3/16" to 1/4". This is an adjustment that should be checked before the new car is delivered to the owner.

e. High Temperature, Heavy Loads, Types of Roads

These are factors which contribute to excessive tire wear. When a car is driven in high temperature areas or under abnormal load conditions, premature failure or rapid wear may result. Since these factors generally produce even rather than uneven wear, the evidence of excessive wear may not be noticed for some time.

Continual driving over poor roads will produce abnormal tire wear. Numerous turns and grades will cause a certain amount of cornering and rapid, even wear, although traveled at reasonably normal speeds.

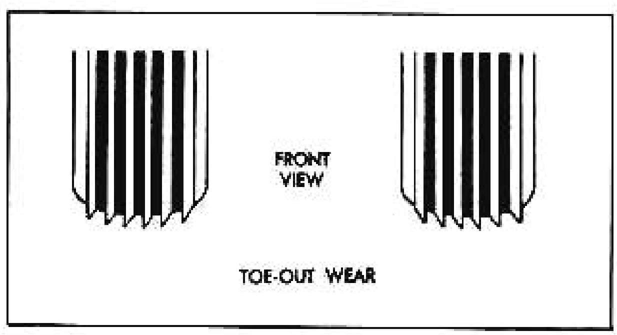


Fig. 6-15 Toe Out Wear

CHASSIS SUSPENSION

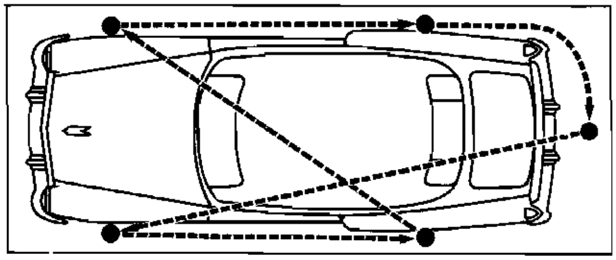


Fig. 6-16 Tire Switching Diagram

In all cases of tire wear, it is very important to know the owners driving habits, the type of roads usually travelled, and the average load in the car, to make an accurate diagnosis of tire trouble. Recommend tire rotation as required. In some cases it may be necessary to rotate the tires more frequently than 4,000 miles, especially in cases of heel and toe wear on the front tires, caused by high speed driving and severe braking.

(12) Interchanging Tires

Normal tire wear is uneven between the front and rear wheels because of the difference in the functions of the front and rear wheels. To minimize tire wear and noise, it is recommended that tires be interchanged at least every 4,000 miles, Fig. 6-16. In addition, utilizing the spare tire in rotation with the other four tires gives 20% more total car mileage before replacement tires are needed. The tires should be rotated as follows:

1. Place spare tire and wheel at the left front.

2. Move left front to the left rear.

3. The left rear to the right front.

4. The right front to right rear.

5. The right rear wheel and tire should be used as a spare.

(13) Testing for Tire Noise

Noise caused by the normal action of tire treads on various road surfaces is often confused with rear axle gear noise or other noises in the car.

To determine whether tires are causing the noise, drive car at various speeds and note the effect of part throttle, sudden acceleration, and deceleration on noise level. Axle and exhaust noise show definite variations under these conditions, while tire noise will remain constant. Tire noise is, however, more pronounced at speeds of approximately twenty to thirty miles per hour.

The tire noise may be further checked by driving the car over smooth pavements or dirt roads (not gravel) with the tires at normal pressure and again over the same stretch of road when the tires have been inflated to fifty pounds pressure. If the noise for which the test is being made is caused by tires, it will noticeably decrease when the tire pressure is increased, whereas rear axle noise should show no change in volume.

Thump is a noise that cannot be corrected by balancing or realignment of wheels and tires. It is a "beat" started by the tire on the road, transmitted and amplified by certain components of the car body, not to be confused with out of balance, radial or lateral run-out.

Thump is an audible reproduction of the tire moving over the irregularities of the road or the irregularities of the tire moving over the road. It is a periodic vibration, perceptible with varying intensity inside the car.

(14) Riding Complaints

In cases of complaints of hard riding, the correct tire pressure and the correct shock absorber action are the first items to investigate. If these are correct, the amount of friction in the front wheel suspension system and in the rear springs should be investigated.

The procedure for checking excessive friction in the front wheel suspension system is as follows: After lubricating the suspension system, first lift up on the front bumper, lifting the car as high as possible. Then slowly release the bumper and let the car assume normal position. Measure the height of the center of the bumper from the floor.

Next, push down on the bumper, pressing the car down as far as possible. Then release slowly, permit the car to assume its normal position and again measure the height of the bumper.

If the difference between these two measurements is 7/8" or more, it indicates excessive friction in the suspension system. Corrective measures include realigning the upper and lower control arms on their inner mounting shafts to permit adjustment of caster without excessive binding on the eccentric pins.

Occasional bottoming of the rear springs under conditions of heavy loads or high speeds over rough roads is entirely normal. Owners should be informed that springs heavy enough to prevent bottoming under all conditions would provide a very hard, uncomfortable ride.

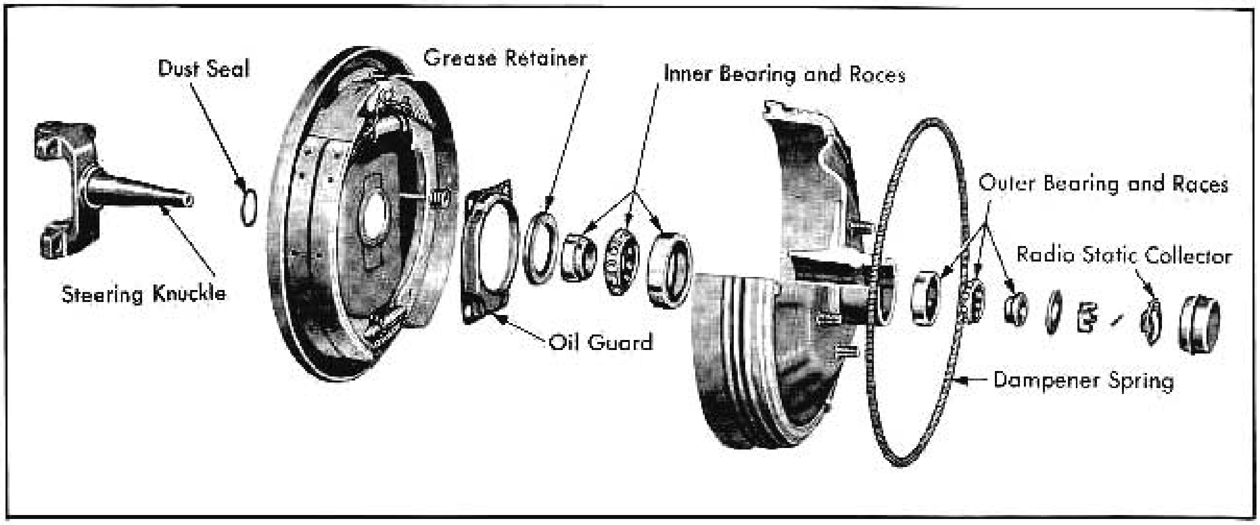


Fig. 6-17 Front Wheel - Disassembled

(15) Removal and Installation of Wheel Shields

The wheel shields in the rear fenders on all 1954 series cars are removed by turning the lower end of the locking rod (located on the lower edge of the center of the wheel shield) one quarter turn outward. Tap the protruding end of the locking rod down about one inch to release the top of the wheel shield from the fender. Move top of shield away from the fender and disengage hooks from retainers at fender.

To install the shield, engage the hooks at the lower ends of the shield into the fender retainers. Lift top edge of shield into position against fender and tap locking rod up to engage with lock at top of fender opening. Turn locking rod one quarter turn inward until it is even with wheel shield.

(16) Removal and Installation of Front Wheel, Hub and Bearings

a. Removal

1. Remove wheel disc.

2. Jack up car.

3. Remove dust cap and take out radio static collector. Fig. 6-17.

4. Remove cotter pin, wheel nut, washer, outer bearing cone and bearing retainer with balls.

5. Remove wheel from spindle.

6. Remove inner bearing packing, cone, and bearing retainer with balls.

7. The outer bearing cups are a press fit in the hub and may be removed by driving out from opposite side with a long punch.

b. Installation

1. Clean bearing and races thoroughly, replacing the complete bearing assembly if any parts are worn, pitted, or rough.

2. Pack bearing cages with G-12 wheel bearing lubricant. Cover cages well but avoid an excess of lubricant.

3. Install parts in the reverse order of disassembly and adjust wheel bearing as outlined in Note 3.

(17) Cleaning White Sidewall Tires

All white sidewall tires on 1954 series cars have a colored protective coating which should be removed from the tires before delivery of the car. In no case should the tires be driven more than 50 miles before this coating is removed.

To remove this coating, wet the tire surface thoroughly with warm water and allow it to soak for one minute, then wash, using a stiff brush or sponge with a stream of water playing on the tire surface.

New white sidewall tires with the protective coating, should be stored with care. Do not place a tire with a white sidewall against a tire with black sidewalls, as the protective coating may induce bleeding of the color by chemical reaction and permanently discolor the white tire.

A great deal of ordinary road dirt which collects on white sidewall tires may be sponged off with clear water or a mild soap solution. Under no circumstances should gasoline, kerosene, or any cleaning fluid containing a solvent derived from oil be used to clean white sidewall tires. Mineral oil in any form is detrimental to rubber, and a cleaner with an oil base will discolor or injure white sidewall tires.

(18) Removal and Installation of Front Shock Absorber

a. Removal

1. Raise hood and remove shock absorber upper retaining nut, retainer, and rubber grommet.

   NOTE: The shock absorber upper stem is square at the top so that it may be held by a wrench to prevent the stem from turning when removing nut.

2. Remove two nuts holding lower shock absorber retaining bracket to spring seat.

3. Remove shock absorber and lower bracket from spring assembly, Fig. 6-18.

4. Remove lower bracket, rubber bushings, spacer, bolt, lock washer, and nut.

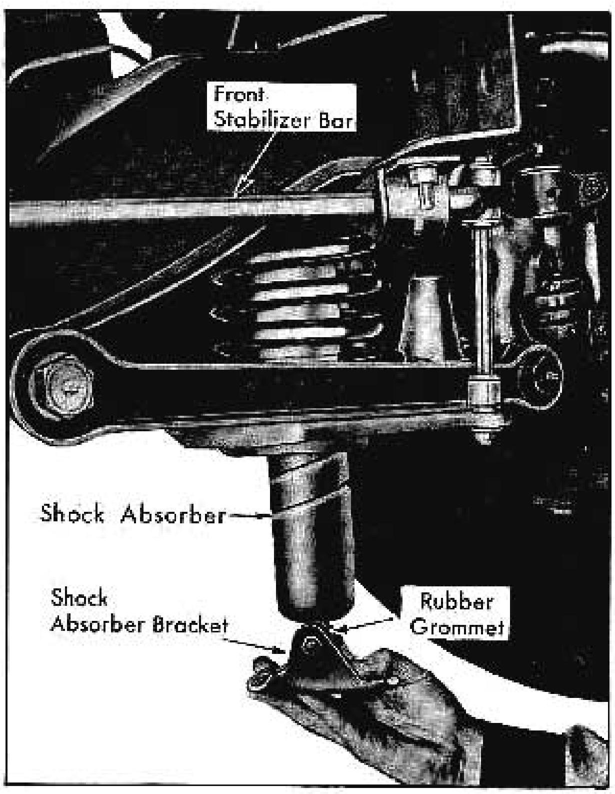


Fig. 6-18 Front Shock Absorber Removal

b. Installation

1. Install bracket, rubber bushings, spacer, bolt, lock washer, and nut on shock absorber.

2. Install retainer and rubber grommet on upper shock absorber stem.

3. Install shock absorber assembly up into coil spring and guide stem through tower in cross member then place lower support over mounting studs in lower spring seat.

4. Install lock washers and nuts to hold support in place.

5. Install grommet, retainer, and nut on upper shock absorber stem and tighten nut, holding stem from turning with wrench.

(19) Removal and Installation of Front Stabilizer

a. Removal

1. Remove nut, retainer, and bushing from bottom of each link. Fig. 6-19.

2. Remove bolts from brackets that hold stabilizer bar to frame and remove stabilizer.

3. The rubber bushings in which stabilizer bar is supported are serviced separately and can be removed at this time.

b. Installation

The installation procedure is the reverse of removal. When assembling link, use Fig. 6-19 as a

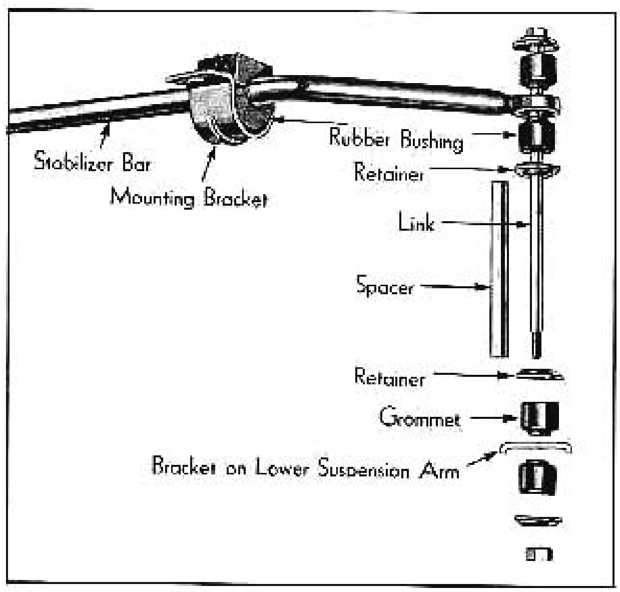


Fig. 6-19 Front Stabilizer Linkage

guide, making sure to arrange the steel retainers and rubber bushings exactly as shown.

(20) Removal and Installation of Steering Knuckle

a. Removal

1. Lift front end of car from floor with jack.

2. Remove front wheel, hub and brake drum assembly, and wheel bearings.

3. Remove brake dust shield mounting screws and remove dust shield, with brake shoe assembly attached, from knuckle and support assembly. Do not damage hydraulic line which will not have to be removed from dust shield in this operation.

4. Drive lock pin from steering knuckle support.

5. Remove dust caps at upper or lower knuckle pin holes, tap out steering knuckle pin, and remove steering knuckle and thrust bearing from steering knuckle support, Fig. 6-1.

6. If knuckle pin bushings are to be replaced, slot the bushings lengthwise with a hacksaw and drive them out with a chisel.

b. Installation

1. Press new bronze bushings (if required) into steering knuckle, making certain that the oil hole in each bushing lines up with the oil hole in the knuckle and that the short groove leads from the oil hole to the outer ends of the knuckle in each instance as shown in Fig. 6-20.

2. Assemble steering knuckle to support with thrust bearing in position between support and lower face of steering knuckle, Fig. 6-1.

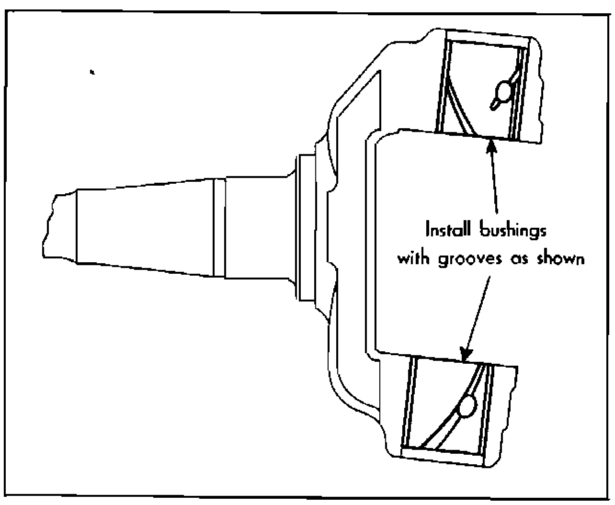


Fig. 6-20 Knuckle Pin Bushing Installation

3. Install knuckle pin through bushings, steering knuckle, and thrust bearing.

4. Drive lock pin in from front of support.

5. Install new dust caps and lubricate both fittings thoroughly.

6. Complete assembly by reversing disassembly procedure.

(21) Removal and Installation of Steering Knuckle Support

a. Removal

1. Raise car, drive lock pin out of steering knuckle support, remove dust caps from top and bottom of steering knuckle, and drive out knuckle pin.

2. Place jack under lower suspension arm to support coil spring while disconnecting knuckle support.

3. Remove nut from rear end of upper pivot pin.

4. Remove threaded pivot pin and rubber dust seals.

5. Remove nut from rear of lower pivot pin.

6. Remove lower pivot pin and rubber dust seals.

7. Place support in vise and loosen clamp screw at upper end of knuckle support and remove upper and lower bushings from support.

b. Installation

1. Install eccentric bushing in knuckle support so that it is centralized and tighten clamp screw lightly.

2. Install bushing in lower end of knuckle support, tightening bushing firmly so that there is no clearance between bushing shoulder and knuckle support.

3. Install lower end of knuckle support, with bushing, between outer ends of lower suspension arm and install rubber dust seals between suspension arm and support.

4. Install threaded pivot pin, holding support so that space between support and arms is equal on both sides.

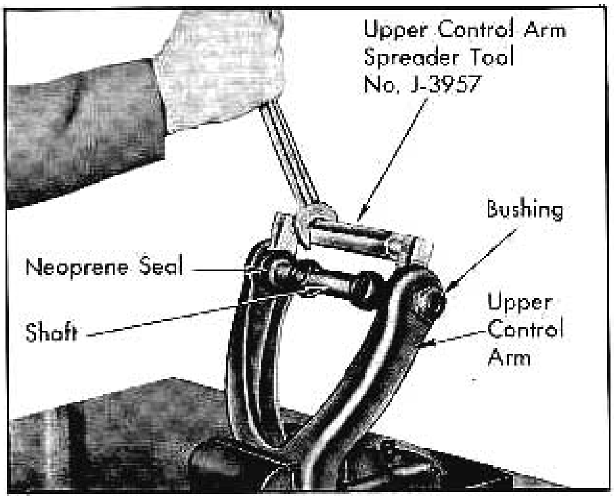


Fig. 6-21 Spreading Upper Control Arm

5. Install upper end of support in position between ends of upper suspension arms and install rubber seals.

6. Install upper pivot pin and nut with upper end of support centralized between ends of upper suspension arms.

7. Position steering knuckle on support and install knuckle pin and dust caps.

8. Check caster, camber, and toe-in.

(22) Removal and Installation of Upper Suspension Arm

a. Removal

1. Jack up car at front frame cross member and also place a jack under the lower suspension arm, on side on which upper arm is to be removed, to support spring.

2. Remove upper steering knuckle support pivot pin and nut.

3. Remove upper suspension arm inner shaft mounting bolts and cross member.

4. Remove arm and shaft assembly from the car as a unit.

5. Place mounting shaft in a vise and remove bushings from arm and shaft and remove shaft from assembly.

b. Installation

1. Install new seals on mounting shaft and lubricate threads of shaft.

2. Install shaft in position in suspension arm and install bushing into arm and onto one end of shaft.

3. Tighten bushing to 140-150 ft. lbs. torque.

4. Install Upper Control Arm Spreader, Tool No. J-3957, between arms as shown in Fig. 6-21 and tighten finger tight. Then, using a wrench, tighten tool two additional flats.

5. Install bushing in arm and onto shaft, tightening to 140-150 ft. lbs. torque.

6. Remove tool from arms and center shaft between arms by turning shaft in bushings.

7. Install lubrication fittings in bushings.

8. Install upper suspension arm assembly in position on cross member and install mounting bolts through shaft into cross member, tightening to 150-160 ft. lbs. torque.

9. Position knuckle support in fork of upper suspension arm and install rubber seals on both sides of support.

10. Install upper pivot pin while holding knuckle support so that space between arm and support is equal on both sides.

11. Tighten pivot pin nut to 70-90 ft. lbs. torque.

12. Remove jacks and check caster and camber.

NOTE: When replacing either upper or lower inner suspension arm bushings it is necessary to remove the arms from the cross member. Outer arm bushings may be replaced by disconnecting knuckle support from arm.

(23) Removal and Installation of Lower Suspension Arm and Front Spring

a. Removal

1. Jack up car at center of front cross member and also place a jack under suspension arm which is to be removed, to support spring.

2. Disconnect front stabilizer link on side from which spring is to be removed.

3. Remove shock absorber, Note 18a.

4. Remove lower pivot pin and nut from steering knuckle support.

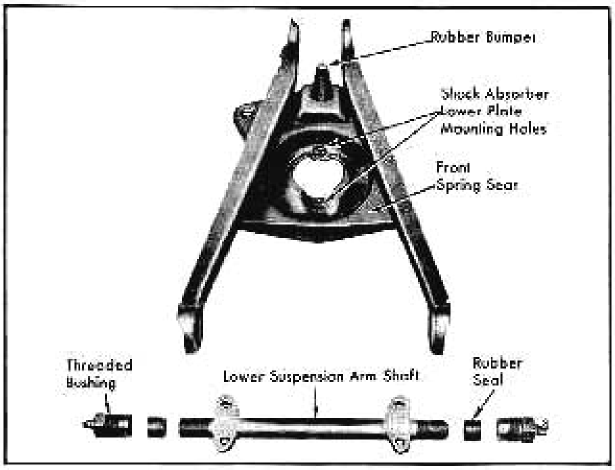


Fig. 6-22 Lower Suspension Arm - Disassembled

5. Lower jack under suspension arm to remove spring and upper and lower rubber insulators.

6. Remove four mounting shaft support bolts at frame cross member and remove arm and shaft.

7. Place assembly on bench and remove threaded bushings, rubber seals, and shaft from arm, Fig. 6-22.

b. Installation

1. Assemble mounting shaft in lower suspension arm, center shaft between ends of arm, install rubber seals, and threaded bushings. Tighten bushings to 195-205 ft. lbs. torque.

2. Bolt mounting shaft to frame cross member, tightening bolts to 60-70 ft. lbs. torque.

3. Install lower rubber insulator in spring seat in lower suspension arm, with molded projections on insulator inserted in holes in spring seat and hole in insulator lined up with hole in seat.

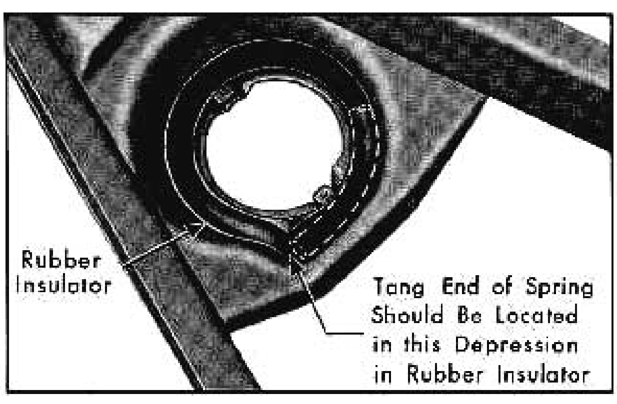


Fig. 6-23 Spring Location in Lower Seat

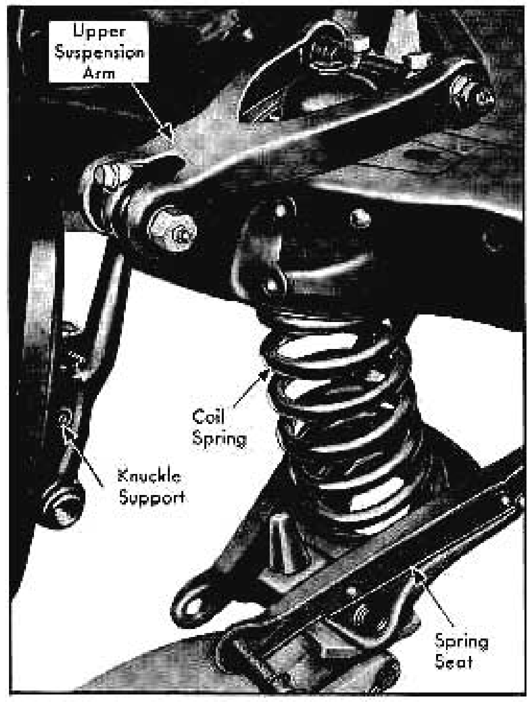


Fig. 6-24 Install Front Spring

4. Tape upper rubber insulator to top (flat end) of spring and install spring in upper seat in cross-member. Rotate spring so that lower tanged end will fit in formed depression, Fig. 6-23, in insulator when lower suspension arm is raised into position.

5. Place jack under lower suspension arm and raise arm into position. Guide spring into position on insulator with tanged end in formed depression. Fig. 6-24.

6. Install rubber seals between support and arms, and install pivot pin and nut, while holding support midway between the outer arms.

7. Connect stabilizer link to lower spring seat.

8. Install shock absorber, Note 18b.

9. Remove jacks and check caster, camber, and toe-in.

(24) Straightening Bent Parts

The straightening of bent parts in the front wheel suspension system should be attempted only within the following limits:

Parts should not be straightened if they are sprung out of alignment more than five degrees. Excessive bending of parts when cold may result in stresses or cracks invisible to the naked eye.

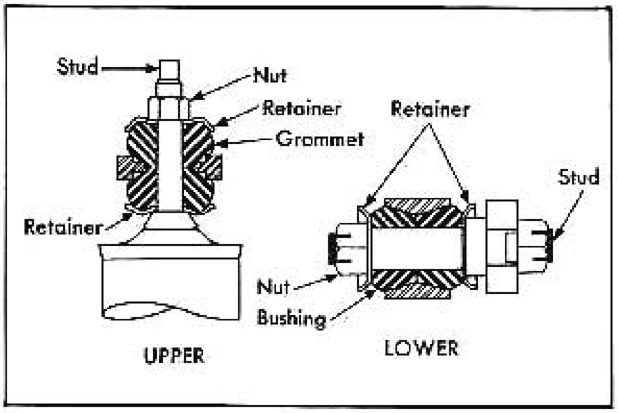


Fig. 6-25 Rear Shock Absorber Bushing Installation

which render the part unsafe for use. Straightening with heat will destroy the effect of previous heat treatment, leaving the steel seriously weakened.

Welding of parts subjected to high stresses should never be permitted because the welding process will change the grain structure of the metal, rendering it unsafe.

(25) Removal and Installation of Rear Shock Absorbers

1. Remove shock absorber upper retaining nut, retainer and rubber grommet.

NOTE: The shock absorber upper stem is square at the top so that it may be held by a wrench to prevent the stem from turning when removing the retaining nut.

2. Remove nut from shock absorber mounting stud on spring "U" bolt plate and remove bushing retainer and outer rubber bushing.

3. Remove shock absorber from stud and guide stem out of upper mounting bracket.

4. To install, reverse the above procedure, being sure the cupped shaped retainers are installed with the convex side next to the bushing, Fig. 6-25, and nuts are tightened to insure proper compression of the rubber bushings.

Shock absorbers are serviced as an assembly. If noisy or leaking, replace the unit.

(26) Removal and Installation of Rear Wheel and Brake Drum

a. Removal

1. Jack up car, remove wheel shield and wheel disc.

2. Remove road wheel.

3. Remove screws holding brake drum to axle shaft flange, Fig. 6-26.

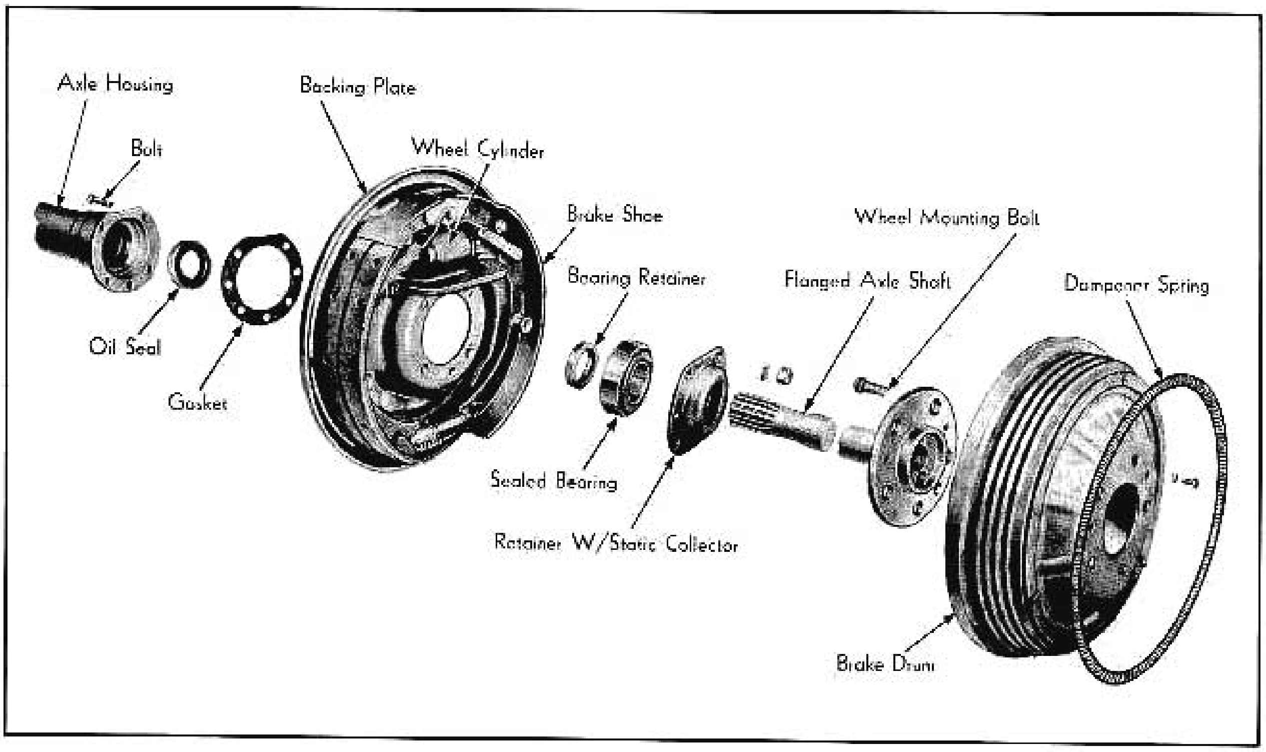


Fig. 6-26 Rear Wheel - Disassembled

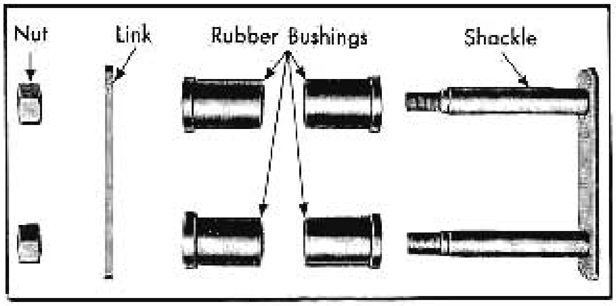


Fig. 6-27 Rear Spring Shackle Disassembled

4. Remove drum.

b. Installation

Installation is the reverse of the removal operation.

(27) Servicing Rear Spring Liners

Replacement rear spring liner tips are available for installation between the spring leaves when original liners wear at the outer ends.

To install these replacement liner tips, it is necessary to use a hardwood wedge 2-1/2" wide, 5" long, and tapered from 1/8" to 3/4" thick in 2" of length. Proceed as follows:

1. Remove spring rebound clips.

2. Raise rear of car until springs are in full rebound position.

3. Mark off length of replacement liner tip on main spring leaf, allowing 1/2" projection beyond second leaf.

4. After placing a piece of sheet metal between liner and spring leaf to protect leaf, pry first and second leaves apart and insert wedge under liner just beyond the point where the old liner is to be cut off.

5. Cut off worn end of original liner with a hacksaw blade. Grinding off a 4-inch section of the back of the saw blade to 1/4" width will permit sawing liner without spreading spring leaves too far apart.

6. Install new liner tip with button end toward axle and work out wedge, keeping liner tip in position.

7. Repeat above operation at each end of the two upper liners in each rear spring.

(28) Removal and Installation of Rear Spring

a. Removal

1. Jack up car so that weight of body is entirely off the spring.

2. Remove spring front shackle bolt nut through hole in frame side bar and drive out shackle bolt.

3. Disconnect shock absorber from lower mounting stud located on spring "U" bolt plate.

4. Remove rear spring shackle nuts and link, Fig. 6-27.

5. Remove spring U-bolt nuts, washers, lower spring plate, lower insulator retainer and insulator pad.

6. Remove spring from rear shackle by removing shackle from frame on left side of car, or driving spring off shackle on right side of car.

b. Installation

1. Install new bushings in spring eyes at front and rear.

2. Install spring on rear lower shackle bolt.

3. Line up front spring eye in bracket on frame and install bolt from inner side of frame and install nut, but do not tighten until car is lowered.

4. Install rear shackle link and shackle nuts.

5. Install insulator pad and retainer on top of spring with hole in pad and retainer over spring center bolt.

6. Position center of spring under rear axle housing bracket with spring center bolt located in hole provided in bracket.

7. Install insulator pad, retainer, and rear spring U-bolt pad on under side of spring over center bolt and install U-bolt nuts and lock washers.

8. Connect rear shock absorber at spring pad stud.

9. Lower car and check torque of front spring eye bolt and rear shackle spring U-bolt nuts which should be 45-52 ft. lbs.

DIAGNOSIS CHART

EFFECT	CAUSE	REMEDY
Hard Steering (Indicated by tightness in steering system).	Low or uneven tire pressure.	Inflate tires to proper pressure.
	Steering gear or connections adjusted too tight.	Test steering system for binding with front wheels off floor. Adjust as necessary and lubricate.
	Insufficient or incorrect lubricant used.	Check lubricant in steering gear and lubricate steering system as required.
		Lubricate front suspension.
	Excessive caster or toe-in.	Check caster and toe-in.
	Suspension arms bent or twisted	Check wheel camber, king pin inclination, and caster. Replace bent arms with new ones.
	Front springs sagged.	Check spring height. Sagged springs should be replaced with new ones. See Note 6.
	King pin bushings scored.	Replace with new bushings.
	Steering knuckle bent.	Replace with new knuckle.
	Thrust bearing scored or worn.	Replace with new bearing.
	Frame bent or broken.	Check frame for proper alignment or breakage. Repair or replace frame as necessary.
Excessive Play or Looseness in Steering System	Steering gear connections adjusted too loose or worn.	Adjust or install new parts as necessary.
	Steering knuckle bearings worn.	Install new bearings.
	Front wheel bearings incorrectly adjusted or worn.	Adjust bearings or replace with new parts as necessary.
Car pulls to one side.	Uneven tire pressure.	Inflate tires to proper pressure.
	Uneven tire wear.	Interchange tires.
	Uneven camber.	Check and adjust camber as necessary.
	Uneven caster.	Check caster and adjust as necessary.
	Rear wheels not tracking with front wheels.	Check alignment of rear wheels with front wheels.
	Shock absorbers inoperative.	Check shock absorbers.

CHASSIS SUSPENSION

DIAGNOSIS CHART (Continued)

EFFECT	CAUSE	REMEDY
Car Pulls to one side (Cont.)	Wheel bearings adjusted too tight.	Check for binding with front wheels off floor. Adjust bearings and lubricate.
	Front springs sagged.	Check spring height and replace if necessary.
	Rear axle shifted. (Spring U-bolts loose or center bolt sheared).	Check U-bolts for looseness. Also measure from rear spring shackle bolt to axle housing. This distance should be equal on both sides of a car.
	Steering knuckle bent.	Replace with new knuckle.
	Steering knuckle arm bent.	Replace with new arm.
	Frame bent or broken.	Check frame for proper alignment or breakage. Repair or replace as necessary.
Scuffed Tires.	Excessive speed on turns.	Caution driver.
	Tires improperly inflated	Inflate tires to proper pressure.
	Wheels or tires out of true.	Check for wheel and tire wobble. See that wheels and tires are properly mounted.
	Toe-in incorrect	Adjust toe-in to specifications.
	Suspension arm bent or twisted.	Check wheel alignment.
	Steering knuckle bent.	Replace with new knuckle.
Cupped Tires.	Normal cupping of tires.	Explain to owner that such cupping is due to normal action.
	Tires improperly inflated.	Inflate tires to proper pressure.
	Wheels, tires, or brake drums out of balance.	Balance wheels and tires.
	Incorrect drag link height.	Correct according to specifications.
	Worn steering knuckle bearings or wheel bearings incorrectly adjusted or worn.	Adjust or replace parts as necessary.
Front Wheel Shimmy	Wheels, tires, or brake drums out of balance.	Balance wheels and tires.
	Wheels or tires eccentric.	Check for tire and wheel wobble or eccentricity. See that wheels and tires are properly mounted.
	Steering gear or steering connections incorrectly adjusted or worn.	Adjust or install new parts if necessary.
	Front wheel bearings incorrectly adjusted or worn.	Adjust or replace if necessary.
	Shock absorbers inoperative.	Check and replace if necessary.

CHASSIS SUSPENSION

DIAGNOSIS CHART (Continued)

EFFECT	CAUSE	REMEDY
Front Wheel Shimmy (Cont.)	Steering knuckle bearings worn.	Install new bearings.
Car Wanders	Steering gear or connections adjusted too loose or worn.	Adjust or install new parts as necessary.
	Drag link height incorrect	Check and adjust to specifications.
	Steering knuckle bearings worn.	Install new bearings.
	Toe-in or caster incorrectly adjusted.	Adjust toe-in and caster.
	Excess friction in front suspension.	Lubricate.
	Front spring height incorrect.	Check spring height and adjust or replace as necessary.
	Rear axle shifted. (Spring U-bolts loose or center bolt sheared off).	Check spring U-bolts for looseness. Also measure from rear spring shackle bolt to housing. This distance should be equal on both sides of car.
Road Shocks	High tire pressure.	Deflate tires to proper pressure.
	Steering gear or connections incorrectly adjusted.	Adjust steering gear and connections.
	Shock absorbers inoperative.	Check shocks and replace if necessary.
	Front springs weak or sagged.	Check spring height and replace if necessary.
	Wrong type or size of tires used.	Install new tires of correct type and size.

TORQUE TIGHTNESS

Application	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Knuckle to brake plate and steering arm	7/16-20	60	70
Knuckle support arm - fixed threaded bushings --			
In lower end of knuckle support	Special	200 Min.	
In lower suspension arm	Special	195	205
In upper suspension arm	Special	140	150
Knuckle support, upper and lower, nut	Special	70	90
Rubber bumper to lower suspension arm	3/8-24	16	20
Spring bolt (front end)	Special	65	75
Spring shackle bushings and hanger bushings	Special	65	75
Stabilizer bracket to frame	3/8-24	25	30
Steering idler arm threaded bushing	Special	110	115
Steering tie rod adjuster clamp bolts	5/16-24	20	20
Steering tie rod pivots to steering arms	1/2-20	50	55
Suspension arm shaft to frame (lower)	7/16-20	60	70
Suspension arm shaft to frame (upper)	9/16-18	150	160
Wheel mounting nuts	1/2-20	90	100

CHASSIS SUSPENSION

SPECIFICATIONS

Subject and Remarks	54-62, 60S	54-75	54-86 Comm.
King Pin inclination	5° 51'	5° 51'	5° 51'
*Camber of front wheels	$-3/8^{\circ}$ to $+3/8^{\circ}$	$-3/8^{\circ}$ to $+3/8^{\circ}$	$-3/8^{\circ}$ to $+3/8^{\circ}$
*Caster angle	0° to -1°	0° to -1°	0° to -1°
Toe in (Car standing)	3/16" to 1/4"	3/16" to 1/4"	3/16" to 1/4"
Turning radius	23" 24"	27-1/2"	29"
*Adjustment must be within $1/2^{\circ}$ or less on both sides of car			
SHOCK ABSORBERS -- Front			
Type	Delco Hydraulic Direct Acting		
Bore	1"	1"	1"
Model No. (Replacement Type)	873G	873G	873G
SHOCK ABSORBERS -- Rear			
Type	Delco Hydraulic Direct Acting		
Bore	1"	1"	1"
Model No. (Replacement Type)	873X	873X	873X
RIMS			
Diameter	15"	15"	15"
Width	6"	6"	6"
Eccentricity	3/64" max.	3/64" max.	3/64" max.
Runout	3/64" max.	3/64" max.	3/64" max.
TIRES			
Inflation pressure, in pounds --			
Front	24	28	24
Rear	24	28	30
Ply rating	4	6	6
Size (Black Walls)	8.00 x 15	8.20 x 15	8.90 x 15
Size (White Walls)	8.20 x 15	8.20 x 15	
WHEELS			
Type	Slotted Disc Optional - Wire Wheels	Slotted Disc	Slotted Disc
Make	Kelsey-Hayes	Kelsey-Hayes	Kelsey-Hayes

FRONT SPRING DATA CHART

Series	Part No.	Color Daub	Normal Load	Rate Per In.
54-6019 (Without Air Conditioner)	1460194	Light Blue	2240	350
54-6219, 6237 and 6237D) (Without A.C.)	1460193	Green	2180	350
54-6267 and 6267S (Without A.C.)	1460195	Pink	2320	375
54-6019, 6219, 6237 and 6237D (With A.C.)	1460195	Pink	2320	375
54-7523 and 7533 (Without A.C.)	1460191	Purple	2430	400
54-7523 and 7533 (With A.C.)	1460192	Orange	2550	400
54-86	1460189	None	2500	540

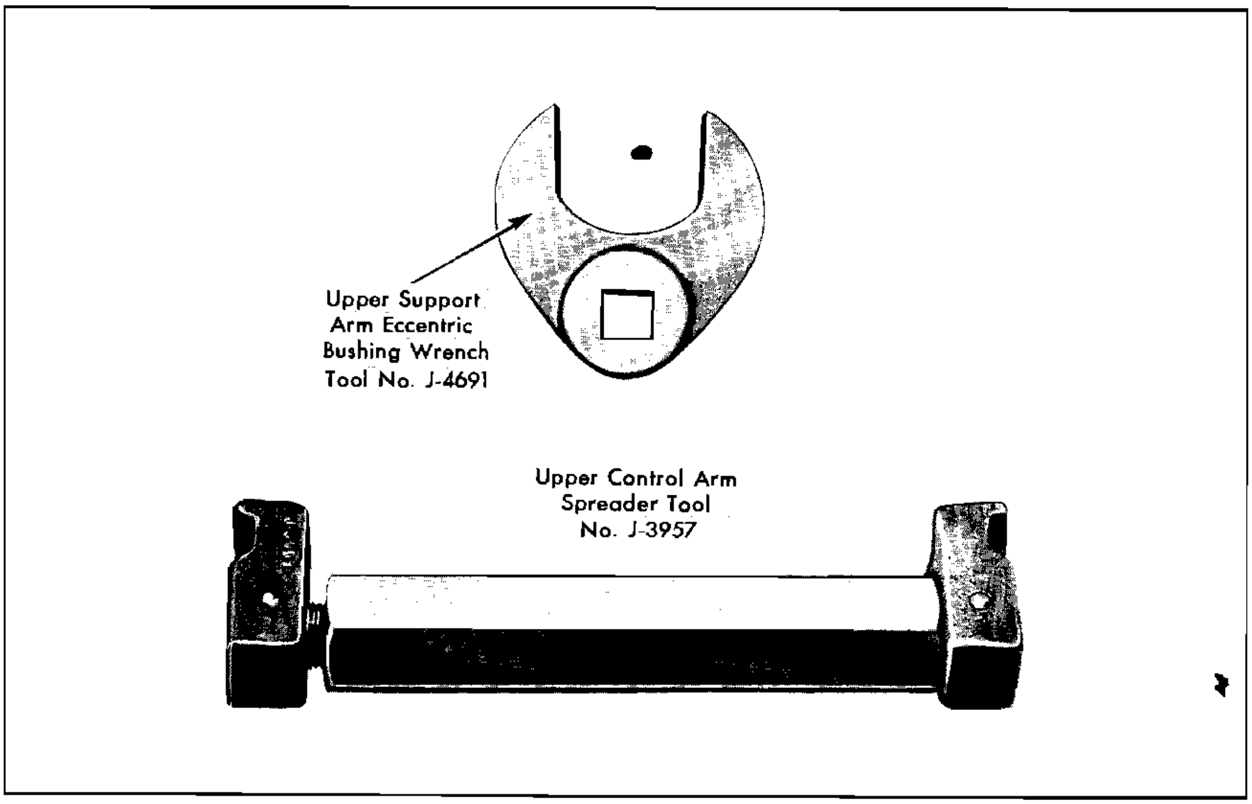
Inside diameter of springs is 4.00 inches.

NOTE: On cars equipped with Air Conditioner, Spring 1460192 or 1460195 is used on both sides, with Shim 1457838 on R.H. side only.

REAR SPRING DATA CHART

Series	Part No.	Color Daub	Normal Load	Rate Per In.	No. of Leaves
54-6019 and 6237D (Without Air Conditioner)	1460924	Light Blue	1190	115	5
54-6219 and 6237 (With Air Conditioner)	1460924	Light Blue	1190	115	5
54-6219 and 6237 (Without Air Conditioner)	1460926	Green	1160	110	5
54-6267 and 6267S (Without Air Conditioner)	1460925	Pink	1260	120	5
54-6019 and 6237D (With Air Conditioner)	1460925	Pink	1260	120	5
54-60 and 62 - Heavy Duty	1460930	Dark Red	1330	140	6
54-7523 and 7533 (Except Exports)	1460927	Purple	1440	140	6
54-7523 and 7533 - Export	1460929	Yellow	1430	170	7
54-86	1460928	None	1700	235	9
54-86-Heavy Duty	1460931	White	1900	235	9

All springs are 2.50 inches in width. Color daub to appear on rear eye only.



Chassis Suspension Special Tools

STEERING

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GENERAL DESCRIPTION

A hydraulically operated power steering gear, Fig. 7-1, which combines the recirculating ball type gear with a hydraulic booster mechanism, is used on all 1954 series 62, 60S, and 75 cars, and is available as optional equipment on the 86 series when the chassis is ordered at the factory. The hydraulic booster is linked to the pitman shaft through a separate power rack and is controlled by a valve assembly on the steering shaft. The gear ratio of the power steering gear is 19.2 to 1. The overall ratio is 21.5 to 1.

The manual steering gear assembly is used as standard equipment on the 1954 series 86 cars only, and is of the recirculating ball type, which provides rolling contact of the gear with the worm to reduce friction and attain ease of handling. Details of construction are shown in Fig. 7-2. The gear ratio of this manual gear is 23.6 to 1, with an overall steering ratio of 27.1 to 1.

The power steering gear, Fig. 7-1, is so designed that it will reduce steering effort, especially during parking, yet not remove the so-called "feel" of steering. In addition, the hydraulic system resists road shock or kick-back. All steering is accomplished in an effort range of from zero to eight pounds pull at the rim of the steering wheel, which is proportional to the force necessary to turn the front wheels. The hydraulic booster system does not assist in steering until an effort of over three pounds is exerted at the rim of the steering wheel. Although there is a great reduction in steering effort, the hydraulic system accomplishes no steering effort, except through the guidance of the driver.

The principal working parts of the hydraulic gear are the steering worm, ball nut, pitman shaft gear, control valve, hydraulic cylinder and power rack. The hydraulic supply system consists of an oil reservoir, hydraulic pump, and a combination pres-

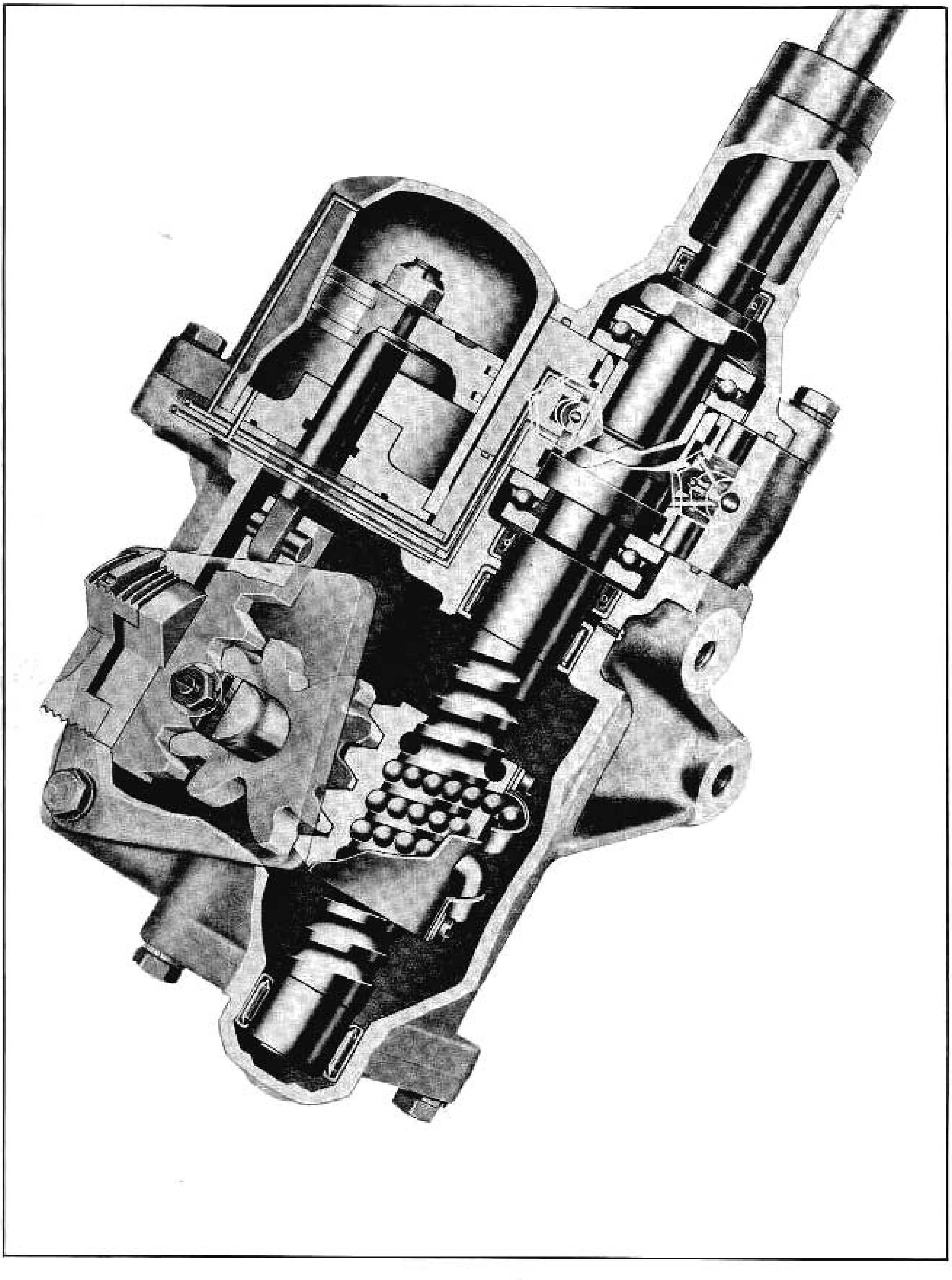

Fig. 7-1 Power Steering Gear Detail

STEERING

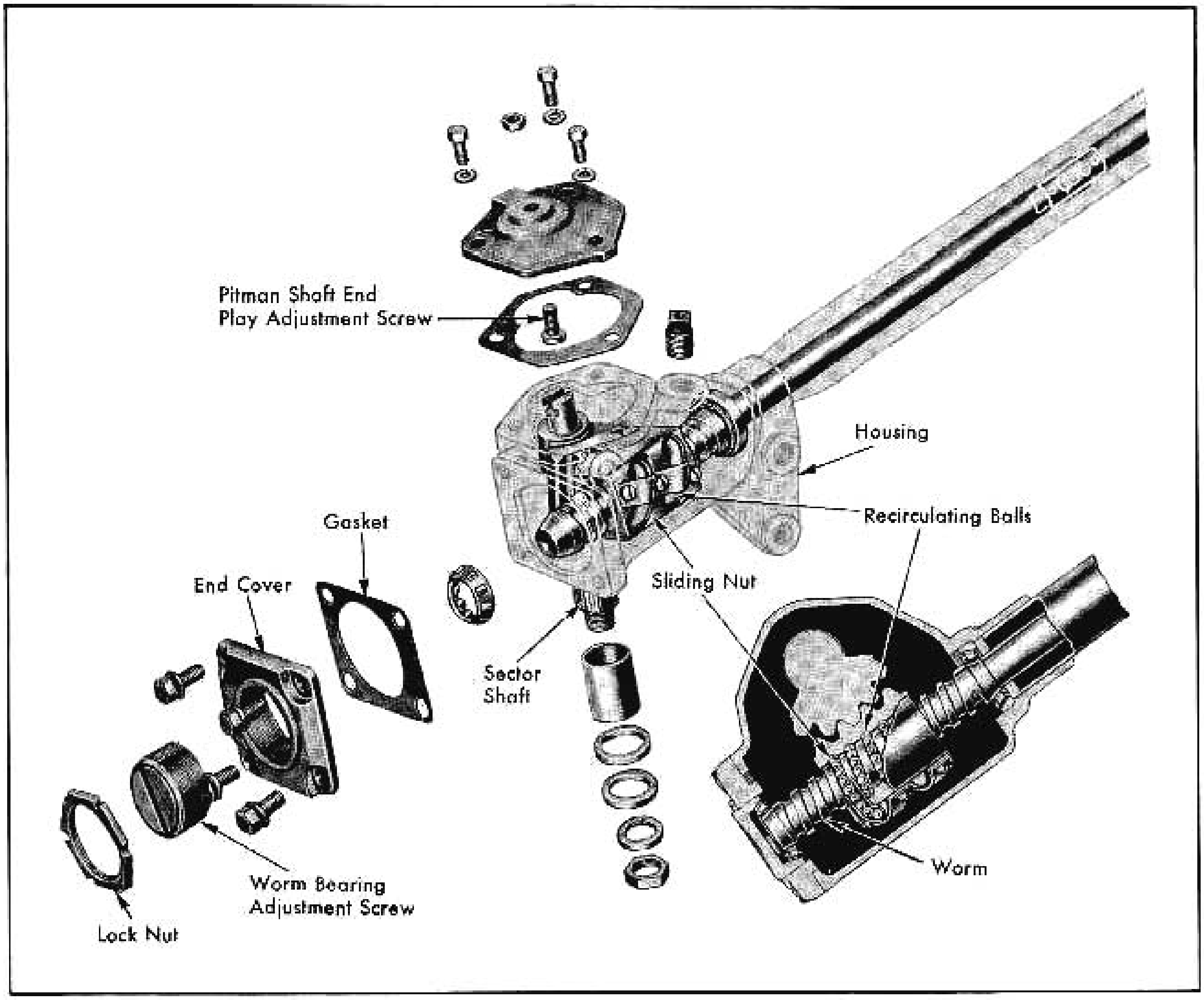

Fig. 7-2 Manual Steering Gear Detail

sure relief and flow control valve. Oil from the pump is directed to the valve body on the gear housing through a high pressure hose.

The hydraulic cylinder assembly is mounted on the steering gear housing and is linked to the pitman shaft gear through a power rack attached to the end of the piston rod. The power rack is guided by an adjustable plate. The control valve body assembly, which directs the flow of oil to the power cylinder, is mounted on the steering gear housing and is concentric with the steering shaft. The control valve body is positively aligned to the housing and cover by machined counterbores in the housing and cover. The valve body assembly consists of a valve spool, valve spool sleeve, ten plungers, five preload springs, a check valve, and the valve body. The valve spool has two annular grooves which connect three annular passages inside the valve body. A valve spool centering sleeve, which is slightly (.005" - .0015") longer than the valve spool, is located between the steering shaft and the valve spool. This sleeve is maintained in a position concentric with the steering shaft by a rubber "O" ring located in a groove in the shaft. Fig. 7-3.

The sleeve is held in position on the shaft by upper and lower thrust bearings, a spring type cone washer and a stake type nut. The sleeve and valve spool are centered laterally in the valve body by five sets of plungers which bear against both the cover and the thrust bearing on the upper end and the gear housing and the thrust bearing at the lower end. The plungers are held against these parts by the action of five springs. It is therefore necessary to overcome the preload of the five springs before the sleeve and the valve spool can be moved either up or down. When there is sufficient resistance to rotation of the pitman shaft developed at the road wheels, continued turning of the steering wheel will result in an axial movement of the worm and shaft to overcome the preload of the plunger

STEERING

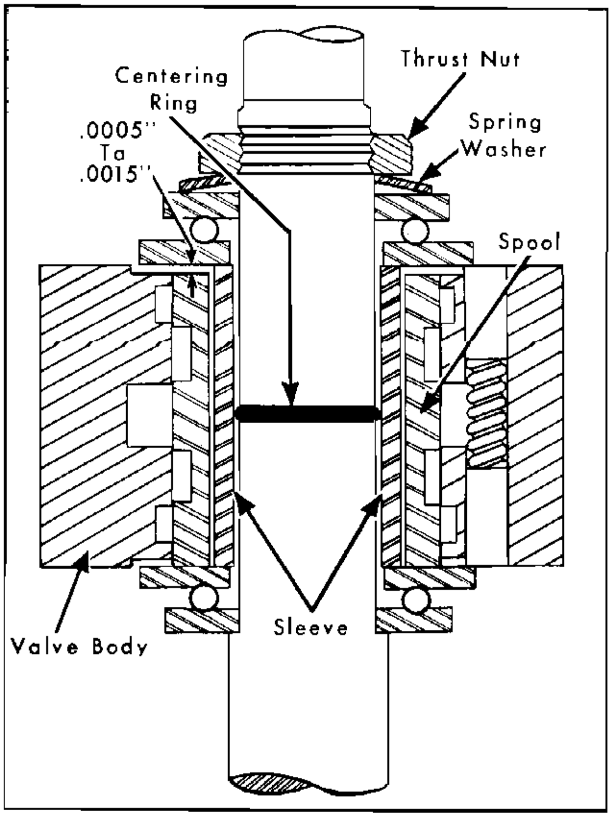

Fig. 7-3 Centering Sleeve Position

springs. This axial movement is due to the lead on the steering worm and the direction of movement is dependent on the direction of rotation of the steering wheel.

With this design, any side load imposed on the thrust bearings, when the shaft is turned, will not be transmitted to the valve spool to cause binding of the spool in the valve body. The valve spool will, however, move upward or downward with the thrust bearings to direct the oil into the proper passages.

When the valve spool is in the neutral or centered position, Fig. 7-4, the oil from the pump flows from

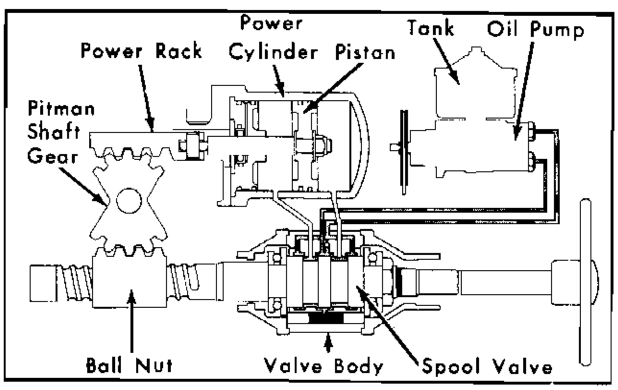

Fig. 7-4 Hydraulic Circuit - Neutral

the center passage of the valve body, through the two annular grooves in the valve spool, to the annular passages at the ends of the valve body and returns to the pump.

As the steering wheel is turned, resistance at the road wheels will cause the shaft and the valve spool to move either up or down depending on the direction in which the wheel is turned. This movement of the valve spool interrupts the direct circuit of the pump by shutting off both direct return passages. Fig. 7-5. The oil is then forced to travel to one end of the hydraulic cylinder, through drilled passages in the

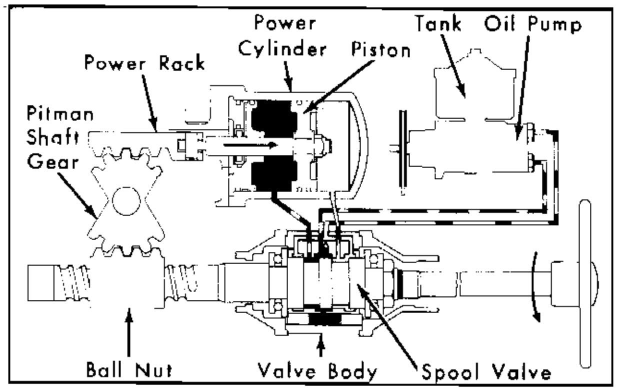

Fig. 7-5 Hydraulic Circuit - Left Turn

housing and cylinder, to move the piston. The opposite end of the cylinder is open to the pump return line, and oil on this side of the piston is permitted to return to the pump.

The hydraulic pump is of the constant displacement type with a flow control valve and builds up only enough pressure to overcome the resistance to the rotation of the pitman shaft. The oil pressure which operates the piston is also diverted to the plungers, on the spring side, to assist in building up a preload which must be overcome by slightly increased effort at the steering wheel. This feature of increasing the centering action of the plungers permits the driver to retain the "feel" of driving the car as was previously mentioned.

A check valve in the return line passage of the valve body permits circulation of oil in the power system in the event of pump failure or if steering is done when the engine is shut off.

The steering linkage consists of the steering knuckle arms, each of which is connected to a tie rod which in turn is connected to the steering connecting rod (drag link). The left end of the drag link is connected to the steering gear pitman arm, and the right end is connected to an idler arm mounted on the right frame side bar. Road harshness at the steering wheel is reduced by means of springs in the drag link, between the tie rod ball sockets and the pitman arm and idler arm ball sockets.

SERVICE INFORMATION

(1) Preliminary Operations Before Steering Gear Adjustments

Often, conditions such as hard or loose steering, road shock, vibration and the like, are not due to the steering gear, but to other related factors, such as: wheel balance, tire pressure, shock absorbers, front end alignment, etc. Therefore, before any adjustment of the steering gear is made, these related factors should be checked and adjusted if necessary.

Other factors in the Power Steering assembly which will affect the operation of this unit are: improper oil level, drive belt tension, dirt or sludge in reservoir, oil leakage at gaskets or fittings. These conditions are discussed in the following notes and should also be checked before any adjustment of the steering gear is made.

(2) Steering Gear Adjustments (Manual Steering Gear)

The recirculating ball type steering gear has two adjustments: The worm bearing adjustment and the pitman shaft end-play adjustment.

a. Worm Bearing Adjustment (Off Center)

1. Disconnect steering connecting rod at pitman arm.

2. Check alignment of steering tube as follows:

a. Loosen three mounting screws holding steering gear to frame side bar.

b. Tighten front screw only.

c. Check space between gear housing and frame side bar, and install proper thickness shims to fill gap at two rear mounting screws, Fig. 7-6. If there is no space at the rear, loosen the front screw and tighten two rear mounting screws. Check space at front of gear, and add spacers to fill gap at this point. If shims are required in the gear housing alignment adjustment, noted above, the straight ahead position of the front wheels, in relation to the steering gear high spot position and toe-in, should be rechecked.

d. Tighten three mounting screws to 40-45 ft. lbs. torque.

3. Turn steering wheel to either stop, then check pull required to turn steering wheel back to 90° from the straight ahead position, using Spring Scale, Tool No. 4-544-A. This off-center pull should be between 1 and 1-1/4 pounds.

NOTE: In order to avoid damage to ball mechanism, do not turn steering wheel hard against stops.

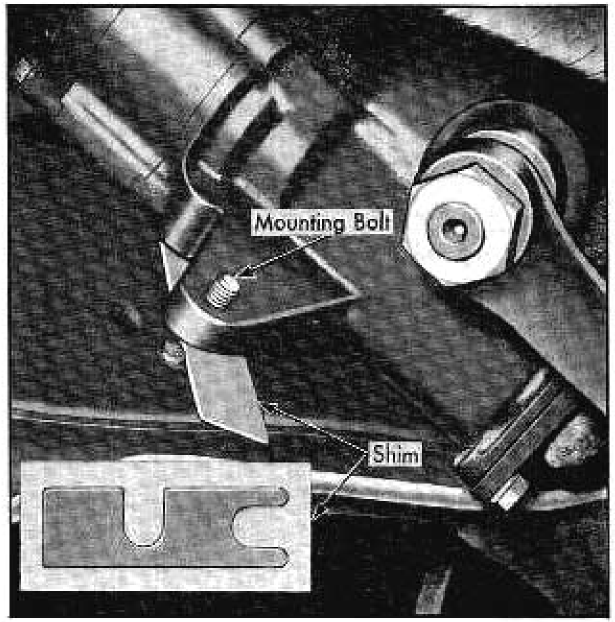

Fig. 7-6 Aligning Steering Gear

4. Loosen locknut, using a 2-1/2" open end wrench, and turn worm bearing adjustment screw as required.

5. Tighten lock nut, when adjustment is correct, and recheck as described in Step 3 above.

b. Pitman Shaft End-Play Adjustment (Through Center)

1. Turn steering wheel about 90° each way through center. The pull through center should be between 1-1/2 and 2 pounds. New cars driven less than 1000 miles require a pull of not less than 2 pounds nor more than 2-1/2 pounds.

2. Loosen lock nut and turn pitman shaft adjusting screw clockwise to increase the pull through center -- counter-clockwise to decrease the pull through center.

3. Tighten lock nut when adjustment is correct, and recheck pull through center.

4. Reassemble steering connecting rod. The end nut at the pitman arm ball end must be turned up tight and backed off 1/2 to 5/8 turn.

(3) Steering Gear Adjustments (Power Steering Gear)

a. Off-Center Preload Check

1. Disconnect drag link at pitman arm.

2. Check alignment of steering shaft as outlined in Note 2a, and add shims as necessary.

3. Back off power rack and pitman shaft adjusting screws at least 1/2 turn.

4. Using Spring Scale, Tool No. J-544A, check the "off-center" pull through at the rim of the steering wheel. This should be between 3/8 and 3/4 lbs.

NOTE: If the pull off-center is greater or less than specified above, it will be necessary to remove the gear from the car. Check thrust bearing lock nut torque (30 ft. lbs.). See Note 22. Also check for binding or rough bearings in upper and lower thrust bearing retainers. Do not attempt to compensate for any variance from off-center pull specifications by adjusting the pitman shaft end play screw or the power rack screw.

b. Pitman Shaft End Play Adjustment

1. Adjust pitman shaft end play screw until pull through center is 1/2 to 1 lb. greater than pull at one full turn off center. Fig. 7-7.

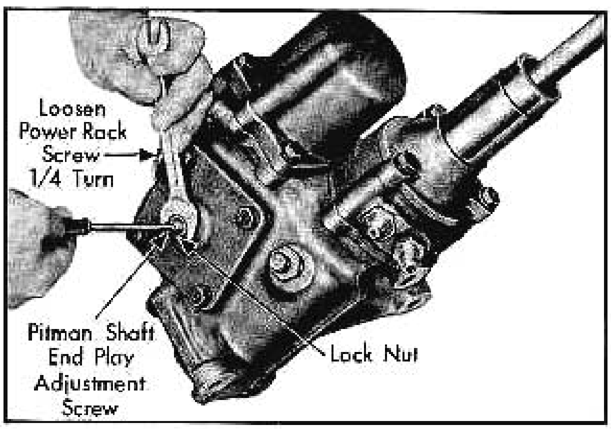

Fig. 7-7 Adjusting Pitman Shaft End Play

2. Tighten adjusting screw lock nut, and recheck pull through center.

c. Power Rack Guide Adjustment

After the pitman shaft end play has been adjusted, the clearance between the power rack gear and the ball nut must be adjusted to prevent binding or excessive lash at this point.

1. Using Special Tool, No. J-5648, tighten the power rack adjusting screw so that the over center pull through is 1/8 to 1/4 lb. greater than that obtained in the pitman shaft end play adjustment. Fig. 7-8 (Note 3b above). This should be measured at the rim of the wheel through an arc not exceeding 3".

2. Tighten power rack adjusting screw lock nut, and recheck adjustment.

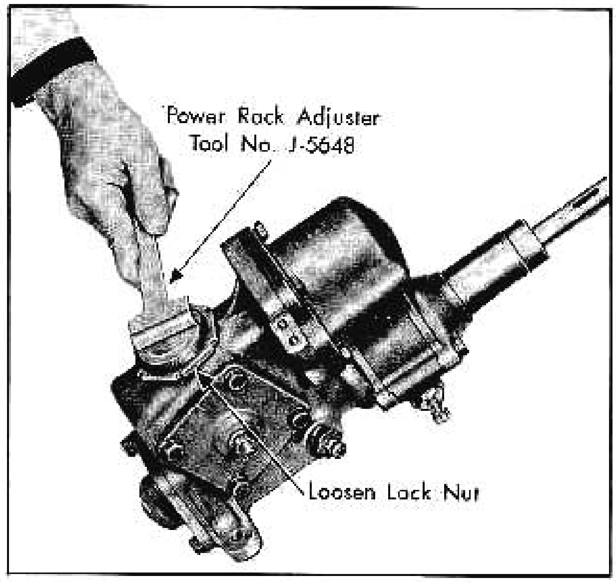

Fig. 7-8 Adjusting Power Rack

3. Connect drag link at pitman arm.

(4) Checking and Bleeding Hydraulic System

a. Checking Fluid Level

1. With engine shut off, remove tank cover hold-down screw, and remove cover and gasket.

2. Level of fluid should be 1/2" below top edge at oil level mark as indicated on outside of tank, Fig. 7-9.

3. Fill to level with Hydra-Matic transmission fluid.

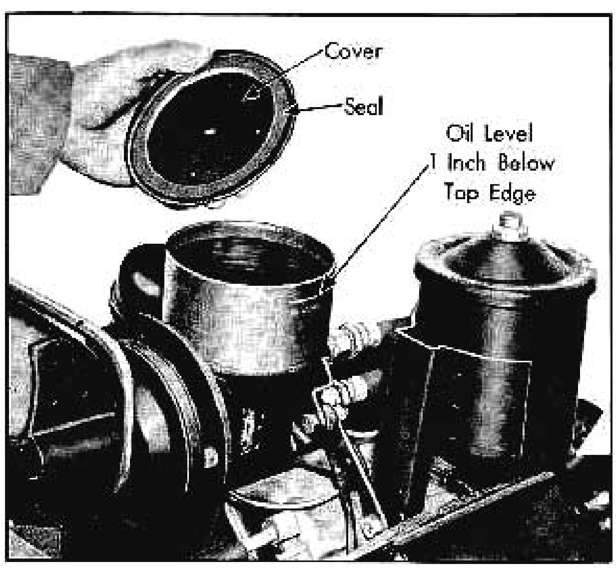

Fig. 7-9 Checking Pump Fluid Level

4. Install gasket, cover, and hold-down screw. Tighten screw to 10-15 ft. lbs. torque.

b. Bleeding the System

If there is air in the hydraulic circuit, the following procedure should be used to bleed the system:

1. Fill oil tank to proper level, and let oil remain undisturbed for about two minutes.

2. Crank engine (coil wire disconnected) and maintain fluid level in tank. Turn wheels (off ground) at the same time to eliminate air pockets in power cylinder.

3. Start engine and run at idle for two minutes. Recheck fluid level, and inspect gear, pump, hoses, and connections for leaks.

4. Increase engine speed to 1500 R.P.M. and continue running at this speed until air bubbles cease to appear. Turn wheels (off ground) from right to left. Do not hit stops.

5. Lower car and turn wheels on ground. Recheck for leaks.

6. Check oil level and refill as required.

(5) Pump Belt Tension Adjustment

1. Loosen pump to mounting bracket screws.

2. Move pump outward until belt is tight.

3. Tighten bracket to pump mounting screws.

4. With shift lever in "N", race engine while turning steering wheel. If belt squeals, it is too loose and must be retightened.

(6) Checking Pump Pressure

1. Disconnect hose at lower union marked "PR" on pump.

2. Install Checking Gauge, Tool No. J-5176, on union at pump, with gauge valve closed, Fig. 7-10.

3. Connect hose to fitting on valve side of gauge.

4. Open gauge valve and run engine at idle.

5. Turn wheels (on ground) against stops. Pressure should not be less than 900 psi.

6. If pressure is less than 900 psi, slowly close gauge valve, observing gauge for pressure increase. Pressure will increase as valve is closed, if pump is operating properly. If pressure increases (950 psi, when valve is closed) the trouble is in the gear.

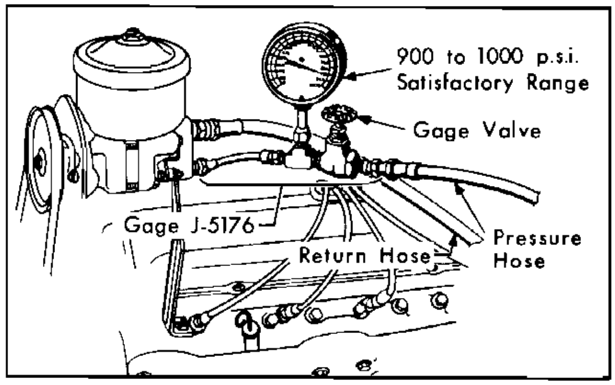

Fig. 7-10 Checking Pump Pressure

CAUTION: Do not leave valve closed for more than fifteen seconds.

7. If pressure does not increase when valve is closed, difficulty is in the pump.

8. If pressure (valve closed) is greater than system pressure, but less than 900 psi, both units require attention.

9. Shut engine off, remove gauge and valve, and reconnect hose to pump.

(7) Drag Link Height Adjustment

The distance between the lower edge of the drag link and the flat spot on the frame side bar, directly above the drag link at each end, should be checked in cases of steering wander and instability after normal corrective adjustments have been made. The procedure outlined below may be used to measure these distances:

1. Place a straight bar across two adjustable jacks, directly below the drag link. Fig. 7-11.

2. Adjust the height of the jacks so that distance "A" (from top of bar to flat spot on frame) is equal on both sides.

NOTE: Adjusting jacks so that distance "A" is an even number of inches will simplify this measurement.

3. Measure distance "B" (from top of bar to bottom of drag link) on both sides.

4. Distance "A" minus "B" should be 4-7/8" and equal at both ends of the drag link within 1/8" (DRAG LINK MUST BE PARALLEL TO FRAME WITHIN 1/8"). A tool to check drag link to frame

STEERING

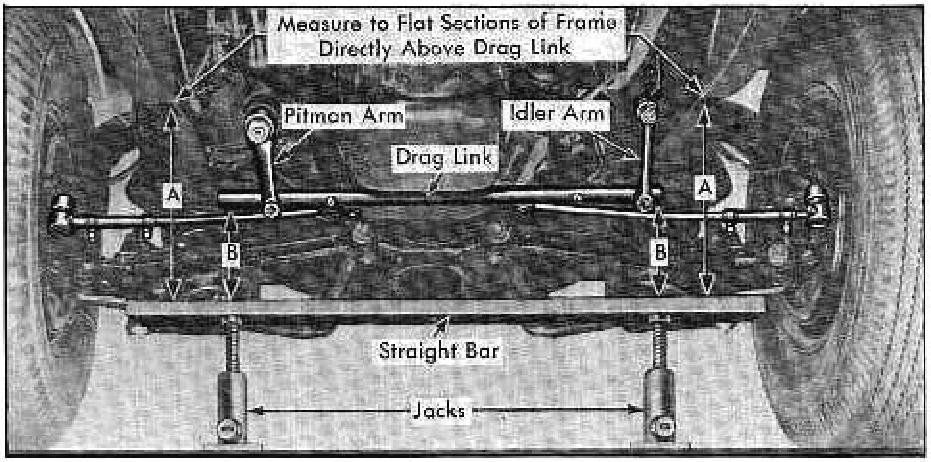

Fig. 7-11 Checking Drag Link to Frame Parallelism

parallelism quickly may be made from any rigid material to the dimensions shown in Fig. 7-12. Place the tool on the top of the drag link at the end, and check the distance between the tip of the tool and the flat spot on the frame with a 1/4" drill as shown in Fig. 7-12. If the tool plus the drill shank does not touch the frame the drag link is too low, and if the tip of the tool will not fit in position, the drag link is too high. Check both ends to see that the clearance between the tool and frame is within the 1/8" allowed for parallelism to frame.

5. If the idler arm end of the drag link is not within limits, remove the idler arm support mounting screws on the frame side bar, and screw the idler arm in or out of bushing until correct height is obtained.

CAUTION: When turning the idler arm into the bushing to raise the drag link, be sure that the idler arm is at least 1/2 turn off of base to prevent interference on turns. When turning idler arm out of bushing, do not unscrew more than 2-1/2 turns from base or excessive play will result. If proper height cannot be obtained with this adjustment, it indicates a bent idler arm which should be replaced.

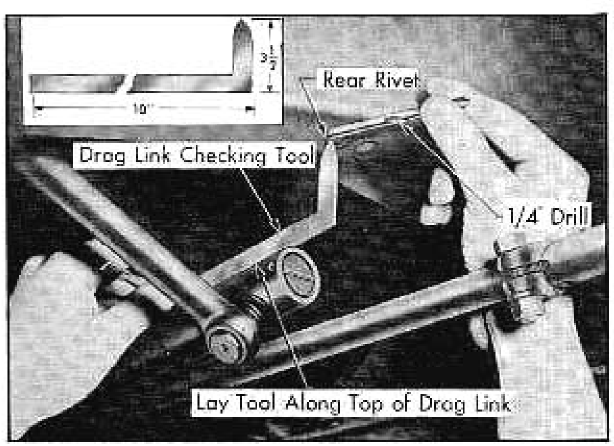

Fig. 7-12 Checking Drag Link Height With Tool

6. If the pitman arm end of drag link is not within limits, the pitman arm must be removed and bent as required.

CAUTION: The bending operation on the pitman arm must be done very carefully to avoid internal stresses and must be performed cold, with a tool placed midway between the ball stud and the splined hole in the steering gear end. Do not bend unless drag link distance to frame at pitman arm end is not within limits. All adjustments for parallelism should be made at the idler arm end if possible.

(8) Removal of Steering Wheel

1. Disconnect horn wire from terminal at lower end of steering column on both manual and hydraulic steering gears.

2. Depress horn button, turn in either direction until locking ears are released and remove button.

3. Remove horn button spring.

4. Remove steering wheel hub nut, Fig. 7-13.

5. Remove horn ring retainer, cushion, and horn ring.

6. Remove steering wheel using Special Puller, Tool No. J-1859, Fig. 7-14.

(9) Installation of Steering Wheel

1. Install steering wheel over splines on steering shaft so that punch marks line up.

2. Install horn ring, cushion, and retainer in

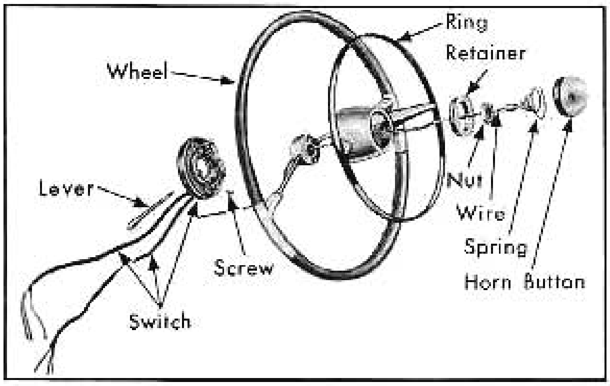

Fig. 7-13 Steering Wheel Assembly

position on steering wheel.

3. Install steering wheel hub nut and tighten to 45-50 ft. lbs. torque.

4. Stake nut to steering shaft.

5. Install spring and horn button, being sure emblem is in proper position.

6. Connect horn wire to terminal on steering column.

(10) Removal and Disassembly of Steering Linkage

a. Removal

1. Disconnect tie rod ends from steering arms

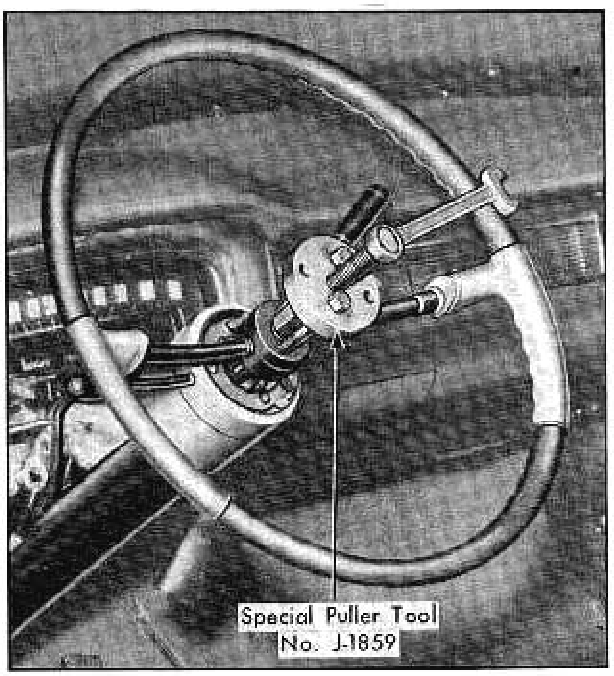

Fig. 7-14 Removing Steering Wheel

at wheels.

2. Remove idler arm support screws from frame side member.

3. Remove pitman arm from pitman shaft, using Special Puller, Tool No. J-2162, Fig. 7-15.

4. Remove steering connecting link with tie rods, idler arm support, idler arm, and pitman arm attached.

b. Disassembly

1. Remove cotter pin, adjusting plug, stop plug, spring, and ball seat from left end of steering connecting link to remove pitman arm from connecting link, Fig. 7-16.

2. Remove inside ball seat, spring, stop plug, spacer, and tie rod outer ball seat to remove left tie rod.

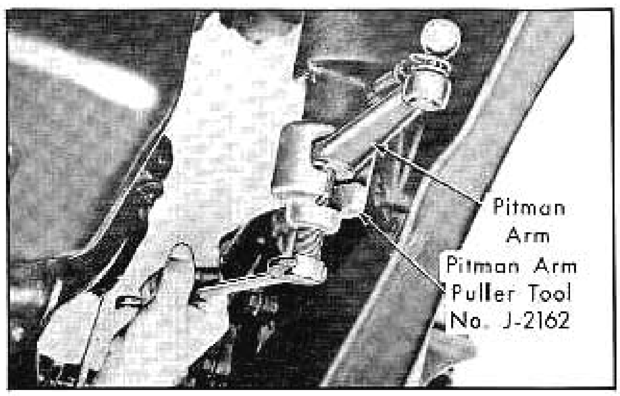

Fig. 7-15 Removing Pitman Arm

3. Remove cotter pin, plug, and outer ball seat from right end of steering connecting link to remove idler arm from connecting link.

4. Remove inner ball seat, spring, stop plug, long spacer, cover, and ball seat, to remove right tie rod.

5. Tie rod ends may be removed from tie rod by loosening clamp screws and unscrewing tie rod or tie rod end from clamp.

6. Remove idler arm support from idler arm bushing by unscrewing support.

7. Remove bushing from idler arm.

(11) Assembly and Installation of Steering Linkage

a. Assembly

1. Assemble all parts in the reverse order of disassembly, being sure all spacers, springs, and stops

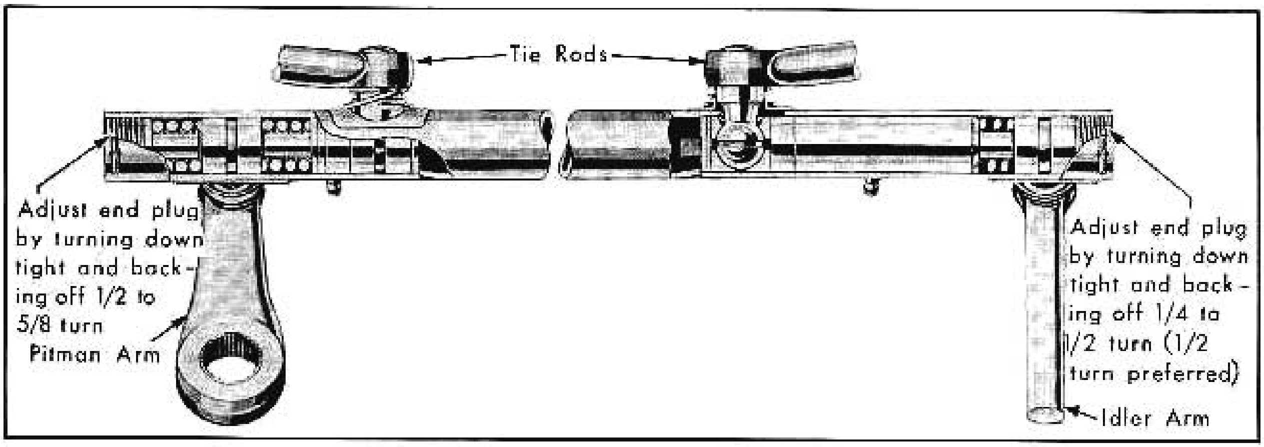

Fig. 7-16 Steering Connector Link

are in correct position.

2. Install end plug in pitman arm end of drag link and adjust by turning down tight and backing plug off 1/2 to 5/8 turn and install cotter pin.

3. Install right end plug and adjust by turning down tight and backing off 1/4 to 1/2 turn.

4. Install bushing in idler arm and tighten to 110-115 ft. lbs.

5. Turn idler arm support with seal into idler arm bushing until it bottoms, and then back off 1/2 to 1-1/2 turns depending on position of bushing in idler arm.

b. Installation

1. Install pitman arm on pitman shaft and tighten nut to 125-150 ft. lbs. torque.

2. Install idler arm support on frame side bar and tighten mounting screws to 30 ft. lbs. torque.

3. Connect tie rod ends to steering arms and tighten nuts to 50-55 ft. lbs. torque.

4. Check drag link height and parallelism to frame. See Note 7.

5. Adjust toe-in.

NOTE: When toe-in adjustment is completed be sure that open side of clamps are over open side of tie rod adjuster before tightening clamp nuts. Fig. 7-17.

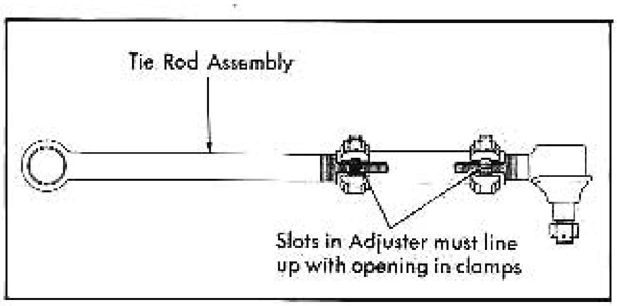

Fig. 7-17 Tie Rod Clamp Position

(12) Removal of Tank and Pump

1. Disconnect hoses at unions on pump. When hoses are disconnected, secure ends of hoses in a raised position to prevent drainage of oil.

2. Install two caps at pump unions to prevent drainage of oil from pump.

3. Remove drive pulley attaching nut.

4. Loosen bracket to pump mounting screws.

5. Remove pump belt.

6. Slide pulley from shaft and remove key.

7. Remove mounting bracket to pump screws.

8. Remove tank and pump assembly.

(13) Disassembly of Tank and Pump

1. Remove tank cover screw, washers, and tank cover with gaskets. Fig. 7-18.

2. Remove gasket from tank cover and discard gasket.

3. Pour out oil and remove four tank to pump mounting screws.

4. Remove tank and cork gaskets from pump

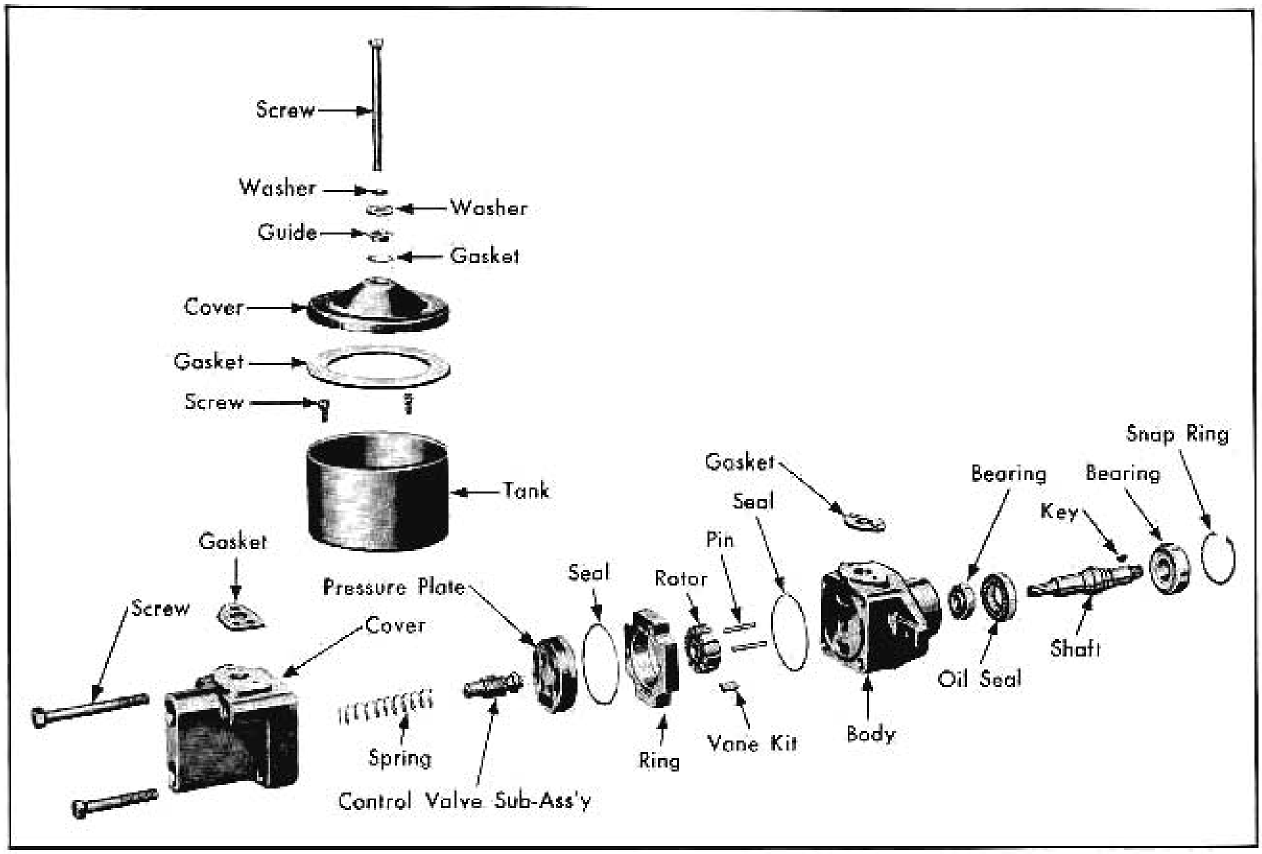

Fig. 7-18 Steering Pump - Disassembled

assembly. Discard gaskets.

5. Remove four pump cover to pump body attaching screws with rear pump mounting bracket.

6. Lift cover assembly from pump assembly.

7. Discard "O" ring seal which fits in front face of pump cover.

8. Remove flow control valve assembly and spring from front face of pump cover.

9. Mark position of pressure plate, and remove plate from dowel pins located in pump body.

10. Mark position of pump cam ring in relation to pump body, and remove ring from dowel pins located in pump.

NOTE: Arrows on outer edges of cam ring point in direction of pump rotation.

11. Remove rotor with vanes from pump shaft.

12. Remove and discard "O" ring from groove in pump body.

13. Remove dowel pins from pump body.

14. Remove shaft bearing retainer snap ring from front face of pump body.

15. Remove drive shaft with large sealed bearing from pump body.

16. Remove oil seal from pump body with a long punch inserted through large holes in machined face of pump body, and discard seal. Fig. 7-19.

17. If necessary to remove small bearing for replacement, remove bearing from pump body by lightly tapping around inner race of bearing with pin punch inserted through center hole in body. Fig. 7-20.

18. Press large sealed bearing off shaft.

(14) Assembly of Tank and Pump

1. Press large sealed bearing over threaded end of shaft with stamped face of inner race toward front of pump.

2. Press small bearing into pump body.

3. Install new oil seal into pump body with the numbered side of seal against seat.

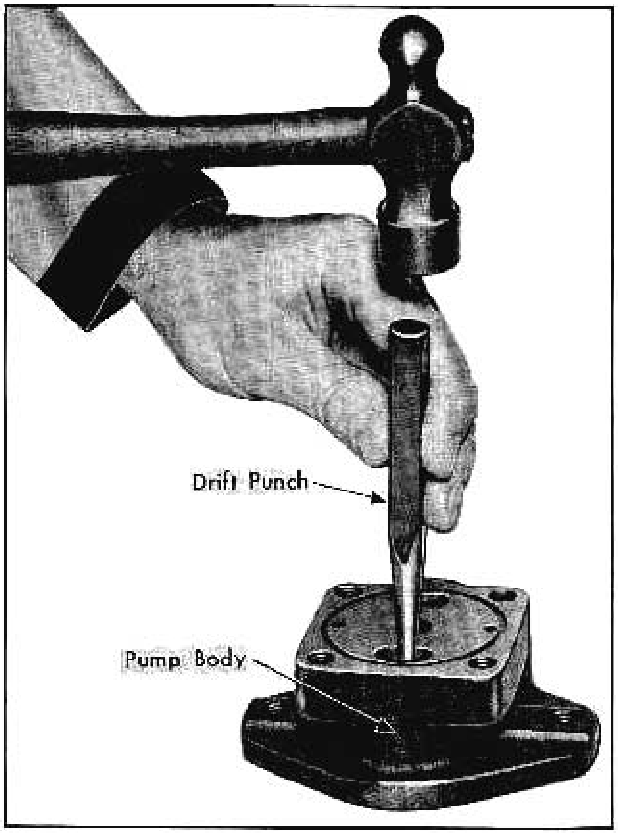

Fig. 7-19 Removing Pump Shaft Oil Seal

4. Install drive shaft and large sealed bearing assembly into pump body.

5. Install shaft bearing snap ring retainer.

6. Install new "O" ring in groove of pump body.

7. Install dowel pins, chamferred end first, into dowel holes in the pump body.

8. Install rotor, with vanes, on pump body over splined end of drive shaft. Assemble vanes in rotor with radius edges toward outside of rotor.

9. Install cam ring on dowel pins and over rotor and vanes. Position correctly according to scribed marks. Fig. 7-21.

NOTE: Arrow on outer edge of cam ring points in direction of pump rotation.

10. Install pressure plate on dowel pins which extend through cam ring, with small arrow on pressure plate at the top.

11. Install control valve and spring in front face of cover.

12. Install new "O" ring which fits in front face of pump cover.

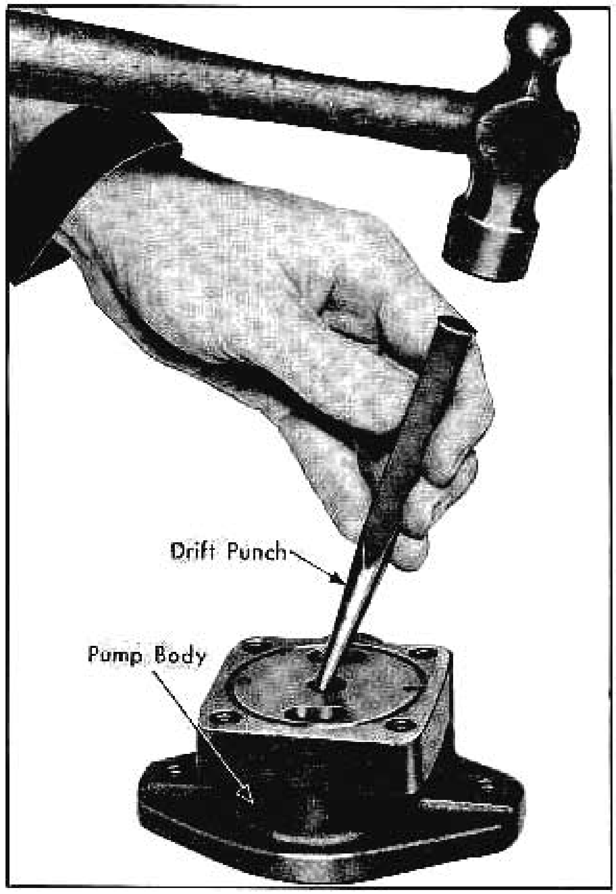

Fig. 7-20 Removing Shaft Bearing

13. Position pump cover assembly over pressure plate and against cam ring.

14. Install four cover to body attaching screws with rear pump mounting bracket.

15. Install new gaskets on pump and tank cover mounting flanges.

16. Position tank on pump assembly, with holes in reservoir lined up with holes in pump assembly,

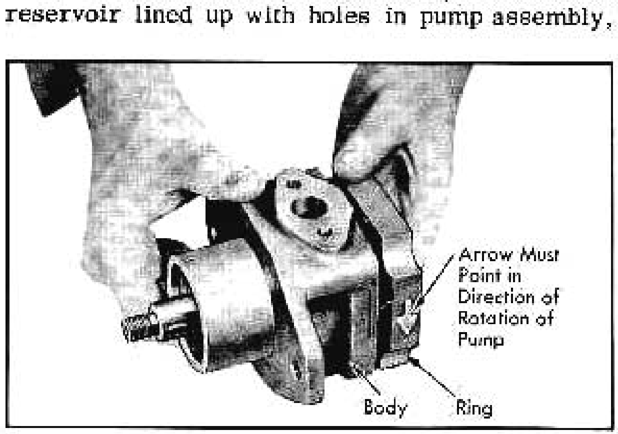

Fig. 7-21 Installing Cam Ring

and install four screws.

17. Install tank cover, with new gasket, cover screw, large washer, and lock washer.

(15) Installation of Tank and Pump

1. Position tank and pump assembly on mounting brackets with holes lined up and install screws loosely.

2. Install key in slot on shaft and slide pulley on shaft.

3. Install drive pulley attaching nut finger tight against pulley.

4. Install pump belt over pulley.

5. Move pump outward until belt is tight; then tighten mounting screws.

6. Tighten pulley nut to 35-45 ft. lbs. torque.

7. Connect and tighten hose fittings.

8. Fill and bleed system.

(16) Removal of Manual Steering Gear

1. Raise front end of car until front wheels are approximately 6 inches above floor.

2. Remove steering wheel as described in Note 8.

3. Remove horn wire from terminal at lower end of steering column.

4. Remove horn contact from steering jacket after removing neutral safety switch mounting screw.

5. Loosen clamp holding lower steering jacket to upper steering jacket, and tap clamp down onto lower jacket.

6. Disconnect steering connecting rod at pitman arm.

7. Remove three bolts holding steering gear to frame side bar.

NOTE: Remove any shims found at upper or lower housing mounting bolts.

8. Strike steering gear housing firmly a few times with a lead hammer to drive the lower jacket down out of the upper jacket.

9. Remove steering gear, lower jacket and steering shaft from bottom of car.

(17) Disassembly of Manual Steering Gear

1. Rotate steering worm until nut is in center of travel.

2. Remove pitman shaft nut.

3. Remove pitman arm from pitman shaft using Special Puller, Tool No. J-2162, Fig. 7-15.

4. Remove three side cover screws, and remove side cover and pitman shaft from housing.

5. To remove side cover from pitman shaft, turn adjuster screw in end of pitman shaft down through cover.

6. Remove four screws and take out end cover with worm bearing, outer race, and thrust washer.

7. To remove lower worm bearing, outer race and thrust washer from cover, loosen worm bearing adjuster screw lock nut and turn screw in through cover.

8. Slide steering shaft and nut assembly out of steering housing.

9. Remove pitman shaft seal from gear housing.

(18) Assembly of Manual Steering Gear

1. Install new pitman shaft seal in gear housing.

2. Install steering shaft and nut assembly in gear housing, keeping the ball nut away from stops on worm.

3. Install worm bearing adjusting screw with lower worm bearing, outer race, and thrust washer in end cover.

4. Install end cover and attaching parts on gear housing making sure bearings seat properly.

5. Tighten worm bearing adjusting screw until a slight drag is felt on bearings. Do not tighten lock nut.

6. Install pitman shaft and adjuster screw inside cover.

7. Rotate steering column until ball nut is in center of travel so that center tooth on pitman shaft will enter center space in nut.

8. Install side cover and pitman shaft in gear housing.

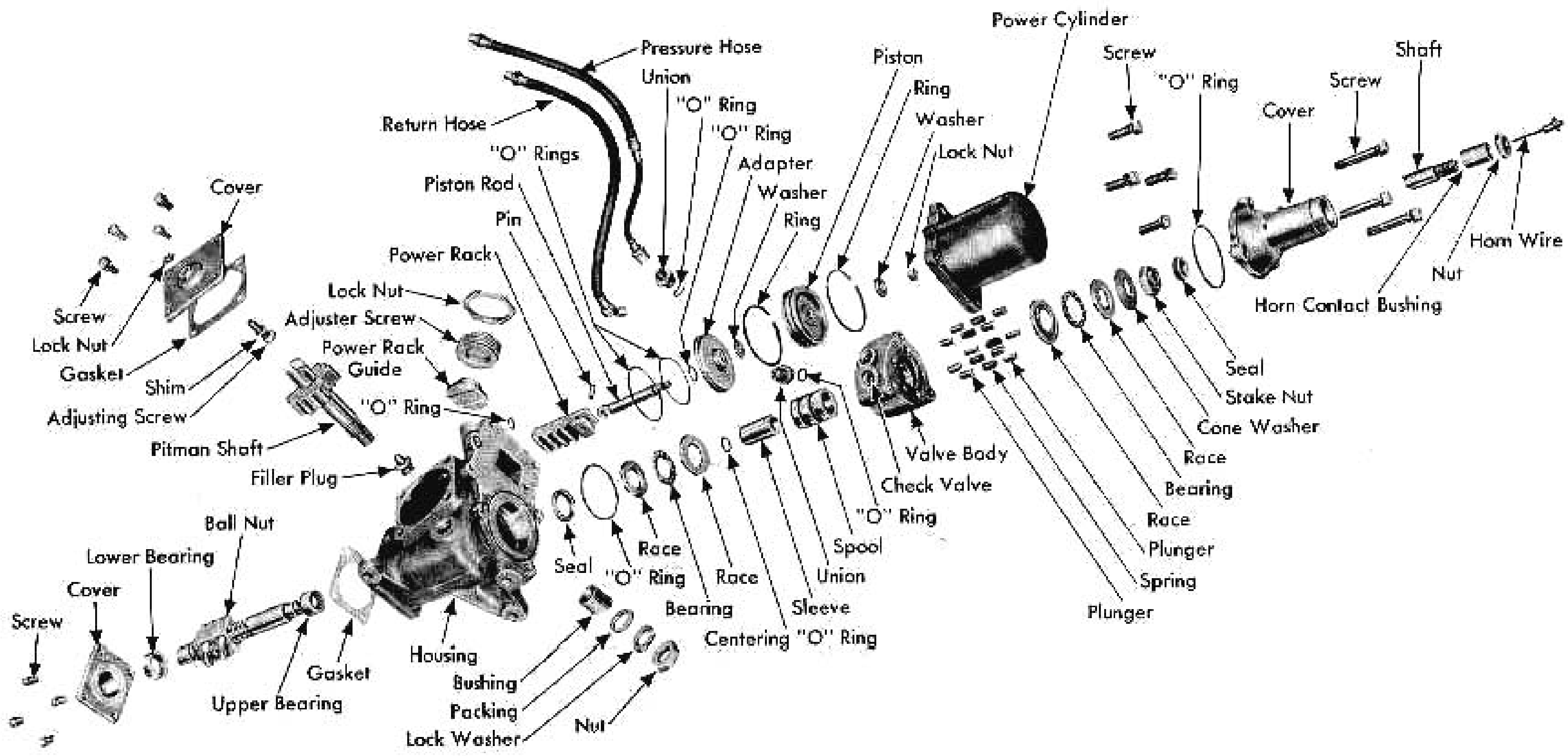

Fig. 7-22 Power Steering Gear - Disassembled

9. Add 2/3 of a tube (13 oz.) of Cadillac Steering Gear Lubricant or equivalent. Adjust gear as outlined in Note 2.

(19) Installation of Manual Steering Gear

1. Make sure that upper end of lower steering jacket is smooth and free from burrs and that lower end of upper jacket is smooth on the inside.

2. Slide steering gear assembly up inside of upper jacket.

3. Use a lead hammer to drive gear housing up until bolt holes in steering gear housing line up with holes in frame side bar.

4. Install three mounting bolts and tighten lower bolt.

5. Slide steering jacket clamp up onto upper jacket and tighten clamp bolt.

6. Align steering gear by use of shims as described in Note 2a.

7. Tighten the three mounting bolts to 40-45 ft. lbs. torque.

8. Connect pitman arm to steering connecting rod, turning end nut up tight and backing it off 1/2 to 5/8 turn.

9. Install horn contact and neutral safety switch.

10. Install horn wire on horn control terminal.

11. Install steering wheel as explained in Note 9.

12. Check drag link height, Note 7.

(20) Removal of Power Steering Gear Assembly

1. Raise front of car and place stands near outer ends of lower suspension arm.

2. Remove steering wheel assembly.

3. Remove screw holding neutral safety switch and horn contact bracket and loosen lower jacket clamp bolt.

4. Disconnect hydraulic steering pump to valve body hoses at pump and valve body. Install caps on pump to prevent loss of oil.

5. Remove fitting from valve body on side closest to frame.

6. Disconnect drag link at pitman arm.

7. Disconnect left exhaust pipe from exhaust manifold and disconnect intermediate hanger. Pull exhaust pipe down from manifold and move in toward engine.

8. Remove three bolts holding steering gear to frame side bar.

9. Carefully slide steering gear down out of upper jacket, and remove complete assembly from car.

NOTE: If gear will not clear lower front suspension arms, it may be necessary to add weight to compress the front springs so that gear may be removed without bending the steering shaft.

(21) Disassembly of Power Steering Gear

a. Removal of Valve Body From Gear Assembly

1. Using a soldering iron, remove the upper tip on the horn contact wire, and remove the plastic insulator.

2. Pull the wire down through the tube and out of opening at horn contact bushing. Fig. 7-22.

3. Remove bushing with wire from steering tube.

4. Remove three valve cover to gear housing screws, and remove valve cover with "O" ring seal. Discard "O" ring. Fig. 7-23.

5. Remove worm bearing lock nut, spring washer, upper and lower races, and bearing.

6. Remove valve body with spool valve and sleeve as an assembly.

7. Remove sleeve centering "O" ring from shaft

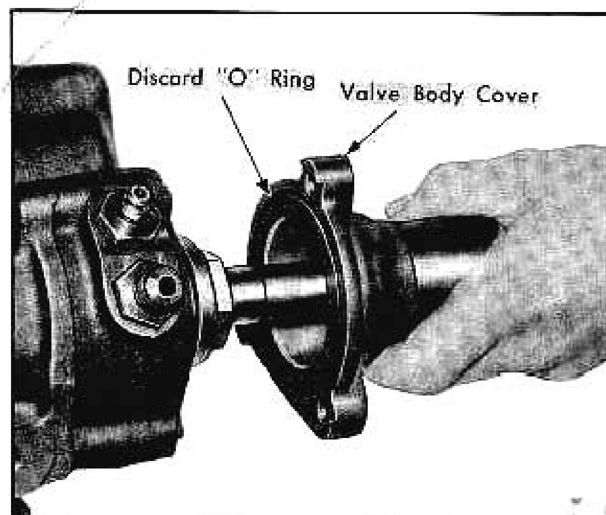

Fig. 7-23 Removing Valve Body Cover

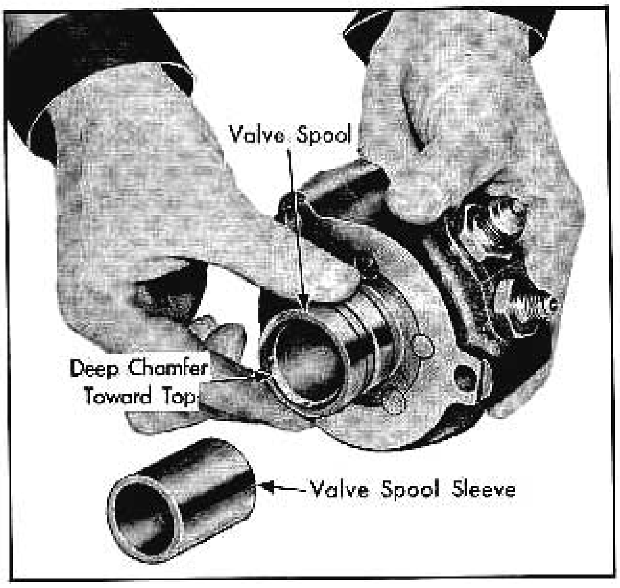

Fig. 7-24 Removing Valve Spool and Sleeve

and discard "O" ring.

8. Remove lower bearing with races.

9. Remove and discard "O" ring seal from gear housing upper flange.

b. Disassembly of Valve Body

1. Slide spool and sleeve out of valve body carefully. Note that top of spool is counterbored. Fig. 7-24.

2. Remove ten plungers and springs, being careful not to nick or score plungers.

3. Remove inlet fitting from valve body, and remove the check valve through return port with a screwdriver. Fig. 7-25.

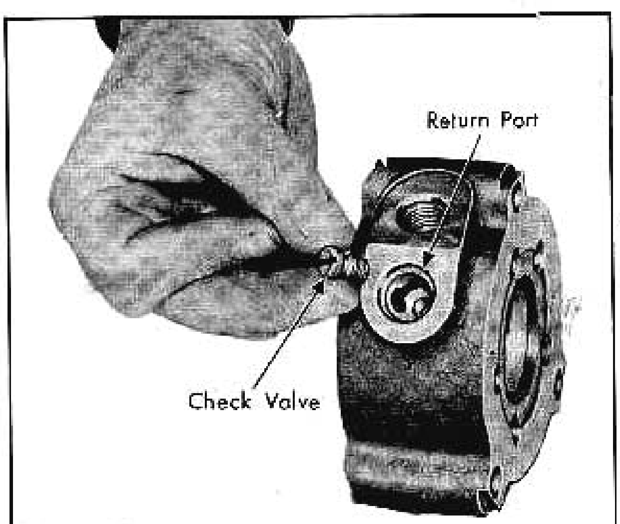

Fig. 7-25 Removing Check Valve

c. Removal of Cylinder Assembly from Gear Housing

1. Remove power rack adjusting screw lock nut.

2. Remove power rack adjusting screw.

3. Remove power rack guide.

4. Remove side cover screws and pitman shaft adjusting screw lock nut. Turn adjusting screw down through cover to remove side cover from housing. Remove cover and gasket.

5. Mark pitman gear tooth, ball nut, and power rack, as shown in Fig. 7-26, to insure proper positioning of parts when reassembling gear.

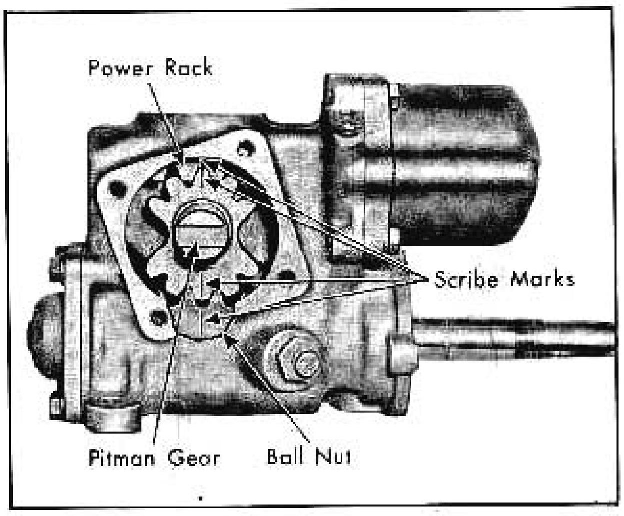

Fig. 7-26 Gear Teeth Locating Marks

6. Remove pitman shaft from gear housing.

7. Remove cylinder to gear housing screws, and remove power cylinder, guiding power rack through opening in housing.

8. Remove large and small "O" ring seals between cylinder and gear housing.

9. Remove small oil ring around oil passage in gear housing.

d. Disassembly of Cylinder

1. Remove adapter and piston assembly from cylinder.

2. Place rack in a vise with jaws against sides of rack.

3. Remove piston rod retaining nut, thrust washers, piston with rings, and adapter assembly.

4. Remove two piston rings from piston assembly.

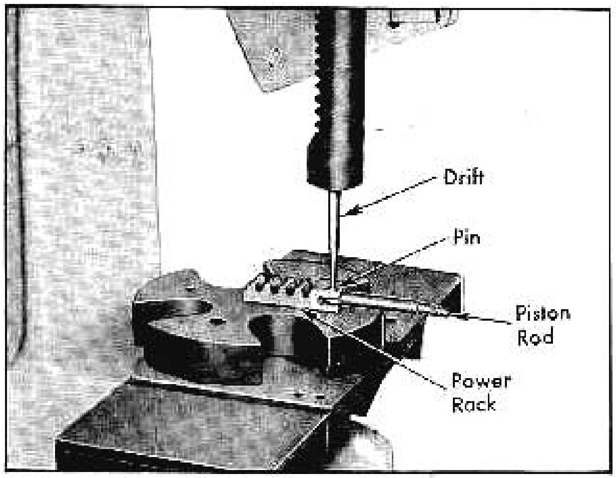

Fig. 7-27 Removing Power Rack Pin

5. Remove "O" ring seal from inner diameter of adapter assembly.

6. Press out power rack to piston rod pin with an arbor press. (Do not nick or score machined surfaces on the power rack). Fig. 7-27.

e. Disassembly of Gear Housing

1. Remove four lower end cover attaching screws, and remove cover with roller bearing and gasket.

2. Using Puller, Tool No. J-5190, remove roller bearing from end cover. Fig. 7-28.

3. Slide steering tube and worm nut, as an assembly, out of gear housing.

4. Remove oil seal from upper end of housing.

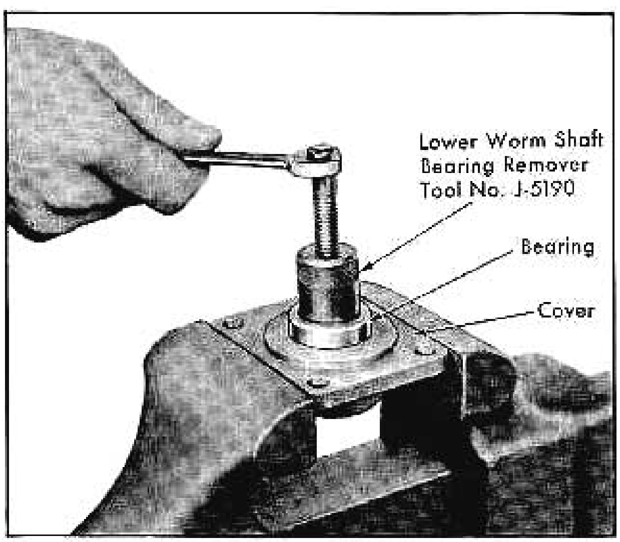

Fig. 7-28 Removing End Cover Roller Bearing

5. Remove pitman shaft bushing from housing.

6. If steering shaft upper roller bearing is defective, it will be necessary to replace the gear housing and roller bearing as an assembly. Removal of the bearing from the housing is not recommended.

(22) Assembly of Power Steering Gear

a. Assembly of Gear Housing

1. Install pitman shaft bushing in its bore in gear housing.

2. Install pitman shaft seal in housing.

3. Install oil seal in upper housing flange, using Tool No. J-5189. Fig. 7-29.

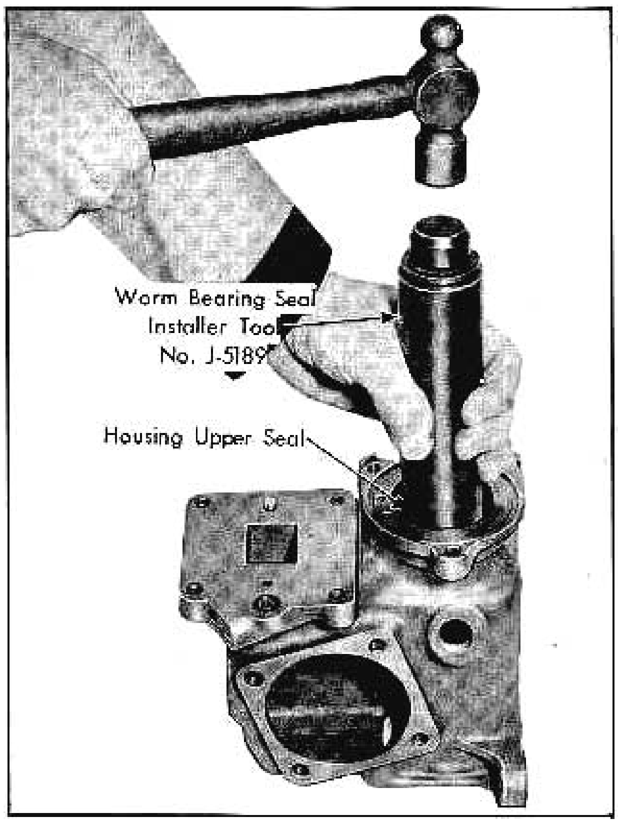

Fig. 7-29 Installing Oil Seal In Housing

4. Slide steering shaft and worm up into housing. Guide upper end of tube carefully through seal at top of housing to avoid damage to lip of seal.

5. Press bearing into end cover using Tool No. J-5191. See Fig. 7-30.

6. Install lower end cover, with bearing and gasket, on housing and tighten screws.

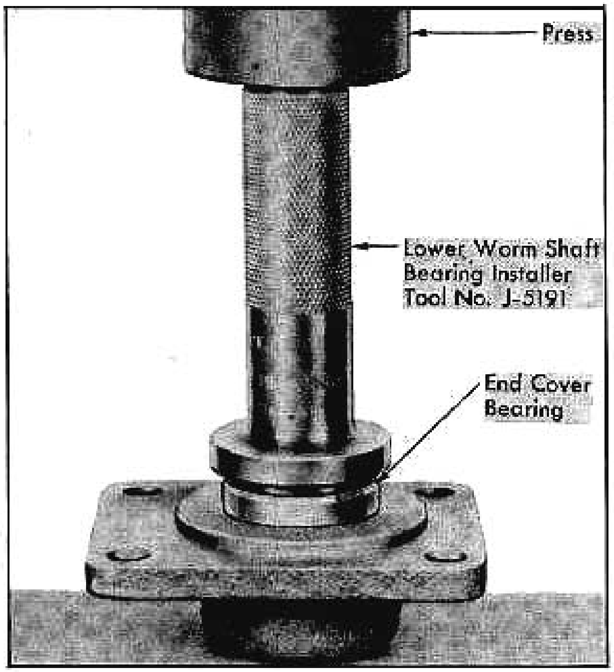

Fig. 7-30 Installing End Cover Bearing

b. Assembly of Valve Body

NOTE: Extreme care must be exercised, when assembling the valve body and power cylinder, to be certain that all parts are clean as any foreign material may affect their proper operation.

1. Install check valve through return fitting port in valve body.

2. Install preload springs and plungers in valve body.

3. Install valve spool in valve body with counter-bored end of spool toward top of valve body. Fig. 7-24.

4. Install sleeve in valve spool.

NOTE: Inject clean Hydra-Matic fluid through inlet and return fittings to lubricate parts.

c. Installation of Valve Body

1. Install lower small thrust washer, bearing with retainer, and large thrust washer over steering tube.

2. Install a new valve spool sleeve centering "O" ring on steering shaft. (Lubricate with Hydra-Matic fluid).

3. Install a new "O" ring seal in groove in gear housing flange. Slide valve body assembly over

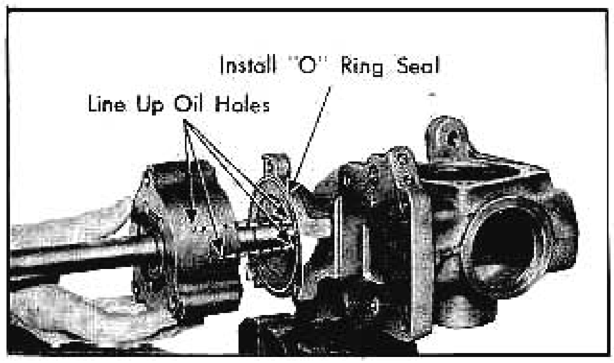

Fig. 7-31 Installing Valve Body

steering tube. Oil holes in lower face of valve body must line up with oil holes in housing flange. Fig. 7-31.

4. Install large thrust washer, bearing with retainer, and small thrust washer above valve body.

5. Install a new spring washer, cup side down, and new staking nut.

NOTE: Be sure new nut turns freely on shaft threads.

6. Temporarily install steering wheel on shaft so that shaft may be held stationary while tightening nut to prevent damage to ball nut mechanism.

7. Tighten nut to 30 ft. lbs. torque, while holding shaft stationary with steering wheel, Fig. 7-32, then back nut off 1/4 turn. Stake nut in place at keyway.

8. Install a new "O" ring seal between the valve body and valve cover.

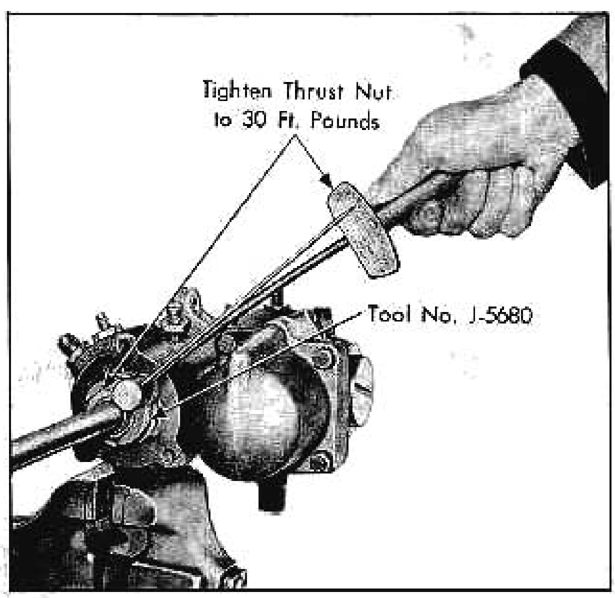

Fig. 7-32 Tightening Thrust Bearing Nut

STEERING

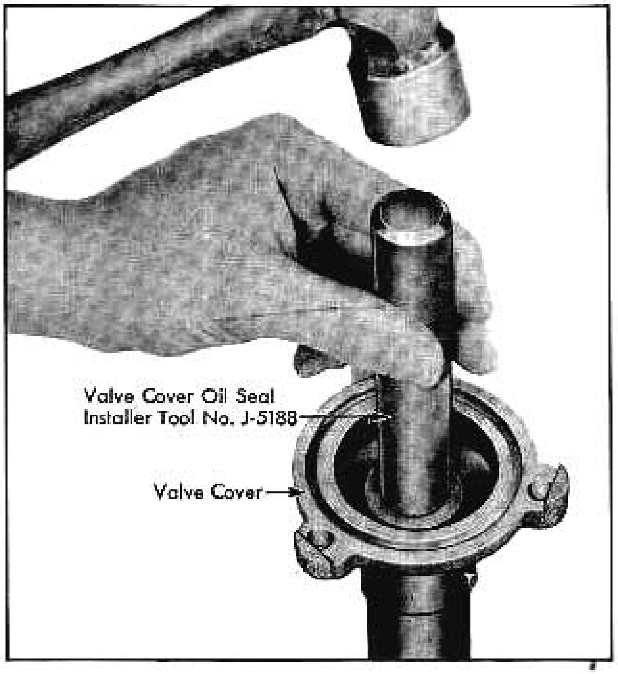

Fig. 7-33 Installing Seal In Cover

9. Install a new inner seal in valve body cover using Seal Installer, Tool No. J-5188, Fig. 7-33.

10. Install valve cover and long attaching screws.

11. Install inlet line fitting, with new "O" ring seal, in valve body.

12. Check off-center pull at rim of steering wheel. This should be 3/8 to 3/4 lbs.

d. Assembly of Power Cylinder

1. Press piston rod pin into power rack and piston rod. Peen around pin, exercising care not to raise burrs on machined surface of power rack.

2. Install a new "O" ring seal in groove in inner diameter of adapter.

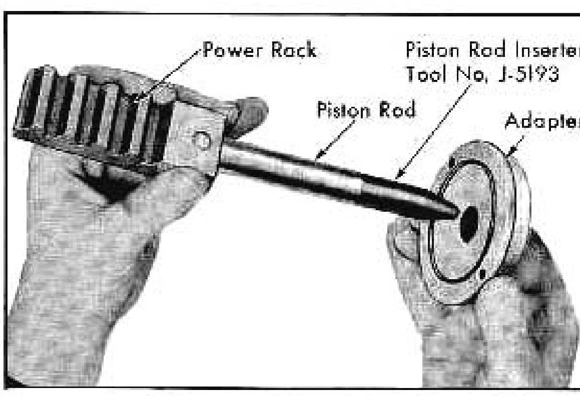

Fig. 7-34 Installing Adapter on Piston Rod

3. Install Special Thimble, Tool No. J-5193, over threaded end of piston rod and slide adapter over Thimble onto piston rod. Fig. 7-34.

4. Install piston rings on piston.

5. Remove Thimble and install piston, with thrust washers on both sides, over piston rod and install piston rod nut. Cupped side of piston must be toward adapter.

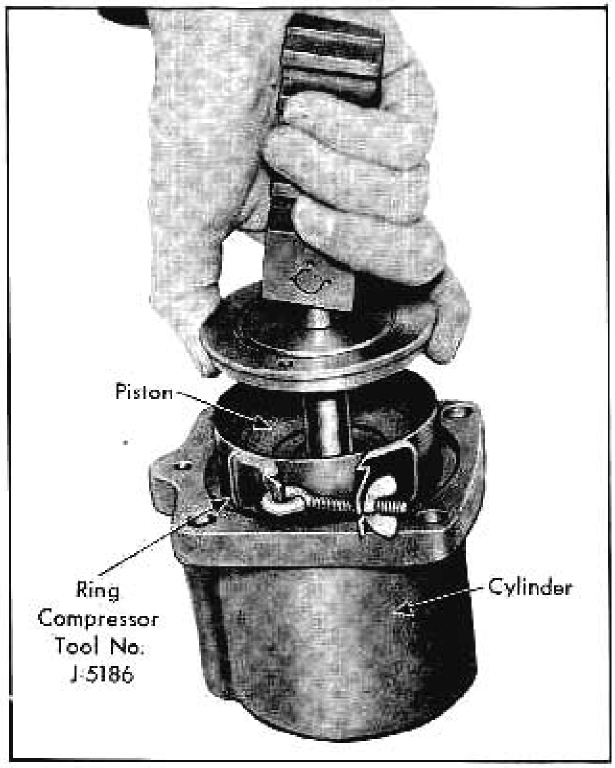

Fig. 7-35 Installing Piston in Cylinder

6. Install piston in cylinder, using Ring Compressor, Tool No. J-5186, to compress piston rings. Fig. 7-35.

7. Slide adapter into cylinder, and install a new "O" ring seal in groove between adapter and cylinder.

8. Install a new "O" ring seal on face of adapter and a small seal around oil passage in gear housing. Fig. 7-36.

e. Installation of Cylinder Assembly on Gear Housing

1. Guide power rack through opening in gear housing and position cylinder assembly on gear

housing, with dowel hole in adapter over dowel pin in housing. Be certain that "O" ring seals are in position. Fig. 7-36.

2. Install cylinder to housing mounting screws.

3. Install pitman shaft in housing, engaging teeth of gear with power rack and worm gear ball nut. Be sure that scribed marks on pitman gear ball nut and power rack are aligned. (Proper alignment of gear teeth will permit at least 4-1/2 complete turns of steering wheel).

4. Install power rack guide with notch parallel to piston rod.

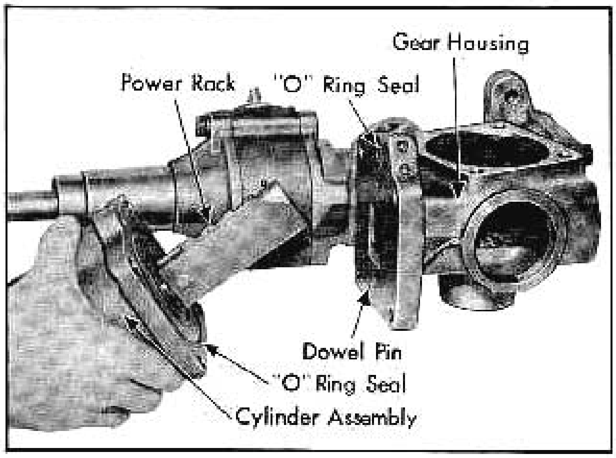

Fig. 7-36 Installing Cylinder Assembly

5. Install power rack guide adjusting screw and lock nut loosely.

6. Install adjusting screw and spacer washer in slot in pitman shaft.

7. Place side cover and gasket over adjusting screw, and turn screw out through cover until cover is positioned on steering gear housing.

8. Install side cover and lock washers.

9. Install adjusting screw loosely.

10. Adjust pitman shaft and power rack as explained in Note 3c.

11. Press new horn contact bushing into place on steering shaft, thread wire through shaft, install plastic insulator, and solder contact on end of wire.

(23) Installation of Power Steering Gear

1. Install steering worm shaft Seal Protector Tool No. J-5159, on upper end of steering shaft.

2. Carefully insert upper end of shaft into shifter tube, and slide assembly up into position until holes in steering gear housing line up with holes in frame side bar.

3. Install screws through frame into steering gear loosely.

4. Align steering gear by use of shims as described in Note 2.

5. Remove seal protector from steering shaft.

6. Install steering wheel and horn ring with button. See Note 9.

7. Measure gap between bottom edge of horn ring and upper edge of directional signal switch carrier. This should be 3/16" with the horn ring in a released position. Slide steering jacket up or down as required to obtain specified clearance.

8. Slide clamp up onto lower jacket and tighten clamp screws.

9. Install horn contact and neutral safety switch assembly in position on lower steering jacket. Adjust safety switch.

10. Connect pitman arm to steering connecting rod, turning end nut up tight and backing it off 1/2 to 5/8 turn.

11. Install exhaust pipe on exhaust manifold studs and connect intermediate hanger to pipe.

12. Check drag link height. See Note 7.

13. Install return line fitting, with "O" ring, in valve body.

14. Remove caps and connect hoses at valve body and pump.

15. Bleed hydraulic system as explained in Note 4b.

STEERING

TROUBLE DIAGNOSIS CHART

Condition	Cause	Remedy
1. Hard steering	Steering tube misaligned or bent Steering adjustment tight Tight upper bearing (at steering wheel)	Check alignment Check adjustments Replace bearing
2. Low oil pressure when tested with gage	Belt slips Low oil Pump mechanical trouble Pump pressure relief valve spring weak Pump pressure relief valve stuck open Flow control valve stuck open	Adjust belt tension Fill reservoir Overhaul or replace Replace flow control valve assembly Free up valve Free up valve
3. Chatter when turning	Loose thrust bearing nut adjustment	Check adjustment
4. Excessive wheel kickback or or loose steering	Lash in linkage, gear, or rack Air in system	Adjust or replace affected unit Bleed and refill
5. Gear noise	Loose power rack adjustment Loose through center adjustment Loose thrust bearing adjustment Loose piston-to-power rack pin	Adjust Adjust Adjust Replace as required
6. Pump noise	Low oil Belt squeal Hose grounded Pump mechanical trouble Clogged intake line Pump shaft seal leaking air Sticky pump vanes	Fill as required Adjust belt tension Reroute hose Overhaul or replace pump Clean out or replace Replace seal Check vanes
7. External oil leaks	Loose connections Loose tank to pump body screws Worn hose "O" ring seals at connections "O" ring seals on either side of valve body	Tighten Tighten screws; replace gasket Replace Replace Replace
8. Internal oil leaks	Upper or lower shaft seal Cylinder adapter seal	Replace Replace
9. Poor centering of steering gear	Incorrect caster or toe-in in front wheels Sticky or faulty spool valve Tight steering linkage Steering gear misalignment Tight power rack adjustment Tight upper bearing (at steering wheel)	Adjust Free up or replace valve body Lubricate Re-shim at frame Readjust power rack Replace bearing

STEERING

TORQUE TIGHTNESS

Application	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Steering gear to frame	7/16-14	40	45
Tie rod pivots to steering arms	1/2-20	50	55
Tie rod adjuster clamp nuts	5/16-24	20	25
Idler arm threaded bushings	Special	110	115
Pitman arm nut	7/8-16	100	125
Steering wheel nut	Special	45	50
Idler arm support to frame	3/8-24	30	35
Lower end cover	3/8-16	25	29
Side cover plate	3/8-16	25	29
Valve cover to housing	3/8-16	15	20
Power cylinder to housing	3/8-16	25	29
Pump tank cover	3/8-16	25	29
Pump cover to body	3/8-16	25	29

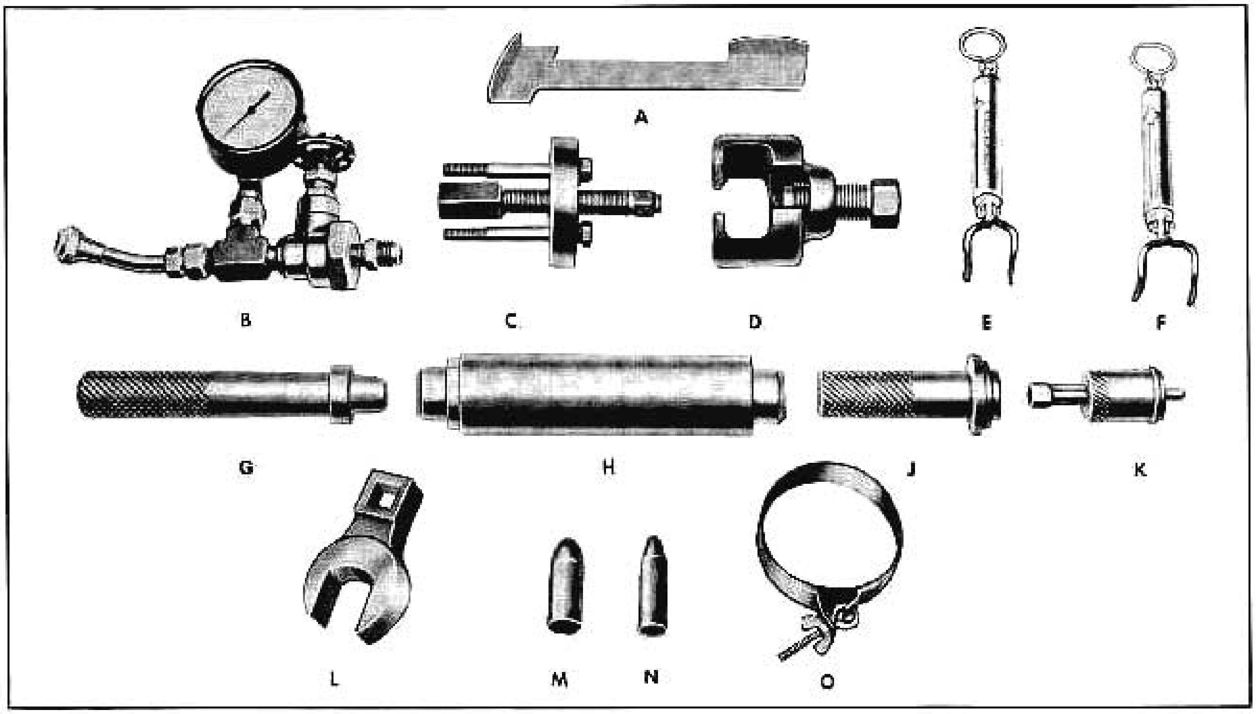

Fig. 7-37 Steering Gear Special Tools

Key	Tool No.	Name
A	J-5648	Power Rack Adjusting Wrench
B	J-5176	Pressure Testing Gauge
C	J-1859	Steering Wheel Puller
D	J-2162	Pitman Arm Puller
E	J-544A	4# Scale
F	J-5178	15# Scale
G	J-5188	Seal Installer
H	J-5189	Bearing and Seal Installer
J	J-5191	Bearing Installer
K	J-5190	Bearing Puller
L	J-5680	Bearing Adjusting Wrench
M	J-5159	Bushing Protector
N	J-5193	Piston Rod Inserter
O	J-5186	Piston Ring Compressor

SPECIFICATIONS

Steering Ratio	Gear	Overall
Power	19.1 to 1	21.5 to 1
Manual	23.6 to 1	27.1 to 1
Tread	62,60S,75	86 Comm.
Front	60"	60"
Rear	63.10"	65.12"
Hydraulic pump pressure	Min.	Max.
With steering wheel held against stops	900 psi	1000 psi.
Pressure relief valve to remain closed against	900 psi.	

REAR AXLE

TABLE OF CONTENTS

GENERAL DESCRIPTION

The design of all rear axle gear assemblies used on 1954 cars, as shown in Fig. 8-1, is identical, although the gear ratios for different series vary to provide optimum performance and economy on all models. The 3.07 to 1 ratio rear axle gear assembly is used as standard equipment on the 1954-62 and 60S Series car, except when Air Conditioning is ordered. A 3.36 to 1 ratio axle is available for these models when ordered with the car, and is standard when Air Conditioning is ordered. The rear axle ratio for the 75 Series is 3.77 to 1 and 4.27 to 1 for the 86 Series whether or not Air Conditioning is ordered.

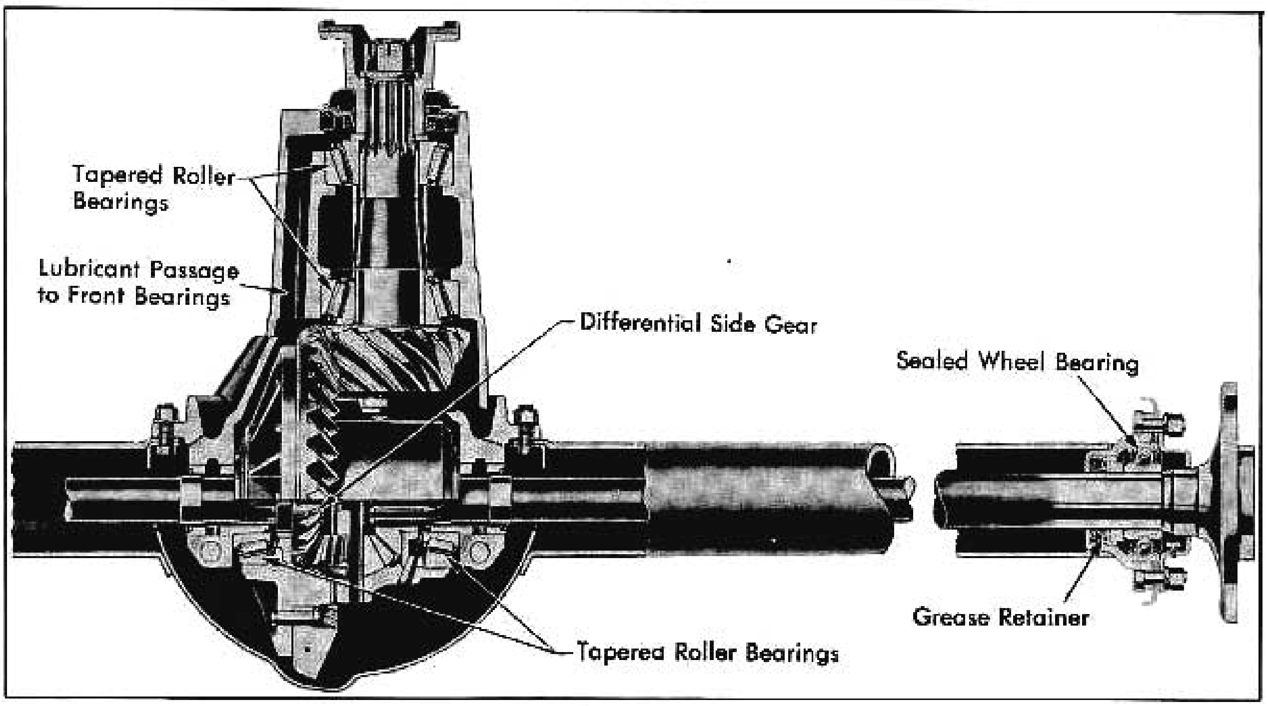

Fig. 8-1 Rear Axle Assembly

REAR AXLE

The axle shaft is of the semi-floating design with a permanently lubricated and sealed ball bearing supporting it at the outer end near the wheels. Axle shaft oil seals are located at the outer ends of the axle housing, just inside the ball bearings.

The power and braking forces are transmitted to the frame through the rear springs (Hotchkiss Drive) which provides additional cushioning for all driving strains, resulting in smoother and quieter operation. Power is transmitted from the transmission to the rear axle assembly by a tubular propeller shaft, with "Mechanics" type universal joints at each end. The rear universal joint cross bearings are attached to the rear axle pinion yoke by four screws and locks for easy removal of the propeller shaft from the car. On all 1954-60S and 62 Series passenger cars, the sliding joint is located at the rear of the transmission. The 1954-75 Series passenger car and the 1954-86 commercial chassis use a special yoke with a threaded plug in combination with a snap ring on the transmission shaft to lock the yoke to the transmission output shaft. On these series cars, the sliding yoke is located at the rear of the rear propeller shaft assembly.

SERVICE INFORMATION

(1) Axle Gear Ratio Identification

The gear ratio of the rear axle assembly on 1954 series Cadillac cars can be determined by an identifying number on the bottom of the differential case beneath the center of the pinion shaft.

The ratios for the various models are listed below.

Series	Ratio	Identification Number
1954-62, 60S	3.07-1	"3"
(optional)	3.36-1	"6"
1954-75	3.77-1	"7"
1954-86 (Comm.)	4.27-1	"4"

(2) Replacement of Rear Axle Oil Seals

Whenever the axle shaft oil seal or the differential pinion shaft oil seal is removed for any reason, a new oil seal must be installed.

Guard against any bending or denting of the seals, as this may cause leakage after installation. Even a slight scratch across the sealing lip may provide a channel for oil to seep through. Seals should be soaked in clean motor oil for 1/2 hour before being installed.

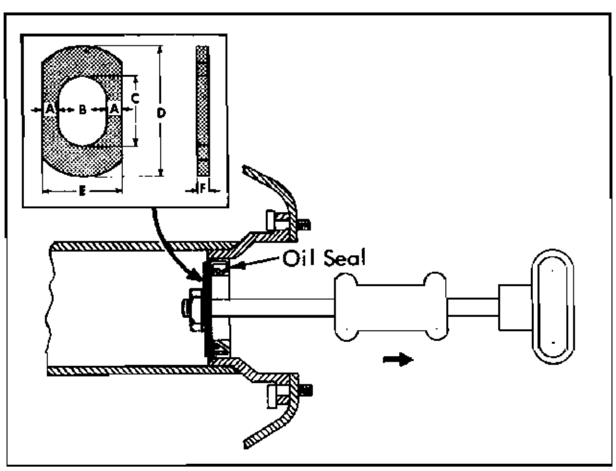

Fig. 8-2 Rear Axle Oil Seal Removal Tool

After removing the road wheel and axle shaft as explained in Note 5, the axle seal may be removed from the rear axle housing.

A tool, to facilitate the removal of the axle seal, may be made up to the dimensions indicated in Fig. 8-2 and used with the Special Slide Hammer Assembly, Tool No. J-2619. Install the plate on the slide hammer shaft and install a flat washer and nut on threaded end.

Dimension	62-60S Series	75-86 Series
A	1/4"	5/16"
B	3/4"	7/8"
C	1-1/8"	1-9/16"
D	2-1/8"	2-9/16"
E	1-1/4"	1-1/2"
F	3/16"	3/16"

Slide the shaft with plate, through seal and pull shaft outward to position plate against inside face of seal, Fig. 8-2. Be sure plate is not behind shoulder in housing, as it will bend the plate. Drive outward with slide hammer to remove seal.

Before installing a new seal, wipe the counterbore into which the seal is pressed and carefully remove any nicks or burrs. The sealing surface on the axle shaft should be polished, using 400 grit "wet" paper and kerosene to insure a smooth surface and to prevent wear on the seal.

The surface of the sealing lip should be coated with lubricant at installation. The outside diameter

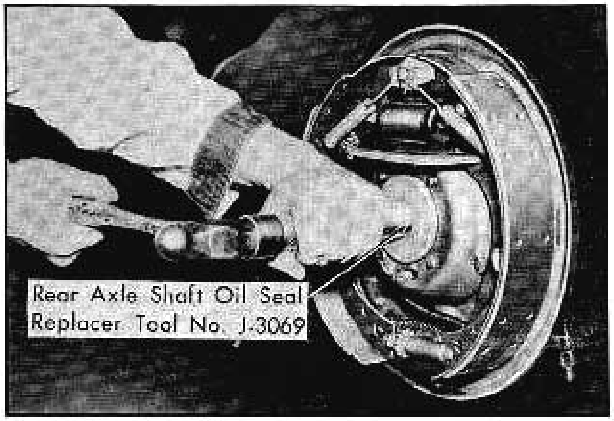

Fig. 8-3 Installing Rear Axle Oil Seal

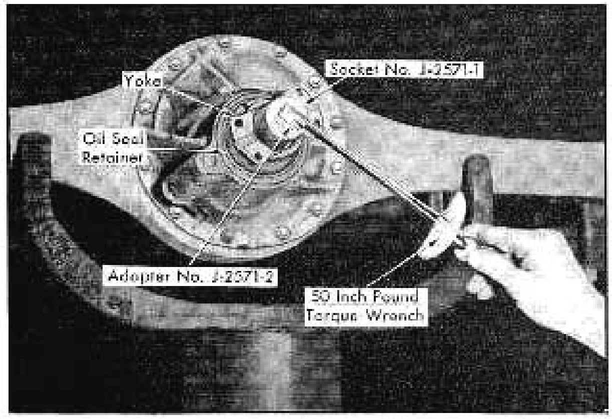

Fig. 8-4 Checking Preload Torque

of the oil seal metal shield should be coated with a good sealer compound before installation.

The oil seal must be pressed squarely into its bore and onto its seat. Use Rear Axle Shaft Oil Seal Replacer, Tool No. J-3069, as shown in Fig. 8-3 to install the rear axle seals on 1954-62-60S and 75 cars. On 1954-86 commercial chassis use Tool No. J-1355A.

(3) Removal and Installation of Rear Axle Pinion Oil Seal or Yoke

When it is necessary to replace the rear axle pinion oil seal or yoke it is very important that the procedure outlined below be followed to avoid overloading the pinion bearings or collapsing the spacer.

a. Removal

1. Remove about 1-1/2 pints of rear axle lubricant from differential, using a suction gun.

2. Remove both rear wheels and brake drums.

3. Disconnect rear universal joint at pinion yoke.

4. Using a 50 inch pound torque wrench (KMO-654 or similar wrench) with Socket, Tool No. J-2571-1, and Adapter, Tool No. J-2571-2, measure the inch pounds torque required to rotate the pinion shaft slowly for at least 1/2 turn. Fig. 8-4. Repeat this torque check at least eight times, which will insure an accurate check over the entire circumference of the ring gear. Record all torque readings.

> NOTE: Before each check of the torque, rotate the pinion shaft 1/4 turn in each direction, to free it up, thus eliminating an unusually high starting torque.

5. Mark pinion shaft and yoke with a punch so that yoke can be installed in same position on spline.

6. Install Pinion Yoke Holding Tool, No. J-2659, on yoke and install two attaching nuts.

7. Install Socket, Tool No. J-2571-1, through hole in holding tool onto pinion nut and remove nut, using a 3/4 inch drive socket wrench.

8. Remove pinion yoke from pinion shaft with Puller, Tool No. J-5514. Fig. 8-5.

9. Remove pinion oil seal.

10. Remove staking burrs on pinion shaft with a small file or thread die, size 7/8" x 14.

b. Installation

1. Coat outer edge of oil seal with a good sealer and lubricate sealing lip. Drive seal into carrier, using Oil Seal Installer, Tool No. J-1357. Fig. 8-6.

> CAUTION: Be sure outer surface of yoke is free from scratches or nicks. Clean up with No. 400 grit "wet" paper and kerosene.

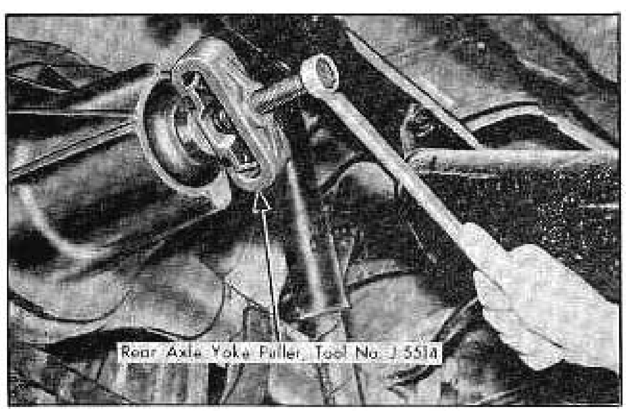

Fig. 8-5 Removing Pinion Yoke

REAR AXLE

Fig. 8-6 Installing Pinion Oil Seal

2. Install yoke on pinion shaft splines with punch marks lined up.

3. Install new pinion nut, holding flange of yoke with Pinion Yoke Holding Tool, No. J-2659.

4. Tighten nut to 225 ft. lbs. torque.

NOTE: In cases where a 300 lb. torque wrench is not available, a Torque Wrench Extension, Tool No. J-3291, may be used with a 200 pound torque wrench, Tool no. J-1264, or any standard 200 pound torque wrench, Fig. 8-7. A table is given below for determining actual torque load on pinion nut for any length of torque wrench used, measured from center of grip to center of drive.

Indicated torque for 225 ft. lbs. actual - 225 x L/12 + L.

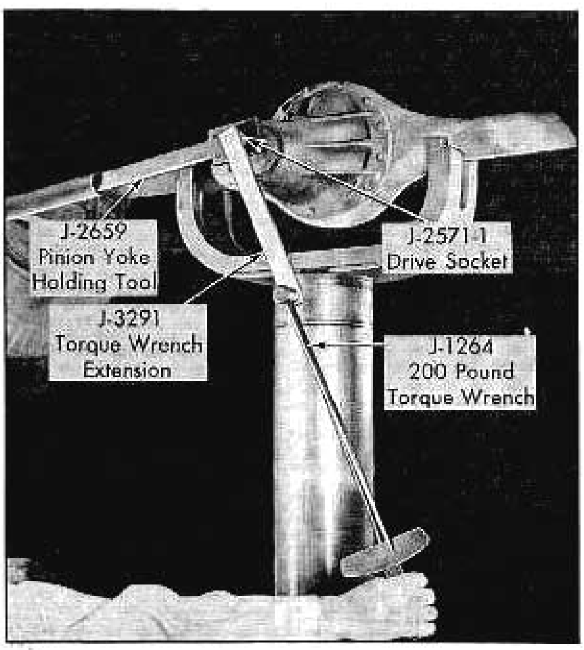

Fig. 8-7 Tightening Pinion Nut

Torque Wrench Length	13	14	15	16	17	18	19	20
Torque Required for 225 ft. lbs. Actual	117	122	125	129	132	135	138	141

5. Measure the inch pounds torque required to rotate pinion shaft as in step 5a. The average torque required should be from 3 to 7 inch pounds greater than the average of the torque recorded in step 5a.

6. If torque is low, tighten the nut in small increments (1/2 a flat at a time approx.) and again measure the torque until the desired torque is obtained.

CAUTION: Do not over tighten and never back off on the nut to reduce preload torque. The maximum allowable torque on an assembly with over 1000 miles is 15 inch pounds (used seal) and 20 inch pounds with a new seal. The torque on a new assembly is 50 inch pounds.

7. Stake pinion shaft into nut.

8. Refill rear axle to correct level.

(4) Measurement of Rear Axle Backlash

1. Place car on hoist.

2. Fasten one end of a piece of bar stock to the yoke on the differential pinion shaft, and the other end to the frame side rail by means of "C" clamps to prevent rotation of the pinion yoke.

3. Apply emergency brake cable on one wheel to prevent wheel from turning.

4. Measure rotation (backlash) of opposite wheel in inches at outer circumference of tire tread. A stiff wire pointer fastened to the fender or car frame will aid in this measurement.

NOTE: Maximum backlash under the above conditions should not exceed 1/2".

(5) Removal and Installation of Axle Shaft and Bearing (Except 54-86)

a. Removal of Axle Shaft and Bearing Assembly

1. Dismount road wheel.

2. Remove two screws holding brake drum to axle shaft flange, and remove drum.

3. Remove four nuts and lock washers (six on 75 series) holding bearing retainer and backing plate to rear axle housing.

REAR AXLE

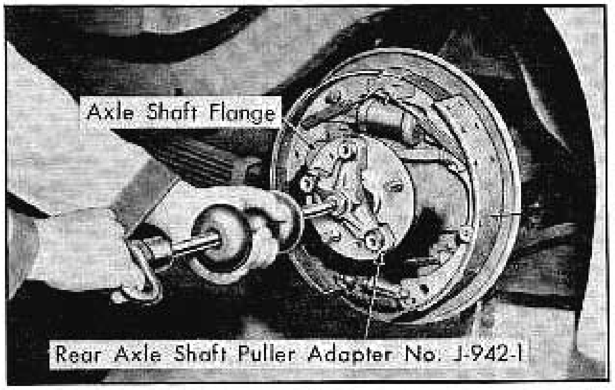

Fig. 8-8 Removing Rear Axle Shaft

4. Install wheel Puller, Tool No. J-942-1, on rear axle shaft studs and install Slide Hammer Assembly, Tool No. J-2619 in Puller. Fig. 8-8.

5. Remove axle shaft.

CAUTION: Be careful not to damage axle shaft oil seal when sliding axle shaft out.

b. Removal of Bearing From Axle Shaft

1. Using a cold chisel and hammer, nick the spacer next to the bearing.

NOTE: The spacer need not be split. Only drive chisel into spacer until spacer can be slipped off shaft.

2. Assemble rear axle shaft and bearing assembly to the "U" shaped piece of Rear Axle Bearing Remover and Replacer, Tool No. J-2986, and place on an arbor press. Fig. 8-9.

3. Assemble the rectangular shaped piece of the tool around bearing and over dowels.

CAUTION: Step 3 must be performed to decrease the danger of the bearing exploding while under arbor press load.

4. Press axle shaft through bearing.

c. Installation of Bearing on Axle Shaft

1. Assemble retainer and new bearing on axle shaft.

2. Place assembly through ring of installer tool on arbor press. Fig. 8-9.

3. Press bearing on shaft up to, but not quite touching shoulder. Fig. 8-9.

4. Release arbor press and remove axle shaft from tool.

5. Assemble spacer to shaft and reinstall on tool.

6. Press shaft through spacer until spacer just contacts bearing.

d. Installation of Axle Shaft and Bearing in Rear Axle Housing

1. Inspect rear axle shaft oil seal for wear or

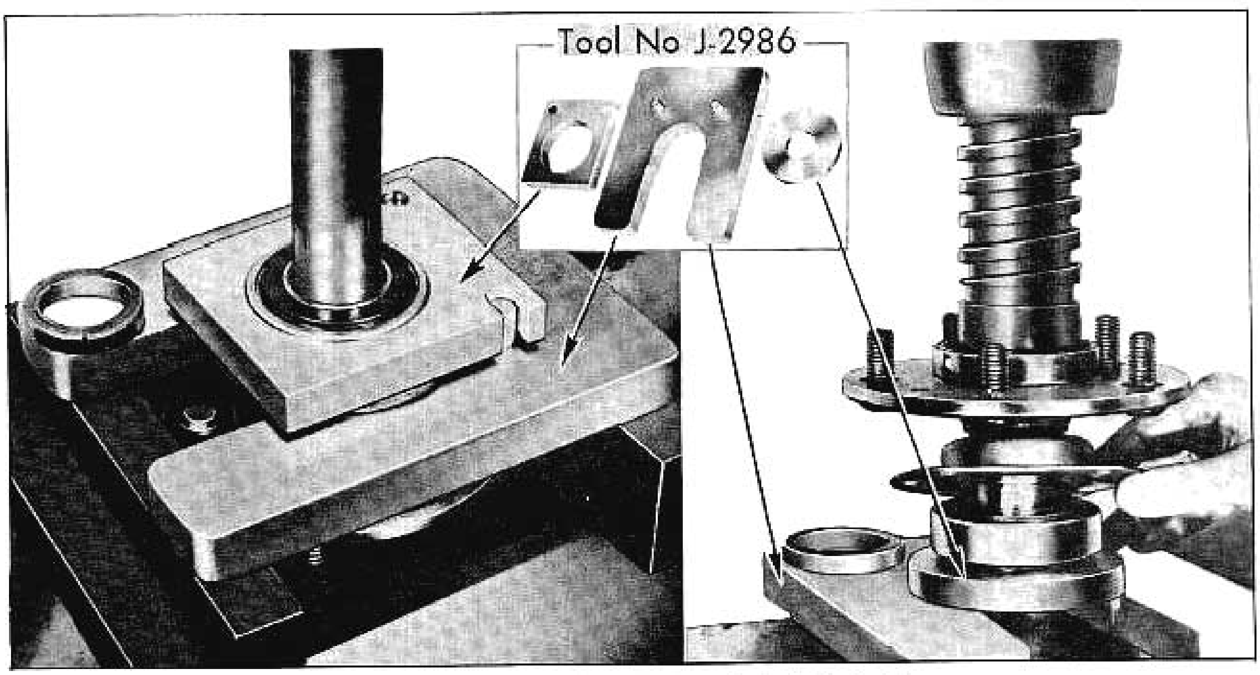

Fig. 8-9 Removing and Installing Rear Axle Shaft Bearing

scratches. Replace seal if there is an indication of leakage, wear, or scratches, as outlined in Note 2.

2. Lubricate inner surface of oil seal leather with chassis lubricant.

3. Apply film of Lubriplate grease in wheel bearing bore in axle housing.

4. Install axle shaft (shorter shaft on left side), being careful not to damage oil seal.

NOTE: Before installing an axle shaft after an oil seal has been replaced, inspect rear wheel bearing for loss of lubricant, since leak in old seal may have permitted differential lubricant to "wash out" grease in sealed wheel bearing. A wheel bearing that spins freely indicates a lack of grease and should be replaced at the same time a new oil seal is installed.

5. Install backing plate and bearing retainer.

6. Install four nuts and lock washers (six on 75 series) on housing bolts, to hold bearing retainer in place, and tighten by inserting a socket wrench through hole in rear axle flange.

7. Install brake drum and two retaining screws.

8. Install road wheel, hub cap, and wheel shield.

(6) Removal and Installation of Axle Shafts (54-86)

a. Removal

1. Dismount road wheel.

2. Remove retaining nut and locking washer from end of axle shaft.

3. Pull wheel hub and brake drum assembly off shaft. Use a five jaw puller, similar to Snap-on Puller, No. J-4567, with two extra jaws, which will reduce possibility of warping or distorting brake drum and will also pull it easier because of equally distributed tension.

4. Disconnect brake line at wheel cylinder.

5. Remove brake backing plate. The axle shaft is held in the housing by the backing plate which, when bolted in place, bears against outer race of wheel bearing.

6. Pull axle shaft and bearing assembly out of housing, using Rear Axle Shaft and Bearing Puller, Tool No. J-838. Be careful not to damage oil seal next to inner side of wheel bearing.

b. Installation

The axle shaft is installed in the reverse order of its removal. It will be necessary to bleed the brake line, which was disconnected when the backing plate was removed.

NOTE: Before installing an axle shaft, after an oil seal has been replaced, inspect rear wheel bearing for loss of lubricant, since leak in old seal may have permitted differential lubricant to "wash out" grease in sealed wheel bearing. A wheel bearing that spins freely indicates a lack of grease and should be replaced at the same time a new oil seal is installed.

(7) Removal and Installation of Differential Carrier

NOTE: Any service on the differential carrier assembly except seal or yoke replacement (See Note 3) should be handled by replacement of the complete assembly. No disassembly or adjustment of this unit should be attempted in the field, because special equipment is used at the factory for mating parts and setting side bearing preload.

a. Removal

1. Disconnect rear universal joint, as explained in Note 8.

2. Remove lubricant from differential with a suction gun.

3. Remove axle shafts, as explained in Notes 5 and 6.

4. Remove nuts and washers holding carrier to axle housing and remove entire assembly with gasket.

b. Installation

Reverse the above procedure using a new carrier to housing gasket.

NOTE: In case of lubricant leakage between the differential carrier and the axle housing, check the following: First make sure that the nuts are tightened to the recommended torque of 30 to 35 ft. lbs. If tightening the nuts does not stop the leak, an extra gasket should be installed, using a sealer. The additional sealing effect of the extra gasket will prevent further leakage. If a replacement differential is installed, special Differential Break-In Lubricant, supplied by the Factory Parts Department, must be used.

(8) Removal and Installation of Universal Joints

Whenever it is necessary to disassemble the universal joints for inspection or overhaul, the propeller shaft must be removed from the car.

On 1954 Series 62 and 60S cars, it is only necessary to remove the cap screws which hold the bearing housings to the rear axle pinion yoke and slide the propeller shaft and front yoke off the transmission mainshaft.

NOTE: Slide a spare yoke into the transmission extension housing to prevent oil from leaking out.

On 1954-75 and 86 commercial chassis, it is necessary to remove cap screws from the universal joint at the cross member as well as the screws at the rear axle pinion yoke. To remove the front propeller shaft, it is necessary to remove the cap screws at the front yoke and also nuts which hold the center bearing support assembly to the insulators at the frame.

a. Removal and Disassembly of Universal Joint

1. Remove bearing retainer lock rings from universal joint, as illustrated in Fig. 8-10.

2. Support the yoke or bearing trunnion on vise jaws.

3. Place Bearing Remover, Tool No. J-4174, over bearing cap and drive on tool until universal joint bearing is out of yoke into tool about 1/2" inch, Fig. 8-11.

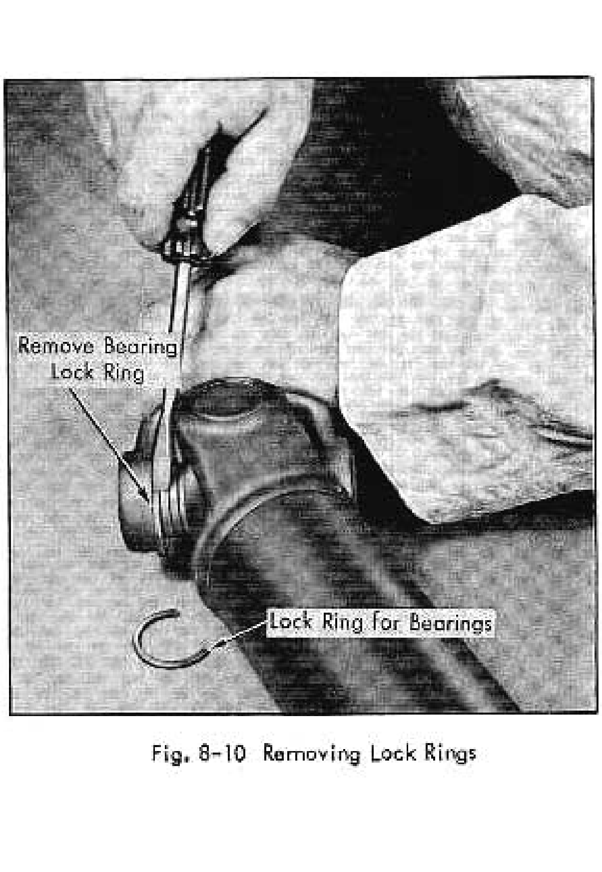

Fig. 8-10 Removing Lock Rings

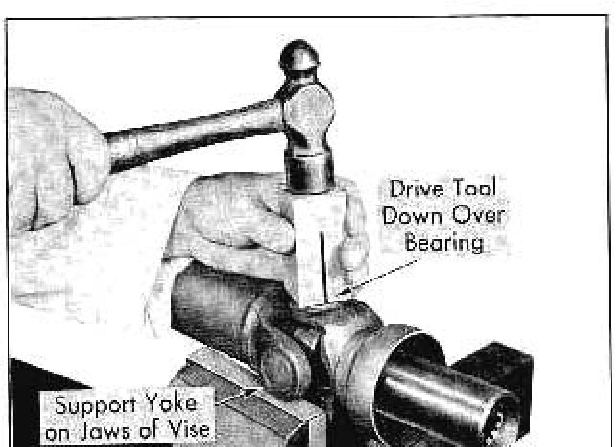

Fig. 8-11 Installing Tool on Bearing

4. Place tool with bearing in vise and tighten vise until tool holds bearing and drives yoke away from tool until bearing is removed. Fig. 8-12.

5. Repeat operations 2, 3, and 4, on opposite bearing and remove cross.

6. Wash all parts thoroughly in clean solvent and inspect bearing housing for wear or pits. Replace any worn or damaged parts.

7. Inspect retainers and cork seals and replace if damaged or if cork is brittle.

b. Assembly and Installation

1. Install rollers into bearing housing and pack with chassis lubricant.

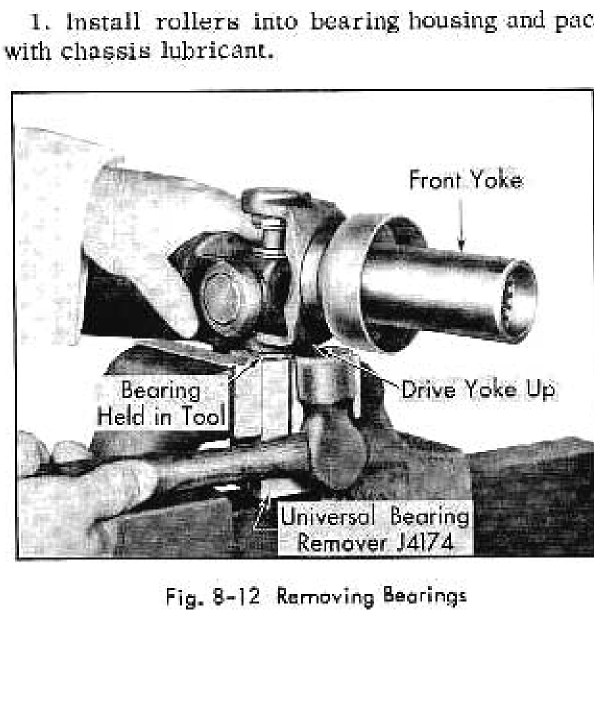

Fig. 8-12 Removing Bearings

REAR AXLE

2. Install retainer and cork seal on universal joint cross.

3. Start one bearing into propeller shaft yoke by tapping lightly with a hammer.

4. Install universal joint cross in position and guide into bearing already started.

5. Start opposite bearing into propeller shaft yoke and place in vise with jaws against bearings. Fig. 8-13.

6. Tighten vise until cross is just ready to enter opposite bearing and adjust position of cross until it enters both bearings.

7. Tighten vise until both bearings are in far enough to allow lock rings to be installed.

NOTE: If bearings do not go into position with normal pressure on the vise, a needle bearing may have fallen out of place and the bearing must be removed and needle repositioned.

8. Install lock rings.

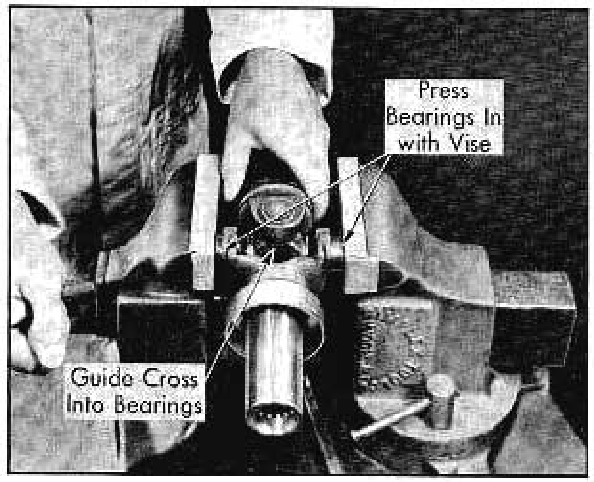

Fig. 8-13 Installing Bearings

(9) Commercial Chassis Universal Joint Yokes

Wear in the drive line after high mileage usually becomes noticeable as a click at the splines and splineways of the universal joint yoke on the transmission mainshaft, and at the universal joint

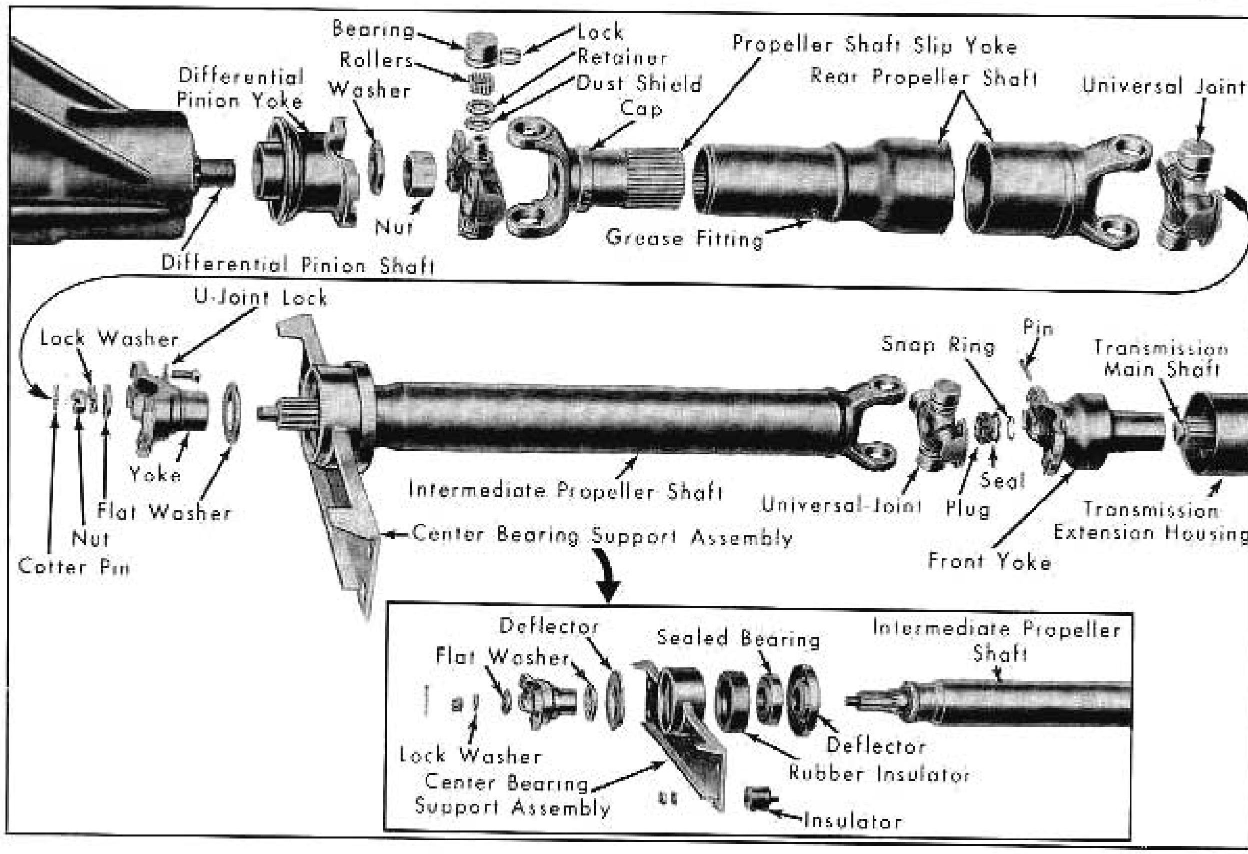

Fig. 8-14 Series 75 and 86 Propeller Shafts - Disassembled

yoke at the rear of the front propeller shaft on commercial cars. Correction of this condition is made by replacing with new yokes as explained in Notes 8a and 8b. Installation of the new yokes is made by driving the yoke on the splines of the shaft.

(10) Disassembly and Assembly of Propeller Shaft (1954-75 & 86)

a. Disassembly

1. Remove propeller shafts, as explained in Note 9.

2. Remove universal joints from shafts as explained in Note 9a.

3. Remove cotter pin, castellated-nut, lock washer, and flat washer which hold the universal joint yoke to the spline end of the front propeller shaft. Fig. 8-14.

4. Slide yoke off propeller shaft.

5. Slide large flat washer off shaft.

6. Press center bearing assembly off shaft over spline end.

7. Press rubber bushing and bearing out of center bearing support.

8. Remove sealed bearing from rubber insulator.

b. Assembly

1. Install sealed bearing in rubber insulator.

2. Press bearing and insulator into bearing support.

3. Install front deflector, bearing support assembly, rear deflector, and flat washer over spline.

4. Press yoke on front drive shaft splines at right angles to front yoke. This should be a tight fit with no backlash or looseness.

5. Assemble flat washer, lock washer, and castellated nut and tighten to 40-50 foot pounds. Back off 1/2 turn and then install cotter pin.

6. Install universal joints in propeller shafts, as explained in Note 9.

7. Install propeller shafts, as explained in Note 8.

SPECIFICATIONS

Subject and Remarks	54-62, 60S	54-75	54-86
Axle shaft length			
Left	30-1/4"	30-1/4"	32-3/4"
Right	32-1/2"	32-1/2"	35"
Runout (at ground surface near splines) not to exceed	.006"	.006"	.006"
Backlash - pinion and ring gear	.003"-.010"	.003-.010"	.003-.010"
Distance - outer face of flange to inner end of bearing inner race	3.075"-3.085"	3.075"-3.085"	
Minimum road clearance (under center of axle housing)	8"	8-1/4"	9"
Gear Ratio	3.07-1	3.77-1	4.27-1
Air Conditioner Equipped Cars and optional (62 & 60S)	3.36-1	3.77-1	4.27-1

TORQUE TIGHTNESS

Location	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Spring U-bolts	Special	45	52
Brake backing plate to axle housing (54-86 Comm.)	7/16-20	55	60
Brake backing plate to axle housing (54-62, 60S, 75)	3/8-24	35	40
Axle shaft hub nuts (86 Comm.)	1-14	285	315
Differential carrier to axle housing	3/8-24	30	40
Pinion shaft nuts	7/8-14	200 Min.	
Universal joint screws	5/16-24	18	22
Intermediate propeller shaft yoke nut (75 & 86 Comm.)	1/2-20	40*	50*
Differential carrier pedestal clamp screw	1/2-20	50	60

* Back off 1/2 turn. See Note 10b, Step 5.

REAR AXLE

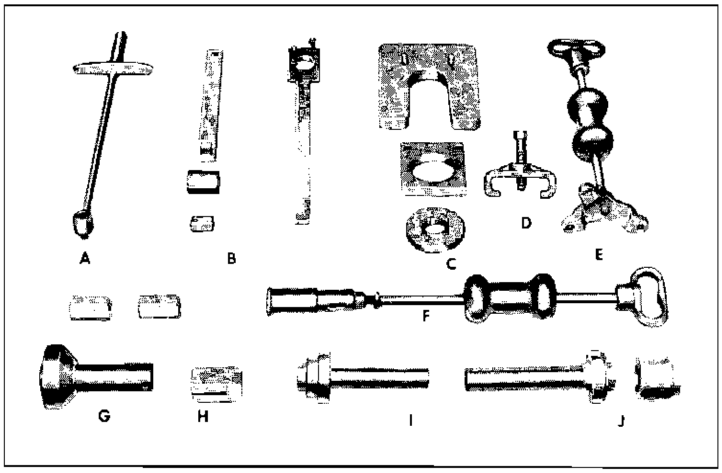

Fig. 8-15 Rear Axle Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-1264	200# Torque Wrench	F	J-2623	Pinion Oil Seal Remover (Shown with slide hammer J-2619-A and J-838)
B	J-3264	Rear Axle Pinion Yoke Replacer Set			
C	J-2986	Rear Axle Bearing Remover and Replacer	G	J-1357	Pinion Oil Seal Replacer
			H	J-4174	Universal Bearing Remover
D	J-5514	Rear Axle Pinion Yoke Puller	I	J-3069A	Rear Axle Shaft Oil Seal Replacer
E	J-942-1	Rear Axle Shaft Puller Adapter (Shown with slide hammer J-2619-A)	J	J-1355A	Rear Axle Shaft Oil Seal Replacer (54-86) with adapter.

OTHER NOTES AND REFERENCES

BRAKES

TABLE OF CONTENTS

GENERAL DESCRIPTION

The braking system consists of hydraulically operated service brakes and a hand lever which applies the brake shoes on the rear wheels independently through a mechanical linkage.

The hydraulic brake system consists of a fluid supply reservoir, a master cylinder in which the hydraulic pressure is originated, four wheel cylinders, where hydraulic pressure is directed to apply the brake shoes to the drums, the tubing and flexible hoses which connect the master cylinder to the wheel cylinders.

A remote filler tube, connected by a pipe to the master cylinder, is mounted on the left side of the cowl to facilitate the addition of fluid to the system.

The master cylinder is mounted on a bracket attached to the frame just ahead of the brake pedal. The function of this unit is to maintain a constant volume of fluid in the brake system at all times, regardless of expansion or contraction due to temperature changes, and to transfer mechanical pressure at the brake pedal to hydraulic pressure on the wheel cylinders.

When the brake pedal is depressed, the master cylinder piston cup closes the by-pass port and builds up pressure in the brake lines and wheel cylinders. When the pedal is released, however, the return of the piston and primary cup in the master cylinder is much faster than the return of fluid from the wheel cylinders to the master cylinder. Consequently, a momentary vacuum is created behind the piston and fluid is drawn from the reservoir into the cylinder barrel during this period through the drilled holes in the piston and past the lip of the primary cup. When the retracting springs fully release the brake shoes, the excess fluid returning to the master cylinder passes through the by-pass port into the reservoir. A check valve at the front end of the master cylinder traps approximately 9 pounds of fluid pressure in the lines to the wheel cylinders.

Wheel cylinders are of the double piston type and are mounted on the brake backing plate just below the anchor pin. Pressure of the fluid in the wheel cylinder, when the brake pedal is depressed, causes the pistons to move outward and force the brake shoes into contact with the drums.

The front wheel brake cylinders have a larger diameter than those on the rear to maintain a higher braking ratio at the front wheels. This is required so that the front wheels will stop turning at the same time as the rear on emergency stops. Rubber cups, in the master and wheel cylinders, prevent the loss of fluid and, consequently, loss of braking pressure.

The brake fluid is forced from the master cylinder to a distributor type fitting mounted on the left frame side bar. From this distributor, three lines carry the fluid to the two front wheel cylinders and to the "T" fitting on the rear axle housing where it is directed to the two rear wheel cylinders. Brake lines are routed along the outside of the left frame side bar, away from the left exhaust system, to prevent overheating of the fluid and resultant loss of brake pedal.

The hand brake control assembly is mounted on the lower flange of the instrument panel at the left of the steering column. It is connected by a steel cable to a relay lever mounted on the frame side bar just in front of the left front body mounting bracket. This lever is connected by a second steel cable, to a lever on the frame X-member which operates the equalizer. A cable runs through the equalizer to each rear brake, where it actuates the brake shoes. The handle of the brake control is pulled straight out to apply the brakes, and turned counter-clockwise to release the brakes. An indicator light on the instrument panel cluster warns the driver when the hand brake is on while the ignition switch is "ON".

The brake stop light switch is operated mechanically by the brake pedal lever arm at its location beneath the toe board. When the brake pedal is depressed, the switch arm, under spring pressure, follows the brake lever downward until the switch is "On". When the brakes are released, the switch arm is returned to its normal "Off" position.

Rivited - on, brake shoe linings of high fade resistant quality are used on all 1954 series cars. The primary linings are grooved at the center to permit dissipation of heat from the surface of the brake drum, resulting in better brake performance and longer lining life.

The brake backing plate flange extends into a groove, formed in the edge of the brake drum, to form an effective trap against water splash, road dirt, or other foreign material.

A vacuum operated Power Brake booster assembly is available as an accessory on all 1954 Cadillac cars. This unit, which is connected in the fluid pressure line between the master cylinder and the brake line distributor fitting on the frame side bar, reduces the amount of foot pedal pressure required to stop the car by utilizing manifold vacuum and atmospheric pressure. The brake pedal height

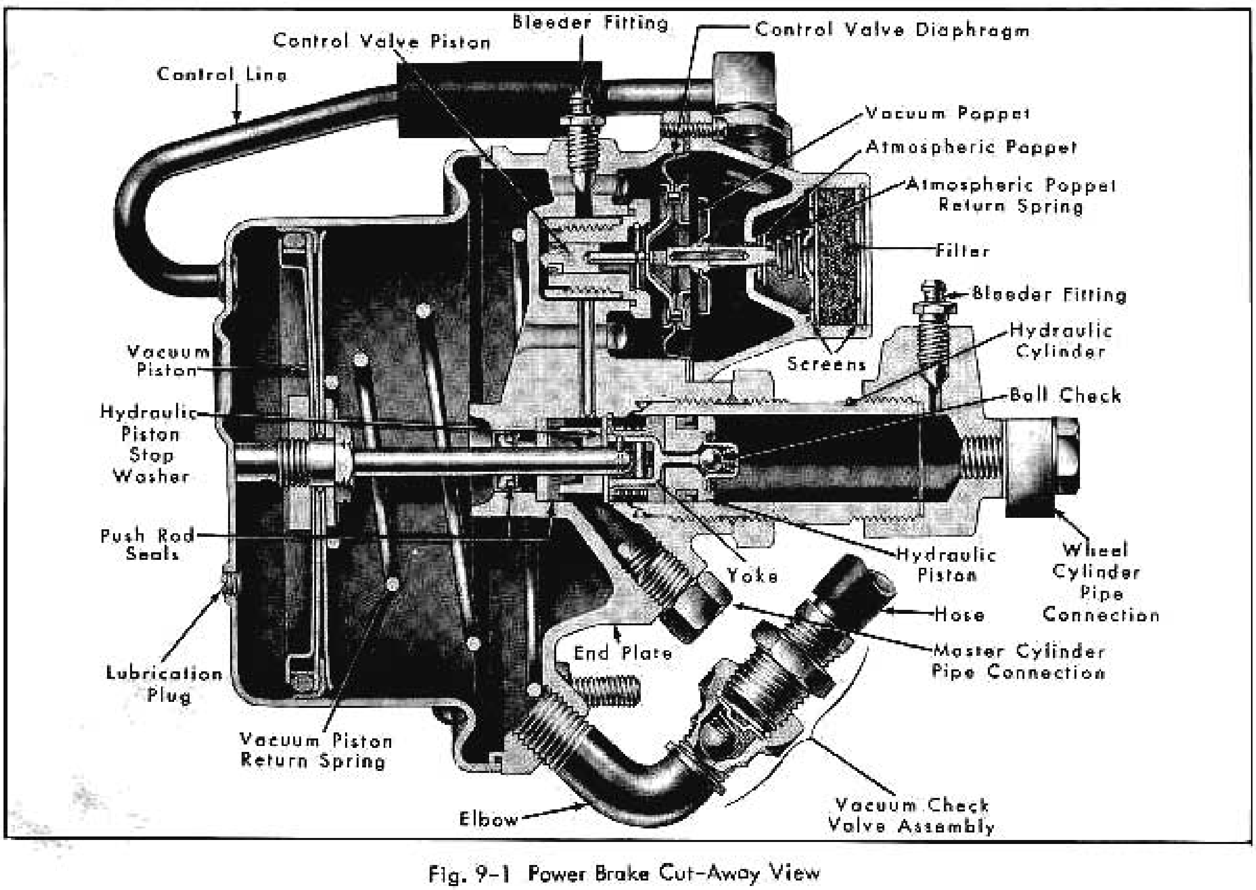

Fig. 9-1 Power Brake Cut-Away View

BRAKES

on cars equipped with the Factory installed Power Brake, is 7/8" lower than that on cars without this accessory.

The Power Brake, Fig. 9-1, consists of three basic units, designed to function as a single assembly and controlled by hydraulic pressure developed in the master cylinder. These three units are:

1. A vacuum power cylinder which contains a piston and a push rod which connects the vacuum piston to the hydraulic piston in the hydraulic cylinder.

2. A hydraulic cylinder which contains a piston with a check valve.

3. A hydraulically actuated vacuum control valve which regulates the degree of brake application or release. This control valve consists of a hydraulically actuated piston, a diaphragm, and an atmospheric and vacuum poppet.

Manifold vacuum is directed to the power brake cylinder through a hose attached to the front of the intake manifold. A check valve in the line between the intake manifold and the power brake serves a dual function:

1. It prevents damage to the power brake in the event of an engine backfire.

2. It traps vacuum in the unit at the highest manifold depression under operating conditions (usually 15 to 22 inches). This trapped vacuum is sufficient to make at least one brake stop with power assist even when manifold vacuum is very low or non-existent.

When the brake pedal is in the released position, the areas on both sides of the vacuum diaphragm and the power piston, Fig. 9-2, are exposed to manifold vacuum.

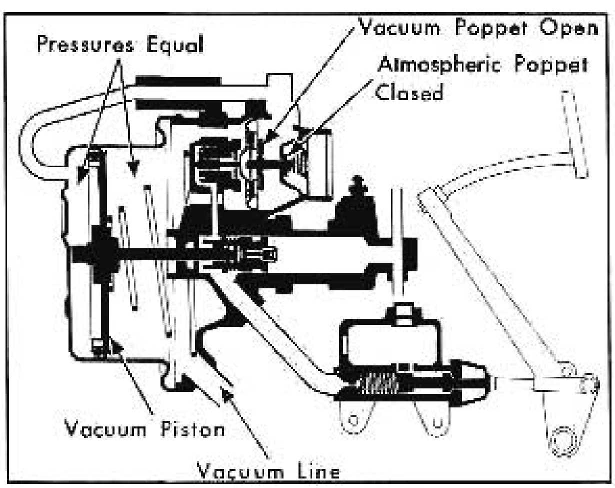

Fig. 9-2 Power Brake Operation - Released Position

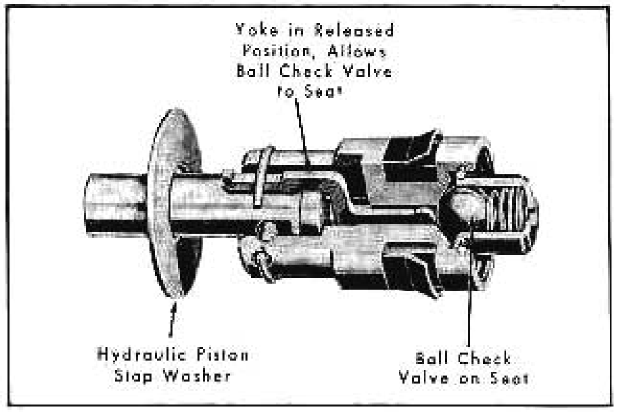

Fig. 9-3 Hydraulic Piston Assembly

As the brake pedal is depressed, the hydraulic pressure developed in the master cylinder is transmitted to the power brake hydraulic cylinder and to the hydraulic piston in the vacuum control valve. As the hydraulic piston in the hydraulic cylinder is against the stop washer when the pedal is first depressed, the check ball in the piston is held off of its seat by the hydraulic piston yoke, Fig. 9-3. This allows fluid from the master cylinder to pass through the piston directly to the wheel cylinders. This safety feature permits normal operation of the standard brake system when the engine is not running or in the event that the power system should fail.

Fluid under pressure is also directed to the hydraulic piston in the vacuum control valve. As

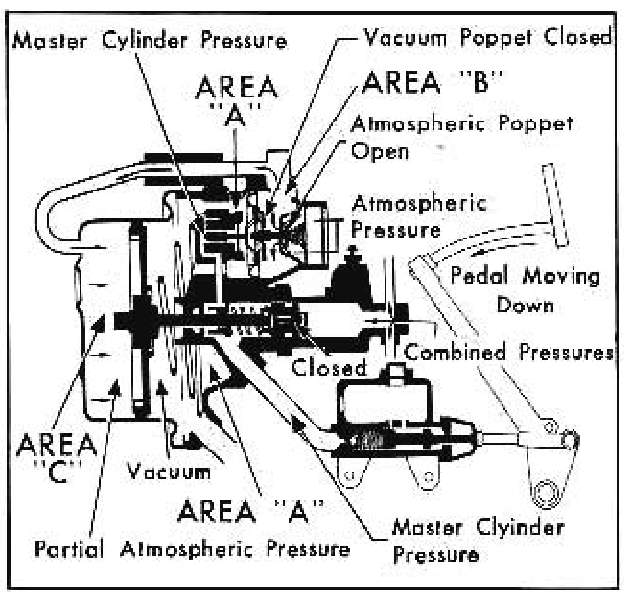

Fig. 9-4 Power Brake Operation - Brakes Applied

fluid pressure moves this piston, it actuates the vacuum diaphragm control shaft and forces the diaphragm against the vacuum poppet valve, sealing off area "B" from manifold vacuum. Continued movement of the piston (and the diaphragm) forces the atmospheric poppet valve off of its seat and admits air under atmospheric pressure through area "B", to area "C". The pressure differential between areas "C" and "A" forces the vacuum piston and push rod toward the hydraulic cylinder. The push rod, attached to the hydraulic piston, forces the hydraulic piston and yoke away from the stop washer, permitting the check valve to close and trap fluid under pressure ahead of the piston. From this point, the total hydraulic pressure, developed in the hydraulic power cylinder and transmitted to the wheel cylinders, is the sum of the push rod pressure and the pressure developed in the master cylinder. Fig. 9-4.

The degree of power brake assist is regulated in the vacuum control valve assembly by controlling the pressure differential between area "B" and "D". Here, hydraulic pressure against the piston is opposed by air pressure and spring pressure on the area "B" side of the diaphragm, when the diaphragm is in contact with the vacuum poppet valve. As the pressure in area "B" increases, (while the atmospheric poppet is open) the force against the vacuum valve and the diaphragm also increases, tending to close the atmospheric valve. Therefore, the degree of power assist is proportional to hydraulic pressure on the small hydraulic piston and consequently it is proportional to foot pedal pressure.

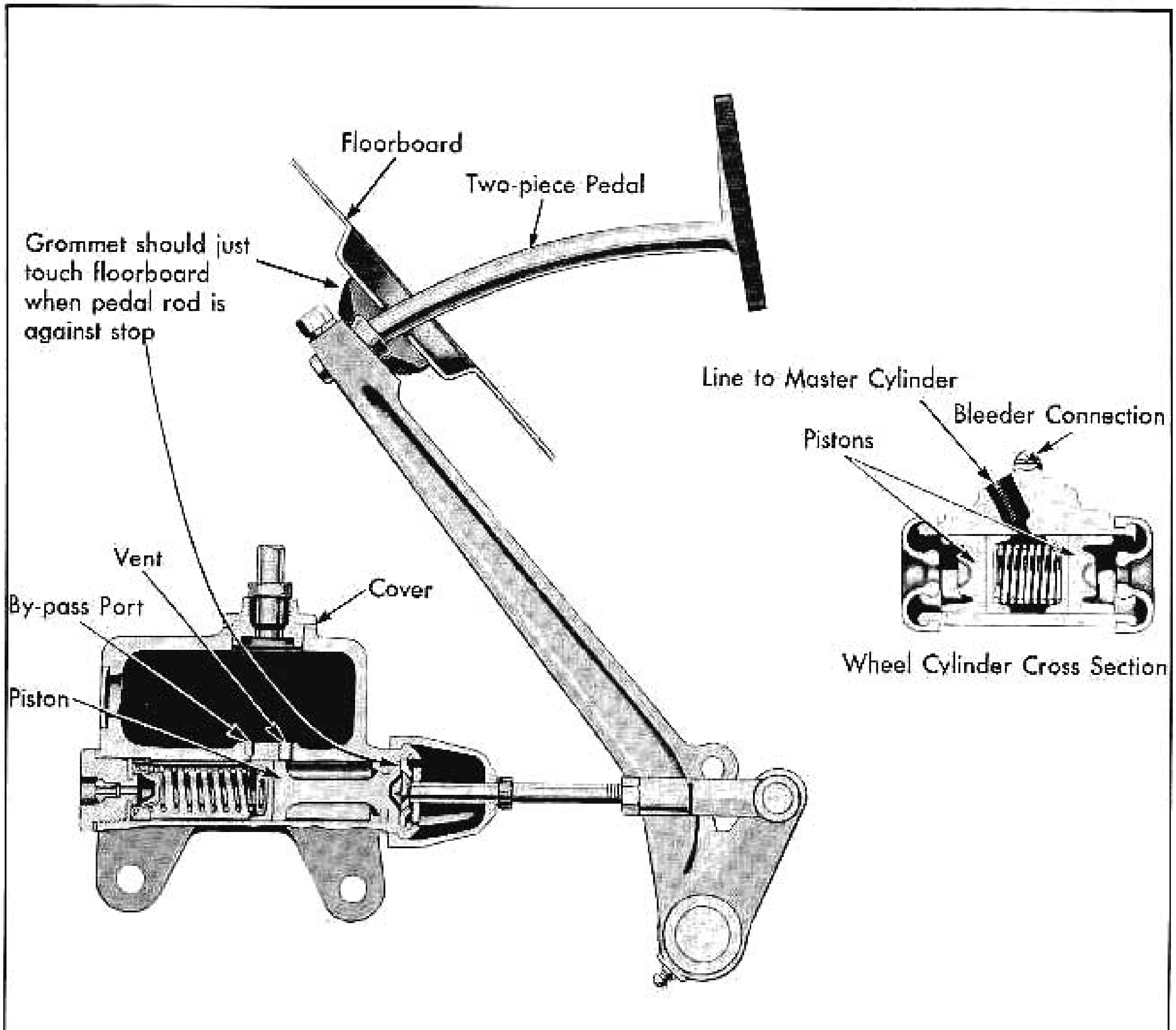

Fig. 9-5 Brake Master Cylinder and Pedal

BRAKES

SERVICE INFORMATION

(1) Brake Pedal Adjustment

NOTE: This adjustment is important and should be checked whenever a major or minor brake adjustment is performed, to be sure that the master cylinder piston and primary cup are properly positioned when the brakes are released to avoid the possibility of brake drag.

1. Check brake pedal action. Pedal must operate freely without any bind at operating shaft or interference with the floor carpet grommet.

2. If brake pedal returns slowly, check the brake pedal return spring. If it is weak or broken replace spring.

3. Loosen lock nut on link between master cylinder and clevis on brake operating arm. Fig. 9-5.

4. Turn link into clevis until grommet on the pedal shaft clears the underside of the toeboard.

5. Back link out of clevis until grommet just rests against the toeboard.

6. Tighten lock nut on link.

(2) Minor Brake Adjustment

1. Jack up car and remove adjusting hole cover from each brake backing plate.

2. Check front wheel bearing adjustment and correct, if necessary, as outlined in Section 6, Note 3.

NOTE: This is very important to assure permanency of lining to drum operating clearance.

3. Check to see that hand brake cables and linkage, including lever on secondary shoes, are free.

4. Tighten the ratchet adjustment (star wheel), using Adjuster Tool No. J-1603A, until the road wheel cannot be turned by hand.

5. Back off ratchet 14 notches and install adjusting hole cover.

CAUTION: Any deviation from this adjustment, such as backing off less than 14 notches to obtain a "high" pedal, can cause serious brake troubles.

6. Repeat this operation on all four wheels.

7. Lower car and check for brake pedal free play. Adjust as explained in Note 1.

(3) Major Brake Adjustment

1. Jack up car and remove all four wheels. Remove adjusting hole cover from each brake backing plate.

2. Check fluid level in master cylinder filler tube and add fluid if necessary.

3. Loosen hand brake cable at equalizer, just to the rear of frame cross member.

4. Check to see that hand brake cables and linkage, including levers on secondary shoes, are free.

5. Adjust brake pedal for free action, complete return to stop, and proper free play at toeboard. See Note 1.

6. Remove front and rear drums and clean out all dirt from brake assemblies and drums. Use care to avoid getting dirt into wheel bearings.

7. Inspect drums and recondition or replace as required.

8. Inspect brake lining assemblies for wear, loose rivets, glazing, or imbedded particles. Also check for oil seal or wheel cylinder leakage and correct as necessary.

9. Lubricate brake backing plate at shoe contact areas with "Lubriplate". Also lubricate hand brake lever and cable at backing plate.

10. Install drums and adjust front wheel bearings.

11. Loosen the anchor pin lock nut 1/2 turn, and tap anchor pin up, then all the way down to bottom of its slot with a hammer.

12. Using adjuster Tool No. J-1603-A, turn the star wheel adjuster to expand brake shoes until drum can just be turned in direction of forward rotation with a two foot bar. This is equivalent to a two hand drag with the wheel and tire installed.

13. Using a hammer, tap the brake backing plate adjacent to the anchor pin. This will cause the

brake shoes to raise the anchor pin into a central position between the ends of the shoes.

14. Check brake drag with the two foot bar, and retighten star wheel adjuster if drag has decreased. Tap backing plate again and recheck drag.

15. Tighten the anchor lock nut to 80 to 120 ft. lbs. torque. The brake drag should increase somewhat when the anchor nut is tightened.

16. Loosen the star wheel 14 notches and insert the .015" feeler gage of Tool, J-1040 in the drum slot with slot at bottom.

17. Rotate drum forward until feeler is wedged between the secondary shoe and the drum. This forces the primary shoe tight against the drum, providing the necessary conditions for measuring secondary shoe clearance.

18. Turn the drum back until the feeler is at the bottom of the secondary lining. Check clearance between secondary shoe and lining. This should be .015". If clearance is not as specified, adjust star wheel to obtain the proper clearance.

19. Check the clearance between upper end of secondary shoe and drum. This should be .010".

20. If upper clearance is greater or less than .010", it will be necessary to loosen anchor pin lock nut, slightly, and tap anchor pin up if clearance is more than specified, or down if clearance is less than .010". Reset lower clearance with star wheel and recheck upper clearance. The clearance between drum and linings at any point, should not be less than .010".

(4) Hand Brake Adjustment

NOTE: Service brakes should be properly adjusted before adjusting the hand brake.

1. Lubricate complete hand brake linkage and check for free movement of cables in conduit and in equalizer, Fig. 9-6.

2. Check rear relay lever spring and replace if weak or broken.

3. Check for proper tension of intermediate cable which may be determined by measuring the distance between the rear edge of the rear relay lever and the end of the slot in the frame X-member. Fig. 9-7. This distance should be 1/8".

4. If distance is greater or less than the specified, adjust the lock nut on the intermediate cable link to obtain the 1/8" clearance specified.

5. Adjust the equalizer lock nut until the rear brake cables are taut.

6. Using a spring scale, pull hand brake lever until scale shows 50 lbs. pull. Measure the distance the handle has traveled from its released position. This should be 2-1/8" to 2-3/8".

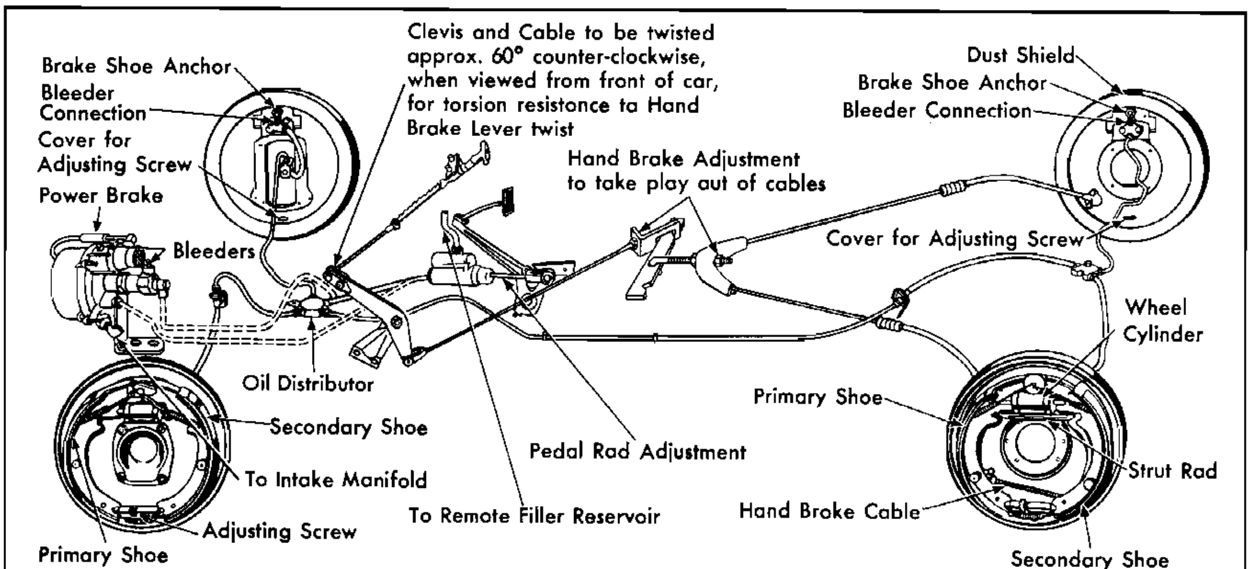

Fig. 9-6 Brake Adjustment References

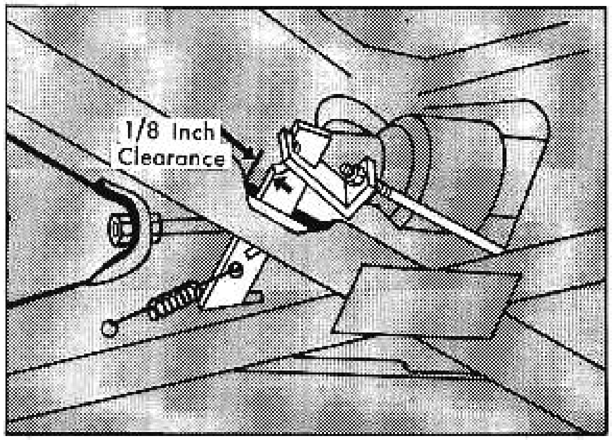

Fig. 9-7 Brake Relay Adjustment

7. Adjust cable tension until above specification is reached. Tighten lock nut.

8. Recheck front cable adjustment as explained in Step 3, above.

(5) Brake Shoe Assemblies

When it is necessary to reline the brakes, it is recommended that the complete brake lining and shoe assemblies be replaced with new assemblies available from the Factory Parts Department. The lining and shoe assemblies are ground to fit a new 12 inch drum perfectly to prevent the possibility of imperfect braking action due to warped or improperly assembled shoes. This reduces the time required for the complete relining operation and insures a satisfactory job for the customer. Those service departments that have adequate brake shoe relining equipment can, of course, obtain lining from the Factory Parts Department.

(6) Relining Brakes

1. Jack up car and dismount all four wheels.

2. Remove wheel hub and brake drum assemblies, (See Section 6, Notes 16 and 26).

CAUTION: Do not depress brake pedal when one or more brake drums are removed.

3. Loosen hand brake cable lock nut at equalizer.

4. Remove brake shoe hold-down cups and springs, Fig. 9-8.

5. Install Wheel Cylinder Clamp, Tool No. KMO-145 to hold wheel cylinder pistons in position.

6. Disconnect brake shoe return springs using Tool No. KMO-526A.

7. Disconnect hand brake cables from hand brake operating levers at rear brakes.

8. Remove shoes and star wheel adjuster from brake locking plate.

9. Disengage shoes from star wheel adjuster and connecting spring.

10. If it is necessary to machine brake drums, do not remove more than .060" over original limit of inside diameter.

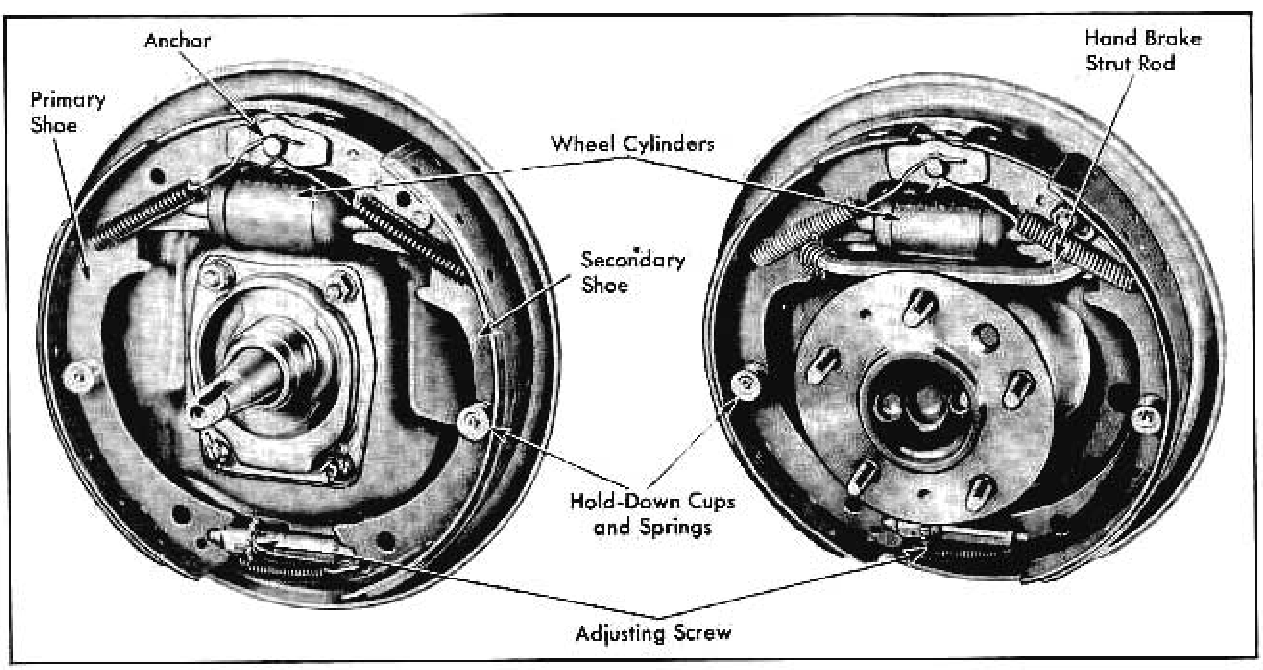

Fig. 9-8 Brake Mechanism at Front and Rear Wheels

9. Clean the brake dust shields and all brake parts.

10. Tighten bolts that hold backing plates to rear axle housing and front wheel spindles.

11. Lubriplate all points of contact between the brake shoe and other brake parts. Use lubriplate sparingly, especially on brake shoe pads.

12. Hook connecting spring between primary and secondary shoes and install star wheel adjuster between shoes so that star wheel will line up with backing plate slot.

13. Install brake shoe hold-down cups and springs and return springs.

14. Remove wheel Cylinder Clamp, Tool No. KMO-145.

15. Loosen notched adjustment screw ("star wheel") to permit assembly of hubs and drums.

16. Install wheel hub and drum assemblies and road wheels.

17. Adjust front wheel bearings, as explained in Section 6, Note 3.

18. Adjust service brakes as outlined in Note 3.

19. Adjust hand brake as explained in Note 4.

20. Install adjusting hole covers on all four brakes.

(7) Machining Brake Drums

When machining brake drums, they must not be machined more than .060" beyond original limit of inside diameter (12.060" total after machining). When brake drums are too thin, the intense heat that frequently develops under severe driving conditions may cause them to distort or warp excessively. Drum diameter should be measured 1/2" from outer flange. If drum runout exceeds .007" it will be necessary to machine the drum, using suitable equipment for this purpose. Be sure to install drum in the machining equipment correctly and to check runout of lathe spindle to insure accuracy of final machining operation.

Replacement brake drums supplied by the Factory Parts Department are finish machined at the Factory before being shipped. This eliminates the necessity of further finishing before installation. Do not machine drums to roughen the braking surface; use coarse emery cloth for this purpose.

(8) Break-In of New Linings

The useful life of brake linings and drums can be prolonged if care is exercised when "breaking-in" the brakes on new cars, or when linings are replaced and drums refinished on cars in service.

To break in the linings and drums, it is only necessary to apply the brakes lightly at low speeds a number of times and to use discretion about applying them at full force at high speeds.

(9) Bleeding Brakes

Bleeding the brakes may be made considerably easier through the use of one of the pressure brake bleeder tools now available. This equipment comprises a tank partially filled with Delco Super No. 11 brake fluid and a rubber hose which connects to the master cylinder remote reservoir. Compressed air applied to the tank forces the fluid into the brake system.

To bleed the brakes after the bleeder has been connected to the master cylinder remote reservoir by its long rubber hose, it is only necessary to loosen the bleeder valve on the wheel cylinder to be bled, and direct the fluid into a partially filled bottle of new brake fluid until bubbles cease. On cars equipped with Power Brakes, attach the bleeder drain hose to the bleeder fitting on the end cap of the power cylinder, back off fitting three quarters of a turn and bleed fluid into a partially full bottle of clean brake fluid until bubbles cease. Next, bleed fitting on end plate above vacuum control valve housing then proceed to wheel cylinders.

CAUTION: Do not run engine when bleeding brakes on cars equipped with Power Brakes. Do not allow any brake fluid to come in contact with the fender or body, as it will damage the finish.

The procedure to be used if the pressure bleeder is not available is as follows:

1. Fill master cylinder remote filler reservoir with Delco Super No. 11 Brake Fluid only. Keep reservoir at least partially filled at all times during bleeding operation.

CAUTION: To avoid possible damage to the braking system do not use any other type of brake fluid.

2. Remove screw from end of bleeder valve at wheel cylinder and install a Bleeder Drain Hose, Tool No. J-747, allowing it to hang in a clean container partially filled with new brake fluid.

On cars equipped with Power Brakes, bleed the power cylinder first by attaching bleeder hose to fitting on end cap, back off fitting three quarters of a turn, and depress brake pedal until bubbles cease. Next, bleed upper fitting on end plate above vacuum control valve housing and then proceed to bleed wheel cylinders.

3. Unscrew hex head bleeder valve three quarters of a turn.

4. Depress brake pedal slowly by hand. Close bleeder valve, while slowly depressing brake pedal then allow pedal to return to released position. Repeat until no bubbles appear. This provides a pumping action which forces fluid through the tubing and out at wheel cylinder (or power cylinder), carrying with it any air that may be present.

5. Watch flow of fluid from drain hose, keeping end of hose in container below fluid level, and when air bubbles cease to appear, or when flow is uninterrupted, close bleeder valve and install bleeder valve screw.

6. If entire system is to be bled, repeat this operation at each of the four wheels.

7. Replenish fluid in reservoir after each cylinder is bled.

NOTE: The fluid withdrawn in bleeding operation should NOT be used again.

8. Refill reservoir with clean Delco Super No. 11 Brake Fluid only to within 3/4 inch of top.

(10) Removal and Disassembly of Master Cylinder

1. Remove splash shield from flywheel housing.

2. Disconnect brake line at front of master cylinder.

3. Depress brake pedal a few times to force all fluid from master cylinder.

4. Loosen remote filler reservoir pipe fitting in master cylinder cover.

5. Disconnect pedal operating rod at clevis on brake pedal. Disconnecting the rod at this point retains approximate adjustment.

6. Remove two bolts holding master cylinder to frame bracket and lower unit from car.

7. Slip rubber boot away from operating rod end of master cylinder.

8. Remove piston stop plate retaining ring, stop plate, and pedal operating rod.

9. Pull piston and secondary cup from end of cylinder barrel.

10. Lightly tap cylinder on a block of wood to remove return spring, primary cup with retainer, and check valve assembly from cylinder barrel.

11. Remove master cylinder head and valve seat from front end of cylinder.

12. Remove master cylinder cover.

After all parts have been removed from master cylinder, they should be washed in clean alcohol. Special care should be taken to make sure that by-pass port in body and bleed holes in piston are clean. Use compressed air to clean holes. Do not run a wire through port, as it may make a burr in the cylinder bore which would score primary cup.

Before washing parts, hands must be clean. Do not wash hands in gasoline or oil before cleaning master cylinder parts. Use soap and water to clean hands. Inspect master cylinder, boot, rubber cups, and check valve. Replace any parts which are scored, swollen, shrunk, or excessively worn.

(11) Assembly and Installation of Master Cylinder

1. Install master cylinder cover.

2. Install master cylinder head and fittings, using a new rubber washer and gasket.

3. Dip check valve assembly in clean brake fluid and install the return spring, and retainer as a unit in the cylinder barrel, with check valve next to cylinder head.

4. Install primary cup in barrel, with cupped end over end of spring.

5. Dip secondary cup in clean brake fluid and assemble on piston.

6. Install piston and secondary cup in barrel, with bleeder holes in piston next to primary cup.

7. Place pedal operating rod against end of piston and install stop plate and retaining ring.

8. Slip boot over end of master cylinder.

9. Position master cylinder in car, with cover below remote reservoir filler pipe, and thread pipe fitting into hole in cover, then install and tighten two cylinder-to-frame bracket bolts. Tighten fitting in cover.

10. Connect pedal operating clevis to pedal and adjust, as explained in Note 1.

11. Connect brake line to master cylinder.

12. Add fluid and bleed all four brakes, and power cylinder on cars so equipped, as explained in Note 9.

13. Install splash shield on flywheel housing.

(12) Removal and Disassembly of Wheel Cylinder

1. Jack up wheel and remove hub and brake drum assemblies.

2. Disconnect brake line at wheel cylinder. Install a cap on line fitting to prevent dirt from entering brake line.

3. Remove brake shoe retracting springs and hold down springs.

4. Remove two cap screws holding wheel cylinder to backing plate and remove cylinder from car.

5. Remove rubber boot from end of wheel cylinder.

6. Slide piston and rubber cup from end of cylinder.

7. Remove piston return spring.

8. Wash all parts in clean alcohol, after washing hands thoroughly with soap and water.

9. Install a plug in brake line fitting hole to prevent entry of dirt into cylinder.

(13) Assembly and Installation of Wheel Cylinder

1. Install piston return spring in cylinder.

2. Install rubber cup and piston in each end of cylinder. Flat side of each cup goes against flat side of piston. (See Fig. 5).

3. Install rubber boot over each end of cylinder.

4. Position wheel cylinder on brake backing plate, slipping the cylinder-to-shoe connecting links in place at the same time.

5. Install cap screws holding wheel cylinder to backing plate.

6. Install brake shoe hold down springs and retracting springs.

7. Remove plug from brake line fitting hole in wheel cylinder and cap from line then connect brake line to cylinder.

8. Install wheel hub, brake drum assembly, and wheel.

9. Bleed brake wheel cylinder that was removed, as explained in Note 9.

(14) Removal of Power Brake Assembly

1. Disconnect brake lines at power cylinder end plate.

2. Loosen vacuum line hose clamp at check valve and slide hose off of check valve.

3. Remove three nuts and lockwashers from the cylinder mounting bracket and remove Power Brake assembly from car.

(15) Disassembly of Power Brake Assembly

a. Disassembly of Hydraulic Cylinder Assembly

NOTE: When disassembling Power Brake, use care in handling parts to prevent their coming in contact with mineral oil or greases. Do not handle hydraulic cups and seals with greasy hands.

1. Loosen hydraulic cylinder nut and unscrew hydraulic cylinder assembly from the end plate. Fig. 9-9.

2. Hold the end cap in a vise and remove the hydraulic cylinder from the cap using an open end wrench on the flat part of the cylinder.

3. Remove cylinder to end cap gasket. Remove the bleeder fitting from the end cap.

4. Remove the bolt holding the hydraulic line connection to the end cap. Remove the fitting and two copper gaskets.

5. Scribe a line on the cylinder shell and end plate so that these parts can be reassembled in their original position.

6. Loosen the four hook bolt nuts and remove cylinder shell, sliding the cylinder tube out of the rubber hose.

7. Compress the piston spring by pressing down on the end plate and install the Vacuum Piston Retaining Strap, Tool No. J-5650, under opposite hook

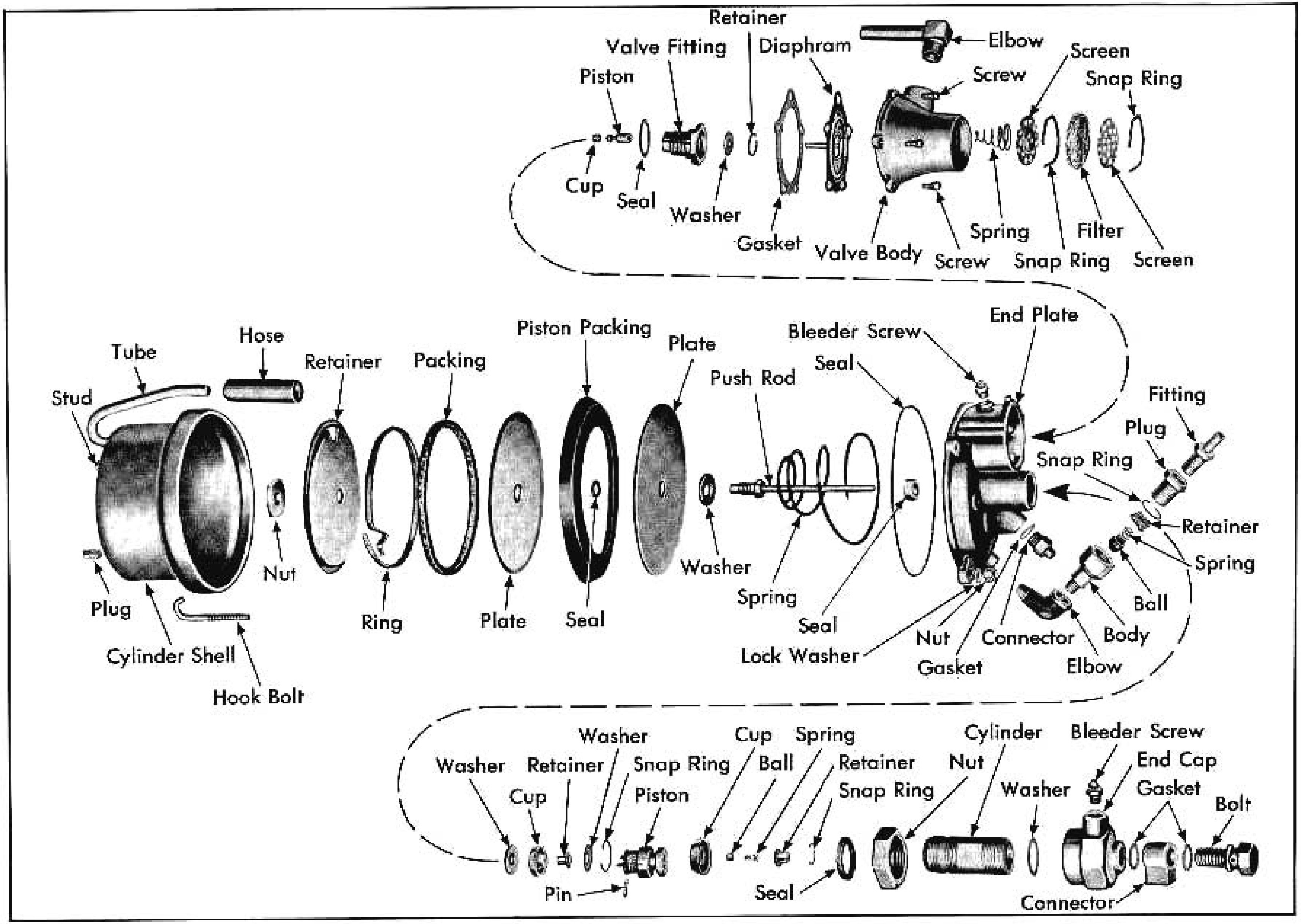

Fig. 9-9 Power Brake – Disassembled

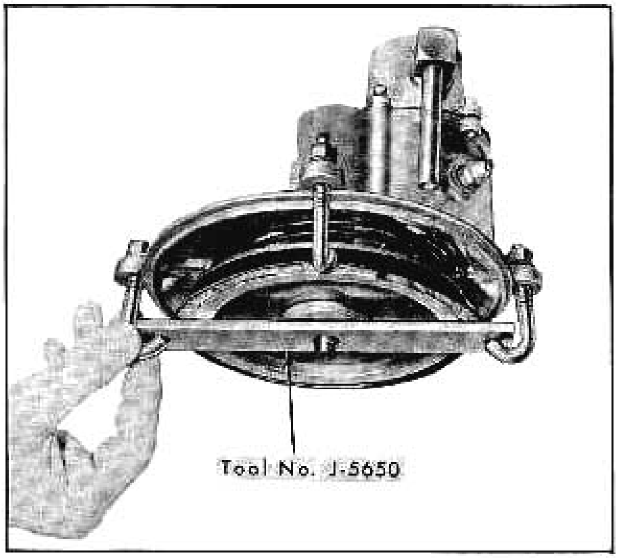

Fig. 9-10 Installing Retaining Strap

bolts as shown in Fig. 9-10.

8. Remove the hydraulic piston assembly from the push rod by holding retaining spring back and removing the small pin, Fig. 9-11.

9. Remove the Retaining Strap, while compressing the return spring, then remove the vacuum piston with push rod and vacuum spring.

10. Remove hydraulic piston cup from piston.

11. Remove snap ring, retainer, spring, and ball.

12. Remove the hydraulic cylinder end seal.

13. Remove the retaining ring and the hydraulic cylinder stop washer.

14. Remove the seat retainer. Note that the counter-bored side is next to seal cup.

15. Remove seal and lower stop washer. Note that lip of cup seal is up.

16. Drive push rod leather retainer out with a flat end rod or drift.

b. Disassembly of Vacuum Control Valve Assembly

1. Scribe control valve body and end plate to insure proper location on reassembly.

2. Remove control valve body screws and remove control valve assembly with diaphragm and gasket.

3. Remove diaphragm from control valve body.

4. Remove air intake filter snap ring and screen.

5. Remove filter.

6. Remove lower snap ring and screen with spring.

7. Remove hydraulic control valve fitting from end plate, using a 1-1/8" socket wrench.

8. Push piston out of fitting and remove cup from piston.

9. Remove seal from fitting.

10. Remove retainer ring and stop washer from fitting.

c. Disassembly of Vacuum Piston

1. Remove nut from threaded end of push rod.

2. Remove retainer plate, packing, and expander ring.

3. Remove small diameter piston plate with rubber seal ring.

4. Remove leather packing, larger diameter piston plate, and washer from push rod.

d. Disassembly of Check Valve

1. Remove check valve assembly from pipe elbow in end plate.

2. Remove plug from bushing.

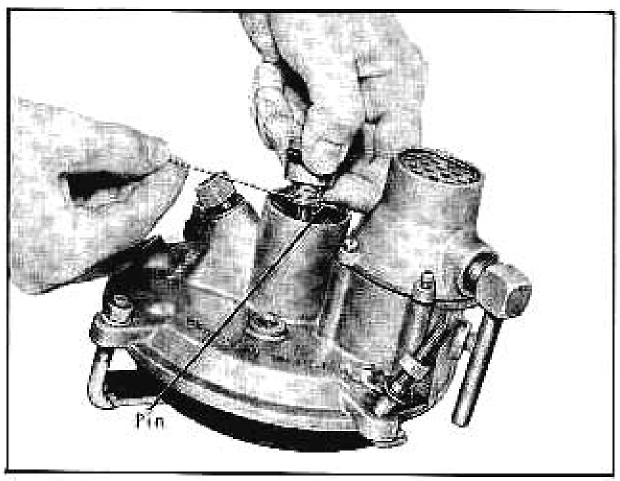

Fig. 9-11 Removing Piston Rod Pin

3. Remove bushing from check valve assembly.

4. Remove snap ring, spring retainer, and spring with check ball.

5. Remove spring from check ball.

(16) Cleaning and Inspection of Power Brake Parts

1. Thoroughly clean all parts to be reused.

2. Keep all hydraulic system parts away from mineral oils or greases.

3. After cleaning, wash hydraulic system parts in clean alcohol before assembly.

4. Do not handle hydraulic system parts with greasy hands.

5. Use new rubber seals and cups when reassembling power brake. Do not attempt to reuse old seals or cups.

(17) Assembly of Power Brake Assembly

a. Assembly of Vacuum Piston

1. Drill a 5/16" hole in a block of wood and place push rod in hole with threaded end up.

2. Install flat washer and larger diameter piston plate (chamfered side of hole up) over threaded end of push rod.

3. Install rubber seal ring over shaft into chamfered hole in piston plate.

4. Install leather packing on piston plate with lip up.

5. Install smaller diameter piston plate over threaded end of push rod, with chamfered side of hole down over rubber sealing ring. Outer diameter of plate will retain leather packing in position.

6. Install cotton wicking in position against inner face of lip of leather packing.

7. Install expander ring inside of cotton wicking, with gripper points up and notch at loop end of expander ring under clip at opposite end of ring.

8. Install retainer plate with cut-out portion over loop of expander ring.

9. Install nut on push rod finger tight, then place hexagonal section of push rod in a vise and tighten nut securely, using care to be sure that retainer plate does not turn. Stake the nut to the shaft.

b. Assembly of Vacuum Control Valve

1. Install stop washer and retainer ring in hydraulic control valve fitting.

2. Install new rubber cup on valve piston with lip of cup toward small end of piston.

3. Install piston in fitting with hole in end of piston next to stop washer.

4. Install a new rubber seal gasket in groove under head of fitting and install fitting into end plate. Tighten fitting securely.

5. Install gasket on end plate.

6. Install vacuum diaphragm over gasket with shaft in hole in hydraulic valve piston.

7. Position vacuum control valve body over vacuum diaphragm with scribe marks on end plate aligned to body and holes in diaphragm and gasket aligned with screw holes in body.

8. Install and tighten five screws.

9. Install spring in vacuum control valve body with small end over raised area of poppet valve seat.

10. Install screen, with depression in larger end of poppet valve spring, and install snap ring.

11. Install filter, upper screen, and retainer.

c. Assembly of Hydraulic Cylinder

1. Install a new push rod leather seal into end plate with lip of seal toward hydraulic cylinder side of end plate.

2. Place end plate on bench and install stop washer with chamfered side down.

3. Install seal cup with lip up and seal retainer with counterbored side next to cup.

4. Install stop washer next to retainer and install snap ring in groove.

5. Place vacuum piston return spring over push rod with small end of spring next to vacuum piston and carefully guide push rod through seat in end plate.

6. Compress spring and use vacuum piston retaining strap, Tool No. J-5650 to hold end plate and

cylinder together.

7. Install ball, spring, retainer, and snap ring in piston.

8. Dip hydraulic piston cup in Delco No. 11 brake fluid and install in groove with lip of cup toward check valve end of piston.

9. Dip hydraulic piston in Delco No. 11 brake fluid and assemble piston on push rod. Install retaining pin in hole in piston and rod. When pin is in position, retaining spring will hold it in place.

10. Place end cap in a vise and install bleeder screw, end cap gasket, hydraulic line connector with copper gaskets and retaining bolt.

11. Thread hydraulic cylinder tube into end cap with milled flats next to end cap, and securely tighten cylinder.

12. Thread check nut on cylinder to limit of threads.

13. Install hydraulic cylinder end seal against shoulder in end plate.

14. Guide the lip of the piston cup into the cylinder carefully and threaded cylinder into end plate until cylinder bottoms firmly against the end seal. Tighten cylinder until bleed screw on end cap is aligned with bleed screw in end plate and tighten check nut securely.

15. Remove Piston Retaining Strap.

16. Place rubber ring gasket in groove on end plate.

17. Saturate the cotton wicking by dipping vacuum piston in Delco Shock Absorber Fluid, and allow excess oil to drain off. In addition, coat inside of cylinder shell lightly with Delco Shock Absorber Fluid.

18. Insert piston into shell by tipping piston as shown in Fig. 9-12.

19. Align scribe marks on shell and end plate, attach hook bolts, and tighten each bolt evenly until all bolts are uniformly tight.

d. Assembly of Check Valve

1. Install end of spring over check ball.

2. Install spring retainer plate with depression in plate in end of spring and install snap ring.

3. Install plug in check valve body.

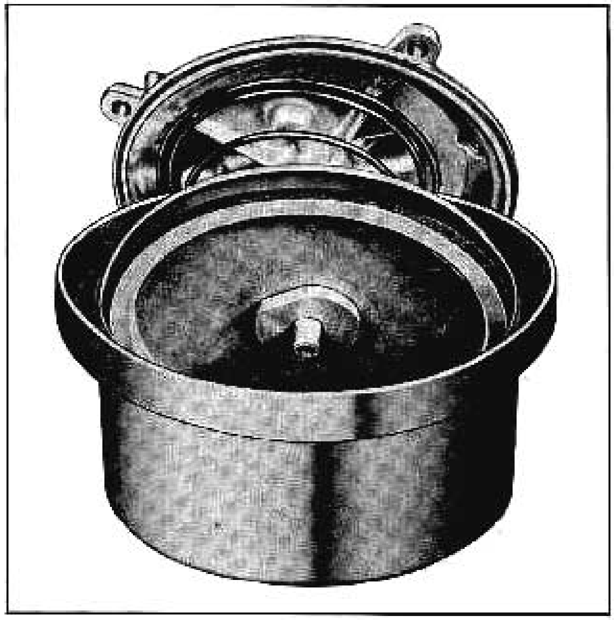

Fig. 9-12 Installing Piston in Cylinder Shell

4. Install fitting in bushing.

5. Install valve assembly in elbow on end plate.

(18) Installation of Power Cylinder Assembly

1. Position Power Brake assembly on mounting bracket and install lockwashers and nuts.

2. Connect vacuum hose to check valve on Power Brake and tighten hose clamp.

3. Connect brake line fittings to end plate.

4. Bleed system as outlined in Note 9.

(19) Tightening Brake Fittings

Whenever brake lines are disassembled for any reason, they should be reassembled with particular care, first, to avoid any foreign matter getting into the system, and, second, to assure leakproof connections.

All of the fittings and connections should be carefully wiped clean before assembly and then tightened thoroughly, to prevent any leakage.

(20) Replacement of Stoplight Switch

a. Removal

1. Fold front carpet back from brake pedal area, to expose stoplight switch mounting screws.

2. Remove mounting screws.

3. Working under the car, disconnect switch wires and remove switch from car.

b. Installation

1. Connect switch wires to switch.

2. Position switch against floor pan, with actuating arm between brake pedal and floor pan.

3. Install screws from top, while switch is being held in position below car.

4. Fold carpet back into position around brake pedal.

5. Check operation of stop lights.

(21) Lubrication of Brake Dust Shields

A popping noise may sometimes occur in the brakes when they are applied in forward speed, after having been applied in reverse. This is generally a result of the edge of the brake shoe hanging slightly on the bosses of the dust shield before centralizing.

In such cases the edges of the shoes should be smoothed up where they contact the bosses and lubricated slightly.

"Lubriplate" is a suitable lubricant for this purpose. Care should be taken in applying lubricant to make sure that none is permitted to get on the brake lining.

This procedure should eliminate objectionable popping. It should be remembered, however, that the centralizing action of the brakes may result in a slight click when the brakes are applied in reverse and should not be construed as cause for repair.

(22) Removal of Hand Brake Handle Assembly

1. Remove bolt holding retaining plates over brake cable pin and brake lever at left side of cowl.

2. Disconnect hand brake cable from lever at left side of cowl by removing bolt holding retaining plates to lever and over pin.

3. Remove two bolts holding hand brake handle assembly to instrument panel.

4. Lower assembly from instrument panel and disconnect wire from hand brake warning light switch.

5. Loosen grommet from cowl panel and remove assembly including grommet from car.

(23) Installation of Hand Brake Handle Assembly

1. Guide cable and pin through opening in cowl panel from inside of car and install grommet on cowl panel.

2. Connect hand brake warning light wire to switch on hand brake assembly.

3. Position hand brake handle below instrument panel and install mounting bolts.

4. Place retainer plates in position on lever, with tangs in holes. Twist pin and cable approximately 60° counterclockwise, as viewed from the front of car, placing pin between retainer plates and into holes in plates. Install bolt through retaining plate and tighten nut.

DIAGNOSIS CHART

Standard Hydraulic Braking System

EFFECT	CAUSE	REMEDY
Brake pedal goes all way down to toeboard.	Normal wear on linings	Adjust brakes.
	No fluid in reservoir.	Add fluid, inspect for leakage, and bleed system.
	Leaks in brake system.	Check entire system for leaks. If no leaks are found at wheels or connections, master cylinder should be removed and bore checked for scratches and scores.

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Brake pedal goes all way down to toeboard.	Air in brake system, which causes a springy, rubbery action of brake pedal.	Bleed system. Check for shrunken or swollen rubber cups, and correct cause. If air enters rear wheel cylinders only, advise owner to apply foot brake before pulling on hand brake. Also overhaul master cylinder and replace check valve.
	Rubber cups damaged or shrunken by excessive heat.	Replace all affected rubber parts. Inspect shoes and linings, and replace both if damaged by heat. Replace drums that run excessively hot.
		Perform Major brake adjustment, and correct any other cause of overheating.
	Rubber cups shrunkeu or swollen by mineral oil in system, or wrong type of brake fluid.	Disassemble all hydraulic parts and wash with alcohol. Dry with compressed air before assembly, to keep alcohol out of system.
		Replace all rubber parts in system, including hoses.
		Replace brake shoe assemblies or linings if glazed by brake fluid leakage.
		Refill and bleed with Delco Super No. 11 Brake Fluid.
No pedal after hard usage.	Excessive heat cuases fluid to vaporize.	Drain fluid, flush system, and refill with Delco Super No. 11 Brake Fluid. Bleed system. Perform Major brake adjustment. Replace linings and shoes if glazed.
		Replace drums that run excessively hot.
		Replace wheel cylinder cups.
Brakes drag at all wheels.	By-pass port hole in master cylinder blocked.	Adjust brake pedal. If condition not corrected, overhaul master cylinder and check for dirt in by-pass.
	Mineral oil in brake system.	Disassemble and clean all brake system parts, as outlined above. Replace all rubber parts, including hoses. Refill and bleed system with Delco Super No. 11 Brake Fluid.

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Brake drags on one wheel.	Brake shoes too close to drum	Adjust brakes.
	Weak or broken shoe return spring.	Replace spring.
	Cylinder cups distorted, or brake hose restricted.	Replace cylinder cups or hose. Replace all rubber parts and disassemble all parts for cleaning, if improper fluid is suspected. Replace lining if contaminated by fluid leakage.
		Flush brake system and refill with Delco No. 11 Brake Fluid.
	Drag or binding in emergency brake cable or linkage.	Check and correct cable adjustment, and lubriplate lever on secondary shoe.
	Loose or defective wheel bearings.	Adjust or replace bearings as necessary.
Car pulls to one side when brakes are applied.	Tires not properly inflated.	Inflate tires to correct and uniform pressure.
	Loose or defective wheel bearings.	Adjust or replace bearings with new ones as necessary.
	Badly misaligned wheels.	Correct wheel alignment.
	Steering gear out of adjustment.	Adjust steering gear and linkage. Be certain location and pull through high spot is correct.
	Backing plate loose on steering knuckle or axle.	Tighten backing plate. Readjust anchor and shoes on both sides.
	Anchor adjustment uneven, between left and right sides.	Perform Major brake adjustment on both sides of car, or all 4 wheels, as required.
	Oil or brake fluid on linings.	Replace brake shoe assemblies or install new linings. Oil soaked linings cannot be cleaned and used again successfully. Also correct condition which caused linings to become soaked.
	Different makes of lining used, between left and right sides.	Different makes of lining have different braking efficiency. Replace brake shoes or install new linings, on both sides at once.
	Scored or out-of-round brake drums.	Machine left and right brake drums, or replace both if more than .030-inches has to be removed.

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Car pulls to one side when brakes are applied.	Drums have different friction between left and right sides.	Switch drums left and right. If pulling not corrected, machine both drums, or replace, as required.
Springy pedal action.	Brake shoes improperly adjusted.	Check and correct anchor and shoe adjustment.
		Brakes must be readjusted with proper clearances at all wheels.
	Air in brake system.	Bleed system.
		Investigate and correct cause of air being drawn into system.
	New lining improperly fitting brake drums.	Install Cadillac Shoe and Lining Assemblies which are ground to fit. Follow break-in procedure for new linings.
Excessive pedal pressure necessary to stop car.	Brake shoes improperly adjusted.	Check anchor adjustments. Readjust brakes with proper clearances at all wheels.
	Brake pedal or linkage binds.	Check pedal rod for binding in floorboard grommet. Reposition grommet as required.
		Lubricate pedal shaft.
		Check for bind in master cylinder, and overhaul assembly if required.
	Lining making only partial contact with drum.	Check anchor and shoe adjustments. If not corrected, replace shoe assemblies and readjust.
	Incorrect linings used.	Replace brake shoes or install new linings.
	Lining glazed.	Roughen or replace lining. If damaged by heat, replace shoes also, and correct cause of overheating.
		Reface drums only when scored or overheated.
		Check and correct brake fluid leakage.
		Caution owner about breaking in new linings.
Too light pedal pressure (brake action severe).	Brake shoes improperly adjusted.	Check anchor adjustment
		Brakes must be readjusted with proper clearances at all wheels.

DIAGNOSIS CHART (Cont'd)

Standard Hydraulic Braking System (Cont'd.)

EFFECT	CAUSE	REMEDY
Too light pedal pressure (brake action severe).	Backing plate loose on steering knuckle or axle.	Tighten backing plate and re-adjust anchor and shoes.
	Oil or fluid on linings.	Replace brake shoe assemblies or install new linings. Linings cannot be cleared and used again successfully.
		Correct condition which caused linings to become soaked.
	Linings damaged by excessive heat.	Replace shoes and linings.
	Scored brake drums.	Machine or replace left and right brake drums.
Squeaking on application	Dampening spring missing or insulated from drum.	Install a new spring, or clean drum and spring.
	Improper adjustment.	Adjust anchor and shoes.
	Lining hard or glazed.	Roughen lining or replace.
	Lining making poor contact with drum.	Check anchor and shoe adjustments.
		Replace shoe assemblies if distorted.
		If lining is new, follow break-in procedure.
	Brake lining cracked.	Replace lining.
	Rivets loose.	Replace shoes or lining.

DIAGNOSIS CHART

Power Brake

EFFECT	CAUSE	REMEDY
Momentary hissing noise as brakes are applied.	Air passing through filter and atmospheric poppet.	Normal condition. Should be audible only with hood raised.
Hissing noise, engine running, brakes on or off.	External vacuum leak - vacuum side of control diaphragm.	Check and correct leak at control valve body, diaphragm, and gasket to end plate. Check and correct leak between vacuum cylinder and end plate.
Hissing noise, engine running, more pronounced with brakes off.	External vacuum leak - atmospheric side of control diaphragm.	Check and correct leak at atmospheric poppet, external pipe and rubber tubing, and valve body screws.

DIAGNOSIS CHART (Cont'd)

Power Brake (Cont'd.)

EFFECT	CAUSE	REMEDY
Hissing noise, engine running, brakes on only.	Internal vacuum leak - air enters through breather.	Overhaul unit, and check for leak at vacuum poppet, control diaphragm, or vacuum power piston.
Little or no boost from power brake. May be accompanied by hissing noise or loss of brake fluid.	Internal vacuum leak between atmospheric and vacuum side of vacuum power piston.	Overhaul unit, and check for leak at vacuum poppet, control diaphragm, or vacuum power piston.
	Internal hydraulic leak.	Check for low brake fluid level. Overhaul unit, and check for presence of brake fluid in inner side of vacuum cylinder, or inner side of control diaphragm. Check and correct leaks at control valve cup, control valve fitting "O" ring seal, vacuum piston push rod seals, or hydraulic power piston cup or ball-check.
	External hydraulic leak.	Correct leak at point of origin.
	Internal friction.	Check and correct Shock Absorber Fluid level in vacuum cylinder. If necessary, overhaul unit, and check for rusty, dirty, or distorted vacuum cylinder wall, dry or worn vacuum piston leather packing, swollen rubber cups due to heat or wrong brake fluid, worn or damaged rubber cups, or dirt, rust, sludge, or foreign matter in power piston or control valve regions.
Booster loses effectiveness while stopping. Pedal grows harder, or "kicks back".	Internal hydraulic leak.	Overhaul unit, and check for small leaks at control valve, valve fitting, and power piston.
	Internal or external vacuum leak.	Overhaul unit, and check for leak at vacuum poppet, control diaphragm, or vacuum power piston.
Tendency to over-brake, pedal drops under foot. May show up as slow application of Power Brake.	Restriction in atmospheric passage.	Clean air filter.
	Sticky control valve.	Overhaul unit, and check for misalignment of control valve assembly.
		Check for dirty or sticky vacuum or atmospheric poppet, as well as sticky control valve.

BRAKES

DIAGNOSIS CHART (Cont'd)

Power Brake (Cont'd.)

EFFECT	CAUSE	REMEDY
Tendency to over-brake, pedal drops under foot. May show up as slow application of Power Brake.	Internal hydraulic leak.	Overhaul unit, and check for leak at hydraulic power piston cup or ball check.
	Internal friction.	Check vacuum cylinder lubricant level.
		Overhaul unit, and check for binding in power piston assembly.
Brakes slow to release, or fail to release completely.	Sluggish control valve action.	Overhaul unit, and check for weak vacuum power piston return spring or atmospheric poppet return spring.
		Check for dirty or sticky control valve.
	Internal friction.	Check vacuum cylinder lubricant level.
		Overhaul unit, and check for binding in power piston assembly.
No power assist on first application after engine shut off.	External vacuum leak.	Check and correct leaks at valve body, external pipe, vacuum cylinder, and atmospheric poppet.
	Internal vacuum leak in check valve.	Overhaul or replace check valve assembly.

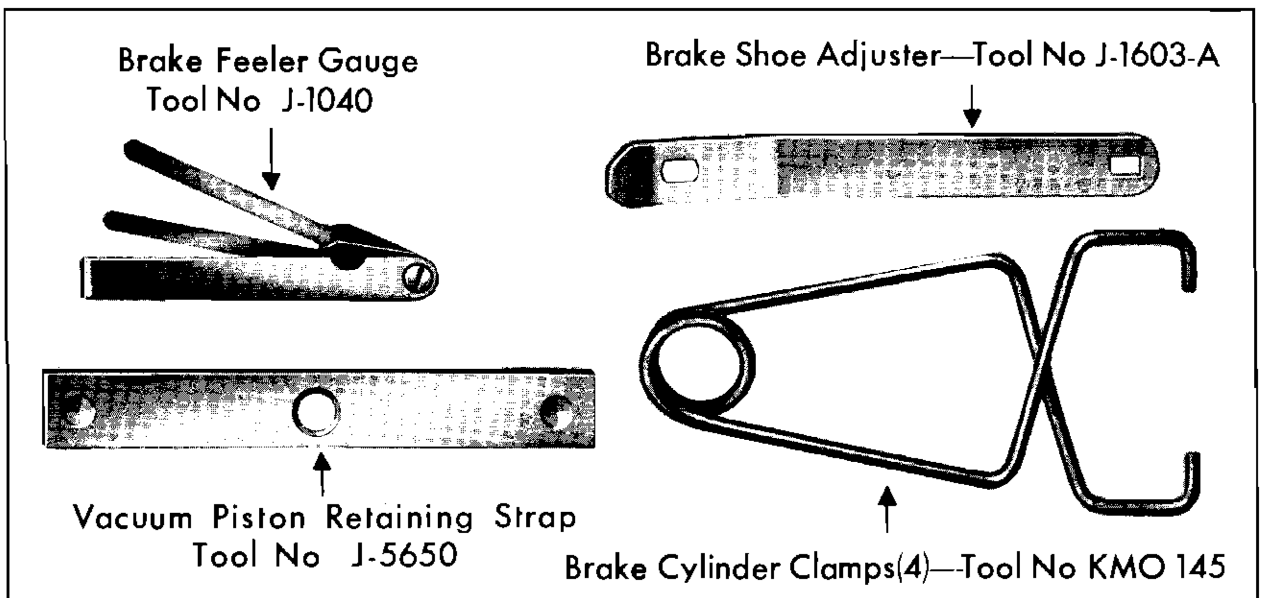

Fig. 9-13 Brake Special Tools

BRAKES

SPECIFICATIONS

Subject and Remarks	54-62, 60S	54-75	54-86
Braking area (Total in Square inches).	220.8	220.8	220.8
Braking ratio -			
Front.	55.8%	55.8%	52.8%
Rear	44.2%	44.2%	47.2%
Drums -			
Inside Diameter:			
Front.	11.995"-12.005"	11.995"-12.005"	11.995"-12.005"
Rear	11.995"-12.005"	11.995"-12.005"	11.995"-12.005"
Out-of-round inside diam. not over -			
Front.	.007"	.007"	.007"
Rear	.007"	.006"	.006"
Clearance between lining and drums	.010"-top .015" bottom	.010" top .015" bottom	.010" top .015" bottom
Remachined diameter not over	12.060"	12.060"	12.060"
Lining - Primary -			
Length, width, thickness:*			
Front.	11.45x2-1/2x1/4	11.45x2-1/2x1/4	11.45x2-1/2x1/4
Rear	11.45x2-1/2x1/4	11.45x2-1/2x1/4	11.45x2-1/2x1/4
Lining - Secondary -			
Length, width, thickness:			
Front.	12.92x2-1/2x1/4	12.92x2-1/2x1/4	12.92x2-1/2x1/4
Rear	12.92x2-1/2x1/4	12.92x2-1/2x1/4	12.92x2-1/2x1/4
Type	Moulded	Moulded	Moulded
Attached to shoes by	Rivets	Rivets	Rivets
Wheel cylinder bore -			
Front.	1-1/8"	1-1/8"	1-1/8"
Rear	1"	1"	1"

* 1/2" wide circumferential groove 1/8" deep full length.

TORQUE TIGHTNESS

Location	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Brake fluid line connections	Special	8	9
Hand brake cable clamps (at hacking plate)	5/16-24	10	13
Pedal clamp bolt	3/8-16	20	25
Front backing plate to knuckle	7/16-20	60	70
Brake backing plate to axle housing (except 86)	3/8-24	35	40
Brake backing plate to axle housing (54-86 Series)	7/16-20	55	60
Brake anchor pin nuts	Special	80	120

ENGINE MECHANICAL

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GENERAL DESCRIPTION

The engine used in all 1954 series Cadillacs is of the 90° overhead valve V-8 type. It has a bore of 3-13/16 inches and a stroke of 3-5/8 inches, giving a piston displacement of 331 cubic inches. The engine has a compression ratio of 8.25 to 1 and develops 230 horsepower at 4400 R.P.M. A side view of the engine is shown in Fig. 10-1.

The crankshaft is supported by five main bearing which use shell type, steel backed babbitt inserts. End thrust is taken by the rear main bearing. The six counterweights used are integral with the crankshaft. The engine is equipped with a harmonic balancer.

Connecting rods for opposite cylinders are carried side by side on the same crankpin. The shell type connecting rod bearings are made of steel backed aluminum.

ENGINE MECHANICAL

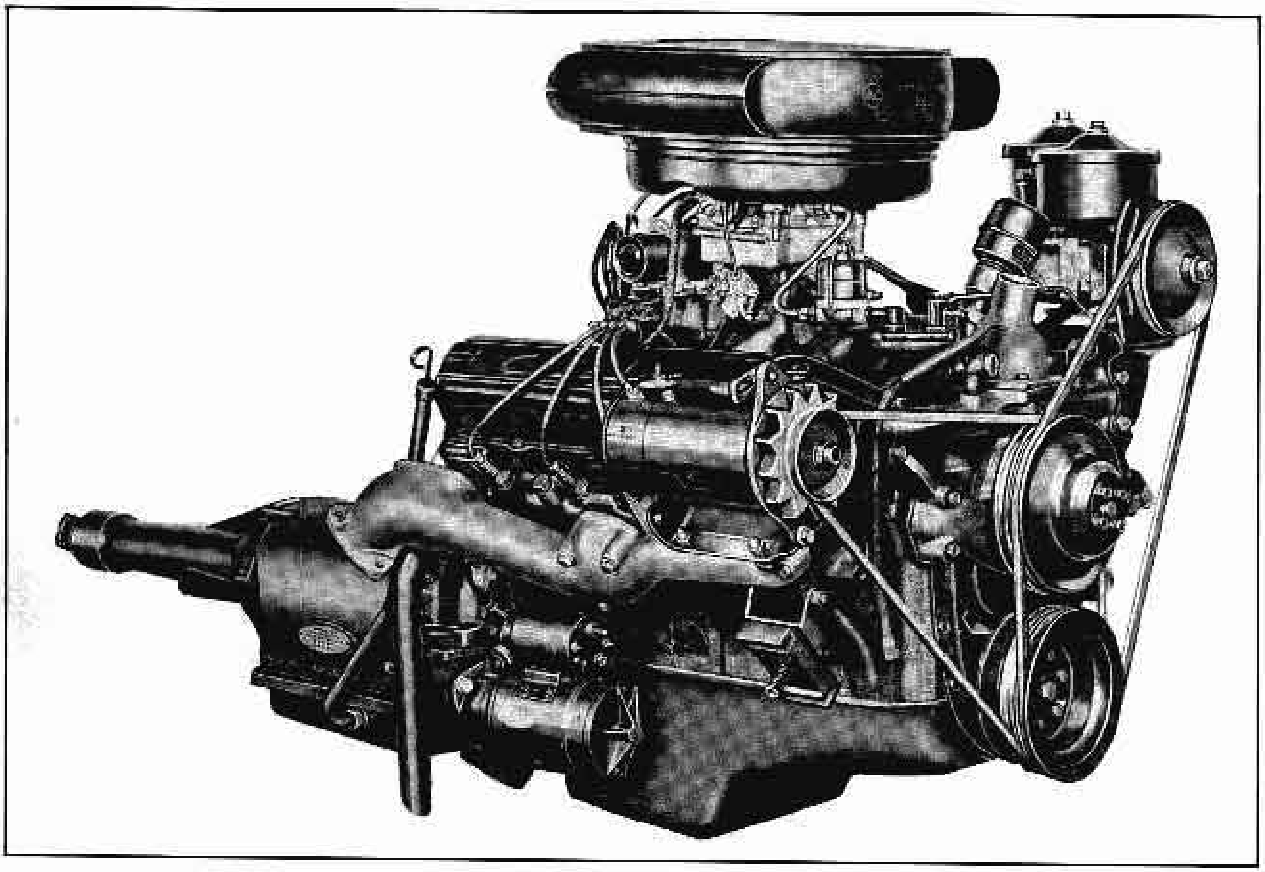


Fig. 10-1 Engine Side View

Cast aluminum pistons with a tin coating are used in the engine. The slipper type pistons are cut away at the skirt below the piston pin to allow for clearance between the crankshaft counterweights and piston skirt when the piston is at the bottom of its stroke.

The piston pins are press fitted into the connecting rods. Holes drilled from the piston skirt into the piston pin bores direct oil from the cylinder walls to the piston pin to assure adequate lubrication.

A chain driven camshaft is supported by five bearings. Wide camshaft lobes allow a minimum of lobe wear. Both the crankshaft and camshaft sprockets have a punched locating mark for correct valve timing when installing the timing chain.

The camshaft gear is cast as an integral part of the camshaft and meshes with the distributor drive gear which is an integral part of the distributor, Fig. 10-2. The distributor drive shaft, rotating in a COUNTERCLOCKWISE direction when viewed from above, drives the oil pump and vacuum pump. The vacuum pump is attached to the underside of the oil pump and is driven by a hexagonal drive shaft between the two pumps.

Hydraulic valve lifters are used to maintain zero clearance throughout the valve train. This arrangement assures quiet operation and eliminates the necessity for valve tappet adjustments. The lifters operate in guide holes drilled in the cylinder block. The valve lifter plunger and lifter body are in matched pairs. The push rods ride in cups in the lifters and extend up through openings in the cylinder block and cylinder head to the rocker arm. An engine cross section showing the valve operating mechanism is illustrated in Fig. 10-3.

ENGINE LUBRICATING SYSTEM -- The oil pump is mounted on the rear main bearing cap. Oil enters the pump through a screened intake, Fig. 10-4, which floats on the oil thereby drawing off only the cleaner surface oil.

Oil is forced by the pump through the main bearing cap to the vertical oil header which first feeds the rear main bearing, Fig. 10-4. The rear connecting rod journal is lubricated by oil from the rear main bearing through a drilled hole in the crankshaft.

The vertical oil header is intersected by the right longitudinal header, through which a portion of the oil is forced. The rest of the oil continues up the vertical header to a connecting header to the left longitudinal header. The upper end of the vertical header is plugged with a pipe plug.

From the connecting header oil flows through a hole to the rear camshaft bearing. The oil pressure signal switch is screwed into the upper end of this connecting header.

The longitudinal headers feed several important points as the oil flows from the rear to the front of the engine. One by-pass is upward through the cylinder block and cylinder head to the rocker arm shaft. Another by-pass is through drilled passages to the hydraulic lifters.

The center main bearing is lubricated by oil from the right longitudinal header through a hole drilled to the bearing. This oil also flows through drilled holes in the crankshaft to the two adjacent connecting rod journals and from the main bearing to the center camshaft bearing through a drilled hole in the block.

Oil which flows through the right longitudinal header through a drilled hole lubricates the front main bearing. The front camshaft bearing is lubricated by oil through a drilled hole from the main bearing to the camshaft. The front connecting rod journal is also lubricated through a drilled hole in the crankshaft.

The hydraulic valve lifter bodies on the left bank, the two intermediate main bearings, and all adjacent connecting rod bearings are lubricated by oil which flows through the left longitudinal header. The two intermediate camshaft bearings are lubricated through drilled holes from the intermediate main-bearings.

The oil pump drive shaft is lubricated by oil which flows through a drilled hole from the rear main bearing.

At the front end of the left longitudinal header is a vertical header that extends upward through the cylinder block and cylinder head to the left rocker arm shaft. The rocker shafts are plugged at both ends to prevent loss of oil pressure. There are two holes in the rocker shaft at each rocker arm. One hole is at the bottom of the shaft, intersecting a 45° groove which distributes the oil evenly under the loaded area of each rocker arm. The other hole is slightly mis-matched with an angular passage in the rocker arm. This misalignment acts as a metering device to prevent excess oil being supplied to the upper end of the rocker arm. This angular passage in the rocker arm intersects a vertical passage which lubricates the push rod seat and provides an exit for oil to the top surface of the rocker arm, where it flows slowly to the valve end of the arm and lubricates the valve tip at this point.

Oil from the cylinder heads drains back to the crankcase through either the front or rear holes in each cylinder head and matching holes in the block leading directly to the crankcase. Excess oil in the valve lifter compartment returns to the crankcase through a drilled hole at the rear of the compartment on the right side.

A drilled and tapped hole at the top of the left cylinder block near the oil filler housing intersects the header which lubricates the left rocker arms. Another drilled and tapped hole in the oil filler housing is provided for the oil filter outlet line. Oil from this line lubricates the fuel pump linkage and fuel pump eccentric.

CRANKCASE VENTILATION SYSTEM -- The crankcase ventilating system provides positive air circulation through the crankcase at road speeds. With the system, air enters the crankcase through the oil filler cap. This cap is fitted with a copper mesh air filter which filters the dust out of the air entering the crankcase, Fig. 10-5. Air is drawn down through the timing gear compartment into the crankcase at the crankshaft level. Air and any contaminating vapors then pass up into the valve lifter compartment through an opening in the rear of the cylinder block between the lower part of the crankcase and valve lifter compartment.

The air then circulates toward the front of the valve lifter compartment and is drawn out through the valve lifter compartment cover channel to the ventilating pipe at the rear of the cover. This pipe extends below the rear of the engine into the airstream which creates a vacuum, causing circulation of air through the crankcase.

SERVICE INFORMATION

(1) Torque Tightness

The proper torque tightness of the attaching bolts and screws of various engine parts is very important on all 1954 engines to avoid both overtightening and under-tightening with possible distortion and permanent injury of parts.

A torque wrench should always be used on the various engine bolts so that they can be accurately tightened according to the torque tightness specifications, which are given on page 10-36.

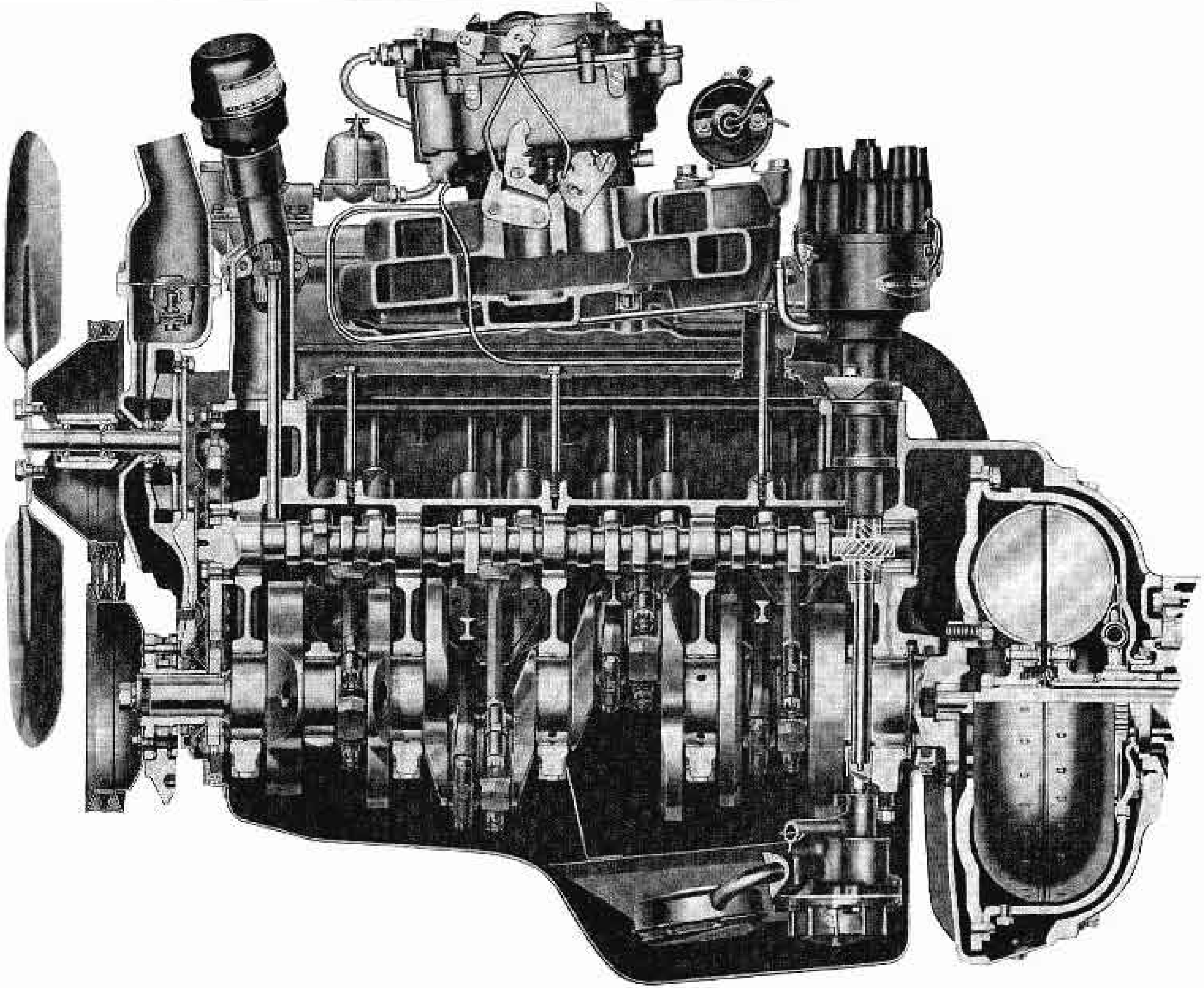


Fig. 10-2 Engine Longitudinal Section

ENGINE MECHANICAL

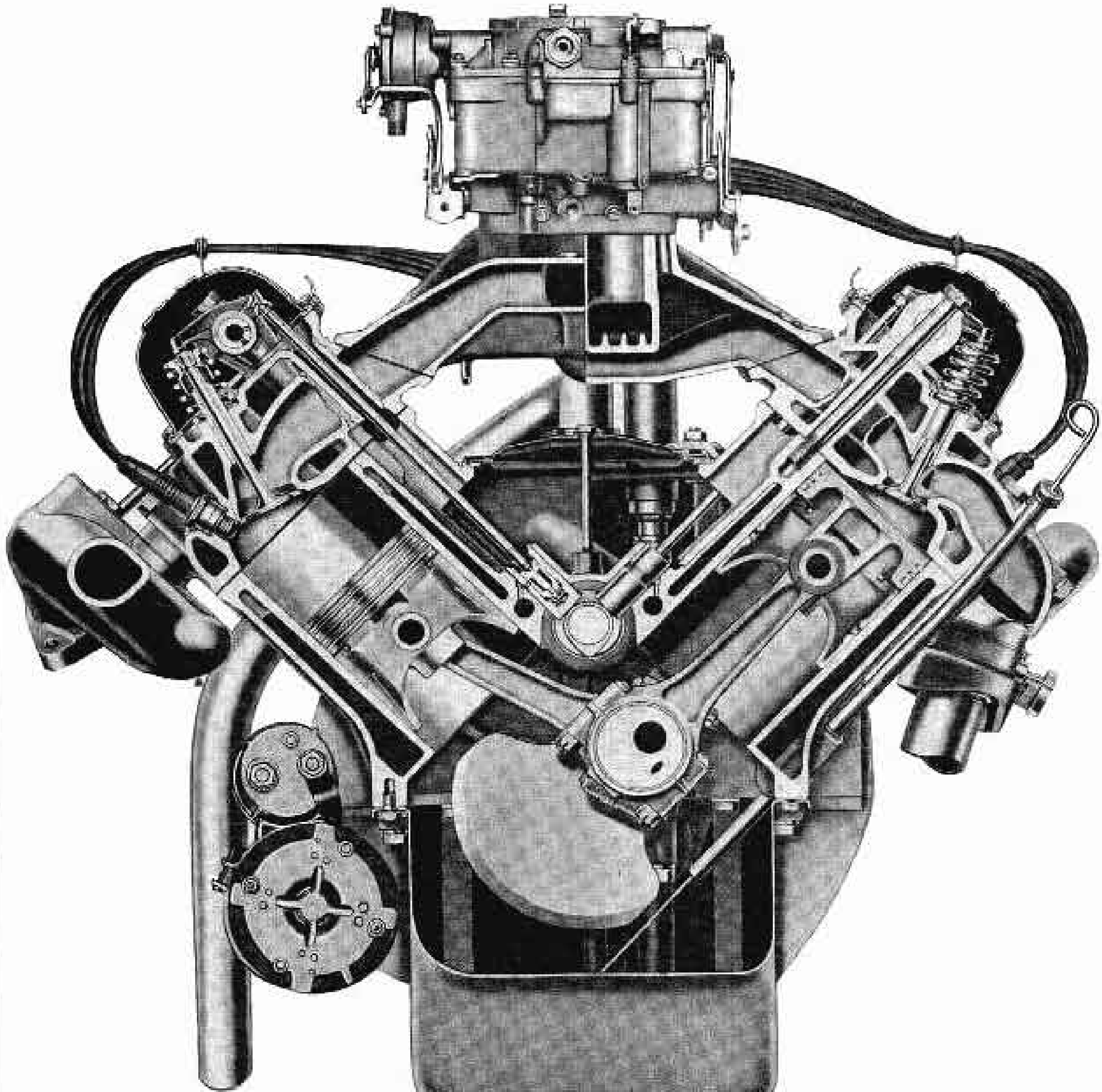


Fig. 10-3 Engine Transverse Section

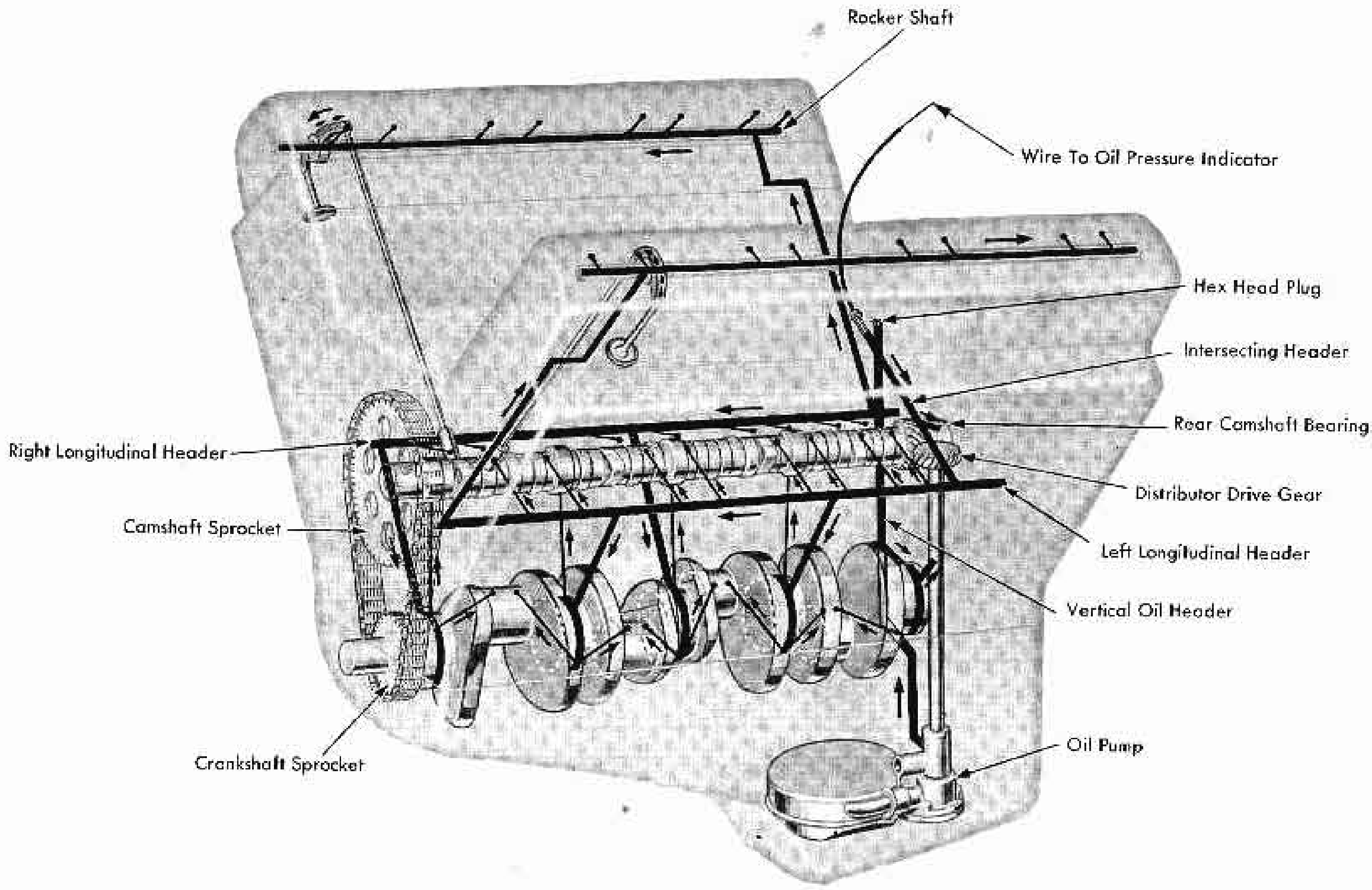


Fig. 10-4 Engine Lubricating System

(2) Cylinder Numbering

Cylinder numbering is by arrangement, rather than by firing order.

The left front cylinder is number one on all 1954 Series engines and the right front cylinder is number two.

The cylinders in the left block are odd numbered (1, 3, 5, and 7); those in the right block are even numbered (2, 4, 6, and 8).

The firing order is 1, 8, 4, 3, 6, 5, 7, 2.

(3) Removal of Cylinder Head

NOTE: Removal procedure will vary, depending on whether or not the car is equipped with Air Conditioning.

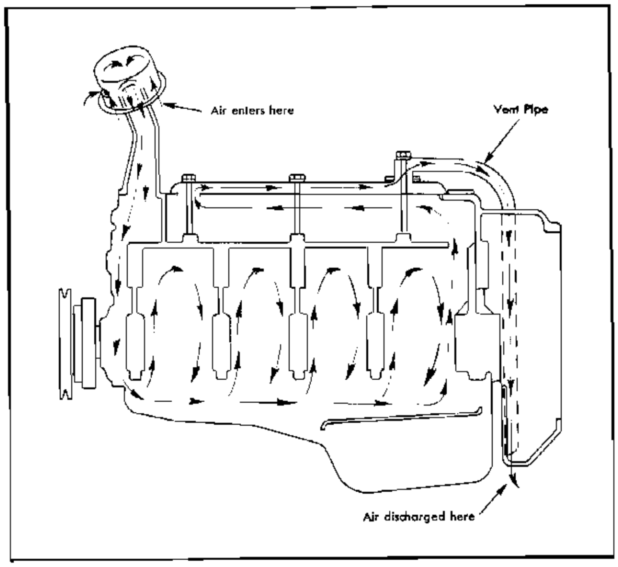


Fig. 10-5 Engine Ventilating System

1. When removing the right cylinder head, on cars equipped with Air Conditioning, remove compressor, mounting brackets, and refrigeration lines as described in Section 16a, Note 10.

2. Drain radiator.

3. Remove oil line from oil filter inlet to block and oil line from oil filter to oil filler housing if left cylinder head is to be removed.

4. Remove oil filter and power steering assembly with mounting brackets from cylinder head if left cylinder head is to be removed.

5. Remove two cap screws from water pump flange at cylinder head.

6. Remove generator if right cylinder head is to he removed.

7. Remove carburetor air cleaner.

8. Remove fuel line from carburetor to fuel pump.

9. Remove ground strap screw from rear of cylinder head at cowl.

10. If left cylinder head is to be removed, disconnect water temperature gauge wire. If right cylinder head is to be removed, remove windshield wiper pipe clamp.

11. Remove vacuum advance line from front of carburetor to vacuum advance on distributor.

12. Disconnect hose from intake manifold vacuum pipe.

13. Disconnect ignition coil high tension wire and primary wire at distributor.

14. Disconnect black resistor wire from porcelain resistor at coil.

15. On cars equipped with Hydro-Vac power brakes, disconnect vacuum hose from intake manifold pipe.

16. Disconnect transmission throttle rod at carburetor throttle lever.

17. Disconnect throttle control linkage at carburetor throttle lever.

18. Remove coil and secondary wiring mounting bracket, remove rocker arm cover screws, disconnect spark plug wires at plugs, and unsnap spring clips from sides of distributor cap.

19. Disconnect heater hose from water pump flange at thermostatic valve if right cylinder head is to be removed or at water pump flange if left cylinder head is to he removed.

20. Remove rocker arm covers, secondary wiring, and distributor cap as an assembly.

21. Remove four screws and four nuts which hold intake manifold to cylinder heads. Lifting manifold slightly upward and toward left of car to avoid fuel filter, remove manifold with carburetor and choke heater pipe.

22. Remove exhaust pipe to manifold screws.

23. Remove four cylinder head cap screws which hold rocker arm assembly to cylinder head and remove rocker arm assembly.

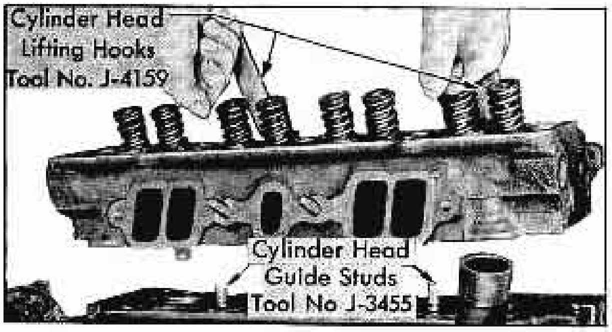


Fig. 10-6 Removing and Installing Cylinder Head

24. Remove push rods through openings in cylinder head.

25. Remove remaining cylinder head cap screws.

26. Remove first and third spark plugs from cylinder head and install Cylinder Head Lifting Hooks, Tool No. J-4159, in spark plug holes.

27. Lift cylinder head off dowels and remove from engine, Fig. 10-6.

(4) Disassembly of Cylinder Head Assembly

1. Remove spark plugs.

2. Place cylinder head (upside down) in cylinder Head Holding Stand, Tool No. J-3064.

3. Place Holding Strap, J-3064-6, over valve heads to hold them in place while compressing springs, and clamp in place on head with the thumb screw provided.

4. Invert head and place valve spring compressing bar over valve stem, Fig. 10-7.

5. Using foot stirrup, compress valve spring and remove valve keepers.

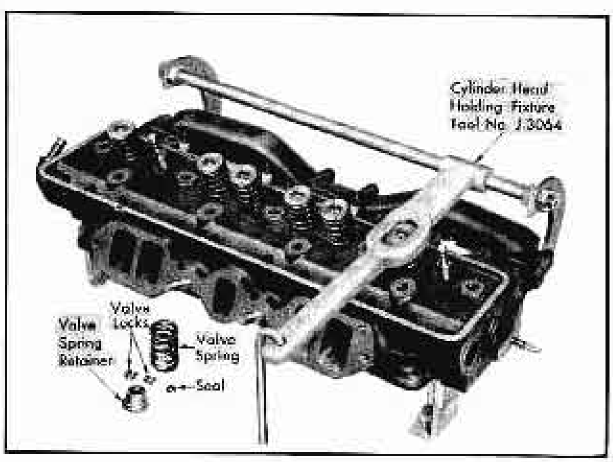


Fig. 10-7 Removing Valve Springs

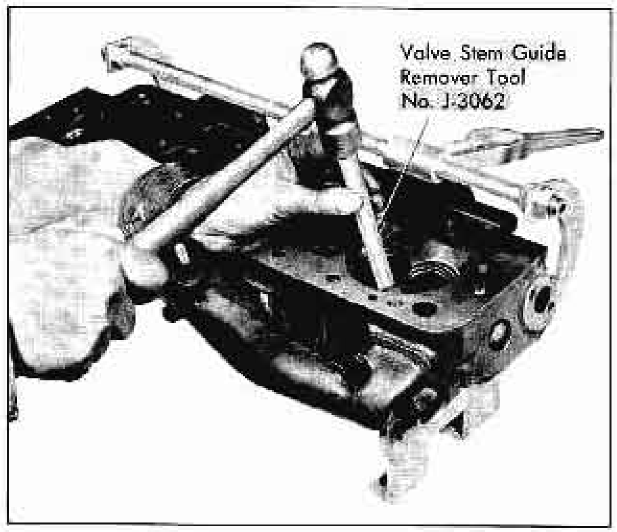


Fig. 10-8 Removing Valve Guides

6. Release bar and remove valve spring retainer, spring and rubber seal from lower groove in valve stem.

7. Invert head in stand, remove Holding Strap, and remove valves from head, being sure to keep them in order so that they can be reinstalled in the same position.

8. If it is necessary to remove valve guides because of excessive clearance between valve stem and valve guide as measured in Note 5, drive out valve guides from bottom side of cylinder head using Valve Stem Guide Remover, Tool No. J-3062, as shown in Fig. 10-8.

(5) Reconditioning Valves and Seats

Valve reconditioning, normally, is required much less frequently in engines having hydraulic valve silencers. When this work is done, the close limits given in the engine specifications, Page 10-34, must be maintained.

Check valve stem to guide clearance, using a 1/16" wide strip of .005" brass shim stock on a "no-go" basis. Bend the end of shim and hang in end of valve guide, with tab extended toward push rod side of head.

Shim should not extend more than 1/4" into guide. If valve stem will enter guide, clearance is excessive and guide and valve should be replaced to prevent excessive oil consumption and improper seating of valves.

Check concentricty of all valve seats. This should be within .004" total, as measured with dial indicator and a solid, slightly tapered, pilot which has a slight bind in the valve guide when installed.

ENGINE MECHANICAL

CAUTION: A pilot of the correct size must be used. Do not attempt to drive pilot into guide. Pilots with adjustable diameters to fit various sized guides are not recommended.

Grind valves to within .001" indicator reading, if concentricity, seat width, or full contact is not indicated or when new valves and guides have been installed.

Check seat width and location on valve to insure proper heat dissipation and prevent build-up of carbon on seats. The desirable seat width depends a great deal upon conditions of operation. Cars operated at moderate or slow speeds in city driving should have a valve seat width of 3/64" to 1/16". For cars driven a great deal at high speeds, the seat width should be 1/16" to 3/32" to insure adequate cooling.

Valve seats should be cut so that there is no more than 1/32" from outer edge of seat to edge of flange on valve head, to allow heat to escape and to provide maximum life for newly ground valves.

New valve heads have a seat angle of 44°, to provide a hair line contact between the head of the valve and the valve seat in the cylinder head which assures good seating of the valve and less chance of burning the valve head due to exhaust gas leakage. Servicemen may, however, reface valves at a 45° angle.

New valves, when lapped in should not have more than 1/64 inch contact (due to 1° difference in angle). Grinding of valves by hand with a grinding compound is not recommended. Use only precision equipment for valves and seat reconditioning, and follow equipment manufacturer's recommendations.

(6) Assembly of Cylinder Head

a. Installation of Valve Guides

1. Position Valve Stem Guide Installer, Tool No. J-3066, through plate and slide Valve Guide Adapter, Tool No. J-3066-4, on installer pilot, Fig. 10-9.

2. Slide valve guide on installer pilot and lubricate outer surface of guide.

CAUTION: Be sure end of valve guide with longest chamfer enters bore first, pointing toward rocker arm side of head.

3. Drive guide into head until shoulder on installer contacts plate on cylinder head. The flat side of the Valve Guide plate rests on the cylinder head, while the notched portion, which acts as a stop for the driving tool, is toward the top.

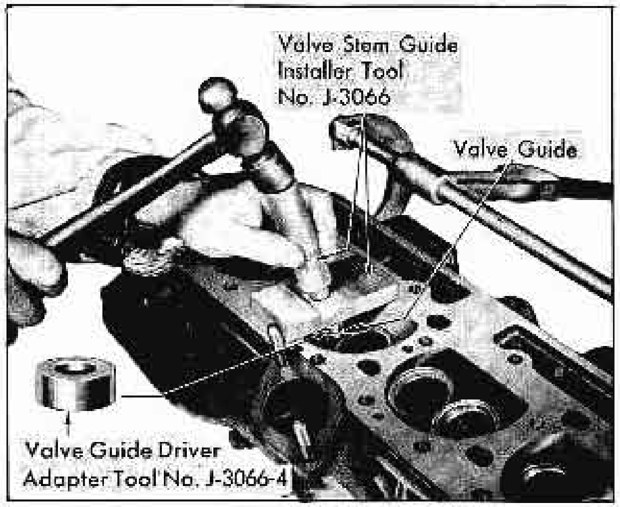


Fig. 10-9 Installing Valve Guides

b. Installation of Valves

1. Install all valves in their respective guides and install Holding Strap, J-3064-6, over valve heads to hold them in place when installing springs.

2. Place cylinder head in Holding Fixture, right side up.

3. Place spring over valve, being sure bottom of spring is in recess in head.

4. Place spring retainer over valve and spring.

5. Place the "thimble" over the valve stem with the tapered portion seated in the valve spring retainer.

6. Using the stirrup, compress the valve spring and then remove the "thimble."

7. Install new rubber seal in lower groove in valve stem (closest to valve head), being sure seal is properly seated.

8. Install valve keepers in position and release tension on foot stirrup.

NOTE: Check to see if oil seal has been installed properly by striking ends of valve stems to seat valve keepers. Compress a suction cup over the spring retainer and valve stem to test for leakage past the seal. If the oil seal is installed properly, the vacuum cup will stick to the spring retainer. If there is no suction, it is an indication of a leaking seal, and the parts must be disassembled and a new seal installed.

9. Install all other valve springs in a like manner.

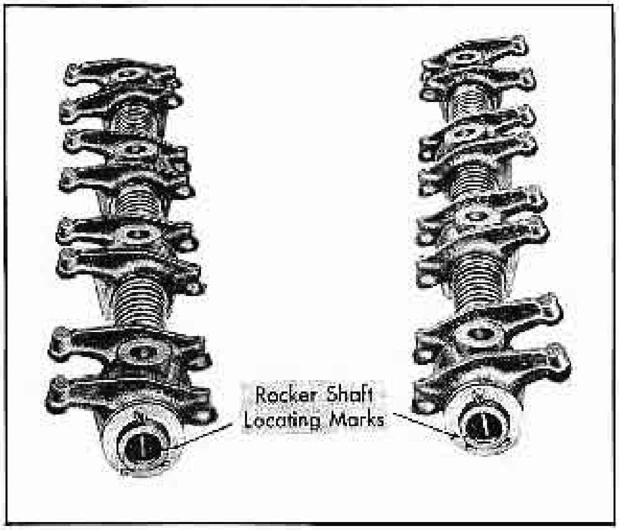


Fig. 10-10 Rocker Arm Locating Marks

c. Installation of Spark Plugs

1. Install spark plugs and copper gaskets in cylinder head.

2. Tighten plugs to 20-25 foot pounds torque.

(7) Installation of Cylinder Head

1. If exhaust manifold was removed from cylinder head, install new gaskets and install manifold cap screws. Tighten screws to 25-30 foot pounds torque.

2. Apply a coat of Cadillac Perfect Seal Gasket Paste to both sides of cylinder head gasket.

   CAUTION: Extreme care must be used when installing cylinder head gaskets to assure freedom from dirt particles between the gasket and the cylinder block or head. Any foreign material may cause water or compression leaks. Blow out cylinder head passages and wipe machined surfaces of cylinder head and block clean.

3. Install Cylinder Head Guide Studs, Tool No. J-3455, (Fig. 10-6), in cylinder head bolt holes at each end of block.

4. Install gasket over studs and dowels in block with side stamped "TOP" facing upward.

5. Using Cylinder Head Lifter Tool No. J-4159, install cylinder head in position over guide studs and dowels.

6. Remove Guide Studs using removing tool provided with set.

7. Install cylinder head cap screws in lower and center rows and tighten finger tight.

8. Install push rods through openings in cylinder head with double grooved end of push rod up.

   CAUTION: Bottoms of push rods must be seated in hydraulic valve lifter cups.

9. Install rocker arm assembly in position on cylinder head with notches on each end of rocker arm shaft pointing downward and toward center of engine, Fig. 10-10, and rocker arm brackets with larger machined surface next to head.

10. Tighten all cylinder head cap screws to 65-70 foot pounds torque, starting from center row and working outward and toward each end. Do not install oil filter bracket cap screw.

11. Install exhaust pipe to manifold, using new gasket. Tighten screws to 15-20 foot pounds torque for right side and 30-35 foot pounds torque for left side.

12. Install intake manifold gaskets in position over locating dowels.

13. Install intake manifold and carburetor, avoiding fuel filter, and being sure manifold is positioned correctly over locating dowels.

    NOTE: When installing intake manifold, be sure choke heater pipe enters hole in heater stove in exhaust manifold before intake manifold is all the way down in position.

14. Install four cap screws and four nuts and washers which hold intake manifold to cylinder heads, placing windshield wiper vacuum pipe clamp between screws and manifold. Tighten all screws to 25-30 foot pounds torque.

15. Connect windshield wiper hose to vacuum line from intake manifold.

16. Connect throttle control linkage to carburetor throttle lever and adjust as explained in Section 13 Note 4.

17. Connect transmission throttle rod to carburetor throttle lever.

18. Install rocker arm covers, secondary wiring and distributor cap assembly.

19. Install spark plugs that have been removed.

20. Install coil and secondary wiring mounting bracket, install rocker arm cover screws, connect spark plug wires to spark plugs, and install distributor cap.

21. Connect heater hose at thermostatic valve if right cylinder head was removed or at water pump flange if left cylinder head was removed.

22. On cars equipped with Hydro-Vac power brakes, connect vacuum line to intake manifold pipe.

23. Connect black resistor wire from porcelain resistor to coil.

24. Connect ignition coil high tension wire and primary wire to distributor.

25. Install vacuum advance line from front of carburetor to vacuum advance on distributor.

26. If left cylinder head was removed, connect water temperature gauge wire, if right cylinder head was removed, install windshield wiper vacuum pipe clamp.

27. Connect ground strap at rear of cylinder head to cowl with screw.

28. Install fuel line between carburetor and fuel filter.

29. Install generator as described in Section 11, Note 21, if right cylinder head was removed. Adjust fan belt tension as described in Section 11, Note 21.

30. Install two cap screws through water pump flange and new gasket to cylinder head.

31. Install carburetor air cleaner.

32. Install oil filter and power steering assembly on cylinder head with remaining cap screw. Tighten to 65-70 foot pounds torque.

33. Install oil line from oil filter outlet to oil filler housing and oil line from block to oil filter inlet.

34. Fill cooling system and add a can of "Du Pont Sealer" if permanent type anti-freeze is to be used. Check for leaks after running engine ten minutes.

35. On cars equipped with Air Conditioning, install the compressor, brackets and refrigeration lines as described in Section 16a, Note 13, if right cylinder head was removed.

(8) Noisy Operation of Valve Lifters

Noisy operation of valve lifters may be due to:

1. Incorrect oil level in crankcase - Oil level should never be above, nor more than a quart below, "full" mark on indicator. If level is too high, foaming may result. If too low, air may enter pump inlet. In either case, noisy valve action may result.

2. Improper oil pressure-If valve action is noisy after the oil is hot, it may be due to low oil pressure.

Low pressure usually results from a leak in the oiling system, a stuck or improperly operating oil pressure relief valve, scored parts, worn bearings, worn oil pump gears, or poor operation of oil pump.

3. Weak valve lifters springs - These can cause noisy valve operation by causing sluggish plunger movement in the cylinder. To check these springs, disassemble plunger assembly, clean thoroughly and reassemble. Check pressure to compress spring dry.

If pressure required to compress spring .35 inch is less than 6-1/2 pounds, the assembly should be replaced.

4. Dirty, worn, or scored valve lifter parts - A recurring tap or click, synchronized with valve action, indicates trouble in a single lifter assembly, which should be disassembled and checked for:

a. Dirt or foreign particles, which can be removed after disassembly by wiping with a soft cloth and washing in kerosene.

b. Varnish or heavy sludge material, which can be removed by the use of a proper solvent.

NOTE: The engine oil pan should always be removed and cleaned when dirt has been responsible for sticking. The oil passages from the header to the lifter bores should also be cleaned thoroughly by blowing out with kerosene and air.

b. Pitting and scoring of surfaces, which may result from gritty particles, excessive wear, poor grade oil, or damage during installation. This condition requires replacement of the complete unit.

c. Incorrect clearance between cylinder and plunger, usually caused by mismating of parts. These parts are carefully fitted in manufacture and are not interchangeable, Fig. 10-11.

5. Lifters that do not turn in their bores. Scoring surface flakings or excessive wear on the bottom of the lifter may prevent the lifters from turning in their bores.

6. Excessive wear on either end of rocker arm or at rocker shaft.

ENGINE MECHANICAL

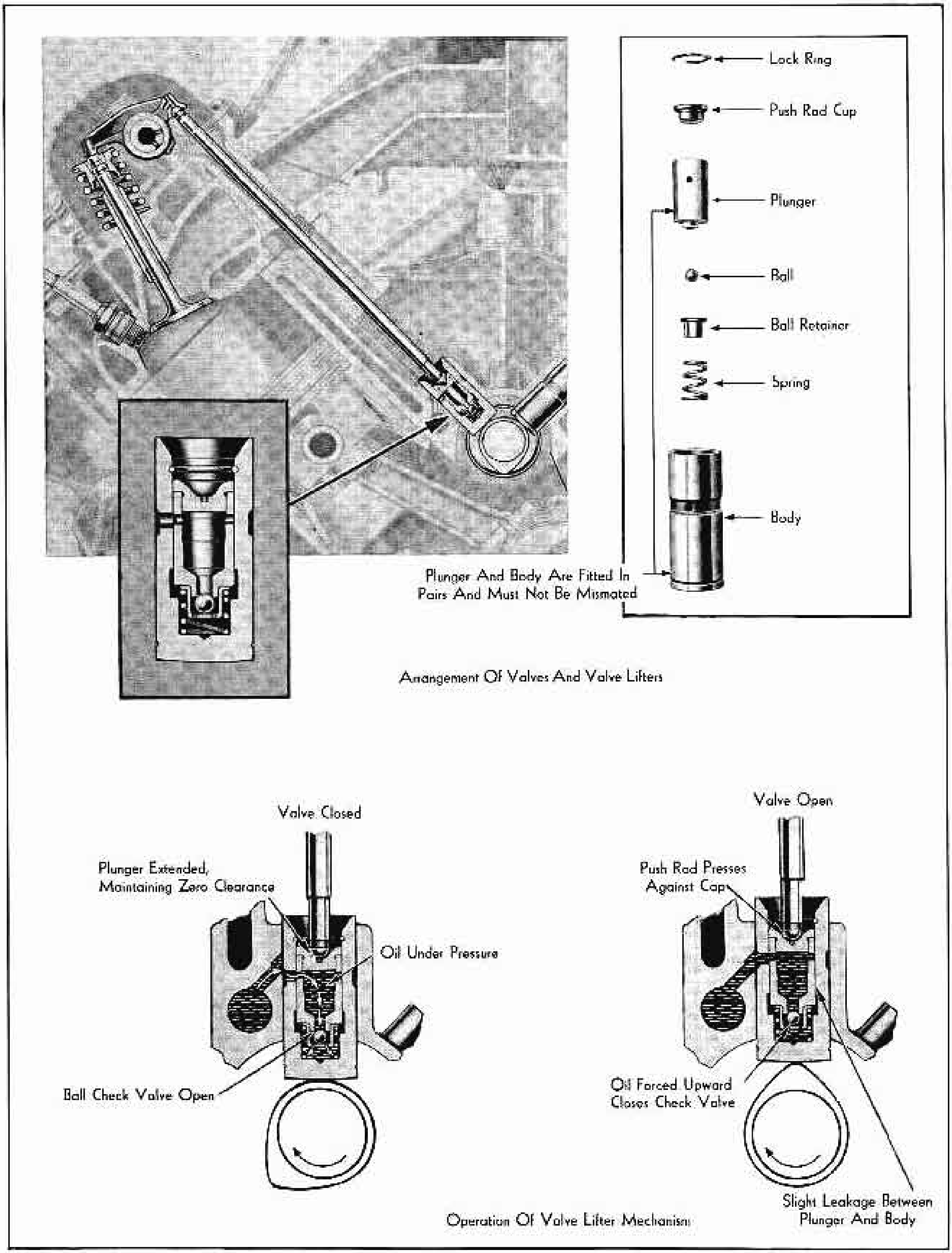


Fig. 10-11 Valve Lifter Mechanism

7. Worn valve stems or push rods.

8. Worn camshaft lobes.

(9) Checking Valve Lifter Leak Down Rate

The Valve Lifter Leak Down Rate Tester, Tool No. J-3074, is used to obtain a comparison of the leak down rates of hydraulic valve lifters without removing them from the engine. This tool employs a simple principle whereby a feeler gauge of a given thickness is placed between the rocker arm and the valve stem, thus causing the valve spring pressure to force oil out of the lifter. To bring more uniformity to this test of leak down, a spring, attached to the tool and compressed against the valve spring retainer, ejects the feeler gauge when the lifter has leaked down enough to allow the valve to seat, thereby removing valve spring pressure from the feeler gauge. By noting the length of time required by each lifter to leak down the thickness of the feeler gauge, the faulty lifter or lifters can be easily located.

The following procedure is to be used when checking with this tool:

1. Remove heater hoses from clips on rocker arm covers.

2. If car is equipped with Hydro-Vac power brakes, disconnect vacuum hose at intake manifold.

3. If car is equipped with Air Conditioning, remove rear bracket and loosen generator.

4. Remove black resistor wire from porcelain resistor at coil.

5. Remove distributor cap, coil, and rocker arm covers as an assembly.

6. Set timing mark "C" on harmonic balancer to pointer and observe position of distributor rotor. Check each lifter as outlined in the following table:

Rotor at No. 1 firing position (pointing toward rear of engine) Check:

1 Intake	5 Intake
1 Exhaust	6 Intake
2 Intake	6 Exhaust
2 Exhaust	7 Intake
3 Exhaust	8 Intake
4 Exhaust	8 Exhaust

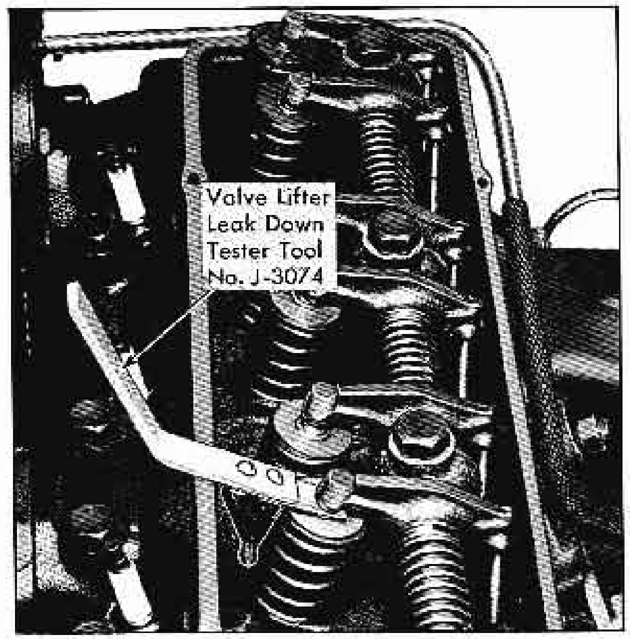


Fig. 10-12 Checking Valve Lifter Leak Down

Rotor at No. 6 firing position (pointing toward front of engine) Check:

3 Intake	5 Exhaust
4 Intake	7 Exhaust

9. Insert feeler gauge of tool between valve stem and rocker arm and at the same time compress tool "pop-out" spring against valve spring retainer, Fig. 10-12.

NOTE: The tool should be installed as quickly as possible to eliminate any unnecessary lifter leak down.

10. Note the interval of time during which the tool is held in place by valve spring pressure.

It will be found through this test that the noisy lifter or lifters will have the shortest leak down time.

(10) Removal of Valve Lifters

1. Remove heater hoses from clips on rocker arm covers.

2. Remove rocker arm covers as described in Note 3, Steps 1-4, 6, 7.

3. Remove intake manifold as described in Note 3, Steps 6-21.

4. Remove three valve compartment cover screws.

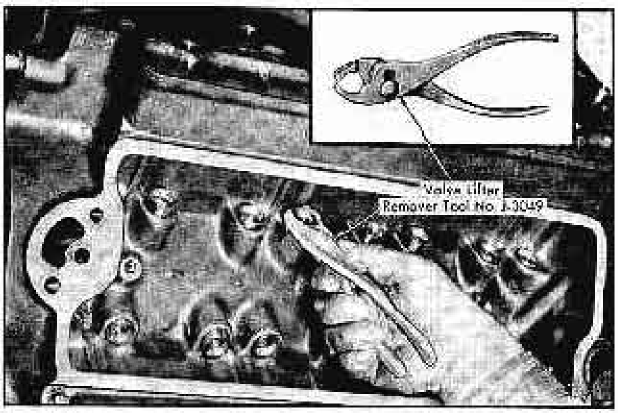


Fig. 10-13 Removing Valve Lifters

5. Loosen engine ventilator pipe clamp screw at flywheel housing, remove long ventilator pipe screw at valve compartment cover and remove cover.

6. Remove rocker arm assemblies as explained in Note 3, Step 23.

NOTE: When only one or two lifters are to be removed, it is not necessary to remove the complete rocker arm assembly. Compress the valve spring, slide the rocker arm over and remove the push rod.

7. Remove push rods.

8. Using Valve Lifter Remover, Tool No. J-3049, remove lifters from engine (Fig. 10-13), keeping them in order so they can be reinstalled in the same bore from which they were removed.

NOTE: Rotate the lifter back and forth while lifting to remove any varnish from the base of the lifter.

(11) Disassembly and Assembly of Valve Lifters

a. Disassembly

1. Press down on center of valve lifter push rod cup.

2. Using a pointed tool, remove lock wire from groove while holding cup down.

3. Invert lifter and slide out push rod cup, plunger, ball retainer and spring.

NOTE: If plunger is stuck in lifter body, place lifter, push rod end down, in Valve Lifter Plunger Remover, Tool No. J-4160, Fig. 10-14. Holding tool firmly in hand with thumb over lifter body, strike tool sharply on block of wood or wooden bench until plunger falls out of body.

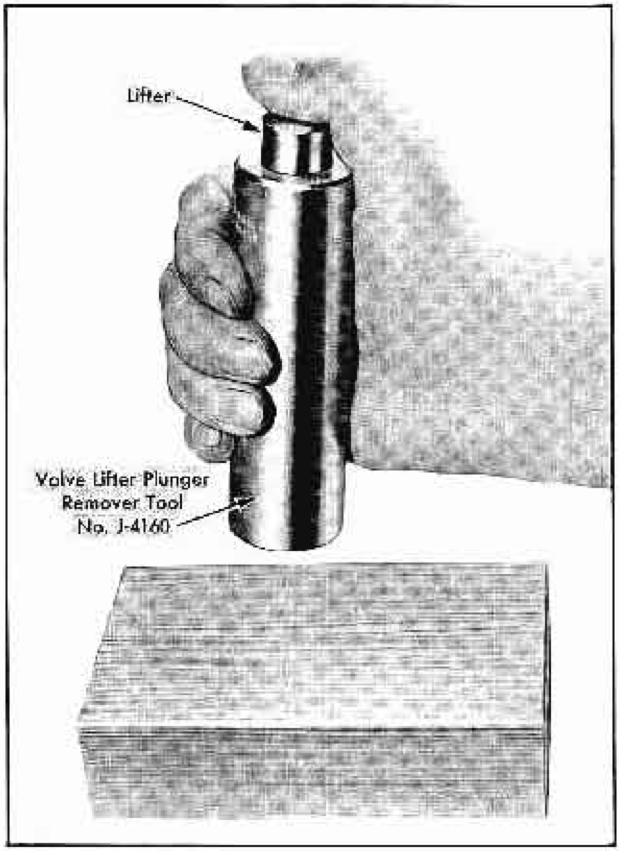


Fig. 10-14 Removing Stuck Plungers From Body

b. Assembly

1. Place ball on its seat in lower end of plunger while holding plunger up-side down.

2. Position ball retainer and spring over ball and end of plunger.

3. Lower lifter body over plunger assembly.

4. Turn assembly right side up and fill plunger with clean engine oil.

5. Jiggle ball with small piece of wire until oil drains out of plunger into body and trapped air is released from body.

6. Refill plunger with oil, place push rod cup on plunger, and position lock wire over cup.

7. Press lock wire into groove with Valve Lifter Lock Wire Installer, Tool No. J-2730, Fig. 10-15.

(12) Installation of Valve Lifters

1. Install lifters in cylinder block in same bores from which they were removed.

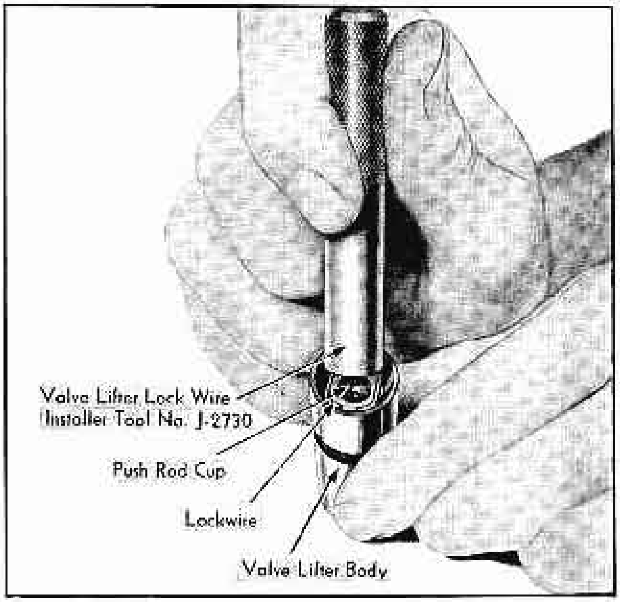


Fig. 10-15 Installing Valve Lifter Lock Wire

2. Install push rods through openings in cylinder head, with double grooved end of push rod at top, and bottom end in push rod cup.

3. Install rocker arm assemblies on cylinder heads, being sure rocker arms are correctly seated over push rods and push rods are correctly seated in their lifter cups.

CAUTION: Be sure all rocker shaft brackets are right side up, or the rocker shaft may be sprung out of alignment when the cap screws are tightened down.

4. Tighten rocker shaft screws to 65-70 foot pounds torque and recheck torque of all cylinder head cap screws which should also be tightened to 65-70 foot pounds.

5. Install valve lifter compartment cover and install front and center screws.

6. Place engine ventilator pipe over opening in valve cover, being sure cork gasket on pipe is in position, install long screw and tighten clamp screw at flywheel housing.

7. Tighten all valve compartment cover screws.

8. Tighten ventilator pipe bracket bolt at flywheel housing to 15-18 foot pounds torque.

9. Install intake manifold as described in Note 7, Step 12-17.

10. Install rocker arm cover assembly as described in Note 7, Steps 18, 20.

11. Connect black resistor wire from porcelain resistor at coil.

12. Replace heater hoses in rocker arm cover clips.

13. If car is equipped with Hydro-Vac power brakes, connect vacuum line at intake manifold.

(13) Vacuum Pump Test

1. Make sure windshield wipers operate satisfactorily with all lines connected.

NOTE: Wiper action should be checked on a wet windshield.

2. Disconnect vacuum pump hose leading from crankcase at check valve on cowl.

3. Connect vacuum gage to vacuum pump hose and start engine. If the vacuum pump is operating properly, the vacuum gage will show a minimum of 20 inches of mercury at sea level at 3600 R.P.M. engine speed.

4. If the vacuum gage does not show this reading the vacuum pump is defective or there is a leak in the vacuum lines.

5. If the vacuum does not increase after tightening vacuum connections, replace vacuum pump as explained in Note 16.

(14) Removal and Installation of Engine Oil Pan

a. Removal

1. Remove oil level indicator.

2. Remove starter motor assembly and place on frame side bar.

3. Remove idler arm support screws and lower support from frame side bar.

4. Remove oil pan screws and nuts which hold pan to cylinder block, and remove oil pan.

5. Remove gaskets from sides of pan, rear main bearing cap, and front cover.

b. Installation

1. Install new cork seals in rear main bearing cap and in front cover, being sure ends of gaskets are in the recess provided for them.

2. Cement pan gaskets to both sides of pan, being sure holes in gasket line up with holes in pan.

3. Place a small amount of chassis grease on each of the four corners of the pan gasket which hang over the front and rear cutouts, which will permit the pan gasket to slide over the corks and insure a good seal.

4. Place pan in position on bottom surface of cylinder block over the four studs, and install nuts and washers loosely.

5. Install remaining 16 screws and tighten screws and nuts in rotation, to 7 to 10 ft. lbs. torque.

6. Install idler arm support in position on frame side bar and install screws.

7. Install starter assembly.

8. Install oil level indicator.

(15) Removal and Disassembly of Vacuum Pump

a. Removal

1. Drain engine oil and remove oil pan, Note 14.

2. Remove oil pan baffle.

3. Disconnect vacuum line at engine block.

4. Remove six screws that hold vacuum pump to oil pump and remove vacuum pump with the oil pump idler gear.

WARNING: The oil pump idler gear may fall out when the vacuum pump is removed.

5. Remove hexagonal drive shaft.

6. Remove vacuum line from vacuum pump.

b. Disassembly

1. Remove two screws that hold plate to vacuum pump and remove plate from dowels.

2. Turn pump open side downward and shake out rotor assembly into hand.

3. Remove vanes and spring from rotor.

(16) Inspection, Assembly, and Installation of Vacuum Pump

a. Inspection

1. Inspect inside of pump body for excessive scoring.

2. Inspect cover plate as explained in Note 18, Step 6.

b. Assembly

CAUTION: Parts must be free from foreign matter before installation. Foreign particles caught between the rotor and pump body may cause the shaft to break.

1. Install spring and vanes in rotor.

2. Compress vanes and install rotor in pump body.

3. Position plate on doweled pump body so that hole in plate lines up with hexagonal hole in rotor.

4. Install two screws in cover plate.

c. Installation

1. Install vacuum line to vacuum pump.

2. Replace hexagonal drive shaft in vacuum pump.

3. Replace idler gear in oil pump and install vacuum pump below oil pump with six screws.

4. Connect vacuum line to engine block.

5. Install oil pan baffle.

6. Install oil pan.

(17) Removal and Disassembly of Oil Pump

NOTE: Oil pump should not be removed unless absolutely necessary because installation requires removal of the distributor to properly align the oil pump.

a. Removal

1. Drain engine oil and remove oil pan.

2. Remove oil pan baffle.

3. Disconnect vacuum line at engine block.

4. Remove two nuts holding oil pump to rear main bearing cap and remove oil pump, vacuum pump, oil float and screen assembly.

CAUTION: After removing the oil pump, the oil pump drive shaft is loose and free to drop out and should be removed.

b. Disassembly

1. Remove cotter pin holding oil float to pump and remove float.

2. Remove cotter pin holding oil pressure regulator valve and spring in body, and remove valve and spring.

CAUTION: Be careful not to lose retainer when removing cotter pin.

3. Remove six screws holding vacuum pump to oil pump and remove vacuum pump with vacuum line.

4. Slide idler gear off idler shaft in pump.

5. Remove pin from collar on end of drive shaft and press collar off shaft.

6. Slide oil pan drive gear out of pump body.

(18) Inspection, Assembly, and Installation of Oil Pump

a. Inspection

1. Inspect strainer screen for dirt and clean thoroughly.

2. Inspect float for leaks.

3. Inspect oil pressure regulator valve for nicks, and burrs which might cause leaks or binding in pump body.

4. Check free length of spring which should be approximately 2-25/64 inches. Compressed to 1-13/32 inches, pressure should be 5-3/4 to 6-1/4 pounds.

5. Inspect drive gear and idler gear for nicks and burrs.

6. Inspect vacuum pump cover plate for wear and dress down on surface plate.

b. Assembly

1. Install oil pump drive gear in oil pump body.

2. Press collar on end of shaft and install lock pin.

3. Slide idler gear into pump body, meshing gear with drive gear.

4. Place vacuum pump assembly with hexagonal drive shaft under oil pump and install six screws.

5. Slide oil pressure regulator valve into pump body.

6. Compress assembly and install cotter pin.

7. Slide oil pump strainer into opening in pump body and install locking pin.

CAUTION: Be sure strainer is installed so that screen is facing cover of oil pump.

c. Installation

1. Install oil pump assembly over studs, guiding vacuum line into fitting in engine block.

2. Install two nuts and lock washers and tighten to 25-30 foot pounds torque.

3. Install oil pan as explained in Note 14.

(19) Removal of Connecting Rods and Pistons

Connecting rod and piston assemblies are removed from above on all 1954 series engines. Connecting rod caps are removed by removing the self locking connecting rod nuts and sliding the caps down off the connecting rod bolts, Fig. 10-16. Install Connecting Rod Guide Studs, Tool No. J-3224, on connecting rod bolts to guide rod out of

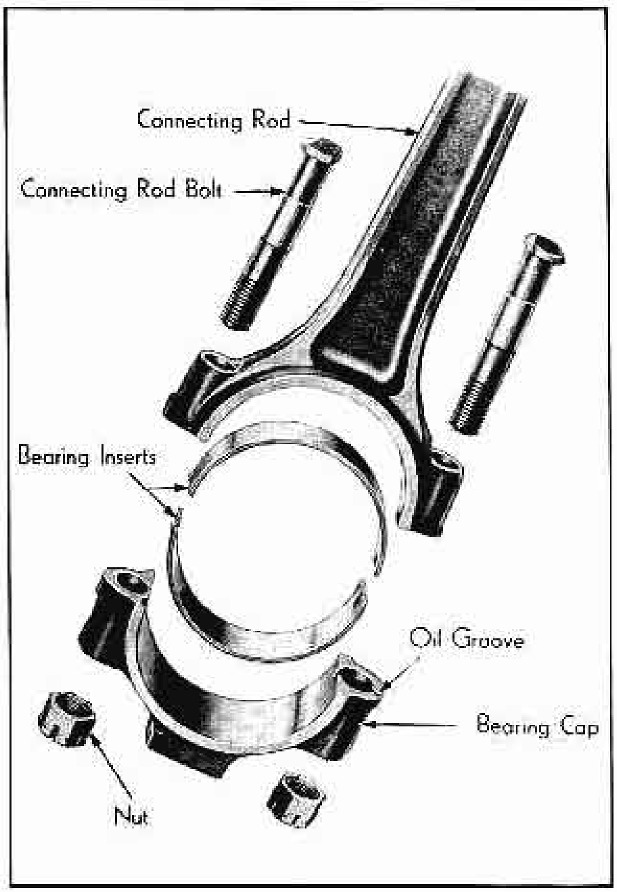


Fig. 10-16 Connecting Rod and Bearing Assembly

bore without nicking or scratching bore. Clean out carbon from top of cylinder bore and ream ridges if necessary to prevent breakage of piston ring lands. Push the connecting rod and piston assembly up until the piston rings are out of the bore and remove piston and connecting rod assembly from the engine.

CAUTION: Do not nick lower edge of bore when pushing rod up.

(20) Replacement of Connecting Rod Bearings

Connecting rod bearings are of the steel-backed aluminum shell type. Bearings worn beyond .0045 inch can be replaced without removing the rod assembly by removing the cap and replacing upper and lower halves. The clearance between the connecting rod bearing and the crankshaft can be measured by the use of a "Plastigauge," as follows:

1. Remove bearing cap and wipe oil from crankshaft journal and bearing insert.

2. With crank pin at approximately bottom dead center, place a piece of Plastigauge in the center of cap.

3. Reinstall bearing cap. Tighten to 40-45 foot pounds torque.

4. 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. 10-17. If this clearance is greater than .0045 inch, replace the bearing.

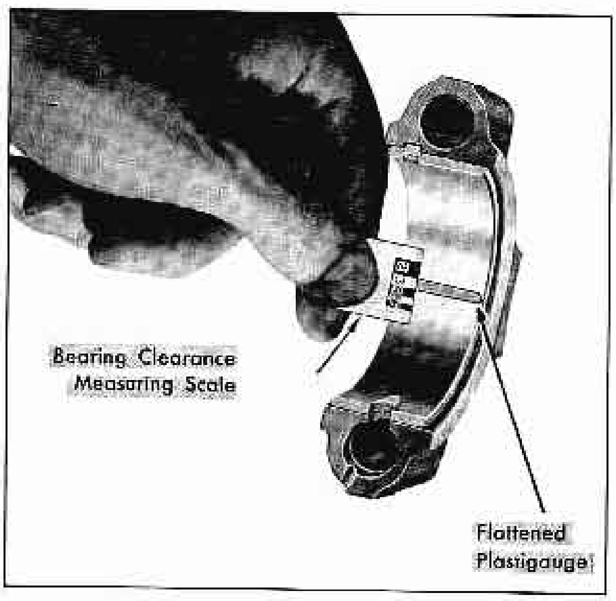


Fig. 10-17 Checking Bearing Clearance

(21) Replacement of Main Bearings

Shell type main bearings of steel-backed aluminum are used. The front four bearings are interchangeable journal to journal, and upper and lower halves are also interchangeable. Crankshaft end thrust is taken by the rear main bearing. Bearings worn more than .005 inch should be replaced. Bearing wear can best be measured by use of the Plastiguage, as explained in Note 20. When one main bearing is being checked, the other four caps should be tight, unless the engine is upside down.

To replace the main bearing:

1. Remove cap and take out worn shell.

NOTE: Each bearing cap is numbered on the left side starting from the front. Do not mismatch these caps or turn them around because they are individually matched when the cylinder block is machined. Casting numbers on the caps are read from the rear of engine.

2. Rotate crankshaft in clockwise direction to turn upper shell out of crankcase, using a flattened cotter pin in the oil passage hole in the shaft to contact the shell and force it out.

3. Place new upper half of main bearing on crankshaft journal, with locating lug in correct position, and rotate shaft to turn it into place with cotter pin.

4. Remove cotter pin, install lower half of main bearing in cap and install cap.

CAUTION: Always clean crankcase thoroughly before installing new main or connecting rod bearings.

(22) Replacement of Piston Rings

Each piston has two compression rings and one oil ring. The top compression ring is made of chrome plated rolled steel. The other two rings are cast iron.

The chamfered face of the compression ring should be installed toward the top of the piston.

When replacing piston rings, install the re-ring sets that have the chrome top compression ring and expanders behind the oil ring. If the re-ring set is to be installed in new or low mileage bores, it is not necessary to install the oil ring expander, Fig. 10-18.

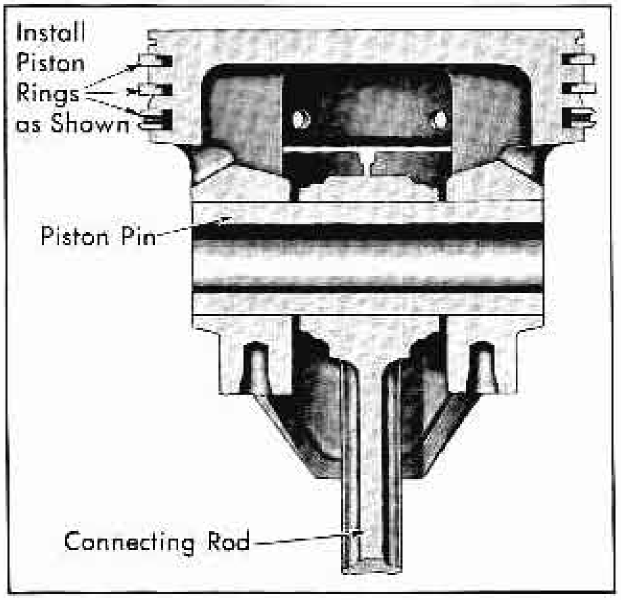


Fig. 10-18 Piston Cross Section

1. Place ring in area of cylinder where piston ring will travel. Be sure ring is square with cylinder bore.

2. Gap between ring ends should be .010" - .020".

3. With ring on piston, clearance between top face of piston ring and ring land should be .0017"-.0035".

(23) Removal and Installation of Piston Pins

a. Removal

1. Install pilot of Piston Pin Removing and Installing Tool, No. J-3848, on puller screw.

2. Install puller screw, with pilot, through piston and pin from side of piston stamped "REAR".

3. Install support over puller screw with small end of support against piston opposite from "REAR" on piston casting.

4. Install nut loosely on puller screw and place assembly in an arbor press, as shown in Fig. 10-19.

5. Press piston pin out of piston and rod assembly.

6. Remove assembly from press and remove puller nut, support, and piston pin from puller screw.

7. Remove puller screw from piston and remove pilot from piston connecting rod.

8. Remove connecting rod from piston.

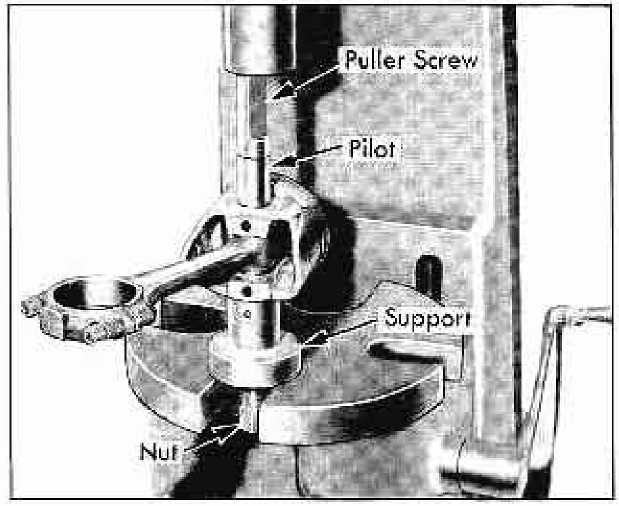


Fig. 10-19 Removing Piston Pin

b. Installation

1. Lubricate piston pin holes to facilitate installation of pin.

2. Position connecting rod in its respective piston so that when assembly is installed in engine the side of piston stamped "REAR" is toward the rear of the engine and numbers on lower end of the rod are down. Fig. 10-20. Numbers 1, 3, 5, 7, are in the left bank and 2, 4, 6, 8 are in the right bank.

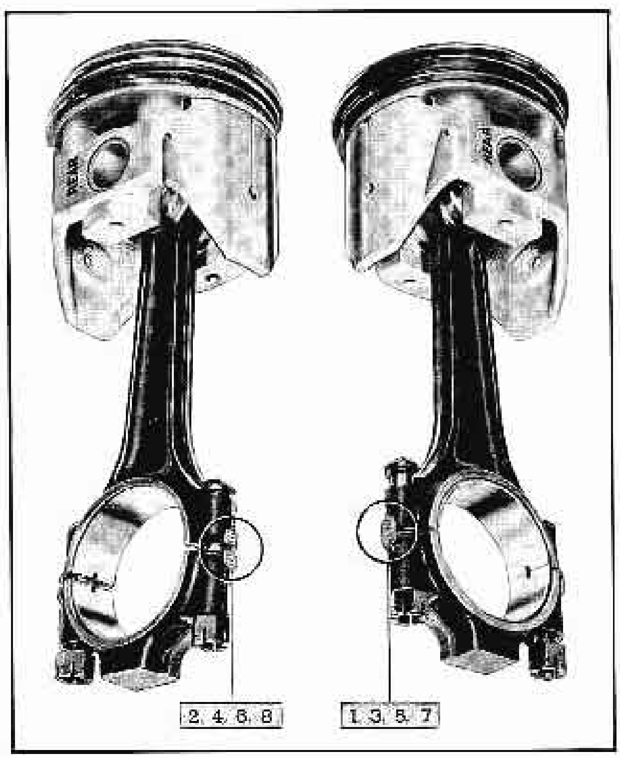


Fig. 10-20 Assembly of Connecting Rods to Piston

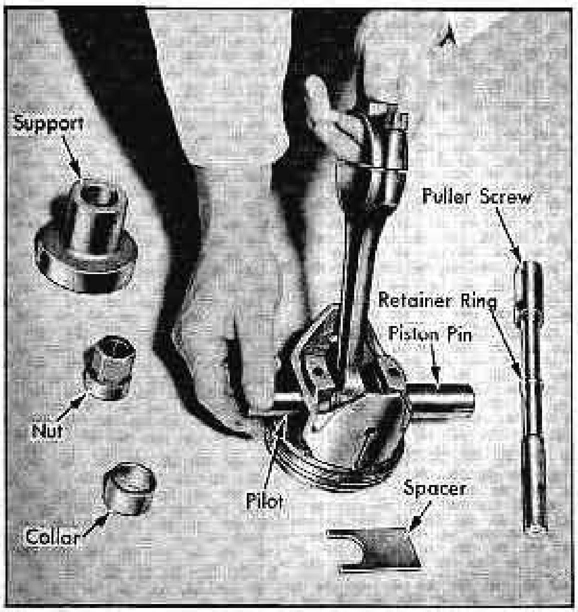


Fig. 10-21 Installing Pilot and Pin in Piston and Rod

3. Install pilot through piston and rod, Fig. 10-21.

4. Lubricate piston pin and insert it in piston pin hole on side of piston marked "REAR" Fig. 10-21.

5. Install puller screw through piston pin and pilot from side of piston marked "REAR", Fig. 10-22.

6. Insert spacer between connecting rod and piston until it is seated on the pilot.

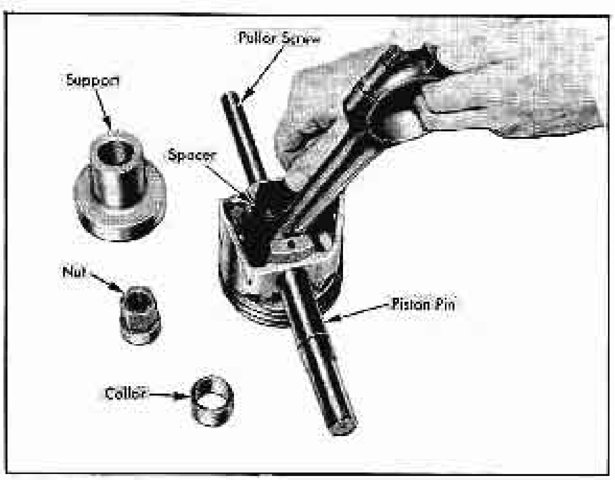


Fig. 10-22 Installing Puller Screw and Spacer

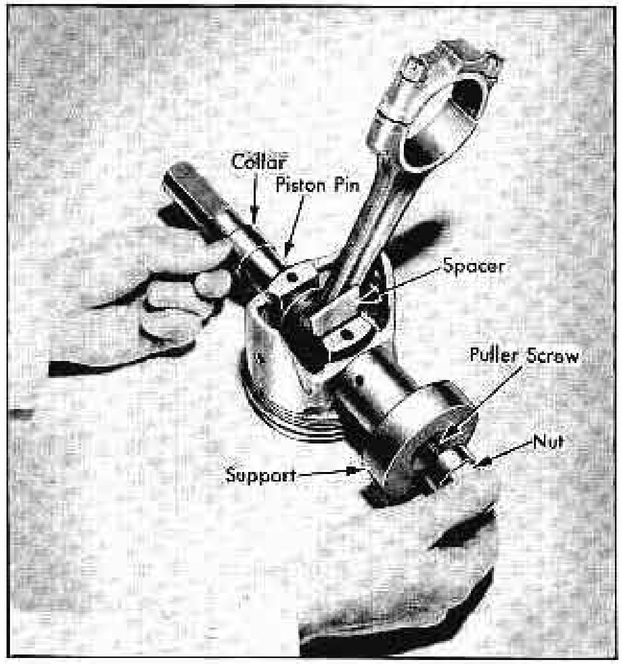


Fig. 10-23 Installing Collar, Support and Puller Nut

NOTE: The spacer must be installed between the piston and the rod on the side opposite that stamped "REAR", Fig. 10-22.

7. Install support over puller screw with smaller diameter toward piston, opposite that stamped "REAR", Fig. 10-23.

8. Install nut on puller screw and tighten with torque wrench to start piston pin into connecting rod, Fig. 10-24.

CAUTION: If pin can be started into connecting rod with less than 15 ft. lbs. minimum torque, the press fit between piston pin and rod is insufficient and either the piston and pin assembly or connecting rod must be replaced.

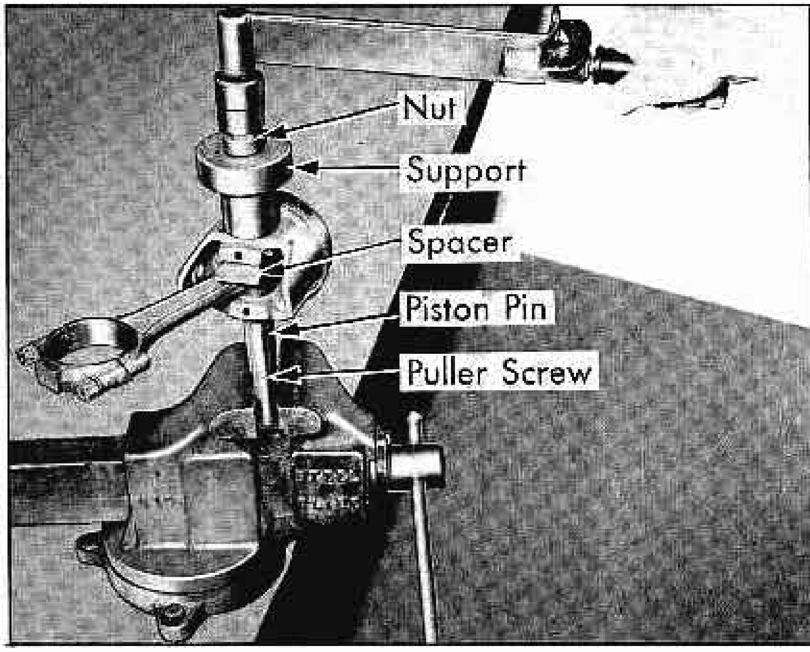
9. Install collar over piston pin, Fig. 10-24.

10. Press puller screw down until top of pin is level with top of collar.

11. Remove collar and spacer.

NOTE: The piston pin will now project slightly from rod and this pin should be guided into the piston pin boss next to the support by hand to assure correct alignment.

12. Press piston pin in until pilot bottoms in support, properly positioning the pin in the rod, Fig. 10 24.



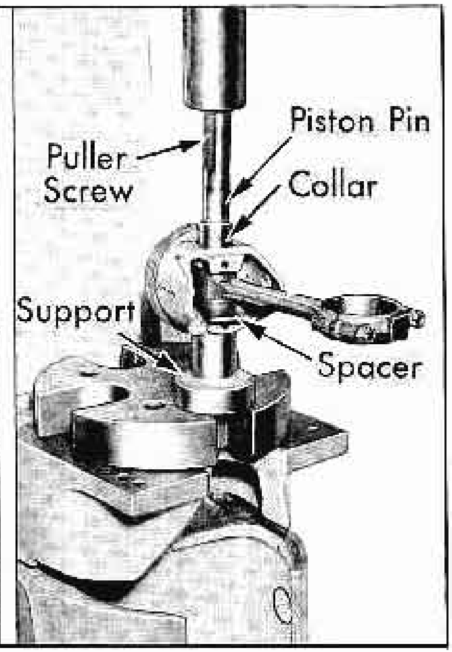


Fig. 10-24 Installing Piston Pin in Piston and Connecting Rod

NOTE: Piston pins are a match fit to the piston and are not available separately. Piston pins will not become loose enough to cause a knock or tapping until after very high mileages and in such cases a new piston and pin assembly should be installed.

(24) Measuring Piston Clearance

Piston should be measured for size 1/8" below the upper cross slot and at right angles to piston pin. Cylinders should be measured 1-1/4" from the top, crosswise to the cylinder block.

The clearance should be .0007" to .0011" in this position at 70°F. Subtract .0001" from measurement for every 6° above 70°F.

At the Factory, a system of letters stamped on the top face of the block, either to the right or left of each cylinder bore, denotes the cylinder sizes as shown below:

Letter	Cylinder Sizes	Piston Sizes
A	3.8125-3.8127	3.8116-3.8118
B	3.8127-3.8129	3.8118-3.8120
C	3.8129-3.8131	3.8120-3.8122
D	3.8131-3.8133	3.8122-3.8124
E	3.8133-3.8135	3.8124-3.8126
H	3.8135-3.8137	3.8126-3.8128
J	3.8137-3.8139	3.8128-3.8130
K	3.8139-3.8141	3.8130-3.8132
L	3.8141-3.8143	3.8132-3.8134
M	3.8143-3.8145	3.8134-3.8136

The chart indicates ten cylinder sizes for the size range of .002". There are twenty sizes, however, as each letter is either "+" or "-". If the letter is stamped to the left of the cylinder, it is "-". If letter is stamped to the right of cylinder, it is "+". This makes it possible to maintain the clearance of .0020-.0022", as formerly stated. For service use, pistons are furnished in the "L" or "M" code sizes only.

If a double letter ("AA") appears either to the left or right of the cylinder it indicates that the cylinder has been bored to .010" over the diameter indicated by the letter in the chart. For example, a cylinder with the letters "CC" stamped on the block to the left of the cylinder would have a diameter of 3.8129" + .010" or 3.8229" and a piston diameter of 3.8214".

Replacement pistons are furnished by the Factory Parts Department in the following sizes:

Standard
.010" oversize
.020" oversize
.030" oversize

Piston diameters, as given in the specification table, can be measured with a large micrometer, as shown in Fig. 10-25.

Before ordering pistons for replacement, it is extremely important to determine the size of the cylinder bores by actual measurement. Actual measurement at the time of replacement is the only certain way to avoid errors in ordering.

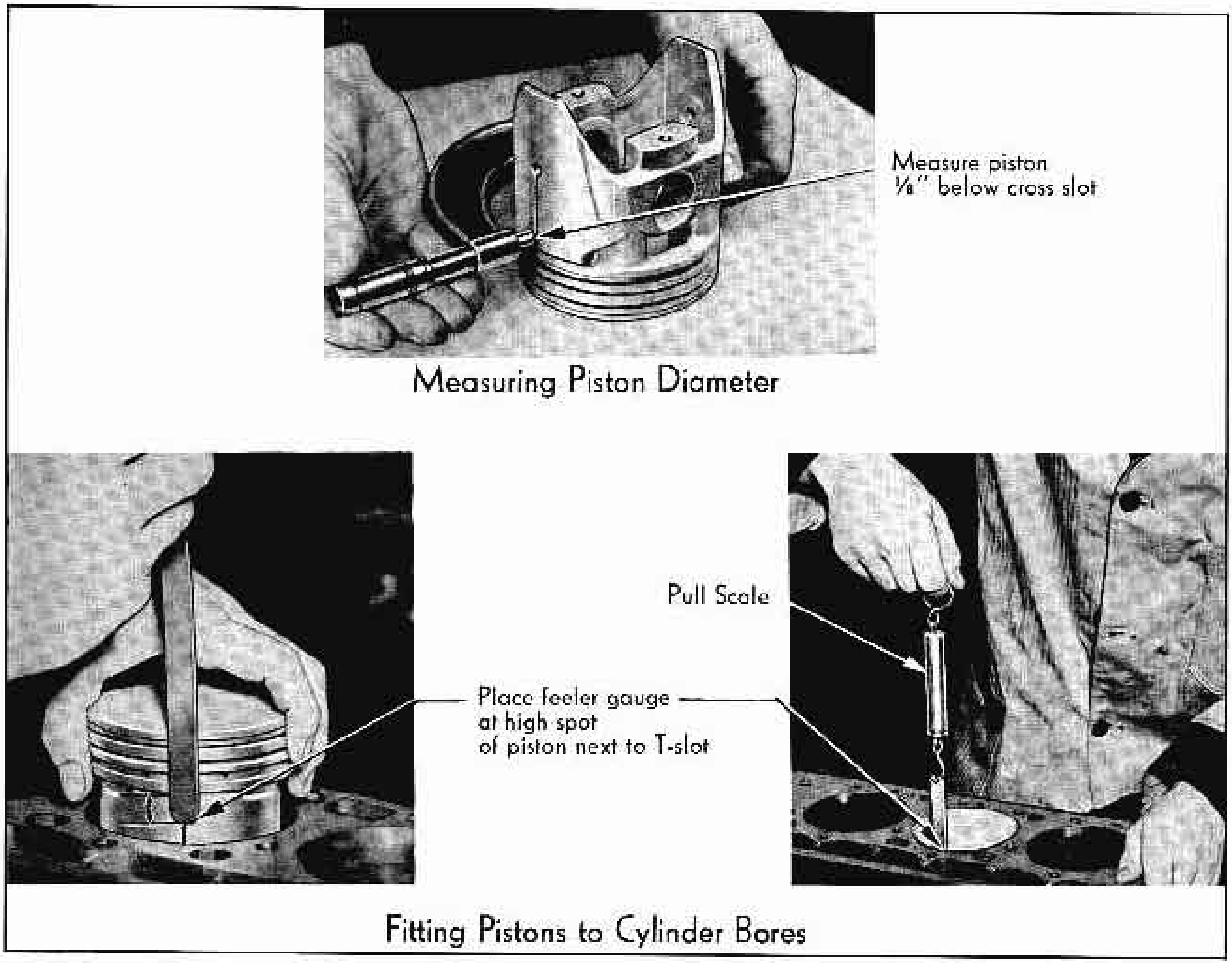


Fig. 10-25 Piston Measurements

There are two methods of measuring piston clearance: with a micrometer or with ribbon feeler gauges. Both of these two methods are explained in detail, as follows:

a. Micrometer Measurements

The equipment required consists of a 3" to 4" outside micrometer and an inside micrometer of the same size. The outside micrometer must be adjusted to turn freely, so that it can be adjusted up to the piston with a very light turning effort on the screw. If it is adjusted to get a frictional feel over the piston, it will show several tenths of a thousandth smaller than its actual size. With practice, fractional thousandths can be checked.

The inside micrometer for measuring the cylinders must be provided with an extension handle and adjusted so the screw turns sufficiently tight to retain its setting while checking the cylinder at the different points to be measured.

The direct readings shown on the inside micrometer should not be taken as the cylinder sizes. After obtaining a light feel on the inside micrometer when one end of the bar contacts the exact center of the cylinder as it is being oscillated in a vertical plane, remove the micrometer and measure its length with the outside micrometer. This should be done, holding one end against the anvil of the outside micrometer and adjusting the screw, until the same feel is obtained as was felt in measuring the piston.

By this method, if the two micrometers do not agree in readings, no error will result in arriving at the actual net clearance of the piston in the cylinder at any point.

In measuring the pistons, it will be noted the upper end of the skirt is always the smallest. All aluminum pistons are ground tapered on the skirt to make the piston .0012"-.0021" larger at the open end. Thus, if the clearance were .002" at the upper end and the skirt tapered .002", there would be no clearance at the bottom, or if the cylinder were .0005" smaller at the bottom, the piston would be in confliction .0005".

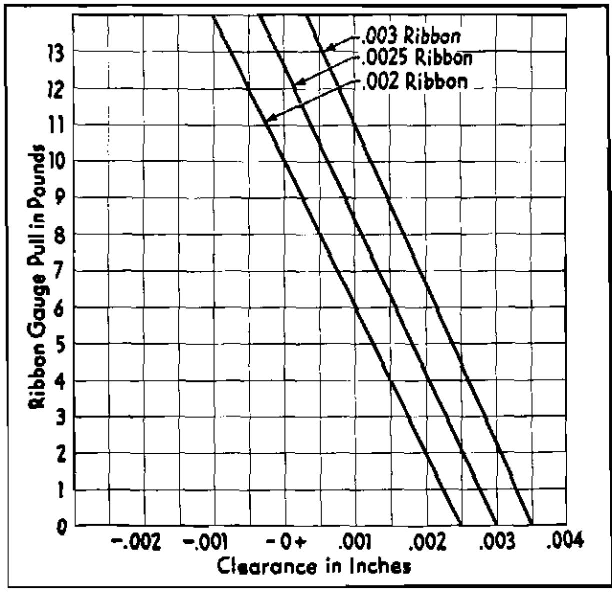


Fig. 10-26 Piston Clearance Chart

The piston skirt is sufficiently flexible so that it will contract to overcome this confliction just as piston rings contract to fit the cylinder.

The above conditions are perfectly normal and are necessary for long life and quietness of piston action. No undue friction or scoring will result, due to the flexibility designed into the casting and the oval shape of the skirt.

b. *Feeler Gauge Measurements*

Where no micrometers are available to measure piston clearance, the use of a feeler ribbon gauge will serve satisfactorily, as there is a definite relation between feeler gauge pull in pounds and micrometer clearance in thousandths of inches, as shown in Fig. 10-26, which is set up for .002", .0025", and .003" feeler gauge thicknesses.

Feeler ribbon gauges for this purpose must be considered as precision tools and if rusted or wrinkled are unfit for use. The most convenient length is about 8", with a cotter pin soldered on one end to hook onto the pull scale. In addition, the lower ends should be rounded and any frayed edges honed to prevent possible scratching of the cylinder and incorrect scale readings. Extreme cleanliness and a little lubrication is also necessary for accurate results.

In order to obtain the piston clearance at the upper end of the skirt, it is necessary to insert the piston into its extreme upper position, along with the ribbon, which must be kept located over the vertical slot and not in excess of 1/2" below the upper end of the skirt, as illustrated in Fig. 10-25. It is advisable to mark the ribbon adjacent to the piston head, so that its proper location on the piston can be maintained. It is helpful in getting the ribbon started into the cylinder along with the piston to use both thumbs to spring the piston inward.

Feeler gauges may also be used for measuring taper in cylinder, as follows:

Using a ribbon which gives between 2 and 6 pounds pull, insert the ribbon with the piston, open end down into the cylinder about one inch, taking the resulting pull at this point and in intervals of each two inches downward, until the open end of the piston is 1/8" below the bottom of the cylinder. By keeping a record of results the clearance difference can be read from the chart.

Checking the clearance with feeler ribbon gauges should not be attempted without help on the under side of the engine to push back the piston when required and to prevent it from being damaged if it should fall through the cylinder.

The clearances will become approximately .0005" greater at the upper end of the skirt, within a few hundred miles of operation, and remain so until increased due to normal wear. The initial increase of .0005" should not be mistaken as misfitting or rapid wear as this condition is due to normalizing of the piston casting. If this did not occur, it would be necessary to fit the piston with .0005" more clearance.

(25) Reconditioning Cylinder Bores

Worn cylinder bores can be reconditioned by reboring and honing in the service station. Several precautions are necessary, however, to assure a perfect fit between piston and cylinder. Take special note of the following:

1. Use the proper grit stone. When honing cylinders with only a few thousandths to be removed, a medium 300 to 400 grit stone will serve for both roughing and finishing. Where considerable stock is to be removed, however, 150 grit stones are best for roughing. To obtain the best results, the cylinders should be round and straight within .0007" and, in addition, free from chatter marks and dug-in spots from the hone.

Fast wearing hones are not recommended, due to the loss of time in keeping them tight and the undue amount of loose abrasive material which may remain in the engine. It is possible to obtain free cutting hones sufficiently hard that wear is negligible.

2. Guard against heat. The most troublesome problem in honing is from the heat generated, which causes the cylinders to expand, giving errors in fitting.

This can be overcome as follows: Use a steady small stream of filtered or fresh clean kerosene on the hone. Dry honing is not recommended, as the cylinder surface may become charged with abrasive and wear the rings out in a short time.

Use a means of driving the hone which controls the speed at 150 R.P.M., or lower, to keep down the heat. A slow speed air drill gives the best control.

Start honing at the lower or unworn end of the cylinder to prevent tapering the hones. Set the hones tight, and keep an up-and-down motion about one second apart for each stroke. Retighten the hone frequently. As the small end is enlarged, the stroke can be increased until the up-and-down motion covers the whole cylinder. It is advisable to reverse the stone holders occasionally to prevent tapering of the stones. As soon as the cylinder warms a little, start honing on another which is not adjacent to the warm one.

As the heat generated is greatest toward the upper side of V-engines and toward the center of the cylinder, this point is liable to be the smallest when the cylinder has cooled. If this condition exists, it may be necessary to rehone at this point. The cylinder limits given are for the whole length of the cylinder, and if the .0007" allowable taper should occur within the ring travel, the ring life will be short.

3. Do not hone too much. It is usual for the greatest wear in the cylinder to occur at the upper end of the upper ring travel, which therefore is the last point in the cylinders to clean up. Providing these spots are not in excess of 1/2" wide when the cylinders are finished for the smallest oversize, it is advisable to allow the condition to remain, rather than go to the expense of honing to the next oversize, as the condition will have very little effect on ring life or performance.

4. Make accurate measurements. Inasmuch as aluminum expands and contracts at approximately two times the rate of iron, it is necessary to correct the clearance results found, if the room temperature is much above or below 70°F. The correction following is for the difference between the expansion of aluminum and iron or steel; therefore, no consideration should be given to cylinder temperature or the tools used for measuring, other than that they be at approximately the same temperature as the pistons when measured. The temperature correction for piston size at other than 70°F is as follows:

Subtract .0001" from micrometer reading for each 6° above 70°F.

Add .0001" to micrometer reading for each 6° below 70°F.

If ribbon gauges are being used, the corrections are:

Subtract .4 lb. for each 6° above 70°F. before referring to chart.

Add .4 lb. for each 6° below 70°F. before referring to chart.

5. Remove all traces of abrasive from engine. Prior to the honing operation tape the crankpins tightly. Following the honing, wash down the cylinders, crankcase, and shaft to remove all abrasive material. This should be repeated at least three times, using a fresh supply each time. Do not use a wiping cloth or an air gun. Remove and clean crankshaft thrust bearing, as these surfaces are sufficiently exposed that abrasive material may have gotten on them.

6. Install proper engine oil. The principle requirements of the best oil for breaking-in rehoned engines are that it should be light, 10-W grade, and sold by a reputable refiner. New cylinder and ring surfaces are less liable to scuff or scratch with such a lubricant.

In addition, a 2-1/2% mixture of this lubricant with the fuel is suggested for the first 200 miles, which is in the ratio of one pint per five gallons of fuel. Do not just pour the oil into the fuel tank, as it will settle around the fuel pipe and cause smoke, hard starting, and stalling. The oil must be diluted and stirred into three times as much fuel as oil used, before adding oil to the fuel supply in the tank. Once the oil is diluted as directed, it will blend and not settle out in the tank.

(26) Connecting Rod Alignment

When connecting rod and piston assemblies are removed from an engine, the wear pattern on the piston skirts should be symmetrical on each side of the vertical slots. Bent or misaligned connecting rods will cause an off angle wear pattern. If this condition exists, the piston, pin, and rod assembly should be replaced. Do not attempt to straighten Cadillac precision connecting rods as field methods are not accurate.

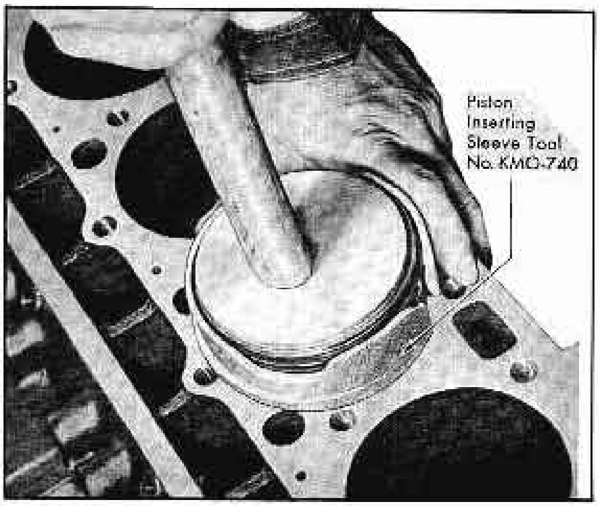


Fig. 10-27 Installing Piston in Cylinder Bore

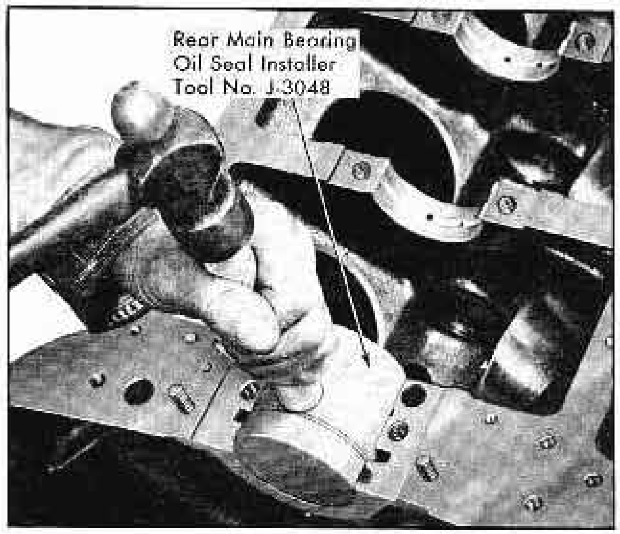


Fig. 10-28 Installing Rear Main Bearing Oil Seal

(27) Installation of Piston and Connecting Rod Assemblies

1. Install piston and rod in cylinder bore with "REAR" on piston toward rear of engine, using Piston Inserting Sleeve, Tool No. KMO-740, Fig. 10-27.

CAUTION: Extreme care must be exercised when installing pistons and rods to be sure rod is lined up with crankshaft journal and does not stick or bind on counterweights.

2. Pull piston and connecting rod down into position on the crankshaft.

3. Install connecting rod cap and bearing over connecting rod bolts, being sure numbered side of cap is on same side as numbered side of rod.

NOTE: Re-check to see that the numbered side of connecting rod on No. 1, 3, 5, and 7 rods are on left side of engine and No. 2, 4, 6 and 8 are on right side of engine and that the rods are on the proper crank pins.

4. Install new self locking nuts and tighten to 40-45 ft. lbs. torque.

5. Repeat this operation for the other seven connecting rods.

(28) Replacement of Rear Main Bearing Oil Seal

Installation of a new rear main bearing oil seal requires use of Rear Main Bearing Oil Seal Compressor, Tool No. J-3048. After crankshaft has been removed from engine and worn packing taken out, proceed as follows:

1. Remove rear main bearing.

2. Install a length of new packing in groove in crankcase and press up into place, using Rear Main Bearing Oil Seal Compressor, Tool No. J-3048, and a hammer, as shown in Fig. 10-28.

3. With tool held in position, cut off each end of packing flush with bearing edge, using a sharp knife, Fig. 10-29.

Fig. 10-29 Cutting Rear Main Bearing Oil Seal

4. Repeat operation in bearing cap. An arbor press or vise will provide the best means of forcing the packing into place and holding it while trimming.

(29) Removal of Timing Chain and Sprockets

1. Remove water pump, Section 13, Note 18.

2. Remove engine oil pan, Note 14.

3. Remove crankshaft pulley and harmonic balancer assembly.

4. Remove engine front cover.

5. Remove two cap screws and lock washers which hold sprocket to camshaft.

6. Remove sprocket with chain from camshaft.

7. Remove crankshaft sprocket.

(30) Removal of Camshaft

1. Remove hood lock plate support.

2. Remove Air Conditioning condenser as explained in Section 16a, Note 21, if car is so equipped.

3. Remove radiator core, Section 13, Note 16-a.

4. Remove timing chain and sprockets, as explained in Note 29.

5. Remove valve lifters, Note 10.

6. Remove distributor, Section 11, Note 12a.

7. Slide camshaft forward carefully until it is out of engine.

CAUTION: Extreme care should be exercised to keep the cam lobes from scratching the camshaft bushings.

(31) Checking Camshaft

The camshaft, on all 1954-Series cars, is made of cast iron and must be handled with particular care to avoid damage.

If the shaft is accidentally dropped, it may be sprung out of alignment, or the cam lobe surfaces may be damaged enough to cause erratic valve action or worn lifters and result in unsatisfactory engine performance.

Whenever the camshaft is removed, it should be checked for proper alignment. To make this inspection, the camshaft should be placed on "Vee" blocks at the front and rear bearing journals, or on centers, on a surface plate. A dial indicator should be mounted so that it is directly over the centerline of the camshaft with the pointer touching the shaft.

Set the dial indicator to read zero on the heel of No. 1 cam lobe and then check the heel of each cam lobe for a full 180° of rotation. If any discrepancy greater than .0015" total indicator reading on any particular cam heel is discovered, the camshaft should be replaced.

The runout of each of the bearing journals should also be checked. If more than .0015" total indicator reading runout is discovered, the camshaft is sprung out of alignment and should be replaced.

(32) Removal of Camshaft Bearings

1. Install puller collet of Camshaft Bearing Removing and Installing Tool No. J-3063 in No. 5 bearing, Fig. 10-30.

NOTE: Install a rubber band over both collet fingers next to thumb screw, to hold fingers while installing collet.

2. Tighten thumb screw and check to see that fingers are securely behind No. 5 bearing.

3. Install arbors "B", "C", and "E" in bearing Nos. 1, 2, and 3, respectively with large diameter of arbors toward rear of block.

4. Slide shaft through all three arbors and through No. 4 bearing.

5. Holding pilot "D" (which is used as an arbor in the removal operation) behind No. 4 bearing, slide shaft through pilot "D".

CAUTION: Be sure sharp corner on pilot "D" outside diameter is toward No. 4 bearing.

6. Thread shaft into puller collet in No. 5 bearing.

7. Slide bridge over front of shaft, with legs of bridge toward front face of block.

8. Slide flat washer on front end of shaft and install puller nut loosely.

9. Place a 3/4" open-end wrench over section of shaft on flats, which are between bridge and block. This keeps shaft from turning during the pulling operation.

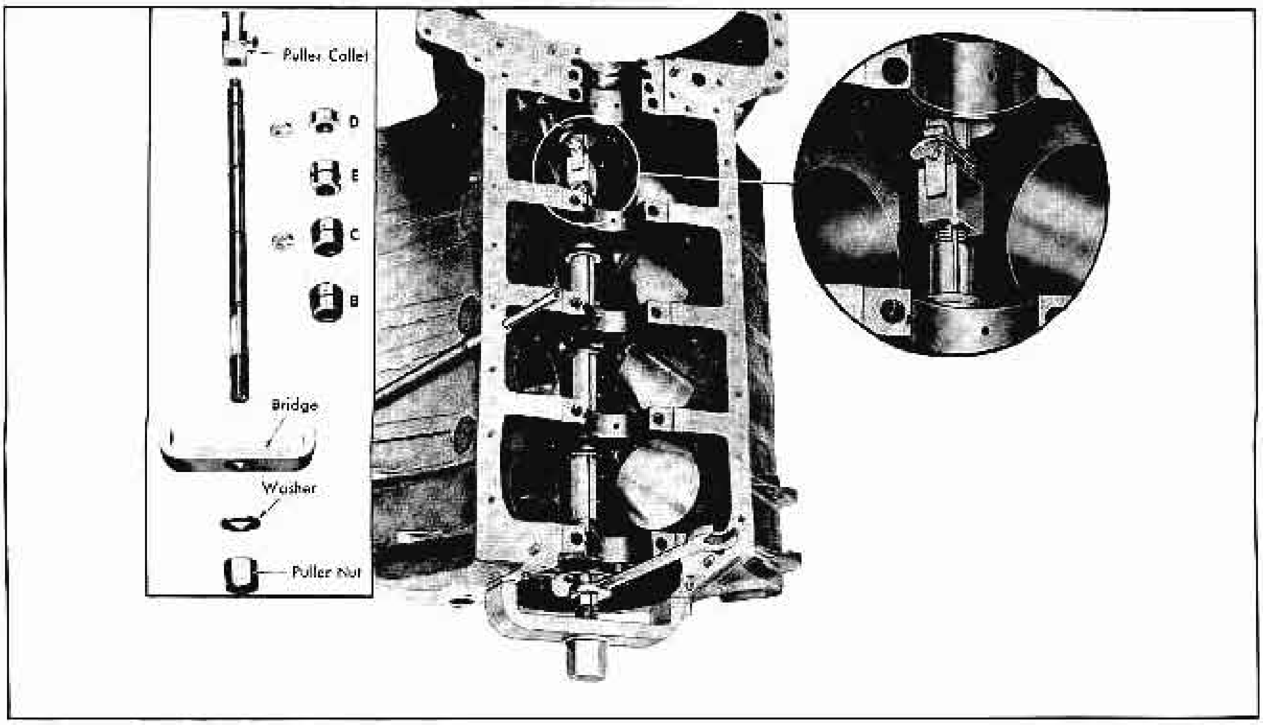


Fig. 10-30 Removing Camshaft Bushings

10. Install a C washer in slot in shaft behind pilot "D".

11. Tighten puller nut until No. 4 and 5 bearings are removed.

12. Remove puller collet and No. 5 bearing from rear end of shaft.

13. Loosen puller nut and slide shaft rearward until C washer can be removed from behind pilot "D"

14. Install C washers behind arbors "B", "C", and "E" respectively (bearings 1, 2 and 3).

15. Tighten puller nut until bearings No. 1, 2 and 3 are removed.

16. Remove puller nut from end of shaft.

17. Remove all pieces of the Camshaft Bearing Removing and Installing Tool and all bearings from cylinder block.

(33) Installation of Camshaft Bearings

1. Install camshaft bearings on arbors "A", "B," "C," E," AND "F" respectively, making sure that the oil holes in the camshaft bearings are centered over the spring loaded steel balls in the arbors.

2. Hold arbor "B" in position between No. 1 and 2 bearing bores and slide shaft through No. 1 bearing bore, through arbor "B," and through No. 2 bearing bore, Fig. 10-31.

NOTE: Arbor "B" must be positioned so that bearing is toward rear of cylinder block.

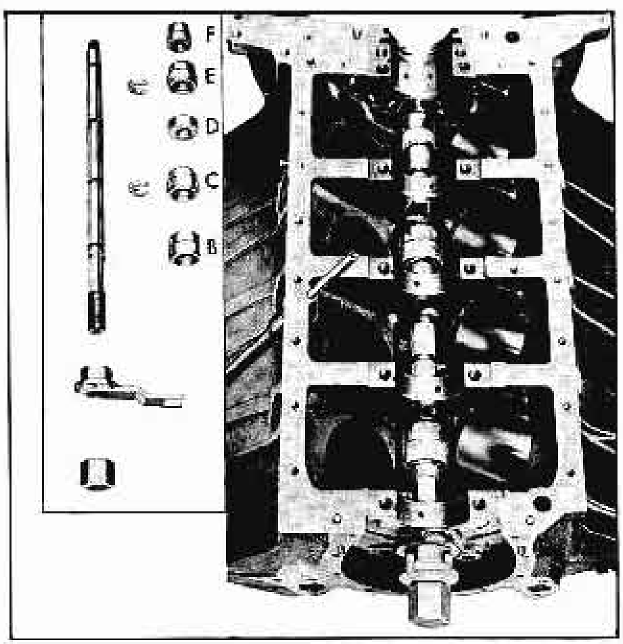


Fig. 10-31 Installing Camshaft Bushings

3. Install arbor "C" on shaft and in No. 2 bearing bore, making sure that the bearing is facing the No. 3 bearing bore.

4. Install pilot "D" in No. 3 bearing bore and slide shaft through pilot "D".

5. Position arbor "E" between No. 3 and 4 bearing bores and slide shaft through arbor, being sure arbor "E" is positioned so that the bearing faces rear of block.

6. Position arbor "F" between bearing bores No. 4 and 5 and slide shaft into arbor, being sure bearing on arbor is toward rear of block.

7. Slide arbor "A" over front end of the shaft, making sure that the grooved end of locating arm is centered over front end of the crankshaft. Fig. 10-31.

8. Install C washer in front of arbor "E" and slide shaft toward the rear until C washer is seated in the recess in arbor "E".

9. Thread driving cap nut on front of shaft until it bottoms on the shaft.

10. Make sure that pilot "D" is in No. 3 bearing bore and that large diameter of arbor "C" is in No. 2 bearing bore. These pilot the shaft in the cylinder block.

11. Using a hammer, drive the cap nut in until the large flange on arbor "A" contacts the front of the block. This will install camshaft bearings No's. 1, 4, and 5 (on arbors, "A," "E," and "F") simultaneously.

CAUTION: Make sure driving cap nut does not back off while driving bearings.

12. Slide shaft forward about 1/2", until the C washer is out of the recess in arbor "E" and remove C washer.

13. Slide arbor "C" out of No. 2 bearing bore and back in front of No. 3 bearing bore.

14. Install C washers in grooves in shaft in front of arbors "B" and "C."

15. With the C washers in place, slide the shaft rearward until the C washers are in the recesses of arbors "B" and "C."

16. Using a hammer, drive the driving cap nut in until it contacts arbor "A." This will install bearings No. 2 and No. 3 simultaneously.

CAUTION: Make sure driving cap nut does not back off when driving bearings.

17. Remove all pieces of the Camshaft Bearing Removing and Installing Tool from the cylinder block.

18. Bend a small piece of wire and place in oil hole in each bearing, to see that holes are lined up with oil holes in cylinder block.

(34) Installation of Camshaft

1. Lower camshaft into position between radiator grille and engine and guide it carefully into cylinder block.

CAUTION: Extreme care should be exercised to avoid nicking or scratching camshaft bearings.

2. Install timing chain and sprockets as explained in Note 35, Steps 1 through 10.

3. Install radiator core, Section 13, Note 16b.

4. Install condenser as explained in Section 16a, Note 21, if car is equipped with Air Conditioning.

5. Install hood lock plate support.

6. Install generator and compressor drive belts as explained in Section 11, Note 21, if car is equipped with Air Conditioning.

7. Install power steering drive belt as described in Section 7, Note 15.

8. Install distributor as explained in Section 11, Note 13b.

9. Install hydraulic valve lifters, Note 12.

(35) Installation of Timing Chain and Sprockets

1. Install crankshaft sprocket over crankshaft key.

2. Install camshaft sprocket in timing chain with timing mark toward the front.

3. Place chain over crankshaft sprocket and line up timing marks on both sprockets, Fig. 10-32.

4. Hold camshaft sprocket in position against end of camshaft and press sprocket on camshaft, being sure dowel on camshaft is lined up with dowel hole in sprocket.

5. Install 2 cap screws and lockwashers to hold sprocket to camshaft.

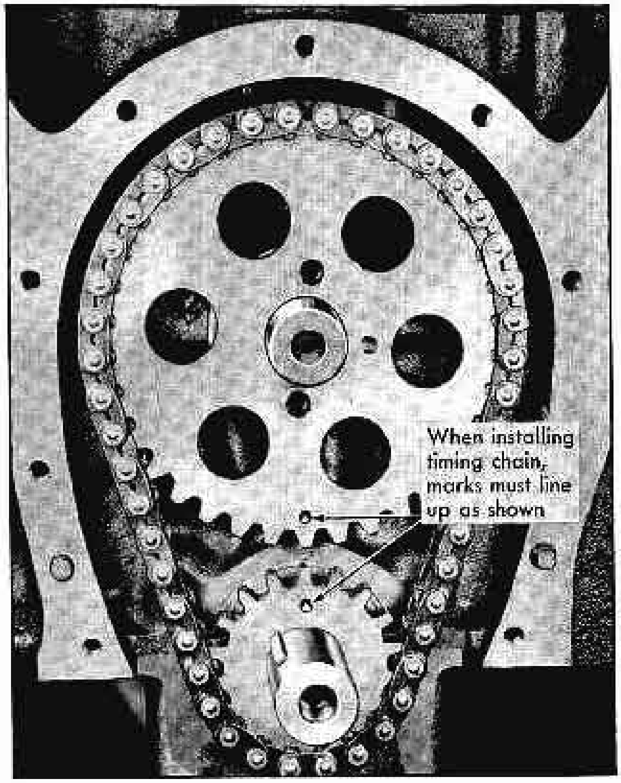


Fig. 10-32 Timing Gear Locating Marks

6. Install new front cover gasket and install cover over locating dowels on block.

7. Install 9 cap screws which hold cover to block and tighten to 10-12 foot pounds torque.

8. Install engine oil pan, Note 14.

9. Install crankshaft pulley.

10. Install water pump, Section 13, Note 21.

(36) Removal of Crankshaft (Engine in Car)

1. Raise car and install stands under car at all four wheels.

2. Remove timing chain and sprockets, Note 29.

3. Remove flywheel, Note 38.

4. Remove oil pan baffle and oil pump, Note 17.

5. Remove steering gear idler arm from right frame side bar and lower steering linkage to floor.

6. Remove spark plugs.

7. Disconnect connecting rods and push piston assemblies up into cylinder bores so that crankshaft can be removed without interfering with rods.

8. Remove front and rear main bearing caps.

9. Support crankshaft at front and rear and remove three intermediate bearing caps.

10. Lower crankshaft from engine.

(37) Installation of Crankshaft (Engine in Car)

1. Raise crankshaft into position and support in place while installing main bearing caps (See Note 21, Step 3), using a new rear main bearing oil seal as explained in Note 28.

2. Lubricate crank pins and pull connecting rod and piston assemblies down toward crankshaft.

3. Install connecting rod caps on crankshaft as described in Note 20.

4. Install camshaft sprocket, timing chain, and timing case cover, Note 35.

5. Install crankshaft pulley.

6. Install water pump using new gaskets, Section 13, Note 21.

7. Connect steering gear idler arm to right frame side bar.

8. Install oil pump, Note 18c.

9. Install flywheel, Note 39.

(38) Removal of Flywheel

1. Raise car 8 inches from floor and place stands under car at all four wheels.

2. Remove transmission, as described in Note 10.

3. Remove flywheel to crankshaft bolts.

4. Remove flywheel and gasket from crankshaft.

(39) Inspection and Installation of Flywheel

a. Inspection

1. Inspect all starter teeth on flywheel and clean up all burred teeth, using a fine file.

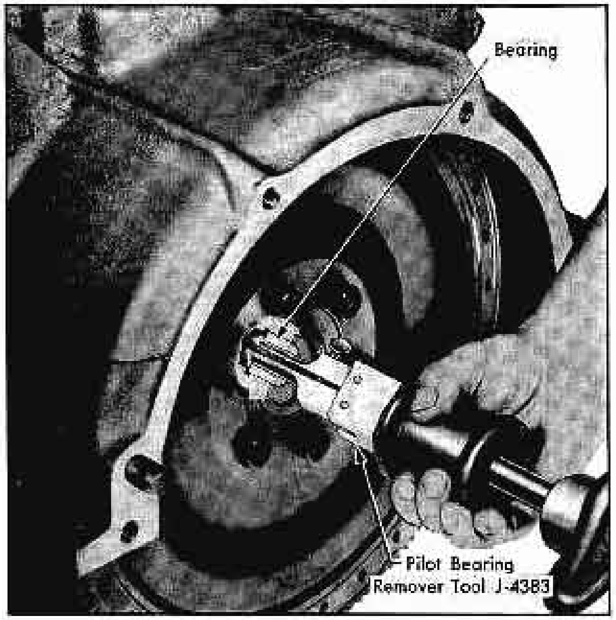


Fig. 10-33 Removing Crankshaft Pilot Bearing

2. Inspect flywheel cover attaching screw holes for stripped threads.

3. Inspect face of flywheel which contacts flywheel cover gasket for nicks or burrs which might cause leaks.

4. Inspect face of flywheel which contacts crankshaft for nicks or burrs which might cause leaks.

b. Installation

1. Place metal gasket on rear of crankshaft and position flywheel over dowel on end of shaft.

2. Dip the six mounting screws in sealer and install, tightening them to 80-85 foot pounds.

3. Install transmission as explained in Section 14, Note 36.

4. Raise car off stands, remove stands, and lower car to floor.

(40) Removal and Installation of Crankshaft Pilot Bearing

a. Removal

1. Remove transmission as described in Section 14, Note 10.

2. Install Pilot Bearing Remover, Tool No. J-4383, in bearing, being sure fingers of collet are behind bearing.

3. Tighten thumb screw to secure collet in bearing and remove bearing by tapping slide hammer against head of tool, Fig. 10-33.

b. Installation

1. Install new pilot bearing on Crankshaft Pilot Bearing Tool, No. J-2985.

2. Position bearing in line with its bore in crankshaft and drive the bearing into the shaft until the flange of tool touches the crankshaft face, Fig. 10-34.

3. Install transmission as described in Note 36.

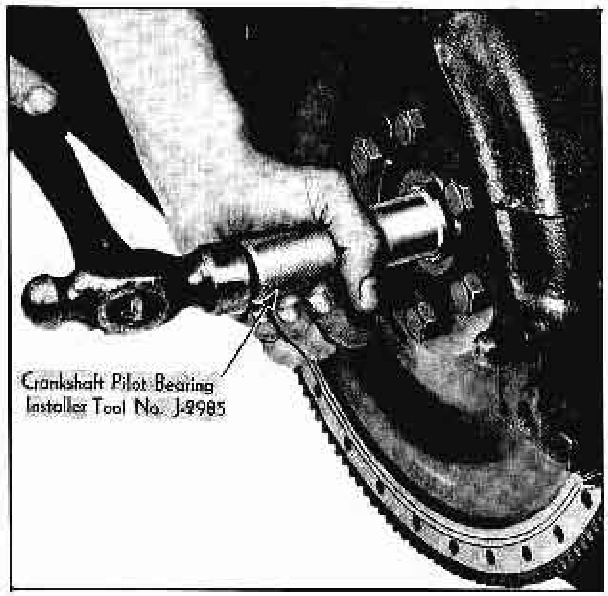


Fig. 10-34 Installing Crankshaft Pilot Bearing

(41) Engine Support Mountings

The engines on all 1954 series Cadillac cars are supported in the chassis; at three points - on each side of the crankcase toward the front of the engine and at the transmission extension housing in the rear. The front engine mountings are supported directly on the frame at an angle, and the rear engine mounting is on a bracket bolted to the frame X member. All supports are equipped with rubber cushions to eliminate vibration and road shocks.

It is important, when attaching the engine mountings to engine and frame, that the nuts and bolts be tightened to the proper torque, as follows:

Nut - Front Support - Cushion to Engine - 25 to 30 ft. lbs.

Nut - Front Motor Support Stud - 80 to 90 ft. lbs.

Engine Rear Support Cushion - 50 to 55 ft. lbs.

Rear Support Cushion to Cross Member - 50 to 60 ft. lbs.

Nut - Cross Member - Engine Rear Support - 25 to 30 ft. lbs.

NOTE: The rear support cushion should be a smooth, push fit in the retainer.

(42) Removal of Engine (with Transmission) from Car

1. Drain cooling system, crankcase, and transmission.

2. Remove hood top panel. Section 4, Note 2.

3. Disconnect battery cables.

4. Disconnect wires from generator.

5. Remove upper and lower radiator hoses.

6. Remove radiator core.

7. Disconnect power steering pump to valve body hoses at pump and install caps on fittings to prevent oil leakage.

8. Disconnect refrigerant lines as explained in Section 16a, Note 10a, on cars equipped with Air Conditioning.

9. Disconnect all heater hoses at water pump. Remove right heater hose from thermostatic valve.

10. Disconnect power brake vacuum line (on cars so equipped) at intake manifold.

11. Remove carburetor air cleaner, disconnect carburetor linkage and fittings and remove carburetor.

12. Disconnect flexible fuel line at fuel pump and remove line from clips.

13. Disconnect ground straps, primary wire at distributor, oil pressure and cooling system temperature switch wires.

14. Disconnect yellow and black wires at porcelain resistor.

15. Disconnect windshield wiper vacuum hoses at manifold line and vacuum pump line.

16. Raise front of car and install stands.

17. Disconnect propeller shaft at rear axle and remove assembly from car by sliding front yoke out of transmission extension housing.

18. Remove transmission linkage slush deflector.

19. Disconnect speedometer cable and shift linkage at transmission.

20. Remove starter from engine.

21. Disconnect front motor supports at frame.

22. Disconnect exhaust pipes from exhaust manifolds.

23. Remove idler arm support screws from frame and lower idler arm and steering connecting link.

24. Loosen hand brake cable at relay.

25. Remove stands from front of car and lower car to floor.

26. Install a rope or chain around intake manifold and attach to chain fall or hoist above engine.

27. Take up slack on rope or chain.

28. Disconnect and remove rear engine support bracket from frame and extension housing.

29. Lift engine, with transmission, out of car.

30. Remove transmission from engine if so desired.

(43) Installation of Engine and Transmission in Car

1. Install transmission on engine.

2. Lower engine and transmission into car, guiding engine so that extension housing will be in position in frame cross member.

3. Guide front engine support studs into holes in frame.

4. Raise car and install rear engine support on extension housing and frame.

5. Lower car and remove rope or chain from intake manifold.

6. Connect left heater hoses to water pump and right heater hose at thermostatic valve.

7. Connect windshield wiper vacuum hoses to manifold vacuum line and vacuum pump line.

8. Connect yellow and black wires to porcelain resistor.

9. Connect ground straps, primary wire to distributor, oil pressure and cooling system temperature switch wires.

10. Connect flexible fuel line to fuel pump.

11. Install carburetor, connect carburetor linkages and fittings and install carburetor air cleaner.

12. Connect power brake vacuum line (on cars so equipped) at intake manifold.

13. Install radiator core.

14. Install upper and lower radiator hoses.

15. Connect refrigerant lines as explained in Section 16a, Note 13b, on cars equipped with Air Conditioning.

16. Connect power steering pump to valve body hoses and fill tank to proper level with Hydra-Matic Transmission fluid.

17. Connect wires to generator.

18. Install hood top panel and align to cowl and fenders.

19. Connect battery cables.

20. Raise front of car and install stands.

21. Connect speedometer cable and shift linkage at transmission.

22. Install transmission linkage slush deflector.

23. Install starter on engine.

24. Using new gaskets, connect right and left exhaust pipes to manifolds.

25. Adjust hand brake cable at relay.

26. Install idler arm support in position on right frame side bar.

27. Tighten front engine support nuts to 80-90 foot pounds torque.

28. Fill cooling system, crankcase, and transmission.

29. Adjust throttle control linkage, as explained in Section 14, Note 4.

30. Set ignition timing and check operation of car.

OTHER NOTES AND REFERENCES

ENGINE MECHANICAL

SPECIAL TOOLS

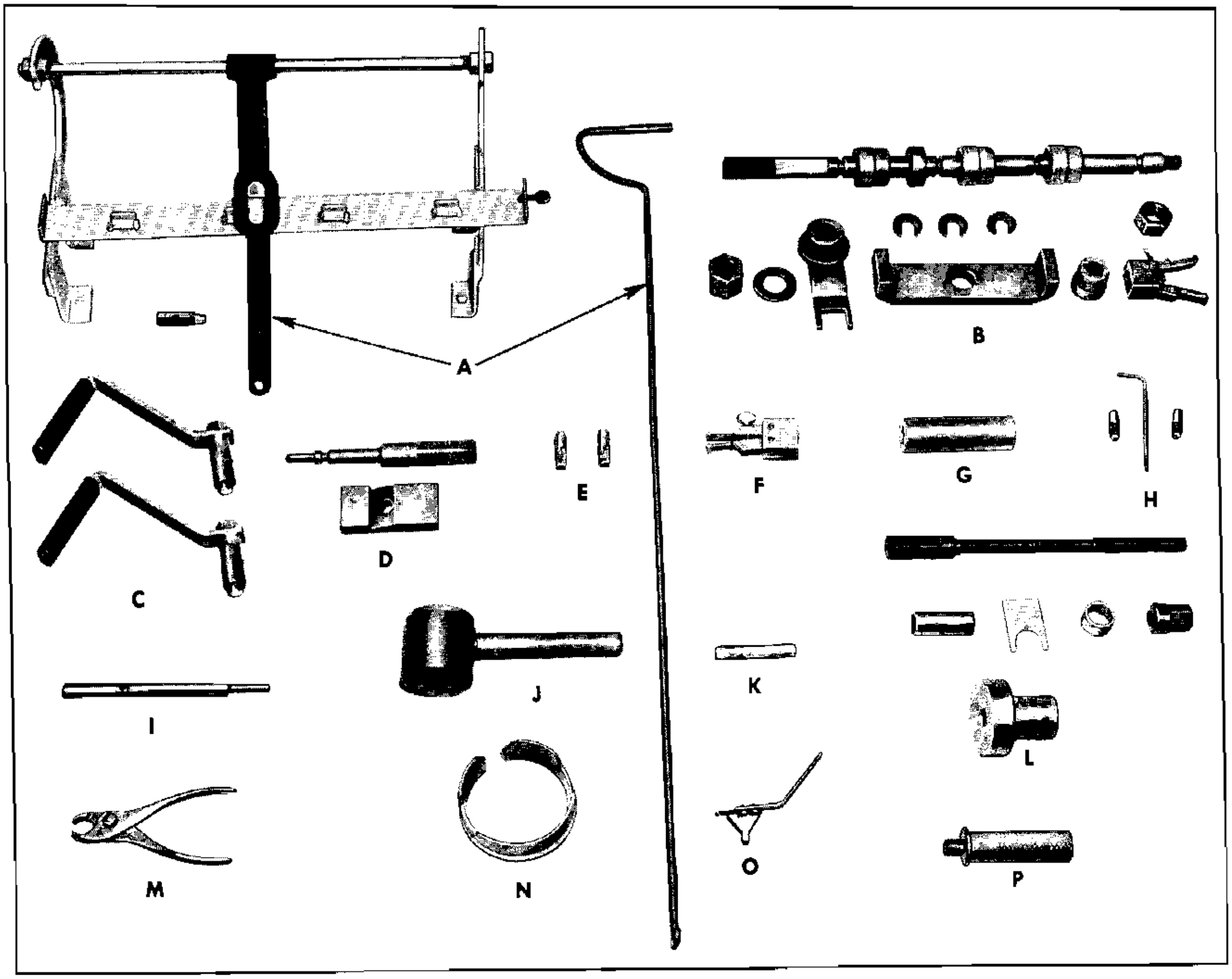


Fig. 10-35 Engine Mechanical Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-3064	Cylinder Head Holder and Valve Spring Compressor.	H	J-3455	Cylinder Head Guide Stud Set.
B	J-3063	Camshaft Bearing Remover and Replacer Set.	I	J-3062	Valve Stem Guide Remover.
			J	J-3048-A	Rear Main Bearing Oil Seal Installer.
C	J-4159	Cylinder Head Removing Handles.	K	J-2730	Valve Lifter Lock Ring Installer.
D	J-3066-A	Valve Stem Guide Installer Set.	L	J-3049	Valve Lifter Remover.
			M	KMO-740	Piston Ring Compressor.
E	J-3224	Connecting Rod Bolt Guide Set.	N	J-3074	Valve Lifter Leak Down Tester
F	J-4383	Crankshaft pilot Bearing Puller (used with Slide Hammer J-2619-A)	O	J-2985	Crankshaft Pilot Bearing Installer.
G	J-4160	Hydraulic Valve Lifter Remover.	P	J-3848	Piston Pin Remover and Installer Set.

ENGINE MECHANICAL

SPECIFICATIONS

Subject and Remarks	All Series
Bore	3-13/16"
Stroke	3-5/8"
Compression pressure --	
At cranking speed (throttle open)	150 p.s.i.
At 1000 R.P.M.	203 p.s.i.
Compression ratio	8.25 to 1
Horsepower --	
Rated (taxable)	46.5
Developed at 4400 R.P.M.	230
Piston displacement	331 Cu. In.
Points of suspension	3
Torque, at 2700 R.P.M.	330 ft. lbs.
VALVES, EXHAUST	
Clearance between stem and guide --	
New limits	.0010-.0025"
Worn limits, not over	.005"
Clearance between lifter body and crankcase	.0010-.0023"
Head diameter, overall	1.562"
Lift	.365"
Seat Angle	44°
Seat width in head	.050"-.068"
Seat eccentricity, not over (total indicator reading)	.004"
Length overall	4-21/32"
Stem, diameter	.3415-.3420"
VALVES, INLET	
Clearance between stem and guide --	
New limits	.0010-.0025"
Worn limits, not over	.005"
Clearance between lifter body and crankcase	.0010-.0023"
Head diameter, overall	1.750"
Lift	.365"
Seat angle	44°
Seat width in head	.050-.068"
Seat eccentricity, not over (total indicator reading)	.004"
Stem, length overall	4.628-4.650"
Stem, diameter	.3415-.3425"
VALVE SPRINGS	
Free length	1.968"
Pressure in Pounds -- Compressed to 1.696" (valve closed)	61
Compressed to 1.326" (valve open)	140
ROCKER SHAFT ASSEMBLY	
Clearance between arm and shaft--	
New Limits	.0007-.0022"
Worn limits	.003"
Clearance between shaft and bracket	.0002-.0017"
Shaft diameter	.8108-.8113"
Diameter of hole in arm	.812-.813"
Short Spring (Center)	
Free length	3-63/64"
Pressure in pounds (when compressed to 1.844")	10-1/2-12
Long spring (end)	
Free length	4-31/32"
Pressure in pounds (when compressed to 2.219")	10-1/2-12
VALVE TIMING (Without ramp)	
Intake opens	22° B.T.D.C.
Intake closes	67° A.B.D.C.
Exhaust opens	63° B.B.D.C.
Exhaust closes	27° A.T.D.C.
CONNECTING RODS	
Bearing material	Moraine Durex
Clearance between bearing and shaft --	
New limits	.0005-.0020"
Worn limits, not over	.0045"
Diameter lower end, without bearing	2.3740-2.3745"
Length, center to center	6-5/8"
End play of rods on crank pin	.008-.014"
PISTON RINGS	
Clearance between rings and sides of grooves in piston --	
Compression rings	.0017-.0035"
Oil rings	.0008-.0026"
Gap between ends in 3.8125" cylinder --	
Compression rings	.010-.020"
Oil rings	.010-.020"
Number of compression rings	2
Number of oil rings	1
Width of compression rings	5/64"
Width of oil rings	3/16"
Width of oil ring slot	.064"
Diameter at bottom of groove	
Oil rings	3.405-3.410"
Compression rings	3.405-3.410"
Maximum wall thickness	
Oil rings	.150"
Compression rings	.184"
PISTON PINS	
Clearance between pin and piston--	
New limits	.00005 to .0001" at 70 F.

ENGINE MECHANICAL

SPECIFICATIONS (Cont'd)

Subject and Remarks	All Series
Pin length	3-3/32"
Pin diameter	1.000
PISTONS AND CYLINDERS	
Cylinder bore out round (new or reground limit) Not over	.0005"
Taper, not over	.0007"
Cylinder bore, standard	3.8125-3.8145"
Cylinder sizes (as indicated by letters stamped on top face of block)	

Letter	Cylinder Sizes	Piston Sizes
A	3.8125-3.8127	3.8110-3.8112
B	3.8127-3.8129	3.8112-3.8114
C	3.8129-3.8131	3.8114-3.8116
D	3.8131-3.8133	3.8116-3.8118
E	3.8133-3.8135	3.8118-3.8120
H	3.8135-3.8137	3.8120-3.8122
J	3.8137-3.8139	3.8122-2.8124
K	3.8139-3.8141	3.8124-3.8126
L	3.8141-3.8143	3.8126-3.8128
M	3.8143-3.8145	3.8128-3.8130

Subject and Remarks	All Series
Piston material	Aluminum Alloy
Piston skirt diameter-standard	3.8110-3.8140"
Piston skirt diameter-oversize--	
.010" oversize	3.8210-3.8230"
.020" oversize	3.8310-2.8330"
.030" oversize	3.8410-3.8430"
Piston skirt top clearance	.0015"
Piston skirt bottom clearance	.000"
Piston top land diameter -- Standard	3.779-3.782"
Piston top land clearance	.0305-.0355"
OIL PUMP	
Backlash between drive gears	.008-.012"
Clearance between pump body and drive shaft --	
New limits	.0010-.0025"
Worn limits, not over	.005"
Clearance between pump body and gears --	
New limits	.003-.005"
Worn limits, not over	.006"
End play in pump gears --	
New limits	.001-.004"
Worn limits, not over	.006"
Oil Pump type	Helical gear
VACUUM PUMP	
Clearances --	
Vane to cover plate	.002-.005"
Rotor to cover plate	.004-.007"
Socket to cover plate	.0144-.0324"
Socket to rotor face	.0104-.0254"
Rotor to shaft	.0010-.0023"
Rotor to depression in body cavity	.0005-.0034"
CRANKSHAFT AND MAIN BEARINGS	
Clearance, main bearings --	
New limits	.0008-.0025"
Worn limits, not over	.005"
Main bearing caps --	
Bolt thread diameter	1/2"
Main bearing journal, diameter	2-1/2"
Main bearing journals, out-of round, not over	.00025"
Main bearing journal length --	
Front	.907"
Intermediate	.907"
Rear	1.622"
Main Bearings, material	Moraine Durex
Crankpin diameter	2.2488-2.2493"
Crankpin out-of-round, not over	.00025"
End play in crankshaft --	
New limits	.001-.005"
Worn limits	.010"
OIL PRESSURE REGULATOR	
Clearance between valve plunger and housing --	
New limits	.0020-.0035"
Worn limits, not over	.005"
Normal pressure to 30 M.P.H. (min)	30-35 lbs.
Idle (average)	15 lbs.
Spring --	
Free length (approx.)	2-27/64"
Pressure at 1-7/16"	4.3-4.8 lbs.
Valve opens at	30 lbs.
CHAINS	
Camshaft chain --	
Adjustment	None
Length	23"
Make	Link Belt
Number of links	46
Pitch	.500"
Width	11/16"
CAMSHAFT	
Bearing Clearance --	
New limits	.001-.0022"
Worn limits, not over	.004"
Bearing out-of-round, not over	.002"
Number of bearings	5

ENGINE MECHANICAL

TORQUE TIGHTNESS

Location	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Camshaft sprocket screws	5/16-18	15	18
Connecting rod nuts	3/8-24	40	45
Cylinder head screws	7/16-14	65	70
Engine, rear support cushion	7/16-14	50	55
Engine, rear support, cushion to cross member bolt	7/16-20	50	60
Engine, rear support, cross member nut	3/8-24	25	30
Exhaust manifold to cylinder head	3/8-16	25	30
Fan blade assembly to flange	5/16-24	15	20
Flywheel to crankshaft	7/16-20	80	85
Flywheel housing plate--lower	1/4-20	10	12
Flywheel housing to crankcase	7/16-14	45	50
Flywheel housing to crankcase--lower	3/8-16	25	30
Flywheel housing to cover--lower	7/16-14	45	50
Front motor support stud nut	1/2-20	80	90
Front support cushion to engine nut	3/8-24	25	30
Harmonic balancer to crankshaft	1/2-20	60	65
Intake manifold to cylinder head	3/8-16	25	30
Intake manifold to cylinder head nut	3/8-24	25	30
Main bearing caps to crankcase	1/2-13	90	100
Oil filler support to crankcase	5/16-18	15	18
Oil pan baffle to crankcase	5/16-18	15	18
Oil pan to crankcase screw	5/16-18	10	12
Oil pan to crankcase nut	5/16-24	15	18
Oil pan drain plug	Special	25	30
Oil pump cover to body	1/4-20	10	12
Oil pump to rear bearing cap nut	3/8-24	25	30
Pulley to balancer hub	5/16-18	15	18
Rocker arm cover to cylinder head	1/4-20	20	25 in. lbs.
Temperature indicator thermal unit	1/2 pipe	35	40
Valve compartment cover to crankcase	1/4-20	20	30 in. lbs.
Valve lifter compartment vent pipe	1/4-20	20	30 in. lbs.

OTHER NOTES AND REFERENCES

ENGINE ELECTRICAL

TABLE OF CONTENTS

GENERAL DESCRIPTION

The 1954 Cadillac has a 12 volt ignition system consisting of the battery, ignition switch, ignition coil, distributor, spark plugs, and wiring.

The 12 volt, 9 plate battery has a capacity of 55 ampere hours, and is used on all series cars, except the 86 Commercial. The 86 Commercial battery has 11 plates and a capacity of 70 ampere hours. The battery is mounted in the lower right rear corner of the engine compartment, near the cowl. The negative battery terminal is grounded to the frame on all series.

An oil insulated induction coil is mounted on top of the intake manifold behind the carburetor. The interrupted low tension current from the battery produces a high voltage in the secondary circuit of the coil. A resistor is connected with the ignition

ENGINE ELECTRICAL

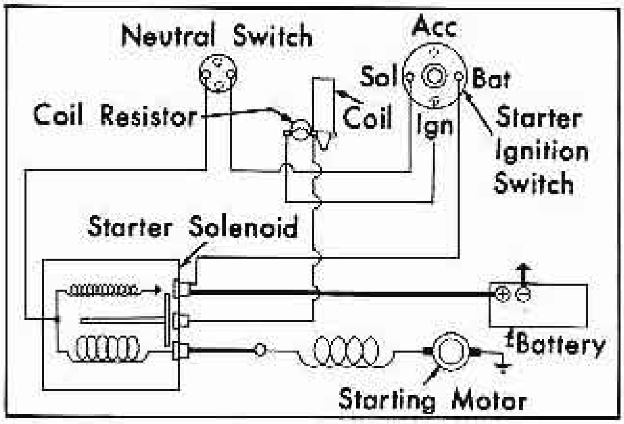


Fig. 11-1 Starting Circuit Diagram

coil primary circuit to avoid burning the breaker points. This resistor reduces the voltage to the coil and breaker points to approximately 9 volts under normal running conditions. In order to insure adequate ignition voltage during the engine cranking period, the resistor is shunted through the starter solenoid circuit, and full available battery voltage is supplied to the ignition coil during this period. Fig. 11-1.

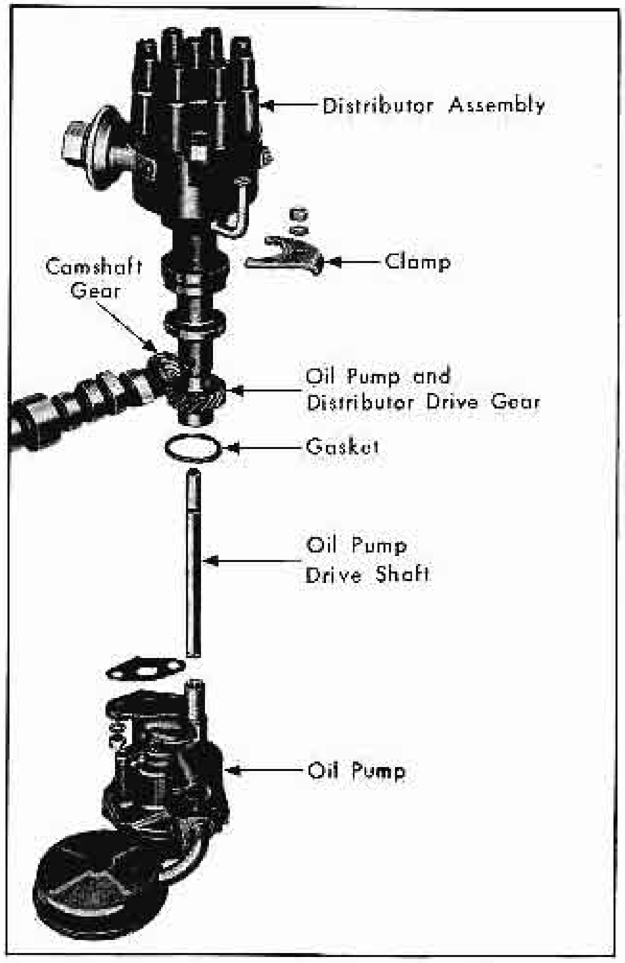


Fig. 11-2 Distributor and Oil Pump Drive Mechanism

The distributor directs the high voltage current in the proper sequence to the spark plugs which ignite the fuel - air mixture in the cylinders.

The distributor, mounted at the rear of the engine, is fully automatic in operation, and is driven by a steel drive gear which is driven by the camshaft drive gear. Fig. 11-2. An outside oiler is provided for lubrication (10W oil) of the distributor. The distributor cam rotates in a counterclockwise direction when viewed from above, and the firing order is 1-8-4-3-6-5-7-2. To eliminate the need for radio noise suppressors on the spark plugs, the distributor rotor has a built-in suppressor.

A single contact point set is used with an eight lobe breaker cam on the distributor shaft. The circuit breaker plate bearing is a bushing located at the center of the plate. Spark advance is controlled by centrifugal weights and by vacuum from the carburetor throttle body. Therefore, ignition timing is controlled by both engine speed and engine load.

Timing marks are located on the harmonic balancer at the front of the crankshaft. These marks, lettered "A" and "C", are located on the balancer so that the piston in number one cylinder is at top dead center when the "C" mark is in line with the pointer on the engine front cover. The "A" line will then be five crankshaft degrees ahead of the "C" line.

The 1954 generator, located on the front of the right exhaust manifold, has an output of 30 amperes at approximately 30 miles per hour. The generator regulator is made up of three separate units: a cut-out relay, a current regulator, and a voltage regulator; all of which are mounted in one complete assembly on the front of the right radiator support baffle.

The cut-out relay makes the connection between the generator and battery when the generator voltage becomes sufficient to close the contact points. When generator voltage becomes less than battery voltage (slow speeds or at idle), opposing magnetic fields are set up in the cut-out relay windings, causing the points to open.

When generator output reaches the value for which the voltage regulator is set, the magnetic field produced by the voltage regulator windings opens the contact points, thus directing the generator field current through a resistance to ground. As soon as the points open, the voltage regulator magnetic field is reduced enough to allow the points to close again by spring tension. This cycle repeats itself from 60 to 70 times per second.

When current from the "A" terminal of the generator reaches the value for which the current regulator is set, magnetism opens those points, sending the generator field current through a resistance to ground. This, in turn, weakens the generator output and the cycle repeats itself from 150 to 250 times per second. Either the voltage regulator or the current regulator operates at any one time - the two do not operate at the same time.

Spring tensions in the individual units of the generator regulator are adjusted by means of screw type adjusters which afford a simple, accurate regulator armature adjustment.

The 12 volt starter motor for 1954 has a spiral splined drive shaft for smoother meshing of gears. The gear ratio between the starter and the flywheel has been increased to lessen the load on the battery when the starter is engaged.

The new four pole four field starter motor drives the flywheel ring through an over-running clutch mechanism. This type of drive is so constructed that the starter pinion, which is solenoid-shifted, must be in mesh with the flywheel before electrical contact with the starter can be made. The starting motor and solenoid are mounted on the lower flywheel housing at the right side of the engine. The starter motor is operated by a combination starter-ignition switch, which energizes a solenoid mounted on the starter housing.

SERVICE INFORMATION

(1) Filling the Battery

The battery should be inspected every 2000 miles during the winter and every 1,000 miles, or every month, during warm weather to make sure that the electrolyte is kept at the proper level. Only distilled water kept in a glass, rubber, or porcelain lined container should be used to replace liquid lost through evaporation. The water level should always be maintained to the bottom of the split ring well.

(2) Battery Electrolyte Tests

The electrolyte (battery solution) can be tested with a hydrometer. The specific gravity registered by the hydrometer should be 1.260-1.280 at 80°F when the battery is fully charged. A gravity reading of 1.150 or below indicates that the battery is entirely discharged. Temperature affects the resistance of the electrolyte; for this reason, a cold battery requires a much higher charging voltage than a warm battery.

Whenever a reading under 1.250 at 80°F is due to a temporary abnormal demand for current due to excessive use of lights or starter, the charging rate should be sufficient to bring the battery up to a fully charged condition again. If the electrolyte tests below 1.200 at 80°F, the battery should be recharged from an outside source.

(3) Causes of Low Battery Conditions

Common causes of low battery conditions other than that due to a defective battery are listed below, and should be investigated when it is indicated that the car has a consistently low battery.

1. Excessive use of accessories with the engine idling or not running.

2. Leaving the car with the lights on or the doors open.

3. Improper installation of accessories.

4. Generator belt loose. Tighten belt.

5. Incorrect regulator settings must be corrected and set preferably toward high limit, as explained in Notes 26, 27, and 28.

6. Self-discharge resulting from a dirty battery case.

7. The battery cable and ground strap must be connected tightly and free of corrosion.

8. If generator output is low it may be checked and corrected as explained in Note 16.

9. A partial ground in the positive side of battery circuit. With clock disconnected and all switches in "OFF" position, a milliammeter or voltmeter connected in series between the positive post and the battery cable should indicate zero.

(4) Visual Inspection

1. Inspect positive (insulated) cable and negative ground strap for corrosion or damage.

2. Inspect metal carrier and hold down clamps for corrosion. If corrosion exists, it will be necessary to remove clamp and battery from car and pour warm water over corroded areas in order to loosen the copper sulphate that has been deposited, so that it can be brushed off and flushed away.

3. The battery posts and terminals should be in-

spected for corrosion. If corroded, wipe off the posts and terminals with a cloth dampened with household ammonia, or a saturated solution of water and baking soda. These alkaline solutions will neutralize any acid on parts being cleaned. Felt washers, soaked with engine oil, should be installed under each terminal to retard corrosion. These should be oiled at each lubrication.

CAUTION: Care should be taken to keep cleaning solution out of battery cells, otherwise, the electrolyte will become prematurely weakened.

4. Examine the battery for cracks in case, raised cells, and also tightness in carrier.

(5) Battery Tests

a. Battery Capacity Test

This high rate discharge test is made to determine the discharge capacity of the battery as compared with its original specifications and ratings.

NOTE: This test can be done only when the battery is in a charged condition. (1.250, or above). If reading is below 1.250, the battery should be slow charged until fully charged, in order to secure proper test results.

1. Turn control knob of Battery Starter Tester to "OFF" position.

2. Zero the ammeter pointer to eliminate instrument errors.

3. Turn voltmeter selector to 15 volt position.

4. Connect positive leads of Ammeter-Voltmeter tester to positive terminal of battery, and negative leads of tester to negative terminal of battery, Fig. 11-3.

5. Turn ampere control knob in clockwise direction until test ammeter reads 180 amps for all series except 86, which is 210 amps, (three times ampere-hour rating of battery).

CAUTION: Do not turn handle in counterclockwise direction, as this will connect ammeter across battery, causing a direct short.

6. With test ammeter at 180 (or 210) amps for 15 seconds, the voltmeter should read 9.6 volts or more, which will indicate satisfactory discharge capacity.

7. Turn ampere control knob to "OFF" position before disconnecting clips.

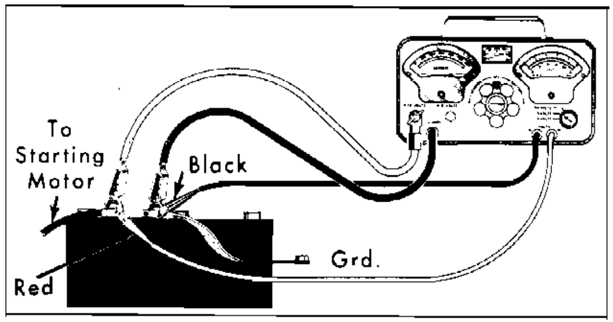


Fig. 11-3 Battery Capacity Test

b. Test Charging Battery

If voltage in above test was below 9.6 volts, the battery should be test charged to determine whether the battery can be satisfactorily charged. This can be done with a fast charger by means of the following three minute test:

1. Make certain the master switch on the charger is off, and the voltage switch in the 12-volt position.

2. Connect charger to battery.

3. Switch on the charger, turn the timer knob past 5 minutes to cock the timer, and then turn it back exactly to three minutes.

4. Set the charging rate at 40-45 amperes. When battery is cold (below 60°F) continue high rate test charge for 10-15 minutes to warm battery.

5. Charge battery for 3 minutes, then check individual cell voltages.

6. If any single cell varies more than .1 volt from the other, the battery should be replaced.

7. Check total battery voltage. This should be less than 15.5 volts and if so, the battery can be fast charged.

8. If the reading is above 15.5 volts, the battery is sulphated and should be cycled and slow-charged until the specific gravity reaches its peak. When specific gravity remains constant after testing battery at one hour intervals for three hours, the battery is at its highest state of charge.

9. Perform the battery capacity test again to obtain an accurate indication of the battery's condition. Replace battery if capacity test does not comply with specifications.

(6) Care of Batteries Not in Use

Batteries in cars in storage or batteries kept in parts stock for sale require special care to prevent plate sulphation or other deterioration due to inactivity.

Before a battery is stored or stocked, an inspection should be made to see that it is filled to the proper level and that it is fully charged (1.250 - 1.280).

Batteries in storage should be checked every two weeks and recharged at least every 30 days, or whenever the specific gravity is below 1.240.

(7) Battery Removal and Installation

a. Removal

1. Remove flexible heater duct.

2. Disconnect hattery cables.

3. Remove two wing nuts and hold-down clamp.

4. Remove battery by using a battery carrying strap on the terminals, lifting it at an angle. Make certain this operation is done carefully to prevent damage to the terminals.

b. Installation

1. Install battery by reversing above procedure.

NOTE: Care should he taken to tighten the wing nuts just enough to prevent vibration of the battery. Avoid over-tightening the nuts, which would cause damage to the battery case.

(8) Starter Circuit Resistance Tests

a. Battery Cable and Starter Switch Test— Insulated Circuit Test

This test measures the resistance of the cables and switches that feed the starter motor. The heavy current used by the starter motor will produce a voltage drop in the wiring which can be measured as an indication of this resistance. Proceed as follows:

1. Using the Battery-Starter Tester, turn the voltmeter selector switch to 15 volt scale.

2. Remove high tension wire from coil center terminal so the engine will not start.

3. Connect solenoid starter "clicker" switch and test leads as shown in Fig. 11-4.

4. Connect positive voltmeter lead to the center of the positive battery post, on which the insulated battery cable is connected. Connect negative voltmeter lead to the starting motor terminal.

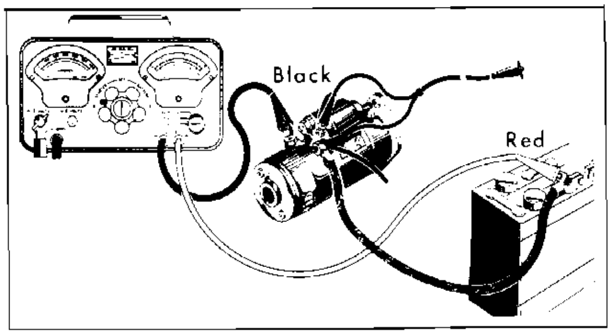


Fig. 11-4 Bottery Cable to Starter Test

5. Close solenoid starter "clicker" switch, and turn voltmeter to 5-volt scale while cranking. Observe reading, and turn meter back to 15-volt scale.

6. The voltmeter should drop .2 of a volt or less while the engine is being cranked. If the voltage drop is more than .2 of a volt it is an indication that the cables or connections are dirty or corroded, or that the solenoid switch is defective.

7. If voltage drop across the entire insulated side of the battery starter circuit exceeds the specified .2 volt, test the individual parts of the insulated circuit for excessive resistance. Maximum voltage drop for each should not exceed the following specifications:

a. Battery to Solenoid Switch	.1 Volt
b. Across Solenoid Switch	.1 Volt
c. Solenoid Switch to Starter Terminal.	Zero

b. Ground Circuit Test

1. Turn voltmeter selector switch of Battery-Starter Tester to 5 volt position.

2. Connect test leads as shown. Fig. 11-5.

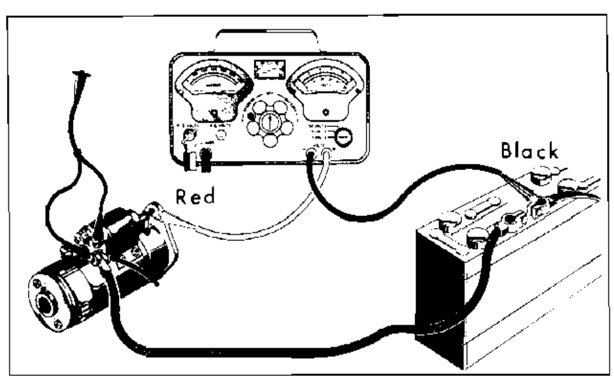


Fig. 11-5 Ground Circuit Test

3. Connect starter solenoid "clicker" switch.

4. Connect negative voltmeter lead to clean spot at the center of the negative battery post, and not to the cable clamp.

5. Connect positive voltmeter lead to the starter mounting bolt.

6. With the starter cranking the engine, the voltage drop should not exceed .1 volt. A reading of more than .1 volt is usually an indication of resistance due to loose, dirty, or corroded connections.

(9) Amperage Draw Test on Starter Motor

This test determines how much current is drawn from the battery in cranking the engine. Proceed as follows:

1. Turn Battery Starter Tester control knob to "OFF" position.

2. Turn voltmeter knob to 15 volt position.

3. Connect test leads as shown in Fig. 11-6.

4. Connect solenoid "clicker" switch from battery to starter solenoid.

5. Disconnect high tension coil lead and close starting motor "clicker" switch to crank engine. Note the exact reading on voltmeter.

6. Open starter motor switch. Turn Battery Tester control knob clockwise until the voltmeter reads exactly as in Step No. 5.

CAUTION: Do not turn handle in counter-clockwise direction, as this will connect ammeter directly across battery causing a direct short.

7. Read test ammeter for starting motor amperage draw. This should be approximately 130 to 165 amps. If amperage draw is higher than specified, various conditions within the starter could cause the trouble, such as: The armature touching the field coils, a grounded field coil, worn starter bushings, bent armature shaft, etc.

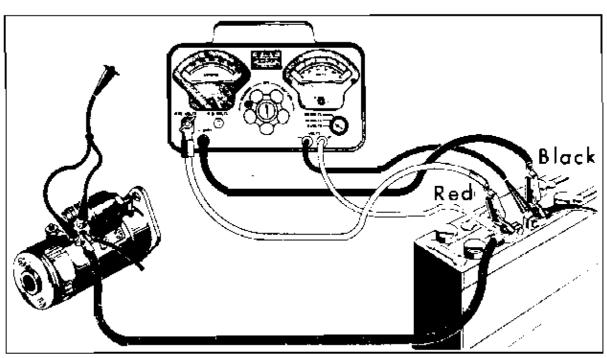


Fig. 11-6 Amperage Draw Test

(10) Inspection and Adjustment of Distributor Contact Points

a. Inspection

Remove distributor cap from the distributor and inspect the contact points for pitting, oxidation, misalignment, or an oily surface.

Pitted or oxidized points should be replaced, and misaligned points should be properly aligned and set. Contact points with an oily surface should be inspected for pitted or oxidized condition, and the source of oil located and corrected. If the points are worn evenly and show a uniform gray surface, they do not need attention, providing the point gap is within limits.

b. Adjustment

1. Loosen contact point support hold-down screw.

2. Set distributor shaft so contact arm rubbing block rests on one lobe of distributor cam.

3. Turn eccentric screw until gap between contact points measures .016" (new and used points).

4. Tighten hold-down screw and recheck gap.

The cam or dwell angle of distributor is 26 - 33 degrees. Dwell angle should not be used as the absolute setting for contact point gap. A feeler gauge or preferably a dial indicator is the only accurate method of measuring point gap.

Whenever the points are cleaned, adjusted, or replaced, the distributor cam wick, breaker plate bushing and felt, and pivot pin should be lubricated with 1 or 2 drops of No. 10-W oil. Lubricate distributor cam lobes with a slight amount of "M31-Lubrico" to reduce rubbing block wear.

(11) Distributor Test Information

For Service Stations equipped with distributor testing machines, the information on 1954 service distributors is furnished below:

Maximum vacuum advance is 13^{o}-14.5^{o} at 16"-17" Hg. Vacuum advance starts at 6.5 to 9.0" Hg.

Centrifugal Advance

Engine Speed R.P.M.	Engine Degrees Spark Advance	Distr. Speed R.P.M.	Spark Advance Distr.
800	0	400	0
1200	3-6.5	600	1-3.25
1600	9-13	800	4.5-6.5
1900	14-18	950	7-9
2400	16-20	1200	8-10
3200	19-23	1600	9.5-11.5
4000	22.5-26.5	2000	11.25-13.25

Vacuum Advance

Vacuum-Inches of Mercury	Distributor Degrees	Engine Degrees
6-1/2	0	0
10	1-1/2 - 4-1/2	3-9
12	5-1/2 - 8-3/4	11-17
14	9 - 12-1/4	18-24
16	11-3/9 - 14-1/2	24-29
17	Min. 13	Min. 26

The 1954 series distributor advance mechanism is designed to give maximum fuel economy and performance. The effect of this design is represented in the above chart. Fig. 11-7.

If tests indicate an improperly operating advance mechanism, disassemble the distributor, as outlined in Note No. 12, and repair or replace worn or defective parts.

Reassemble distributor, as outlined in Note No. 13, and measure the contact arm spring pressure. This spring pressure should be 19-23 oz. To adjust spring tension, bend spring until required tension is obtained. Adjust contact points, as outlined in Note 10b. The gap measurement should be .016".

(12) Removal and Disassembly of Distributor

a. Removal

1. Remove distributor cap from distributor.

2. Disconnect vacuum pipe at vacuum control. Fig. 11-8.

3. Disconnect primary lead at distributor.

4. Turn the engine to top dead center for number one cylinder ("C" on harmonic balancer). The rotor will now point to number one insert in distributor cap, toward rear of engine.

5. Remove distributor hold down nut and clamp.

6. Lift the distributor out of the engine.

NOTE: The distributor rotor will turn slightly as the drive gear becomes disengaged from the teeth of the camshaft gear. Scribe a line on the edge of the distributor cup, directly below the tip of the rotor. This will assure proper engagement of drive gear teeth with camshaft teeth to retain correct timing when reinstalling distributor.

b. Disassembly

1. Remove rotor from end of distributor shaft. Fig. 11-8.

2. Remove ground wire screw at breaker plate, and two screws holding vacuum advance to distributor housing, and remove vacuum advance mechanism.

3. Remove primary insulator from housing.

4. Remove three screws holding breaker plate to distributor housing.

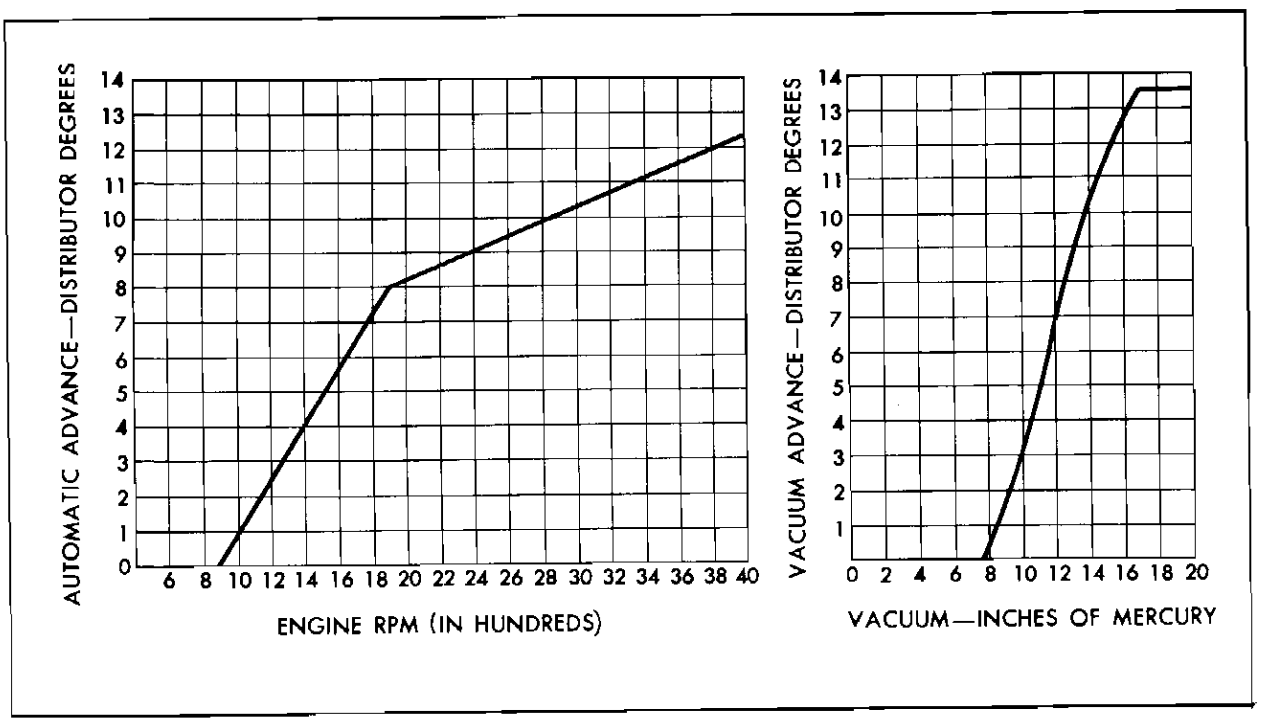


Fig. 11-7 Distributor Advance Curves

NOTE: Two of these screws hold the distributor cap retaining clips in position.

5. Lift breaker plate contact point and condenser assembly out of distributor housing.

6. Remove contact point support hold-down screw.

7. Remove contact points.

8. Disassemble contact arm spring, primary jumper wire, and condenser lead wire from contact point support fibre insulator.

9. Remove condenser hold-down screw and condenser from breaker plate. Inspect bushing in breaker plate for wear.

NOTE: The breaker plate assembly is serviced as a complete assembly. No attempt should be made to disassemble this unit.

10. Bend down ends of counterweight hold-down plate lock washers, and remove nuts and lock washers.

11. Remove both governor weight springs and remove governor hold-down plate.

12. Remove both governor weights.

13. Remove "O" ring seal from shaft housing.

NOTE: No attempt should be made to remove the distributor shaft from housing, as this is serviced as an assembly.

(13) Assembly and Installation of Distributor

a. Assembly

To assemble the distributor, reverse the disassembly procedure as outlined above, being sure to install new governor weight hold-down plate lock washers. Bend tangs of these washers up around nuts.

b. Installation

1. Install rubber "O" ring seal below distributor housing mounting flange.

2. Install distributor, starting with rotor pointing toward rear and slightly to right of engine.

NOTE: If the engine has been cranked, remove number one spark plug. Crank the engine until number one piston is in firing position, and timing mark "C" lines up with pointer on engine front cover, engage distributor drive gear with oil pump drive shaft so that rotor is above mark scribed on edge of cup in removal.

3. Install distributor hold-down clamp and nut.

4. Connect distributor primary lead.

5. Install distributor cap.

6. Fill distributor oiler tube with 10-W oil.

7. Set timing (Note 14).

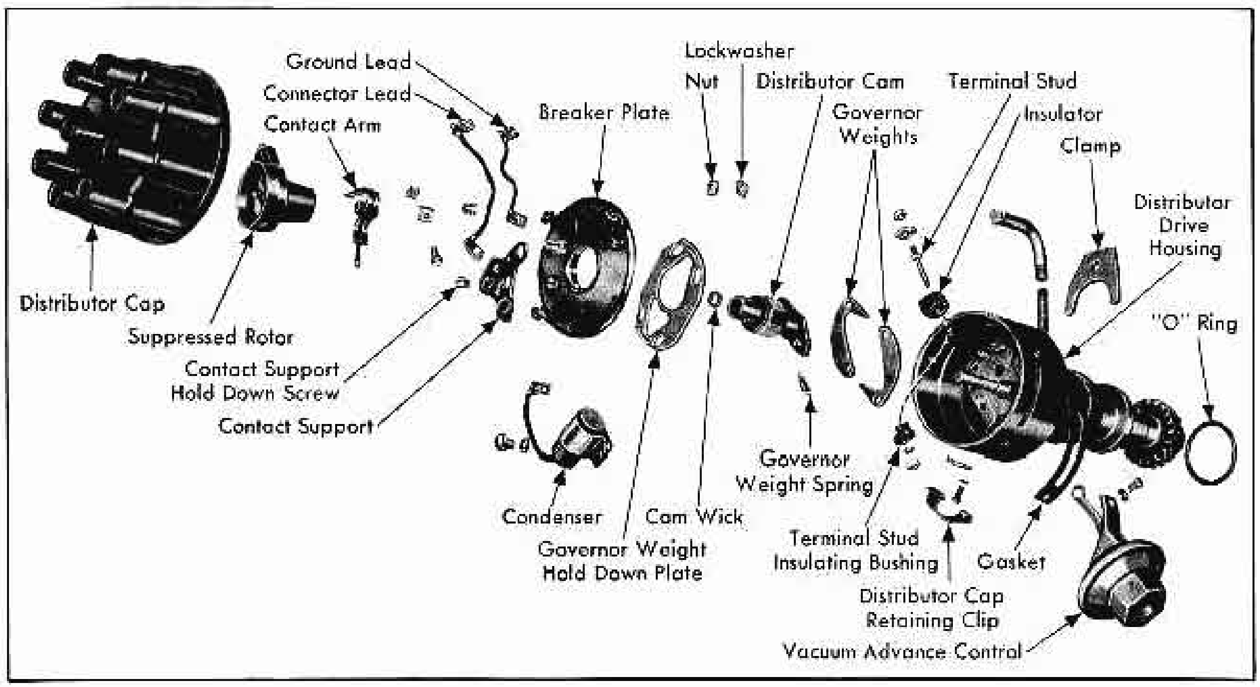


Fig. 11-8 Distributor Disassembled

8. Connect vacuum advance pipe at vacuum control unit.

(14) Setting Timing

1. Adjust distributor clamp nut to allow the distributor to be turned without excessive looseness.

2. Disconnect carburetor vacuum advance pipe at distributor and plug end of pipe with tape. (This is important, as carburetor trouble can affect the timing adjustments). Fig. 11-9.

3. Insert an adapter pin alongside No. 1 wire in distributor cap, if spark plug connectors are not available.

4. Connect a suitable timing light to adapter or connector.

NOTE: Make sure that timing marks and timing pointer are clean. Then draw a chalk line half way between "A" and "C" lines on the harmonic balancer.

5. Start engine and warm to operating temperature. Engine idle speed should be 400 R.P.M. Observe timing light flashes on harmonic balancer in relation to pointer, and rotate distributor so that light flashes as pointer and the chalk line on the harmonic balancer are opposite each other. The chalk line is 2-1/2 degrees before top dead center, Fig. 11-9.

NOTE: In localities where gasoline of the required octane rating is not available, the ignition timing may be retarded toward the "C" line on harmonic balancer to eliminate "PING".

6. Insert an adapter pin alongside No. 6 wire and note the chalk line with relation to the pointer when light flashes. If the chalk line shows up before or after the pointer, set the distributor to divide the variance.

NOTE: If this variance is excessive, the distributor and its alignment should be rechecked.

7. Tighten clamp nut to 15 to 18 ft. lbs. and recheck timing to make sure that it did not change.

8. Remove tape from distributor pipe, and connect pipe.

NOTE: If timing advances with engine idling, it is a fair indication that the throttle valves are open. Carburetor cleaning and adjustment is then necessary.

(15) Generator Charging Circuit Precautions

The following precautions are extremely important in avoiding trouble in the charging circuit. Fig. 11-10. Everyone who does any electrical work whatever should be thoroughly familiar with them.

The battery should always be disconnected before any wires at the generator or at the voltage

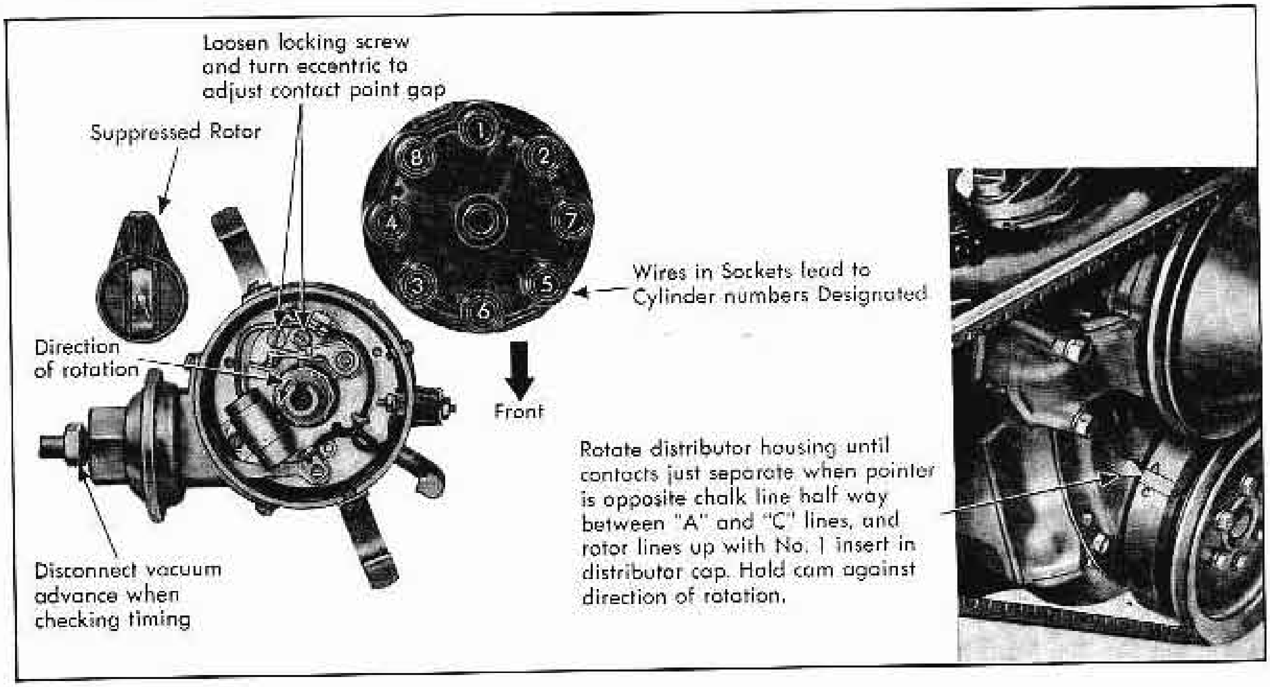


Fig. 11-9 Ignition Adjustments

regulator are removed. This is necessary to prevent the possibility of loose connections being grounded in such a way as to reverse the generator polarity - a condition which will cause arcing, fluttering and burning of the cut-out relay points.

A further precaution to assure correct generator polarity after connecting the battery, generator, and regulator is to connect a jumper lead momentarily between the "Gen" and "Bat" regulator terminals before starting the engine. The momentary surge of battery current will polarize the generator correctly.

When installing a radio noise suppression condenser on a generator, be sure it is connected to the generator armature terminal. Under no circumstances should it be connected to the field terminal, as this would result in rapid oxidation of the regulator contact points. Never run or test the generator on an open circuit for more than a few seconds as both the generator and regulator may be damaged.

(16) Generator Tests

a. Output Test

1. Disconnect lead from battery terminal of the regulator.

2. Connect ammeter leads of Volt-Ampere Tester as shown in Fig. 11-11.

3. Be sure knob on Volt-Ampere Tester is in "DIRECT" position.

4. Temporarily ground the generator field, with the jumper lead.

5. Start the engine and gradually increase its speed until the ammeter indicates at least 25% (38 amperes) above rated generator output of 30 amperes. This will indicate that the generator is in good condition. If the generator does not produce its rated maximum output in the above test the generator should be checked further to determine the cause of low output.

b. Visual Inspection

Check For:

1. Sticking or worn brushes.

2. Burned insulation or thrown solder.

3. Dirty, burned, or glazed commutator.

4. Frayed, worn or slipping fan belt.

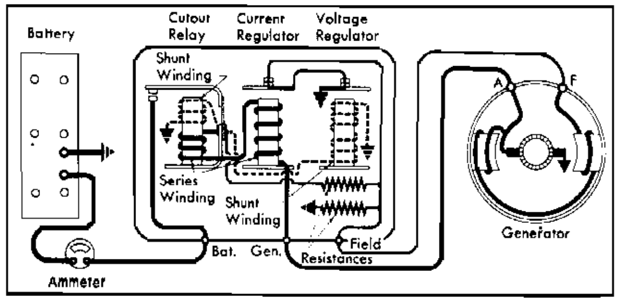


Fig. 11-10 Generator Charging Circuit

c. Testing for Ground in Generator

1. Remove the generator from the car.

2. Raise ground brush from commutator and insulate it from commutator with a piece of cardboard.

3. Connect the Armature Tester to a 110 volt supply outlet.

4. Using test points, check for ground from main brush lead on "A" terminal to generator frame.

5. If a ground is indicated in above tests, raise and insulate both brushes and check in turn, the insulated brush holder, armature commutator, and fields to locate the ground.

d. Checking for Open Circuit or Shorts

1. If no ground is indicated in above test, check field coils for open circuit.

2. Remove armature from generator and check between adjacent bars with test points. An open circuit in the armature windings will be indicated if the bulb on the tester does not light.

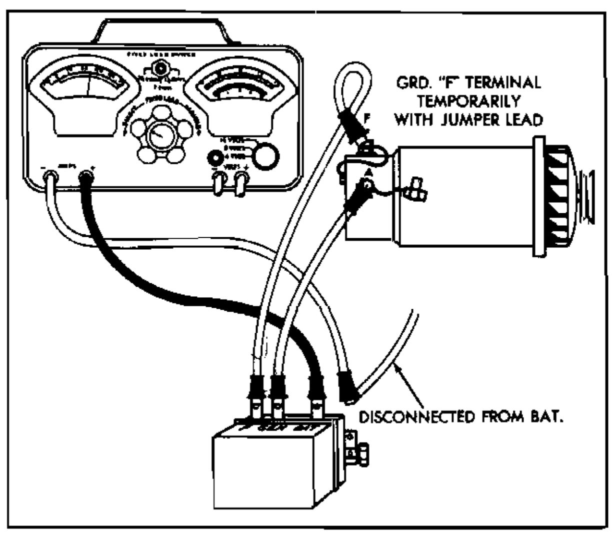


Fig. 11-11 Generator Output Test

3. Test armature for short circuit using the "growler" on the tester. A short circuit will cause a short strip of steel, such as a hack-saw blade, held over the armature core to vibrate.

(17) Generator Circuit Resistance Tests

Excessive resistance in the charging circuit will cut down current to the battery and increase generator voltage. It is important, therefore, to determine the voltage drop through the charging circuit.

a. Insulated Side of Charging Circuit

1. With control knob in "DIRECT" position, set voltmeter selector switch of the Volt-Ampere Tester to 4 volt position.

2. Temporarily ground the generator field terminal, with jumper wire.

3. Connect test leads as shown in Fig. 11-12.

4. Start engine and adjust speed so that the generator charges exactly 20 amperes without lights, radio, heater, or other accessories operating. The voltmeter should not read more than .8 volt, from the armature terminal of the generator to the positive terminal of the battery.

If voltmeter reading exceeds .8 volt, it indicates excessive resistance in the circuit.

With charging rate at exactly 20 amperes, place voltmeter leads across each part of the circuit in turn. The readings should not exceed the following values:

a. From armature terminal of generator to armature terminal of regulator . . . . . . .15 volts

b. From armature terminal of regulator to battery terminal of regulator . . . . .20 volts

c. Average voltage drop across test ammeter and leads . . . . . .25 or less

d. From end of disconnected battery wire to ungrounded post of battery . . . . .20 volts

Total .80 volts or less

b. Ground Side of Charging Circuit

1. Be sure the control knob is in "DIRECT" position.

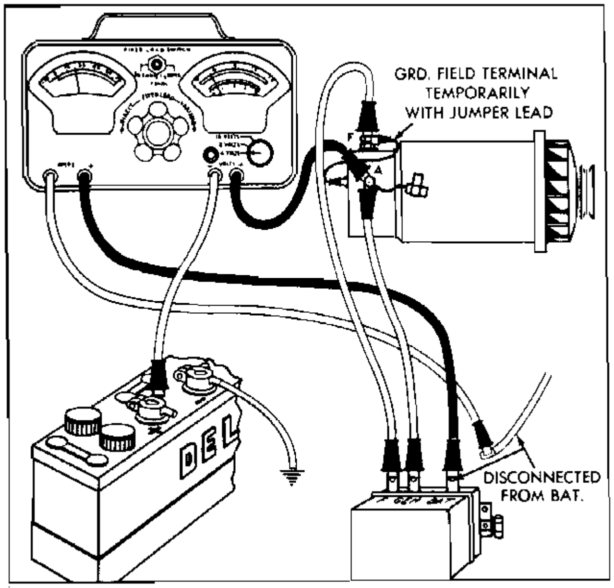


Fig. 11-12 Generator Circuit Resistance Test-Insulated Side

2. Connect ammeter and jumper lead, as shown in Fig. 11-13, and leave voltmeter selector switch in 4 volt position.

3. Connect the voltmeter from the grounded battery terminal to the ground on the generator end frame.

4. With an ammeter reading of 20 amperes, the voltmeter should not exceed .1 volt.

c. Regulator to Ground

1. Remove jumper lead from the generator field circuit.

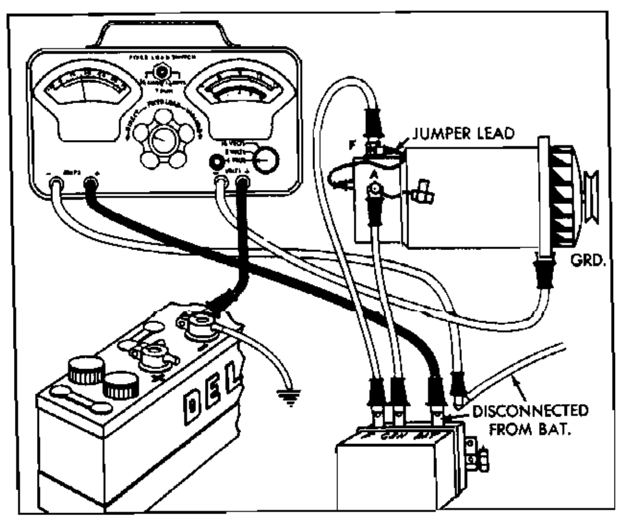


Fig. 11-13 Generator Circuit Ground Test—Grounded Side

2. Be sure control knob is in "DIRECT" position.

3. Connect ammeter as shown in Fig. 11-14.

4. Connect the voltmeter from the generator ground to base of regulator assembly. Be sure voltmeter switch is in 4 volt position.

5. Slowly increase engine speed from idle to 1,500 R.P.M. while observing the voltmeter. Voltmeter reading should be less than .1 volt if regulator ground circuit is satisfactory.

NOTE: Increase engine speed momentarily to see if the generator charges after the jumper lead is removed. If the generator charges with the jumper lead on, but will not charge after the jumper lead is removed, the most common causes are: Cutout relay set too high, voltage regulator set below closing voltage of the cutout relay, or a defective field circuit in the regulator.

(18) Removal of Generator

1. Disconnect battery.

2. Disconnect wires from generator.

3. Remove two generator mounting bolts and nuts, adjusting screw, and generator belt.

4. Remove generator from engine.

(19) Disassembly of Generator

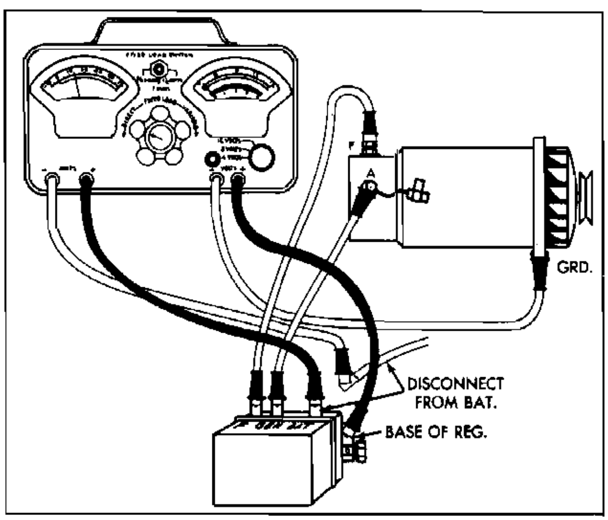


Fig. 11-14 Regulator Ground Test

1. Place generator in a bench vise, using vise as a holding fixture only, using care not to damage frame.

2. Remove two through bolts and end frame.

3. Remove drive end frame and armature assembly from generator frame.

4. Inspect brush holders in frame to see that they are not loose and that they are properly aligned.

5. Inspect Durex bearing in commutator end frame for wear. If bearing is worn excessively, replace commutator end frame.

6. Remove generator pulley, attaching nut, and lock washer.

7. Remove generator pulley, using vise as holding fixture for armature.

8. Remove key from shaft and slide outside spacer washer off the shaft.

9. Remove drive end frame with bearing and bearing retainer plate from armature shaft.

10. Remove bearing retainer plate screws, retainer plate, and gasket from drive end frame.

11. Remove bearing from drive end frame.

12. Slide inside spacer washer from armature shaft.

13. Remove field and armature terminal nuts, and push terminal studs through frame.

14. Remove two large screws which hold pole pieces and field coils to generator frame.

15. Remove pole pieces and field coils as an assembly from the generator frame.

(20) Assembly of Generator

1. Install pole pieces in field coils and install this assembly in generator frame, being sure field terminal lead is near the hole in frame for lead terminal stud.

2. Install two screws which hold pole pieces and field coils to frame, and tighten.

3. Install field terminal stud through insulator in generator frame.

4. Install armature lead and terminal stud through insulator in generator frame.

5. Install narrow spacer washer on armature shaft.

6. Pack drive end bearing with chassis grease and install in drive end frame.

7. Install bearing retainer plate and gasket on drive end frame and install screws.

8. Install drive end frame assembly on shaft and slide on thick spacer washer.

9. Install key in keyway of armature shaft and install generator ventilating fan and pulley.

10. Install lock washer and nut on end of armature shaft and tighten to 70 ft. lbs. torque.

11. Install armature and drive end frame assembly in generator frame, holding brushes out to clear commutator.

12. Position generator frame dowel pin with hole in drive end frame.

13. Inspect brushes to see that they are seated correctly.

14. Install commutator end frame on generator frame, aligning dowel pin with hole.

15. Install and tighten two through bolts.

(21) Installation of Generator

1. Install generator on right exhaust manifold bracket and loosely install two mounting screws and generator adjusting strap clamp screw.

2. Install generator belt

3. Connect field and armature wires.

4. Connect battery.

5. Momentarily connect a jumper lead on regulator, across "Gen" and "Bat" terminals before starting engine, to assure correct polarity.

(22) Accessory Ground Circuit Test

The headlights and accessories are usually grounded to the body or sheet metal of the car. If there is not a good ground circuit between the car body and the engine, there will be a voltage drop from the car body to the engine when the lights and accessories are turned on. This condition will result in light flare-up or could cause reverse generator polarity.

NOTE: This test must be made with engine off.

1. Turn the voltmeter selector switch to the 4 volt position.

2. Connect one voltmeter lead to ground on the car body and the other lead to ground on the engine.

3. Turn on all lights and accessories, then note the voltmeter reading. This should not exceed .1 volt.

4. If the voltmeter reading exceeds .1 volt, test the voltage drop at the ground strap connection between the engine and car body.

(23) Primary Wiring Insulation Test

This test, using a megohm tester, is used to detect intermittent short circuits. The megohm test applies approximately 500 volts to the circuit and will show intermittent and "damp weather" shorts that cannot be found by other methods.

1. Disconnect the positive battery cable from its battery post.

2. Turn off all switches, and close all doors to prevent operation of courtesy lights from door switches.

3. Turn the tester master switch "ON".

4. Connect the condenser tester leads together and turn switch to megohm position. Adjust meter to "SET LINE" with regulator.

5. Touch battery cable to its battery post to wind clock or disconnect clock for safety.

6. Connect condenser leads as shown in Fig. 11-15. Meter should read in Blue Meg band if insulation in primary circuit is normal.

7. If tester reads out of the blue band after disconnecting the clock, the short in the primary

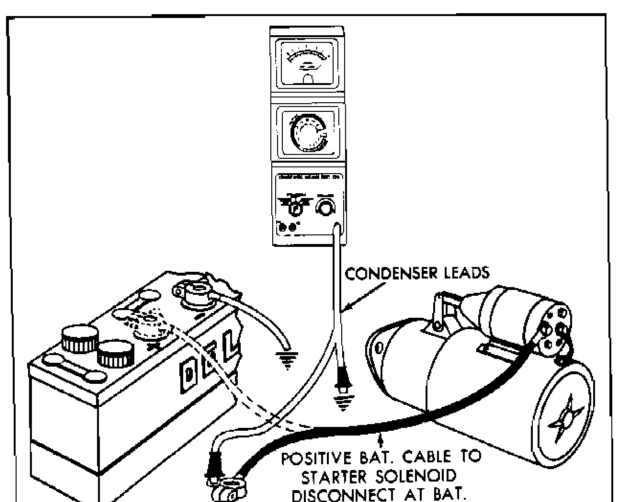


Fig. 11-15 Primary Wiring Test

wiring circuit may be located by disconnecting the battery wire at each of the following units in turn:

Stop Light Switch
Courtesy Light Switches
Horn Relay and Wire
Starter Switch
Light Switch
Ignition Switch
Regulator
Spotlight Switch
Heater Switch
Condenser - Generator

(24) Regulator Tests

In analyzing complaints of generator operation, any of several basic conditions may be found.

a. Fully Charged Battery and Low Charging Rate

This indicates normal generator-regulator operation. Regulator settings may be checked as outlined in Notes 26, 27 and 28.

b. Fully Charged Battery and a High Charging Rate

This indicates that the voltage regulator is not reducing the generator output as it should. A high charging rate to a fully charged battery will use excessive water, damage the battery, and the accompanying high voltage is very injurious to all electrical units.

This operating condition may result from:

1. Improper voltage regulator setting.
2. Defective voltage regulator unit.
3. Grounded generator field circuit (in either generator, regulator, or wiring).
4. Poor ground connection at regulator.
5. High temperature which reduces the resistance of the battery to charge so that it will accept a high charging rate, even though the voltage regulator setting is normal.

If the trouble is not due to high temperature, determine the cause of trouble by disconnecting the lead from the regulator "F" terminal with the generator operating at medium speed. If the output remains high, the generator field is grounded either in the generator or in the wiring harness. If the output drops off, the regulator is at fault and it should be checked for a high voltage setting or grounds.

c. Low Battery and High Charging Rate

This is normal generator-regulator action. Regulator setting may be checked as outlined in Notes 26, 27, and 28.

d. Low Battery and Low or No Charging Rate

This condition may be due to:

1. Loose connections, frayed or damaged wires.
2. Defective battery.
3. High circuit resistance.
4. Low regulator setting.
5. Oxidized regulator contact points.
6. Defects within the generator.

If the condition is not caused by loose connections, frayed or damaged wires, and the system voltage is still low, momentarily ground the "F" terminal of the regulator with the generator operating at a medium speed.

If output increases, check the regulator for oxidized contact points or a low voltage setting, either of which would prevent the generator from producing rated output.

Make the following test to check for oxidized contact points:

1. Insert an ammeter at the "BAT" terminal of the regulator and turn control knob of Volts Ampere Tester to "DIRECT" position.

2. Turn on headlights and operate engine at a speed which will produce 5 ampere output.

3. Ground the "F" terminal momentarily with jumper lead. Fig. 11-16.

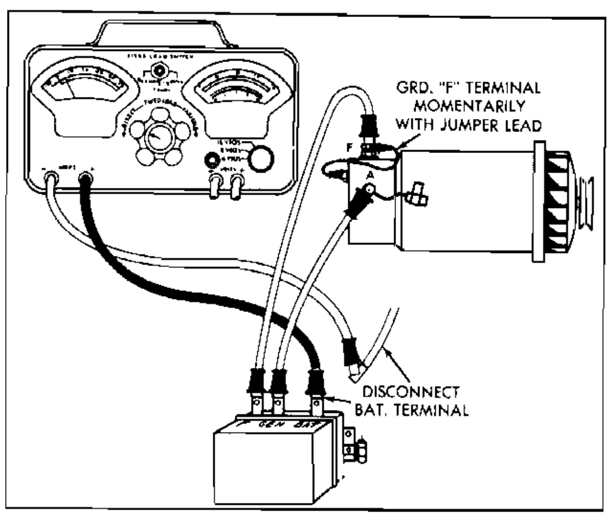


Fig. 11-16 Testing for Oxidized Points

4. If output increases more than 2 amperes, oxidized points are indicated and both voltage and current regulator points should be cleaned.

5. If output remains low, test the generator.

6. If no output at all is obtained from the generator, make sure cut-out relay is operating, since it may be failing to close, due to an open circuit in the core winding.

e. Burned Resistors, Windings, or Contacts

These result from open circuit operation or high resistance in the charging circuit. Where burned resistors, windings, or contacts are found, always check car wiring before installing a new regulator. Otherwise, the new regulator may also fail in the same way.

f. Burned Relay Contact Points

This is due to reversed generator polarity. Generator polarity must be corrected after any checks of the regulator or generator, or after disconnecting and reconnecting leads.

(25) Cleaning Contact Points

The contact points of a regulator will not operate indefinitely without some attention. It has been found that a great majority of all regulator trouble can be eliminated by a simple cleaning of the contact points, plus some possible readjustments. The flat points should be cleaned with a spoon or riffler file. A flat file cannot be used successfully to clean the flat contact points, since it will not touch the center of the flat point where point wear is most apt to occur. On negative grounded regulators which have the flat contact points on the regulator armatures, loosen the contact bracket mounting screws so that the brackets can be tilted to one side. Never use emery cloth or sandpaper to clean the contact points.

(26) Voltage Regulator Adjustments

The voltage control unit of the regulator limits charging system voltage to the value for which the unit is adjusted. This test should be made at normal operating temperature.

1. Make certain jumper wire is removed from field terminal of generator.

2. Switch voltmeter to 16 volt scale and rezero the pointer to the set line while pressing the chrome button.

3. Connect a 1/4 ohm resistor to the regulator

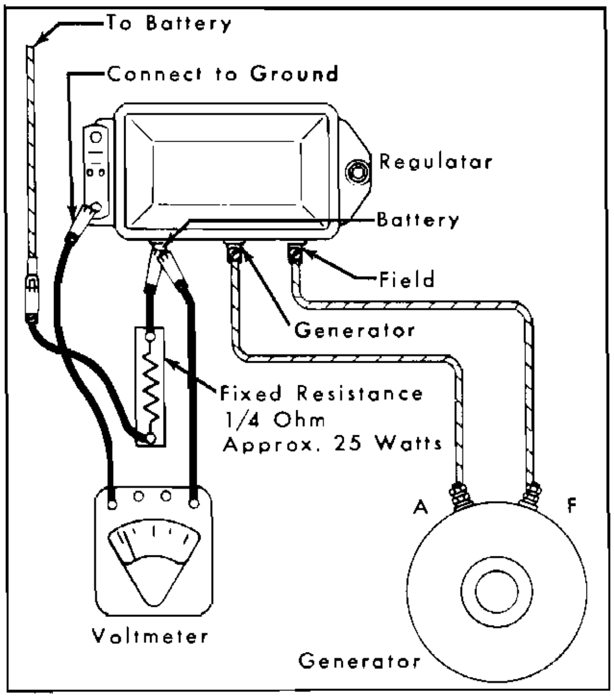


Fig. 11-17 Voltage Regulator Adjustment

"BAT" terminal and to the loose insulated wire connector as indicated in Fig. 11-17. No polarity precautions are required.

4. Connect voltmeter across charging circuit, putting red clip on regulator "BAT" terminal and black clip on ground.

NOTE: Since the voltage drop tests have been made, making certain regulator is properly grounded, the black clip can be connected to the regulator base, generator frame, or the negative battery clamp.

5. Start engine and run at 1500 R.P.M. to normalize temperature of voltage regulator unit.

NOTE: The regulator cover must be in place during this procedure. If the system has started out cold, a warm-up period of 15 minutes, with the voltage regulator operating, would be necessary. Be certain all lights and accessories are "OFF".

6. The next step is to cycle the regulator. This is done by slowing the engine down briefly. Move the red voltmeter clip to the "GEN" terminal and reduce engine speed until generator voltage drops to 4 volts. Then move voltmeter clip back to "BAT" terminal.

7. Slowly increase engine speed to 1500 R.P.M. and note voltmeter reading. The reading should be between 13.8 and 14.8 volts.

8. Slow engine to idle.

9. If voltage is other than specified, remove the cover and check air gap with points just barely touching. This should be .075" and may be adjusted by loosening the armature screws and moving the armature either up or down as required. The point gap, with armature down, should not exceed .012".

10. Check that generator voltage is down to 4 volts and run engine back up to 1500 R.P.M. Take another reading.

NOTE: A difference in readings may be evident with the cover off. Allow for this difference when adjusting the voltage.

11. Turn adjusting screw clockwise to raise voltage to 14.5 volts. If setting is above 14.5 volts, loosen screw until voltage is below 14.5 and make final adjustment by increasing the voltage to 14.5. Recheck voltage setting after cover is installed.

(27) Cut-Out Relay Adjustments

The cut-out relay has two functions: to close the charging circuit when the generator potential is higher than that of the battery, in order to maintain the charge of the battery; and to open the charging circuit when the generator potential is lower than the battery, to prevent discharge of the battery through the generator.

To determine the closing voltage of the relay, test as outlined below:

1. Turn the control knob of Volt-Ampere Tester to "DIRECT" position.

2. Turn voltmeter selector switch to 16 volt position.

3. Connect test ammeter and voltmeter leads as shown in Fig. 11-18.

4. Start engine and slowly increase engine speed, noting voltage at which cut-out relay points close. When the relay points close, the voltmeter needle flickers and the ammeter starts to register.

5. The cut-out relay points should close between 11.8 and 13.6 volts at operating temperature with cover on.

If closing voltage is outside these limits, the cover should be removed and the air gap, between the cut-out armature and center of core should be checked and adjusted to .020". The air gap may be adjusted by loosening the two screws on the back of relay and raising or lowering the armature as

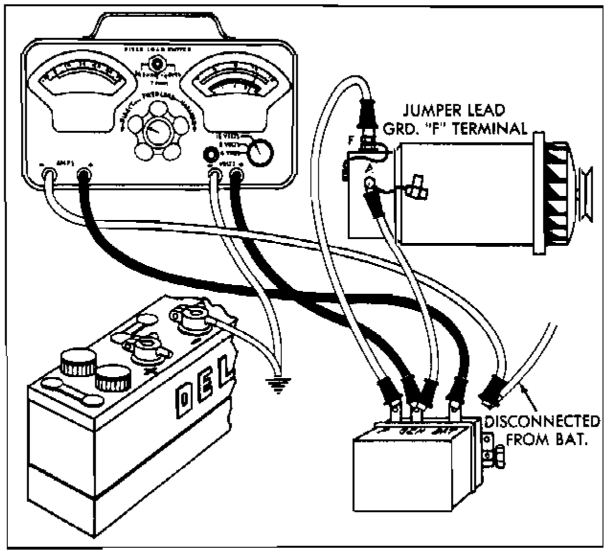


Fig. 11-18 Cut-Out Relay Adjustment

necessary. Make sure that both points on the armature close simultaneously. If they do not, bend spring fingers so they do. Adjust the closing voltage by turning adjusting screw clockwise (left hand threads) to increase closing voltage and counterclockwise to decrease closing voltage. Adjust to 12.8 volts.

(28) Current Regulator Adjustments

The current regulator limits the flow of current from the generator. Too low a current setting will prevent the generator from carrying the ignition, accessory, and battery charging loads, while too high a setting will overload and burn out the generator armature.

1. Be sure the jumper lead is removed from the generator field circuit.

2. Connect the Volts-Ampere Tester with control knoh locked in "FIXED LOAD" position, as shown in Fig. 11-19 (Voltmeter leads not used).

3. Be sure the "FIXED LOAD" switch of the tester is in the 1-1/2 ohm position.

4. Start engine and adjust speed to approximately 1500 R.P.M.

5. With the cover in place and the regulator at operating temperature, turn the control knob of the tester to "VARIABLE" position, and adjust the control knob to obtain the highest possible reading on ammeter (27-33 amps).

6. If regulator setting is other than specified above, the cover should be removed and the points inspected for burning or pitting.

7. Adjust the air gap between core and armature to .075" with points just touching.

8. Contact point opening with armature down should be .012" minimum.

9. Turn adjusting screw clockwise to increase current or counter-clockwise to decrease the current setting. Make final adjustment by increasing current setting. Adjust to 30 amperes, and recheck with cover in place.

(29) Secondary Efficiency Test

This test provides an over-all indication of the performance of the entire ignition system.

1. Turn coil tester selector switch to secondary efficiency position.

2. Connect Tachometer leads, as shown in Fig. 11-20.

3. Start engine and set speed at 1000 R.P.M.

4. Ground red (positive) lead of Coil Tester.

5. Connect the black lead to each spark plug in turn, and note the reading on the secondary efficiency scale of the Coil Test Meter.

6. Readings should be in the good band and even at all plugs.

Secondary efficiency test indications are as follows:

a. Reverse meter reading (off scale to left with leads connected as in Steps 4 and 5) indicates-coil of wrong polarity; primary wires reversed at coil; or battery connected backwards.

b. Uneven reading at plugs indicates defective spark plug wires or connections, corroded distributor cap towers, uneven spark plug gaps, or a "COCKED" distributor cap.

c. Unusually high readings at two or more plugs indicates a cracked distributor cap or insulation breakdown between spark plug wires.

d. Low reading at all plugs indicates excessive resistance in either the primary or secondary circuit, or a weak coil.

e. If the reading is unusually low at one or two plugs, remove the wire from the plug and again note the reading. If the reading improves with the wires removed, the plug is shorted out.

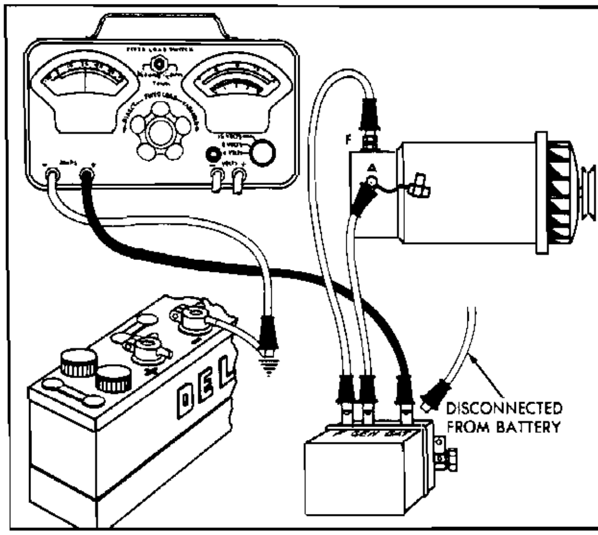


Fig. 11-19 Current Regulator Adjustment

(30) Cleaning and Setting Spark Plugs

Type 46-5 spark plugs are used on 1954 engines, and should be cleaned with an AC Model "A" or "K" spark plug cleaner. The condition of the cleaning compound is important. It must be dry, because, if moist, the compound may pack in the space between the insulator tip and shell, allowing only the tip of the plug to be cleaned. Also, the compound must be sharp to do a good cleaning job. After prolonged use, the particles of compound lose their sharp cutting edges and will not clean properly.

With the spark plug in the cleaner and the air blast turned on, press the cleaner hood down, rocking the plug, if the model "A" cleaner is being used. Raise the cleaner hood to the air blast position for a few seconds. Rotate the plug in its adapter and repeat the operations until the entire insulator is clean (white). It should be noted here that some spark plugs may have fused deposits on the lower insulator tips that are difficult, if not impossible, to remove. Make sure that all cleaning compound is removed from the plug.

The correct spark plug gap for 1954 engines is

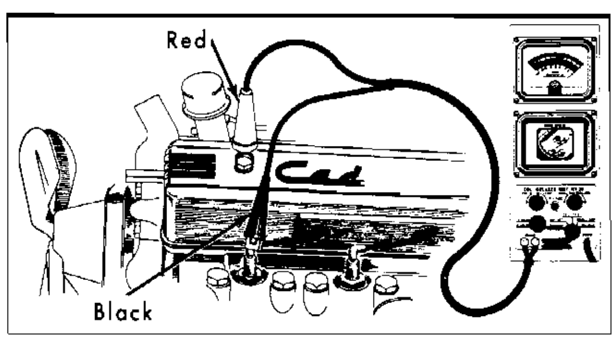


Fig. 11-20 Secondary Efficiency Test

.035". The gap should be checked only with a round wire gage, and should be adjusted by bending the side electrode only. Never bend the center electrode. The plugs should be tightened in the engines to 20-25 ft. lbs. torque.

The type 46-5 spark plug is used as original equipment on all 1954 Cadillacs to satisfy the majority of owners who largely drive at lower speeds on shorter runs. For owners who drive at higher speeds on longer runs, the cooler 44-5 type plug is recommended. When replacing spark plugs, note the condition of the electrodes. If they appear to be excessively burned or blistered, a cooler plug should be used. If the plugs have sooty carbon deposits, a hotter plug should be used. Under no circumstances, however, should a type 48 plug be used in a 1954 engine.

(31) Ignition Primary Circuit Resistance Test

Excessive voltage drop in the primary circuit will lessen the secondary output of ignition coil, resulting in hard starting and poor performance.

1. Turn the voltmeter selector switch of the Volts-Ampere Tester to the 4 volt position.

2. Connect test leads as shown in Fig. 11-21.

3. Remove distributor cap and close breaker points by rotating engine a fraction of a revolution at a time with the cranking motor.

4. Be sure all lights and accessories are turned off.

5. Turn ignition switch "ON". Voltmeter should read not more than .1 volt.

6. Test ignition switch by turning it off and on several times. Voltmeter should read the same each time switch is turned on.

7. Test all wires for tightness. Move them about and note any change in meter reading.

8. Remove voltmeter leads and place them across the primary wire from the coil to the distributor as shown by dotted leads in Fig. 11-21. Voltmeter should read less than .1 volt.

NOTE: If voltmeter reading exceeds the specified maximum, isolate the point of high resistance by placing the test leads across each connection and wire in turn. The reading across a connection should be zero. The reading across any one wire should be proportionate to its length as compared to the length and allowable voltage drop of the entire circuit.

(32) Ignition Coil Tests

The coil in the ignition circuit of an engine acts as a transformer by stepping up the battery voltage to a voltage sufficiently high to jump the rotor gap in the distributor and the spark plug gap while under compression. The common causes of coil failure are as follows:

1. High resistance due to corroded connections or broken wires.

2. Short circuits or breakdown of insulation between turns of the coils and grounds.

3. Breakdown of insulation between the windings and the core or case.

a. Reading the Coil Tester Meter

The OHM scale is to be used for measuring the resistance from zero Ohms to 100,000 Ohms.

To measure the resistance of a unit, connect the positive primary and the ground lead clips together. Turn the switch to the "DWELL-OHM" position.

Adjust the Dwell-Ohm Regulator until the meter reads on the set line. Disconnect the leads. Connect the unit in which resistance is being measured, in series with the test leads. The meter will then indicate the amount of resistance in the unit.

The "OHMS" scale is read from right to left from 0 to 100,000 Ohms. From 0 to the first graduation indicates 100 Ohms. 5C indicates 500 Ohms, 1M indicates 1,000 Ohms, 100M indicates 100,000 Ohms.

b. Calibrating the Coil Tester

To assure an accurate test of the ignition coil,

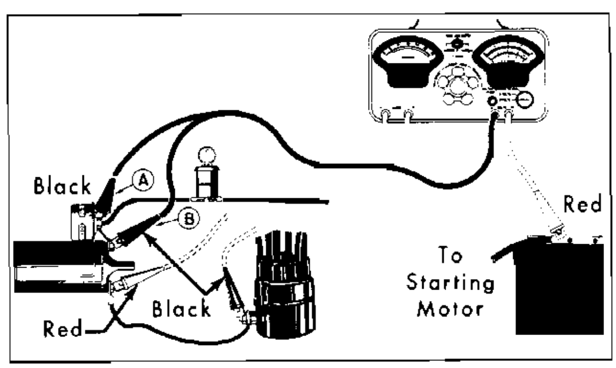


Fig. 11-21 Ignition Primary Circuit Resistance Test

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the battery in the tester must be charged to at least 1.250 specific gravity. The calibration of the Coil Test Unit will vary slightly with long periods of use due to normal wear of the point rubbing block in the breaker assembly. The calibration should be checked and adjusted, if necessary, at least twice each year.

IMPORTANT: This procedure outlines the proper method of testing the calibration of the Coil Test Unit. The calibration of the Unit should be checked at least twice a year and more often if in continuous use.

1. Zero meter to left side of scale, using adjustment on face of meter.

2. Connect blue ground and red primary leads together as shown in Fig. 11-22.

3. Turn master switch "ON".

4. Turn switch of the Coil Tester Unit to "DWELL-OHM" position, and use dwell-OHM regulator to adjust meter needle to set line.

5. Disconnect leads and connect the primary leads (red and black) together.

6. Meter now reads the dwell of the Coil Breaker Unit. It should be 6, plus or minus 1/2 division. If meter does not read within these limits, remove cover from Coil Breaker Unit and adjust Tester distributor points, with breaker running, until proper reading is obtained.

7. Disconnect test leads and proceed with coil tests.

c. Coil Heat On or Off the Vehicle

Before testing any coil it should be brought to operating temperature. If the coil is on a vehicle which has been operated for a sufficient period of time to bring the coil to normal operating temperature, the coil does not need additional heating before testing. If, however, the coil is not up to temperature, the coil must be heated with the Coil Heater.

1. Disconnect primary ignition lead at the distributor and remove the high tension lead from the coil tower.

2. Insert adapter lead in coil tower and connect coil tester leads as shown in Fig. 11-23.

NOTE: Primary lead may be connected directly to coil primary terminal as shown or through the hallast resistor on a 12 volt coil.

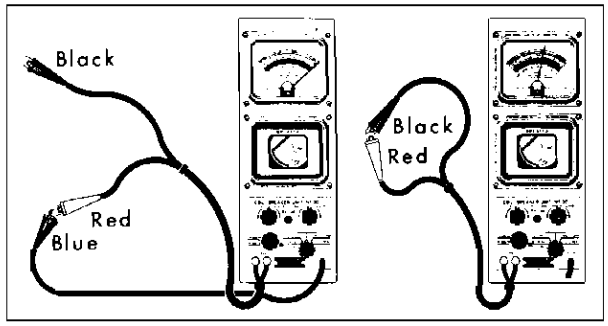

Fig. 11-22 Calibrating Coil Tester

3. Turn Master switch "ON".

4. Turn Voltage Selector Switch to 12 volt position.

5. Turn Selector Switch of the Coil Tester to "COIL HEAT" position.

6. Heat Coil 6 minutes only.

CAUTION: Do not touch leads while tester is in "Coil Heat" position. Turn selector switch to secondary efficiency position before removing clips.

d. Coil Secondary Continuity Test on Vehicle

This test is made to determine the condition of the secondary windings of the coil. A high reading will indicate an open or high resistance secondary, while a low reading will indicate a shorted winding. This test, in addition to the Coil Capacity Test, is necessary for a thorough test of the coil condition.

1. Disconnect distributor primary wire.

2. Turn Master switch "ON".

3. Turn the switch of the Coil Tester Unit to "DWELL-OHM" position.

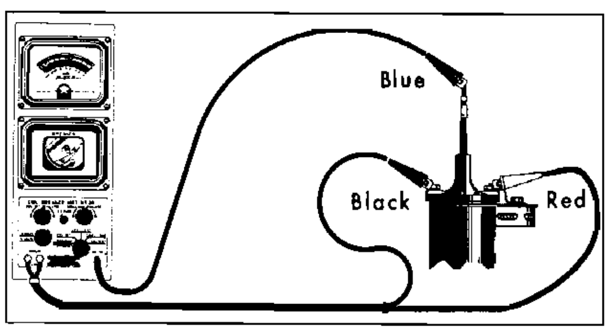

Fig. 11-23 Heating Coil

4. Connect leads as shown in Fig. 11-24.

5. The meter should read LESS than 20,000 OHMS resistance. A reading of more than 20,000 OHMS indicates a BAD coil.

e. Coil Capacity Test

This test determines whether or not the coil is satisfactory for vehicle operation when used in conjunction with the Coil Secondary Continuity Test.

1. Turn the Voltage Selector Switch of the Coil Tester to 12 volt position.

2. Disconnect the distributor primary lead (and Tach Dwell lead if used), preferably at the coil as shown in Fig. 11-25.

3. Turn on ignition switch.

4. Remove high tension lead from coil.

5. Connect tester leads as shown in solid lines, Fig. 11-25 to include ballast resistor in test circuit.

6. Turn switch of Coil Tester Unit to "Coil Set" position, and adjust Coil Set Regulator until meter reads at set point 8.

7. Turn switch to "Coil Test" position. The coil meter should be steady in the GOOD band.

NOTE: If coil tests BAD, reconnect positive tester lead as shown by dotted lines in Fig. 11-25 and readjust Coil Set Regulator until meter reads at set point 8, then retest Coil.

If the Coil now tests Good, check Ballast Resistor and resistor connections.

Ballast Resistor value:

1.40 to 1.65 Ohms.

8. Turn Tester Switch to "Secondary Efficiency" position.

(33) Condenser Tests

a. Preliminary Steps

The condenser has two important functions: First, it aids in the collapse of the primary field: Second, it prevents arcing and pitting of the breaker points.

The condenser should be tested for:

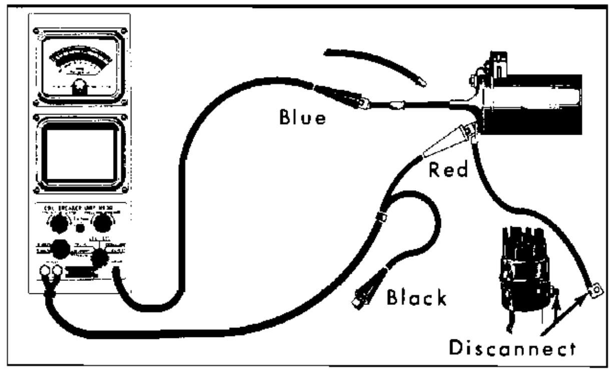

Fig. 11-24 Coil Secondary Test

1. Series resistance.

2. Correct capacity.

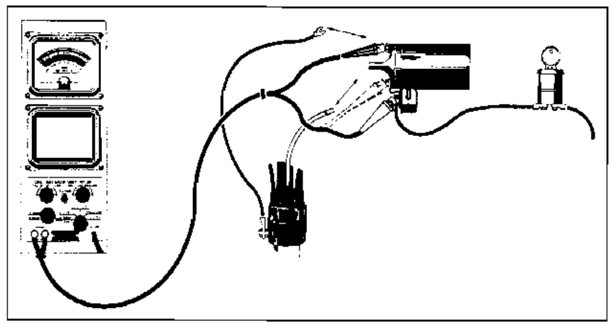

Fig. 11-25 Coil Capacity Test

3. Maximum insulation breakdown resistance.

These factors are tested on the Condenser Tester with one hook-up, by turning the Selector Switch to the proper position. First, however, the meter

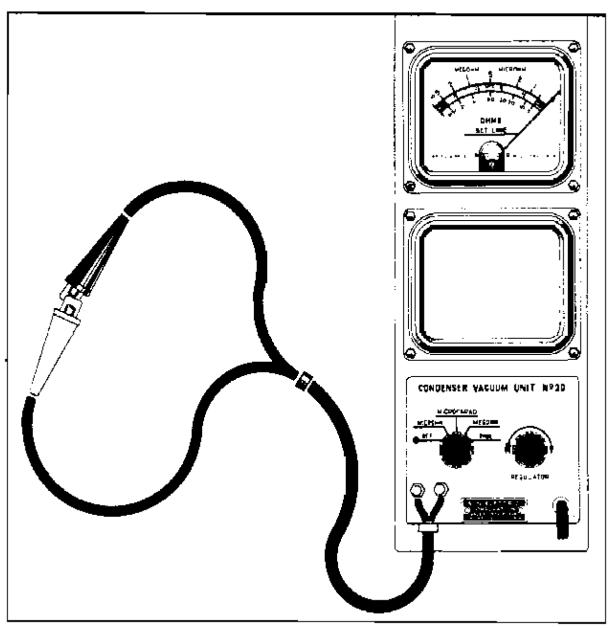

Fig. 11-26 Calibrating Condenser Test Meter

should be calibrated:

1. Connect the Condenser Tester wire clips together, Fig. 11-26.

2. Turn Master switch "ON".

3. Turn switch of the Condenser Tester Unit to "Microhm" position and allow unit to warm up.

4. Turn regulator knob until meter reads on set line.

5. Leave in "Microhm" position and proceed with Condenser Tests.

b. Condenser Tests

Microhm (series resistance) Tests

1. After calibrating tester, leave switch in "Microhm" position and connect test leads as shown in Fig. 11-27.

2. Meter should read in blue microhm bar at right of scale.

3. If reading is not in blue bar, move grounded lead of Condenser Tester to the body of the condenser. If reading improves, condenser is poorly grounded.

4. Move condenser pigtail lead about. If a deflection of the meter is noted, lead is making poor contact; condenser should be replaced.

Microfarad (capacity) Test

1. Turn switch to "Microfarad" position.

2. Read Microfarad capacity on center scale of meter.

3. Capacity should be .18 to .23 MFD.

Megohm (insulation) Test

1. Turn switch to "Megohm" position.

2. The meter should read in the blue, megohm bar at left of scale.

3. If the meter reads to the right of the blue bar, condenser Insulation is leaking.

NOTE: When testing condenser off the vehicle connect one condenser test lead to the insulated condenser terminal and the other test lead to ground on condenser body. Always discharge condenser after testing.

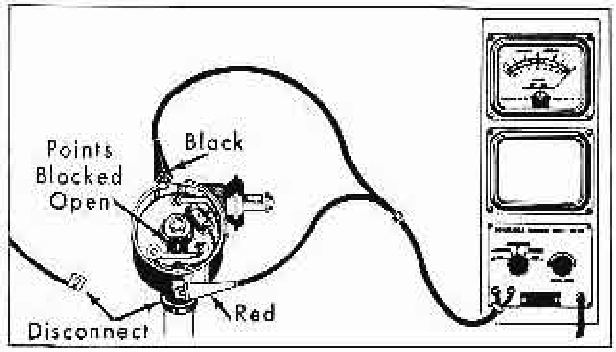

Fig. 11-27 Condenser Tests

(34) Starter Pinion Adjustment

1. Remove starter from car.

2. Press on clutch as shown in Fig. 11-28, and take up movement.

3. Check the clearance between the starter pinion and pinion stop with a feeler gage. The clearance should be .010" to .140", when in cranking position.

4. If clearance is incorrect, adjust pinion by loosening the plunger linkage screw and changing the position of the serrated linkage as required.

(35) Starting Motor Circuit

The starting motor is engaged when the ignition key is turned to the extreme right position, by means of a solenoid, Fig. 11-29, mounted on the starter housing. The solenoid first engages the starter pinion with the flywheel gear and then closes the main switch so that battery current is delivered to the cranking motor.

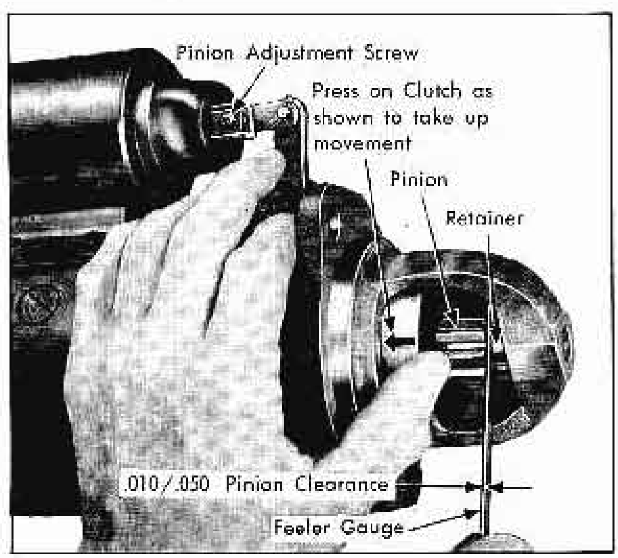

Fig. 11-28 Starter Pinion Adjustment

The solenoid is drawn into the engaged position by the pull-in coil, and held in position by the hold-in coil, while the ignition key is held in the extreme right position, Fig. 11-29. The contact bar at the end of the solenoid completes a direct circuit between the battery and the starter motor, energizing the starting motor.

The current consumption of the solenoid switch should be 72-76 amperes at 10.0 volts for both windings, and 18-20 amperes at 10 volts for the hold-in winding alone.

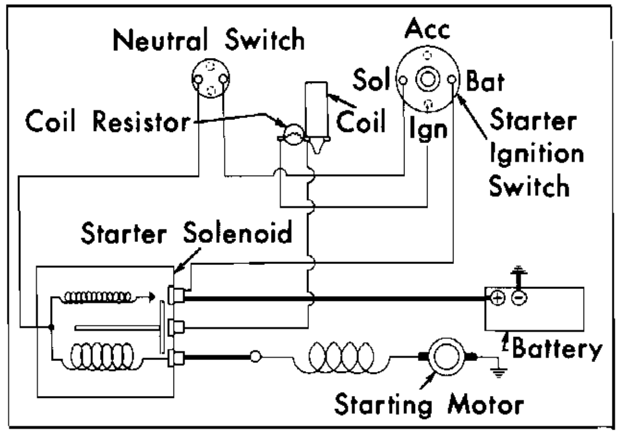

Fig. 11-29 Starting Circuit

(36) Normal Cranking Motor Maintenance

Lubrication -- Whenever the cranking motor is disassembled for repair or service, place a few drops of light engine oil on the oilless bushings in the end bearings. Avoid excessive lubrication, since this might cause lubricant to be forced out onto the commutator where it would gum and cause poor commutation with a resulting inferior cranking motor performance. Never oil commutator.

Inspection -- Since there are no inspection windows in the extruded frame, the commutator end frame should be removed periodically and the brushes and commutator inspected. If the commutator is dirty, it may be cleaned with No. 00 sandpaper. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR. If the commutator is rough, out-of-round, or has high mica it should be turned down on a lathe and the mica undercut. Worn brushes should be replaced.

(37) Checking Inoperative Cranking Motor

If the cranking motor does not develop rated torque and cranks the engine slowly or not at all, check the battery, battery terminals and connections, the ground cable, and the battery-to-cranking motor cable. Corroded, frayed, or broken cables should be replaced, and loose or dirty connections corrected.

The overrunning clutch should withstand 50 to 60 foot pounds torque without slipping. The pinion should turn freely and smoothly in the overrunning direction. The solenoid switch contacts should be checked for burned condition, and the contact disc and terminal studs replaced if necessary.

If the above are all in order, inspect the brushes and commutator. The brushes should form a good contact with the commutator and have the correct spring tension. If there are burned bars in the commutator, it may indicate open circuited armature coils which prevent proper cranking. Inspect the soldered connections at the commutator riser bars, and resolder these connections and turn down the commutator as necessary.

Tight or dirty bearings will reduce armature speed or prevent the armature from turning. A worn bearing, bent shaft, or loose pole shoe will allow the armature to drag, causing slow speed or failure of the armature to rotate. Check for these conditions. If the brushes, bearings, commutator, switch, etc., appear in good condition, the battery and external circuit all right, and the cranking motor still does not operate correctly, remove the cranking motor for Bench Check as to NO-LOAD and TORQUE tests.

(38) Starter Motor Tests

1. NO-LOAD TEST -- Connect the cranking motor in series with a battery of the specified voltage and an ammeter capable of indicating several hundred amperes. If an R.P.M. Indicator is available, read the armature R.P.M. also. Test should indicate 95 amperes at 10.1 volts at approximately 3500 R.P.M.

2. TORQUE TEST -- Torque testing equipment, if available, may be used to determine if the motor will develop rated torque. A high current-carrying variable resistance should be connected into the circuit so the specified voltage at the cranking motor may be obtained since a small variation in the voltage will produce a marked difference in the torque developed. The lock torque developed is 11 lbs. ft. at 460 amperes at 5.2 volts.

(39) Interpretation of No-Load and Torque Tests

1. Low free speed and high current draw with low torque:

a. Tight, dirty or worn bearings, bent shaft or loose pole shoe screws.

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b. Grounded armature or field. Check further by isolating various parts of the motor and checking with a test lamp to determine location of ground.

NOTE: The end of the shunt field coil must be disconnected from ground before checking for grounded armature or field.

c. Shorted armature. Check on growler.

2. Failure to operate with high current draw:

a. Direct ground in switch, terminal or fields.

b. Frozen shaft bearings.

3. Failure to operate with no current draw:

a. Open field circuit. Inspect internal connections and trace circuit with a test lamp. (See note concerning shunt field in 1b).

b. Open armature coils. Inspect commutator for badly burned bars.

c. Broken or weak brush springs, worn brushes, high mica on the commutator, or other causes which would prevent contact between the brushes and the commutator.

4. Low no-load speed with low torque and low current draw:

a. An open field winding. Check with a test lamp to determine "open" location. (See note concerning shunt field in 1b.)

b. High internal resistance due to poor connections, defective leads, dirty commutator, and causes listed under 3c above.

5. High free speed with low developed torque and high current draw indicates shorted fields.

(40) Removal and Disassembly of Starting Motor

At regular intervals, the cranking motor should be disassembled for cleaning and inspection of all parts. The overrunning clutch, armature and fields should not be cleaned in any degreasing tank, or with grease dissolving solvents, since these would dissolve the lubricant in the clutch mechanism and would damage the insulation in the armature and field coils. It is suggested that parts be cleaned with oleum spirits and a brush. All worn parts should be replaced and the commutator turned down in a lathe if necessary. The rubber boot covering the solenoid plunger should be replaced if the old one has deteriorated enough to permit moisture and dirt to enter solenoid. OIL OR GREASE IS VERY DETRIMENTAL TO THIS BOOT.

a. Removal

1. Disconnect battery cable at starter solenoid.

2. Disconnect starter button and coil feed wires at solenoid terminals.

3. Remove two starter mounting bolts at flywheel housing. Pull starter forward and remove from car.

b. Disassembly

1. Remove solenoid.

a. Remove nut and lockwasher connecting switch to motor terminal.

b. Remove cotter key and pin from plunger linkage.

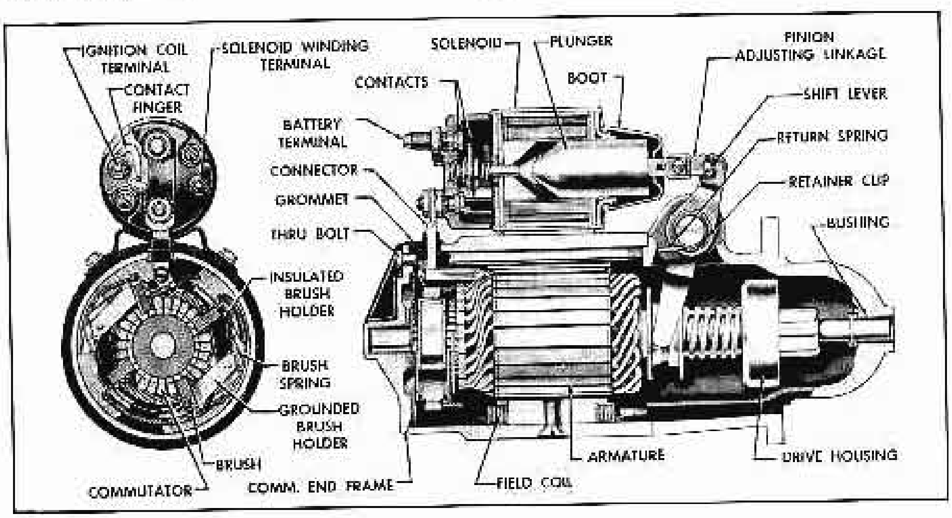

Fig. 11-30 Starter Cross Section

c. Remove four switch attaching screws, and take off solenoid switch.

2. Remove three bolts and remove commutator end frame and field frame assembly, Fig. 11-30.

3. Remove large retainer clip, then unhook shift lever spring and remove.

4. Remove small retainer clip and remove upper shift lever shaft.

5. Remove armature with clutch and lower shift lever from housing. Also remove thrust collar.

6. Remove clutch from armature by first sliding thrust collar off end of armature shaft, Fig. 11-31.

7. Slide a standard 1/2" pipe coupling or other metal cylinder of suitable size onto shaft, so end of coupling or cylinder butts against edge of retainer, Fig. 11-32. Tap end of coupling with hammer, driving retainer towards armature and off snap ring.

8. Remove snap ring from groove in shaft, using pliers or other suitable tool. Replace snap ring if distorted.

9. Slide retainer and clutch from armature shaft.

10. Disassemble brush holders from field frame.

a. Remove screws attaching leads and brushes to the holders.

b. By hand, 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 a group.

c. Repeat procedure for remaining set of brush holders.

(41) Assembly and Installation of Starter Motor

The assembly and installation of the starter motor is the reverse of the procedure described above, with the exception of the following procedure for replacing clutch on armature shaft.

a. Lubricate drive end of armature shaft with grade 20 oil.

b. Slide clutch assembly onto armature shaft with pinion outward.

c. Slide retainer onto shaft with cupped surface facing end of shaft.

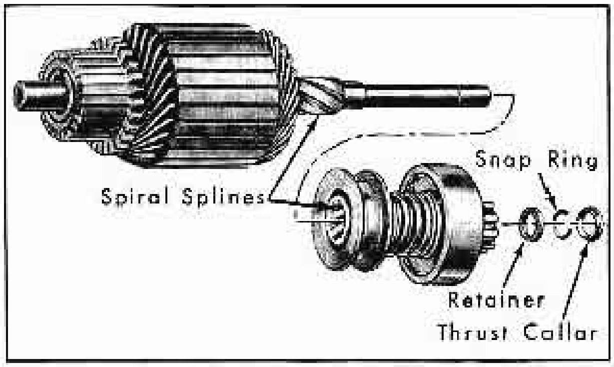

Fig. 11-31 Starter Armature Assembly - Exploded

d. Stand armature on end of wood surface with commutator down. Position snap ring on upper end of shaft and hold in place with a block of wood. Hit wood block a blow with hammer, forcing snap ring over end of shaft. Slide snap ring down into groove by hand, Fig. 11-33.

e. Assemble thrust collar on shaft with shoulder next to snap ring.

f. Place armature on work bench and position retainer and thrust collar next to snap ring. Then using two pair of pliers at same time (one pair on

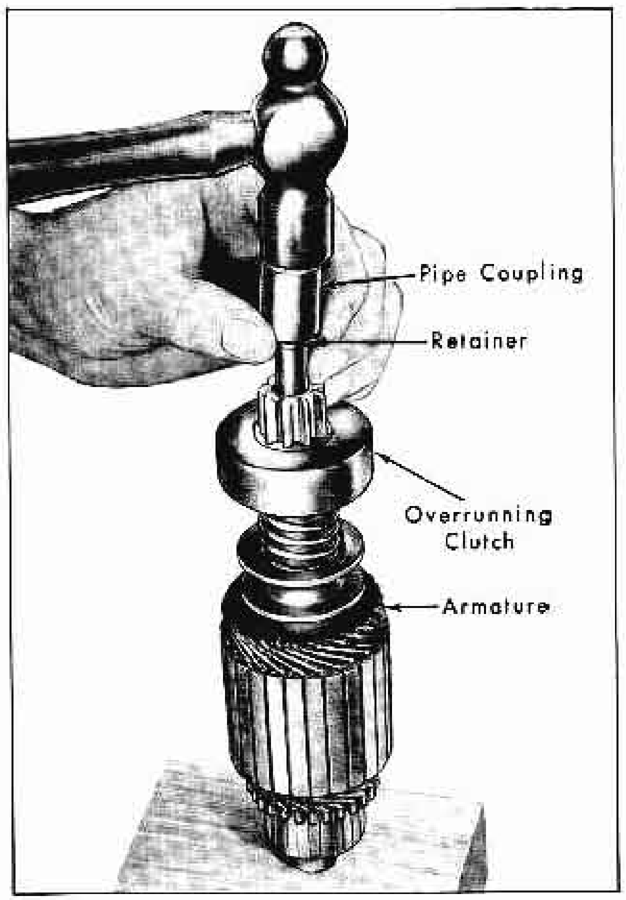

Fig. 11-32 Driving Retainer Off Snap Ring

either side of shaft), grip retainer and thrust collar and squeeze until snap ring is forced into retainer, Fig. 11-34.

(42) Engine Tests

Engine tests, includes the inspection, testing, and adjustments of the various components of the engine and engine accessories. These various tests have been covered in detail in this section and only a reference to the note number will be made.

1. Inspect and test the battery. This includes visual inspection, electrolyte test, capacity test, and test charging battery, Notes 1-7.

2. Inspect and test the starting system. This includes visual inspection of connections, starter circuit resistance tests, and amperage draw test on the starter motor, Notes 8 and 9.

3. Inspect, test and adjust the distributor as explained in Notes 10 and 11.

4. Make certain engine idle R.P.M. is correctly adjusted - 400 R.P.M. in "Drive".

5. Inspect and test the performance of the generator. This includes observing generator charging circuit precautions, visual inspection, output tests, testing for ground in generator, and resistance tests, Notes 15-17.

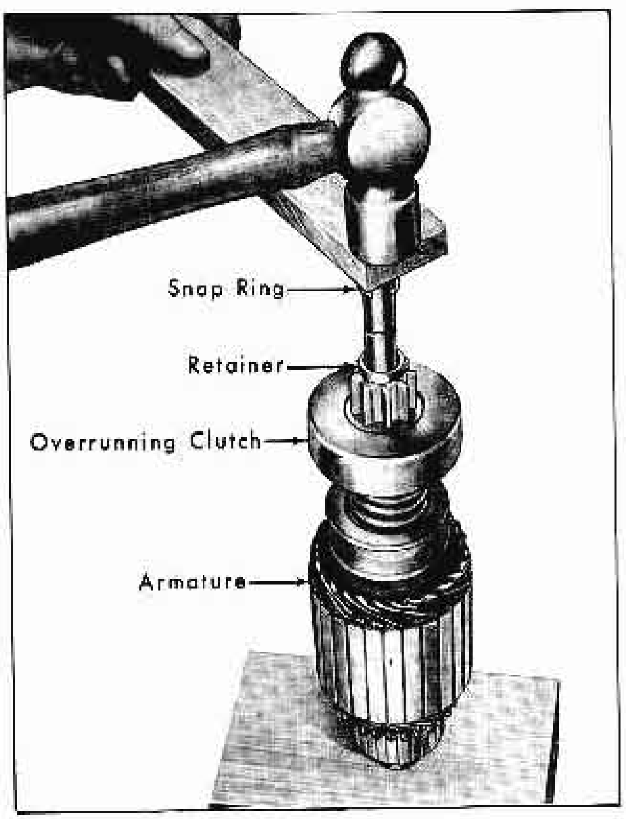

Fig. 11-33 Installing Snap Ring on Shaft

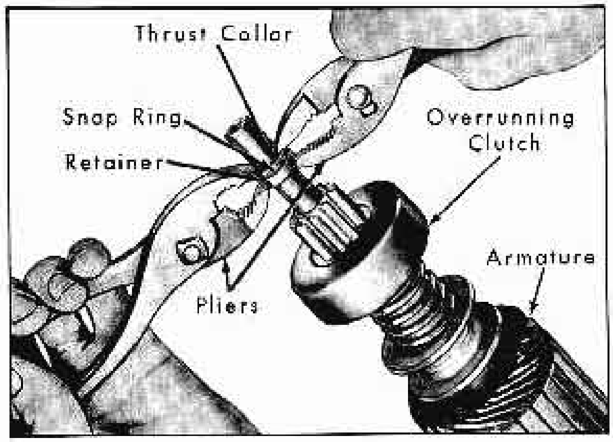

Fig. 11-34 Installing Snap Ring Into Retainer

6. Test regulator for proper performance as explained in Notes 24-28.

7. Test spark timing, Note 14.

8. To provide an indication of the over-all performance of the entire ignition system, make the secondary efficiency test, Note 29.

9. The fuel system should be inspected thoroughly. Clean all fuel lines, strainers and flexible lines. The fuel filter strainer must be replaced if plugged.

10. Clean and service carburetor air cleaner, Section 2, Note 10.

11. In cases where carburetor is not functioning properly, it should be overhauled, Section 12.

12. Test fuel pump for proper pressure, volume, and inches of vacuum, Section 12.

13. Clean and set spark plugs, Note 30.

14. Test the ignition primary circuit for excessive voltage drop which would lessen the secondary output of the ignition coil, resulting in hard starting and poor performance, Note 31.

15. Test the coil continuity and capacity for proper performance, Note 32.

16. Test all condensers for series resistance, capacity, and insulation, Note 33.

17. Check all water hoses and tighten clamps.

18. Tighten cylinder heads - 65 to 70 ft. lbs.

19. Tighten manifolds - 25 to 30 ft. lbs.

20. Adjust generator belt to proper tension.

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SPECIFICATIONS

Subject and Remarks	All Series
IGNITION	
Coil, amperes draw, engine running	1.25A
Coil, Delco-Remy type number	1115082
Distributor, Delco-Remy Type No.	1110844
Distributor advance - engine degrees	
Centrifugal advance	$24^{\circ} \pm 2^{\circ}$
Vacuum advance	$27.5^{\circ} \pm 1.5^{\circ}$
Dwell angle range	26°-33°
New and used point gap	.016"
Tension of contact arm spring	19-23 oz.
Timing mark, ahead of center	$2\text{-}1/2^{\circ}$
Spark plugs --	
A.C. type number	46-5
Gap	.035"
Thread	14MM
Ignition switch -- Delco-Remy type number	1116470
Firing order	1, 8, 4, 3, 6, 5, 7, 2
Cond. Capacity in Microfarads	.18-.23
GENERATOR	
Delco-Remy type number	1102002
Armature --	
Commutator out of round, not over	.002"
End play in bearing, not over	.005"
Car speed at min. peak charging rate	25.5 MPH
Delco-Remy type number	1102002
Generator ventilation	Forced Air
Ratio of armature RPM to engine RPM	2.15-1
Brush spring tension	24-32 oz.
GENERATOR TEST SPECIFICATIONS	
Output, cold --	
Cut-in Engine RPM	535
Amperes	0
Volts	12.8
Given Speed, Engine RPM	1000
Amperes	30
Volts	14.0
GENERATOR REGULATOR	
Delco-Remy type number	1118826
Current regulator --	
Air gap (between armature and center of core)	.075"

Subject and Remarks	All Series
*Current setting, in amperes	
Range	27 - 33
Adjust to	30
Cut-out relay --	
Air gap	.020"
Contact point opening	.020"
*Contacts close at volts	11.8-13.6
Adjust to	12.8
Voltage regulator --	
Air gap	.075"
Voltage setting --	
*Closed circuit in volts	
Range	14 - 15
Adjust to	14.5
STARTING MOTOR	
Delco-Remy type number	1107622
Armature --	
Commutator out-of-round, not over	.005"
Bearings --	
Commutator end	Oilless Bushing
No center bearing	
Drive end	Oilless Bushing
Lock amperage	460
Lock torque, in ft. lbs	11.5
Lock voltage	5.2
Gear ratio	19.5-1
No load RPM	6500
Amperage	75
Volts	10.3
Brush spring tension	30-40

*At operating temperature after 15 minutes running with 8 to 10 amps. current flow through regulator.

Subject and Remarks	All Series
BATTERY	
Capacity, ampere hours	
54-62, 60S, 75	55
54-86 Comm'l.	70
Delco-Remy type number	
54-62, 60S, 75	3EM60-W
54-86 Comm'l.	3EM70-W
Plates, number of	
54-62, 60S, 75	9
54-86 Comm'l.	11
Terminal grounded	Negative

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TORQUE TIGHTNESS

Application	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Distributor clamp nut	5/16-24	15	18
Generator bracket to exhaust manifold nut	3/8-24	25	30
Generator to adjusting link	5/16-24	15	18
Generator mounting	5/16-24	12	15
Generator terminal nut	No. 12-24	12	15 In. Lbs.
Ignition coil mounting screw	5/16-18	15	18
Regulator mounting screws	1/4-20	2	3
Spark plugs	14 mm	20	25
Starter mounting	7/16-14	45	50
Starter solenoid terminal nut	8-32	15	18 In. Lbs.

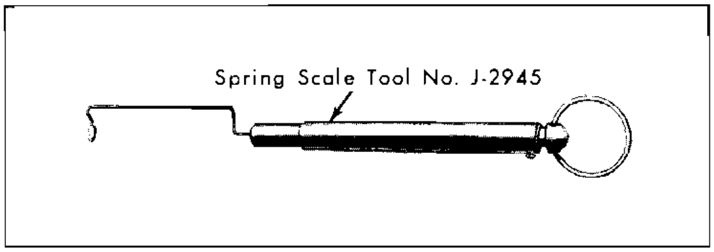

Fig. 11-35 Special Tools

OTHER NOTES AND REFERENCES

ENGINE ELECTRICAL

OTHER NOTES AND REFERENCES

ENGINE FUEL AND EXHAUST

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ENGINE FUEL AND EXHAUST

GENERAL DESCRIPTION

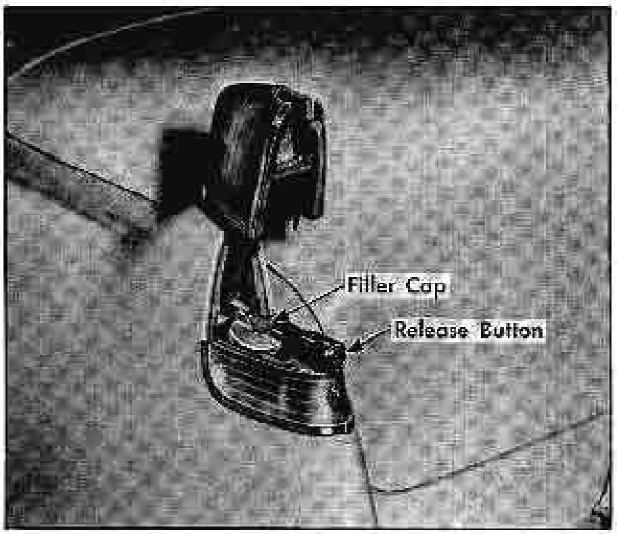

Fig. 12-1 Gasoline Filler Cap

The fuel tank on all 1954 Series Cadillac cars is mounted against the lower surface of the trunk compartment with two support straps and insulated from the underbody with anti-squeak. This provides for easy removal from below without disturbing any of the sheet metal parts.

The tank is constructed of two shallow pans, square in shape, placed flange to flange and welded around the entire flange. Ribs stamped into the pan provide a rigid construction.

Two tubes are attached to the tank and join at the upper end of the filler pipe. One allows air to escape from the tank when gasoline is added.

The gasoline filler cap is located below the hinged left rear tail lamp, as shown in Fig. 12-1.

The gasoline line is attached to the left front corner of the tank and extends along the left frame side bar to the fuel pump. This location permits maximum cooling of the lines by outside air currents and prevents vapor lock.

The fuel pump is mounted on the engine oil filler housing. The pump push rod is driven by an eccentric, machined as an integral part of the camshaft. Fuel is drawn into the fuel pump on the downward stroke of the diaphragm as the rocker arm is moved upward by the push rod.

Some engine operating conditions do not necessitate full travel of the diaphragm in the fuel pump. When this condition of fuel pump sufficiency is reached, a separate spring and link arrangement keeps the rocker arm and push rod in contact.

A fuel filter, connected between the fuel pump and the carburetor, receives fuel from the pump and filters out all dirt particles in excess of .001" in diameter. This removes a cause of flooding and possible clogging of small passages in the carburetor.

Either the four-barrel Rochester Model 4GC or Carter Model WCFB carburetor are used interchangeably on 1954 engines. While both carburetors differ in design, operating principles and characteristics are similar. The basic carburetion systems of each carburetor are briefly described in the following paragraphs.

Rochester Carburetor Circuits

The Rochester Model 4GC Carburetor consists basically of two dual carburetors. The two carburetors will be referred to as the Primary side and the Secondary side. The Primary side completely controls the metering to the engine throughout the idle and part throttle ranges. The Secondary Side supplements the fuel and air from the Primary Side throughout the idle and power or wide open throttle range.

Float System

To aid in maintaining the correct fuel level under all conditions of operation, two sets of dual floats are used.

Both sides of the carburetor incorporate individual float systems for maintaining the proper fuel level in each float bowl. All fuel enters the carburetor on the primary side.

As the fuel level drops, the dual floats also drop, thus allowing fuel pressure to move the inlet needles off their seats. Pressure from the fuel pump forces fuel through the filter screen into the inlet passage and the float bowl. As the fuel level rises, the floats rise and force the inlet needles into their seats, closing the fuel passage.

Both sides of the carburetor are individually and internally vented. These vents transmit the pressure from beneath the air cleaner to the fuel in the float bowls. The amount of the fuel metered by the carburetor is dependent upon the pressure in the float bowls causing fuel to flow.

To minimize difficult hot weather starting or rough idling, an external vent is incorporated which opens only when the throttle valves are in the closed position. This external idle vent consists of an actuating lever attached to the pump shaft and lever assembly, idle vent valve retainer, idle vent valve spring, and idle vent valve. When the throttle valves are closed, the actuating lever contacts the spring loaded vent valve and holds it open. This permits vapors from the float bowl to be vented to the atmosphere. As the throttle valves are opened, the idle vent valve spring closes the vent valve thus eliminating the atmospheric vent and returning the carburetor to an internal balance.

A cored passage in the bowl casting links the primary and secondary float bowls together. In this way any abnormal rise in fuel level on one side will tend to be absorbed by the other, and should not seriously disrupt the operation of the engine. This passage also equalizes vapor pressures between the two bowls.

Idle Circuits

At small throttle openings, the vacuum created at the main discharge nozzles is not great enough to cause fuel to flow from the nozzles. Additional systems are provided to supply the proper mixture ratios required throughout the idling range. These circuits are shown in Fig. 12-2.

A fixed idle system is provided in the primary throttle bores which is supplied with fuel from the secondary side of the carburetor. The secondary idle fuel is drawn from the float bowl through the main metering jets into the fuel well in the bottom of the secondary float bowl. It then passes through the calibrated restriction in the end of each idle tube. The fuel is then drawn up through the idle tube, is bled at the idle air bleeds, passes through other calibrated restrictions, and is again bled by additional calibrated air bleeds. This mixture is drawn through the channel in the float bowl around the secondary throttle body bores, is further bled by the lower idle air bleeds, and is discharged from the throttle body idle orifices in the primary throttle bores. As the throttle is opened, the vacuum acting on the fixed idle discharge holes decreases very rapidly. These discharge holes, therefore, stop feeding fuel in the off-idle range.

In addition, an adjustable idle system is provided in the primary side of the carburetor. This system provides the balance of fuel required for normal curb idle as well as that required for operation in the off-idle range. The primary idle fuel is drawn from the float bowl through the main metering jets into the fuel well in the bottom of the primary float bowl. It then passes through the calibrated idle tube restrictions and idle tubes. Air joins this fuel at the calibrated air bleed and the mixture passes through a calibrated restriction and then through the float bowl idle channel, is further bled at the lower idle air bleeds and upper idle holes, and is discharged from the primary throttle body needle holes. As the throttle valves are opened, the bleed

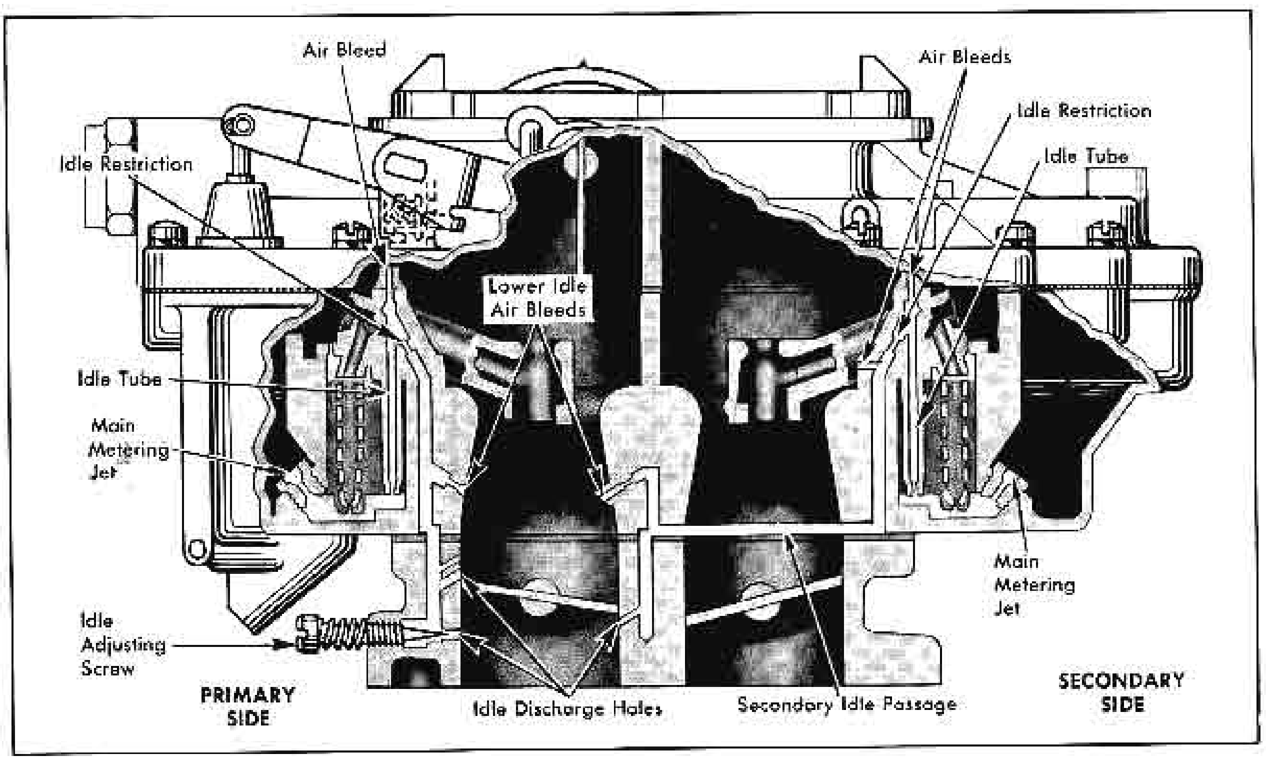

Fig. 12-2 Rochester Carburetor Idle Circuits

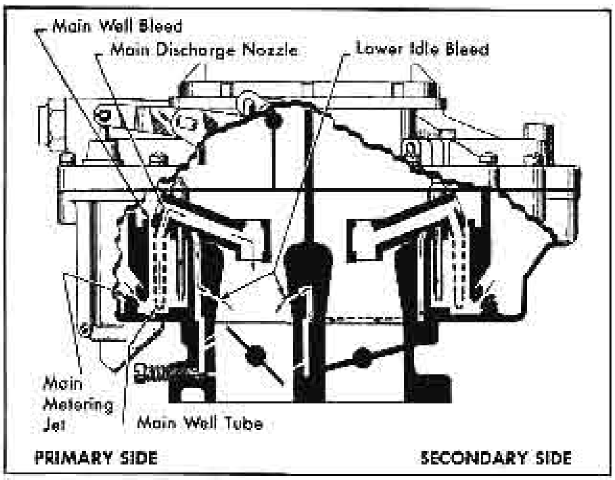

Fig. 12-3 Part Throttle Circuits

effect of the idle holes above the throttle valves gradually diminishes. When these holes become exposed to manifold vacuum they then become fuel discharge holes to meet the increased demand of the engine.

Part Throttle Circuit

As the throttle valves are opened to a greater degree and more air is drawn through the carburetor, it is necessary to provide a means other than the idle systems for supplying additional fuel to meet the engine requirements. Refer to Fig. 12-3.

The primary side of the carburetor meets this increased demand for fuel in the following manner: At a point of sufficient throttle opening, manifold vacuum, multiplied several times in the large and small venturi, is transmitted to the upper tips of the main well tubes, which act as main discharge nozzles. This partial vacuum draws fuel from the float bowl through the calibrated main metering jets and into the air bled main well tubes. While passing through the main well tubes, air joins the mixture through calibrated holes in the sides of the main well tubes. Air is admitted to the main well through the main well bleeds. The mixture then passes from the tip of the nozzle through the mixture passage to the small venturi and on into the intake manifold.

As the throttle opening is progressively increased and more fuel is drawn through the main well tubes, the fuel supply from the bowl is restricted to the main metering jets, and the fuel level in the main well drops. As this fuel level drops, other calibrated holes in the main well tubes are uncovered to the air. When this occurs they become additional air bleeds, thus mixing progressively more air with the fuel passing through the main well tubes. Thus, although the nozzle suction is increased by exposure to manifold vacuum as well as by air flow, as the throttle valves are opened, the fuel mixture to the

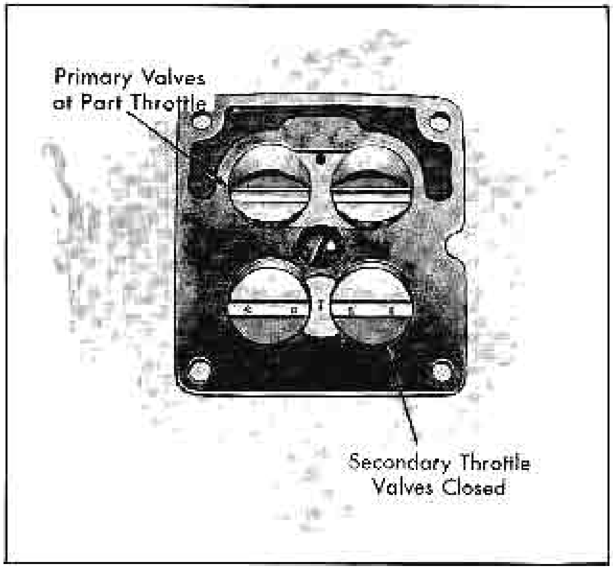

Fig. 12-4 Early Part Throttle

engine remains constant through the part throttle range.

An additional source of fuel to maintain a constant mixture ratio at wide primary throttle openings is furnished by the lower idle air bleeds which project into both sides of each primary throttle bore. These nozzles supplement the fuel discharged by the main system to fill the gap between late part throttle and early power system operation. Fuel is discharged from these nozzles at throttle openings which correspond to a steady speed of approximately 70 to 90 miles per hour. It will be noted that these nozzles acted as air bleeds during the operation of the idle system. When they are acting as discharge nozzles the idle discharge holes in the throttle body bleed air and mix it with the fuel passing through these part throttle nozzles.

The throttle valves on the secondary side of the carburetor are closed during idle and part throttle operation, as shown in Fig. 12-4. The secondary throttle valves are mounted off-center on the shaft so that manifold vacuum holds them closed until they are forced open against a return spring by linkage actuated by the primary throttle shaft. The primary throttle valves are approximately 3/4 open at the instant the secondary valves begin to open, Fig. 12-5. This amount of primary throttle opening is sufficient to drive the car approximately 90 miles per hour, although all four throttle valves can be opened fully at any car speed, depending upon accelerator pedal position.

During the remaining 1/4 of the primary throttle travel to fully open position, the secondary throttle valves open through their full travel, so that all four throttle valves reach the wide-open position together, as shown in Fig. 12-6.

ENGINE FUEL AND EXHAUST

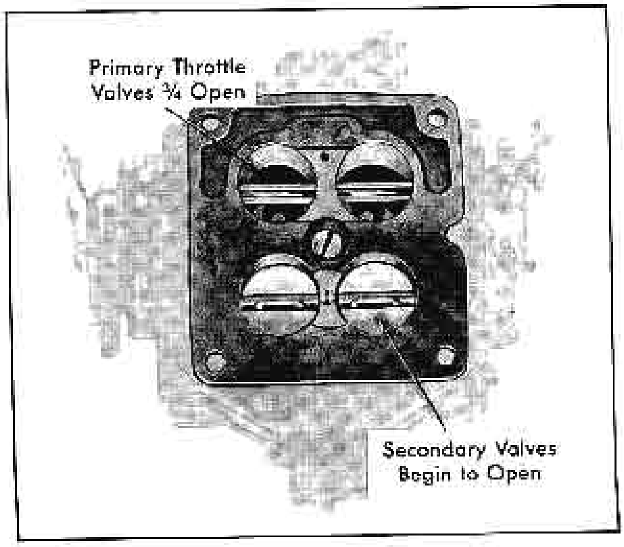

Fig. 12-5 Late Part Throttle

The secondary side of the carburetor supplies a constant fuel-air mixture when called for by high primary throttle openings. The secondary side, therefore, supplies fuel only during the idle and power ranges. Its calibration is fixed, requiring no adjustments other than the throttle valve position as determined by the linkage.

Power System

To achieve the proper mixtures required when more power is desirable or sustained high speed driving is to be maintained, the Model 4GC Carburetor employs the use of a vacuum operated power piston in the air horn and a power valve in the float bowl. This power system is located within and acts only upon the primary side of the carburetor.

The power piston vacuum channel is exposed to manifold vacuum beneath the throttle valves. The vacuum in this channel varies directly with the manifold vacuum. In the idle and part throttle ranges, the manifold vacuum is normally quite high. This vacuum is sufficient to hold the power piston in its extreme up position. However, as the throttle valves are progressively opened, the manifold vacuum drops. When the vacuum drops below approximately 9 inches of mercury, the calibrated spring above the power piston forces the piston down. This situation occurs at very high driving speeds or upon rapid acceleration. When the piston drops down, it unseats the spring loaded power valve permitting additional fuel to flow from the float bowl through the calibrated power restrictions and into the main well. This additional fuel supplements that already flowing through the main metering jets into the main well on the primary side, raising the fuel level in the main well and thus

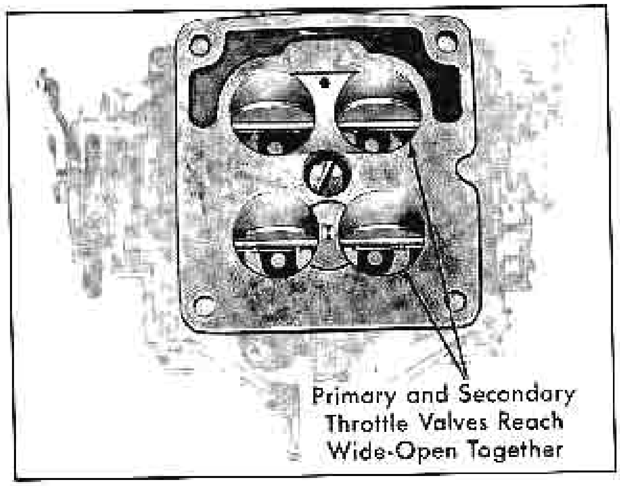

Fig. 12-6 Full Throttle

making the mixture being delivered to the manifold slightly richer than normal part throttle mixtures. This power mixture continues to be supplied as long as the manifold vacuum remains below approximately 9 inches of mercury. When the manifold vacuum again increases sufficiently, the force of the power piston spring is overcome and the piston is drawn up. This action allows the power valve to close, and returns the carburetor to the economical part throttle mixtures. Refer to Fig. 12-7.

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. It is the purpose of this hole to prevent the transfer of vacuum acting on the piston from acting also on the surface of the fuel in the float bowl. Any leakage of air past the upper rings of the piston will be compensated for by this vacuum break hole and will not affect carburetor calibration.

It is also in the power range that the secondary side of the carburetor provides additional air and

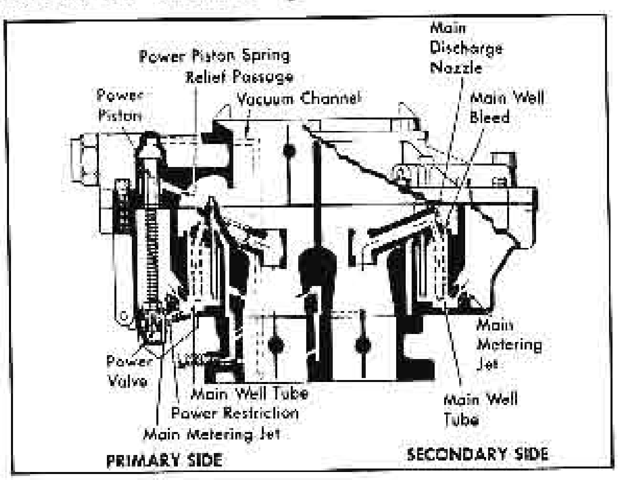

Fig. 12-7 Full Throttle Circuits

fuel to the engine for increased power. In this range manifold vacuum acting on the secondary side of the carburetor is multiplied at the large and small venturi and draws fuel from the float bowl through the calibrated main metering jets into the main wells. This fuel then passes through the main well tubes and is bled in a manner similar to that discussed previously in the operation of the primary main well air bleeds.

The mixture of fuel and air is then drawn to the nozzles at the upper tips of the main well tubes. It then passes through the mixture passage to the small venturi and is discharged into the intake manifold.

Accelerator Pump System

When the throttle is opened suddenly the air flow and manifold vacuum change almost instantaneously, while the heavier fuel tends to lag behind causing a momentary leanness. The accelerator pump, shown in Fig. 12-8, overcomes this condition by providing the additional fuel necessary for smooth operation on rapid acceleration.

Since the throttle valves on the secondary side of the carburetor remain fully closed throughout part throttle operation, it is only necessary to have one accelerator pump, that being located on the primary side of the carburetor.

A double spring pump plunger is used on the Model. 4GC Carburetor. The rates of compression of the top spring versus the bottom springs are carefully calibrated to insure a smooth, sustained charge of fuel for aceleration.

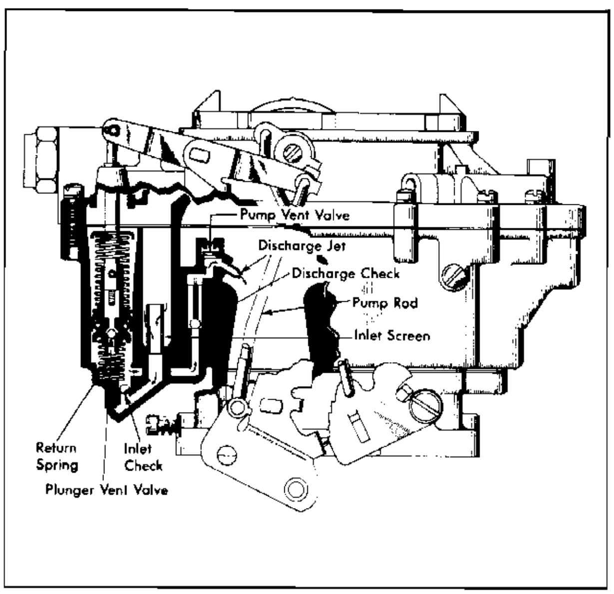

Fig. 12-8 Accelerator Pump System

On the pump intake or up stroke, fuel from the float bowl passes through the pump filter screen, unseats the aluminum inlet ball, and fills the pump well.

The accelerator pump, being connected through the inside pump lever, pump shaft and lever assembly, and pump rod to the throttle lever, moves at the slightest change in throttle opening. Upon acceleration or down stroke of the pump plunger, the force of fuel in the pump well seats the inlet ball. The fuel is then forced through the discharge channel, unseats the pump outlet ball, and discharges through the pump jets into the main air stream. No targeting of these pump jets in required.

The accelerator pump system is vented to acquire peak operating efficiency. The pump plunger head has been vented to minimize the effect of fuel percolation in the float bowl pump well. This has been accomplished by the design of a ball check and seat in the plunger head. In this manner any buildup of fuel vapors in the pump well will rise and by-pass the ball, thus venting themselves into the float bowl. There is, therefore, always a charge of solid fuel beneath the plunger head for rapid acceleration. Without this feature, any vapor pressure buildup would evacuate the charge of fuel in the pump system, thus causing poor initial acceleration.

The primary cluster is so designed that further venting of the pump system is unnecessary. This design prevents what is commonly known as "pump pull-over" or fuel enrichment at high speed due to fuel being drawn through the pump discharge jets.

Choke System

The Model 4 GC Carburetor uses a fully automatic choke to insure proper starting and driving during engine warm-up. Choking of the carburetor is necessary only on the primary side, due to the fact that 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 and a slot in the fast idle cam. Whenever the choke valve is closed, this lockout arrangement prevents opening of the secondary throttle valves. However, when the choke valve is wide open, the fast idle cam drops down so that the lockout lever clears the cam, thus permitting the secondary throttle valves to open.

The choke system is composed of a thermostatic coil, vacuum piston offset choke valve, fast idle cam, modifier lever and rods. Its operation is controlled by a combination of intake manifold vacuum, air forces on the offset choke valve, atmospheric temperature, exhaust manifold heat, and primary throttle opening.

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 valve to open slightly against the torque of the thermostatic coil. In addition, intake manifold vacuum is applied to the vacuum piston through a vacuum channel from the throttle body, which also tends to open the choke valve. Therefore, the choke valve assumes a position where the torque of the thermostatic coil is balanced against vacuum pull upon the choke piston and air velocity against the offset choke valve, thereby causing a regulated air flow into the carburetor which provides a richer mixture during the warmup period.

During warmup, the vacuum piston serves to modify the choking action to compensate for varying engine loads or acceleration. Any acceleration or increased road load decreases the vacuum exerted on the choke piston. This allows the thermostatic coil torque to momentarily close the choke valve to provide the engine with a sufficiently richer mixture for acceleration.

As the engine warms up, outside air is heated by passing through the hot air stove on the right exhaust manifold and is drawn into the thermostatic coil housing. This hot air raises the temperature of the coil, which in turn causes the coil to slowly relax its tension. Thus the choke valve is allowed to move gradually to the full open position.

To prevent stalling during the warm-up period, it is necessary to run the engine at a fast idle. This is accomplished by the fast idle screw which bears against 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 the choke lever and collar assembly. The fast idle cam holds the primary throttle valves open sufficiently during the warmup period to give an increased idle RPM, until such time as the choke valve moves to the full open position.

While the automatic choke is in operation, the driver may wish to advance the throttle to the full wide open position. Since this would decrease pull upon the vacuum piston thereby closing the choke valve, it is desirable to provide increased carburetor air flow by opening the choke valve mechanically. To accomplish this, a tang on the fast idle cam is contacted by the primary throttle lever at wide open position so as to sufficiently open the choke valve. This is called the choke unloader, and also serves to dechoke an over rich condition during cold operation. This choke unloader will also relieve a flooded condition on starting by allowing more air to enter the carburetor and mix with the excess gasoline in the manifold whenever the engine is cranked with the accelerator held fully depressed.

An additional fuel mixture control during warmup is the choke modifier, which progressively relaxes the tension on the thermostatic coil as the primary throttle opening is increased. This is accomplished by a rod which is connected to the secondary actuating lever on the primary throttle shaft to a longer lever protruding from the choke housing. Instead of the thermostatic coil being attached to the choke cover, the outer end is engaged by the shaft of this longer lever. The torque which tends to close the choke valve is thus lessened to compensate for the decrease of manifold vacuum pull upon the choke piston as the primary throttle is opened. The choke modifier feature therefore tends to maintain the correct air-fuel ratio for any throttle opening.

Carter Carburetor Circuits

The Carter Model WCFB carburetor is basically two dual carburetors contained in one assembly, with duplicate low and high speed circuits and float chambers. The section containing the metering rods, accelerator pump, and choke system is termed the Primary Side of the carburetor, while the other section is the Secondary Side. The secondary side supplies a fixed ratio of air and fuel at or near wide open throttle, to supplement that of the primary side.

Float System

The purpose of the float system is to maintain an adequate supply of fuel at the proper levels in the two carburetor bowls for use by the low speed, high speed, pump, and choke circuits.

Primary and secondary bowls are separated by a partition, and one assembly of dual floats with needle valve is used in each bowl. The fuel inlet connection is on the primary side. Fuel is supplied from this point to the primary needle and seat through a passage around the air horn in the bowl cover. Incoming fuel must pass through a brass strainer screen in order to reach either needle seat.

Each of the two bowls is vented into the air cleaner through passages in the air horn section of the bowl cover. Bowl vents are calibrated to provide the proper pressure above the surface

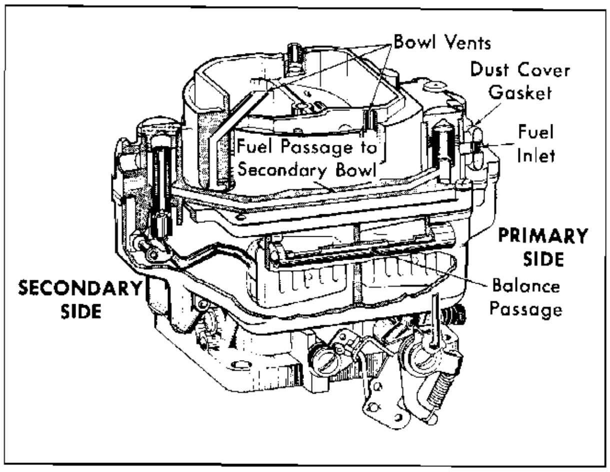

Fig. 12-9 Carter WCFB Float System

of the fuel in the bowls at all times. Since the same pressure which causes air to flow into the carburetor also causes fuel to flow, the restriction offered by the air cleaner does not influence the fuel air ratio metered by the carburetor. A connecting passage along the outside of the bowl casting tends to equalize the vapor pressure between the two bowls. Fig. 12-9.

The atmospheric idle vent allows vapors to escape from the carburetor bowls to the outside air, under conditions of idling or stopping the engine when hot. Refer to Fig. 12-10.

Idle Circuits

Fuel for idle and early part throttle operation is metered through the low speed circuits of the primary side of the carburetor, shown in Fig. 12-10. Discharge of fuel from the idle ports in the throttle body continues as the primary throttle is opened until the vacuum at the main discharge nozzles becomes great enough to draw fuel through the main system.

In idle and early part throttle operation, fuel enters the main wells from the primary bowl, through the metering rod jets on the primary side of the carburetor, and is drawn up through calibrated low speed jets at the bottoms of the idle tubes. These low speed jets measure the amount of fuel to be used.

The fuel is then drawn up and air is bled through the by-pass restriction. This mixture is drawn up and through the cross-over passage in the bowl cover. The mixture then passes through a calibrated economizer restriction which retards the flow to allow additional air to be mixed in at the air bleed passage in the bowl. The rate of fuel flow through the economizer determines the amount of air which enters the air bleeds.

After the fuel is broken up and mixed with air in this manner, it is conducted down through passages in the bowl to the fixed and adjustable idle ports in the two primary throttle bores.

The fixed idle ports are vertical slots which extend partly above and partly below the primary throttle valves at normal idle and very early part throttle conditions. The size of the idle port below the valve which feeds the fuel mixture thus in-

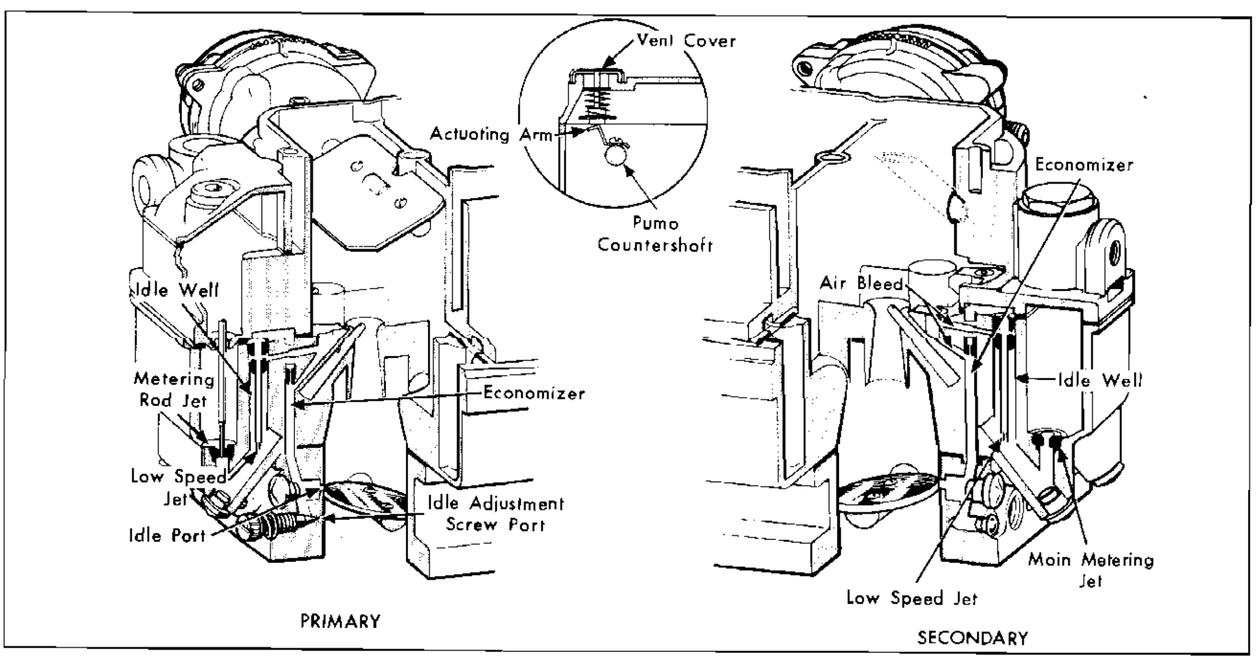

Fig. 12-10 Carter Carburetor Low Speed Circuits

creases as the throttle valve is opened. At the same time, the portion of the slot above the valve, which acts as an additional air bleed, becomes progressively smaller. Calibration of this arrangement is such as to provide the correct mixture for operation at small throttle openings, until the main nozzles come into action.

The amount of fuel mixture supplied by the adjustable ports is governed by the setting of the idle adjusting screw on the primary side.

The secondary side of the carburetor contains an equivalent low speed system which serves only to bring the secondary barrels into action smoothly, without disrupting the air-fuel mixture at small secondary throttle openings.

The secondary side does not supply any fuel at idle or part throttle operation. The secondary throttle valves remain seated until forced open by linkage connected to the primary throttle, since the secondary valves are offset and use manifold vacuum plus spring tension to seal themselves closed. When the secondary valves are closed, the fixed low speed slots in the secondary throttle bores are sealed off by the valves and do not feed any fuel mixture to the engine. The secondary throttle bores do not have adjustable idle ports.

Part Throttle Circuits

Fuel for part throttle and full throttle operation is supplied by the high speed circuits, through the main discharge nozzles.

The main discharge nozzles come into action as the throttle valves open sufficiently to allow manifold vacuum to reach the large and small venturi in each of the four barrels. Manifold vacuum is multiplied at the venturi, causing fuel to be drawn up through the main discharge passages to the nozzles.

Fuel enters the main wells through the metering rod jets on the primary side and through smaller jets without metering rods on the secondary side. Air bleeds are located within the small venturi on the upper sides of the nozzles.

The metering rods in the primary jets determine the proportion of fuel supplied to the primary discharge nozzles, for a given air flow through the venturi. In the part throttle range, the large, or economy step of each rod is positioned in the jet, giving a fixed fuel-air mixture.

The position of the metering rods is dual controlled, by manifold vacuum and by mechanical linkage with the primary throttle. The metering rods are lifted by this linkage to supply more fuel through the jets at wide primary throttle openings, to fill the gap between part throttle and power system operation.

Anti-percolator passages and bushings with calibrated holes are used to vent vapor pressure from the main well and low speed well passages, so that vapors formed by engine heat will not force extra fuel out of the discharge nozzles, Fig. 12-11.

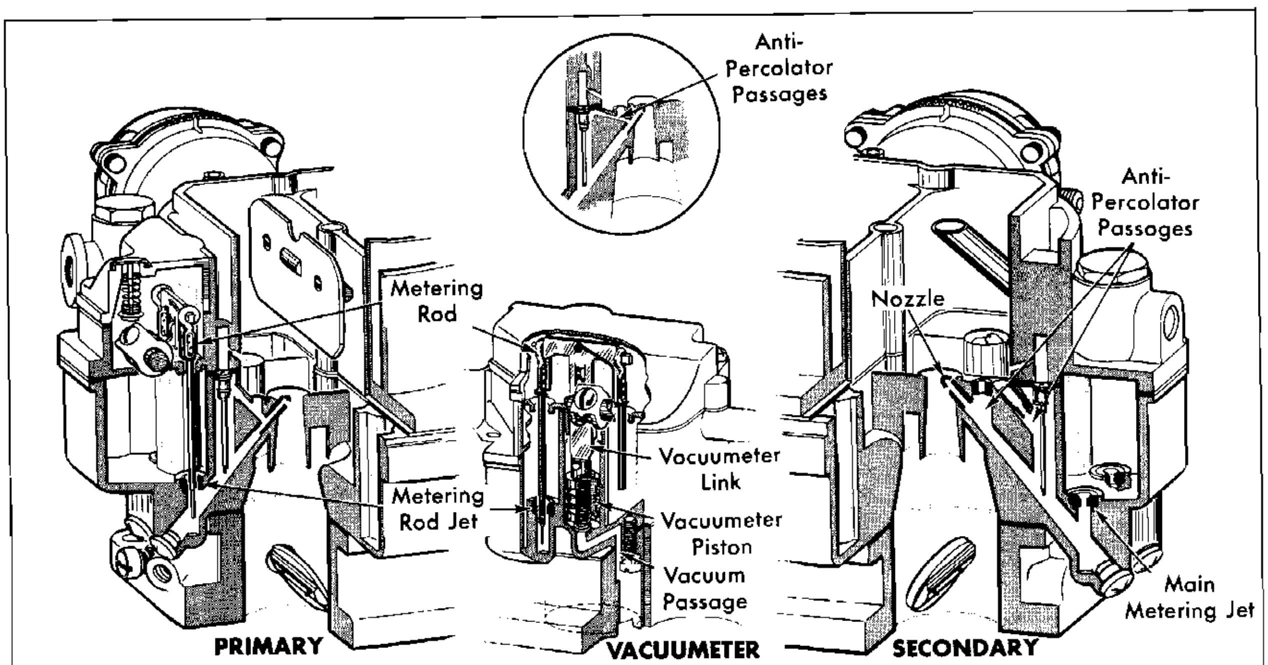

Fig. 12-11 High Speed Circuits

The secondary throttle valves remain closed and do not allow any fuel or air to be supplied by the secondary side of the carburetor until the primary throttle valves are approximately 3/4 open. At this point, a mechanical linkage engages the secondary throttle shaft and forces it open against a return spring. The secondary throttle opens at a faster rate than the primary throttle, so that all four throttle valves reach the wide open position together.

All four throttle valves can be opened at any car speed, since the amount of opening is dependent only upon the accelerator pedal position. The primary throttle opening at which the secondary throttle is just ready to open will drive the car up to approximately 90 miles per hour, but the reserve power of the two secondary barrels is also available for acceleration at any lower speed, except during the warm-up period when the choke is on.

The secondary side of the carburetor has a fixed calibration, and it requires no adjustments other than the throttle valve opening as determined by the linkage.

Power System

In order to supply the correct fuel mixtures required for high power output, such as in accelerating rapidly or maintaining very high cruising speeds, the metering rods which pass through the primary jets are lifted to place the smaller steps within the jets.

The metering rods are lifted mechanically as previously discussed, by linkage connected to the primary throttle. This linkage includes a lever on the accelerator pump countershaft which raises the yoke to which the metering rods are attached, as shown in Fig. 12-11.

In addition to mechanical actuation, the metering rods are held in the lean, or economy, position by manifold vacuum exerted on a vacuum piston operating in a cylinder in the bowl casting, and are lifted to the power position by a spring which raises the vacuum piston when manifold vacuum falls below a certain predetermined amount. Low manifold vacuum occurs during rapid acceleration or other heavy throttle conditions.

The vacuum passage to the metering rod vacuum piston connects the lower end of the cylinder in the bowl casting through the throttle body to the intake manifold. Possible leakage of air past the vacuum piston will not affect the pressure above the fuel in the float chambers, since the upper end of this cylinder is open to the air horn, and is sealed from the float chambers by the bowl cover gasket.

Since the secondary side of the carburetor has no metering rods, fuel enrichment for power operation is performed entirely by the primary side.

Accelerator Pump System

When the throttle is opened suddenly at speeds below approximately 30 miles per hour, the air flow through the carburetor increases almost instantaneously, while the fuel, being heavier, tends to lag behind. To provide smooth engine operation under these conditions, the accelerator pump shown in Fig. 12-12, injects a measured amount of fuel into the air stream as the throttle is opened.

Since no lag in acceleration occurs at greater throttle openings, it is necessary to have only one accelerator pump, which is located on the primary side of the carburetor and is linked to the primary throttle.

When the throttle is closed, the pump plunger is moved upward in its cylinder, and fuel is drawn into the pump bore through the intake check valve. The discharge check valves are seated at this time to prevent air being drawn into the pump cylinder.

As the throttle is opened, the pump plunger is moved downward, seating the intake check and forcing fuel out through the discharge passage. Fuel pressure from the plunger unseats the pump discharge valve, allowing the fuel to be forced out the twin discharge jets into the air stream in the two primary venturi. The pump jets are contained in a die cast assembly and no targeting adjustment is required.

Excessive pressure due to rapid movement of the pump plunger is prevented by the pump relief valve in the discharge passage. When the throttle is opened suddenly, the pump plunger shaft telescopes, compressing the plunger spring, which forces fuel out the pump jets in a smooth, sustained stream. The pump spring beneath the plunger is so calibrated with respect to the plunger spring that the duration and intensity of the pump discharge supplies the correct amount of fuel for smooth engine operation.

At car speeds above approximately 30 miles per hour, accelerator pump discharge is no longer necessary. Accordingly, the plunger is made to bottom in the pump cylinder at all throttle openings beyond that required for steady cruising at this speed.

During high speed operation, a partial vacuum exists at the pump jets, due to the velocity of the air stream. To prevent fuel from being drawn through the pump circuit, the passage to the outer

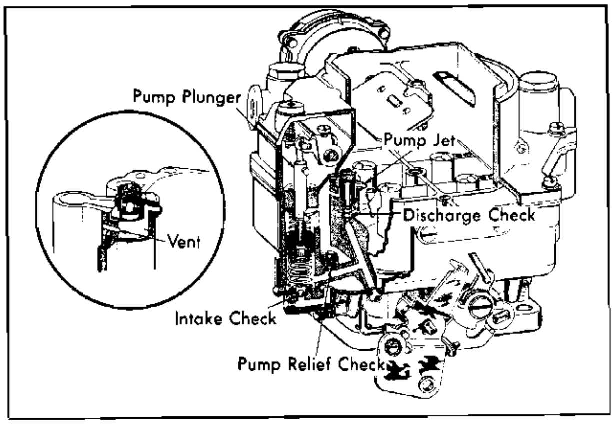

Fig. 12-12 Accelerator Pump System

pump jets is vented by a cross passage to the carburetor bowl above the fuel level. This allows air to be drawn off instead of fuel. Actually, the fuel discharge orifices are the inner pump jets, as shown in the inset of Fig. 12-12. The fuel stream never touches the walls of the outer jets which shield the fuel from the airstream and which are vented to the bowl.

Choke System

The climatic control, or automatic choke, provides a richer mixture as required for quick cold engine starting and smooth operation during the warm-up period, as illustrated in Fig. 12-13.

Choking is necessary only on the primary side of the carburetor, since the secondary throttle valves are locked in the closed position whenever the choke is partially on. In addition, an extra lockout pawl keeps the secondary lockout linkage engaged until the primary throttle is returned to idle position for the first time after the warm-up period is over.

When the engine is cold, tension of the thermostatic coil spring holds the choke valve closed. When the engine is started, air velocity against the off-set choke valve causes the valve to open slightly against the thermostatic spring tension. Intake manifold vacuum applied to the choke piston also tends to pull the choke valve open. The choke valve assumes a position where tension of the thermostatic spring is balanced by the pull of vacuum on the piston and force of air velocity on the offset valve.

When the engine starts, slots located in the sides of the choke piston cylinder are uncovered allowing intake manifold vacuum to draw warm air through the hot air tube, from the hot air stove located on the exhaust manifold, through the climatic control housing. The flow of warm air in turn heats the thermostatic spring and causes it to lose some of its tension. The thermostatic spring loses its tension gradually until the choke valve reaches full open position.

If the engine is accelerated during the warm-up period, the corresponding drop in manifold vacuum allows the thermostatic spring to momentarily close the choke, providing a richer mixture. The choke modifying linkage between the thermostatic spring and throttle shaft relieves thermostatic spring tension during cold engine acceleration.

During the warm-up period it is necessary to provide a fast idle speed to prevent engine stalling. This is accomplished by a fast idle cam which is rotated by a connector rod attached to the choke shaft. The fast idle cam prevents the primary throttle valves from returning to a normal, warm engine idle position while the climatic control is in operation.

If, during the starting period, the engine is flooded, it is necessary to hold the choke open sufficiently and remove the excessive fuel in the intake manifold. This may be accomplished by depressing the accelerator pedal to the floor mat and engaging the starter. The projection on the throttle lever (unloader) will rotate the fast idle cam and in turn partially open the choke valve.

Idle Speed-Up Control

Cars equipped with the Cadillac Air Conditioner have a vacuum powered, solenoid operated, Idle Speed-Up Control attached to the carburetor. This device is designed to increase the engine idle RPM from 400 to 900, when the selector is in the Neutral "N" position and the Air Conditioner switch is "On", to provide adequate cooling and guard against possible overheating of the engine during parking.

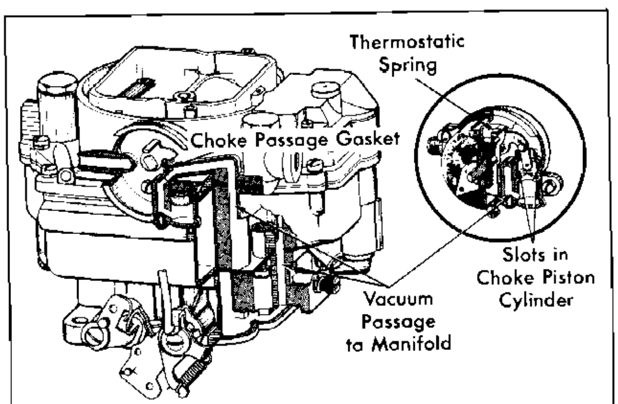

Fig. 12-13 Choke System

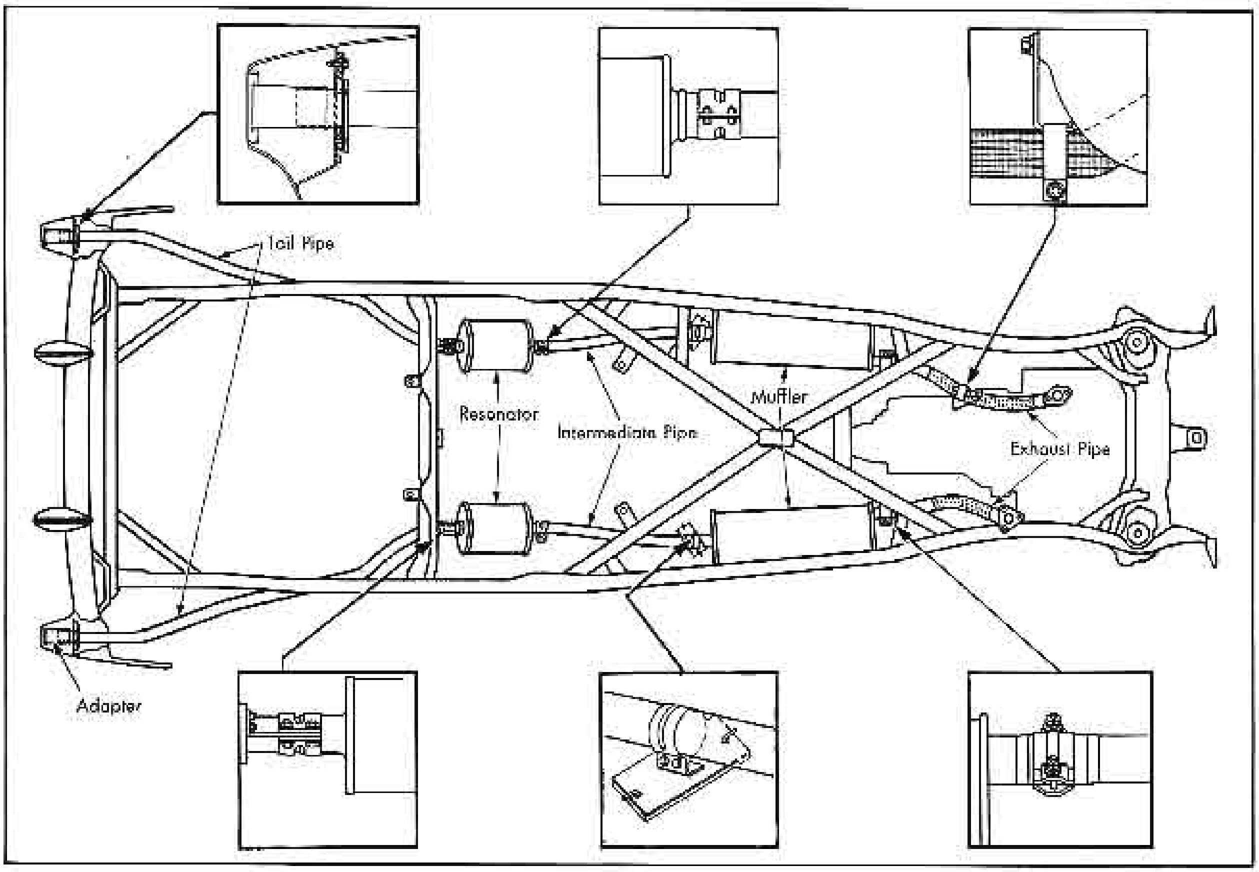

Fig. 12-14 General Arrangement of Exhaust System

Exhaust System

The dual exhaust system, designed to reduce back pressure, consists of two exhaust pipes, mufflers, intermediate pipes, resonators, tail pipes, and sleeves, as shown in Fig. 12-14.

These units are supported by brackets, insulated from the frame and bumper by rubber and fabric cushions. Provision for fore and aft expansion in the exhaust system, when it becomes warm, is made at the adapters on the rear bumper. The tail pipes are supported by three spring type clips which prevent rattles at this point and permit fore and aft movement.

A thermostatically controlled heat valve, at the junction of the left exhaust manifold and exhaust pipe, controls the flow of exhaust gases from the left cylinder head. During the engine warm-up period the valve is closed, forcing the hot exhaust gases through the ribbed heat passage under the intake manifold to heat the intake gases to provide optimum performance and economy when the engine is cold. A branch of this passage conducts exhaust gases up to the carburetor, as shown in Fig. 12-15. These hot gases warm the carburetor in the region of the primary throttle valves and idle ports, to prevent stalling due to ice formation during engine warm-up on cool, humid days. For the above reasons it will be noted that exhaust gases are emitted only through the right exhaust outlet in the rear bumper during the warm-up period.

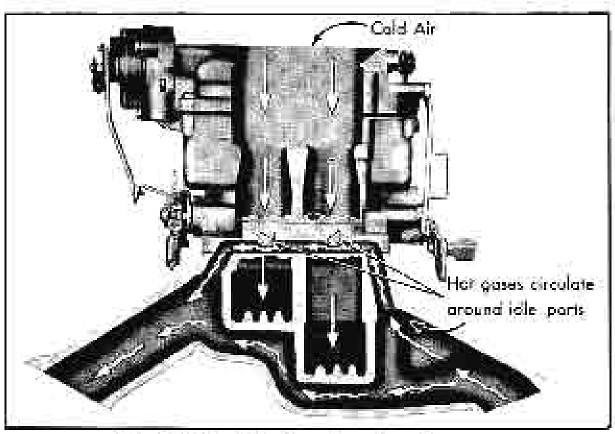

Fig. 12-15 Idle Port Heating Passages

SERVICE INFORMATION

(1) Fuel Requirements

All 1954 Series engines have a compression ratio of 8.25 to 1 and in order to prevent detonation a premium gasoline with an octane rating of 82 Motor Method and 91 Research Method should be used.

Detonation is caused by using a gas which is too low in octane rating for the engine in which it is used. The charge of gasoline in the combustion chamber burns so rapidly that it creates enough heat and pressure to ignite the unburned portion of the charge with an abrupt explosion or "knock". If nonknocking fuels are not locally available the spark setting may be retarded from the "A" toward the "C" position on the harmonic balancer to prevent detonation.

Detonation should not be confused with pre-ignition, which is caused by incandescent carbon in the combustion chamber igniting the gasoline charge ahead of the normal point of spark plugs firing.

Pre-ignition is commonly described as "wild ping" because of its uneven rhythm. Pre-ignition first appears in one or two cylinders and then gradually spreads to all cylinders in the engine, while detonation which is due to low octane gasoline affects all cylinders. The best remedy for pre-ignition is to remove the carbon from the combustion chambers.

(2) Rochester Carburetor Adjustments

NOTE: It is necessary that the following adjustments be performed in the exact sequence given. However, these adjustments can be classified into independent groups. Adjustment groups are: a-b, c-d, and e-f-g-h-i-j. When one adjustment of a group is made, the rest in the group must be performed.

a. Float Level Adjustment

Both floats may be adjusted as described below.

1. Remove bowl cover with gasket from carburetor bowl, as outlined in Note 10c.

2. With bowl cover inverted on a flat surface, bend float arms vertically until floats appear level in relation to each other.

NOTE: Rochester floats are adjusted with the bowl cover gasket on the cover, as shown in Fig. 12-16.

3. Place Float Gauge, Tool No. J-5683, in position as shown in Fig. 12-16, so that gauge is located against the curvature in the bore of the carburetor air horn.

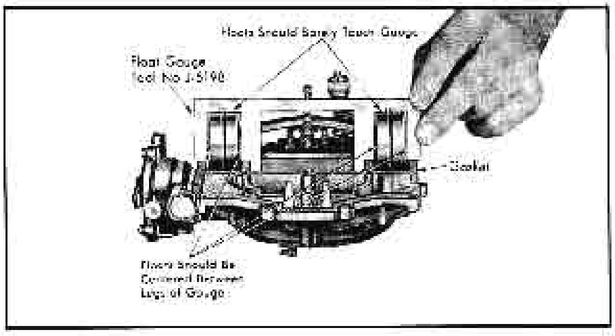

Fig. 12-16 Float Level Adjustment

4. Bend the float arms at the rear of the float assembly. They should be bent until the floats just clear the top portion of the gauge between the gauge legs (the scale dimension from the gasket to the bottom of each float should be 1-19/32 inches).

5. Bend arms horizontally until each float is centered between the gauge arms. Tilt the bowl cover assembly 90° to each side and check to see that the floats do not touch gauge legs, indicating the floats will not touch sides of bowl.

6. Recheck float setting after centering of floats.

b. Float Drop Adjustment

1. Hold bowl cover in an upright position and measure the distance from the bottom of the cover gasket to the bottom of the floats. This distance should be 2-1/4 inches, as shown in Fig. 12-17.

2. Bend the tang at the rear of the float against the needle seat to lessen the drop and away from the seat to increase the drop. Both float assemblies should be adjusted in the same manner.

3. Install bowl cover assembly, as outlined in Note 12f.

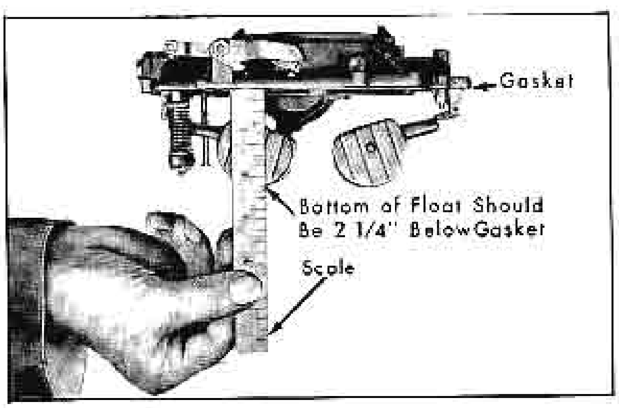

Fig. 12-17 Float Drop Adjustment

ENGINE FUEL AND EXHAUST

c. Accelerator Pump Adjustment

Back off idle stop and fast idle screws so that the throttle valves are fully closed. Hold the throttle in this position and carefully bend the pump rod until the dimension from the air horn surface to the bottom edge of the pump plunger rod is 61/64", as shown in Fig. 12-18.

NOTE: If this adjustment group is performed separately, the fast idle screw must be readjusted as in paragrpah "f" below.

d. Atmospheric Idle Vent Adjustment

NOTE: This adjustment is important because it insures proper vent opening at closed throttle, lessening the possibility of percolation.

1. Place .063" end of wire gauge, Tool No. J-5195, between the throttle valve and the primary bore of the throttle body on the side opposite the idle adjusting screws.

2. Close the throttle against the gauge and bend the atmospheric vent contact arm, using Tool No. J-5197, until it just contacts the atmospheric vent valve in the bowl cover, Fig. 12-19.

e. Choke Modifier Adjustment

1. Close primary throttle. Be certain throttle valves are seated in their bores.

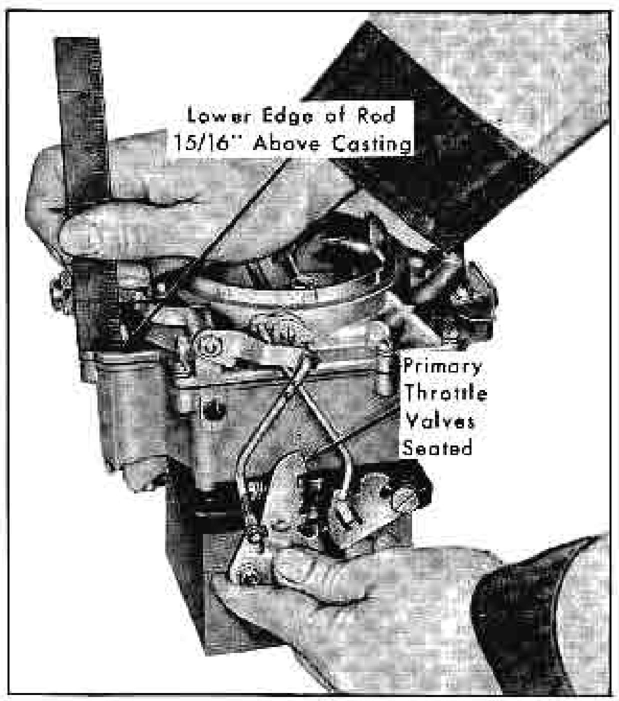

Fig. 12-18 Accelerator Pump Adjustment

2. Loosen thermostat lever retaining screw. Rotate metal pointer counterclockwise from free position until thermostat spring starts to close

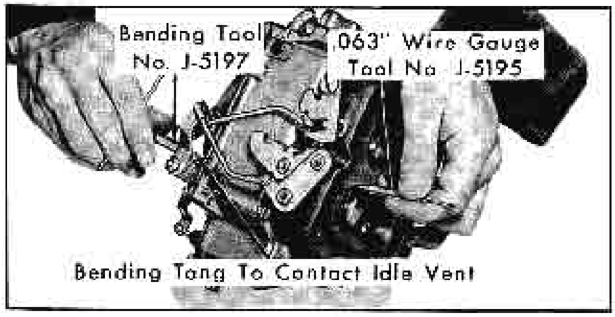

Fig. 12-19 Idle Vent Adjustment

choke valve. Continue counter-clockwise until metal pointer lines up with the index position on thermostat cover.

3. Tighten retaining screw.

f. Fast Idle Adjustment—Carburetor Off Engine

1. Move the fast idle cam so that choke is fully closed.

2. Hold the throttle lever in the closed position so that the fast idle screw rests on highest step of fast idle cam.

3. Adjust fast idle screw to obtain a clearance of .026" between the throttle valves and the primary bore of the throttle body on the side opposite the idle adjusting needles, Fig. 12-20. Measure the throttle opening with Tool No. KMO-658.

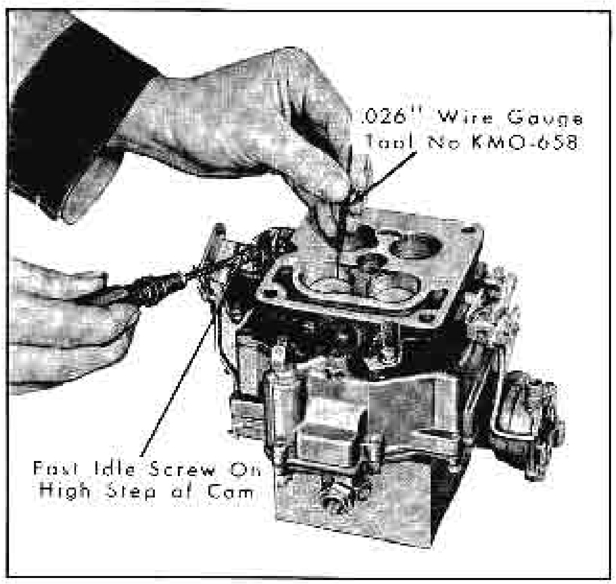

Fig. 12-20 Fast Idle Adjustment

ENGINE FUEL AND EXHAUST

g. Choke Rod Adjustment

1. Position fast idle cam and primary throttle so that fast idle screw contacts the second step of fast idle cam, and rests against the shoulder of the highest step, as shown in Fig. 12-21.

2. Hold the choke valve closed so that the choke trip lever is in contact with the choke counter-weight lever.

3. With the fast idle screw and cam in this position, carefully bend the choke rod to obtain a clearance of .040", as measured with Tool No. J-5196, between the top edge of the choke valve and the dividing wall in the air horn, Fig. 12-21. Using Bending Tool No. J-1137, as shown in Fig. 12-22.

h. Choke Unloader Adjustment

1. With the choke trip lever in contact with the choke counter-weight, move the throttle to the full open position.

2. Hold in this position and carefully bend tang of fast idle cam to obtain a clearance of .125", as measured with a 1/8" drill, between the top edge of the choke valve and the dividing wall in the air horn, Fig. 12-23. Use Bending Tool No. J-5197 as shown in Fig. 12-24.

i. Secondary Throttle Opening Adjustment

1. With carburetor inverted, move choke to fully opened position.

2. Rotate primary throttle to fully open position.

3. Check opening of secondary throttle valves.

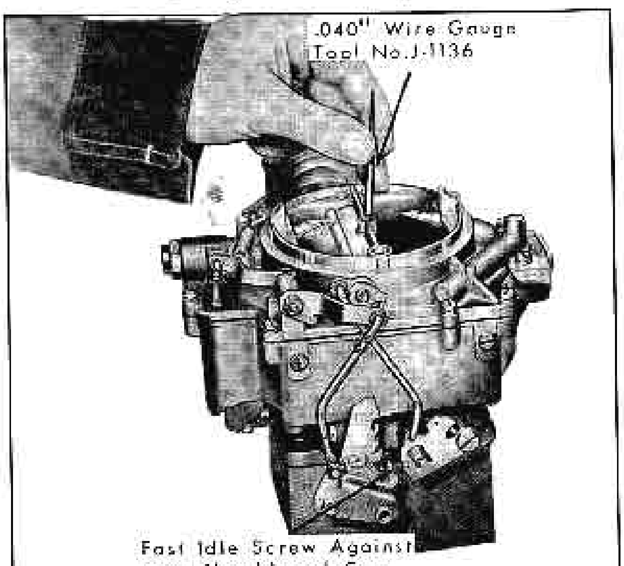

Fig. 12-21 Choke Rod Adjustment

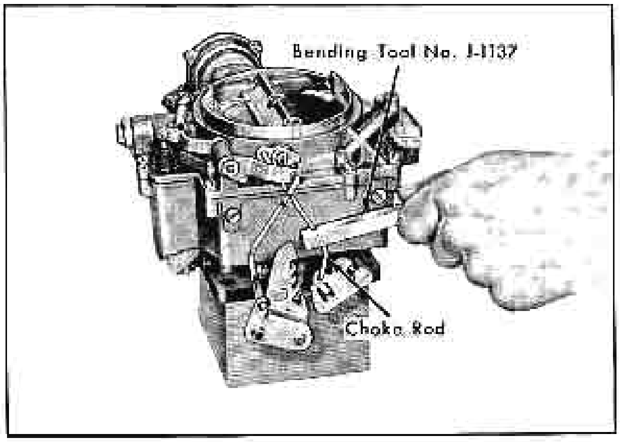

Fig. 12-22 Bending Choke Rod

They should reach wide open position at the same time.

4. If adjustment is required, disconnect both ends of the secondary throttle link.

5. Check wide-open stops on primary and secondary throttle shafts, and bend tangs as required to obtain wide open positions.

6. Connect secondary throttle actuating link.

7. Use heavy pliers to bend the throttle link as needed so that both throttle shafts reach their wide open stops together. When this adjustment is properly made, the secondary throttle opening position is automatically set correctly.

j. Secondary Throttle Lockout Adjustment

1. Position the fast idle cam and secondary

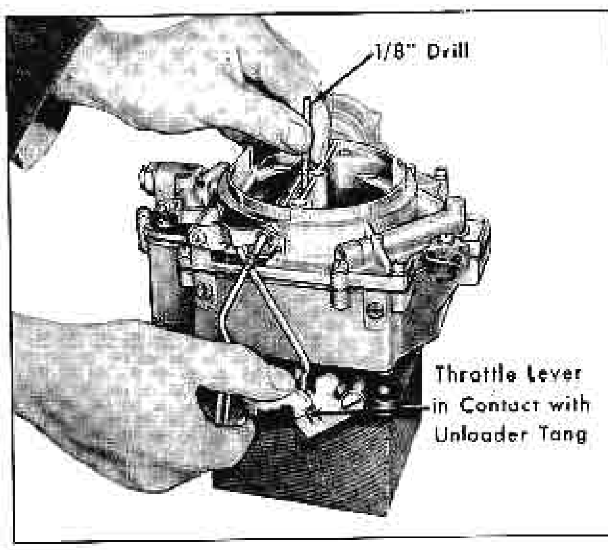

Fig. 12-23 Unloader Adjustment

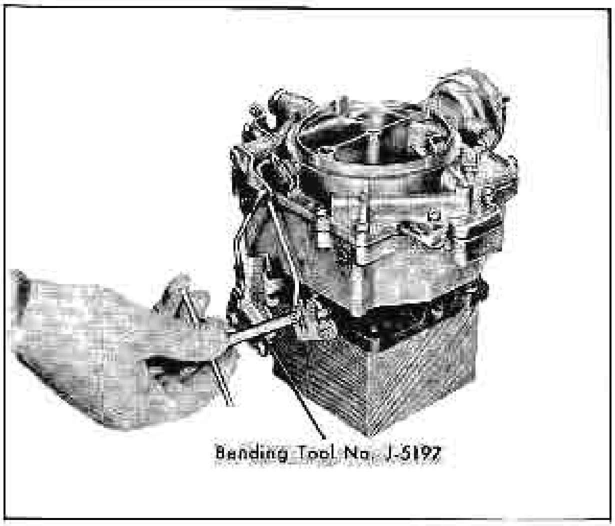

Fig. 12-24 Bending Unloader Tang

lockout lever, as shown in Fig. 12-25, with the choke valve partially closed.

2. Check the clearance between the lever and cam with .015" feeler gage as shown.

3. Use pliers to bend the lever to obtain the proper clearance (.015").

4. Open the choke valve and position the fast idle cam and lockout lever as shown in Fig. 12-26.

5. Measure the clearance between the lever cam in this position with .015" feeler gage and bend with Tool No. J-5197 to secure specified clearance.

(3) Carter Carburetor Adjustments

NOTE: It is necessary that the following adjustments be performed in the exact sequence given. However, these adjustments can be classified into independent groups. Adjustment groups are: a-b, c-d-e, and f-g-h-i-j-k. When one adjustment of a group is made, the rest in the group must be performed.

a. Float Level Adjustment

NOTE: The Carter carburetor float level adjustment is made with the bowl cover gasket removed.

Primary and secondary floats are set at different heights, using two separate gauges.

1. Remove bowl cover assembly from carburetor bowl, as outlined in Note 13c.

2. Remove float hinge pins, primary and secondary floats with needles and clips attached.

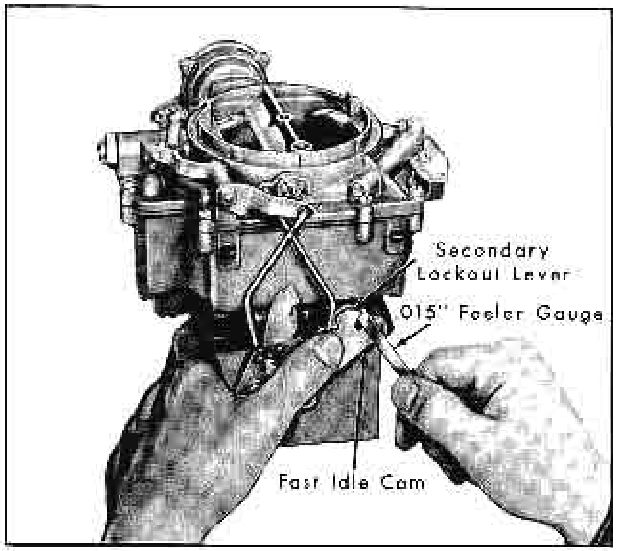

Fig. 12-25 Secondary Lockout-Choke On

3. Remove metering rods, and then remove vacuumeter piston by rotating 90° to either side.

4. Remove bowl cover gasket.

5. Replace needles, floats, and hinge pins, taking care that floats and needles are replaced on the same side from which they were removed.

6. With bowl cover inverted on a flat surface, bend float arms vertically until floats appear level in relation to each other.

7. Place Primary Float Level Gauge, Tool No. J-5457, in position as shown in Fig. 12-27.

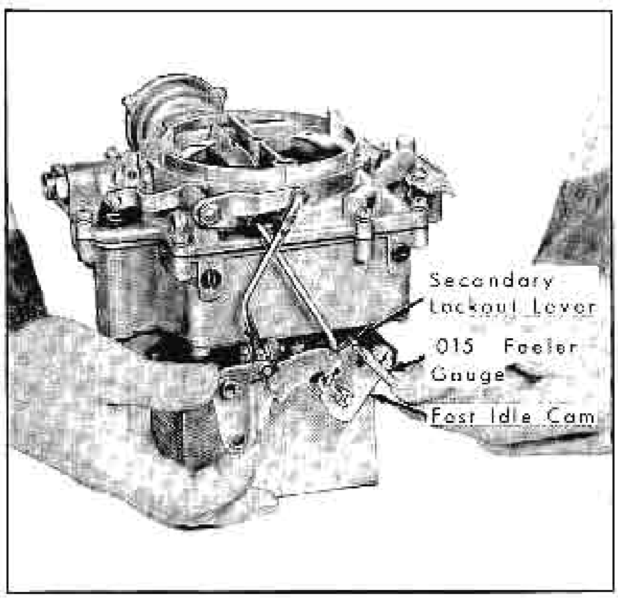

Fig. 12-26 Secondary Lockout-Choke Off

ENGINE FUEL AND EXHAUST

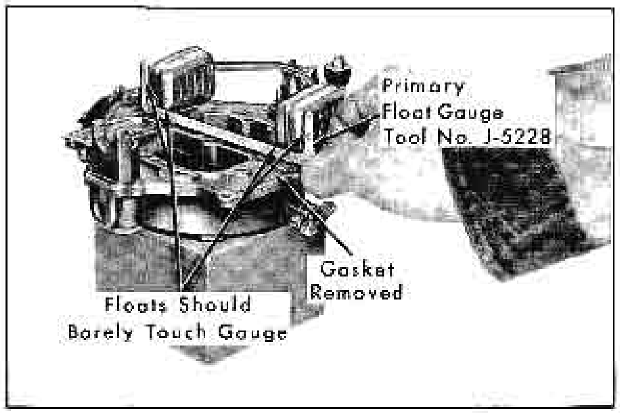

Fig. 12-27 Float Level Adjustment

8. Both floats should just clear the horizontal section of the gauge. Bend float arms as required.

9. With notched end of gauge fitted tightly against the side of the bowl cover casting, float arms should be bent for sideways adjustment until floats barely touch the vertical uprights of float gauge.

10. Repeat steps 7, 8, and 9 for secondary floats, using Secondary Float Level Gauge, Tool No. J-5458. It will be noted that the distance between center of float and casting machined surface is 1/8" for the primary floats, and 3/16" for the secondary floats.

b. Float Drop Adjustment

1. After performing the Float Level Adjustment, hold bowl cover assembly in upright position and note the distances which the floats drop, Fig. 12-28.

2. Measure from machined surface of bowl cover casting down to bottom and center of floats. Distances should be 1-15/16" for primary floats and 2" for secondary floats, as shown in Fig. 12-28.

3. Adjust as necessary by removing float and bending the small tang which contacts the float needle seat. Bend tang towards needle seat to lessen drop, or away from seat to increase drop.

4. Invert bowl cover assembly and remove floats.

5. Inspect bowl cover gasket carefully. If damage is noted, discard it and use a new gasket. Place gasket on bowl cover.

6. Install floats with needles and clips, being careful to distinguish between primary and secondary floats.

7. Install vacuumeter piston, and assemble bowl cover to carburetor as outlined in Note 15g, installing metering rods after assembly.

c. Accelerator Pump Adjustment

1. Remove dust cover and gasket.

2. Be sure that pump connector link is installed in outer hole (long stroke) of pump lever, with ends extending towards counter shaft arm.

3. Back off both idle stop screws until primary throttle valves are fully seated in their bores.

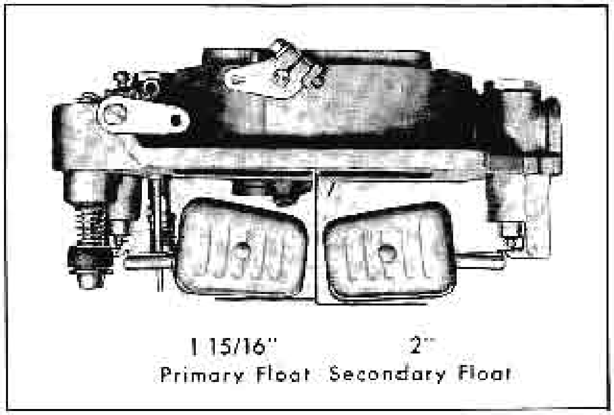

Fig. 12-28 Float Drop Adjustment

4. Use Bending Tool No. J-1137 as shown in Fig. 12-29 to lengthen or shorten pump rod as required until the top of the pump plunger shaft is 9/32" below the top of the dust cover boss, Fig. 12-30. Optional Adjustment: Hold a straightedge across top of dust cover boss as shown in Fig. 12-31. Adjust length of pump rod as in step 4 above, until the flat on top of the pump arm (under set screw) is

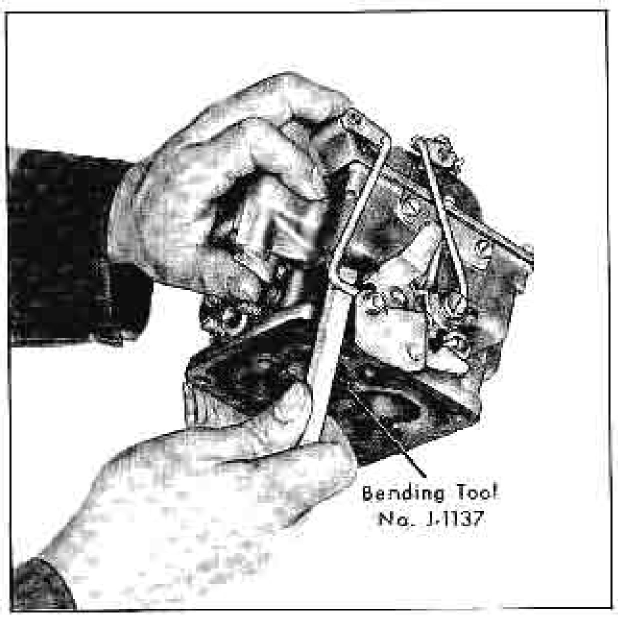

Fig. 12-29 Bending Pump Rod

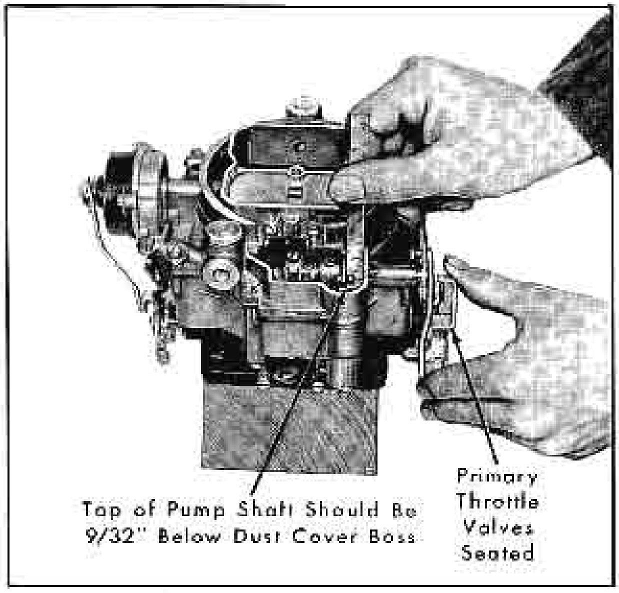

Fig. 12-30 Accelerator Pump Adjustment

parallel with upper edge of straightedge. Unloader Gauge J-818-3 may be used conveniently for this adjustment.

5. Make Metering Rod and Idle Vent Adjustments as outlined below.

d. Metering Rod Adjustment

1. Loosen set screw in metering rod lever to obtain a slight bind on the pump countershaft. Lift lever slightly.

2. With primary throttle valves seated in their bores, depress metering rod link until metering

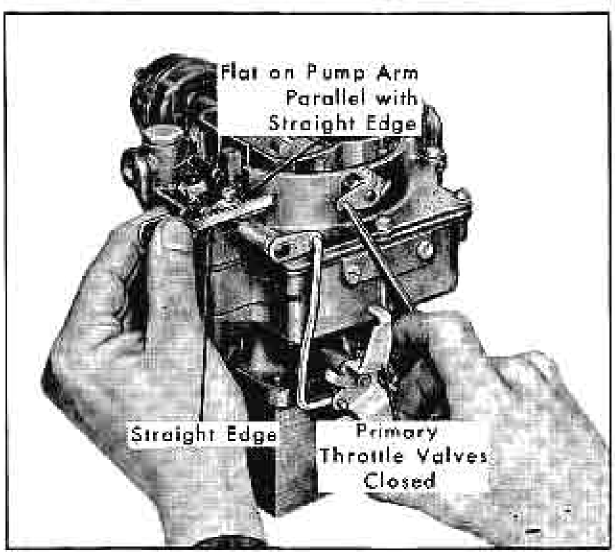

Fig. 12-31 Optional Pump Adjustment

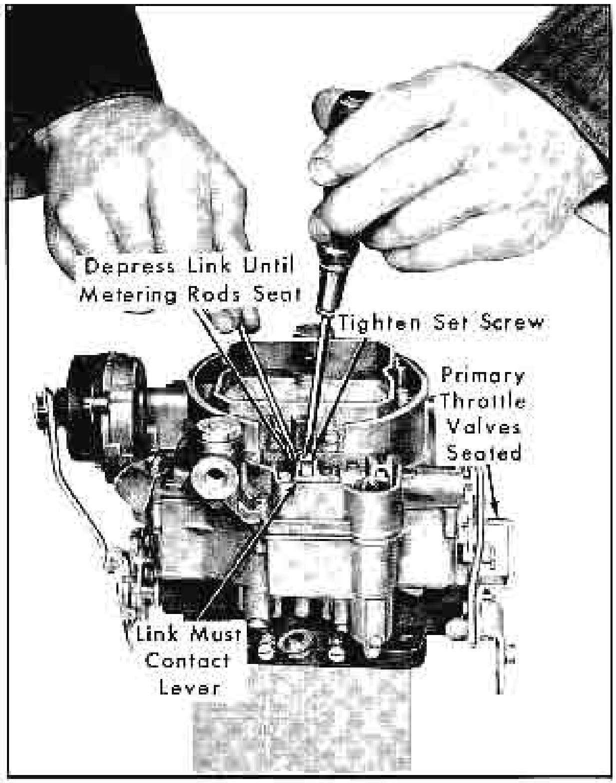

Fig. 12-32 Metering Rod Adjustment

rods bottom against the bowl casting, as shown in Fig. 12-32.

3. Keeping the lever in contact with the metering rod link, tighten set screw.

e. Atmospheric Idle Vent Adjustment

NOTE: The idle vent may be adjusted with the carburetor on the engine and air cleaner removed. Be sure the accelerator pump and metering rods are properly adjusted, as the idle vent adjustment depends on the pump adjustment.

1. Check vent valve opening by measuring the difference in height (at the rivet head on valve) with the primary throttle valve in the open position and then in the closed (hot idle) position. Be sure choke is off. This should be 1/32 inch. Fig. 12-33.

2. If the vent valve opens more than 1/32 inch, it may be adjusted by simply pressing the valve down slightly, with the throttle closed, until the proper opening is obtained.

3. If the vent valve opening is less than 1/32 inch, it will be necessary to remove the dust cover with valve and bend the actuating arm, Fig. 12-34, up slightly and repeat above operations after installing dust cover.

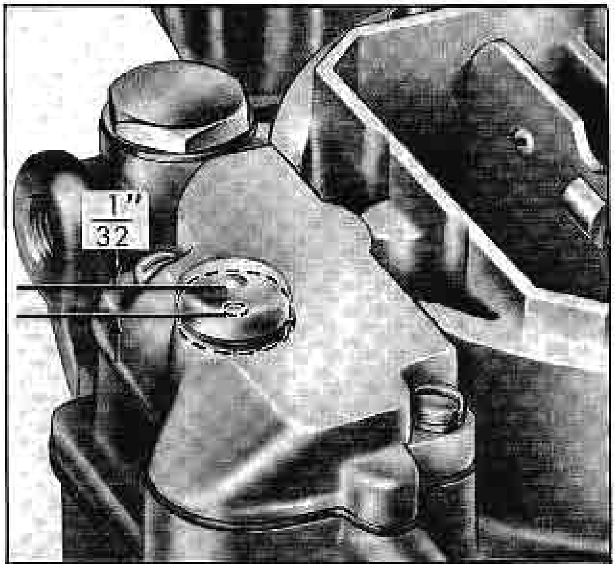

Fig. 12-33 Idle Vent Opening

CAUTION: Loss of low speed cruising fuel economy, due to a rich mixture, will result if valve opens too high, since it will not close soon enough as the throttle is opened. If vent valve does not open far enough, its advantages will be reduced.

4. Replace air cleaner and check idle smoothness when hot.

f. Choke Modifier Adjustment

1. Loosen choke cover retaining screws and rotate climatic control assembly to index setting (central mark on choke housing). Retighten retaining screws. Refer to Fig. 12-35.

2. Remove spring clip from lower end of choke modifier rod and remove rod.

3. Rotate metal pointer and lever counter-clockwise from free position until thermostatic spring starts to close choke valve. Continue counterclockwise until metal pointer lines up with plastic pointer on coil housing.

4. Holding metal pointer in this position, loosen clamp screw and rotate modifier lever until lever points forward (toward fuel inlet) and scribed line is vertical. Retighten clamp screw.

5. Hook upper end of choke modifier rod into modifier lever.

6. Use Bending Tool No. J-1137 at upper angle of rod to lengthen or shorten modifier rod as required until it freely enters hole in lever on primary

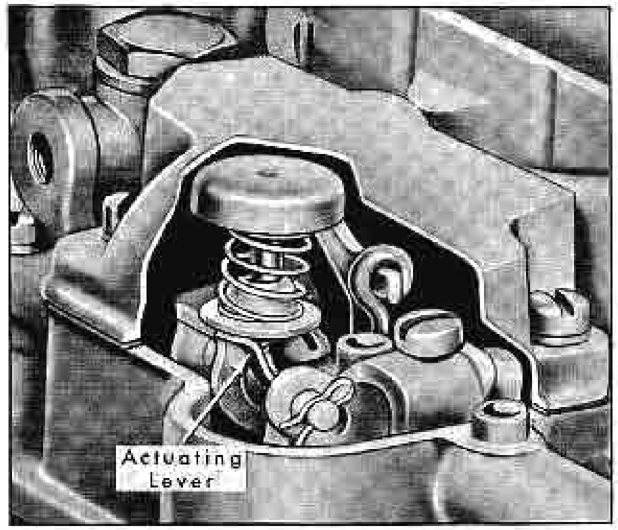

Fig. 12-34 Atmospheric Idle Vent Adjustment

throttle shaft, as shown in Fig. 12-35, when pointer is aligned as in Step 4 above, and primary throttle valves are seated.

7. Install spring clip on lower end of choke modifier rod.

g. Choke Rod Adjustment

1. Loosen choke lever clamp screw.

2. Insert .020" wire gauge, Tool No. J-1136, between tang on fast idle cam and boss on throttle body casting. Hold this gauge in place by pressure of screwdriver exerted on choke lever clamp screw, as shown in Fig. 12-36. This will automatically take up all slack in the linkage.

3. Hold choke valve tightly closed, and tighten clamp screw.

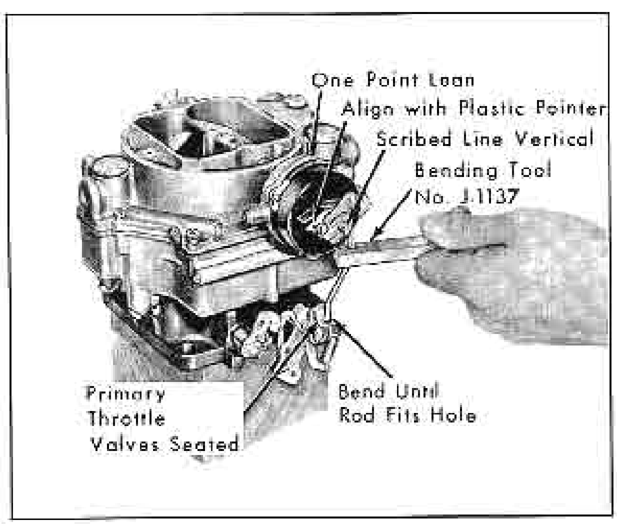

Fig. 12-35 Choke Modifier Adjustment

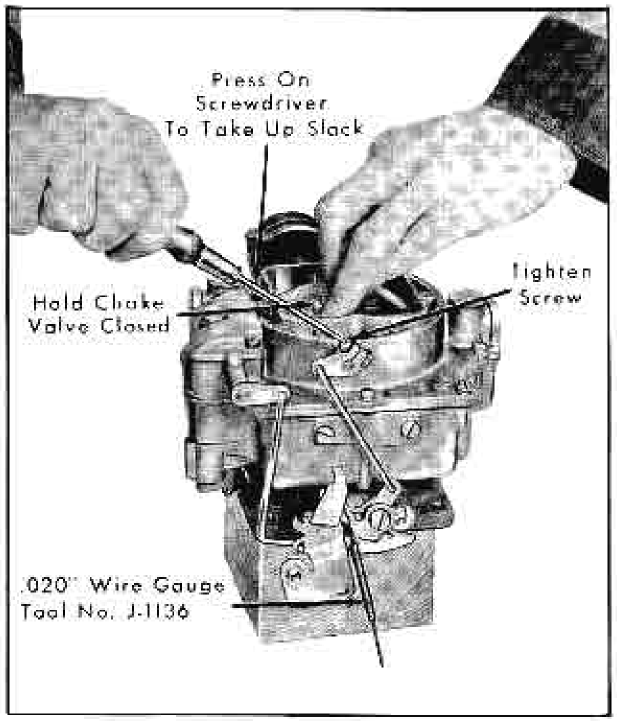

Fig. 12-36 Choke Rod Adjustment

4. Make Unloader, Secondary Lockout, and Fast Idle Adjustments as outlined below.

h. Choke Unloader Adjustment

1. Rotate primary throttle to full open position.

2. Insert 3/16" Unloader Gauge, Tool No.

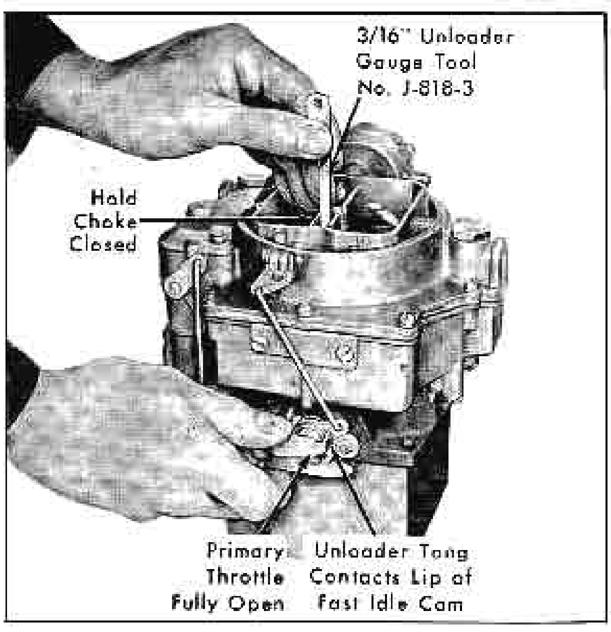

Fig. 12-37 Unloader Adjustment

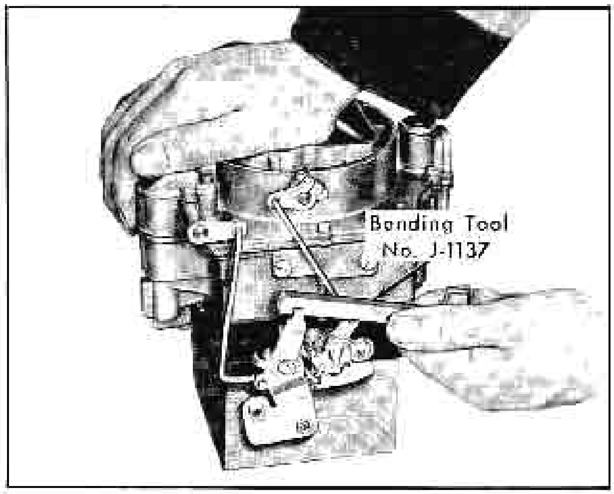

Fig. 12-38 Bending Unloader Tang

J-818-3, between upper edge of choke valve and inner dividing wall of air horn, as in Fig. 12-37. Under finger pressure, choke valve should give a slight drag on gauge.

3. Using Bending Tool No. J-1137 as shown in Fig. 12-38, bend unloader tang on throttle lever as required.

i. Secondary Throttle Opening Adjustment

1. With carburetor inverted, move choke to fully open position.

2. Rotate primary throttle to fully open position.

3. Check opening of secondary throttle valves. They should be fully open at the same time.

4. If adjustment is required, remove the secondary throttle actuating link.

5. Check wide-open stops on primary and secondary throttle shafts, and bend tangs with heavy pliers as required to obtain wide open position.

6. Install secondary throttle actuating link. (Note that the link goes in the hole nearest the center of the secondary throttle shaft and the hole in corner of lever on the primary shaft.)

7. Use heavy pliers to bend throttle link as needed so that both throttle shafts reach their wide-open stops together. When this adjustment is correctly made, the secondary throttle opening postion is automatically set correctly.

j. Secondary Throttle Lockout Adjustment

1. Close primary throttle valves against .015"

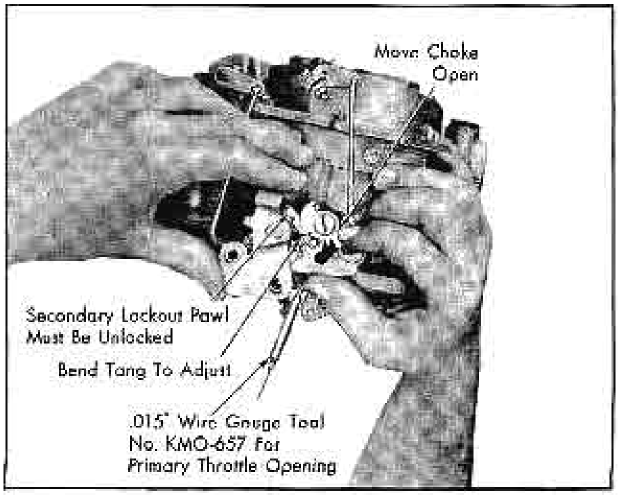

Fig. 12-39 Secondary Lockout Pawl Adjustment

wire gage, Tool No. KMO-657, and hold fast idle cam clear of adjusting screw. Wire gage should be on side of bore opposite idle ports. Refer to Fig. 12-39.

2. Observe whether secondary lockout pawl is moved to unlocked position. Adjust as required, using long-nosed pliers on the tang which contacts primary throttle lever just behind the fast idle screw, until lockout pawl just clears dowel in throttle body casting, as shown in Fig. 12-39.

3. Holding choke valve closed, adjust secondary throttle shaft tang sideways, using heavy pliers, as required to obtain a clearance between this tang and the secondary lockout cam of .015", measured with a feeler gage as shown in Fig. 12-40.

4. Open choke fully. Tang on cam trip lever should move secondary lockout cam to permit rotation of secondary throttle shaft when primary throttle is opened sufficiently, Fig. 12-41.

5. Adjust tang as required to obtain a minimum clearance of .015" between secondary throttle shaft tang and lockout cam, using Bending Tool No. J-5197, as shown in inset of Fig. 12-41.

6. Check to see that tang on cam trip lever returns secondary lockout cam to locked position when choke valve is fully closed. Adjust cam trip lever tang for minimum clearance if necessary.

k. Fast Idle Adjustment (Off Engine)

1. Invert carburetor as shown in Fig. 12-42.

2. Place .020" wire gauge, Tool No. J-1136, between primary throttle valve and side of bore opposite idle screws.

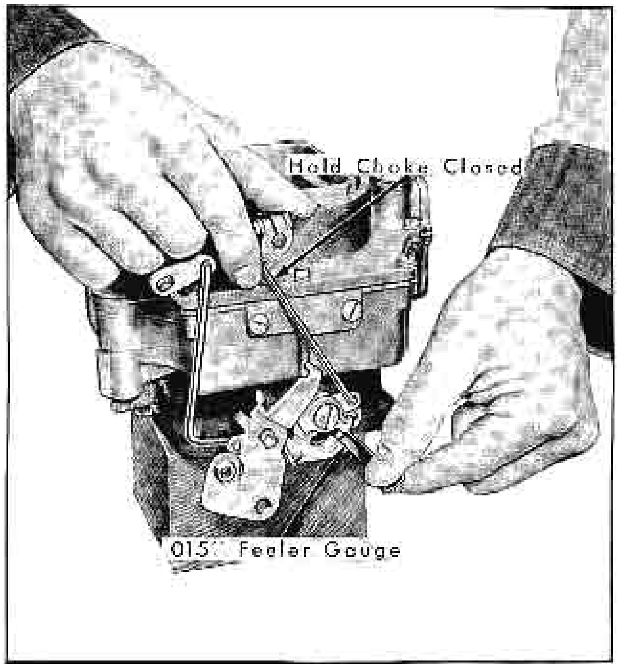

Fig. 12-40 Secondary Lockout-Choke On

3. Move choke valve to fully closed position, and adjust fast idle screw to give a slight drag on the wire gauge when screw is resting on the high step of the fast idle cam.

NOTE: Idle Speed and Mixture Adjustments and Fast Idle Adjustment on Engine must be performed after installation of carburetor, as described in Notes 4 and 6 below.

(4) Idle Speed and Mixture Adjustments

NOTE: The following procedure applies to

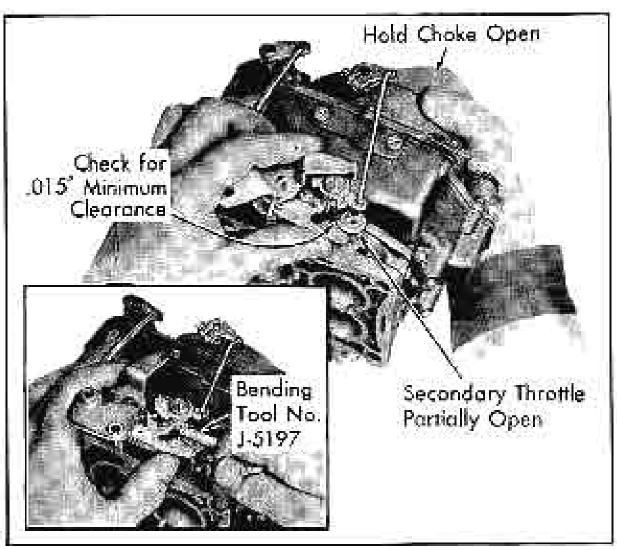

Fig. 12-41 Secondary Lockout-Choke Off

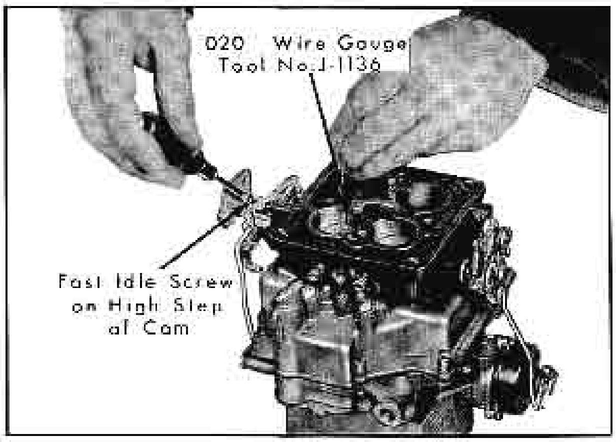

Fig. 12-42 Fast Idle Adjustment

both the Rochester 4 GC and the Carter WCFB carburetors.

1. Connect a tachometer to the engine and set the hand brake securely. Place transmission in neutral.

2. Start and warm engine to normal operating temperature. Be sure that choke is fully off and that carburetor is on slow idle.

3. Loosen front and rear T.V. rod jam nuts at carburetor throttle lever trunnion. Place selector in either "Dr" position.

4. Set idle speed to not more than 400 RPM.

5. Turn one idle mixture adjusting screw in or out until highest RPM is reached.

6. Repeat step 5 with the other idle mixture adjusting screw.

7. Reset idle RPM as noted in step 4.

8. Repeat steps 4-7 until turning the mixture screws will not cause an increase in engine idle RPM, and the smoothest engine idle is obtained.

9. Shut off engine.

10. Disconnect throttle rod from dash relay by removing spring clip.

11. Place 1/4 inch drill shank through gauging hole of relay lever and bracket.

12. Adjust relay rod trunnion position to allow free entry into hole in relay lever, with throttle in hot idle position.

13. Install spring clip in trunnion.

14. Push rearward on end of T.V. rod to position transmission throttle valve against its stop.

15. Bring rear jam nut up against trunnion, with hrottle in hot idle position.

16. Back off rear jam nut 2-1/2 complete turns.

17. Tighten front jam nut, making certain that linkage does not bind in any position.

18. Remove drill shank from gauging hole.

NOTE: For complete Hydra-Matic linkage adjustment, refer to Section 14, Note 4.

19. Perform Fast Idle Adjustment on Engine, as outlined in Notes 5 and 6.

20. Drive car to check transmission shift smoothness. It may be necessary to readjust T.V. jam nut slightly to obtain smooth shifting.

(5) Fast Idle Adjustment on Engine-Rochester Carburetor

1. Start engine and allow engine and transmission to reach operating temperature. Tachometer should still be connected from previous adjustments. Transmission should be in neutral.

2. Make certain choke is fully open.

3. Hold throttle lever closed so that fast idle adjusting screw rests on highest step of fast idle cam. Choke valve will not be disturbed, if engine is warm.

4. Adjust fast idle screw to give a speed of 1700 RPM with transmission in neutral.

5. Return engine to normal idle.

6. Shut off engine and remove tachometer.

(6) Fast Idle Adjustment on Engine—Carter Carburetor

1. Start engine and allow engine and transmission to reach operating temperature. Tachometer should still be connected from previous adjustments. Transmission should be in neutral.

2. Make certain choke is fully open.

3. Hold choke rod down by pressing on end of cam trip lever.

4. Open primary throttle slightly and rotate fast idle cam to its stop against spring tension, so that fast idle screw rests on high step of cam.

5. Adjust fast idle screw to give a speed of 1700 RPM with transmission in neutral.

6. Return engine speed to normal idle.

7. Shut off engine and remove tachometer.

(7) Idle Speed-Up Control Adjustment

1. Start engine and allow it to warm up.

2. Turn the Air Conditioner "On".

3. With selector shift lever in the neutral position "N"; (On Carter Carburetors)

Adjust serrated nut on rod to maintain idle speed at 900 RPM.

Lock serrated nut with jam nut.

(On Rochester Carburetors)

Hold the stem with a wrench and adjust the hex-head screw to maintain an idle speed of 900 RPM.

(8) Removal of Carburetor from Engine

NOTE: The following procedure applies to both the Rochester 4 GC and the Carter WCFB carburetor.

1. Remove air cleaner and air cleaner mounting stud and gasket.

2. Disconnect fuel line from carburetor and loosen fuel line at fuel filter. (Note Carter requires a 5/16 straight tube fitting in carburetor to attach fuel line. Rochester has a combined strainer nut and 5/16 invert flare and, therefore, does not require another fitting. Just screw in fuel line nut.)

3. Disconnect manifold to choke housing heater pipe.

4. Remove front jam nut from carburetor to transmission T.V. rod, and rotate throttle lever to allow removal of rod from trunnion (leave trunnion attached to throttle lever, since the T.V. rod must be readjusted when carburetor is replaced).

5. Disconnect throttle relay rod from throttle lever by removing throttle return spring from rod.

6. Unscrew distributor vacuum line at carburetor throttle body fitting.

7. Remove four nuts holding carburetor to intake manifold studs.

8. Lift carburetor off manifold, and disengage distributor vacuum line.

9. Remove and discard carburetor to manifold gasket.

(9) Installation of Carburetor on Engine

NOTE: The following procedure applies to both the Rochester 4 GC and the Carter WCFB carburetor.

1. Scrape old gasket off intake manifold. Clean gasket from bottom of carburetor. Place a new carburetor to manifold gasket over studs of intake manifold, with opening for carburetor heating passage toward front of car.

2. Start distributor vacuum line into fitting on carburetor throttle body.

3. Lower carburetor onto intake manifold studs, with choke housing to right side of car.

4. Install and tighten 4 nuts on manifold studs. Be sure to tighten nuts evenly, using a short open-end wrench.

5. Tighten distributor vacuum line fitting.

6. Connect and tighten manifold to choke housing heater pipe.

7. Connect and tighten fuel line to carburetor. Tighten fuel line at fuel filter. (Note: Be sure strainer nut on RPD carburetor is tight.)

8. Insert throttle relay rod in lower throttle lever hole. Secure with hook end of throttle retracting spring, inserted from below.

9. Open throttle and insert T.V. rod into trunnion on throttle lever. Install front jam nut loosely.

10. Install air cleaner mounting stud in carburetor and gasket in position.

11. Install air cleaner.

12. Perform Idle Speed and Mixture Adjustments and Fast Idle Adjustment, as outlined in Notes 4 to 6 above.

(10) Rochester Carburetor Disassembly

a. Idle Speed—Up Control Removal (on cars equipped with Air Conditioning)

1. Remove vacuum pipe connection at idle speed-up control.

2. Remove cover screw which retains control wire clip.

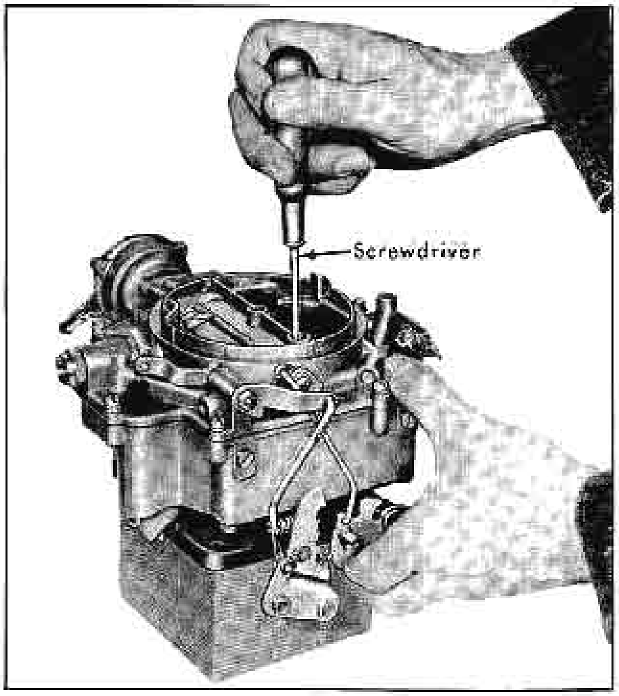

Fig. 12-43 Removing Bowl Cover Screws

3. Remove four mounting plate to bowl cover screws and lockwashers.

4. Lift idle speed-up control and mounting plate from bowl cover.

b. Idle Speed-Up Control Disassembly

1. Remove 2 screws and washers from bakelite cover.

2. Remove spring from coil.

3. Remove valve from inside idle support control.

4. Remove elbow from idle speed-up control.

c. Bowl Cover Removal

1. Remove modifier rod by removing horseshoe clip on bottom of rod and retainer clip on top.

NOTE: The upper type clip may be easily removed by pushing with a screwdriver against the projecting tang.

2. Remove pump rod by procedure in above step.

3. Remove choke lever and trip lever with retaining screw from choke shaft.

4. Remove fast idle cam pivot screw. Remove choke rod and fast idle cam attached.

5. Remove 3 inner and 10 outer bowl attaching screws with lockwashers. One of the inner bowl screws is located in a counterbore just inside the edge of the air horn as shown in Fig. 12-43. On cars equipped with the Idle Speed-Up Control, only 2 inner bowl and 7 outer bowl attaching screws remain to be removed. The other 4 have been removed previously.

6. Break bowl cover loose from bowl using finger pressure only. Do not attempt to pry cover loose.

7. Lift bowl cover assembly straight up out of the bowl by gripping air horn section as shown in Fig. 12-44. Be careful not to bend float assemblies.

d. Bowl Cover Disassembly

1. With bowl cover assembly inverted, remove float hinge pins and floats. Remove needles from their seats.

NOTE: Keep parts from primary side separate from those of the secondary side.

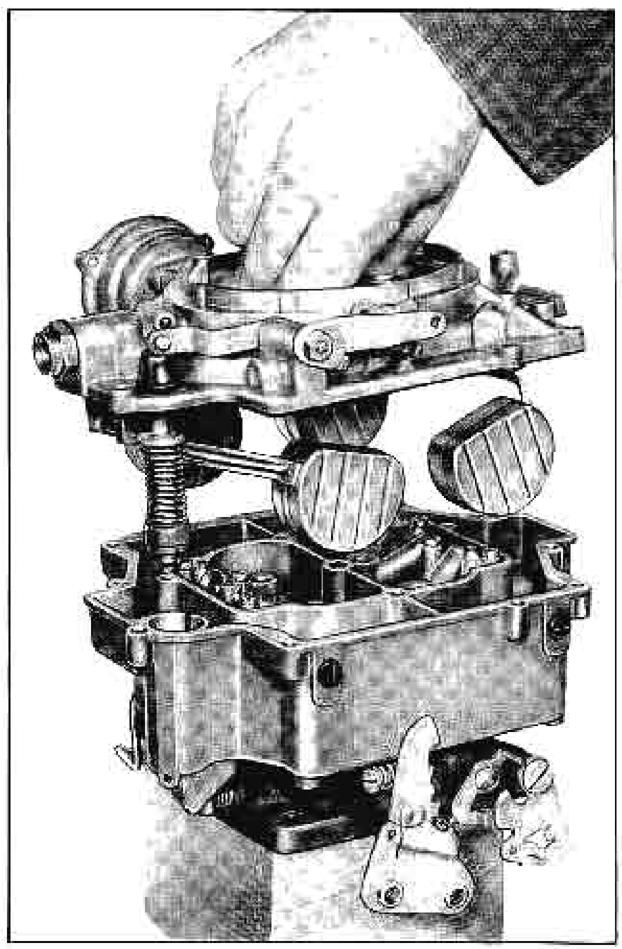

Fig. 12-44 Removing Bowl Cover

2. If necessary, remove vacuum power piston from bowl cover by pulling out with pliers.

3. Remove and discard bowl cover gasket.

4. Remove primary and secondary needle seats and gaskets using a screwdriver. Remove screen from secondary needle.

NOTE: If needle valves and seats are to be reused, it is particularly important to keep the needle valves mated with their corresponding seats.

5. Remove idle vent valve, spring, and retainer by inverting bowl cover and pressing on retainer with a screwdriver and then sliding the assembly up out of well in bowl cover.

CAUTION: Hold hand over valve assembly when removing so the parts will not be lost.

6. Turn bowl cover right side up. Remove horseshoe pin from accelerator pump plunger shaft, disengage plunger shaft from pump lever, and pull pump plunger with rubber boot downward and out of bowl cover. Rubber boot, retainer, washer, and spring may be removed from pump for cleaning if desired.

7. Remove nut and lockwasher from pump shaft and remove pump lever. Slide pump countershaft out of bowl cover boss.

8. Remove fuel inlet nut, gasket, and strainer.

e. Choke Disassembly

1. With bowl cover right side up on bench, remove retaining screw and thermostat lever.

2. Holding choke valve open, file staked ends of the 2 brass screws.

3. Holding choke valve closed, remove 2 choke valve screws. Discard used screws and slide choke valve out of slot in shaft.

4. Remove thermostat cover with 3 screws and retainers. Do not remove metal pointer or thermostat coil from shaft in cover.

5. Remove thermostat cover gasket and choke baffle plate.

6. Carefully rotate choke shaft counter-clockwise until choke piston clears vacuum cylinder.

7. Slide choke shaft out of housing and bowl cover.

8. Disconnect choke piston from link attached to shaft by tapping piston and then letting piston pin fall into cupped hand.

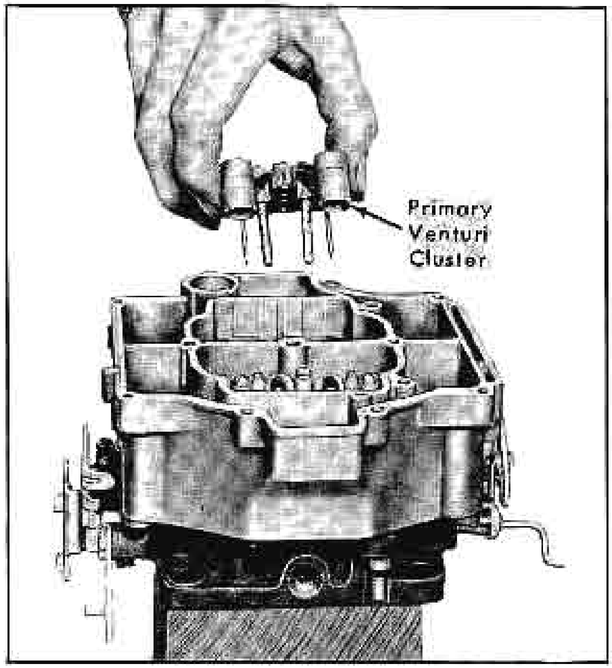

Fig. 12-45 Removing Venturi Cluster

9. Remove choke housing from bowl cover by removing 2 attaching screws and lockwashers. Remove and discard choke housing gasket.

f. Bowl Disassembly

1. Remove pump spring and pump inlet screen from bowl, using long-nosed pliers.

2. Remove aluminum pump inlet ball by inverting bowl.

NOTE: Never substitute a steel ball for the aluminum ball.

3. Remove power valve and gasket with a screwdriver.

4. Remove primary and secondary main metering jets using a screwdriver.

5. Remove primary and secondary venturi clusters, as shown in Fig. 12-45, by removing 3 attaching screws and lockwashers from each. Break cluster loose by finger pressure only, and remove and discard gaskets. Do not attempt further disassembly of either cluster.

6. Remove "T" slot from primary side with long-nosed pliers. Remove copper spring and then invert bowl and catch ball in cupped hand.

NOTE: Keep ball separated from ball removed in step e. 2.

7. Remove and discard fuel sight plugs if threads or screwdriver slots are damaged. Otherwise, plugs may be left installed.

g. Throttle Body Removal

1. Remove 3 linkage rods, as described in Note 10b, if this has not already been done.

2. Invert carburetor on workbench.

3. Remove large screw and lockwasher from counterbore in center of throttle body, using a screwdriver.

4. Remove 3 small attaching screws and lockwashers using a cross-head screwdriver.

NOTE: First remove idle speed-up control vacuum pipe from nipple, on Air Conditioner equipped cars.

5. Break throttle body loose from bowl with finger pressure only. Do not attempt to pry bowl loose.

6. Remove and discard throttle body to bowl gasket.

h. Throttle Body Disassembly

1. Remove 2 idle adjusting mixture screws with springs.

2. Remove nipple for distributor vacuum line. Remove elbow for idle speed-up control vacuum line if car is equipped with Air Conditioner.

3. Remove idle stop screw (hex-head) with spring from throttle body, and remove fast idle adjusting screw with spring from primary throttle lever.

NOTE: Keep each adjusting spring with its adjusting screw for easier identification.

4. Remove cotter pin, flat washer, spring washer and T.V. trunnion from throttle lever. Discard cotter pin.

5. Remove horseshoe clip from each end of secondary throttle actuating link. Remove washer from upper end of throttle link.

6. Unhook inner long end of primary throttle shaft override spring from lever, using long-nosed pliers.

7. Remove override spring retaining screw from primary throttle shaft.

8. Slide secondary throttle actuating lever and override spring off primary throttle shaft.

9. Remove throttle link from secondary throttle lever.

10. Remove secondary throttle lever retaining screw and spacer from secondary throttle shaft.

11. Slide secondary throttle lever and secondary throttle return spring off throttle shaft.

NOTE: Do not attempt further disassembly of the throttle body. The low speed ports in each throttle valve bore are bored at the factory after the valves are installed and adjusted, gaging from the closed throttle valve. If original adjustment of throttle valves is changed, the low speed metering calibrations will be changed.

(11) Inspection and Cleaning of Rochester Carburetor Parts

1. Thoroughly clean all metal parts of carburetor in carburetor cleaning solvent, with the exceptions noted below, and dry with compressed air.

CAUTION: Do not wash accelerator pump plunger assembly, thermostat coil and cover assembly or pump boot, in cleaning solvent. Wash these parts in clean gasoline only.

2. Clean and blow out all passages with compressed air. Remove any gum deposits which may have accumulated within carburetor parts. Clean carbon out of throttle body heat passage.

3. Make sure all calibrated restrictions, such as idle ports, air bleeds, or vents, are clean, but do not pass drills through these passages.

4. Check all shafts and their corresponding bearing bores for wear. Check each piston in its respective cylinder. Check for worn jets and worn holes in the ends of the various levers.

5. Inspect the accelerator pump plunger leather, replacing the plunger as an assembly if the leather is creased or cracked.

6. Examine float needles and seats. If a needle appears grooved, replace entire set with a factory matched needle, seat, and gasket.

7. Inspect idle mixture adjusting screws for burrs, ridges, or grooves. If wear is evident, replace screws.

8. Inspect floats for dents or leaks. Inspect

hinge pin bores for burrs or wear. Check hinge pins for straightness.

9. Clean strainer screens of dirt and lint. If distorted or plugged, these screens should be replaced.

10. Inspect fast idle cam for excessive wear on the steps, which would impair smooth engine operation during warmup. If wear is noted, replace cam.

11. Carefully inspect throttle body and valve assembly for wear at the throttle valves and bores, and between the shafts and their bores. This unit must be replaced as an assembly only, due to close manufacturing selective fit tolerances.

12. Always use new gaskets when reassembling carburetor.

(12) Rochester Carburetor Assembly

a. Throttle Body Assembly

1. Place secondary throttle return spring on secondary throttle shaft, with bent end of spring in hole in throttle body.

2. Wind up return spring 1 complete turn in the clockwise direction, and place secondary throttle lever on shaft over end of spring. Bent portion of lever should be placed above shaft as shown in Figs. 12-46 and 12-47.

3. Install spacer and retaining screw on end of secondary throttle shaft.

4. Place end of throttle link, which does not have washer attached, in hole in secondary throttle lever. Retain it with a horseshoe clip to secondary throttle lever.

5. Start secondary throttle actuating lever onto primary throttle shaft, with curved slot portion outward and rearward. With inner side of lever on shaft, place override spring on shaft, long end inward, and slide lever fully onto shaft with washer end of throttle link inserted through curved slot. Refer to Figs. 12-46 and 12-47 for assembly details.

6. Install override spring retaining screw through loop end of spring, and into primary throttle shaft from upper side.

7. Hook inner end of override spring over top edge of inner portion of lever, using a screwdriver to push the extended portion of the spring onto the inner portion of the lever.

8. Install a washer and a horseshoe spring on the upper end of the secondary throttle actuating link.

9. Install fast idle screw with long, heavy spring in primary throttle lever.

10. Install round-tipped, hex-head idle stop screw with short, heavy spring in primary shaft boss of throttle body.

11. Install T.V. trunnion, spring washer, flat washer, and retain with a new cotter pin.

12. Install nipple for distributor vacuum line. Install elbow for idle speed-up control on cars equipped with Air Conditioner.

13. Install 2 idle mixture adjusting screws with springs.

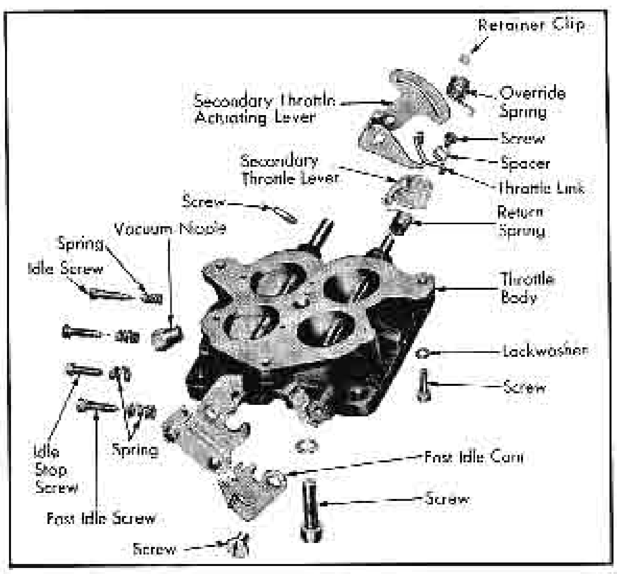

Fig. 12-46 Throttle Body Disassembled

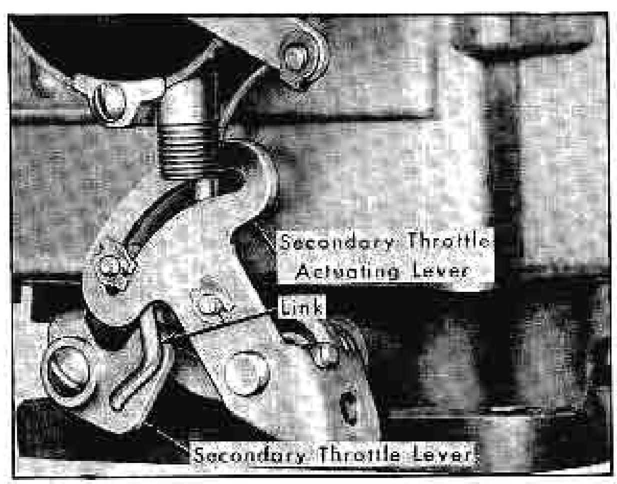

Fig. 12-47 Secondary Throttle Linkage

ENGINE FUEL AND EXHAUST

CAUTION: Tighten idle mixture adjusting screws carefully, so as not to groove needles or enlarge seats. Back out each screw 1 to 1-1/4 turns from the seated position for initial adjustment.

b. Throttle Body Installation

1. Place new throttle body to bowl gasket on bottom surface of bowl with bowl inverted on workbench.

NOTE: Gasket is not reversible. Large and small projecting tabs must be placed on primary side of bowl, surrounding the vacuum passage to the power valve piston.

2. Place throttle body assembly on bowl with primary throttle lever and fast idle cam on same side of bowl as fuel sight plugs, as shown in Fig. 12-48.

3. Start 3 outer Phillips attaching screws with lockwashers through gasket into bowl.

4. Install and tighten large center screw with lockwasher, using a screwdriver.

5. Tighten 3 outer screws uniformly, using a Phillips screwdriver.

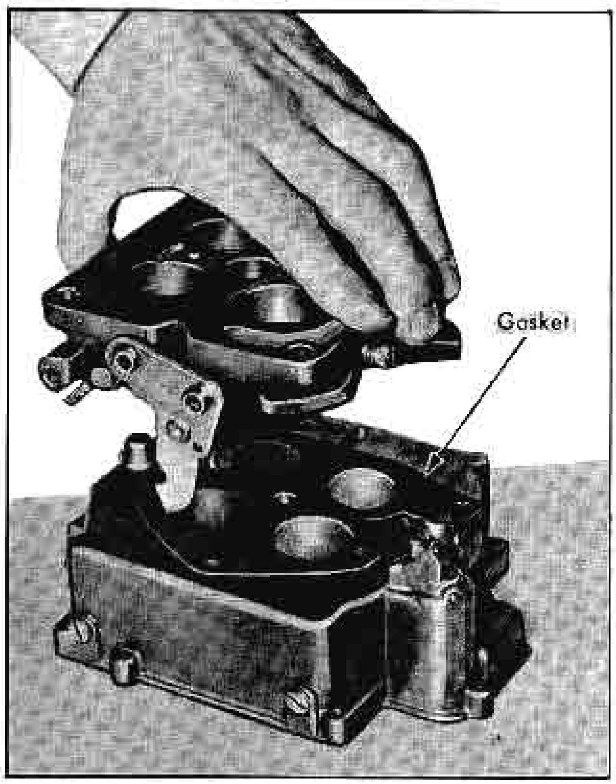

Fig. 12-48 Installing Throttle Body

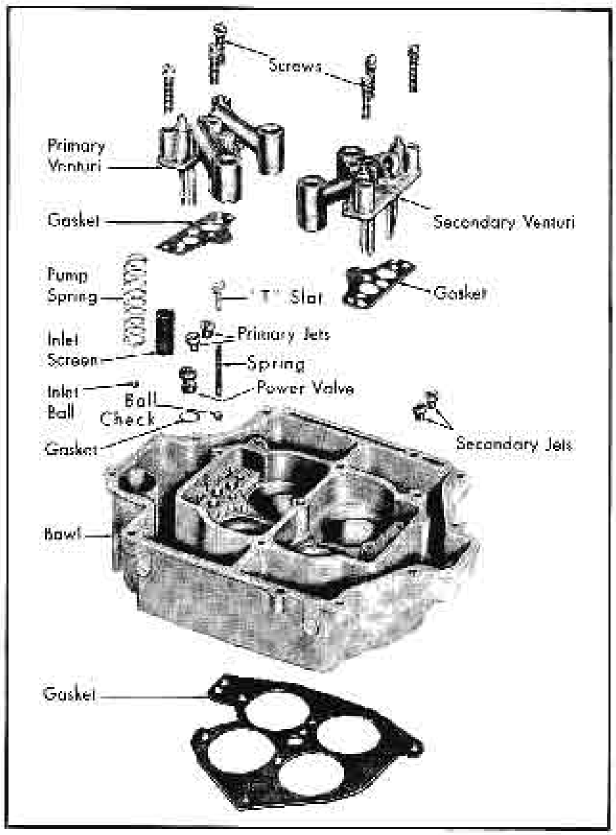

Fig. 12-49 Bowl Assembly Disassembled

6. If bowl cover was not removed, install 3 linkage rods as outlined in Note 12f. If any linkage parts were replaced, perform adjustments 2c through 2j.

c. Bowl Assembly

1. Install fuel sight plugs.

2. With bowl upright, drop ball and copper spring into bore under primary venturi cluster location. Refer to Fig. 12-49. Then put "T" slot into the fixed position of the bore causing the spring to become compressed.

3. Place new gaskets on primary and secondary venturi clusters and install in bowl, with 3 screws and lockwashers in each.

NOTE: The primary venturi cluster contains the accelerating pump jets. The secondary does not and therefore does not have added metal in front of the center screw. Also notice the projecting tang which aligns each cluster in the bowl. To the rear of the tang is found the cluster number 1 or 2.

4. Sort out primary and secondary main metering jets.

ENGINE FUEL AND EXHAUST

NOTE: The secondary jets have larger holes than the primary jets. The primary jets have 48 stamped on them while secondary jets are stamped with number 64.

5. Install primary and secondary jets using a small screwdriver to position it into the hole.

6. Install power valve and gasket using a screwdriver.

7. Drop aluminum pump inlet ball into pump bore. Tilt bowl to roll back into seat.

8. Place pump spring in pump bore and compress into position with finger pressure.

9. Install pump inlet screen, using long-nosed pliers.

d. Choke Assembly

1. With bowl cover right side up on bench, place new choke housing gasket on bowl cover boss. Refer to Fig. 12-50.

2. Install choke housing with 2 self-locking attaching screws.

3. Install choke piston on link attached to choke shaft with piston pin.

4. Slide choke shaft into housing and bowl cover. Rotate shaft so that piston enters vacuum cylinder.

5. Slide choke valve, with letters "RP" down through slot in choke shaft. Retain valve with 2 new brass screws. Press firmly on choke housing end of shaft, and hold valve tightly closed with the fingers while tightening screws to insure good alignment.

6. Carefully and lightly stake threaded ends of choke valve screws, being careful not to bend choke shaft.

7. Install choke baffle plate with curved slot

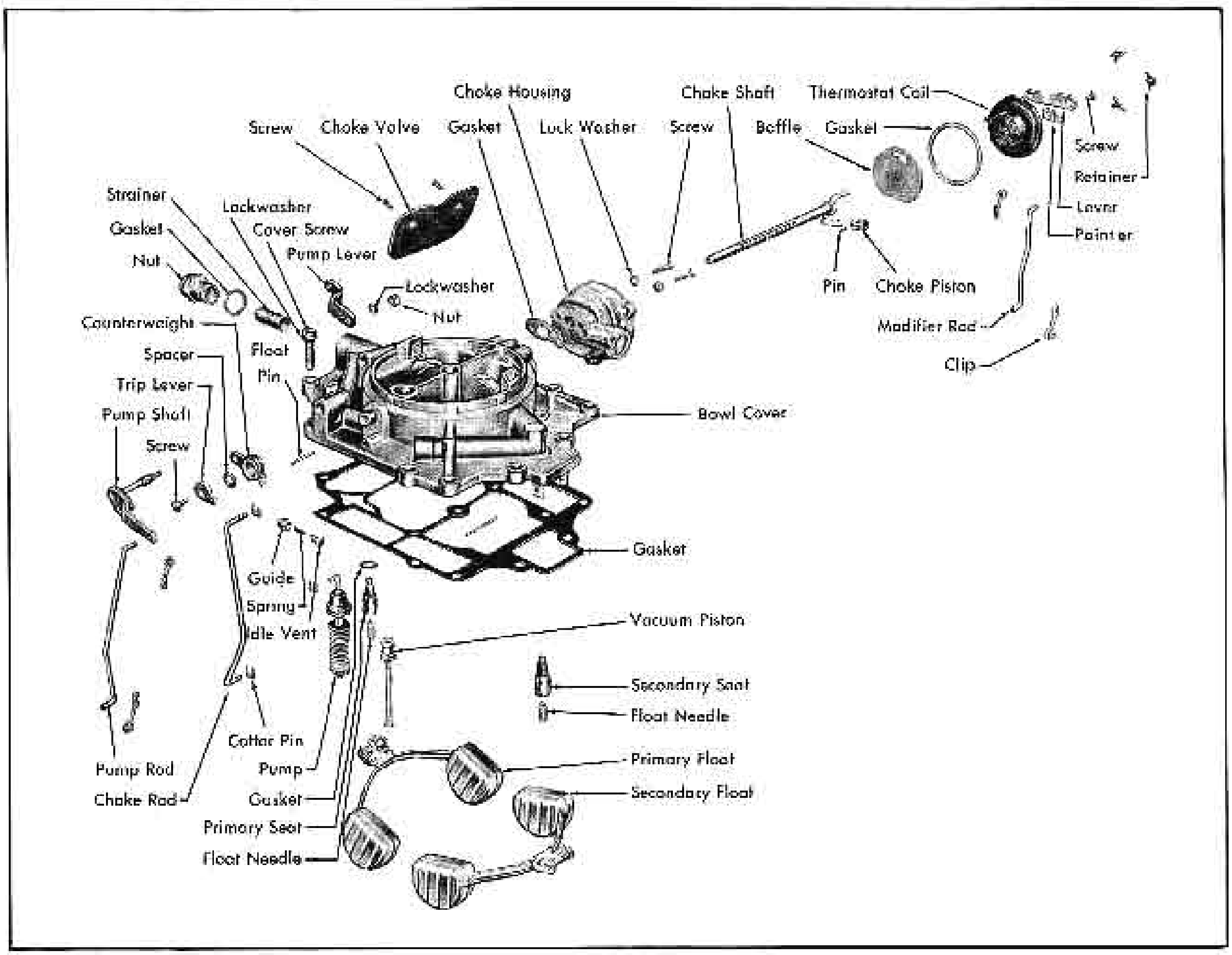

Fig. 12-50 Bowl Cover Assembly Disassembled

over tang on choke lever (baffle plate is symetrical side to side).

8. Install gasket and thermostat cover with projection on plastic cover at top of choke housing. Install 3 screws and retainers.

9. Install thermostat lever loosely with retaining screw. Lever should point forward and slightly down when metal pointer is at the scribed mark.

e. Bowl Cover Assembly

1. Place fuel strainer in inlet nut with gasket, and screw into place on primary side of bowl cover. Refer to Fig. 12-50.

2. Assemble pump plunger with spring washer, and retainer. Slide rubber boot onto plunger shaft, open end first.

3. Holding bowl cover upright, insert plunger assembly through hole in casting from below. Pull rubber boot through hole until one flange of boot is above casting with the other flange below.

4. Place a drop of heavy oil on pump countershaft and insert into boss of bowl cover with outer lever rearward.

5. Install pump lever on countershaft with lock washer and nut. Slip pump shaft into lever end, and retain with a horseshoe clip.

6. Invert bowl cover and install idle vent valve, spring, and retainer in underside of pump countershaft boss, with valve facing rearward. Compress spring and press assembly into position until retainer snaps into front side of boss.

7. Install primary and secondary needle seats and gaskets.

8. Place a new bowl cover gasket on bowl cover.

9. Install primary and secondary needles (tapered point down into needle seat), floats, and hinge pins.

NOTE: The flat side of the "D" float should be facing toward the bowl cover.

10. Perform Float Level and Float Drop Adjustments, as outlined in Notes 2a and 2b.

f. Bowl Cover Installation

1. Holding bowl cover assembly as shown in Fig. 12-44, carefully lower cover onto bowl, guiding pump plunger into its bore.

CAUTION: Be careful not to hold bowl cover in such a way as to press against floats.

2. Install the 3 inner and 10 outer bowl cover screws with lockwashers, tightening inner group first.

NOTE: If car is equipped with air conditioning, install the idle speed-up control to the bowl cover on the right side of the fuel inlet.

3. Install end of choke rod in choke lever, from side opposite collar, with horseshoe clips.

NOTE: A horseshoe clip is installed on each side of the choke lever and choke rod.

4. Install lower end of choke rod in fast idle cam, from side of projecting unloader tang, and retain horseshoe spring.

5. Place choke lever on choke shaft, with collar inward and lever pointing toward accelerator pump.

6. Install trip lever with "RP" stamping on outside and with straight edge of trip lever above the tang on the choke lever. Install retaining screw.

7. Attach fast idle cam to carburetor throttle body with pivot screw, using a screwdriver.

8. Install pump rod, with elbow end at the bottom, fastening the ends with 2 retaining clips. Place clips on end of lever, insert pump rod end through clip and lever, and then swing clip around to snap onto rod.

9. Rotate thermostat lever counter-clockwise from free position until coil picks up choke valve.

10. Install modifier rod in hole in the secondary throttle actuating lever and install horseshoe clip on the outside of the secondary throttle actuating lever.

11. Raise end of thermostat lever and install modifier rod, using the remaining retainer clip.

12. Check Choke Modifier Adjustment and choke settings, as outlined in Note 2e, and adjust as required. Check other adjustments as necessary.

NOTE: It is possible to remove the bowl cover assembly for float adjustment or other routine service without removing the carburetor from the engine. If linkage parts are replaced or bent, or new gaskets added, the full adjustment procedure on the bench and on the engine must be performed.

13. Connect vacuum line to elbows located at idle speed-up control and throttle body.

g. Idle Speed-Up Control Assembly

1. Install valve stem into hole.

2. Insert spring inside coil.

3. Install coil, spring, and bakelite cover on idle support housing with 2 screws and washers.

4. Install elbow into idle speed-up control housing.

h. Idle Speed-Up Control Installation

1. Install idle speed-up control in position on bowl cover.

2. Install four mounting plate to bowl cover screws.

3. Install control wire clip under cover screw.

4. Connect vacuum pipe to speed-up control.

(13). Carter Carburetor Disassembly

a. Idle Speed-Up Control Removal

1. Remove vacuum pipe from nipple on idle speed-up control.

2. Remove 3 screws and lockwashers from the mounting bracket attached to the bowl cover.

3. Lift idle speed-up control from bowl cover.

b. Idle Speed-Up Control Disassembly

1. Disconnect vacuum line from nipple on idle speed-up control housing.

2. Remove lock nut, round serrated nut, and spring from end of shaft.

3. Remove large hex-head nut, lockwasher, and separate bracket from casting.

4. Remove 6 screws and washers from circular housing.

5. Open assembly, exercizing care not to lose tapered coil spring and little brass rod in shaft hole on opposite side of diaphragm.

c. Bowl Cover Removal

1. Remove air cleaner, gasket, and mounting stud if carburetor is to be left on the engine.

2. Remove modifier rod by removing spring clip on lower end (with screwdriver pressing against the open end of the clip) and rotating rod to disengage upper end.

3. Remove choke rod by above procedure.

4. Remove pump rod by removing spring clip from lower end, and spring retainer, spring, and washer from the upper end. Remove spring retainer by rotating it 90° until the corresponding slot on the pump rod is located, then slide it off.

5. Remove dust cover and gasket with 2 screws and lockwashers.

6. Remove 16 bowl cover screws and lockwashers as shown in Fig. 12-51. (6 of these are found around the edge of the air horn, 9 around the flange of the bowl cover, and 1 within the dust bowl enclosure.) Extreme care must be taken not to damage the idle vent arm tang on the pump countershaft when removing the inner bowl cover screw and lockwasher within the dust bowl enclosure.

NOTE: Do not disturb levers on choke and pump shafts, unless disassembly or adjustment operations are contemplated.

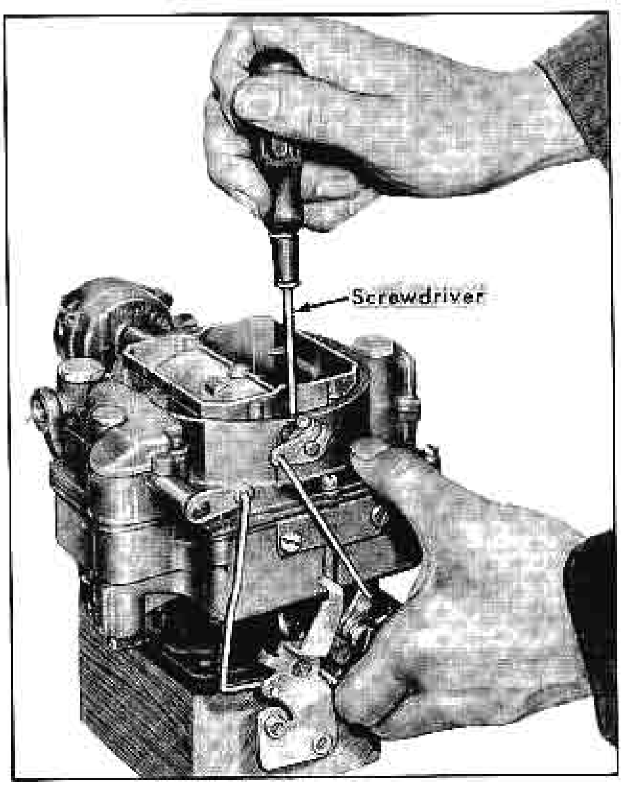

Fig. 12-51 Removing Bowl Cover Screws

7. Break bowl cover loose from bowl, using finger pressure only. Do not attempt to pry cover loose.

8. Lift bowl cover assembly straight up out of bowl by gripping air horn section as shown in Fig. 12-52, being careful not to bend float assemblies.

d. Bowl Cover Disassembly

1. Remove metering rods through upper side of bowl cover.

2. Remove spring clip from pump connector link.

3. Invert bowl cover assembly, and remove float hinge pins and floats with needles and clips attached.

NOTE: Keep parts from primary side separated from those of secondary side.

4. Remove accelerator pump plunger assembly.

5. Rotate vacuumeter piston 90° to either side and remove.

6. Remove and discard bowl cover gasket.

7. Remove primary and secondary needle seats with gaskets, using a screwdriver.

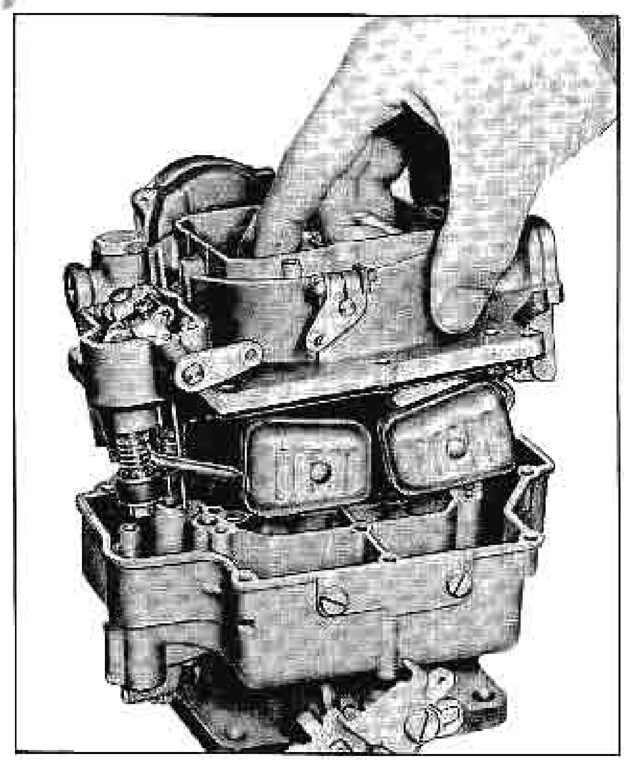

Fig. 12-52 Removing Bowl Cover

NOTE: If needle valves and seats are to be reused, it is important to keep the needle valves mated with their corresponding seats.

8. Remove front fuel strainer with plug and gasket.

9. Remove rear fuel plug and gasket.

10. Loosen clamp screws on pump shaft. Mark the relative position of clamps on shaft before loosening to insure proper assembly later on.

11. Remove idle vent arm screw and lockwasher.

12. Slide pump shaft out of bowl cover.

13. Remove clamps and metering rod carrier with spring.

e. Choke Disassembly

1. With bowl cover right side up on the bench, loosen the clamp screw on choke lever and remove lever.

2. Remove 2 choke valve screws, using a small screwdriver.

3. Remove 3 thermostat cover screws and retainers. Lever may be removed from pointer shaft by loosening clamp screw, but do not remove metal pointer or thermostat coil.

4. Remove choke housing gasket and baffle.

5. Carefully rotate choke shaft counter-clockwise until choke piston clears vacuum cylinder.

6. Remove choke shaft from housing and bowl cover, taking care not to enlarge holes in either casting with sharp edges of shaft.

7. Disconnect choke piston from link by pushing piston pin out with a piece of wire.

8. Remove choke housing from bowl cover by removing 3 attaching screws.

9. Remove gasket between choke housing and bowl cover and discard gasket.

f. Bowl Disassembly

1. Remove pump jet screw, pump jet, and gasket with a screwdriver. Remove pump valve by inverting bowl and tapping.

NOTE: Pump jet screw is hollow.

2. Remove relief valve and gasket with screwdriver.

3. Remove primary and secondary metering jets with a screwdriver. Secondary jets are numbered 120-185 and primary 120-166.

4. Remove pump spring and vacuum piston spring.

5. Remove pump inlet ball retainer with Tool No. J-1306. Remove inlet ball by inverting bowl.

6. Remove primary and secondary idle jets with a screwdriver.

7. If threads or screwdriver slots are damaged, remove and discard fuel sight plugs. Otherwise, plugs may be left installed.

g. Throttle Body Removal

1. Remove 3 linkage rods, as described in Note 13c, if this has not already been done.

2. Loosen 4 throttle body attaching screws with lockwashers.

3. Break throttle body loose from bowl by using finger pressure only. Do not attempt to pry throttle body loose. Remove screws and lockwashers from counterbores in throttle body.

4. Remove and discard throttle body to bowl gasket.

h. Throttle Body Disassembly

1. Remove 2 idle mixture adjusting screws with springs.

2. Remove nipple for distributor vacuum line, and elbow for idle speed-up control on Air Conditioner equipped cars.

3. Remove idle stop screw with spring, and remove fast idle adjusting screw from primary throttle lever.

4. Remove cotter pin, flat washer, spring washer, and T.V. trunnion from throttle lever.

5. Remove screw holding fast idle cam assembly to throttle body.

6. Remove throttle link with washer by removing spring retainer and washer from one end, and clip from the other end.

7. Remove retainer screw on end of primary throttle shaft, and slide off spacer, modifier lever with override lever and spring, secondary throttle actuating lever, and spring washer.

8. Remove secondary throttle lever by removing retainer screw and spacer, and sliding lever off shaft. The spring will come off when the secondary throttle lever is removed from the shaft.

NOTE: Do not attempt further disassembly of throttle body. The low speed ports in each throttle valve bore are bored at the factory after the valves are installed and adjusted, gaged from the closed throttle valve. If original adjustment of throttle valves is changed, the low speed metering calibrations will be changed.

(14) Inspection and Cleaning of Carter Carburetor Parts

1. Wash all parts thoroughly in carburetor cleaning solvent, with the exceptions noted below, and dry with compressed air.

CAUTION: Do not wash accelerator pump plunger assembly and plastic thermostat housing assembly in clean solvent. Wash these parts in clean gasoline only.

2. Clean and blow out all passages with compressed air. Remove any gum or carbon which may have accumulated within carburetor parts. Clean carbon out of throttle body heat passage.

3. Make sure all calibrated restrictions, such as idle ports, air bleeds or anti-percolator passages are clean, but do not use a drill for cleaning.

4. Check all shafts and their corresponding bearing bores for wear. Check each piston in its respective cylinder. Check for bent metering rods, worn jets, and leaking floats. Replace all worn or damaged parts.

5. Inspect the accelerator pump plunger leather, replacing the plunger as an assembly if the leather is creased or cracked.

6. Examine float needles and seats. If a needle appears grooved, replace entire set with a factory matched needle, seat, and gasket.

7. Inspect the idle mixture adjusting screws for burrs, ridges, or grooves. If wear is evident, replace screws.

8. Inspect floats for dents or leaks. Inspect hinge pin bores for burrs or wear. Check hinge pins for straightness.

9. Clean strainer screens of dirt or lint. If distorted or plugged, replace screens.

10. Inspect fast idle cam for excessive wear on the steps. If wear is noted, replace cam.

11. Carefully inspect throttle body and valve assembly for wear at the throttle valve and bores, and between the shafts and their bores. This unit must be replaced as an assembly only, due to close manufacturing selective fit tolerances.

12. Always use new gaskets when reassembling carburetor.

(15) Carter Carburetor Assembly

a. Throttle Body Assembly

1. Assemble spring washer, secondary throttle actuating lever, override lever with spring and modifier lever, spacer, and retaining screw onto choke housing end of primary throttle shaft. Refer to Figs. 12-53 and 12-54 for assembly details.

NOTE: It will be necessary to hook override spring between modifier lever and override lever before placing on throttle shaft, and to stretch spring slightly with pliers when installing over hooked portion of override lever.

2. Slide secondary throttle lever with spring onto secondary throttle shaft. Install spacer and retaining screw as shown in Fig. 12-54.

3. Install throttle link with washer on inside of secondary throttle lever, fasten with spring and retainer. Short leg of link goes into center hole of secondary throttle actuating lever and retain with spring clip. See Figs. 12-53 and 12-54.

4. Referring to Fig. 12-53, assemble fast idle cam and spring, cam trip lever, and lockout cam with pawl to throttle body with bearing screw.

NOTE: Long tang on trip lever faces outward and slips between fast idle cam and long end of spring. Short end of spring hooks over unloader tang on fast idle cam. Lockout pawl should be raised above dowel in throttle body when assembling. Tighten screw with Tool No. J-816-4.

5. Install idle stop screw with spring in throttle body.

6. Install fast idle adjusting screw in primary throttle lever.

7. Install nipple for distributor vacuum line. Install elbow for idle speed-up control on Air Conditioner carburetors.

8. Install T.V. trunnion, spring washer, flat washer, and retain with new cotter pin.

9. Install 2 idle mixture adjusting screws with springs.

CAUTION: Tighten idle mixture screws carefully, so as not to groove needle or enlarge seat. Back out 1-1/4 to 2 turns from seated position for initial adjustment.

b. Throttle Body Installation

1. Place new throttle body to bowl gasket on bottom surface of bowl with bowl inverted on workbench. Gasket will slip over 4 idle mixture passage bosses.

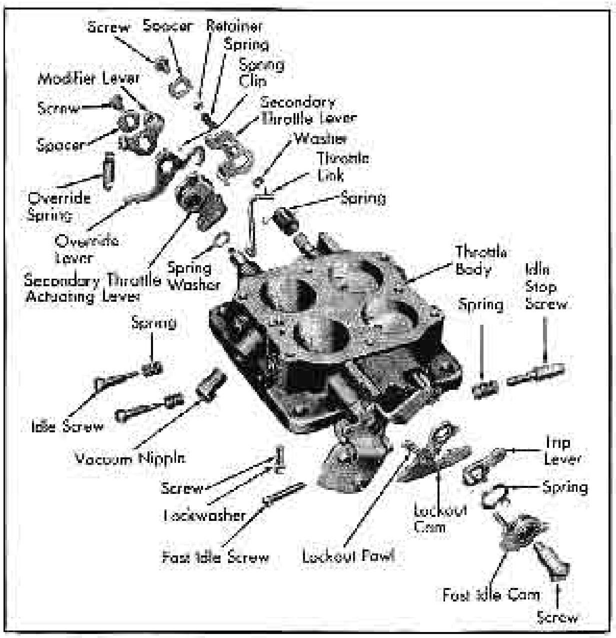

Fig. 12-53 Throttle Body Disassembled

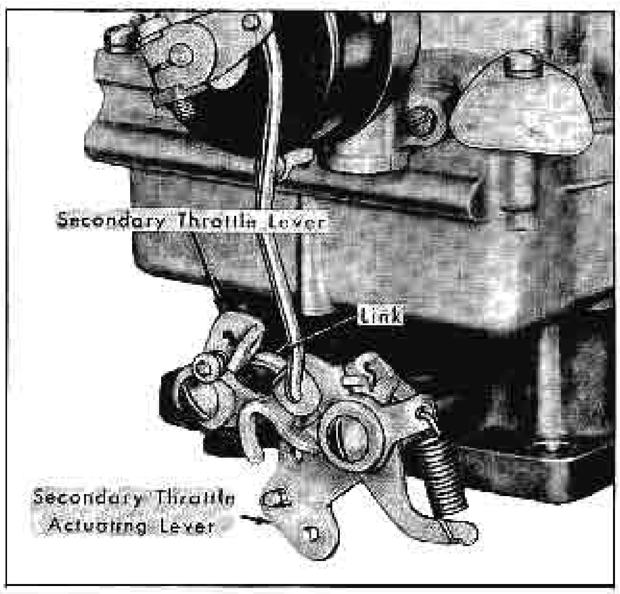

Fig. 12-54 Secondary Throttle Linkage

NOTE: Select correct position by alignment with venturi bores. Tapered slot in middle side of gasket must be on primary side.

2. Place throttle body assembly on bowl with primary throttle lever and fast idle cam on same side as bowl sight plugs, as shown in Fig. 12-55.

3. Install 4 attaching screws and lockwashers, tightening uniformly. Use 4 screws with largest diameter.

4. If bowl cover was not removed, install 3 linkage rods as outlined in Note 15g, and perform adjustments 3c through 3k.

c. Bowl Assembly

1. Install sight plugs, using screwdriver.

2. Drop pump inlet ball into its seat in center of pump cylinder.

NOTE: Ball will not center itself. If ball misses its seat, flip it in with a piece of wire.

3. Install ball check retainer with Tool No. J-2110 and a small hammer. Be sure that retainer falls in position with raised portion upward.

4. Drop pump check valve into its bore, pointed

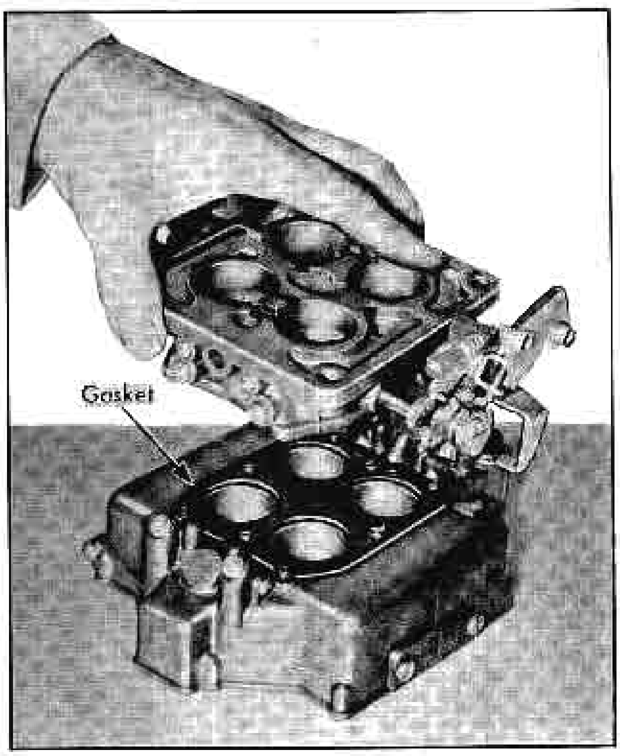

Fig. 12-55 Installing Throttle Body

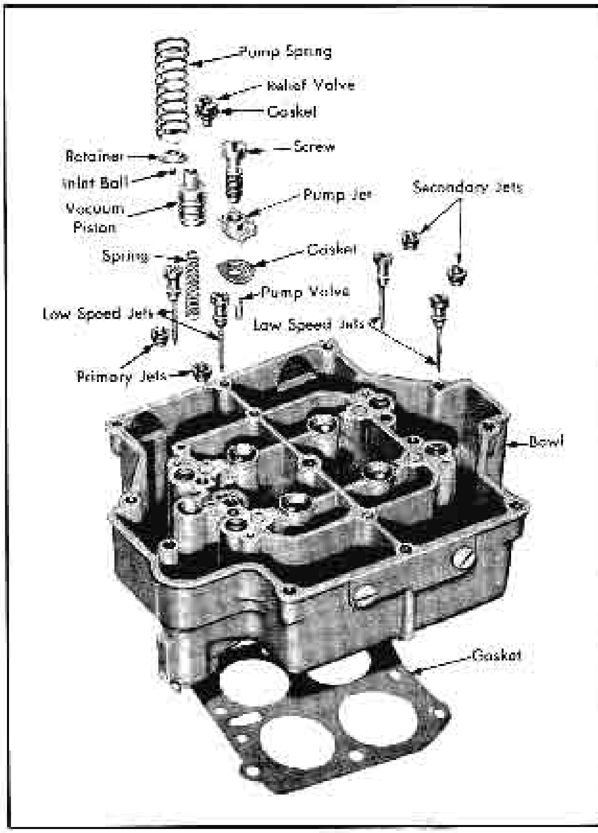

Fig. 12-56 Bowl Assembly Disassembled

end down, and install gasket, pump jet, and screw. Refer to Fig. 12-56.

5. Grip relief valve (with gasket) and place in seat. Tighten with screwdriver.

6. Lower primary jets into seat using a bent paper clip.

NOTE: This is the reverse of the Rochester Carburetor arrangement, and can be remembered by association with the metering rods used in the Carter carburetor. The metering rods can be used to select the Carter jets with the larger holes.

7. Drop each secondary jet into its seat and tighten with screwdriver.

8. Drop pump spring and vacuum piston spring into their respective bores.

9. Install primary and secondary idle jets with a screwdriver.

d. Choke Assembly

1. Install gasket on inner side of choke housing. Refer to Fig. 12-57.

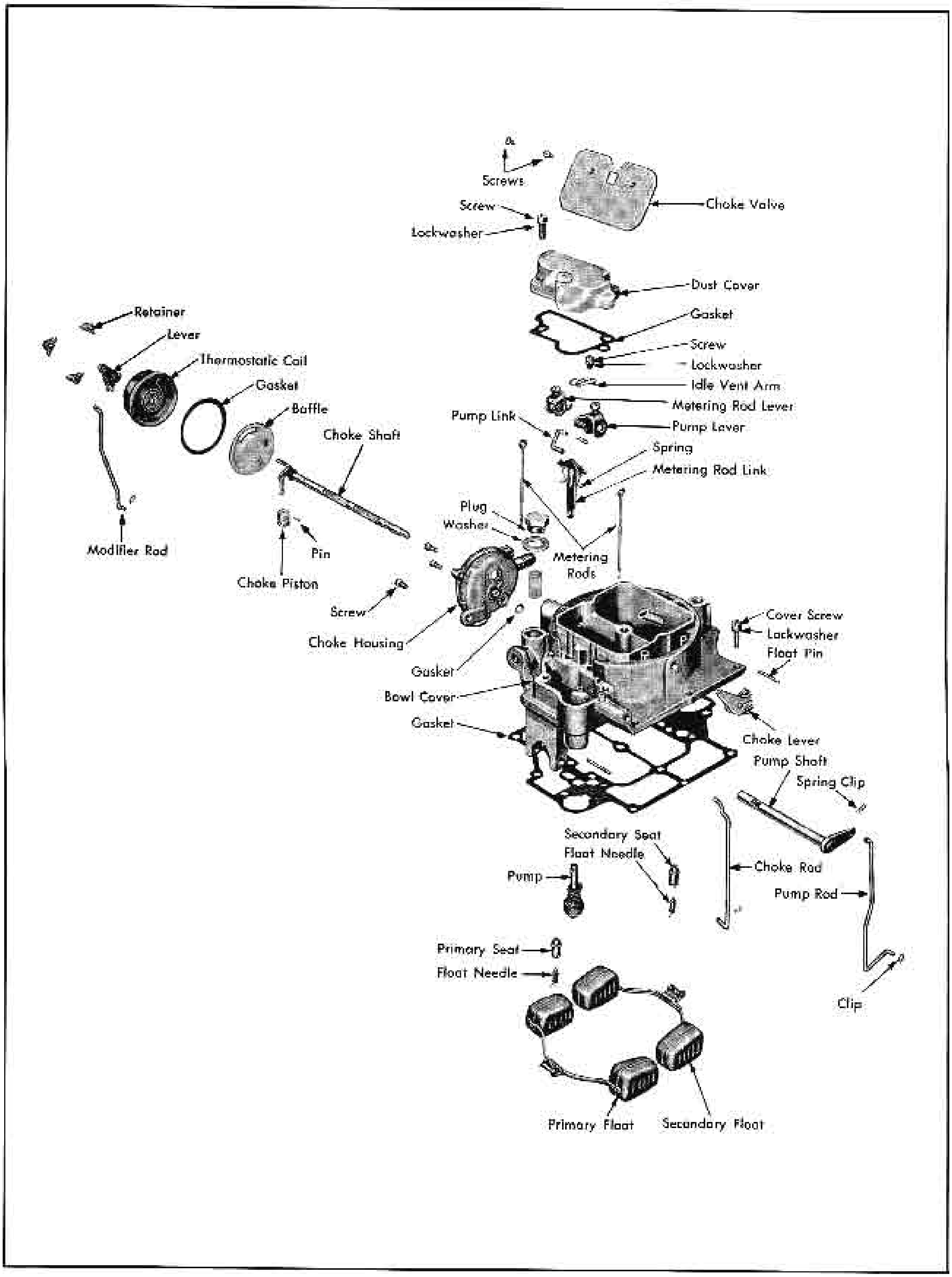

Fig. 12-57 Bowl Cover Assembly Disassembled

2. Attach choke housing to bowl cover with 3 notched screws. The two longest screws go on bottom of choke housing.

3. Assemble choke piston and pin onto link attached to choke shaft.

4. Insert choke shaft into choke housing and bowl cover being careful not to damage bore. Rotate shaft so that piston enters vacuum cylinder.

5. Install choke baffle plate with attached leaf spring facing out, and holes over exhaust passage and tang of choke piston lever.

6. Install plastic thermostat cover and gasket with 3 screws and retainers, so that scribed mark on edge of cover lines up with the index mark.

7. Install choke valve (with trademark up) on choke shaft with 2 new screws. Hold choke valve tightly closed with the fingers while tightening screws, to insure good alignment.

8. Carefully and lightly stake threaded ends of choke valve screws, being careful not to bend choke shaft.

9. Loosely install choke rod and choke lever, both pointing forward. Secure choke rod and modifier rod with spring clip at lower ends.

e. Bowl Cover Assembly

1. Assemble metering rod spring into upper hole of metering rod carrier, and insert into slot within dust cover boss. Refer to Fig. 12-57.

NOTE: Projecting tang on metering rod link must point rearward, or toward the air horn.

2. Start pump shaft into dust cover boss, then install pump lever (which fits onto the slotted portion of the pump shaft). Place metering rod lever on end shaft after passing through second bearing.

3. Tighten metering rod lever set screws. Install idle vent arm and tighten screw. Final adjustment will be performed later, as outlined in Note 3d.

4. Install fuel strainer with plug and gasket, on primary side. Install brass plug and gasket on secondary side.

5. Invert bowl cover, and install primary and secondary needle valve seats with gaskets, using a screwdriver.

6. Assemble primary and secondary needle valves with clips to the corresponding floats.

7. Install primary and secondary float assemblies with hinge pins.

8 Perform float adjustment as outlined in Notes 3a and 3b.

9. Remove float assemblies and install a new bowl cover gasket.

10. Reinstall primary and secondary float assemblies.

11. Install vacuum piston on metering rod link in horizontal position, then rotate to vertical.

12. Place pump assembly in bowl cover bore, and turn bowl cover upright while holding pump plunger.

13. Place bowl cover on bowl, with pump spring under plunger.

14. Using a pair of long-nosed pliers, install pump link through plunger shaft and pump arm with ends pointing away from choke housing side, and upper end in outer hole (long stroke) of pump arms. Retain link with spring clip on upper end.

f. Idle Speed-Up Control Assembly

1. Put small brass rod into vertical slot on diaphragm rod and slide diaphragm rod into other circular cover.

2. Drop ball in valve stem opening and place solenoid valve into the valve stem opening. Install gasket, solenoid switch, and spring on inside diameter of coil.

3. Install 2 screws and washers on solenoid housing with wire connections pointing away from the 6 hole circular cover.

4. Make sure that tab on diaphragm is lined up with mounting bracket side of circular cover. Insert tapered coil spring with large diameter end of spring against circular metal retainer on diaphragm.

5. Install 6 screws and washers fastening the circular covers together.

6. Install spring, round head nut, and hex-head nut to diaphragm rod. The large diameter of the round head nut should be against spring.

g. Bowl Cover Installation

1. Holding bowl cover assembly as shown in

Fig. 12-52, carefully lower cover onto bowl, guiding vacuum piston and pump plunger into their respective bores.

CAUTION: Be careful not to hold bowl cover in such a way as to press against floats.

2. Install the 6 inner bowl cover screws with lockwashers. The seven longest screws are installed in positions indicated in Fig. 12-56, and remaining screws in their respective places.

NOTE: Install idle speed-up control if car is equipped with Air Conditioning. Install vacuum pipe to idle speed-up control and throttle body.

3. Connect longest bent end of pump rod to primary lever with spring clip, and connect upper end of rod to pump arm with washer, spring, and spring retainer.

4. Install upper end of choke rod in slotted choke shaft lever, and retain lower end in cam trip lever with spring clip.

5. Rotate thermostat lever counter-clockwise from free position until coil picks up choke valve. Continue turning until metal pointer lines up with plastic pointer on choke housing.

6. Holding thermostat lever in this position, install upper end of modifier rod into lever from inner side. Slip lower end of rod into primary throttle shaft modifier lever and retain with spring clip.

7. Install metering rods through looped ends of metering rod spring and holes in bowl cover. Insert rods through metering jets and hook onto metering rod carrier at the ends of the "T"

8. Check to see that metering rod assembly is free to slide up and down against pressure of vacuum piston spring.

9. Check adjustments as required. If disassembly of bowl cover or throttle body has been performed, then adjustments outlined in Notes 3c through 3k will be necessary. If no disassembly has been performed, and if carburetor was adjusted correctly before removal of the bowl cover, then further adjustments may be omitted.

NOTE: It is therefore possible to remove the bowl cover assembly for float adjustment or other routine service without removing the carburetor from the engine. If levers on choke or pump shafts are loosened, however, the full adjustment procedure on the bench and on the engine must be performed.

10. Install dust cover and gasket with 2 screws and lockwashers.

11. Install air cleaner gasket, mounting stud and air cleaner, if carburetor has been left on engine. Otherwise, install and adjust carburetor as described in Notes 6 and 9.

(16) Fuel Pump Tests

1. To check the fuel pump capacity, disconnect gasoline line from filter to carburetor at fuel filter outlet, swing fuel line out of the way, and remove filter from pump.

2. Attach a one foot piece of 5/16" tubing to pump outlet. The pump should fill 1/2 pint bottle with fuel in 9 strokes (fuel spurts) at cranking speed. (26 cc per stroke minimum.) If 1/2 pint of fuel is delivered as specified, the pump is normal and gas line and tank are not obstructed. If no gas flows, or if only a little gas flows, check for the following:

a. Strainer nut on pump loose. Tighten nut.

b. Fuel line connections loose or cracked. Tighten or replace fuel line fitting.

c. Fuel line clogged. Blow out with compressed air.

d. Diaphragm flange screws loose. Tighten flange screws.

e. Flexible inlet line pinched, broken or porous. Replace flexible line.

f. Fuel pump push rod worn too short (7.1425 to 7.1475 inches long). If rod is worn excessively, check eccentric for wear by measuring rod stroke (.245 to .250 inch).

3. If pump does not operate properly after above corrections have been made, replace pump.

(17) Fuel Pump Removal

1. Disconnect flexible fuel line at end near front motor mount, and remove line from clips.

2. Disconnect flexible fuel line at fuel pump.

3. Remove fuel line between fuel filter and carburetor.

4. Remove two screws and flat washers holding fuel pump to oil filler housing, and remove pump with gasket and fuel filter.

5. Remove and discard pump mounting gasket.

6. Remove fuel filter from pump.

(18) Fuel Pump Disassembly

1. Wash outside of pump assembly in solvent and blow off with compressed air to remove loose dirt and grease.

2. Remove inlet valve chamber plug, gasket and screen.

3. Mark edges of top cover and body with a file to assure reassembly in correct relative position.

4. Remove cover flange screws and lock washers. Separate top cover from body by jarring cover with a screw driver handle.

5. If valve and cage assemblies, Fig. 12-58, are worn or damaged, remove by prying out with a narrow screw driver blade.

6. Clamp mounting flange of pump body in vise. File riveted end of rocker arm pin until flush with washer. Drive out rocker arm pin with drift punch.

7. Remove rocker arm, bushing, and link assembly with spring. Push bushing out to disassemble link and arm assembly.

8. Remove diaphragm from pump body.

9. File off staking burrs which retain diaphragm rod seal and remove seal.

10. Clean body and cover in solvent and blow out all passages with compressed air.

11. Inspect cover and body for cracks and breakage. Check for flange warpage on a smooth flat surface. Any warped castings must be replaced. Check strainer screen for damage or obstruction. Replace screen if deposits cannot be removed by swishing in solvent.

(19) Fuel Pump Assembly

1. Soak new diaphragm in clean kerosene while performing following steps.

2. Make an assembly of link and rocker arms with bushing, Fig. 12-58.

3. Place rocker arm and link in body with link hook pointing away from diaphragm flange. Position spring in pump and on rocker arm.

4. Align rocker arm bushing hole with hole in body and temporarily retain in position with small end of a tapered tool.

5. Press oil seal and retainer assembly into recess of body casting with lip of seal pointing down. Retain seal by staking body in four places.

6. Place diaphragm springs, with retainer on top, over oil seal retainer.

7. Insert diaphragm pull rod through retainer, spring, and oil seal. Tip diaphragm so pull rod will angle slightly away from hooked end of link. Hold body with diaphragm flange down so link will fall into engagement with slot in pull rod.

8. Install rocker arm pin through hole in body and through rocker arm assembly.

9. Install washer on small end of rocker arm pin and peen pin over washer.

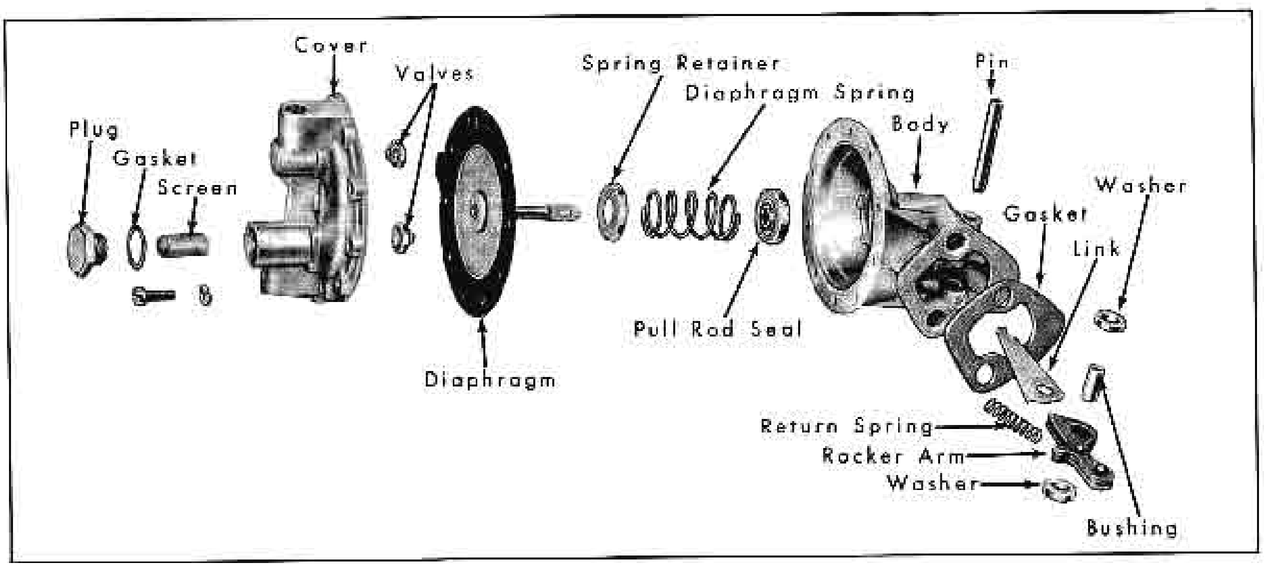

Fig. 12-58 Fuel Pump Disassembled

10. Place valve gaskets in position in cover and insert two valve and cage assemblies.

NOTE: Outlet valve spider should face into cover and inlet valve spider should face out of cover. Stake die casting to secure valve and cage assemblies in place.

11. Turn cover so that diaphragm flange rests on bench and install screen, gasket, and inlet valve chamber plug.

12. Install cover on body, making sure that file marks on cover and body are lined up. Push on rocker arm until diaphragm is flat across body flange. Install top cover screws and lockwashers loosely until screw heads just contact lock washers. Push rocker arm to full stroke and tighten cover screws securely.

(20) Fuel Pump Installation

1. Install fuel filter on fuel pump.

2. Install a new gasket on mounting flange of pump.

3. Crank engine until pump push rod in oil filler housing is at its lowest point.

4. Lubricate end of push rod with a drop of engine oil.

5. Position pump assembly on engine, fitting pump to oil filler housing with bearing surface of rocker arm on top of push rod.

6. Install two screws and flat washers holding pump assembly to oil filler housing.

7. Install fuel line between fuel filter and carburetor.

8. Connect flexible fuel line to fuel pump, and install line in clips.

9. Connect flexible fuel line to fuel line that leads from gas tank.

(21) Removal of Exhaust System Assembly

a. Removal of Exhaust Pipe

1. Raise front of car and disconnect steering connecting rod at pitman arm.

2. Disconnect exhaust pipe from manifold. On left side, remove heat control valve.

3. Loosen exhaust pipe to muffler coupling screws. On left side, remove slush deflector and loosen hanger clamp screw and slide clamp off hanger.

4. Remove exhaust pipe from muffler.

b. Removal of Muffler

1. Remove exhaust pipe as explained above.

2. Disconnect hanger, at rear of muffler, from frame.

3. Loosen muffler to intermediate pipe coupling screws.

4. Remove muffler from intermediate pipe.

c. Removal of Intermediate Pipe

1. Remove resonator as outlined in Note 21d.
2. Loosen muffler rear coupling screws.
3. Remove intermediate pipe from muffler.

d. Removal of Resonator

1. Raise rear of car.

2. Remove resonator to intermediate pipe coupling screws.

3. Remove hanger, at rear of resonator, from frame.

4. Drive resonator off intermediate pipe.

5. Loosen front screws of coupling at rear of resonator.

6. Reinstall hanger to frame crossbar screws.

7. Drive resonator forward off tail pipe.

e. Removal of Tail Pipe

1. Remove resonator as described in Note 21d.

2. Remove sleeve from end of tail pipe at opening in bumper.

3. Remove hanger from frame crossbar, slide tail pipe forward out of spring bracket, and remove from car.

(22) Installation of Exhaust System Assembly

a. Installation of Tail Pipe

1. Install tail pipe in position in car with rear of pipe in bumper brackets.

2. Install resonator on intermediate pipe.

3. Install forward end of tail pipe in resonator.

4. Install hanger on frame and install front and rear couplings at resonator to tail pipe and intermediate pipe joints.

5. Align pipes and resonator and tighten coupling screws.

6. Install sleeve through bumper opening, over end of tail pipe. Flange of sleeve should be 1/4" ahead of face of bumper.

b. Installation of Resonator

1. Install resonator on intermediate pipe.

2. Slide tail pipe forward into resonator.

3. Align pipes and resonator and install couplings. Tighten screws securely.

c. Installotion of Intermediate Pipe

1. Install intermediate pipe in muffler.

2. Install resonator as described in Note 22b.

3. Align pipes and install couplings, tightening screws securely.

d. Installation of Muffler

1. Install muffler on intermediate pipe.

2. Install exhaust pipe as explained in Note 22e.

3. Install couplings at front and rear of muffler, align pipes and muffler, and tighten coupling screws.

e. Installation of Exhaust Pipe

1. Install exhaust pipe in muffler.

2. Install heat control valve, with gaskets, on left exhaust manifold flange.

3. Position exhaust pipe against manifold flange or heat control valve flange on left side and install screws.

4. On left side, install clamp over hanger and tighten clamp screw.

5. Tighten exhaust pipe to muffler clamp screws.

6. Install slush deflector on left side.

7. Install steering connecting rod on pitman arm.

8. Lower car.

(23) Removal and Installation of Heat Control Valve

a. Removal

1. Remove left exhaust pipe support to bell housing screw.

2. Remove screws which hold left exhaust pipe to manifold.

3. Holding exhaust pipe down slightly from manifold, slide heat control valve, with upper and lower gaskets, out and remove from car.

b. Installation

1. Install heat valve, with gaskets, between exhaust pipe and left exhaust manifold. Be sure face of valve, stamped "Top", is next to exhaust manifold.

2. Install exhaust pipe to manifold screws. Tighten to 30-35 ft. lbs. torque.

3. Install exhaust pipe support to bell housing screw.

(24) Installation of Exhaust Manifolds

Exhaust manifolds are subject to such extreme variations in temperature that the metal expands and contracts to a considerable degree. For this reason, care should be exercised not to tighten the manifolds bolts too tight. The manifold bolts should be tightened to 25-30 foot pounds, and retightened after the engine has been run at least 15 minutes.

(25) Cleaning Fuel Lines

In order to assure a continuous supply of clean fuel, the entire fuel system should be cleaned out twice a year, preferably in the spring and in the fall. This should include cleaning the fuel filter, draining the water trap at the bottom of the gasoline tank, disconnecting all fuel lines, and blowing them out with compressed air in reverse direction to fuel flow.

(26) Removal and Installation of Gasoline Tank

1. Drain gasoline from tank.

2. Raise rear end of car from floor.

3. Disconnect filler neck and vent pipe at lower clamps.

4. Disconnect gasoline line.

5. Disconnect gauge wire on float unit.

6. Remove tank support straps and lower tank from car. Installation is performed by reversing above operation.

(27) Care in Storage

Whenever a car is to be put in storage for any length of time, all gasoline should be drained from the entire fuel system, including the carburetor, fuel filter, fuel pump lines, and tank. This must be done to assure freedom from gum formation left by evaporating.

SPECIFICATIONS

Carburetor	Rochester 4-GC 7006221 -standard- 7006220 Air Conditioner-	Carter WCFB 2109-S 2110-S
Throttle Bore		
Primary	1-5/16"	1-5/16"
Secondary	1-5/16"	1-5/16"
Main Venturi		
Primary	1"	1-1/16"
Secondary	1-1/16"	1-1/16"
Small Venturi		
Primary	1/4"	11/32"
Secondary	1/4"	11/32"
Low Speed Jets		
Idle Needle Orifice	.046"	.0595
Primary	.026"	.028"
Secondary	.026"	.028"
Main Metering Jets		
Primary	.048"	.0935"
Secondary	.064"	.067"
Power Valve Restriction	.038	
Metering Rods		
Economy Step		.073
Power Step		.054
Float Setting	(Gasket to Bottom of floats)	(Casting to top of floats)
Primary	1-19/32"	1/8"
Secondary	1-19/32"	3/16"
Choke Setting	index	index
Accelerator Pump		
Capacity - 10 strokes	15 cc. minimum	15 cc. minimum
Idle Screw Setting - Turns Open	1 to 1-1/4	1/2 to 1-1/2
Idle Speed	400 RPM in drive	400 RPM in drive

FUEL PUMP

NOTE: Testing to be done with entire car at room temperature

Fuel pressure at idle speed	3-1/2 to 5-1/4 p.s.i.
Fuel discharge per stroke at cranking speed	26 cc. minimum
Fuel discharge in 9 strokes at cranking speed	1/2 pint minimum
Push rod stroke	.245" to .250"
Push rod length	7.1425 to 7.1475"
Push rod diameter	.4355" to .4360"

ENGINE FUEL AND EXHAUST

TORQUE TIGHTNESS

Location	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Carburetor to intake manifold	5/16-24	15	20
Fuel tank strap nuts	5/16-24	2	3
Fuel tank drain plug	5/8-18	25	30
Fuel pump to oil filler housing	3/8-16	25	30
Muffler clamps - front	3/8-24	25	30
Muffler clamps - rear	3/8-24	25	30
Muffler support to frame - 75 and 86	5/16-18	4	8
Resonator clamps	3/8-24	25	30
Resonator support to frame	5/16-12	10	15
Exhaust pipe to manifold - right	5-16-24	15	20
Exhaust pipe to manifold-left	3/8-24	30	35

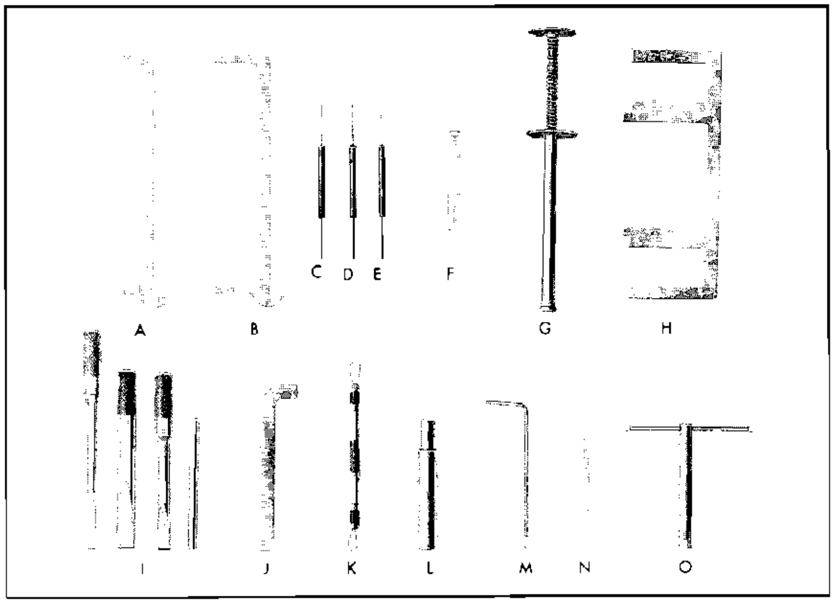

Fig. 12-59 Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-5457	Primary Float Gage (1/8" Carter)	G	KMO-658	Screw Holder
B	J-5458	Secondary Float Gage (3/16" Carter)	H	J-5683	Float Level Gage (1-19/32") Rochester
C	J-5195	Idle Vent Gage (.063"), Rochester	I	J-816	Screw Driver Bit Set
D	KMO-658	Fast Idle Gage (.026"), Rochester	J	J-1137	Bending Tool
E	J-1136	Choke Rod Gage (.040"), Rochester	K	J-1136	Wire Gage (.020", .030" and .040" Carter)
F	KMO-657	Wire Gage (.015" and .018" Carter)	L	J-2110	Ball Retaining Ring Inserter
			M	J-1306	Ball Retaining Ring Removing Tool
			N	J-818-3	Unloader Gage (3/16" Carter)
			O	J-5197	Bending Tool

OTHER NOTES AND REFERENCES

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GENERAL DESCRIPTION

The cooling system on all 1954 Cadillac engines is a low capacity type, made possible by the small cylinder head area exposed to flame and by high mechanical and combustion efficiencies, which decrease the amount of heat transferred to the coolant. This allows a large amount of heat energy to be converted into useful power to increase engine efficiency.

The radiator cores are of the tube and center construction. Water passages are wide and straight with smooth interiors to permit maximum coolant flow and also effective cleaning of the radiator.

Pressure in the cooling system is controlled by a pressure operated vent type radiator cap which prevents the coolant from reaching the overflow pipe. As a pressure of 12 to 15 pounds is required to open this valve, the boiling point of the solution is raised and there is less likelihood of loss of coolant, particularly volatile anti-freezes.

The water pump is centrally mounted at the front of the cylinder block to assure even distribution of the coolant to both banks. The pump is driven by a belt, which also drives the generator. The coolant is drawn from the bottom of the radiator and delivered to both cylinder blocks simultaneously. The coolant circulates around the cylinders and up through drilled holes to the cylinder heads. After circulating through the heads, the coolant flows through the thermostat housing which is located at the top of the water pump. Fig. 13-1.

A thermostat is used on all 1954 series cars to control water temperature by restricting the flow of coolant from the cylinder heads to the radiator when the engine is cold.

When the thermostat is closed, the coolant from the cylinder heads is drawn through a by-pass in the pump body and recirculated through the cylinder blocks. When the engine is sufficiently warm, the thermostat will open and coolant will flow back to the upper radiator tank where it is cooled as it is drawn through the radiator core, to the bottom, to repeat the cycle. Air is drawn through the radiator core by a four blade fan on 1954-62 and 60S series cars and a five blade fan on 75 and 86 commercial cars.

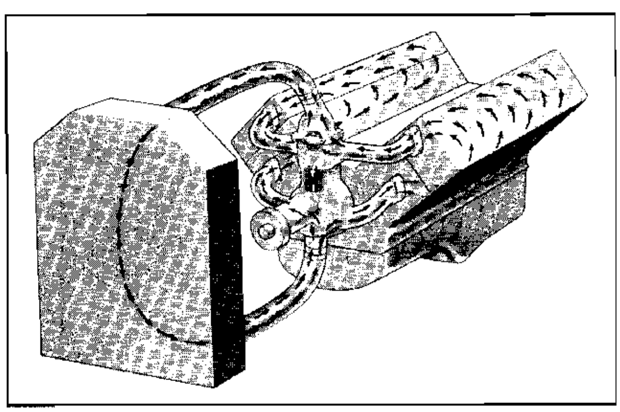

Fig. 13-1 Flow of Coolant

SERVICE INFORMATION

(1) Removal of Radiator Filler Cap

The radiator cap on all 1954 series cars is of the bayonet type with a safety catch. To remove the cap, it is first rotated toward the left until the stop is reached. In this position the cooling system is vented to the atmosphere through the overflow pipe. The cap should be left in this safety position until all pressure or steam has been relieved. If the coolant boils when the cap is placed in the safety position and steam continues to escape, cool the radiator by flowing cold water over outside of radiator while the engine is idling. The cap may then be removed by further rotation to the left.

(2) Draining and Refilling the Cooling System

There are three drain plugs in the cooling systems of all 1954-Series cars. One is located at the side of each cylinder block and third is mounted at the bottom of the radiator on the right side.

In order to assure a complete drainage of the cooling system, be sure to open all three drain plugs, and to have the engine hot when draining. Also, the dash and underseat heater hoses should be disconnected and heater cores emptied, using compressed air regulated to 15 lbs. pressure.

(3) Radiator Preventive Maintenance

Cadillac Cooling System Inhibitor should be added to every car when the cooling system is drained, flushed, and refilled each spring and fall.

The importance of adding an inhibitor, when installing fresh liquid in the spring, is generally recognized. It is equally important to add a charge of Cadillac Cooling System Inhibitor in the fall, regardless of the type of anti-freeze that is used.

(4) Preparation of Cooling System for Anti-Freeze

Before installing an anti-freeze solution, the cooling system should be inspected and serviced for winter operation. The system should be thoroughly cleaned and all loose scale and iron rust removed, as explained in Note 15.

Cylinder heads should be tightened and gaskets replaced, if necessary, to avoid possibility of anti-freeze solutions leaking into engine, or combustion gases blowing into cooling system. Anti-freeze, or water, mixed with engine oil may form sludge, which will interfere with lubrication and, in some cases, may form varnish-like deposits which will cause gumming and sticking of moving parts. A cooling system sealer such as "DuPont Sealer" should be added if permanent type anti-freeze is to be used.

The water pump seal must be leak-tight, not only to avoid loss of liquid, but to prevent air from being drawn into cooling system. Aeration of cooling liquid causes foaming and promotes oxidation, which may result in serious corrosion.

After anti-freeze has been installed, the entire system, including the hose connections, cylinder head gaskets and pump, should be inspected regularly to be sure that no leaks have developed.

Anti-freeze, or water, or both, may be lost from the cooling system through leaks, evaporation, boiling, or expansion. Loss by expansion is a result of overfilling. In the 1954 Cadillac cooling system, the coolant expands approximately 4 pints, when heated from cold to the maximum temperature, and space for this expansion should be left, when adding liquid to the radiator. The correct height when filling a cold engine, is 2-1/4 inches below the top of the filler neck. At the normal operating temperature of about 170° F, the height will be 1-3/4 inches below the top of the filler neck.

(5) Anti-Freeze Recommendations

The available commercial materials which may be used for preparing anti-freeze solutions for automobile radiators are denatured alcohol, methanol, propanol, ethylene glycol, and distilled glycerine.

Kerosene or other oils, or solutions containing calcium chloride, magnesium chloride, sodium silicate or other inorganic salts, are not satisfactory for use in the cooling system.

Denatured alcohol and methanol are used extensively for anti-freeze solutions. The various types of alcohol anti-freeze afford protection against freezing and have the advantage of wide distribution and low first cost. There are, however, two important disadvantages: Alcohol may be lost, especially on warm days or during hard driving, and unless the solution in the radiator is tested periodically and sufficient alcohol added to replace the loss, the engine or radiator, or both, are likely to be damaged by overheating or subsequent freezing. The car finish is softened and damaged by contact with alcohol solutions or vapors. Alcohol accidentally spilled on the finish should be flushed off immediately with a large quantity of cold water, without wiping or rubbing.

The use of the pressure radiator cap on Cadillac cars serves to increase the boiling point of the anti-freeze solution and reduces the possibility of loss through evaporation or boiling.

Ethylene glycol is, in initial cost, more expensive than alcohol. It has the advantage, however, that in a tight system only water is required to replace evaporation losses, although any solution lost mechanically through leakage or foaming must be replaced by additional new solution. Under ordinary conditions, ethylene glycol solutions are not injurious to the car finish.

Radiator glycerine, which is chemically treated in accordance with the formula approved by the Glycerine Producer's Association to avoid corrosion, is satisfactory for use in the cooling system.

(6) Testing Anti-Freeze Solutions

A hydrometer test will indicate whether anti-freeze, or water, or both, should be added to bring the solution to proper level and to maintain the desired freezing point.

Cars shipped by truck or delivered at the factory during winter are protected by the addition of a methanol-alcohol anti-freeze solution. Solutions of this type should be checked with an alcohol tester, having both a glass tube and a glass float. Methanol-alcohol cannot be tested with all purpose or combination testers as the alcohol will attack the plastic float or tube.

Some devices used for testing anti-freeze solutions will indicate correct freezing point only when test is made at a specific temperature. Other testers, provided with thermometers and tables, indicate freezing points corresponding to readings made at various temperatures. Disregarding the temperature of the solution, when testing, may cause an error as large as $30^{\circ}F$. Some testing devices are made to test only one kind of anti-freeze solution. Others have several scales and may be used for the corresponding kinds of anti-freeze.

The freezing point of a solution containing both alcohol and ethylene glycol cannot be determined accurately by means of a hydrometer. Also, the freezing point of solutions containing different types of permanent anti-freeze with an ethylene glycol base cannot be accurately determined by means of a tester.

(7) Checking Radiator Cap and Seat

The cooling system pressure should be checked whenever cases of overheating, coolant loss, or anti-freeze odors are noticed.

A cylinder block testing gauge, similar to the one shown in Fig.13-2, will prove helpful in testing the cooling system pressure according to the following procedure:

1. Check all heater and radiator hose connections for leaks.

2. Tighten all cylinder head screws to proper torque.

3. Remove left cylinder block drain plug and immediately insert testing gauge fixture.

4. Fill cooling system so that water level is 2-1/4 inches below the top of radiator filler neck.

5. Place a container filled with water so that end of radiator overflow pipe is immersed.

6. Moisten the radiator cap gasket and install cap securely.

7. Open air cock on pressure testing fixture and adjust so that pressure does not exceed 17 pounds.

8. As soon as a large number of bubbles are observed escaping from overflow pipe, record the pressure shown by gauge, shut off air valve, and record time.

NOTE: The original pressure should be at least 12 pounds per square inch. After two minutes, the pressure should not drop more

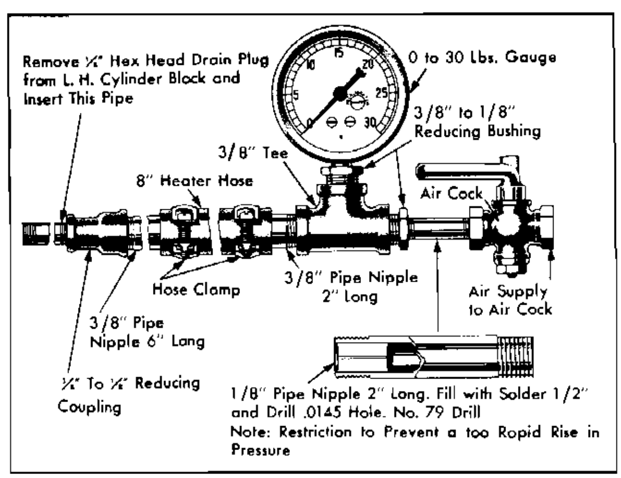

Fig. 13-2 Crankcase Air Pressure Gauge

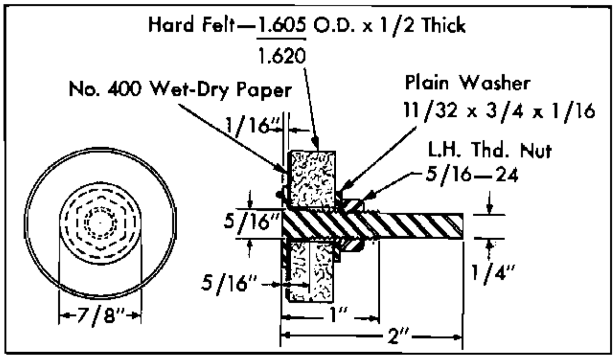

Fig. 13-3 Filler Neck Refinishing Tool

than 3 pounds per square inch below original pressure.

9. If pressure is below these specifications, inspect radiator cap gasket for obvious causes of leakage, such as cracks and cuts. Examine radiator cap gasket seat within filler neck for dents or surface imperfections. If this surface is bent or badly dented, filler neck must be replaced.

10. If filler neck seat is only scratched or pitted, it may be resurfaced with a tool made for this purpose, as shown in Fig.

CAUTION: Remove only a small amount of material from the seat. Excessive refinishing will ruin filler neck.

11. Repeat pressure test after refinishing.

(8) Removal of Thermostat

1. Drain radiator partially.

2. Remove upper radiator hose.

3. Remove four cap screws from thermostat housing at top of water pump body and remove housing and gasket.

4. Remove thermostat from top of water pump body.

(9) Radiator Thermostat Tests

A radiator thermostat may be checked by placing it, with the thermostat heat control unit down on a brick in a pan of water also containing a thermometer. Neither the thermostat nor the thermometer should rest on the bottom of the pan, because of the uneven concentration of heat at the point where the pan is heated.

To test a standard thermostat, the water in the pan should be heated and should be stirred continuously as the temperature approaches 155°F. The thermostat valve should start to open at a temperature between 163°F and 168°F. When the water reaches a temperature of 188°F, the valve should be fully open.

High temperature thermostats should start to open at 177°F to 182°F and should be fully open at 202°F.

(10) Installation of Thermostat

1. Install thermostat in opening at top of water pump with valve up.

NOTE: Be sure that the thermostatic spring strap is parallel to the centerline of the car (fore and aft). This will reduce the possibility of the right hand bank running at a higher temperature than the left hand bank.

2. Install a new thermostat gasket, coated with gasket cement, on water pump housing.

3. Install thermostat housing on water pump body and install cap screws, tightening them to 13 ft. lbs. torque.

4. Install upper radiator hose on radiator and pump housing.

5. Fill cooling system.

(11) Flushing Cooling System

1. Remove generator drive belt and water pump, See Note 18.

2. Install reverse flushing apparatus in right cylinder head outlet hole.

3. Turn on full flow of water.

4. Remove second, third, sixth, and seventh cylinder head bolts from the lower row, next to the exhaust manifolds, one at a time and insert Cylinder Block Air Gun, Tool No. J-1543, Fig. 13-4. Blow air into each hole several times.

5. Duplicate this operation on left cylinder block.

6. Shut off flow of water and examine water passage with a flashlight. If they are still dirty, repeat the flushing operation.

7. Reverse flush radiator with radiator cap and hoses removed.

8. Install water pump using new gaskets.

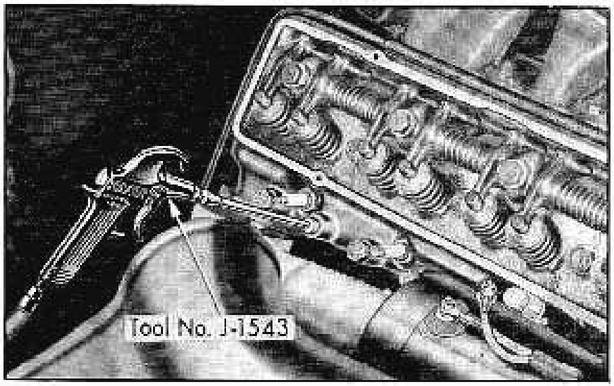

Fig. 13-4 Cleaning Cylinder Block

9. Install radiator hoses.

10. Install generator drive belt and adjust, as explained in Section 11, Note 24.

(12) Vacuum Tests for Radiator Clogging

1. Remove radiator filler cap and attach vacuum gauge or a mercury manometer to radiator drain fitting.

NOTE: It is necessary to install either a fitting with a 1/4 to 1/8 inch pipe reducing bushing or a plain tube fitting to avoid air leakage at this point.

2. Run engine until solution has been warmed to between 160°F and 180°F and make certain that thermostat valve is open.

3. Accelerate engine to a speed of about 3000 R.P.M. and take reading on vacuum gauge or mercury manometer. If vacuum exceeds 5" of mercury, this is evidence of at least partial radiator clogging or restriction.

NOTE: A quick check for a restricted radiator may be made by removing the radiator cap and warming up the engine. If the engine speed is increased from idle to 2000 R.P.M., the coolant level in the upper radiator should not rise appreciably. If the level rises or coolant overflows from the filler neck when the speed is increased, it indicates a restricted radiator.

(13) Air and Gasket Leakage Tests

The following test procedure will show the presence of combustion chamber leakage at cylinder head gaskets and air leakage at suction side of water pump.

1. Fill cooling system completely. Do not leave any air or expansion space, as in normal filling.

2. Install a radiator cap without a pressure valve, or a cap in which pressure valve has been drilled out.

3. Attach a length of 3/8 inch rubber tubing to the radiator overflow pipe and submerge the other end of hose in a jar partially filled with water.

4. Jack up car and run engine with transmission in drive range or high gear. Evidence of leakage from lower radiator hose, water pump or cylinder head gaskets will be bubbling of air through rubber hose into jar.

Cylinder head gasket leakage is most evident at speeds not over 10 MPH operating under full load or wide open throttle, a condition secured by momentarily applying the brakes.

Water pump leakage is most evident at higher speeds (around 60 M.P.H.) and with little or no load.

(14) Correction of Air and Water Leakage

Cylinder head gasket leakage can be corrected by installing new gaskets after cleaning cylinder head and block surfaces and tightening heads properly, as explained in Section 10, Note 7.

CAUTION: Be sure no foreign material falls out of cylinder head onto gasket when placing the cylinder head on the gasket.

Water pump leakage, in an otherwise normal cooling system, can usually be remedied by replacing worn pump parts. A water pump in good condition will, however, leak air at high speeds, if radiator is so badly clogged that there is a high restriction at the pump inlet or if the lower radiator hose leaks.

(15) Radiator Cleaning Procedure

NOTE: This procedure is recommended for all cars once a year, and to give maximum efficiency to average cooling systems in need of cleaning.

1. Drain solution from cooling system by opening all drains.

2. Refill system with fresh water and add one package of Cadillac Cooling System Cleaner.

3. Run engine at medium speed for one hour at a temperature as hot as possible without boiling. Cover radiator if necessary.

NOTE: Radiator cap should be installed.

4. Drain system by opening all drains.

5. Flush entire system thoroughly with clear water to remove all cleaner.

NOTE: Cooling systems containing oil should be cleaned with a solution of "Sal Soda", using the procedure outlined above for normal cleaning at radiators. When this solution is used, restrict the water flow through the heater cores, by using clamps or disconnecting the heater hoses and inserting plugs to prevent leakage while performing cleaning operation. Flush the system thoroughly with water after draining the solution, to prevent chemical action of the "Sal Soda" with the radiator core.

6. Inspect following points in cooling system.

a. Check radiator core for leaks.
b. Check radiator air passages for plugging with bugs, leaves, etc.
c. Check thermostat to see that it opens and closes properly.
d. Check condition and tension of generator drive belt.
e. Check condition of hoses and tighten clamps.
f. Refill cooling system. In summer, use water and the Cadillac Cooling System Inhibitor. In winter, use the inhibitor also, regardless of whether or not the anti-freeze also contains an inhibitor. Run engine until thoroughly warm to make sure system is full.

(16) Removal and Installation of Radiator Assembly

a. Removal

1. Drain radiator, and remove upper and lower radiator hoses.

2. On Air Conditioner equipped cars, remove fan ring.

3. Remove six screws, and six spacers on Air Conditioner cars, which hold radiator to support. The center screws behind the condenser on Air Conditioner cars, may be reached with a long end wrench.

4. Remove radiator.

b. Installation

1. Place radiator in position against support, and install six radiator to support mounting screws. On Air Conditioner equipped cars, place spacers between radiator and support before installing screws.

2. Check space between rear face of radiator core and front edge of the fan blade assembly. This should be 1/2 to 1 inch and is important for efficient fan operation.

3. On Air Conditioned equipped cars, install fan ring.

4. Install radiator hoses and clamps.

5. Fill cooling system.

(17) Disassembly and Assembly of Radiator Core

a. Disassembly

1. Loosen side straps, where they are soldered to the upper and lower radiator tanks.

2. Remove the overflow tube from side of radiator by loosening clips.

3. Melt solder at tank to header lap joints and lift off tank.

b. Assembly

1. Assemble the tanks to the core in the reverse order of disassembly, being sure all joints are clean and free from foreign material before soldering.

(18) Removal of Water Pump

1. Drain cooling system.

2. Remove generator drive belt.

3. Remove upper and lower radiator hoses and heater hoses from water pump.

4. On Air Conditioner equipped cars, the following steps must be performed before proceeding.

a. Remove compressor drive belt.

b. Remove fan ring.

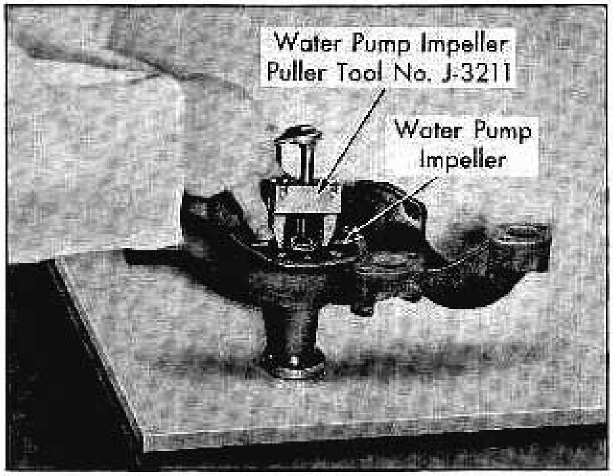

Fig. 13-5 Removing Impeller From Pump

c. Remove two screws which secure compressor mounting bracket to right upper and lower water pump outlet flanges.

d. Remove compressor support strap to thermostat housing screw, and move support out of the way.

e. Loosen compressor support to cylinder block screw.

5. Remove the power steering hydraulic pump from the cylinder head in order to remove the water pump left outlet flange screws from cylinder head.

6. Remove the four screws which hold the pump inlet flanges to the cylinder block, and remove the water pump with gaskets. On Air Conditioner cars, lift the pump out toward the left side of the engine.

(19) Disassembly and Inspection of Water Pump

a. Disassembly

1. Remove thermostat housing from pump by removing the four cap screws and gasket.

2. Remove thermostat from pump body.

3. Remove screws which hold fan blade assembly and pulley to hub and remove blade assembly and pulley.

4. Remove cap screws which hold cover plate to pump body and remove cover plate and gasket.

5. Remove the plastic impeller from pump shaft with Water Pump Impeller Puller Tool No. J-3211, Fig. 13-5.

6. Remove seal, dampener, and seal washer assembly from pump body.

b. Inspection

1. Inspect the impeller blades for indication of improper clearance or for excessive wear.

2. Inspect seal washer and spring loaded seal for wear or cracks and replace if necessary.

3. Check shaft bearing in pump for roughness or excessive end play. If found defective, remove the hub, shaft, slinger, and bearing assembly by pressing out through the front of the pump body.

4. Examine machined seal surface in pump for scratches or nicks and refinish with Water Pump Seal Seat Refinishing Tool, No. J-2999A, as shown in Fig. 13-6.

(20) Assembly of Water Pump

1. If bearing, shaft, and slinger assembly has been removed, replace by pressing new assembly into body, using Water Pump Shaft Installer and Hub Spacer, Tool No. J-3249, as shown in Fig. 13-7.

2. Install washer and seal assembly over the driving lugs of slinger. Washer should slide freely over lugs of slinger.

3. Press impeller on shaft, until outer face of impeller is .005 to .010 inches below back face of water pump.

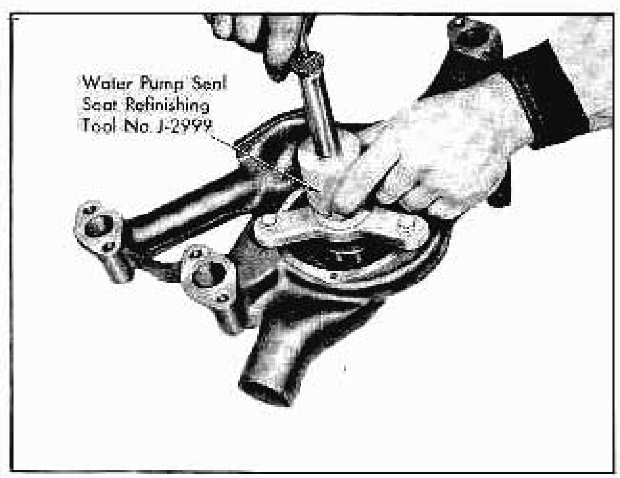

Fig. 13-6 Refinishing Water Pump Seal Seat

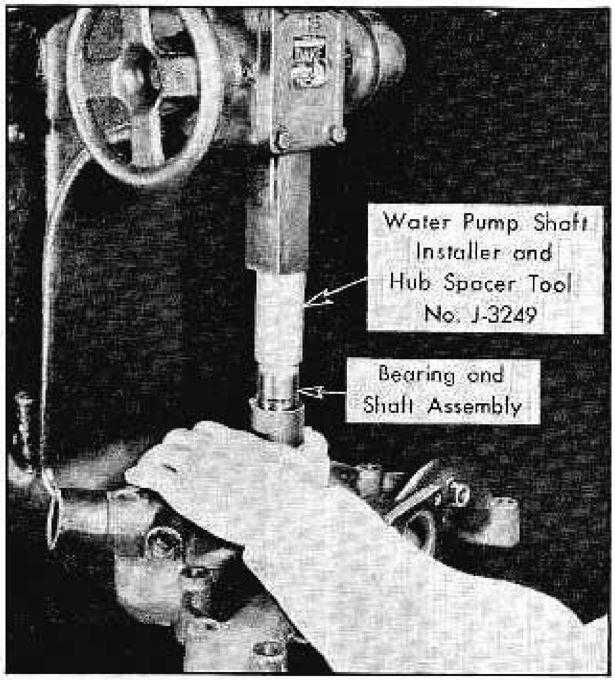

Fig. 13-7 Pressing Bearing and Shaft Into Pump Housing

4. Press new hub on shaft, using Hub Spacer, Tool No. J-3249, until tool bottoms on shaft.

5. Brush gasket cement on pump and cover. Assemble cover gasket and cover to pump. Install cap screws and washers.

6. Spin shaft in pump to be sure impeller has clearance.

7. Install pulley and fan assembly on water pump shaft hub and install cap screws and lock washers.

8. Install thermostat in pump housing, and coat thermostat housing and pump flange with gasket cement and install gasket and housing, tightening screws to 15-18 ft. lbs. torque.

(21) Installation of Water Pump

1. Brush gasket cement on water pump inlet and outlet flange surfaces and place new gaskets in position on pump, Fig. 13-8.

2. Place pump in position against cylinder head and block and install mounting screws in inlet flanges.

3. On cars equipped with power steering, install hydraulic steering pump in position with front mounting bracket over left pump outlet flange and install two mounting screws.

4. On Air Conditioner equipped cars, proceed as follows:

a. Tighten the one compressor support to cylinder head screw.

b. Move compressor support strap into position on thermostat housing and install screw.

c. Install two screws which secure compressor support to right upper and lower water pump outlet flanges.

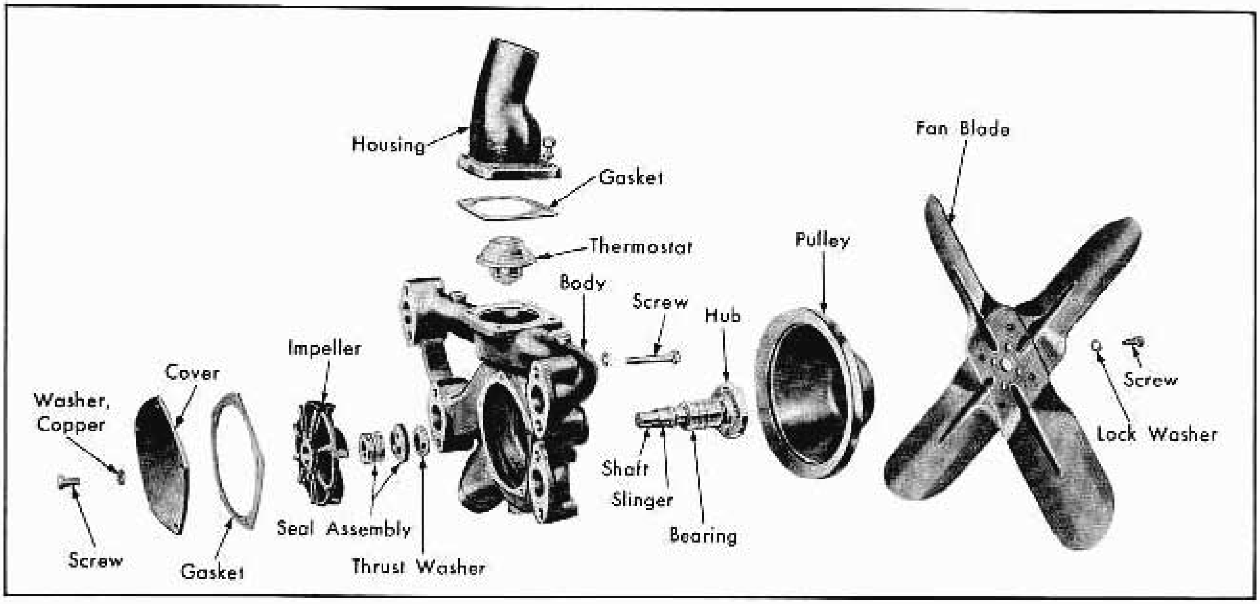

Fig. 13-8 Water Pump - Disassembled

ENGINE COOLING

d. Install fan ring.

e. Install compressor drive belt.

5. Install radiator and heater hoses and install generator drive belt, adjusting tension as explained in Section 11, Note 24.

6. Install hydraulic steering pump drive belt and adjust tension as explained in Section 7, Note 6.

7. Fill radiator and check for leaks.

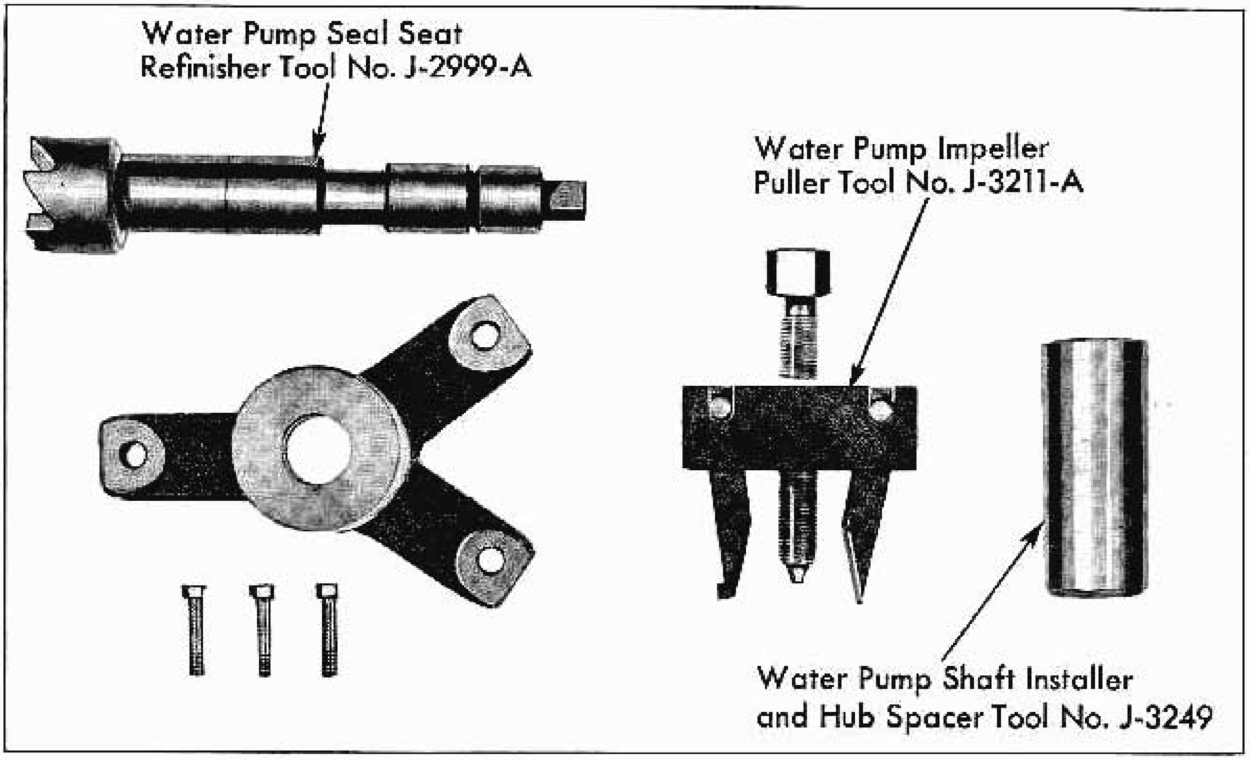

Fig. 13-9 Engine Cooling Special Tools

Tool No.	Name	Model Adaptation	
J-1543-A	Cylinder Block Air Gun	1938-54	All Models
J-3249	Water Pump Shaft Installer and Hub Spacer	1949-54	All Models
J-3211-A	Water Pump Impeller Puller	1949-54	All Models
J-2999-A	Water Pump Seal Seat Refinisher	1949-54	All Models

TORQUE TIGHTNESS

Location	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Hose clamp	Special	15	20
Radiator anchorage nut	5/8-18	70	80
Thermostat housing	5/16-18	15	18
Water pump to crankcase	3/8-16	25	29
Water pump to cylinder head	3/8-16	25	29
Water pump cover to body	1/4-20	10	12

ENGINE COOLING

SPECIFICATIONS

Subject and Remarks	All Series
FAN	
Belt--	
Length-pitch circumference	57"
Width	.380"
Type	Wedge
Distance from fan hub to end of fan shaft	.3255" Mean
Drive Radio--	
Standard	.95 to 1.0
Air Conditioner cars	1.1 to 1.0
Number of Blades--	
62, 60S Standard	4
Air Conditioner cars	4
75 and 86 Com'l.	5
RADIATOR	
Area of core, in sq. in.	359.93
Capacity of system (with heater) 62, 60S, 86	22 Qts.
Capacity of system (with heater) 1%	24-1/2 Qts.
Capacity of system (without heater)	19-3/4 Qts.
Radiator core make	Harrison
Radiator core center constant (standard)	.222"
Radiator core center constant (Air Conditioner cars)	.20"
Tube spacing	.550"

Subject and Remarks	All Series
Radiator cap pressure	12 to 15 lbs.
Hose, thermostat housing to radiator (top)--	
Diameter, inside	1-3/4"
Length--	
Standard	8-7/16"
Air Conditioner equipped cars	9-1/4"
Type	Molded
Hose, radiator to water pump--	
Diameter, inside	1-3/4"
Length--	
Standard	8-7/16"
Air Conditioner equipped cars	9-1/4"
Type	Molded
WATER PUMP	
Clearance between impeller and pump body	.005"-.010"
THERMOSTAT	
Type	Dole
Standard--	
Starts to open	163°F to 168°F
Fully open	188°F
High Opening--	
Starts to open	177°F to 182°F
Fully open	202°F

OTHER NOTES AND REFERENCES

HYDRA-MATIC DRIVE

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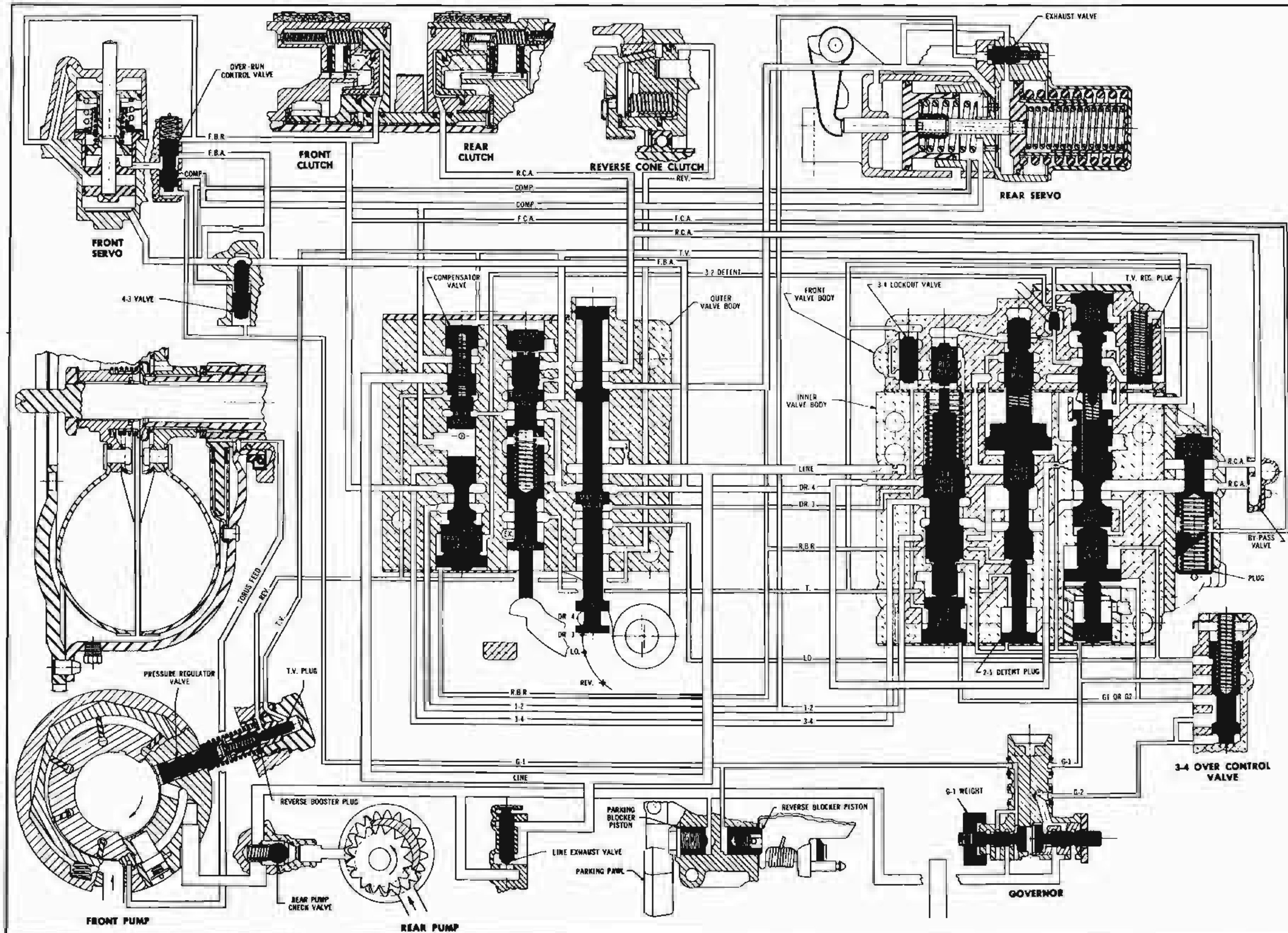

Fig. 14-1 Hydra-Matic Transmission Oil Circuit

HYDRA-MATIC DRIVE

GENERAL DESCRIPTION

The 1954 Hydra-Matic transmission is available as standard equipment on all series Cadillacs.

In operation and construction, the transmission is essentially the same as it has been in previous models with only minor changes.

The over-all line pressure in the hydraulic system has been slightly increased by changing the T.V. plug in the Pressure Regulator Assembly. This will improve the 2-3 shift smoothness. Other changes, assisting the 2-3 shift, include a new compensator valve spring, plus changes in the design of the transition and compensator valves. Using two front pump slide priming springs, instead of one, will provide faster pump slide response to pressure requirements. This means that the flow of oil will be faster and readily available when required.

A groove has been machined in the transmission case to accommodate a new front pump rubber "O" ring seal in place of the paper gasket used previously. This necessitates a change in the case which is new for 1954.

The fluid coupling has been completely changed -- component parts are smaller and shorter. The core ring of the torus members has been removed, making use of a full vane. As a result of this change, the mainshaft and intermediate shaft are shorter. The torus check valve retainer with attaching screws has been eliminated. The check valve can be installed in the driven torus member in a "cocked" position to simplify ease of assembly.

The band anchor lock nut, previously finished on one side, is now finished on both sides. Therefore, the lock nut can be installed either way for locking the band adjustment and will not loosen.

The transmission air breather is of the pencil type. It is located in a bore at the top of the case. The intake hole for the breather is located between the transmission case and flywheel housing.

The throttle shaft "O" ring seal is improved. The diameter is smaller and will improve the seal between the throttle shaft and detent lever. To allow for proper location and seating of the "O" ring, the throttle shaft has an additional groove.

SERVICE INFORMATION

(1) Hydra-Matic Diagnosis

a. Shop and Road Tests for Slippage

Check fluid level with transmission at operating temperature and connect a tachometer to engine to indicate R.P.M.

Unit Slipping	Speeds Affected
Front Band	First, Third, Reverse
Rear Band	First, Second
Front Clutch	Second, Fourth
Rear Clutch	Third, Fourth
Reverse Clutch	Reverse

1. Neutral Test

Increase engine speed with selector lever in neutral - car should not move ahead forcibly although there may be some tendency to creep in new cars.

2. First Speed Test

Place selector lever in "Dr" or "Lo" range and apply hand and foot brakes to prevent car movement. Test for slippage by opening throttle (stall test).

CAUTION Do not run stall test for longer than 15 to 20 seconds, otherwise, the fluid in the coupling will begin to vaporize, causing the torus members to slip. This would result in higher R.P.M. and appear as band slippage. Observe stall test time very closely to avoid false readings. After stall testing car, run engine for a few minutes to dissipate heat.

If engine speed is over 1900 R.P.M., either front or rear band is slipping as both are applied in first. If properly performing engine, as determined by its performance in other speeds, will only turn up 1000 R.P.M. during this stall test, the transmission is probably in second speed instead of first. If engine races with selector in "Dr" or "Lo" ranges with brakes applied, proceed to Reverse Test. An engine which turns up 1700 to 1900 R.P.M. indicates no serious malfunction of either band.

3. Reverse Test

Place selector lever in "Rev" with brake applied and open throttle. If the engine turns up over 1900 R.P.M. in the stall test outlined in First Speed Test but does not indicate over 1900 R.P.M. in the Reverse test, the rear band is slipping as this band is not applied in reverse.

If the car refuses to move foreward but will move in reverse, the rear band or rear servo is inoperative. If the car will move forward but will not reverse, the difficulty probably is in the cone clutch reverse unit. The neutral, first, and reverse tests are quick checks of the manual control linkage, front and rear bands and servos, and the reverse unit, that can be made right on the shop floor.

4. Second Speed Test

With selector lever in "Lo" range, start out on the road from a complete stop. When the shift at minimum throttle is noticed, the transmission is in second speed. The front clutch may now be tested for slippage by opening the throttle and applying the brakes to hold the car at a low constant speed. Rear band and front clutch are the units now in operation; but the stall test under First Speed Test has already checked both bands for slippage. Any noticeable increase in engine speed, using full throttle without a proportional car speed increase, indicates a slipping front clutch.

5. Third Speed Test

Using the normal fourth speed "Dr" range at 30 M.P.H. vehicle speed, open the throttle wide forcing the 4-3 downshift. The shift to third can be felt in the car, and we have positively placed the transmission in third speed. Decrease the car speed by use of the brakes while throttle is maintained in the open position. If the engine R.P.M. increases, the rear clutch is slipping. The front band is also used in this speed, but it has been checked in the First Speed Test.

b. Air Checking Oil Circuits (Fig. 14-2)

Drain transmission, remove bottom pan, oil screen, side cover, and control valve assembly.

NOTE: When removing the top row of transmission case side cover attaching screws, it is necessary to remove the rear engine support from the frame and the extension housing so that the extension housing rests in the frame cross member.

Connect Blow Gun, Tool No. J-4353-1, to a source of air pressure (approximately 80 pounds) and carefully check each passage in sequence, Fig. 14-2. Refer to the oil passage chart, Fig. 14-3, noting the operation of unit actuated and presence of any unusual leakage.

NOTE: Remove excess oil from transmission before proceeding with air check by applying pressure to each passage while holding a cloth over remaining passages to absorb the oil and protect the operator.

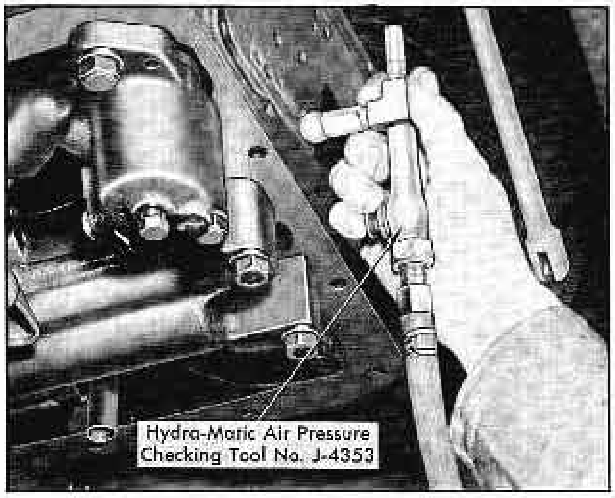

Fig. 14-2 Air Checking Oil Circuits

1. Front Clutch Apply

Air pressure applied into this passage should actuate front clutch. As pressure is intermittently applied, movement of the clutch piston should be audible and, in most cases, can be felt by holding front drum firmly with free hand.

If an unusual amount of air is escaping around oil delivery sleeve area, another check at this point must be made after servos are removed to observe more clearly the point of leakage.

If a fog of oil is emitted from inside front of front drum, accompanied by escape of a great amount of air, leak is probably due to a faulty front clutch seal.

Leakage from any other drilled passages inside of transmission case, while pressure is applied at Point No. 1, is an indication of a faulty transmission case or oil delivery sleeve.

2. Front Band Apply

Air pressure applied into this passage should actuate the front servo and apply band with no unusual escape of air. Observe area around flat surface of servo body, that rests on case. No appreciable escape of air should be present at this location.

A small amount of air leak from hole No. 3 is permissible. However, leak from hole No. 3 should not be an open blow-by, but only an amount that would leak past apply piston ring gap. A slight

HYDRA-MATIC DRIVE

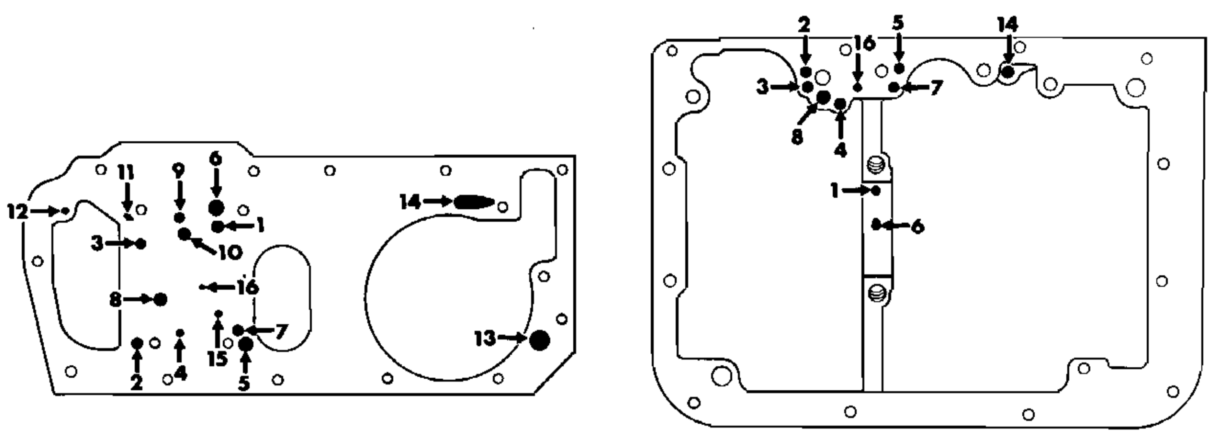

Fig. 14-3 Identification of Oil Passages

leak from the front servo valve body is permissible.

3. Front Band Release

Air pressure applied into this passage will not actuate servo because apply piston is held in released position by retracting spring. However, no unusual escape of air should be emitted between servo body and transmission case or around band release cylinder, except that which would normally leak past release piston ring gap.

4. Governor (G-1) to 4-3 Valve

Air pressure applied here should not escape between servo body and transmission case or from any other passages on side of case except, possibly, a very small amount from passage No. 2. A slight leak from the front servo valve body is permissible. When the overrun control valve is actuated, a slight click will be noticed.

5. Rear Band Release

Air pressure applied into this passage should release the rear servo and band with no unusual escape of air. A small amount of air will escape through piston ring gaps but this should not be enough to impair normal servo operation. Observe area where servo body rests on case. There should be no appreciable amount of air escape at this point. Check other passages on side of case for interconnection. While a very small amount of air may be emitted from passage No. 7, there should be no blow-by from any other passage.

6. Rear Clutch Apply

Air pressure applied into this passage should actuate rear clutch. As pressure is intermittently applied, movement of the clutch piston should be audible and, in most cases, can be felt by holding rear drum firmly with free hand.

If an unusual amount of air is escaping around oil delivery sleeve area, another check at this point must be made after servos are removed to observe more clearly, the point of leakage.

If a fog of oil is emitted from inside rear unit drum assembly, accompanied by escape of a large amount of air, leak is probably due to a faulty rear clutch seal or oil delivery sleeve rear ring.

Escape of air from any other passage on side of case is an indication of interconnecting passages.

7. Compensator to Front and Rear Servos

Air pressure applied into this passage should actuate rear servo to tighten rear band which is applied by spring pressure, and to actuate front

HYDRA-MATIC DRIVE

servo to apply front band. No appreciable amount of air should escape from either front or rear servo, or any other passages on side of case except that which may escape through piston ring gaps.

8. Main Line Pump Feed

Air pressure applied into this passage will result in a large amount of air and oil blowing out from front side of front drum assembly. This blow-by is emitted from rear side of front pump and is normal. While air pressure is applied to this point, observe closely other passages on side of case for slightest amount of escaping air or oil bubbles, which would be an indication of interconnected passages.

9. Pressure Gage Hole to Top of Case

Air pressure applied into this passage should produce no leak whatsoever if plug is sealed in place between band adjusting screws.

Observe other passages for escape of air.

10. Exhaust Port for Valve Body

Air pressure applied into this hole should be a complete blow-by to inside of transmission case. Remove blow nozzle and visually inspect this hole to be sure that it is completely open for its full diameter to the inside of case. A partial obstruction of this passage can cause poor shift conditions.

11. T. V. Pressure Line

This passage is the modulating T.V. pressure line to the T.V. plug in the pressure regulator and need not be checked in this diagnosis procedure.

12. Reverse Booster Pressure

This passage directs oil behind the reverse booster plug in the pressure regulator and need not be checked in this diagnosis procedure.

13. Reverse Cone Clutch Piston Apply

Air pressure applied into this passage should actuate the reverse cone clutch piston. As pressure is intermittently applied, movement of the clutch piston should be audible and, in most cases, can be felt by holding the reverse internal gear with free hand.

If an unusual amount of air is heard escaping around the cone clutch piston, either the outer or inner seals or both in the reverse cone assembly are leaking. The unit should be disassembled and both oil seals replaced.

14. Governor Feed

This passage directs main line pressure oil to the governor and need not be checked in this diagnosis procedure.

15. Line Exhaust

This passage exhausts main line pressure when the engine is turned off and car is at a standstill and need not be checked in this diagnosis procedure.

16. 1-2 Oil

This passage directs main line pressure oil to fast dump valve in rear servo and need not be checked in this diagnosis procedure.

17. Procedure for Visual Air Check of Clutch Hydraulics

a. Assemble front clutch piston with seals and expanders into front clutch drum and install Clutch Piston Actuator, Tool No. J-4353-5, over piston and drum.

b. Install front unit drum and piston, with actuator tool, onto front end of oil delivery sleeve, using Ring Compressor, Tool No. J-1537.

c. Assemble rear clutch piston with seals and expanders into rear clutch drum and install Clutch Piston Actuator, Tool No. J-4353-5, over piston and drum.

d. Install rear unit drum and piston, with actuator tool, onto rear end of oil delivery sleeve, using Ring

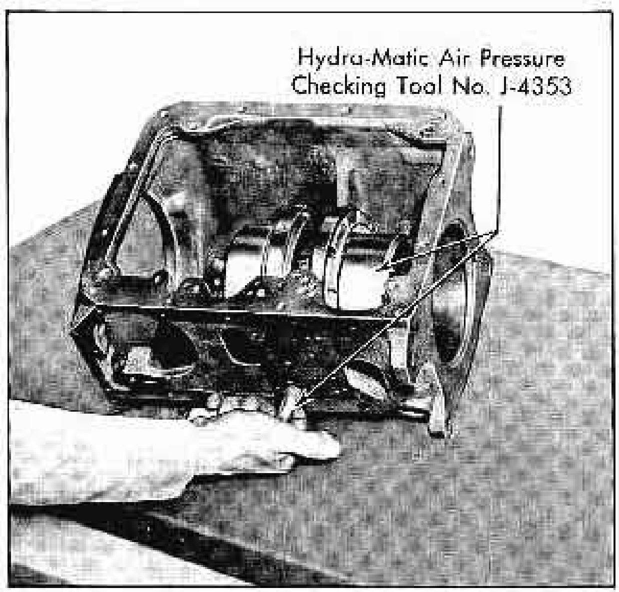

Fig. 14-4 Checking Clutch Hydraulics

Compressor, Tool No. J-1537.

e. Position clutch drum and piston assemblies, with oil delivery sleeve, into transmission case. Position center bearing cap over oil delivery sleeve, indexing dowel in cap with hole in sleeve. Tap into place using punch and hammer.

CAUTION: Do not use screws to pull cap into position.

f. Install two cap attaching screws and tighten.

g. Repeat front and rear clutch apply checks outlined in items 1 and 6 under Procedure For Air Checking Transmission. You may now observe piston action and make a thorough visual check for clutch line leaks. Fig. 14-4.

(2) Adding and Changing Fluid

Whenever the Hydra-Matic transmission is drained and refilled or fluid is added to bring the level up to "Full" mark on the dipstick, use only Cadillac Hydra-Matic Transmission Fluid or an Automatic Transmission "Fluid Type A" with an Armour Qualified number embossed on top of container (Brand Name AQ-ATF). This assures the user that the fluid has all the properties essential for correct operation of the Hydra-Matic transmission.

The fluid level should be checked every 2000 miles along with regular car lubrication, and the fluid should be drained and replaced every 25,000 miles.

a. Checking Fluid Level

1. With selector lever in "N" (neutral) position, run engine at a speed of 20 M.P.H. for approximately 1-1/2 minutes.

NOTE: Always check the oil level after the engine has been running to be sure the fluid coupling is filled and thus obtain an accurate reading.

2. Reduce engine speed to slow idle (carburetor off the fast idle step approximately 375-400 R.P.M.). Raise the hood and remove transmission dipstick (located at the right rear side of engine), wipe it clean, and check fluid level.

3. With engine still running, add fluid to bring level to "F" (full) mark on dipstick. ("L" to "F" marking on dipstick is one quart.)

CAUTION: Do not fill above "F" mark on dipstick as this will cause foaming when transmission oil is hot.

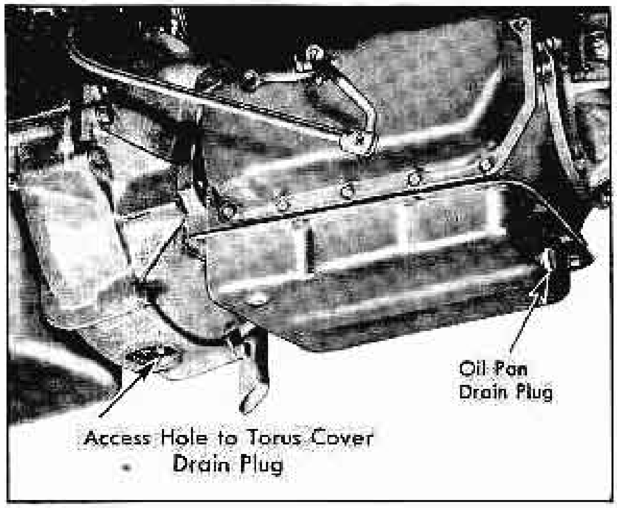

Fig. 14-5 Transmission Drain Plugs

b. To Replace Fluid

1. Remove drain plug from transmission oil pan and from torus cover, which is accessible through the inspection hole in lower flywheel housing. Fig. 14-5.

2. Allow old fluid to drain completely and reinstall drain plugs and inspection hole cover.

3. Open hood and add 7 quarts of Automatic Transmission Fluid into the oil filler tube.

4. Run the engine at a speed of approximately 800 R.P.M. for approximately 1-1/2 minutes with the selector lever in "N" (neutral).

5. Reduce engine speed to slow idle (carburetor off the fast idle stop) and add 2-1/2 to 3 quarts of fluid to bring the level up to the "F" mark on the dipstick.

NOTE: The capacity of the Hydra-Matic transmission is approximately 10 quarts for a refill, but the correct level is determined by the mark on the gage rather than by the amount added. Do not overfill as foaming may result when the oil is hot.

6. Shut off engine, replace dipstick and close hood.

(3) Manual Control Linkage Adjustment

1. Disconnect manual control rod from control lever at transmission. Fig. 14-6.

2. Move control lever at transmission to the normal drive position. The drive position can be

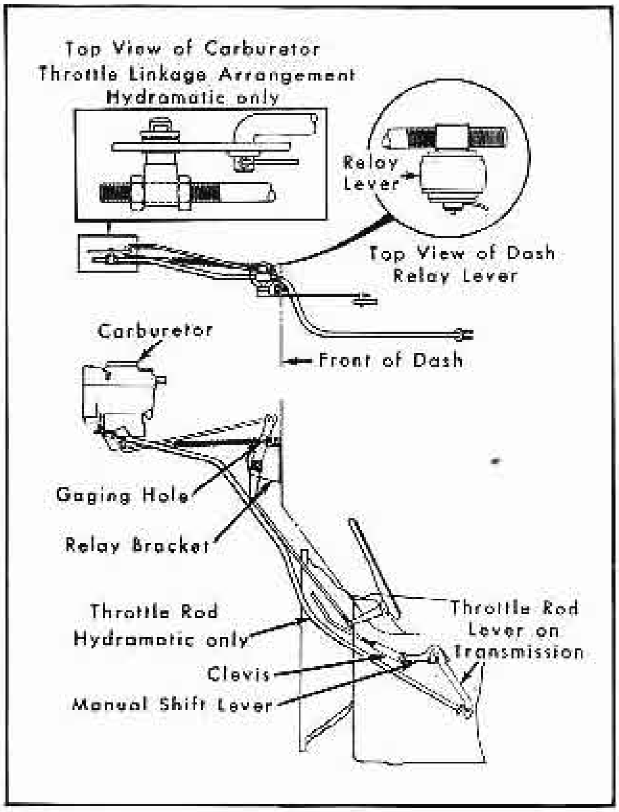

Fig. 14-6 Manual and Throttle Control Linkage

found by moving the manual lever at the transmission fully forward and upward and then moving it rearward until the first detent is felt.

3. Move selector lever on steering column to the stop for normal "DR-4" (left hand arrow) position.

4. Adjust clevis on lower end of control rod until clevis pin can be inserted freely through clevis and manual control lever.

5. Assemble clevis, pin, and lever, and install new cotter pin.

(4) Throttle Control Linkage Adjustment

1. Remove transmission throttle control lever clevis pin, and check lever position with Tool No. J-3065-C by fitting tool to rear face of transmission case and inserting clevis pin through lever and proper hole in tool while lever is in its rearward position. Fig. 14-7. If throttle lever is misaligned, bring it into alignment by bending with Tool No. J-2029.

2. Assemble linkage to transmission throttle lever and install new cotter pin.

3. Remove spring clip from carburetor to dash relay rod trunnion and remove trunnion from dash relay lever.

4. Place 1/4 inch drill shank through gaging hole in dash relay lever and into dash relay bracket. See Fig. 14-6 above.

5. Set carburetor throttle in hot idle position (375 R.P.M.) with transmission in drive range.

6. Adjust carburetor to dash relay rod trunnion to allow free entry into dash relay lever.

7. Install spring clip in trunnion.

8. Back off both jam nuts on the throttle valve rod at carburetor to allow free movement of rod in trunnion.

9. Push on end of throttle valve rod to position transmission throttle valve against its stop.

10. Bring rear jam nut up against trunnion and back off 3 complete turns.

NOTE: This adjustment may be increased or decreased to improve shift characteristics.

11. Tighten front jam nut, making certain linkage moves freely.

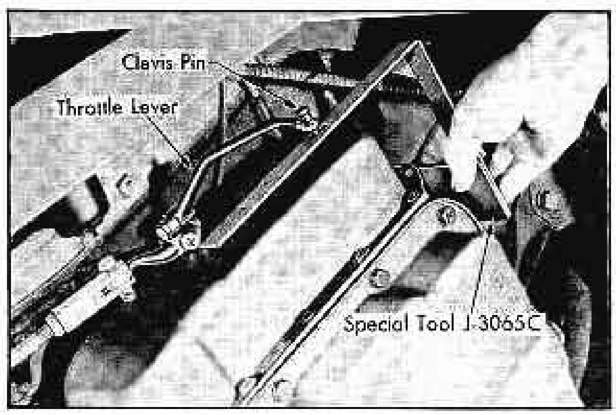

Fig. 14-7 Throttle Lever Checking Gauge

12. Remove 1/4 inch drill shank from dash relay and check position of accelerator pedal with wide open throttle. Pedal should touch floor mat with slight pressure (allow 1/2" clearance if mat has been removed) when throttle is wide open.

13. Adjust accelerator pedal position at pedal end of dash relay to accelerator pedal rod.

14. Road test car to insure proper shifting characteristics Fig. 14-8.

HYDRA-MATIC DRIVE

3.07 AXLE, 62 AND 60S SERIES

	Drive 4 Range			Drive 3 Range			Lo Range		
Shift	Minimum Throttle *	Throttle At Detent *	Full Throttle *	Minimum Throttle *	Throttle At Detent *	Full Throttle *	Minimum Throttle *	Throttle At Detent *	Full Throttle *
1-2	5-8	14-18	20-23	Same as Drive 4 Range			Same as Drive 4 Range		
2-3	11-16	33-38	36-41	Same as Drive 4 Range					
3-4	21-26	68-75	73-79	73-79	73-79	73-79	Shifts 2-4 at 42 MPH		
4-3	14-17	27-31	70-75	70-77	72-79	72-79	Shifts 4-2 at 41 MPH		
3-2	8-12	7-10	21-24	Same as Drive 4 Range					
2-1	4-7	6-9	8-11	Same as Drive 4 Range			Same as Drive 4 Range		

3.36 AXLE, 62 AND 60S SERIES

1-2	5-8	13-17	18-22	Same as Drive 4 Range			Same as Drive 4 Range
2-3	10-15	30-35	33-37	Samc as Drive 4 Range			
3-4	19-24	62-68	67-72	67-72	67-72	67-72	Shifts 2-4at 38
4-3	13-16	25-28	64-69	64-70	66-72	66-72	Shifts 4-2 at 37
3-2	7-11	6-9	19-22	Same as Drive 4 Range			
2-1	3-6	5-8	7-10	Same as Drive 4 Range			Same as Drivc 4 Range

3.77 AXLE, 75 SERIES

1-2	4-7	12-15	16-19	Samc as Drive 4 Range			Same as Drive 4 Range
2-3	8-13	27-31	30-34	Same as Drive 4 Range			
3-4	17-21	55-61	60-64	60-64	60-64	60-64	Shifts 2-4 at 34 MPH
4-3	12-14	22-25	57-61	57-63	58-64	58-64	Shifts 4-2 at 33 MPH
3-2	7-8	5-8	17-20	Same as Drive 4 Range			Same as Drive 4 Range
2-1	3-5	5-8	7-9	Same as Drive 4 Range			

4.27 AXLE, 86 SERIES

1-2	4-6	10-13	15-17	Same as Drive 4 Range			Same as Drive 4 Range
2-3	8-12	24-28	26-32	Same as Drive 4 Range			
3-4	15-18	49-55	53-58	53-58	53-58	53-58	Shifts 2-4 at 30 MPH
4-3	10-13	19-23	51-55	51-56	51-56	51-56	Shifts 4-2 at 29 MPH
3-2	6-9	5-7	15-17	Same as Drive 4 Range			
2-1	3-5	4-7	6 8	Same as Drive 4 Range			Same as Drive 4 Range

*Shift Speeds MPH

Fig. 14-8 Hydra-Matic Shift Points

(5) Internal Band Adjustments

NOTE: In order to obtain maximum band life and smooth shifting, the Hydra-Matic bands must be adjusted by the Internal Method at 500 miles. After the bands have been adjusted, the T.V. rod at the carburetor must be adjusted and ROAD TESTED to insure proper performance as described in Note 4.

a. Front Band

1. Drain Hydra-Matic fluid from transmission.

2. Remove transmission oil pan and gasket.

3. Remove the pipe plug from front servo. Loosen "hex" adjusting screw of Gage No. J-1693, until approximately 1/8" of threads are exposed above gage body. Install gage, tightening by HAND ONLY. Fig. 14-9.

NOTE: Before making band adjustment, be sure anchor is seated on adjusting screw and the band is centered on drum.

4. Tighten the "hex" adjusting screw with fingers until the stem of gage is felt to JUST touch piston in front servo.

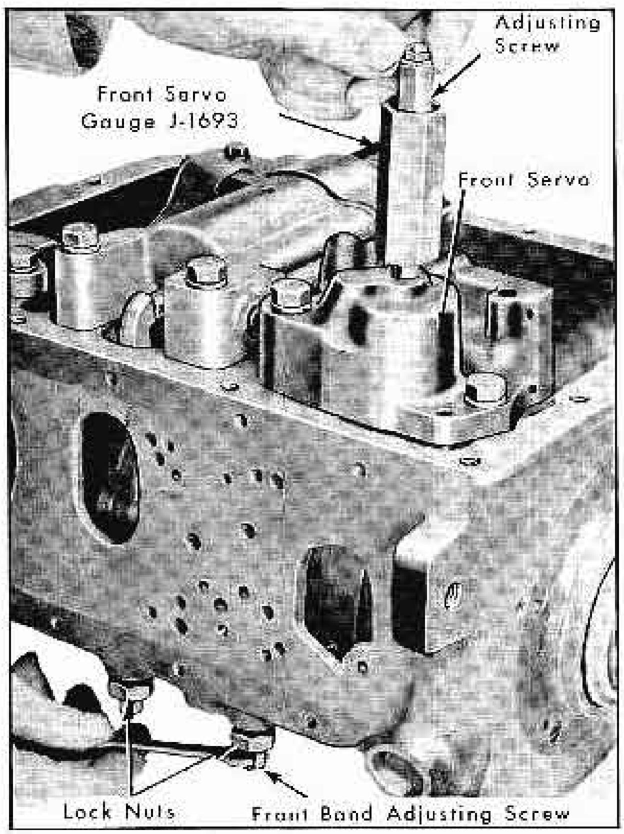

Fig. 14-9 Adjusting Front Band

5. Using a wrench, tighten this "hex" adjusting screw 5 turns from the point where it was felt by hand that stem JUST touched piston.

6. Remove floor mat over band adjusting hole cover and remove cover.

7. Loosen band adjusting screw lock nut.

8. Tighten front band adjusting screw until knurled washer on top of the band adjusting gage is just free to turn.

9. Hold band adjusting screw and tighten band adjusting screw lock nut securely to 40-50 ft. lbs. torque.

10. Loosen gage adjusting screw at least six full turns and remove gage. Install and tighten pipe plug.

b. Rear Band

1. With rear band centered on drum, tighten band adjusting screw until actuating lever contacts face of gage J-5071. Fig. 14-10.

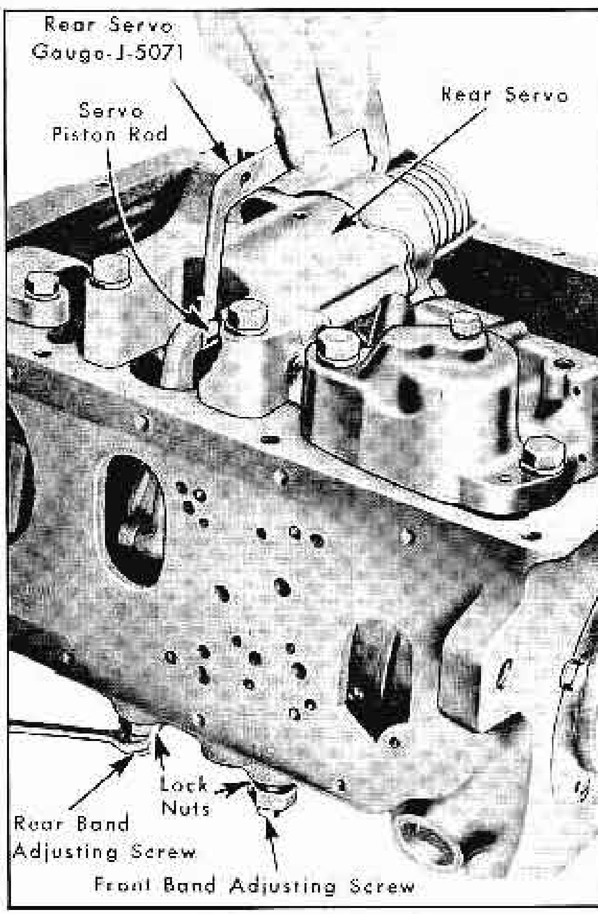

Fig. 14-10 Adjusting Rear Band

CAUTION: Do not go beyond adjustment. If adjusting screw is accidently turned beyond adjustment, loosen two or three turns and repeat adjustment.

2. Hold band adjusting screw and tighten adjusting screw lock nut to 40-50 ft. lbs. torque.

(6) Towing Instructions

Cadillac cars equipped with Hydra-Matic Drive and driven less than 1,000 miles, should never be towed unless the propeller shaft is disconnected, or the rear wheels are raised off the ground. This is necessary because of possible close production limits which might cause the front clutch to drag and possibly burn up.

Cadillac cars equipped with a Hydra-Matic Drive, driven more than 1,000 miles, may be towed 50 to 75 miles with the selector lever in the "Neutral" position, without disconnecting the propeller shaft, or raising the rear wheels off the ground, provided the Hydra-Matic Drive was operating satisfactorily up until the time of towing.

Towing speeds of 15 to 25 M.P.H. should be maintained when possible throughout the distance traveled to insure proper lubrication.

(7) Checking Pump Pressure

The pump pressure can be checked with the transmission in the car, using a gage calibrated to at least 200 P.S.I.

1. Remove band adjusting hole cover from floor pan, clean dirt from top of case and remove plug from top of transmission case (between band adjusting screws).

2. Screw pressure gage line fitting into hole in case, with gage placed so it can be read from the driver's seat.

3. Drive car until transmission oil has reached normal driving temperature (approximately 200°F).

a. Drive Range Check

The following tests may be made by road test or with car on jack stands.

1. Zero throttle pressure - At 30 M.P.H. in fourth gear with zero throttle, oil line pressure should be 64 to 72 P.S.I.

2. Full throttle pressure (road test) - Full throttle pressure in fourth gear at 30 M.P.H. (full throttle without going through detent) should be at least 40 P.S.I. higher than zero throttle pressure test reading. (Car on jacks)

3. To check the operation of the rear pump alone, drive the car at 40 to 45 M.P.H. in fourth speed. Then shift to neutral and turn off the ignition. Pressure should be at least 75 P.S.I.

Low rear pump oil pressure should be corrected by replacement of the pump gears, by correcting excessive end play in the gears or by checking for leakage in other units.

b. Reverse Pressure Check

1. Place the selector lever in reverse position and note pressure with engine running at 400 R.P.M. This reading should be as high or higher than the previous pressure checks in drive range.

2. With the selector lever in Reverse, apply the foot brake and increase engine speed to half throttle. Pressure could increase to 145 P.S.I. minimum. The pressure range at the above conditions is from 145 P.S.I. to 210 P.S.I.

If pressure readings are below the specified amount for any of the above tests, a malfunctioning pressure regulator or a leak in the system is indicated.

(8) Seals Against Leakage

The several precautions which must be observed to prevent fluid leaks are as follows:

1. Use new gaskets and "O" rings whenever there is a disassembly.

2. Use a very small amount of vaseline or heavy grease to hold gaskets in place during assembly or to seal gaskets. Never use gasket paste or shellac.

3. Be sure to install washers under the correct screws when reinstalling the front cover.

4. Use Permatex No. 3 on screws to seal threads.

5. Make sure flywheel cover gasket is not wrinkled or creased when installed. Also make sure that gaskets have not stretched or shrunk during storage.

(9) Correction of Leaks

a. At Fluid Coupling

If the fluid level is found to be low during periodic lubrication inspections, check for fluid

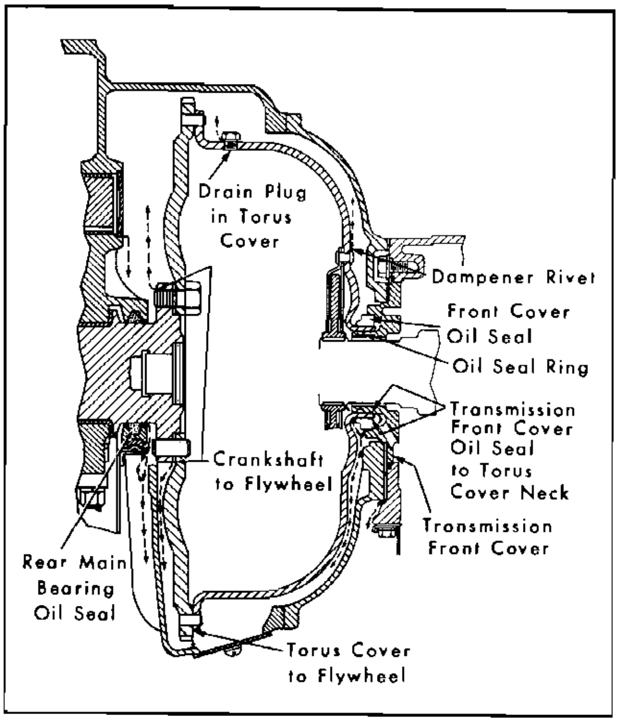

Fig. 14-11 Location of Possible Oil Leaks

leaks. Leakage may be at several points, among which are:

1. Between flywheel and crankshaft.

2. Between flywheel and torus cover.

3. Between torus cover neck and front oil seal.

4. Between front oil pump housing (front cover) and transmission case.

To determine at which point the leakage occurs, Fig. 14-11, remove the lower flywheel housing, wash the flywheel and torus cover thoroughly with cleaning solvent and allow to dry completely. Then spread a clean piece of paper under the flywheel and cover, and run the engine at a speed equivalent to 50-60 miles per hour. When spray appears on the paper, shut off the engine and check the flywheel and torus cover for the presence of fluid.

NOTE: To perform the above operation it will be necessary to cut an old flywheel housing away, leaving just enough of the housing to attach it to the engine and to mount the starter motor on solidly in order to start the car.

If fluid is streaked along the front face of the flywheel, the leakage is between the flywheel and crankshaft. If fluid is streaked along the torus cover, the leakage is between the torus cover neck and oil seal, or between the front cover and the case, or at the rivets that hold the dampener to the torus cover. If none is found either on the flywheel or torus cover, the leakage may be occurring at the joint between the flywheel and torus cover.

Leakage between the flywheel and torus cover can be corrected by installing a new gasket. Make sure that the gasket is not wrinkled and fits properly. Tighten the cap screws evenly to a torque tightness of 40 foot-pounds.

Leakage between the flywheel and crankshaft can be corrected by using new flywheel bolts and a new gasket. Coat the gasket with Gasket Compound (Supplied by Factory Parts Department) when installing. The ridges or raised portions of the gasket are installed towards the rear of the car. Torque to 75 foot-pounds. If new screws and a gasket do not stop the leak, the threaded portion of the screws should be tinned.

Leakage between the front oil seal and torus cover neck may be due either to a defective oil seal, to excessive runout of the torus cover, pin holes or roughness at cover neck. In extreme cases, it may be necessary to replace the cover.

b. At Rear Extension Housing

Place selector lever in reverse and run engine at 1500 R.P.M. Check for leaks between extension housing and case. If leaks are noted at this point, replace gasket between housing and case.

Check rear oil seal for leaks and replace if necessary as described in Note 11i. Check extension housing cover gasket for leaks and replace if necessary.

(10) Removal of Hydra-Matic Transmission from Car

1. Place car on jacks with all four wheels approximately 12 inches above the floor.

2. Disconnect propeller shaft at rear universal joint flange and remove shaft with front universal and yoke.

3. Disconnect battery and remove starter motor.

4. Remove slush deflector from lower flywheel housing.

5. Remove flywheel housing lower cover and drain transmission at oil pan and torus cover. Fig. 14-5. See Note 2b.

6. Place a jack under engine at rear of oil pan, using a wood block to prevent damage to oil pan, or use special Engine Support Stand, Tool No. J-3068.

7. Remove transmission fluid filler tube from transmission oil pan.

8. Place Hydra-Lift under car and raise transmission just enough to take strain off rear engine support.

9. Disconnect engine rear support at transmission extension housing. Remove bracket cross member that carries support.

10. Remove throttle control rod from throttle lever on transmission.

11. Disconnect manual shift rod from manual lever on transmission control.

12. Remove throttle control lever and manual lever from side of transmission case to prevent damage from bending.

13. Disconnect speedometer cable at rear of transmission.

14. Remove cap screws holding torus cover to flywheel and push cover toward rear of car to disengage dowels locating it on flywheel.

CAUTION: Cover should not be pried away from flywheel.

15. Lower jack or Engine Support Stand, Tool No. J-3068 under engine oil pan until top of flywheel housing clears floor pan.

16. Remove four screws holding flywheel housing to engine crankcase.

17. Remove transmission and flywheel housing as a unit by moving back toward rear of car, and at the same time lowering assembly to the floor. Fig. 14-12.

(11) Disassembly of Transmission

a. Removal of Torus Members, Torus Cover and Flywheel Housing from Transmission Fig. 14-13

NOTE: Fluid coupling cannot be removed as a unit. The components must be taken off one at a time as described below.

1. Place transmission and fluid coupling assembly in fixture J-2541-A on bench.

2. Move shift lever on side of transmission toward rear to reverse position.

3. Straighten mainshaft nut lock washer, using chisel and a light hammer.

4. Remove mainshaft nut, using 1-7/16" socket.

5. Slide driven torus member off front end of transmission mainshaft with check valve and spring.

NOTE: If torus sticks, tap end of mainshaft with plastic or similar hammer and at the same time, pull out torus member.

6. Remove driven torus snap ring from mainshaft.

7. Remove driving torus snap ring from intermediate shaft.

8. Remove driving torus member.

CAUTION: Do not attempt to remove torus cover and driving torus members together.

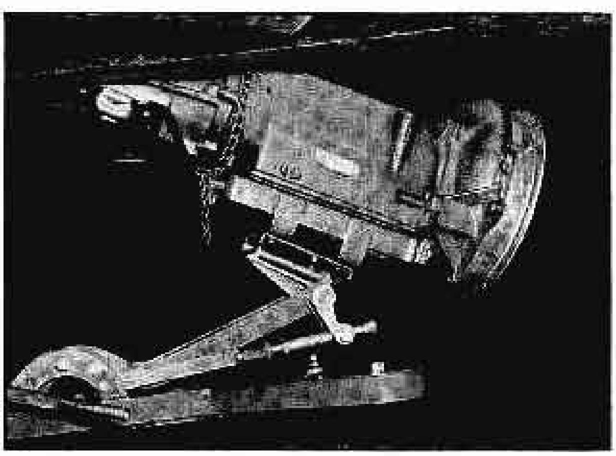

Fig. 14-12 Removing Transmission

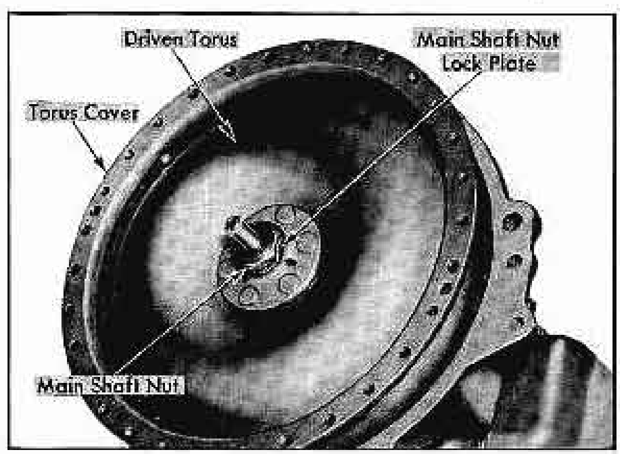

Fig. 14-13 Torus Members on Transmission

HYDRA-MATIC DRIVE

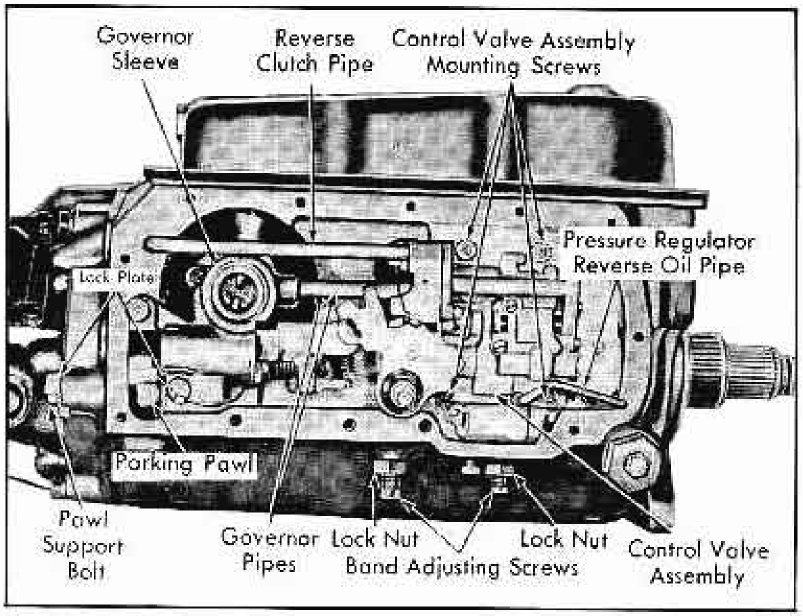

Fig. 14-14 Transmission with Side Cover Removed

9. Remove torus cover. Do not attempt to remove torus cover by pulling and pushing on cover in a rough manner as this may result in a broken oil seal ring. Work hub of torus cover back through oil seals gently, and then pull torus cover forward with a quick jerk.

10. Remove four screws and lock washers holding flywheel rear housing to front of transmission case. Remove flywheel rear housing and gasket.

11. Move shift lever on side of transmission to "Lo" position.

12. Loosen clamp screw (Phillips head) holding shift lever to inner throttle lever shaft at side of transmission and remove lever.

13. Remove oil pan screws (1/2") and lock washers. Remove oil pan and gasket.

14. Remove side cover screws (7/16") and cover with gasket. Fig. 14-14.

NOTE: When removed in car, rear engine mount should be removed to simplify ease of removal.

15. To avoid damage to oil pan screen, lift screen and front pump intake pipe as an assembly from the front pump and rear pump intake pipe. Fig. 14-15.

b. Removal of Valve Body Assembly

NOTE: Removal may be done with transmission in car. Side cover must be removed. Oil pan need not be removed.

1. Using screwdriver, remove pressure regulator reverse oil pipe from valve body and case. Fig. 14-16.

CAUTION: Use very light pressure and be careful in prying out pipe since it bends easily and might be difficult to put back.

2. Remove four screws (7/16") holding valve body to transmission case. Fig. 14-14.

3. Work valve body toward front of case to

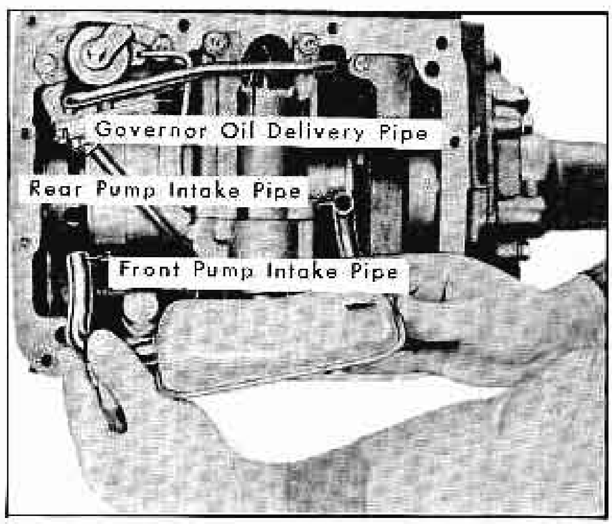

Fig. 14-15 Removing Oil Pan Screen and Intake Pipe

HYDRA-MATIC DRIVE

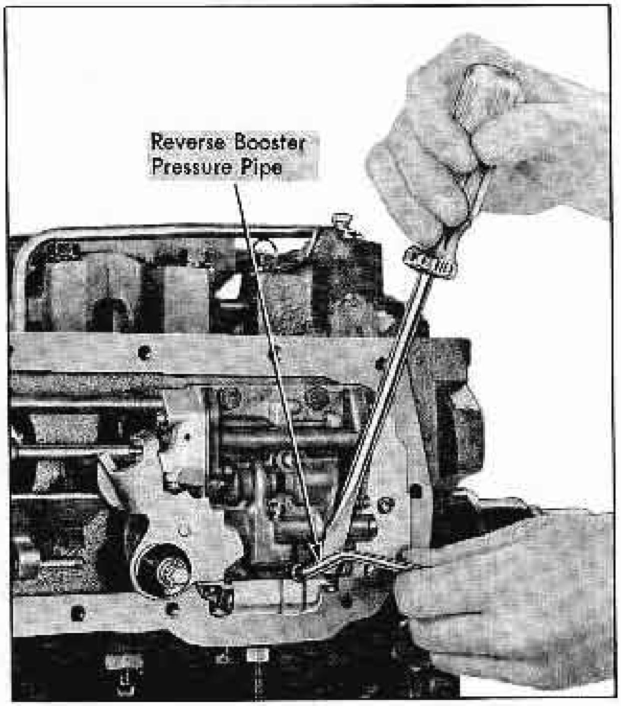

Fig. 14-16 Removing Reverse Oil Pipe

clear governor pipes and reverse clutch pipe. (Be careful not to kink pipes when sliding valve body forward.)

4. Governor pipes may remain either in valve body or bracket assembly. Remove governor pipes. Remove reverse clutch oil pipe from case.

5. Be sure to protect valve body from dirt as soon as it is removed - wrap valve body in clean paper or cloth.

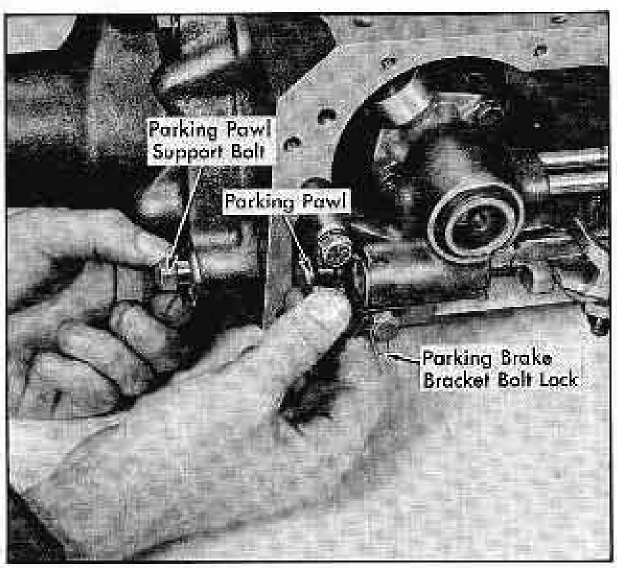

Fig. 14-17 Removing Parking Pawl Bolt

c. Removal of Parking Brake Assembly

NOTE: Removal may be done with transmission in car. Side cover and valve body (11b) must be removed. Oil pan need not be removed.

1. Unhook parking brake release spring from pin assembly at end of bracket and remove spring.

2. Loosen lock plate and remove parking brake pawl support bolt (9/16") from rear of case. Fig. 14-17. Move pawl down into case away from reverse internal gear. (Pawl cannot be removed at this time.)

3. Loosen lock plate and remove two bolts holding bracket assembly to case.

4. Pull governor sleeve off, being careful not to tilt it because oil rings would twist and be damaged. Do not lose roller for the parking bracket crank. Fig. 14-18.

5. Remove parking pawl from case.

d. Removal of Front and Rear Servos

NOTE: Servos may be removed with transmission in car. Side cover need not be removed. Rear servo may be removed without removing front servo.

1. Remove governor oil delivery pipe. Be careful not to crush this pipe when prying it from front servo and governor. Fig. 14-19.

2. Loosen lock nut (3/4") and back off rear band adjusting screw (3/8") at least five turns.

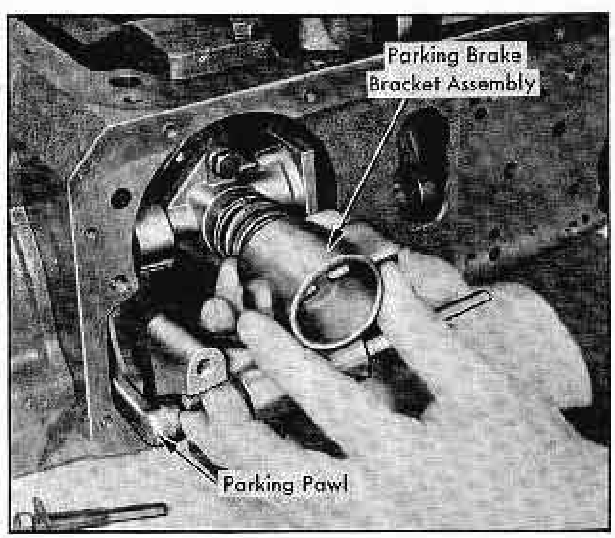

Fig. 14-18 Removing Governor Sleeve

HYDRA-MATIC DRIVE

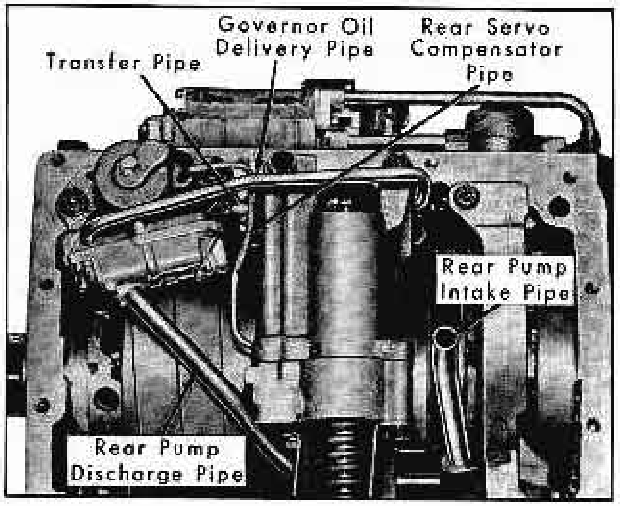

Fig. 14-19 Removing Governor Oil Delivery Pipe

NOTE: Be sure this screw is loosened enough to take all tension from the band apply spring before loosening rear servo attaching screws.

3. Remove front and rear servo attaching screws (9/16").

4. Separate rear servo from front servo at compensator transfer pipes by moving rear servo toward rear of transmission. Disengage compensator pipes from servos. Remove rear servo.

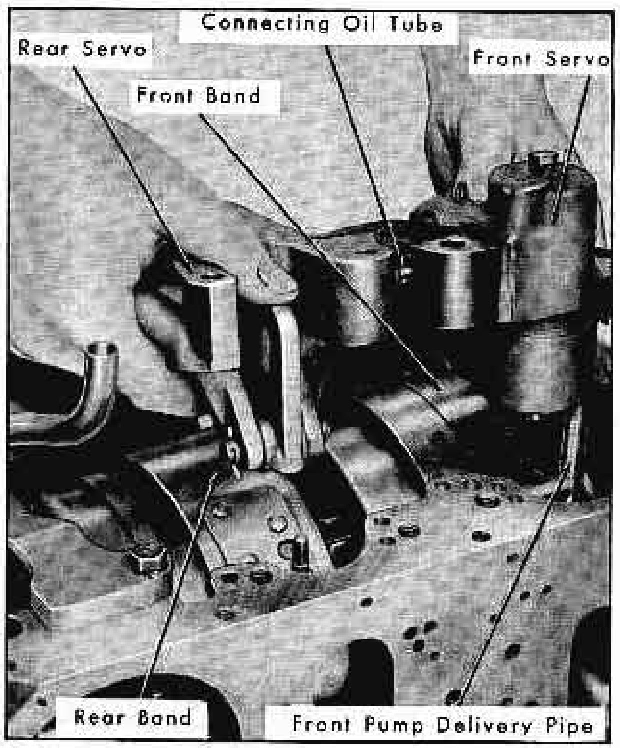

Fig. 14-20 Removing Servos

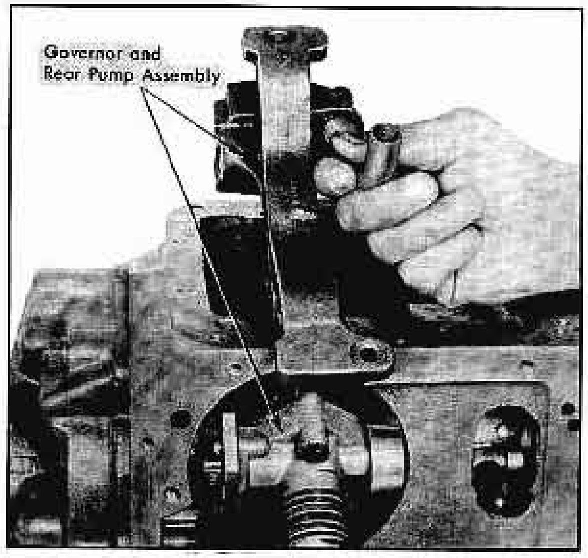

Fig. 14-21 Removing Rear Oil Pump and Governor Assembly

(Both servos may be removed together as an assembly.) Fig. 14-20.

5. Remove front servo, pulling straight up from case off front pump delivery pipe.

6. Remove front pump delivery pipe by pulling straight up from front pump.

e. Removal of Rear Oil Pump and Governor

NOTE: Units may be removed with transmission in car. Requires removal of oil pan, parking bracket (Note 11c), valve body (Note 11b) and rear servo (Note 11d).

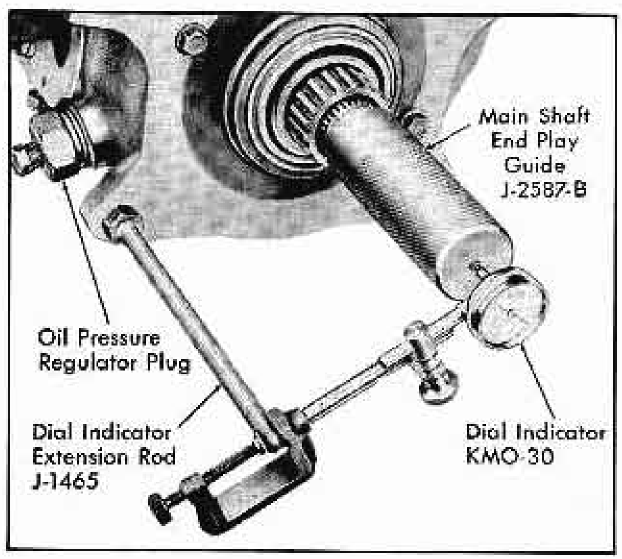

Fig. 14-22 Checking Mainshaft End Play

HYDRA-MATIC DRIVE

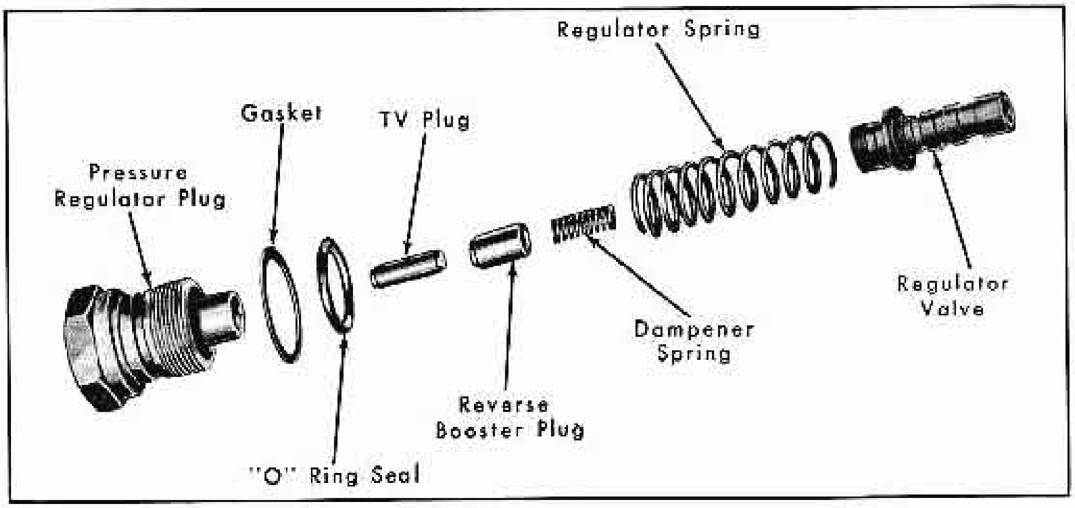

Fig. 14-23 Pressure Regulator - Exploded

1. Remove rear oil pump attaching screws (1/2").

2. Position governor so that the large round governor G-1 weight is toward front of transmission.

3. Remove governor and rear pump assembly by moving toward valve body side of transmission case and lift to clear case. Fig. 14-21.

f. Checking Mainshaft End Play

1. Install Mainshaft End Play Guide, Tool No. J-2587-B over mainshaft and intermediate shaft. Fig. 14-22.

2. Set up dial indicator on transmission case using Tool No. J-1465.

3. Insert screwdriver between front clutch drum and center bearing cap, holding front planet unit forward. The screwdriver should be placed at an angle to prevent damage to the oil delivery sleeve.

4. Move mainshaft back and forth. End clearance should be .004" to .018". Be sure to get just free mainshaft end play. Forcing mainshaft will give inaccurate reading.

NOTE: Record amount of end clearance so that the proper selective washer can be installed when the transmission is reassembled.

5. Remove screwdriver from between front clutch drum and center bearing cap.

6. Remove dial indicator and mainshaft end play guide.

g. Removal of Pressure Regulator

NOTE: This assembly may be removed with transmission in car.

1. Loosen regulator valve plug (1-1/4").

CAUTION: Pressure regulator valve assembly is under spring pressure.

2. Hold pressure against regulator plug while unscrewing plug by hand.

3. Remove plug, reverse booster plug, T.V. pressure plug, springs and valve as an assembly from side of transmission case. Fig. 14-24.

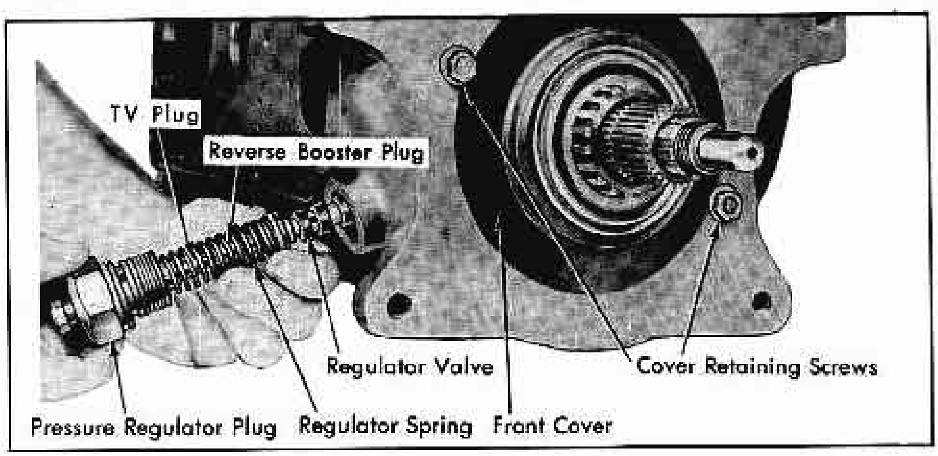

Fig. 14-24 Removing Pressure Regulator Assembly

h. Removal of Front Oil Pump and Front Drive Gear Assemblies

NOTE: Fluid Coupling Assembly (11a), Pressure Regulator Assembly (11g) and front servo (11d) must be removed. Side cover need not be removed. It is necessary to remove transmission from car.

1. Remove snap ring holding front drive gear assembly on front end of front planet carrier assembly and remove steel and bronze thrust washers from planet carrier.

NOTE: These washers have a smaller outside diameter than similar washers used in the transmission and should be tied together and kept separate to avoid confusion when reassembling.

2. Remove two front oil pump cover-to-case screws (7/16").

3. Remove front pump locating washer from its counterbore, using snap ring pliers.

4. Remove front oil pump assembly and front drive gear as an assembly. Fig. 14-25.

NOTE: Tap lightly from rear of pump with light hammer and brass drift if necessary.

5. Remove "O" ring from pump.

6. Remove bronze thrust washer from front end of planet carrier. Tag this washer for correct reassembly.

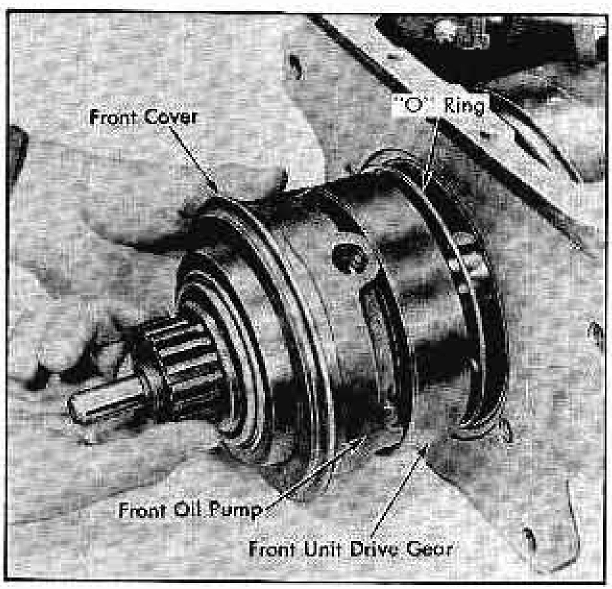

Fig. 14-25 Removing Front Oil Pump

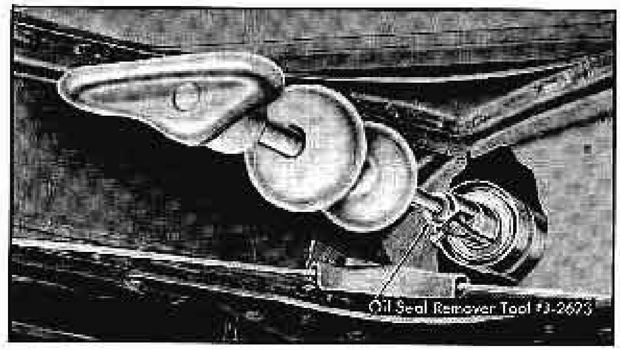

Fig. 14-26 Removing Extension Housing Oil Seal (In Car)

i. Removal of Extension Housing and Reverse Unit

NOTE: Units may be removed with transmission in car. Oil pan, side cover, parking bracket (11c), valve body (11b), rear servo (11d) and rear oil pump (11e) must be removed.

1. Remove extension housing oil seal, using slide hammer Tool No. J-2619-A and collet No. J-2623. Fig. 14-26.

NOTE: Removal of seal will not be necessary unless complete overhaul is required, however this seal can be removed and installed with transmission in car if it is leaking.

2. Remove six reverse sun gear and drive flange attaching screws (1/2"). Drive flange can be held from turning by using Drum Holder No. J-1459. Fig. 14-27.

3. Install screwdriver between the center bearing cap and rear clutch drum to prevent the drum from moving forward. The screwdriver should be placed at an angle to prevent damage to the oil delivery sleeve. Fig. 14-28.

4. Remove five extension housing to transmission case attaching screws (9/16") and lock washers.

5. Carefully remove reverse assembly from transmission case. If assembly sticks, tap on front end of mainshaft with plastic or similar type hammer. Fig. 14-28.

CAUTION: The selective thrust washer may stick to the mainshaft or it may remain in the counterbore of the output shaft. Be sure to remove this washer when reverse assembly is removed. Remove stationary cone lock key.

6. Remove mainshaft through rear of transmission.

HYDRA-MATIC DRIVE

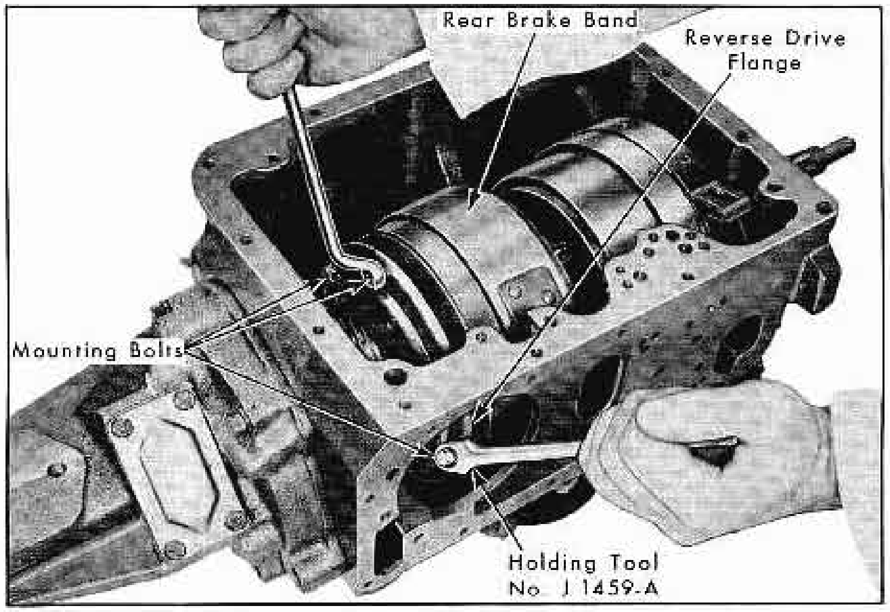

Fig. 14-27 Removing Reverse Drive Flange Bolts

7. Remove bronze thrust washer from rear clutch hub.

8. Install Rear Hub Retainer, Tool No. J-2174 on rear unit and remove screwdriver from front of rear unit, Fig. 14-29.

j. Removal of Front and Rear Units from Case

NOTE: Transmission must be removed. Remove oil pan, parking bracket (11c), valve body (11b), servos (11d), rear oil pump (11e), pressure regulator assembly (11g), front pump and front drive gear (11h), reverse assembly and mainshaft (11i).

1. Using a light hammer and chisel, bend back edges of lock plate under two center bearing cap attaching screws.

2. Remove two center bearing cap to case screws (5/8") and lock plate.

NOTE: It may be necessary to equalize distance by moving front and rear clutch drums to allow socket wrench to seat on screw head.

3. Install suitable spring or wire to hold front band on front unit drum.

4. Lift both front and rear clutch and drum assemblies, with bands, from transmission case, Fig. 14-29.

5. Remove bands from front and rear unit.

k. Removal of Front and Rear Units from Planet Carrier (Intermediate Shaft)

1. Place planet carrier with front and rear

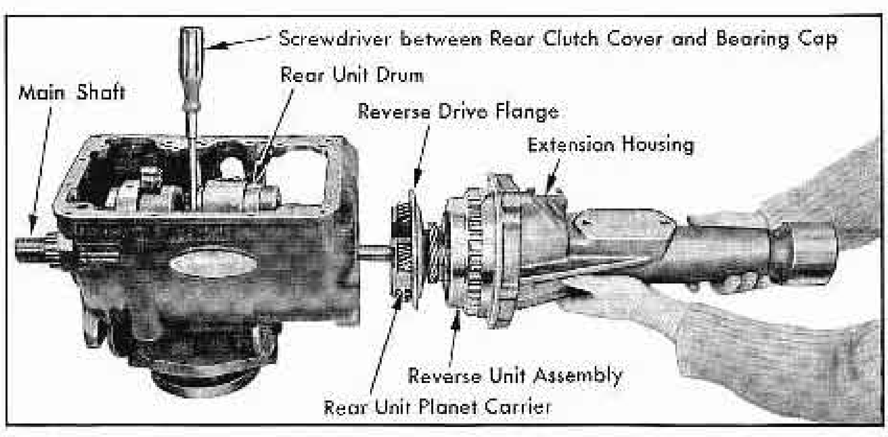

Fig. 14-28 Removing Extension Housing and Reverse Unit Assembly

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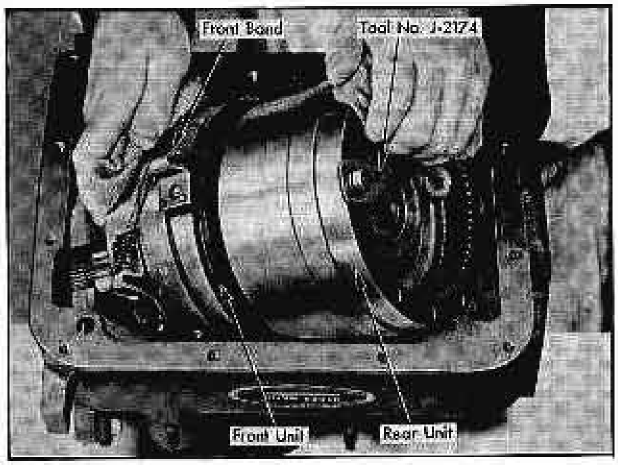

Fig. 14-29 Removing Front and Rear Units

clutch and drum assemblies into holding fixture, Tool No. J-2187.

2. Remove rear clutch hub rear snap ring.

3. Lift rear unit from planet carrier.

4. Remove rear clutch hub front snap ring from planet carrier.

5. Remove center bearing cap from oil delivery sleeve.

NOTE: Be careful not to damage or lose bearing cap, otherwise entire case would have to be replaced. Discard center bearing cap lock plate as it should not be used again.

6. Remove oil delivery sleeve from intermediate shaft

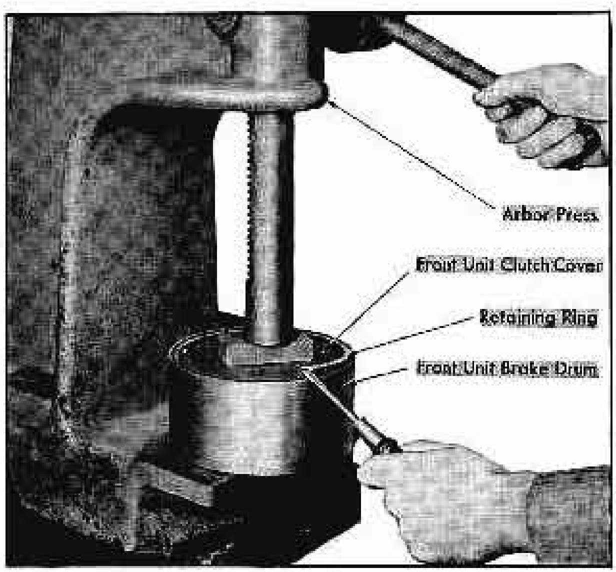

Fig. 14-30 Removing Clutch Cover Ring

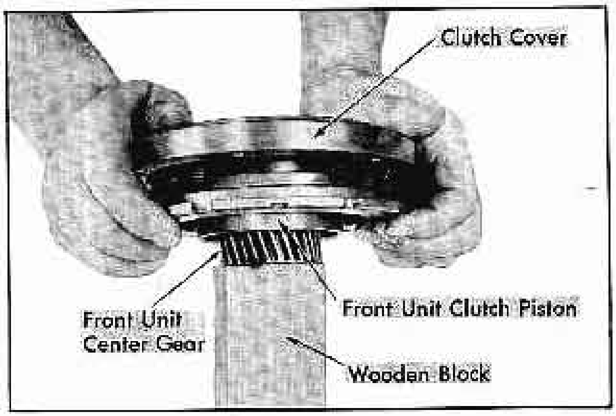

Fig. 14-31 Removing Front Unit Clutch Piston

7. Remove snap ring from recess in front unit.

CAUTION: Hold snap ring open while lifting from carrier to avoid damaging bearing surface.

8. Lift front unit assembly from planet carrier.

9. Remove steel and bronze thrust washers from recess in front unit.

(12) Disassembly of Individual Units

a. Disassembly of Front Unit

1. Place front unit assembly in press and remove clutch cover retaining ring. Fig. 14-30.

2. Separate drums by tapping front face of center gear on front clutch drum with plastic or similar hammer.

3. Remove front clutch annular piston from clutch drum by bumping front face of center gear on soft wood block. Fig. 14-31.

4. Remove six inner and six outer front clutch release springs from front unit drum.

5. Remove four composition clutch drive and four steel clutch driven plates from drums. Fig. 14-32.

6. Remove rubber piston seals and brass expanders from annular piston and clutch drum piston. Use blunt edge screwdriver.

b. Disassembly of Rear Unit

1. Remove Rear Clutch Hub Retainer, Tool No. J-2174, from rear unit drum.

2. Remove rear clutch hub and bronze thrust washer.

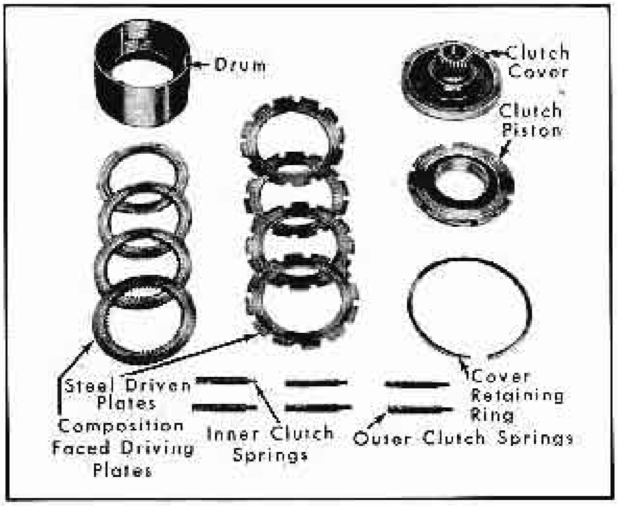

Fig. 14-32 Front Unit Disassembled

3. Place rear unit assembly in a press and remove clutch drum retaining ring.

4. Separate drums by tapping lightly on clutch drum rear thrust face, using block of wood and hammer.

5. Remove six inner and six outer clutch release springs and six guide pins.

6. Remove eight composition and eight steel clutch plates. Fig. 14-33.

7. Remove annular piston from clutch drum by tapping clutch drum near thrust face on block of wood.

8. Remove rubber seals and brass expanders from annular piston and rear unit clutch drum.

NOTE: If necessary to replace the internal gear, remove the two fillister head screws that attach the gear to the drum and remove the gear. This gear should not be removed from the drum unless replacement is necessary.

c. Disassembly of Reverse Assembly

1. Remove speedometer driven gear from rear bearing retainer (1" wrench).

2. Remove oil seal from extension housing, using Oil Seal Remover Collet, Tool No. J-2623, if seal has previously been required.

NOTE: Collet and Slide Hammer may also be used to remove oil seal in car as shown in Fig. 14-26.

3. Remove cover and gasket from rear bearing retainer.

4. With Tool No. J-2182, remove snap ring holding the output shaft to the rear bearing retainer. Fig. 14-34.

5. Stand rear bearing retainer on carrier end, lift up on rear bearing retainer and tap output shaft with rawhide hammer to free it from the ball bearing -- then lift rear bearing retainer from output shaft. Fig. 14-35.

6. Remove reverse internal gear and stationary cone from rear bearing retainer by compressing stationary cone by hand.

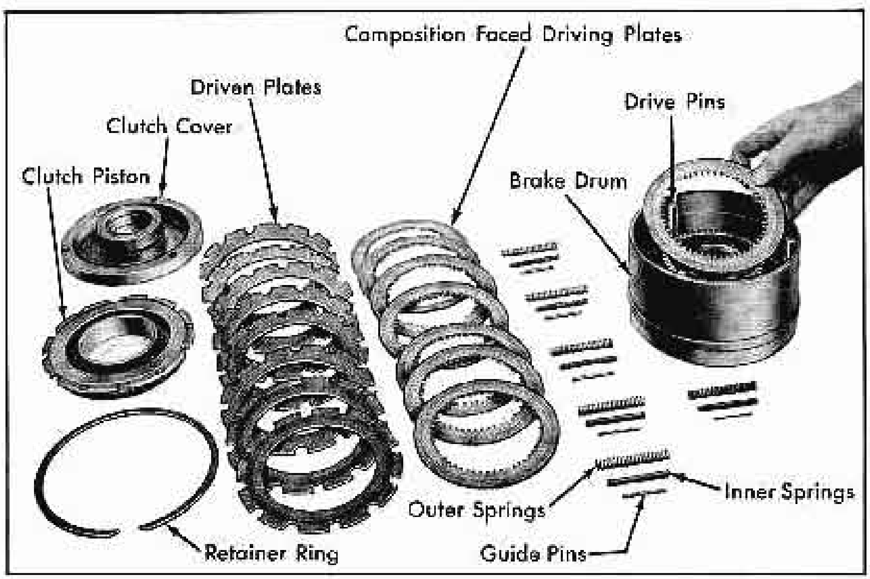

Fig. 14-33 Rear Unit Disassembled

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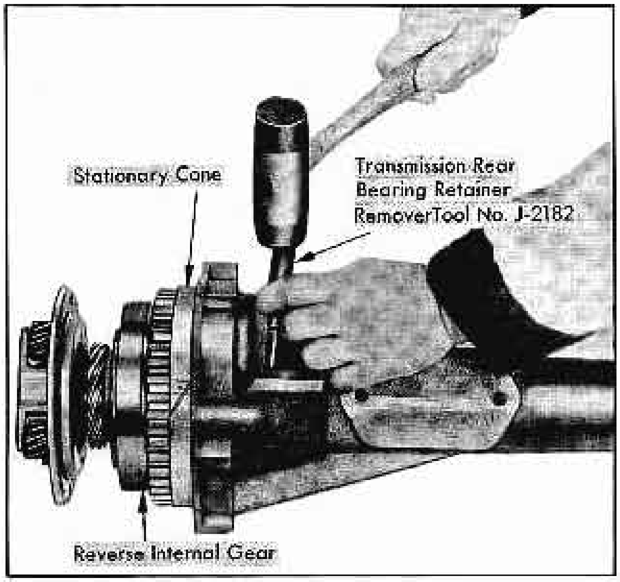

Fig. 14-34 Removing Snap Ring from Output Shaft

7. With screwdriver, remove snap ring locating ball bearing in rear bearing retainer. Fig. 14-36.

8. Remove ball bearing from rear bearing retainer by tapping out gently.

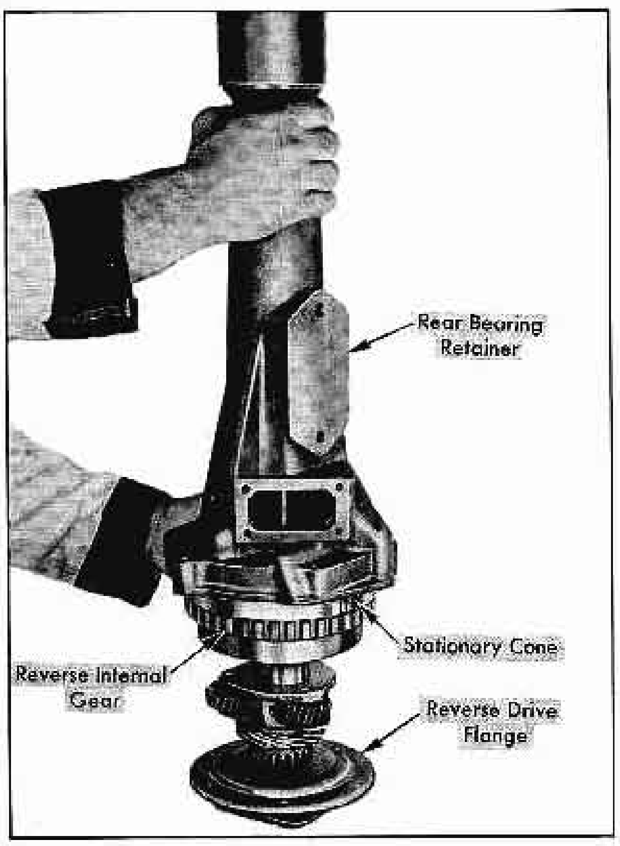

Fig. 14-35 Removing Rear Bearing Retainer

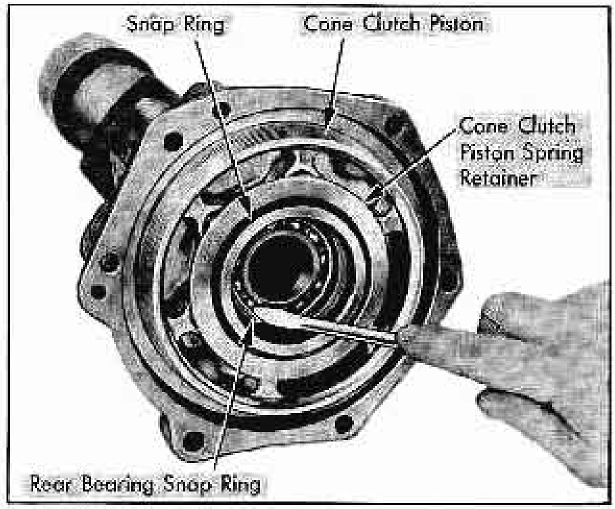

Fig. 14-36 Removing Rear Bearing Snap Ring

9. With Tool No. J-4670-A, compress clutch release coil springs and remove large snap ring. Fig. 14-37.

10. Remove special tool.

11. Remove coil spring retainer.

12. Remove the six coil release springs.

13. Remove the reverse cone piston by pulling straight out. Do not try to turn piston, as it is located by four dowel pins.

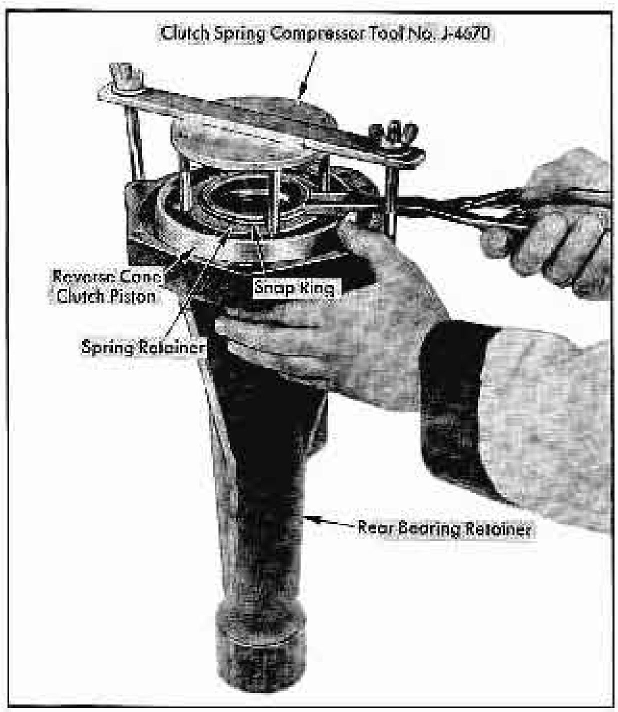

Fig. 14-37 Removing Clutch Release Spring Retainer

14. Remove outer oil seal from reverse cone piston by pulling off with fingers.

15. Remove inner oil seal by pulling lip up with fingers and removing with needle-nose pliers.

16. Remove large bronze thrust washer from reverse internal gear.

17. Remove reverse stationary cone from reverse internal gear by using large snap ring pliers to expand cone, Fig. 14-38.

18. Remove reverse clutch release spring and spring retainer from internal gear.

19. Remove small spacer from output shaft.

20. Remove reverse planet carrier from output shaft. It may be necessary to tap output shaft.

21. Remove snap ring that holds sun gear and drive flange assembly to the output shaft.

22. Remove the sun gear and drive flange assembly from output shaft.

23. Remove the steel and bronze thrust washers from the output shaft.

(13) Cleaning and Inspection of Parts

Group Disassembled Units for Inspection

A thorough inspection should be made of each part after the transmission is disassembled to determine what parts should be replaced. It is very important to distinguish between parts that are simply "worn-in" and those worn to the extent that they affect operation of the unit. Only worn, broken or damaged parts should be replaced.

a. Inspection of Case, Oil Delivery Sleeve, and Front and Rear Bands

1. Thoroughly clean the transmission case with cleaning fluid.

2. Remove oil pressure line pipe plug between band adjusting screw (band anchor stop). Blow out all oil passages through case. Check for restricted, leaky, or interconnected passages.

3. Make certain pencil type breather is not driven too far into case. Outer edge of breather plug must be flush with surface of case. Fig. 14-39. Otherwise, it is possible to restrict the case vent passage and cause foaming of the oil.

4. Inspect transmission case for cracks.

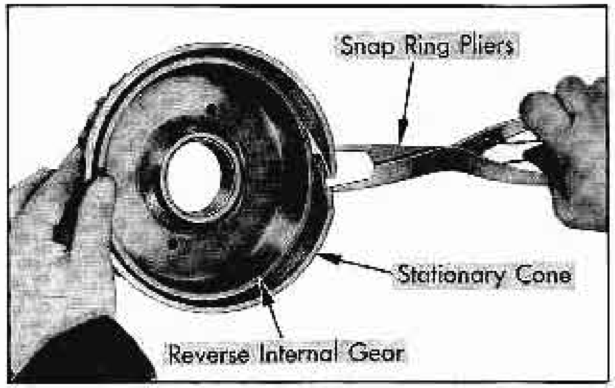

Fig. 14-38 Removing Stationary Cone

5. Inspect oil delivery sleeve for scored or marred bearing surfaces.

6. Insert a wire or paper clip through both oil delivery sleeve holes to check for open passages into the opening between oil seal ring grooves.

7. Check oil seal ring clearance in grooves. (.0005 to .0030). Examine grooves for damage. Check oil seal ring gap clearance. (.0015 to .0075).

8. Install oil delivery sleeve with dowel hole toward case and tighten cap with dowel in one of the two oil holes. Apply oil on each side of bearing cap. Apply air pressure to two clutch apply holes in side of case. If movement of oil on delivery sleeve is observed, leakage is indicated. Attempt correction by installing a new oil delivery sleeve. If new sleeve leaks, dress bearing cap down with fine emery cloth on surface plate until sleeve does not leak. Clean thoroughly after dressing.

9. Remove bearing cap and oil delivery sleeve.

10. Inspect adjusting screws (band anchor stops) and threads in case. Inspect lock nuts for damage.

11. Pressure regulator valve must have a free fit in front pump body.

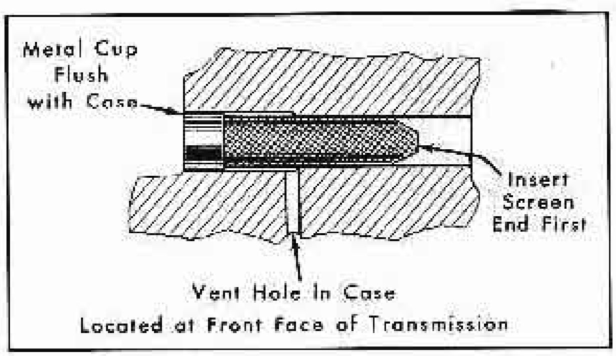

Fig. 14-39 Installing Air Breather

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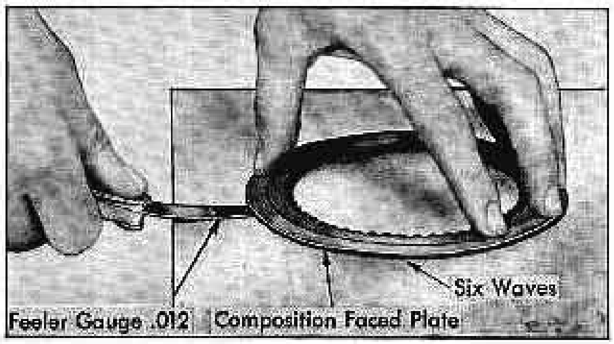

Fig. 14-40 Checking Clutch Plates

12. Inspect both bands for burned, glazed, worn, cracked, or loose lining.

13. Inspect steel bands for distortion or cracks.

14. Check strut on rear band for alignment and free pivoting. The rear band is furnished with strut attached.

15. Inspect anchor ends of front band for broken welds or worn sockets.

CAUTION: Do not pry either band open or distort bands in any manner. They are surface ground at the factory for drum fit.

16. Clean all parts thoroughly.

b. Inspection of Front Unit

1. Inspect clutch drive pins in front unit. If they are scored, loose or distorted, replace drum and drive pin assembly. Pins are not furnished separately.

2. Inspect drum for deep grooves or scores at band surface and clutch plate surface.

3. Inspect clutch release springs for distortion or collapsed coils. Free length is 2-15/64".

NOTE: Slight wear, (bright spots) on side of outer release springs indicating slight contact with drum is permissible.

4. Inspect composition-faced driving clutch plates for damaged surfaces, worn teeth, and correct waving. Plates should have 6 waves at least .010" deep. Fig. 14-40.

NOTE: If flakes of facing material can be moved by scratching the surface with the thumbnail, the plate should be replaced. Discoloration of drive plates is not an indication of failure.

5. Inspect clutch driven plates for scored surfaces. Driven plates must be flat.

6. Inspect annular clutch piston for scores. Be sure oil seal grooves are thoroughly clean.

7. Inspect front clutch drum for scores in piston bore, oil delivery sleeve bore and oil seal grooves. Inspect gear teeth and thrust faces for damage.

8. Inspect front planet carrier gears for damaged teeth and excessive roller bearing wear.

9. Inspect bearing surfaces of planet carrier shaft.

10. Inspect steel and bronze thrust washers.

11. Clean all parts thoroughly.

c. Inspection of Rear Unit

1. Inspect rear internal gear for damaged teeth.

2. Inspect clutch drive pins in rear unit drum. If they are scored, loose or distorted, replace rear drum and drive pin assembly. Pins are not furnished separately.

3. Inspect rear unit drum for deep grooves or scores at band surface and clutch plate surface.

4. Inspect composition-faced driving clutch plates for damaged surfaces, worn teeth, and correct waving. Plates should have 6 waves at least .010" deep.

NOTE: If flakes of facing material can be removed by scratching the surface with the thumbnail, the plate should be replaced. Discoloration of drive plates is not an indication of failure.

5. Inspect driven clutch plates for scored surfaces. Driven plates must be flat.

6. Inspect rear unit clutch drum for scores in piston bore and thrust surface.

7. Inspect surface of babbit bushing in clutch drum.

8. Inspect annular clutch piston for scores. Be sure all seal grooves are thoroughly clean.

9. Inspect clutch release springs for distortion or collapsed coils. Free length is 2-15/64".

NOTE: Slight wear, (bright spots) on side of outer release springs indicating slight contact with drum is permissible.

HYDRA-MATIC DRIVE

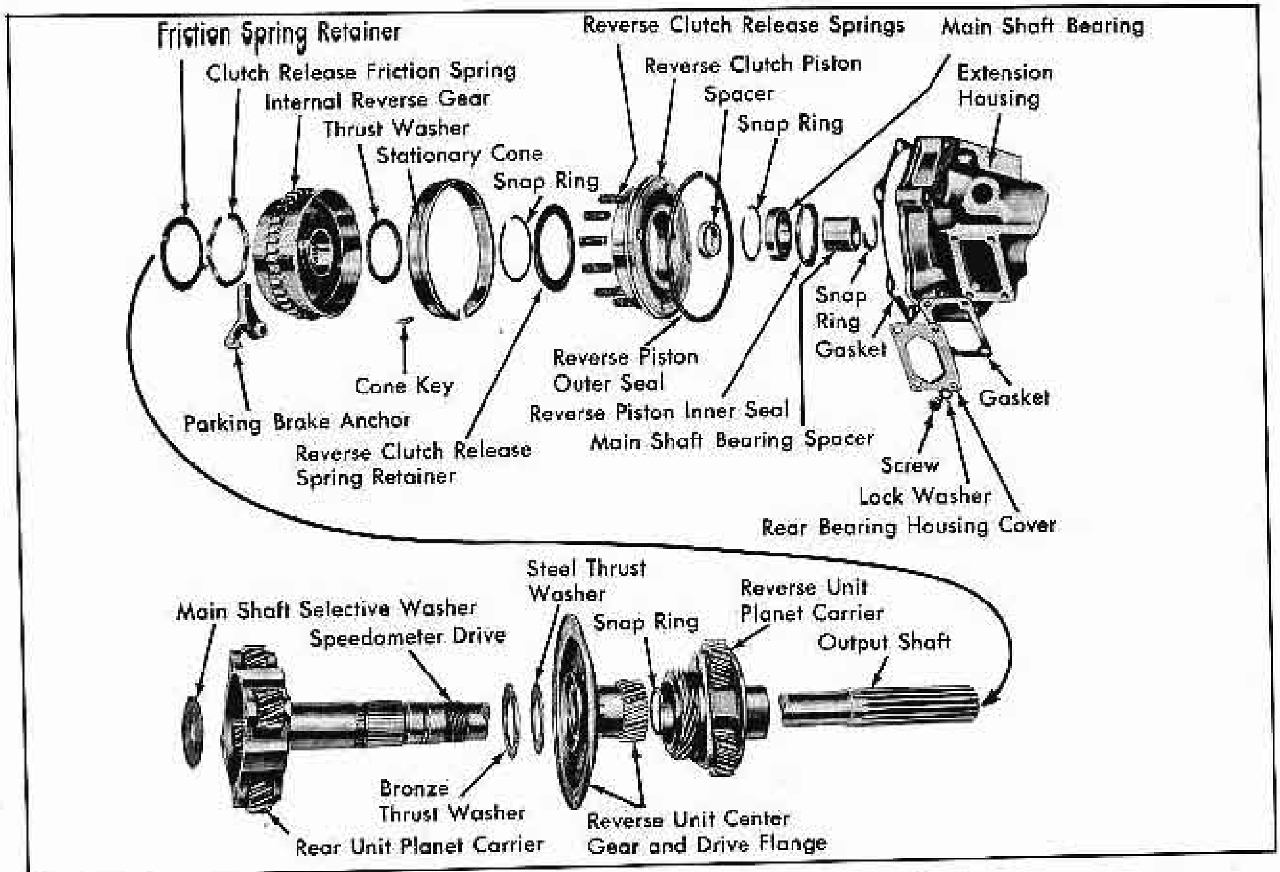

Fig. 14-41 Output Shaft and Reverse Assembly - Disassembled

10. Inspect clutch release spring guide pins for distortion and length (1-5/8" ± .010").

11. Inspect front and rear thrust faces, internal and external splines, and blow out drilled passages in rear clutch hub.

12. Clean all parts thoroughly.

d. Inspection of Reverse Assembly and Mainshaft (Fig. 14-41)

1. Inspect ball bearing by first thoroughly cleaning and oiling, then rotate slowly by hand, feeling for roughness. Do not spin bearing with air.

2. Inspect reverse internal gear for damaged teeth and scored or damaged inside bearing surface.

3. Inspect reverse internal gear for scored or burned cone surface.

4. Inspect reverse internal gear parking teeth for damage.

5. Inspect reverse planet carrier for worn or damaged teeth and worn roller bearings.

6. Inspect splines of reverse carrier for damage.

7. Inspect bronze oil pump drive gear on reverse planet carrier. If gear is worn or damaged, replace as follows:

a. Remove snap ring holding gear to carrier.

b. Saw between two teeth to within 1/64 inch of the inside diameter.

c. Insert chisel in sawed slot and break gear off carrier.

CAUTION: Make sure not to lose steel locating ball under gear.

d. Place new gear on metal supported by two bricks, and heat with torch from underneath until gear just begins to turn color.

e. Make sure steel locating ball is in hole in planet carrier.

f. Using tongs or asbestos gloves, drop bronze gear over planet carrier with forged depression toward shoulder of carrier. Support in place until cool.

g. Install snap ring.

NOTE: If retaining ring shows wear, replace.

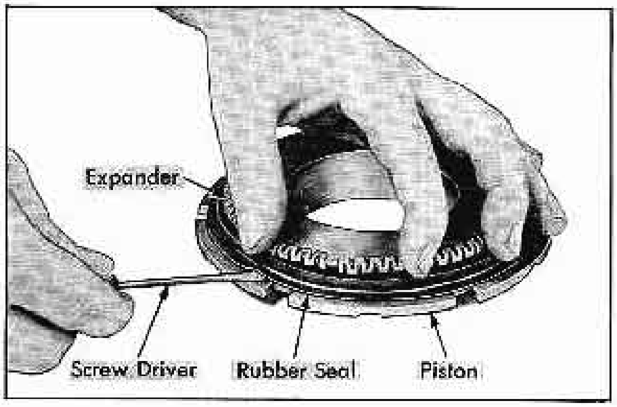

Fig. 14-42 Installing Oil Seal and Expander on Piston

8. Inspect reverse center gear and flange assembly for damaged teeth or worn bushing. If damaged, replace assembly. The center gear is not furnished separately.

9. Inspect output shaft assembly for scored thrust and bearing surfaces. Fig. 14-41.

10. Inspect output shaft splines for nicks or burrs.

11. Inspect output shaft speedometer drive gear surface for wear or damage.

12. Inspect steel and bronze thrust washers for excessive wear.

13. Inspect reverse internal gear thrust washer for wear or scoring.

14. Inspect reverse clutch release spring and retainer for signs of damage or burning.

15. Inspect reverse clutch stationary cone for burning or excessive wear.

16. Inspect reverse piston coil release springs for distortion or collapsed coils. Free length 1-11/32".

17. Inspect reverse piston for burning on cone surface.

18. Inspect reverse piston for scores on piston. Be sure oil seal grooves are thoroughly clean.

19. Inspect four reverse piston pins for scoring, looseness or distortion.

20. Inspect inner and outer piston seal operating surfaces for scoring or roughness.

21. Inspect rear bearing retainer bushing for excessive wear and see that oil holes in retainer are open.

22. Inspect mainshaft for damaged gear teeth, thrust and bearing surfaces.

23. Clean all parts thoroughly.

(14) Assembly of Individual Units

a. Assembly of Front Unit

1. Place front unit drum on bench with drive pins up.

2. Install four drive and four driven plates into front drum alternately, starting with a composition plate.

NOTE: Install driven plates with square notches over drum pins. Also, apply Hydra-Matic fluid to face of each plate surface as assembled.

3. Install six outer clutch release and then six inner clutch release springs through plates into spring holes of drum.

4. Install new inner brass expander into ring groove in clutch drum with expanding lips down.

5. While holding brass expander in position, work new inner piston rubber seal into ring groove with lip down over brass expander. Fig. 14-42.

NOTE: Work expander well back into position under seal so brass edges are not exposed. Before replacing large outer seal on clutch piston, install the piston into the clutch drum to insure proper installation and seating of new inner rubber seal and expander. Remove clutch piston and inspect inner seal.

6. Place new large rubber seal over front annular piston beyond seal groove.

7. Install new large brass expander in piston groove with lips up.

8. While holding expander in position, work rubber seal well into groove with lip up.

NOTE: Work expander well back into position under seal so brass edges are not exposed.

9. Install piston into clutch drum resting on outer rubber seal. Align square notches in piston with holes in drum. While applying slight hand pressure to piston, guide seal into bore with the flat side of a blunt screwdriver.

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10. Install clutch drum and piston assembly over front planet carrier into front unit drum.

11. Place carrier in press and press clutch drum below snap ring groove. Install clutch drum snap ring, positioning gap of ring between two drive pin holes.

CAUTION: Snap ring must be well seated into groove to prevent interference with ledge on drum.

12. Release press and remove assembly.

13. Tap front face of center gear with a rawhide or similar hammer so the clutch drum will seat against snap ring.

14. Insert intermediate shaft into drive plates and drum by rolling drum on bench while pressing carrier firmly into the plates.

15. Place planet carrier and drum assembly into holding fixture.

16. Install bronze, then steel thrust washer over intermediate shaft.

NOTE: Locating lug on steel washer must fit over flat portion of intermediate shaft.

17. Install snap ring over intermediate shaft into groove above steel washer.

CAUTION: Do not allow snap ring to score bearing surface of intermediate shaft.

b. Assembly of Rear Unit (Fig. 14-33)

1. Place the rear unit drum and internal gear assembly on the bench with the drive pins up.

2. Install eight drive and eight driven plates in the drum, alternating the plates.

NOTE: Start with a drive (composition) and finish with a driven (steel) plate. Assemble driven plates with square notches over drive pins. Apply Hydra-Matic fluid to face of each plate when installing.

3. Install six outer and six inner clutch release springs into the rounded cutouts in the steel clutch discs and into the holes in the drum. Install the six release spring guide pins.

4. Position a new rubber seal on inner piston of clutch drum above groove. Install a new brass expander into ring groove of clutch drum with expanding lips down.

5. While holding the brass expander in position, work the rubber seal into ring groove with lip down over brass expander.

6. Place a new rubber seal over rear annular piston beyond seal groove.

7. Install a new brass expander in piston groove with the lips facing up. While holding expander in position, work rubber seal with lip up well into the groove.

NOTE: Work expander well into position under seal so that edge of expander is not exposed.

8. Place piston into clutch drum resting on outer rubber seal. Align square notches in piston with holes in clutch drum. While applying slight hand pressure to piston, guide seal into bore with side of a screwdriver.

9. Install rear clutch drum and piston assembly over drive pins into drum.

10. Place rear unit on a press and press the clutch drum until it is below the snap ring groove in the drum. Install clutch drum snap ring, positioning gap of ring between two drive pin holes.

CAUTION: Snap ring must be well seated in the groove to prevent interference with ledge on drum.

11. Release press and remove assembly.

12. Tap front face of clutch drum using wood block and hammer to seat the clutch drum against the snap ring.

13. Install front bronze thrust washer into deep counterbore in rear clutch hub and retain with petrolatum.

14. Install rear hub and thrust washer into clutch drive plates. Rotate hub and drum on bench to mesh splines with teeth of plates.

15. Install rear clutch hub holding Tool, J-2174, on rear drum to hold huh in place. Use one reverse drive flange attaching screw to hold tool.

16. Install oil delivery sleeve over intermediate shaft with long bearing up. Compress exposed oil delivery sleeve rings with ring compressor, J-1537, and tap oil delivery sleeve into bore of front clutch drum with plastic or similar hammer. Fig. 14-43.

NOTE: Stagger ring gaps 180° apart to minimize oil leakage.

HYDRA-MATIC DRIVE

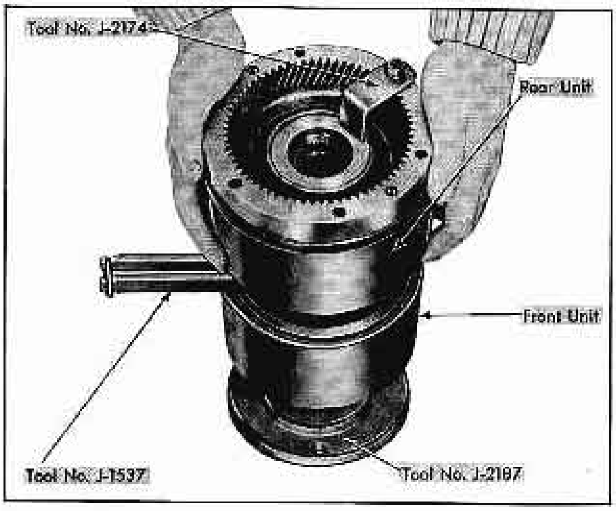

Fig. 14-43 Installing Rear Unit Assembly on Intermediate Shaft.

17. Install rear clutch hub front snap ring into second groove on intermediate shaft.

18. Compress exposed oil delivery sleeve rings, install rear unit drum assembly on intermediate shaft. Fig. 14-43.

19. Install rear clutch hub rear snap ring.

NOTE: Both the front drum and rear drum should be free to rotate under slight force. If either drum binds, the unit should be disassembled and the cause of trouble corrected.

c. Assembly of Reverse Unit

1. Hold reverse center gear in left hand with drive flange up; install the steel thrust washer, and then the bronze thrust washer in the recess of the drive flange.

2. Still holding the reverse center gear in the left hand, pick up the output shaft with the right hand, insert output shaft end through drive flange and center gear until carrier bottoms on the two thrust washers.

3. Holding drive flange and center gear tightly against the carrier to keep thrust washers from moving, set the output shaft and the carrier on table on the carrier end.

4. Install reverse planet carrier snap ring.

NOTE: Do not pick up this unit until completely assembled to prevent washers from slipping out of place.

5. Install reverse planet carrier over output shaft with bronze drive gear down, meshing pinions with sun gear. (Be sure the unit is bottomed against the reverse planet carrier snap ring.)

6. Install the reverse clutch release flat spring and spring retainer in reverse internal gear on reverse internal gear side.

7. Install reverse stationary cone on reverse internal gear cone. (Use large snap ring pliers to spread cone for installation being careful not to spread cone to such an extent that it will become distorted.) Fig. 14-38.

NOTE: Small dowel on cone should point toward teeth on gear.

8. Install large bronze thrust washer over collar of reverse internal vear, using petrolatum to hold thrust washer in place.

9. Install reverse cone piston inner seal with lip down.

10. Install outer oil seal on reverse cone piston with seal lip toward flat side of piston.

11. Install piston in retainer but do not line up holes in piston with dowels in retainer.

12. Install .025" shim stock (Tool No. J-4752) between seal and retainer until it rests on ledge of retainer. Fig. 14-44.

13. Rotate piston until holes are lined up with dowel pins and press piston down into retainer.

14. Remove shim.

15. Install the six reverse clutch release coil springs.

Fig. 14-44 Installing Reverse Cone Piston

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16. Install reverse clutch release coil spring retainer and compress springs with Special Tool No. J-4670-A, Fig. 14-37.

17. Install large snap ring, holding spring retainer in place.

18. Remove Special Tool No. J-4670-A.

19. Check dowel pin height as shown in Fig. 14-45. Lay straight edge across reverse cone clutch piston and measure distance from face of straight edge to face of rear bearing housing. This distance should be 3/8" to 13/32".

NOTE: If the above measurement is less than 3/8" the dowels are too short and the unit should be replaced. If it is greater than 13/32", disassemble the unit and press dowels in as far as they can go with an arbor press. Reassemble the unit and remeasure. If the pin height is still too great, replace the rear bearing housing retainer and oil seal.

20. Install ball bearing in rear bearing retainer. Be sure that bearing is fully and squarely seated by tapping gently.

21. Install new large special type snap ring in rear bearing retainer locating ball bearing.

22. Install reverse internal gear and stationary cone into rear bearing retainer by compressing stationary cone by hand. (Position keyway of stationary cone so it will line up with keyway in case when installed.) Fig. 14-46.

23. Place small spacer over output shaft.

24. Install output shaft in rear bearing housing

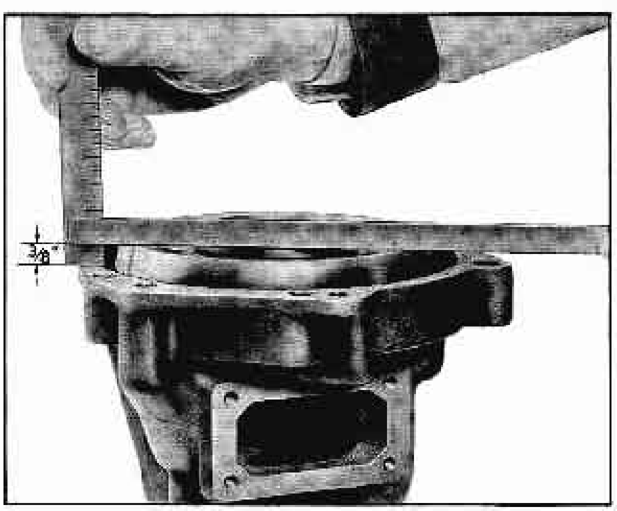

Fig. 14-45 Checking Dowel Pin Height

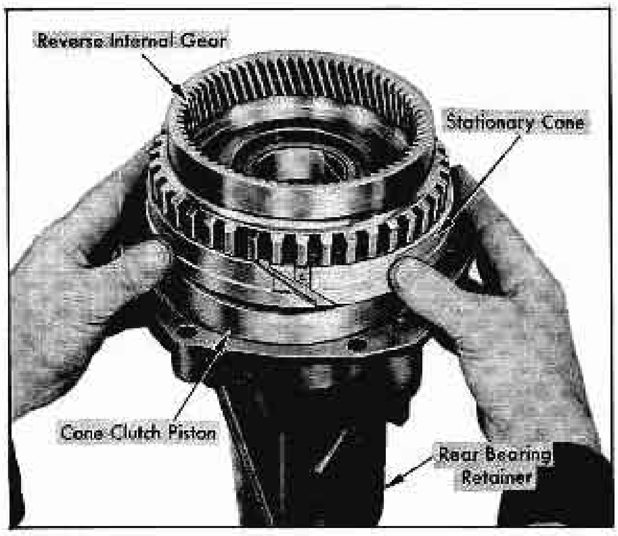

Fig. 14-46 Installing Stationary Cone

and mesh carrier gear with the reverse internal gear.

NOTE: Be sure rear bearing is all the way down on the output shaft. Snap ring cannot be installed until retainer is fully seated.

25. Install rear bearing retainer sleeve over output shaft at rear of housing and let it fall into place.

26. Install open type snap ring through window in rear bearing retainer, locking bearing retainer sleeve to ball bearing. (Be sure sleeve is between snap ring and ball bearing).

27. Install cover with gasket over window on rear bearing retainer and tighten four screws.

28. Install new rear oil seal using Oil Seal Installer, Tool No. J-1942-A, Fig. 14-47.

29. Install stationary cone to case lock key, and hold in place with petrolatum.

30. Install speedometer driven gear.

Fig. 14-47 Installing Extension Housing Oil Seal

(15) Installation of Front and Rear Units and Rear Bearing Retainer in Case

1. Remove front and rear units from holding fixture and position front band over front of front unit drum so short anchor end will be positioned to fit over adjusting screw when units are placed in the case. Install suitable spring or wire to hold front band on front drum.

2. Install front and rear units in case by lowering front end of planet carrier into case first.

3. Install rear band on rear unit drum and position anchor end of band over adjusting screw.

4. Remove spring from front band and position anchor end of band over adjusting screw.

NOTE: Make sure single hole in oil delivery sleeve is centered between center bearing cap attaching screw holes and is facing up.

5. Position center bearing cap over oil delivery sleeve with dowel registering with single dowel hole in sleeve. Lightly tap bearing cap in place.

6. Install a new center bearing cap lock plate and tighten screws.

7. Install screwdriver securely between the center bearing cap and rear clutch drum to prevent the front drum moving forward. The screwdriver should be placed at an angle to prevent damage to the oil delivery sleeve.

8. Remove Rear Hub Holding Tool, No. J-2174, from rear drum.

9. Position rear clutch hub rear thrust washer in the counterbore of rear hub and retain with petrolatum.

10. Install correct size selective washer in counterbore of output shaft and retain in place with petrolatum.

NOTE: If mainshaft did not have correct end clearance prior to disassembly, select proper washer to bring end clearance within limits of .004" - .018".

Selective thrust washers are furnished in the following eight sizes:

Mark	Size
1	.055" - .059"
2	.063" - .067"
3	.071" - .075"
4	.079" - .083"
5	.087" - .091"
6	.095" - .099"
7	.103" - .107"
8	.111" - .115"

11. Install mainshaft in output shaft, meshing center gear with planet pinions.

12. Install gasket on extension housing using petrolatum to hold it in place.

13. Install mainshaft and reverse assembly into rear end of transmission case, aligning stationary cone lock key into keyway in case. Then align extension housing screw holes to case.

14. Just start five extension housing to case attaching screws and lock washers and parking brake pawl support screw and lock.

15. Align holes in reverse drive flange and rear drum and install six reverse drive flange screws and lock washers. After two screws are entered finger tight, remove screwdriver. Tighten screws to 10-13 ft. lbs. torque.

CAUTION: Tighten the six screws evenly without distorting flange. While tightening screws, test for freeness by holding output shaft and turning mainshaft.

16. Push or tap extension housing against case. Then tighten mounting screws evenly to 28-33 ft. lbs. torque.

NOTE: It is not necessary to torque parking brake pawl support bolt at this time.

17. Test for freeness by turning mainshaft, output shaft and front and rear unit drums.

18. Tighten center bearing cap attaching screws to 40-50 ft. lbs. torque.

19. Bend lock plate up around screws using large pliers.

(16) Checking End Clearance of Mainshaft

1. Install Mainshaft End Play Guide Tool No. J-2587-B, over mainshaft and front planet carrier to support mainshaft.

2. Set up dial indicator on transmission case using Tool No. J-1465. Fig. 14-22.

3. Insert screwdriver between front clutch drum and center bearing cap, holding the front planet unit forward.

4. Move mainshaft back and forth. End clearance should be .004" to .018". Be sure to get float clearance only, not forced clearance.

NOTE: If end clearance is outside limits, disassemble and install correct selective thrust washer. See Note 15, Step 10, for correct size thrust washers.

5. Remove screwdriver from between front clutch drum and center bearing cap.

6. Remove dial indicator and mainshaft end play guide.

7. Install snap ring in groove on mainshaft.

(17) Disassembly, Inspection and Assembly of Pressure Regulator Assembly

a. Disassembly (Fig. 14-23)

1. Remove pressure regulator spring from pressure regulator plug.

2. Remove small dampener spring from reverse booster plug.

3. Remove reverse booster plug from pressure regulator plug assembly.

4. Remove T.V. pressure plug from pressure regulator plug assembly.

5. Remove pressure regulator valve from pressure regulator spring.

b. Inspection

1. Inspect the reverse booster plug for nicks or scores and for free movement in pressure regulator plug.

2. Inspect the T.V. pressure plug for nicks or scores and for free movement in pressure regulator plug.

3. Check pressure regulator spring for distortion or collapsed coils.

4. Check oil passages in pressure regulator plug with air to make certain lines are free.

5. Check pressure plug seal and gasket for damage or wear.

c. Assembly

1. Install pressure regulator valve in pressure regulator spring. Small end of spring must fit in groove on valve.

2. Install T.V. pressure plug in pressure regulator plug assembly.

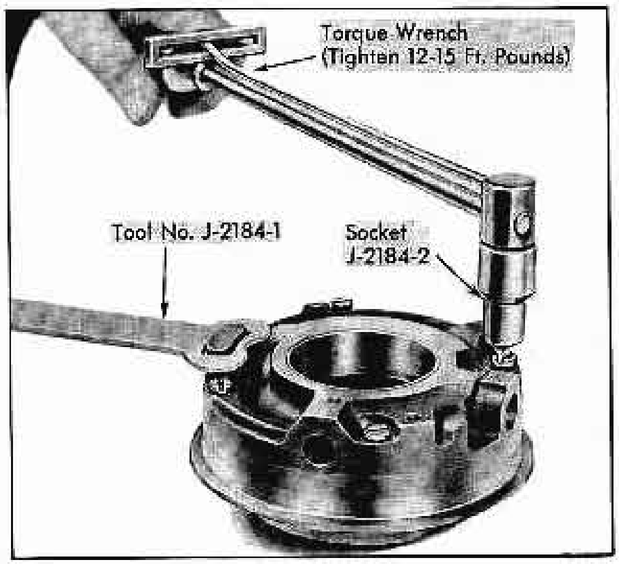

Fig. 14-48 Disassembling Front Pump

3. Install reverse booster plug and spring in pressure regulator assembly with chamfered end in regulator plug.

4. Install pressure regulator spring in pressure regulator plug.

(18) Disassembly, Inspection and Assembly of Front Pump and Front Unit Drive Gear

a. Disassembly

1. Remove front drive gear from front pump; tap gear with plastic or similar hammer if necessary.

2. Hold front pump assembly with Tool J-2184-1 and remove four screws and washers, using screwdriver socket J-2184-2. Fig. 14-48.

CAUTION: It is important to use Tool J-2184-1 while removing the pump body attaching screws. NO ATTEMPT SHOULD EVER BE MADE TO HOLD PUMP BODY BY INSERTING A BAR INTO THE INTAKE BORE OR PRESSURE REGULATOR PISTON BORE.

3. Carefully lift pump body from cover. Never lift the cover from the body as this will permit the internal parts to drop from the assembly.

4. Mark the face of the rotor with pencil or prussian blue to be sure that it will be assembled with the top side up.

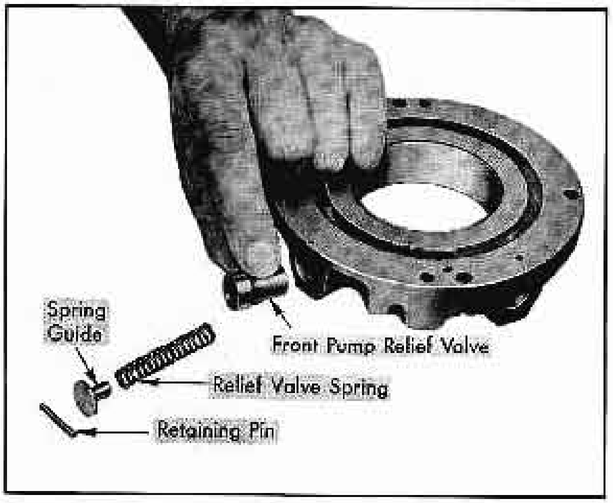

Fig. 14-49 Removing Relief Valve Spring and Guide

5. Compress the pump relief valve spring by pressing on the guide and remove the pin from the body. Hold guide with finger pressure to prevent guide from popping out too fast.

6. Remove guide, spring and valve. Fig. 14-49.

7. Remove front pump intake "O" ring seal from pump body intake port with a sharp awl or similar instrument. Discard "O" ring.

8. Remove two guide rings, rotor, and seven vanes. Fig. 14-50.

9. Remove slide and two priming springs. Fig. 14-51.

10. Remove front cover oil seal from pump cover, using a small screwdriver. Discard oil seal.

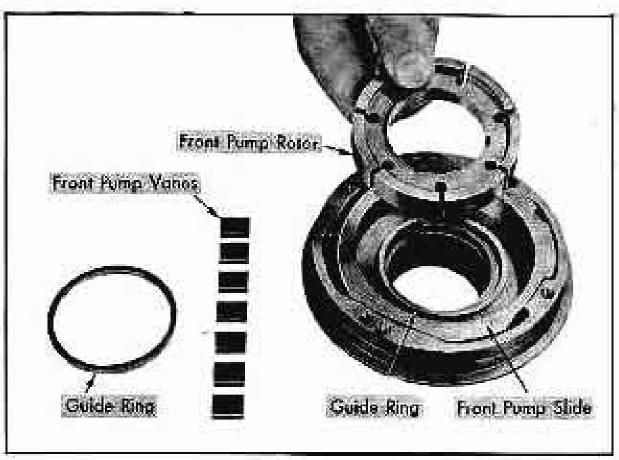

Fig. 14-50 Removing Front Pump Rotor

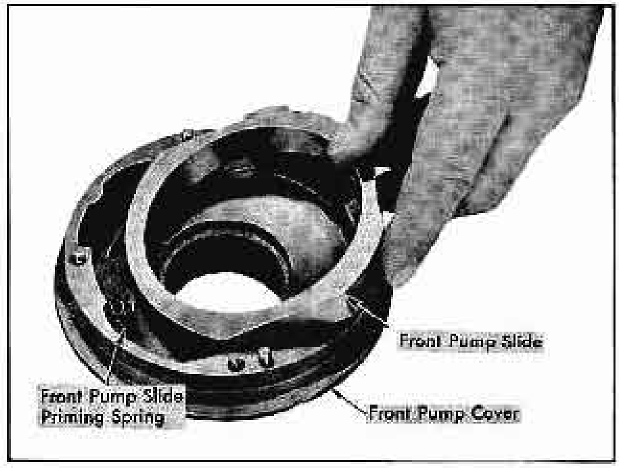

Fig. 14-51 Removing Front Pump Slide

b. Inspection

1. Inspect entire unit for dirt, scores or burrs. All edges should be sharp without chamfers on radii. Fig. 14-52.

2. Inspect slide to be sure the two bleed holes are open and free of dirt.

3. Inspect slide for free movement in pump cover. It should not bind under any circumstances.

4. Check pressure regulator valve for freedom in pump body bore.

5. Check freeness of vanes in rotor slots.

6. Check to be sure oil seal ring is free and not broken.

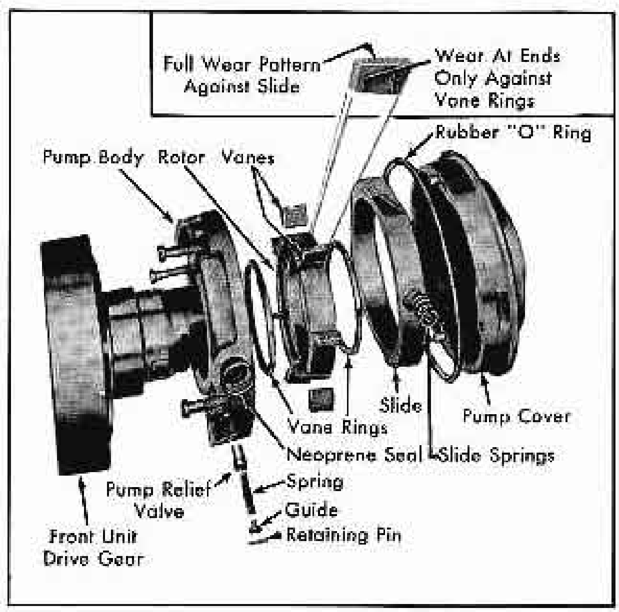

Fig. 14-52 Front Pump - Disassembled

7. Inspect guide rings for flatness. Place rings inside rotor and replace if they bind in any position.

8. Inspect pump bushing for scores or flaking. Slight wear of bushing is permissible. If bushing shows excessive wear on one side, it is an indication that either the bushing is not concentric with the cover or the locating bore in the rear flywheel housing is not aligned with the crankshaft bore in the crankcase.

9. Check small rotor drive key for wear or looseness in rotor or front unit drive gear.

10. Inspect all passages for obstruction.

11. Check freedom of front pump relief valve in pump body bore. Valve should be free to travel the depth of the bore.

c. Assembly

1. Install new seal in pump cover with step side up. Drive seal into place, using Tool No. J-1776-A with adapter A2.

2. Install pump relief valve, spring and guide in pump body. Compress relief valve spring and install retaining pin.

3. Install new intake pipe rubber "O" ring seal in pump body using a small screwdriver.

4. Install priming springs and slide in pump cover.

CAUTION: Be sure spring is located properly by moving slide against it until slide bottoms against the lower stop in cover.

5. Install lower vane ring in pump cover.

6. Install rotor with marked face up.

7. Install seven vanes in rotor slots. Make certain vanes fit between guide ring and slide.

NOTE: Check edges of vanes for wear pattern. One edge will be polished full length -- this edge should face the slide.

8. Position upper vane guide ring on rotor, centering it between vanes.

9. Lubricate internal parts of pump cover with Hydra-Matic fluid.

10. Place pump body over dowel pins in pump cover. Pump body should fit freely on dowel pins.

11. Assemble pump body to pump cover with four attaching screws, using new washers. Tighten to 12-15 ft. lbs. torque.

12. With pump completely assembled, move rotor by hand to be sure rotor, vanes, and slide are free. Be sure priming springs will return slide after springs are compressed.

13. Assemble front unit drive gear to the front pump, aligning key on front unit drive gear with slot in pump rotor. DO NOT FORCE PUMP ON DRIVE GEAR UNDER ANY CIRCUMSTANCES.

(19) Installation of Front Pump and Front Drive Gear

1. Position bronze thrust washer over intermediate shaft, against front carrier.

2. Position front oil pump "O" ring seal in case.

3. Install front pump and front unit drive gear assembly over intermediate shaft. Align locating counterbore in pump cover with counterbore in case.

4. Install pump cover locating washer in counterbore.

5. Install two front pump attaching bolts and tighten to 10-13 ft. lbs. torque.

6. Install the bronze, then steel thrust washer over intermediate shaft, against front end of front unit drive gear. These washers were tied together during disassembly.

7. Install snap ring holding thrust washers in place.

(20) Disassembly, Inspection and Assembly of Governor and Rear Pump Assembly

a. Disassembly

1. Mark edge of governor body and drive flange (if not previously marked) so that they may be reinstalled in original position.

2. Remove two screws and lock washers holding governor body to governor drive flange. Remove governor assembly from drive flange. Fig. 14-53.

3. Carefully remove four governor oil seal rings from governor body.

4. Remove G1 and G2 stop plates.

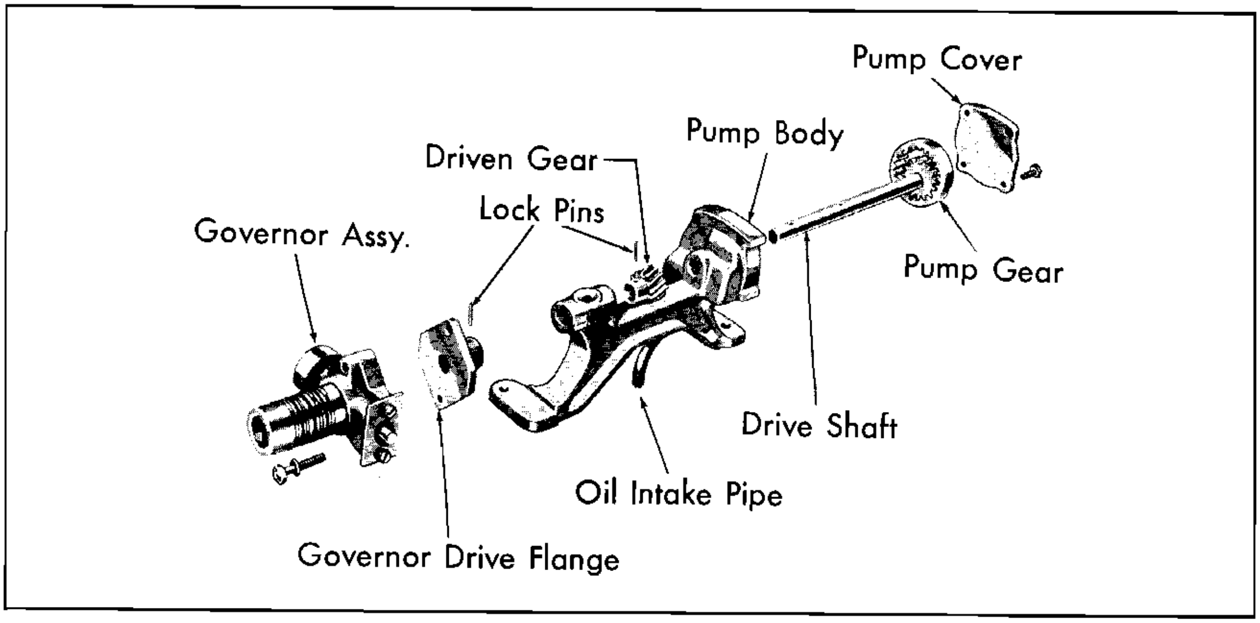

Fig. 14-53 Rear Oil Pump and Governor - Disassembled

NOTE: These stop plates are different than those used on previous transmissions and extreme care must be taken during assembly.

CAUTION: Do not attempt to remove either G1 or G2 valve from governor casting.

NOTE: The disassembly described above is for replacement of oil rings and for cleaning purposes. With the exception of the oil rings, the governor is serviced as a complete unit.

5. Remove four screws and lock washers holding pump cover to body and remove cover.

6. Remove outer gear from pump body.

b. Inspection

1. Inspect pump gears for damaged teeth.

2. Inspect cover and gear pocket in body for scores.

3. Inspect governor ring lands and rings for freedom in grooves. If lands are damaged or worn then replace the complete governor assembly.

4. Inspect governor mounting face for flatness to get oil-tight joint.

5. Inspect both the G1 and G2 valves for free movement.

NOTE: If governor plungers still stick, replace complete assembly.

6. Inspect governor body for sand holes or blocked passages.

c. Assembly

1. Install rear oil pump driven gear in pump body.

2. Position cover on pump body and install four mounting screws.

3. Install governor oil seal rings. Place oil seal rings in bore of parking bracket assembly and check ring gap. Gap should be .001" to .007". Groove clearance should be .001" to .003".

4. Install G1 and G2 stop plates.

CAUTION: When installing the G1 and G2 stop plates, be sure governor valves are properly positioned in their respective bores so the stop plates will enter freely without striking and damaging shoulder on valves.

5. Position governor assembly on drive flange, lining up locating marks.

6. Install two body to flange screws and lock washers. Tighten screws to 6-8 ft. lbs. torque.

(21) Installation of Governor and Rear Pump Assembly

NOTE: Before installing the rear pump, make certain that the pump to case mating surface is entirely free of nicks or burrs and that both attaching bolt holes in the case have a good chamfer.

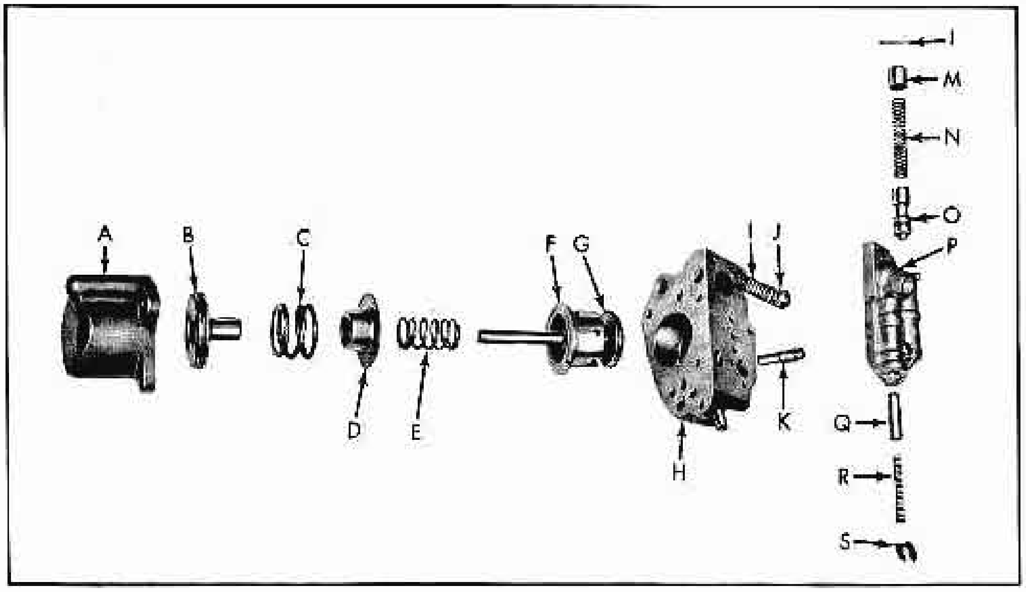

Fig. 14-54 Front Servo - Disassembled

KEY	NAME	KEY	NAME
A	Release Cylinder	K	4-3 Downshift Valve
B	Release Piston	L	Overrun Control Retainer Pin
C	Booster Spring	M	Overrun Control Valve Plug
D	Retracting Spring Retainer	N	Overrun Control Valve Spring
E	Retracting Spring	O	Overrun Control Valve
F	Compensator Piston	P	Valve Body
G	Apply Piston	Q	Line Exhaust Valve
H	Servo Body	R	Line Exhaust Valve Spring
I	Check Ball Spring	S	Line Exhaust Valve Spring Retainer
J	Check Ball		

1. Position the large round governor weight to the front of transmission and locate one reverse drive flange attaching screw up to provide clearance for pump and governor assembly to slide into transmission case.

2. Slide the pump and governor assembly into position in case.

(22) Disassembly, Inspection and Assembly of Front Servo.

a. Disassembly (Fig. 14-54)

1. Remove three cap screws and lock washers from front servo valve body; separate servo valve body from servo body, and remove check ball and spring.

NOTE: Handle servo valve body with care to avoid damage as it is made of die cast material.

2. Remove 4-3 downshift valve from front servo body.

3. Remove line exhaust valve spring retainer clip, line exhaust valve spring and valve from front servo valve body.

4. Remove overrun control retainer clip, plug, spring and valve from front servo valve body.

5. Remove three screws from release cylinder and separate release cylinder from front servo body, Fig. 14-55.

6. Remove booster spring, retracting spring retainer and retracting spring.

7. Remove front servo apply piston assembly from servo body. Fig. 14-56.

NOTE: This piston assembly should not be disassembled as it is serviced as a complete unit.

8. Remove front servo release piston from release cylinder. Fig. 14-57.

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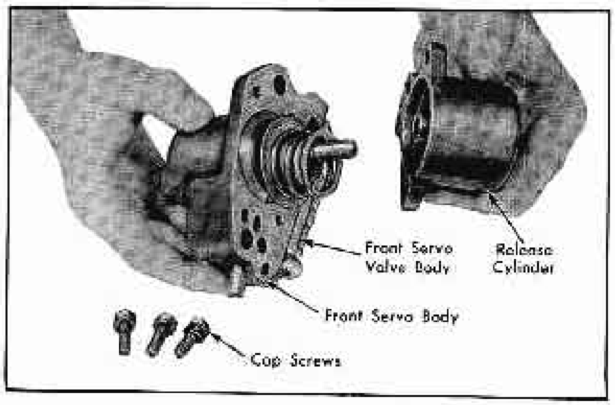


Fig. 14-55 Removing Front Servo Release Cylinder

b. Inspection

1. Check mating machined surfaces of servo body, release cylinder and front servo valve body for scores and obstructed or interconnected passages, Fig. 14-58.

2. Inspect servo piston assembly and cylinder bores for scores, broken rings, and freedom of rings in grooves and obstructed passages.

3. See that the 4-3 downshift valve is free in bore and check the 4-3 downshift plug orifice for free passages in servo body. Fig. 14-59.

4. Inspect front servo retracting spring for distortion or collapsed coils; the free length should be approximately 1-33/64".

5. Check free length of overrun control valve spring - approximately 1-9/64".

6. Check compensator transfer pipe for snug fit in servo body; make sure the piston assembly locating dowel pin is snugly in place.

c. Assembly

1. Install overrun control valve, spring, plug and retainer pin in servo valve body.

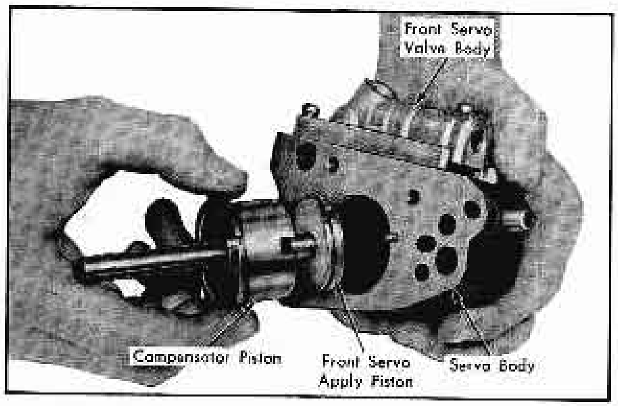


Fig. 14-56 Removing Front Servo Apply Piston

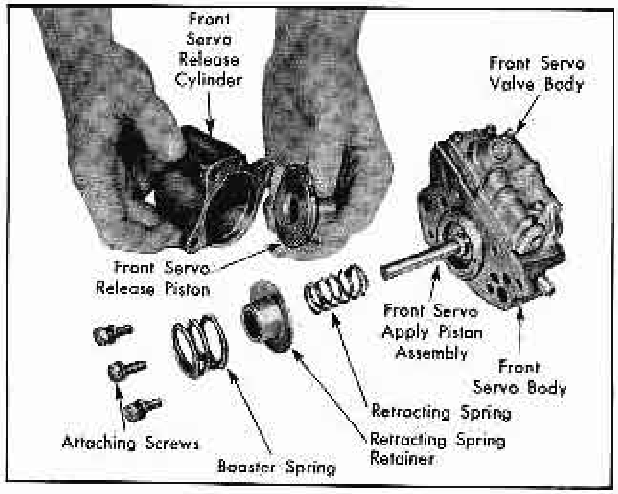


Fig. 14-57 Removing Front Servo Release Piston

2. Install line exhaust valve, spring and retainer clip in front servo valve body.

3. Install 4-3 downshift valve in servo body.

4. Install check ball spring and ball in servo body and carefully assemble front servo valve body to servo body and install three attaching screws. Fig. 14-60.

5. Install servo piston assembly into servo body by carefully compressing and starting oil seal ring. Be sure groove in piston assembly locates on positioning pin.

6. Install retracting spring, retainer and booster spring on apply piston assembly stem. Fig. 14-61.

7. Install servo release cylinder by carefully starting ring on release piston into release cylinder.

8. Assemble release cylinder to servo body.

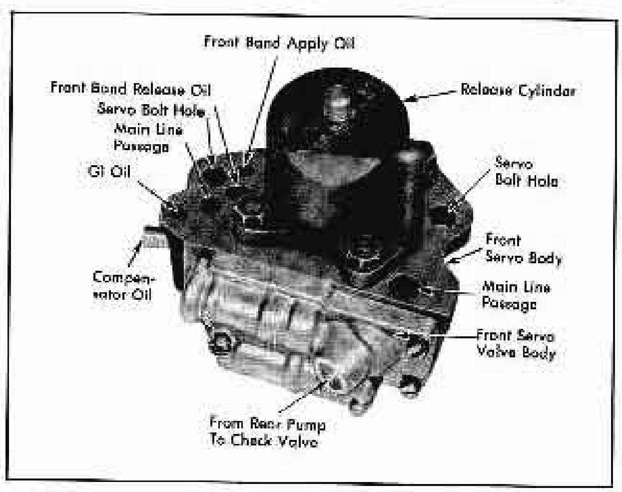


Fig. 14-58 Front Servo Oil Passages

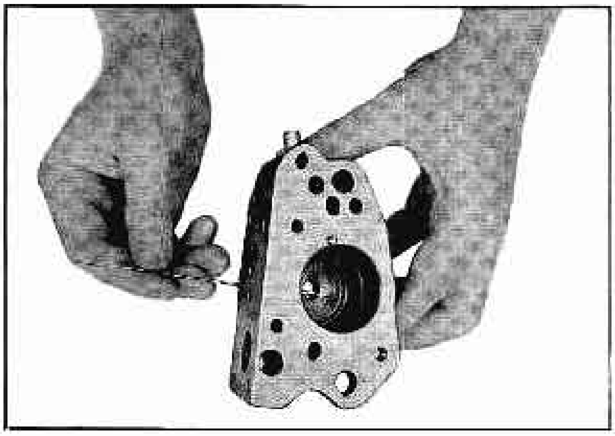


Fig. 14-59 Checking 4-3 Downshift Passage

(23) Disassembly, Inspection and Assembly of Rear Servo

a. Disassembly (Fig. 14-62)

1. Place rear servo in arbor press and bring ram down to rest on spring retainer. Fig. 14-63.

2. Remove two retainer screws and lock washers holding spring retainer to servo body while keeping ram of press against spring retainer.

3. Release press slowly until servo springs are released, and remove rear servo assembly from press.

4. Remove spring retainer, accumulator spring, compensator piston and spring.

5. Remove accumulator body and piston assembly from servo body.

6. Remove rear servo gasket, exhaust valve and spring from the accumulator body.

7. Rest accumulator body on a vise with copper jaws and tap accumulator piston through spring and accumulator body.

8. Remove booster piston and spring from servo body.

9. Remove cotter pin from each end of pivot pin holding band actuating lever to bracket on servo body. Push pivot pin out of servo body bracket and band actuating lever.

CAUTION: Take care not to lose needle bearings out of band actuating lever when removing pivot pin.

10. Remove lever and needle bearings.

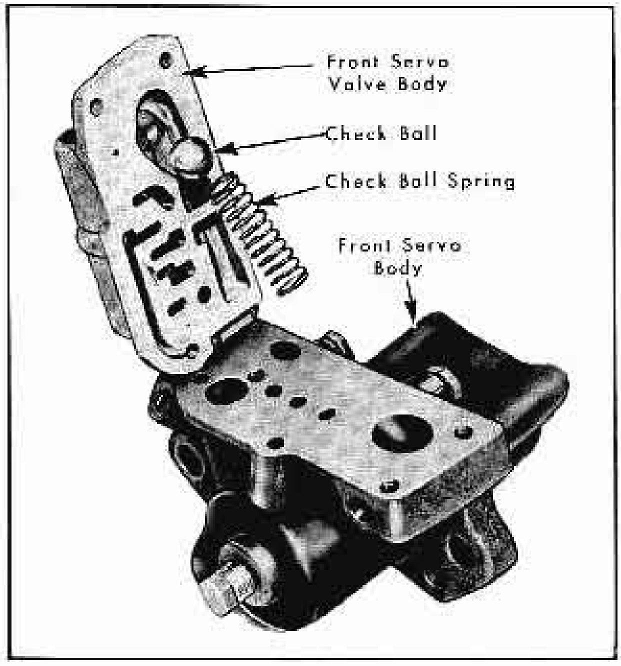


Fig. 14-60 Check Ball and Spring Location

b. Inspection

1. Wash all parts in cleaning solvent, and dry them thoroughly with compressed air. Inspect accumulator spring retainer for bend or for evidence of severe strain. Reshape retainer as required.

2. Insert rear servo compensator piston in accumulator piston bore and check clearance using a feeler gauge. Clearance should be .003 to .005 inch.

3. Inspect servo body and accumulator body for nicks, scores, obstructed passages, or other con-

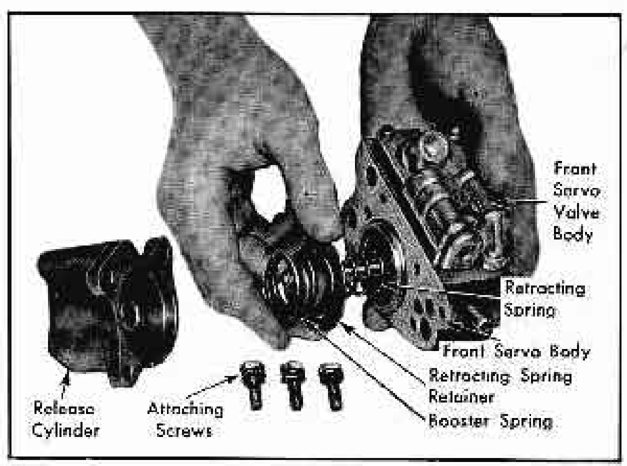


Fig. 14-61 Installing Front Servo Springs

HYDRA-MATIC DRIVE

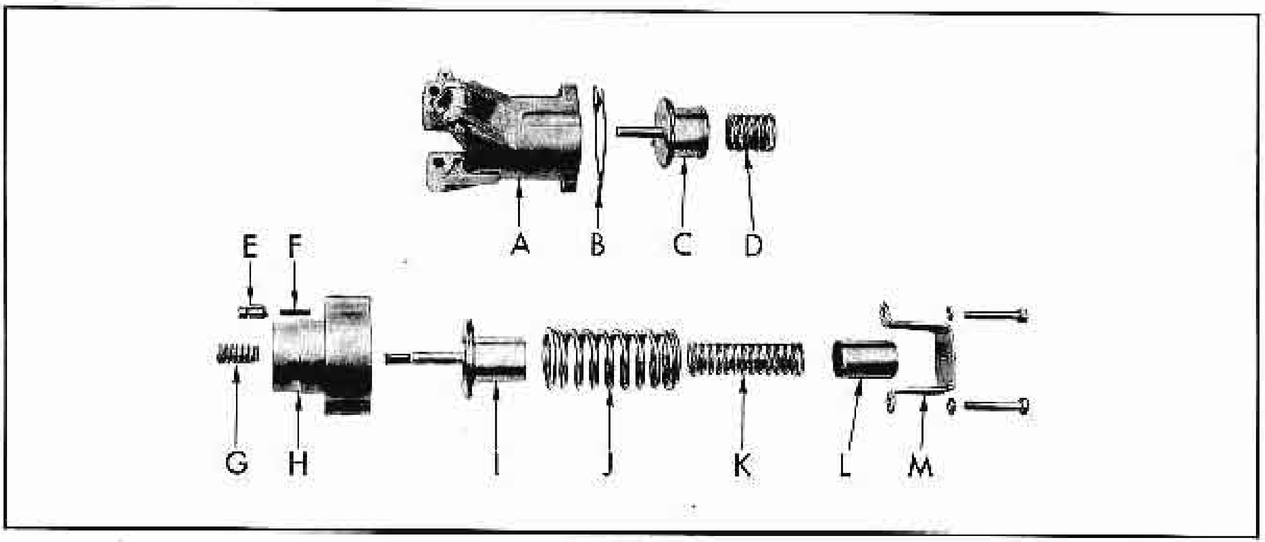


Fig. 14-62 Rear Servo - Disassembled

KEY	NAME	KEY	NAME
A	Body	H	Accumulator Body
B	Gasket	I	Accumulator Piston and Pin
C	Booster Piston and Pin	J	Accumulator Piston Spring
D	Booster Piston Spring	K	Compensator Spring
E	Exhaust Valve	L	Compensator Piston
F	Exhaust Valve Spring	M	Accumulator Piston Spring Retainer
G	Booster Piston Spring		

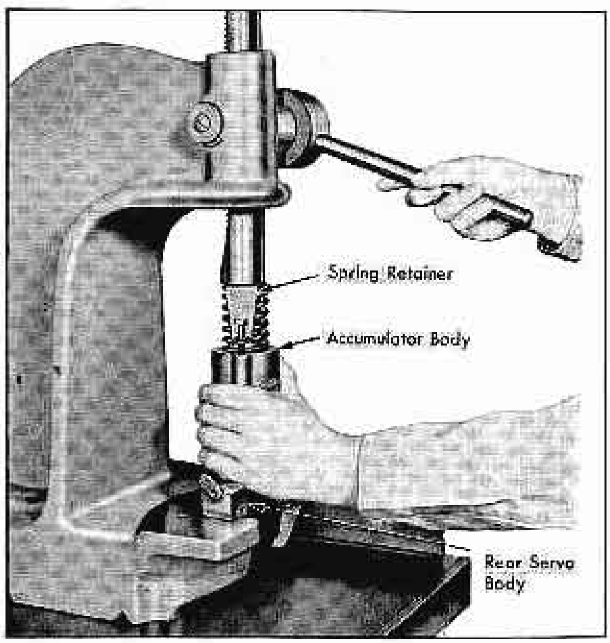


Fig. 14-63 Disassembling Rear Servo

ditions which might cause oil leakage or prevent free operation.

NOTE: Be sure accumulator check valve is not broken and rivet is not loose, and that check valve plunger is free. Check to see that hole in check valve is open and valve seats flat on accumulator body. The check valve is not held in a fixed position by the rivet and can be moved as much as 1/16". Check position of valve before installation and, if mispositioned, center it over the drilled passage in accumulator body using a screwdriver. The position of the bleed hole in the check valve in relation to the drilled hole in the accumulator body is not important as long as the bleed hole is not obstructed. It is impossible for the check valve to shift that much.

4. Inspect actuating lever for cracks, bends, or brinelling. Inspect needle bearings and replace any that have flat spots or are excessively worn.

5. Inspect accumultor piston and piston rod for any nicks or burrs which might cause oil leakage or sticking. Inspect accumulator piston bore and outside diameter, compensator piston outside diameter, and portion of piston rod which contacts accumulator body. Inspect accumulator body check valve for free operation and spring flatness.

6. Insert accumulator piston and rod (without oil ring) in accumulator body, and measure clearance between piston and body, using a feeler gauge. Clearance should be .005 to .009 inch. Check accumulator piston ring in body and on piston. Ring gap should be not more than .010 inch. Ring side clearance should be .0005 to .0025 inch. Inspect accumulator body for nicks or burrs which might cause oil leakage or sticking.

7. Check clearance between booster piston and bore in accumulator body, using a micrometer and a telescope gage. Clearance should be .006 to .010 inch.

8. Insert booster piston and rod (without large oil ring) in servo body and measure clearance between piston and body, using a feeler gage. Clearance should be .006 to .010 inch.

9. Insert large booster piston ring in servo body and measure ring gap, using a feeler gauge. Ring gap should be not more than .010 inch. Install ring on booster piston and measure clearance between ring and edge of ring groove in piston. Clearance should be .0005 to .0025 inch. Check rod on booster piston to see that it operates freely in servo body.

10. Inspect all servo springs for damage, distortion or collapsed coils.

Spring	Free Length
Accumulator Piston Spring, Outer	4-1/4"
Accumulator Piston Spring, Inner	3-59/64"
Booster Spring	1-19/32"

11. Inspect rear servo exhaust valve and bore for scores and freedom in bore. Inspect gasket for damage. Replace gasket if there is the slightest indication of damage.

c. Assembly of Rear Servo

1. Coat servo lever needle bearings with heavy grease and assemble in pivot pin hole in lever. Position servo lever with needle bearings in bracket on rear servo body and push pivot pin through bracket and lever. Install cotter pins holding pivot pin in servo body bracket.

2. Lubricate booster piston with clean fluid and insert in servo body, using extreme care not to damage oil ring on booster piston. Place booster spring in booster piston.

3. Lubricate accumulator piston with clean fluid and install in accumulator body, using extreme care not to damage oil ring on booster piston. Place booster spring in booster piston.

4. Install small booster piston spring on accumulator piston rod with small tapered end of spring toward accumulator body. Tap spring on rod until small end of spring seats against shoulder.

5. Place the inner accumulator piston spring in accumulator piston.

6. Lubricate compensator piston with clean fluid and place over inner accumulator piston spring.

7. Place outer accumulator piston spring over compensator.

8. Install two retainer mounting screws in the retainer and place over the outer accumulator piston spring.

9. Install gasket on accumulator body, retaining with petrolatum.

10. Position accumulator assembly on servo body and place complete servo assembly in an arbor press so that ram of press rests on retainer.

11. Install two screws and lock washers holding spring retainer in position with arbor press. Remove servo from arbor press.

(24) Installation of Front and Rear Servo

1. Install front pump delivery pipe in front pump body.

2. Position front servo with piston stem in slot on end of front band; place servo on front pump delivery pipe; push servo into position against case.

3. Insert front servo attaching screws and lock washers. Do not enter more than 2 or 3 threads.

4. Insert rear pump discharge pipe into passage in front servo and rear pump.

5. Place rear servo in position, engaging rear band strut with actuating lever while installing two oil transfer pipes from front servo.

6. Install rear servo attaching screws, then tighten to 23-28 ft. lbs. torque.

7. Install rear pump screws and tighten to 15-18 ft. lbs. torque.

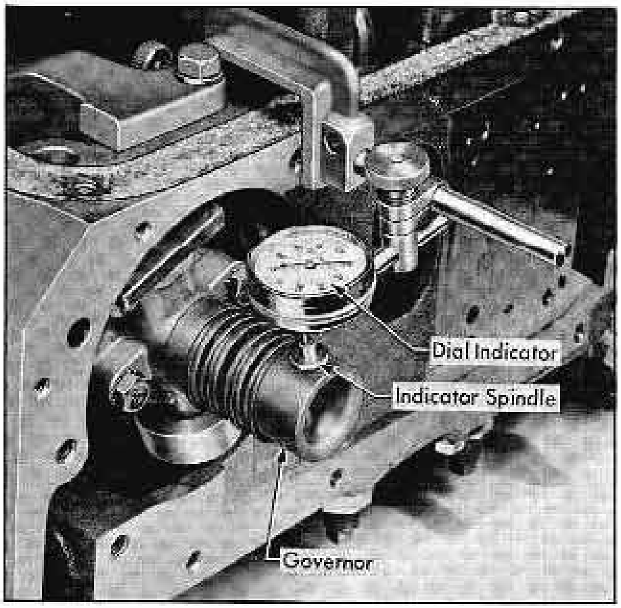


Fig. 14-64 Checking Governor Runout

8. Install dial indicator and check governor runout at tower about 1/4" from the end of the governor. Fig. 14-64. Runout should not exceed .005". If runout exceeds .005", rotate governor 180° on flange and recheck. If runout still exceeds .005", check flange runout which should not exceed .002". If runout of drive flange exceeds .002", correct condition by replacing one or all of the following parts: governor drive flange, gear set or complete rear oil pump assembly. Fig. 14-65.

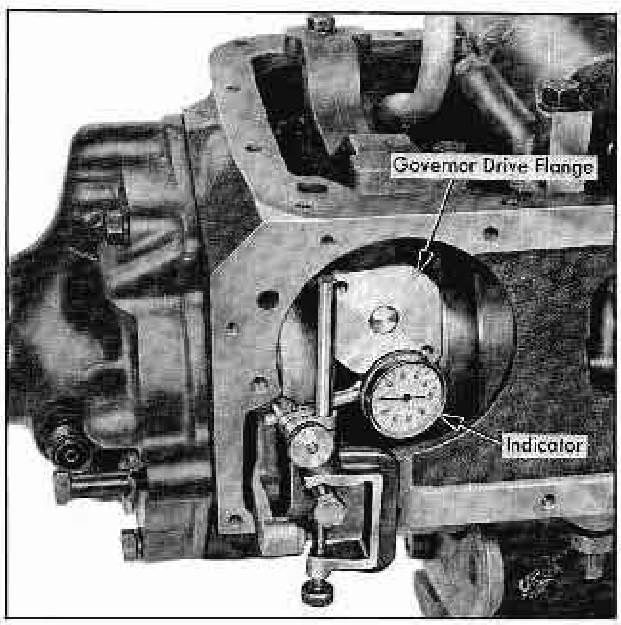


Fig. 14-65 Checking Governor Drive Flange Runout

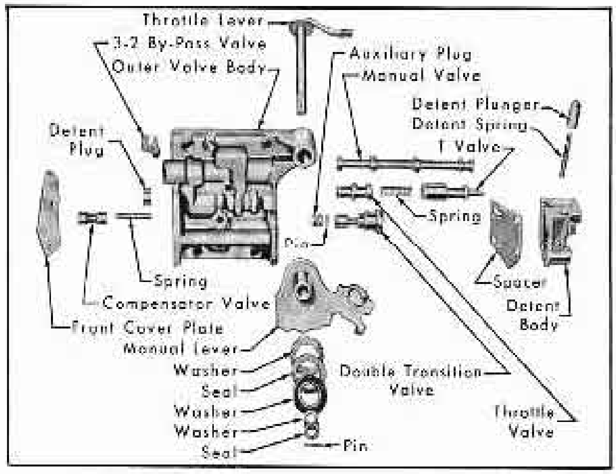


Fig. 14-66 Outer Valve Body - Disassembled

9. Install front pump intake pipe into reamed hole in pump body - sealed by "O" ring.

CAUTION: Do not drop gasket, bolts or lock plates into case.

10. Tighten two front pump attaching screws with steel washers to 10-13 ft. lbs. torque.

(25) Internal Band Adjustments

Perform the internal band adjustments as described in Note 5.

(26) Disassembly, Inspection and Assembly of Valve Body

a. Disassembly—Outer Valve Body (Fig. 14-66)

CAUTION: Never use a vise to hold any part of the valve body during repair as body is a die casting and can easily be damaged.

1. Remove pin, manual shaft rubber seal and outer and inner seal washers from shaft. Remove inner control lever and throttle lever.

2. Move inner detent control lever slowly counter-clockwise to permit removing detent tension spring and plunger.

3. Remove manual valve.

4. Remove two screws holding inner and outer valve bodies together.

5. Separate inner and outer valve bodies and remove separator plate.

6. Remove 3-2 by-pass valve (spring steel) from outer valve body.

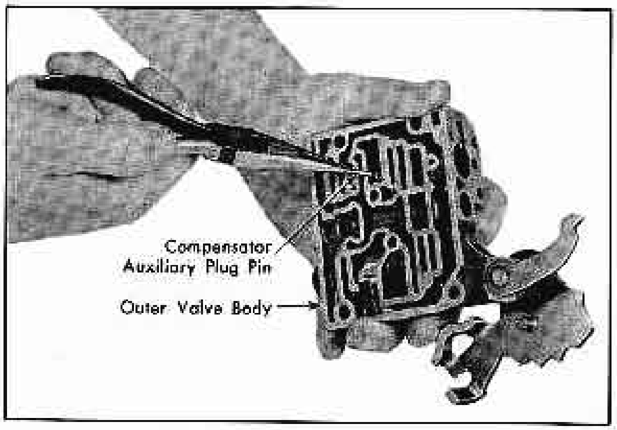


Fig. 14-67 Removing Compensator Plug Pin

7. Remove three screws from detent plunger retainer and remove retainer and plate.

8. Remove "T" valve, spring, throttle valve and double transition valve from outer body.

9. Remove three screws and outer valve body from plate (AM) and remove compensator valve, spring and detent plug.

10. Remove pin that holds compensator auxiliary plug in place, using long nose pliers, Fig. 14-67.

NOTE: If compensator auxiliary plug is free in outer body, removal of pin and plug is not necessary.

11. Remove compensator auxiliary plug by inserting a 1/8 inch punch or rod in hole in plug and, using a small punch at the opposite end, push the plug through the opening for the double transition valve.

CAUTION: Extreme care must be exercised to see that this plug which is very short does not drop and become lodged in the body, as the casting would probably be damaged in attempts to dislodge it.

b. Disassembly—Timing Valve Body (Fig. 14-68)

1. Remove two screws and remove 3-2 timing valve body assembly from inner valve body.

2. Remove timing valve plug retainer pin, plug, spring and valve.

c. Disassembly—Rear Valve Body (Fig. 14-68)

1. Remove three screws holding rear valve body assembly to inner valve body.

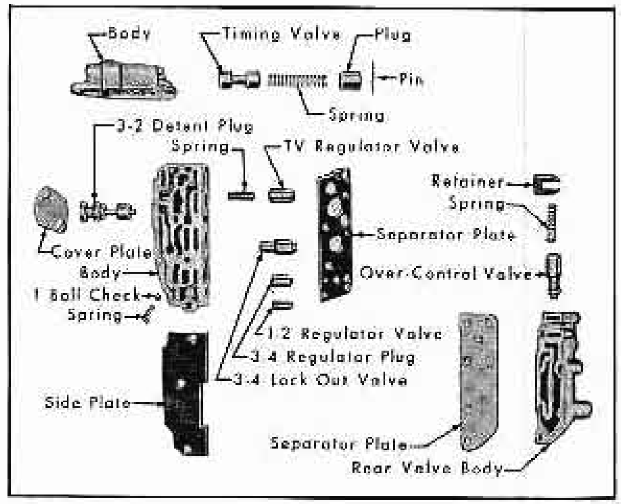


Fig. 14-68 Timing, Rear, Front Valve Body - Disassembled

2. Remove rear valve body and separator plate.

3. Remove over-control retainer, spring, and valve from rear valve body.

d. Disassembly—Front Valve Body (Fig. 14-68)

1. Remove three screws holding front valve body side plate to front valve body and remove plate.

2. Remove "T" oil ball check and spring from front valve body.

3. Remove three screws holding front valve body to inner valve body and remove front valve body and separator plate.

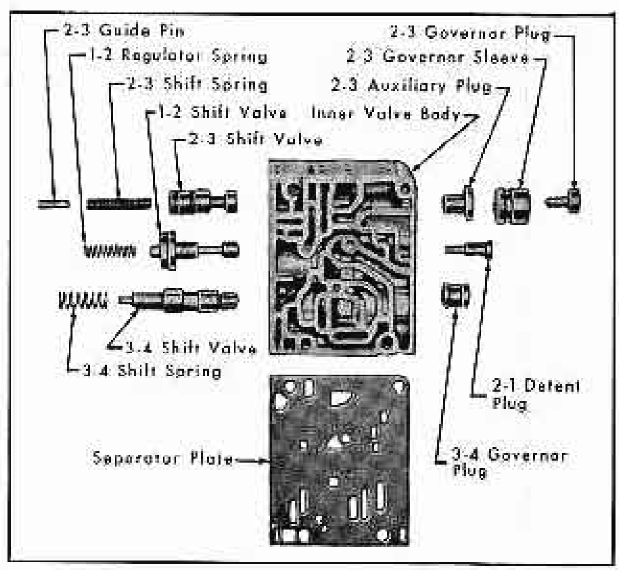


Fig. 14-69 Inner Valve Body - Disassembled

HYDRA-MATIC DRIVE

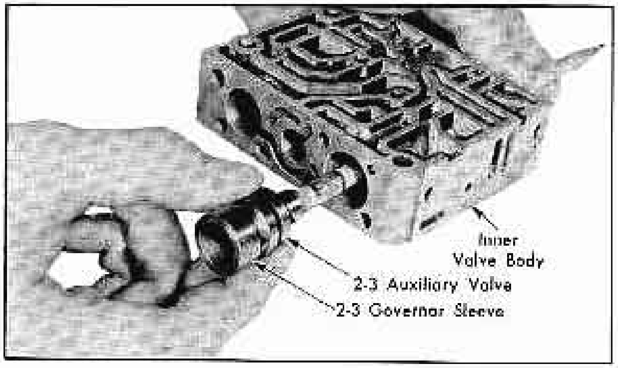


Fig. 14-70 Removing 2-3 Governor Sleeve and 2-3 Auxiliary Valve

4. Remove 4-3 shuttle valve, 3-4 regulator plug, 1-2 regulator plug, TV regulator valve, and spring from front valve body.

5. Remove two screws and 3-2 detent plug plate and remove 3-2 detent plug from front body.

e. Disassembly—Inner Valve Body (Fig. 14-69)

1. With front valve body off inner valve body, remove the following from the inner valve body: 3-4 shift valve spring, 3-4 shift valve, 1-2 regulator plug spring, 1-2 shift valve, 2-3 shift valve spring, 2-3 shift valve spring guide pin, and 2-3 shift valve.

2. With rear valve body off inner valve body, remove the following from the inner valve body: 3-4 governor plug, 2-1 detent plug, 2-3 governor plug, 2-3 governor sleeve, and 2-3 auxiliary valve. Fig. 14-70.

f. Inspection (Fig. 14-71)

1. Clean valve body castings, valves and other parts in clean solvent.

CAUTION: Wash all these parts one at a time. Do not allow valves to bump together as this might cause nicks and burrs.

2. Inspect valves carefully to see that they are free from burrs, scratches, or other damage. Remove burrs with a fine stone or crocus cloth.

CAUTION: In removing burrs, be careful not to round off shoulders, because sharp edges are necessary in this type of valve to prevent dirt from wedging between valve and body. Do not remove any more metal than is necessary.

3. Inspect valve body castings carefully. See that mating surfaces are free from nicks and scratches that extend across webbing. Test these surfaces for warpage on a surface plate. If warpage is noted, lap the affected surfaces until smooth and flat, as explained below: Fig. 14-72.

a. Lap all sealing surfaces of the valve body and separator plates lightly on a lapping plate using a lapping compound such as Carborundum (five). If a lapping plate (preferred) is not available, a flat glass may be used with No. 400 grit emery paper and kerosene.

b. Wash off and inspect carefully. High spots will show up as dull gray patches while any low spots as indicated by arrows, Fig. 14-72 will be shiny. If visual inspection indicates surfaces are not perfectly flat, continue lapping until all shiny spots have disappeared and the entire surface is a dull gray color.

4. Align separator plate on outer body and make certain that leaf type check valve in outer body is free, that the orifice in the valve is not plugged, and that the valve completely seals the square hole in the separator plate.

5. Check shifter valves and plugs for free movement in their operating positions in the valve body. Make this check with valves and valve bodies dry. Valves will operate satisfactorily if they fall of their own weight in their respective bores when valve body is tilted and shaken slightly.

6. Individual valves of this assembly are not supplied separately, except for the manual valve. If any valves or body castings are not serviceable, a complete inner valve body assembly may be replaced. Refer to Master Parts List for component parts which are replaceable on the control valve assembly.

7. Check the fit of the throttle valve inside lever and shaft in the hub of the inside detent control lever on the outer valve body. If the shaft binds in the hub, is excessively worn, or if the oil seal is missing or damaged, it will be necessary to replace the defective parts.

8. Before reassembly, make certain the springs can be accurately identified for correct assembly. Fig. 14-73.

g. Assembly—Outer Valve Body (Fig. 14-66)

1. Insert compensator auxiliary plug into outer valve body, making certain plug does not drop into valve body and become lodged. After plug is in place, install pin to hold plug in place. Plug must be free in bore.

2. Insert spring, compensator valve, and detent plug in outer valve body.

HYDRA-MATIC DRIVE

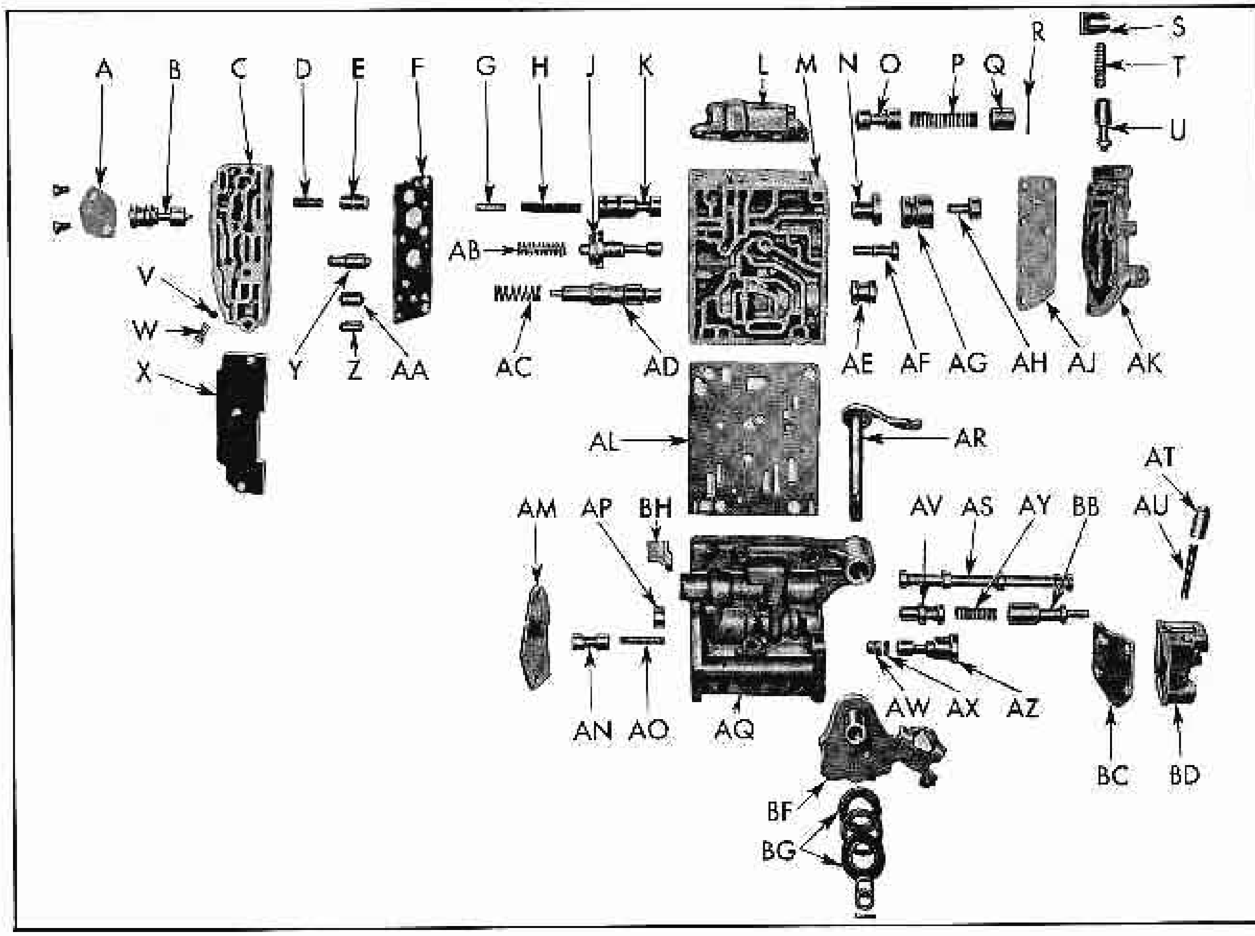


Fig. 14-71 Valve Body - Disassembled

KEY	NAME
A.	3-2 Detent Plug Plate
B.	3-2 Detent Plug
C.	Front Valve Body
D.	TV Regulator Valve Spring
E.	TV Regulator Valve
F.	Front Valve Body Separator Plate
G.	2-3 Shift Valve Spring Guide Pin
H.	2-3 Shift Valve Spring
J.	1-2 Shift Valve
K.	2-3 Shift Valve
L.	Timing Valve Body
M.	Inner Valve Body
N.	2-3 Auxiliary Valve
O.	Timing Valve
P.	Timing Valve Spring
Q.	Timing Valve Plug
R.	Timing Valve Plug Retainer Pin
S.	Over-Control Valve Spring Retainer
T.	Over-Control Valve Spring

KEY	NAME
U.	Over-Control Valve
V.	"T" Oil Ball Check
W.	"T" Oil Ball Check Spring
X.	Front Valve Body Plate
Y.	1-2 Regulator Plug
Z.	4-3 Shuttle Valve
AA.	3-4 Regulator Plug
AB.	1-2 Regulator Plug Spring
AC.	3-4 Shift Valve Spring
AD.	3-4 Shift Valve
AE.	Governor Plug
AF.	2-1 Detent Plug
AG.	2-3 Governor Sleeve
AH.	2-3 Governor Plug
AJ.	Rear Valve Body Spacer Plate
AK.	Rear Valve Body
AL.	Valve Body Spacer Plate
AM.	Outer Valve Body Front Plate

KEY	NAME
AN.	Compensator Valve
AO.	Compensator Valve Spring
AP.	Detent Plug
AQ.	Outer Valve Body
AR.	Inner Throttle Lever
AS.	Manual Valve
AT.	Detent Plunger
AU.	Detent Tension Spring
AV.	Throttle Valve
AW.	Compensator Auxiliary Plug
AX.	Compensator Auxiliary Plug Pin
AY.	Throttle Valve Spring
AZ.	Double Transition Valve
BB.	"T" Valve
BC.	Detent Plunger Retainer Plate
BD.	Detent Plunger Retainer
BF.	Inner Control Lever
BG.	Rubber Seals & Washers
BH.	3-2 By-Pass Valve (Spring Steel)

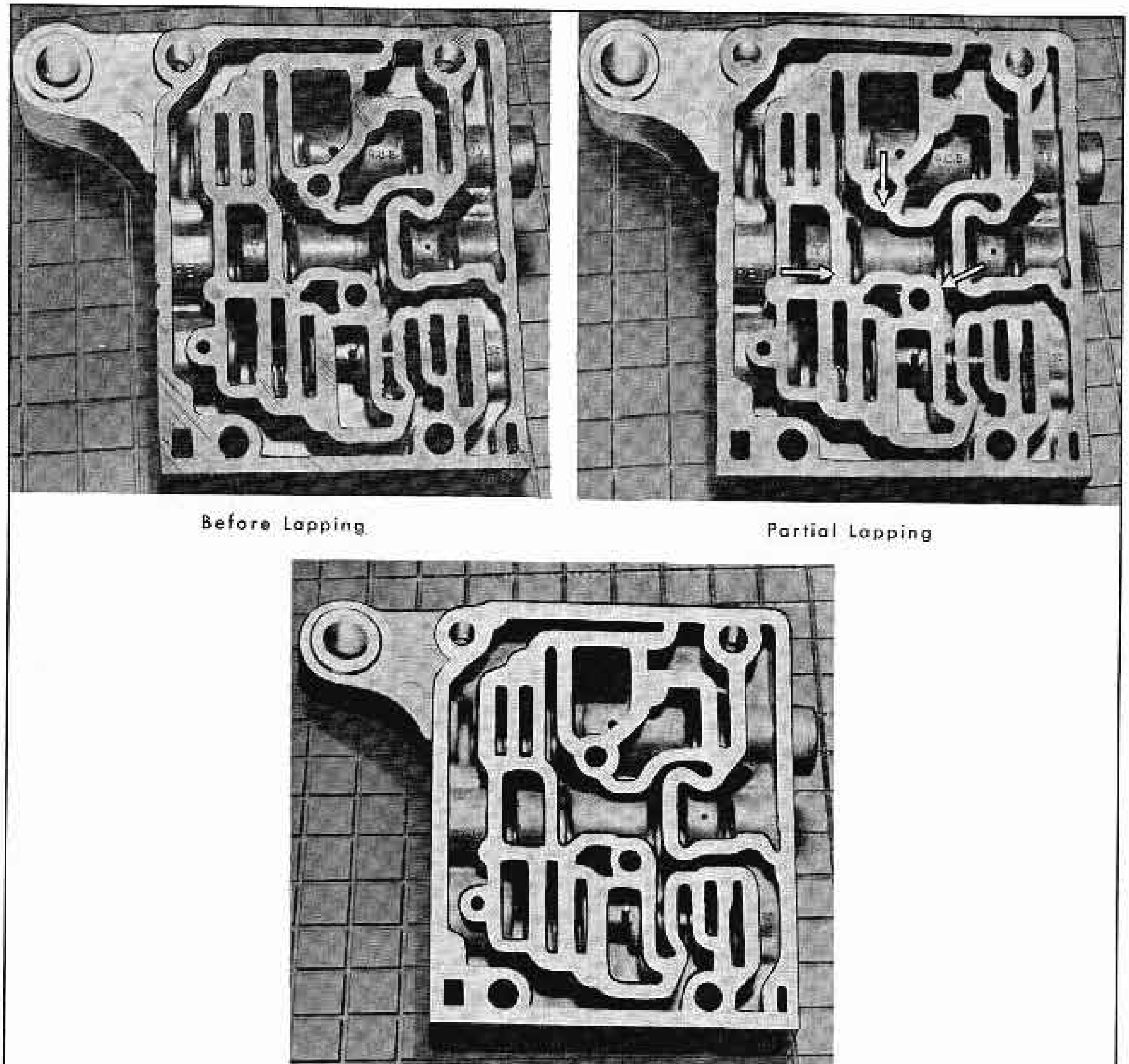


Fig. 14-72 Lapping Surfaces of Valve Body

3. Install outer valve body front plate, securing with three attaching screws.

4. Install double transition valve, throttle valve, spring and "T" valve.

5. Position inner throttle lever through bore in outer valve body. Install inner control lever on throttle lever shaft.

6. Install manual shaft rubber seal, outer and inner seal washers and pin.

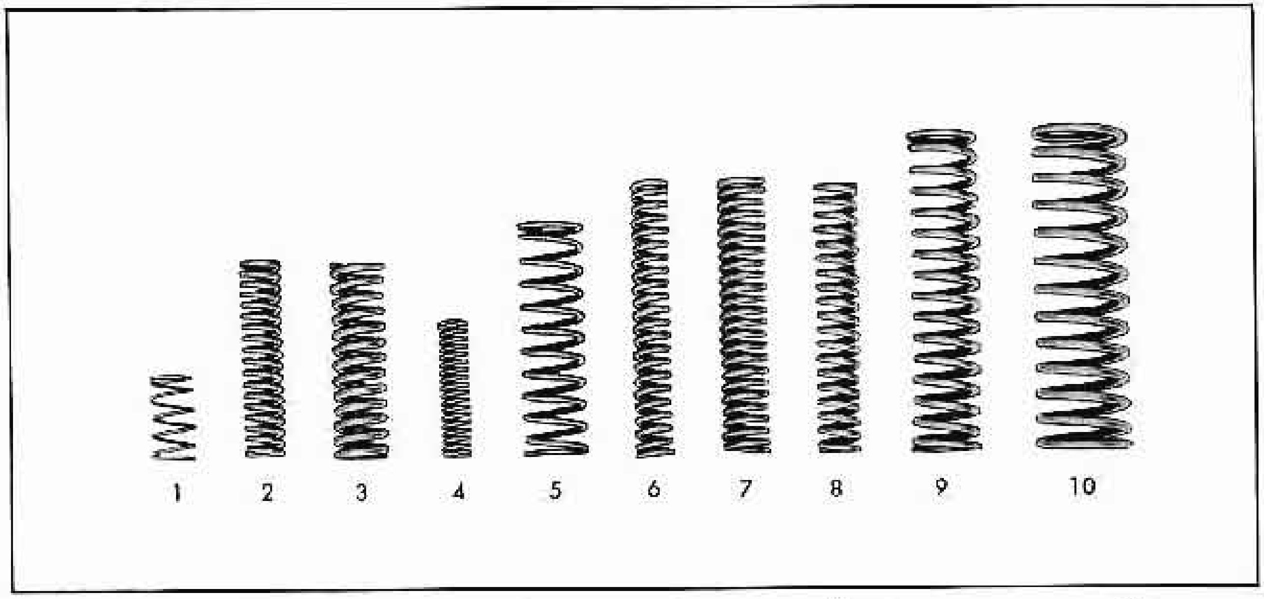
7. Position separator plate on outer valve body. Install detent plunger retainer on plate and tighten three attaching screws.

8. Install manual valve, detent spring, and plunger. Align manual valve with the inside detent lever pin and rotate lever clockwise to index the plunger on the detent control lever assembly.

9. Install 3-2 by-pass valve (spring steel) into outer valve body.

h. Assembly—Timing Valve Body (Fig. 14-68)

1. Insert 3-2 timing valve into timing valve body, followed by spring and plug.



Key	Name	Size	Key	Name	Size
1.	"T" Oil Ball Check Valve	7/16 x 7/32	6.	Detent	1-21/64 x 13/64
2.	T.V. Regulator Valve	1-21/64 x 7/32	7.	2-3 Shift Valve	1- 7/16 x 17/64
3.	Throttle Valve	61/64 x 9/32	8.	Over-Control Valve	1-19/64 x 15/64
4.	Compensator Valve	39/64 x 3/16	9.	Timing Valve	1-19/32 x 3/8
5.	1-2 Regulator	1- 1/8 x 9/32	10.	3-4 Shift Valve	1-37/64 x 1/2

Fig. 14-73 Comparison of Springs in Valve Body

2. Press plug into bore and install plug retainer pin. Mount timing valve body assembly to inner valve body with two attaching screws.

i. Assembly—Front Valve Body (Fig. 14-68)

1. Insert 3-2 detent plug in front valve body.

2. Install 3-2 detent plug separator plate on front valve body with two attaching screws. Make certain plate is installed correctly to cover bore in body.

3. Install spring and "T" oil ball check in front valve body, Fig. 14-74.

4. Install front valve body side plate using three screws and tighten.

5. Insert spring, TV regulator valve, 1-2, and 3-4 regulator plugs and shuttle valve in front valve body.

j. Assembly—Rear Valve Body (Fig. 14-68)

1. Insert over control valve, spring, and retainer in rear valve body.

2. Install rear to outer valve body.

k. Assembly—Front to Inner Valve Body

1. Insert 2-3 shift valve, 1-2 shift valve, 3-4 shift valve, and 3-4 shift valve spring in inner body.

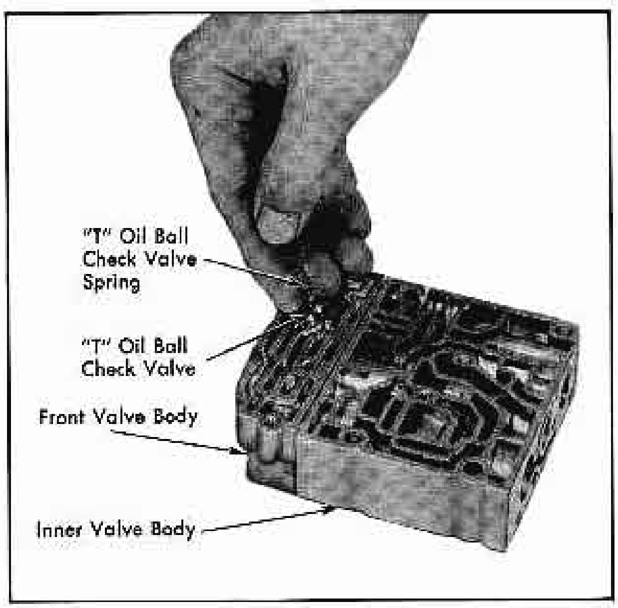


Fig. 14-74 Installing "T" Ball Check and Spring

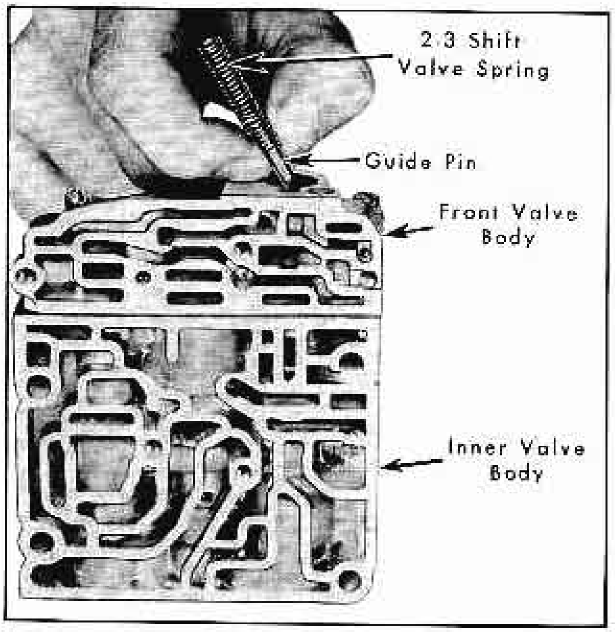


Fig. 14-75 Installing 2-3 Shift Valve Guide Pin, Spring and 1-2 Regulator Plug Spring

2. Depress 3-4 shift valve spring and insert assembly clamp, Tool No. J-5157, over inner valve body. Insert front valve body separator plate under tangs of tool. Make certain plate is positioned correctly.

3. Insert 2-3 shift valve spring, guide pin, and 1-2 regulator plug spring through holes in separator plate in inner valve body. Fig. 14-75.

4. With front valve body assembly and inner valve body assembly on a clean, flat surface, bring the two assemblies together. Fig. 14-76.

NOTE: It will be necessary to align the 1-2 regulator plug spring in the inner valve body to the 1-2 regulator plug in the front valve body. Start the screws into the inner valve body, making sure proper alignment is maintained.

5. Remove assembly clamp, Tool No. J-5157, by sliding it off inner valve body. Tighten screws alternately to bring the two valve body assemblies together evenly.

l. Assembly—Rear to Inner Valve Body

1. Insert 2-3 auxiliary valve and 2-3 governor sleeve in inner valve body.

NOTE: Work valve in carefully to prevent cocking on sleeve counterbore. Shake inner valve body assembly to make certain 2-3 auxiliary valve is free in bore.

2. Insert 2-3 and 3-4 governor plugs in inner valve body. Insert 2-1 detent plug in the inner valve body.

3. Install rear valve body and spacer plate to inner valve body. The 2-1 detent plug can be held in position with the plate while starting the three attaching screws.

m. Assembly—Outer to Inner Valve Body

1. Position spacer plate and outer valve body assembly on inner valve body assembly.

2. With four valve body to transmission case attaching holes in proper alignment, tighten the two attaching screws.

(27) Disassembly, Inspection and Assembly of Parking Brake Bracket

a. Disassembly

1. Compress parking blocker piston spring and remove retaining pin, spring and parking piston.

2. Round off head of reverse blocker piston stop pin with a file, and pull pin out of bracket.

3. Remove reverse blocker spring and piston from bracket. Fig. 14-77.

b. Inspection

1. Inspect the bracket and crank assembly to see that the crank operates freely in the bracket without binding but does not show signs of unusual wear.

2. Check the crank roller for signs of unusual wear.

3. Inspect the crank pin which carries the roller to see that there are no visible cracks at the point where the pin joins the crank.

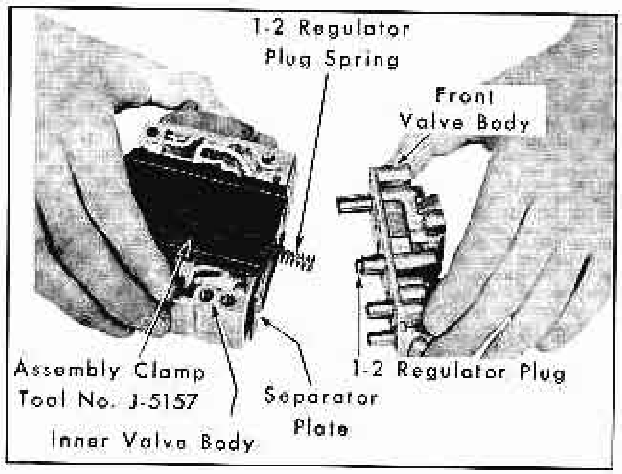


Fig. 14-76 Assembling Front to Inner Valve Body

HYDRA-MATIC DRIVE

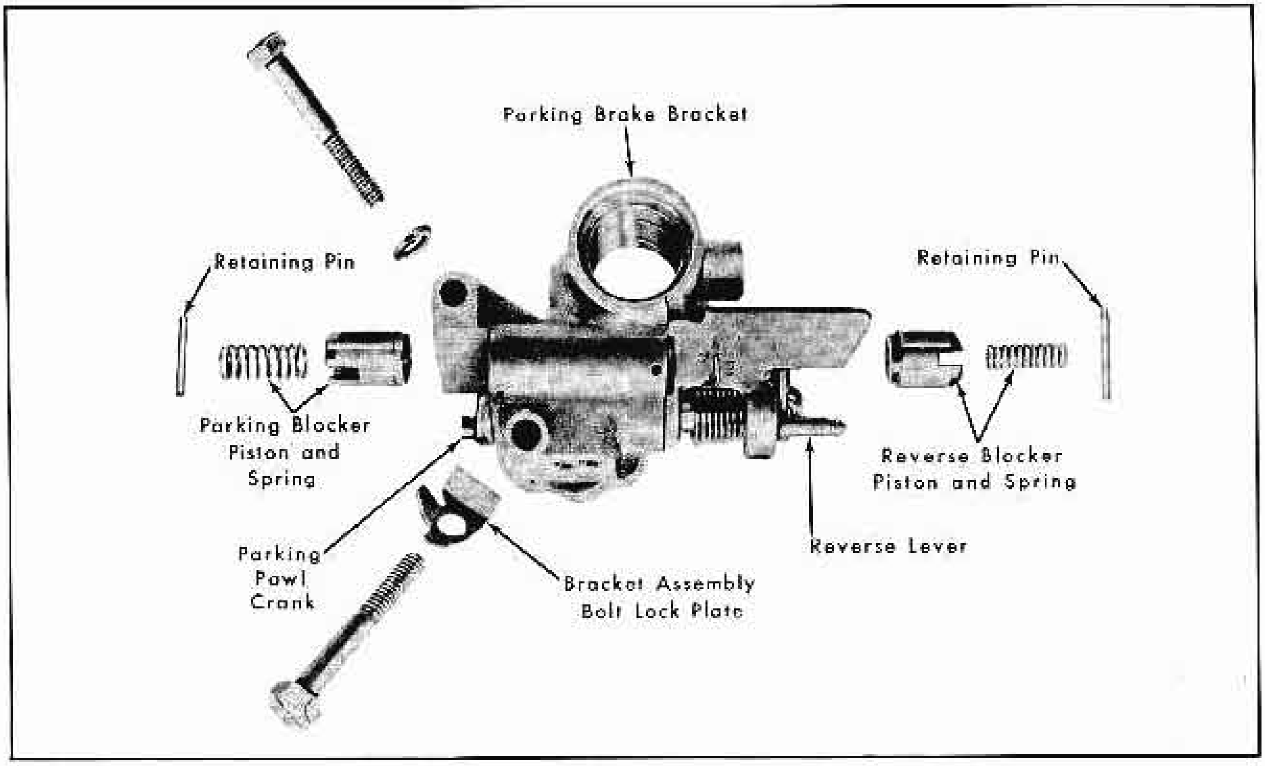


Fig. 14-77 Parking Brake Bracket - Disassembled

4. Clean and inspect the oil passages to the two blocker pistons in order to remove all dirt and any other obstruction.

5. Inspect the two blocker pistons and bores in the bracket to see that both are free of scores and burrs. Check the fit of the two blocker pistons in their respective bores to insure a non-binding, non-leaking fit. This can readily be done by placing one finger over the oil hole to the sleeve, pulling the piston outward, and observing if a slight vacuum is created.

6. Inspect parking pawl for cracks or signs of unusual wear.

7. Check oil delivery sleeve for score marks or excessive wear.

8. Check governor feed passage by inserting tag wire. Fig. 14-78.

9. Check to be sure center hole in governor oil delivery sleeve is plugged and that the plug is firmly staked in place.

10. Check blocker piston springs. Parking blocker piston spring should have a free length of approximately 1-1/16" and reverse blocker piston spring should be approximately 15/16".

11. Inspect mounting surfaces on bracket and case. Must be flat and smooth to maintain pressure.

12. Clean all parts thoroughly.

c. Assembly

1. Install reverse blocker piston with slotted end out. Install reverse blocker piston spring in reverse blocker piston and hold in with a screwdriver while installing blocker piston stop pin. Peen both ends of pin to lock in place.

2. Install parking blocker piston and spring.

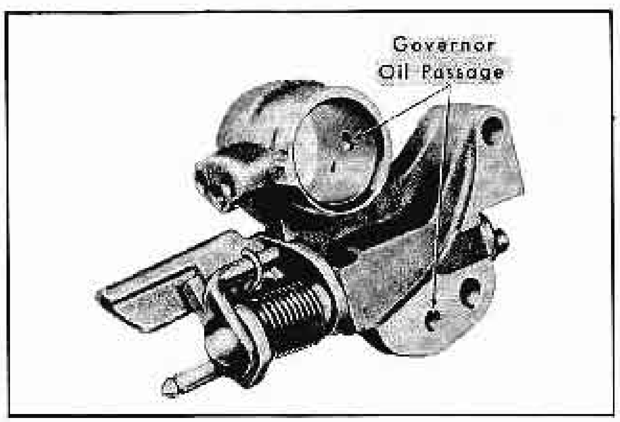


Fig. 14-78 Location of Governor Feed Passages

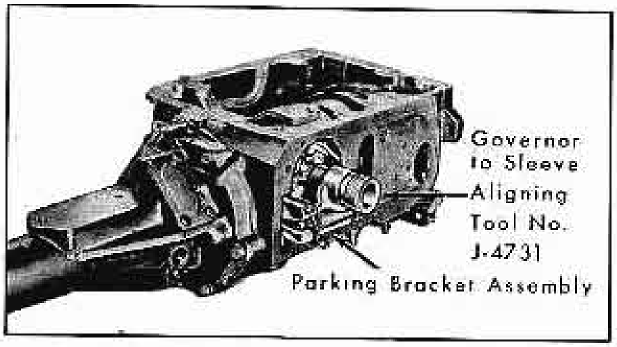


Fig. 14-79 Checking Governor Sleeve Clearance

3. Compress spring and install retaining pin.

NOTE: When assembling parking brake bracket assembly to the transmission case, be sure to use the blocker piston pin retainer. This retainer keeps the parking blocker stop pin in place, seals against oil pressure that may come through the bolt hole and locks the bracket to case bolt in place.

(28) Installation of Valve Body and Parking Brake Bracket Assembly

1. Remove parking brake pawl support bolt from case. This bolt was previously installed to insure alignment of threads.

2. Install parking pawl into position in case but let pawl slide down as far as possible. DO NOT INSTALL PARKING BRAKE PAWL SUPPORT BOLT.

3. Install two oil delivery pipes into the parking brake bracket assembly.

4. Place the chamfered side of the oil delivery sleeve over the end of the governor and press gently on, guiding rings into the oil delivery sleeve.

5. Start bracket to case screws into case.

6. Install roller on parking brake pawl crank, raise pawl to position and install parking brake pawl support bolt. Tighten bolt to 23-28 ft. lbs. torque. Bend lock plate over flat of bolt.

7. Install parking pawl return spring over inner oil delivery pipe and hook other end over parking brake lever pin.

8. Install reverse clutch pipe with "L" end in rear of transmission case.

9. Install control valve assembly over two oil delivery pipes and reverse clutch pipe and start screws. Press valve body and bracket assembly against case. Tighten valve body screws evenly. Torque valve body screws to 6-8 ft. lbs. Do not tighten bracket screws yet.

(29) Checking Governor to Sleeve Clearance

1. With Governor Alignment Tool No. J-4731 in place between governor and sleeve, Fig. 14-79, tighten the rear pump bolts and parking brake bracket screws. Tool should rotate freely and governor should rotate freely as much as gear backlash allows. Rotate output shaft to turn governor 1/4 turn and check governor and tool again for freeness. If governor or tool bind at any point, loosen bracket and/or rear pump and adjust to give governor free movement. Recheck governor each 1/4 turn for a complete revolution. If bracket cannot be adjusted to give free clearance for complete governor rotation it will be necessary to remove the governor and check the drive flange run out.

2. If governor to bracket bore bind exists, mark the position of governor body on drive flange. After control valve assembly and bracket assembly are removed, remove two bolts holding governor body to drive flange.

3. Locate dial indicator on transmission case so that spindle of indicator rests against face of flange, Fig. 14-65.

4. Rotate output shaft several revolutions and note runout of drive flange as measured on dial indicator. Runout should not exceed .002".

5. If runout of drive flange exceeds .002", correct condition by replacing one or all of the following parts: governor drive flange, gear set or complete rear oil pump assembly.

6. If the runout of governor drive flange is less than .002", rotate governor body 180 degrees from original position and reinstall governor body on flange. Recheck governor freeness in bracket.

(30) Installation of Pressure Regulator Assembly

CAUTION: Extreme care must be exercised to be sure that the rubber seal is not damaged when pressure regulator assembly is installed in case.

1. Remove all sharp corners and burrs from bore in case with a small hone.

2. Apply a small amount of grease on the new neoprene seal before installing pressure regulator assembly.

3. Install a new pressure regulator gasket with seam side toward threaded end of plug.

4. With pressure regulator valve, springs and plugs assembled, locate valve on seat in front pump.

5. Apply pressure on regulator plug and tighten in transmission case to 40-50 ft. lbs. torque.

6. Apply sealing compound (Permatex No. 3, Aviation Form-A-Gasket Cement) to threads of oil pressure line pipe plug and install plug between band adjusting screws using 7/16" six point socket.

(31) Installation of Side Cover and Outer Shift Lever

1. Place a new gasket on side cover and retain in place with petrolatum.

2. Position side cover and gasket assembly over manual shaft.

3. Install side cover attaching bolts with COPPER WASHERS finger tight. Shift cover to centralize manual shaft in hole and tighten bolts to 10-12 ft. lbs. torque.

4. Install outer shift lever. Tighten clamp bolt to 10-13 ft. lbs. torque.

(32) Installation of Transmission Oil Screen and Pan

1. Install oil screen and front pump intake pipe as an assembly.

2. Place new oil pan gasket on transmission case.

3. Position oil pan over gasket.

4. Start attaching bolts with lock washers to line up pan. Then tighten screws to 10-13 ft. lbs. torque.

5. Install new oil pan drain plug gasket and tighten plug to 35-45 ft. lbs. torque.

(33) Inspection of Torus Cover

1. Inspect inner and outer diameter of torus cover oil seal hub for score marks.

2. Place oil seal ring in bore of torus cover neck. Measure ring gap, using a feeler gage. Fig. 14-80. Maximum gap should be .010 inches.

3. Inspect grooved gasket surface for nicks or burrs. Two continuous ridges should appear on the sealing surface.

4. Inspect the splines of hub for wear or damage.

5. Check torus cover hub runout as follows:

a. Assemble the torus cover to the flywheel, without a gasket, using four screws evenly spaced.

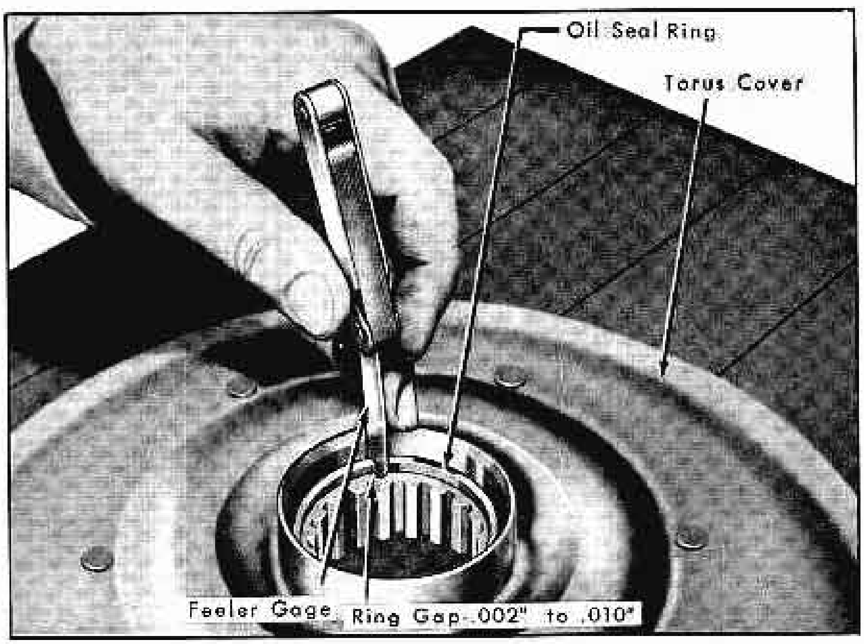


Fig. 14-80 Measuring, Front Cover Ring Gap

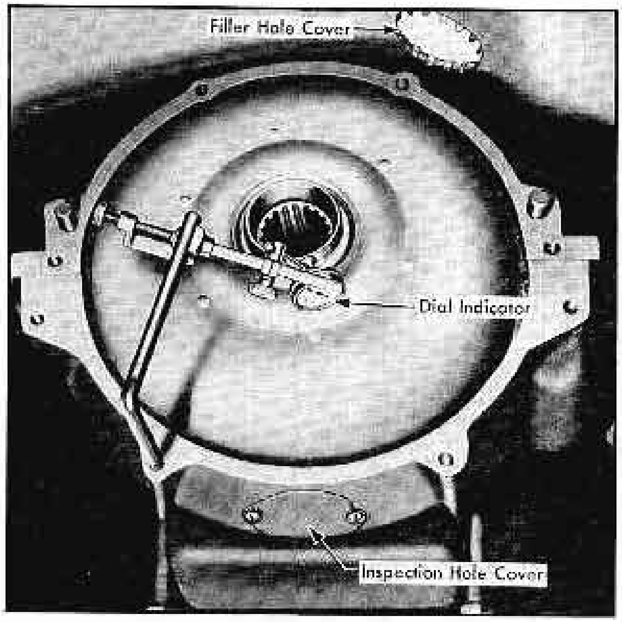


Fig. 14-81 Flywheel Cover Hub Runout

b. Attach Dial Indicator, Tool No. KMO-30 to an arbor fastened to the crankcase and locate bottom on cover hub. Fig. 14-81.

c. Rotate the flywheel and observe the runout which must not exceed .005".

d. If runout exceeds .005" and flywheel runout (see below) does not exceed .005", replace torus cover.

(34) Inspection of Flywheel

1. Inspect the sealing surface which bears against the torus cover to flywheel gasket for nicks or burrs.

2. Inspect the flywheel gear teeth for damage.

3. Check flywheel runout with the dial indicator mounted so the stem will contact the sealing surface just inside the row of torus cover bolt holes. Flywheel runout should not exceed .005" total reading.

(35) Installation of Rear Flywheel Housing and Torus Member

1. Position transmission case to rear flywheel housing gasket against face of transmission.

2. Position rear flywheel housing on front of transmission, and install attaching bolts and lock washers. Tighten to 40-50 ft. lbs. torque.

3. Install torus covers on splines of front drive gear. Push on cover evenly, without rocking, to prevent damage to oil seal and rings.

4. Install drive torus member on splines of intermediate shaft and install snap ring, using Snap Ring Pliers, Tool No. KMO-410. Fig. 14-82.

NOTE: Torus hubs are a hand push fit on the transmission shafts. Do not use force to assemble. If they stick, remove and examine for nicks and burrs.

5. Install check valve spring, valve and driven torus member on mainshaft against mainshaft snap ring.

NOTE: Use extreme care when installing driven torus member to avoid damaging hub and check valve.

6. Move shift lever (inner) into reverse position.

7. Install a new mainshaft nut lock plate with ear over flat on torus hub and install mainshaft nut (1-1/2" socket). Tighten to 30-35 ft. lbs. torque.

8. Bend lock plate up against nut.

(36) Installation of Hydra-Matic Transmission in Car

1. Be sure face of flywheel and grooves are thoroughly cleaned.

2. Place a new gasket on face of flywheel and retain in place with grease. Do not use shellac or other types of sealers that harden or flake.

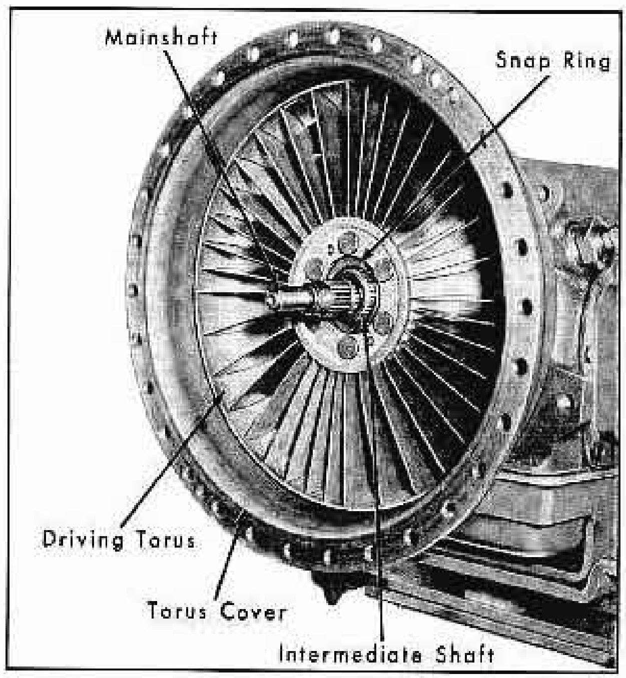


Fig. 14-82 Driving Torus Installed

NOTE: It is very important that gasket be in perfect condition, free from creases, and fitting properly; that flywheel and torus cover mounting faces be free of nicks or burrs; and that a good seal be made to prevent any possible leaks at this point.

3. Slide transmission under car. Raise into position carefully with Hydra-Lift making sure that dowel pins in crankcase enter holes in flywheel housing without cocking and that transmission mainshaft pilots into crankshaft pilot bearing.

4. Position flywheel with large dowel at top and smaller dowel at bottom. Start torus cover over top dowel being sure that large dowel hole in cover is over large dowel and smaller dowel hole in cover is over smaller dowel.

CAUTION: If cover is not installed correctly with respect to dowels the torus cover will be distorted and leak fluid. The large dowel hole and large dowel are identified by a daub of yellow paint.

5. Install and tighten securely screws holding flywheel housing to crankcase, using a torque wrench and tightening to 45-50 ft. lbs.

6. Install one torus cover screw adjacent to each dowel pin in flywheel and tighten until just snug. Install two more screws 90° from these screws and tighten until just snug. Then install remaining torus cover screws and tighten all screws consecutively to 40 ft. lbs. Retighten after running engine to 3500 R.P.M. This method of tightening will assure evenly applied pressure to prevent leaks.

7. Be sure drain plugs in torus cover and oil pan are tight.

8. Install flywheel lower cover.

9. Lift engine to about one inch above its normal height, using a jack with wooden block under engine and not the Hydra-Lift. (Lift is not designed to lift weight of entire engine.) Remove Engine Support Stand, Tool No. J-3068.

10. Install bracket that carries engine rear support, lower engine, and connect support.

11. Install slush deflector to flywheel housing.

12. Install transmission fluid filler tube in oil pan.

13. Install universal joint sliding yoke with propeller shaft on transmission output shaft.

14. Connect rear universal joint, using new lock plates.

15. Connect speedometer cable.

16. Install starter and spark plugs.

17. Install throttle and manual levers, making sure serrations in levers line up with serrations on shaft and are tightened securely. Adjust throttle and manual linkage as explained in Notes 2 and 3.

18. Lower car to floor.

19. Fill transmission with approximately 11 quarts of Cadillac Hydra-Matic Fluid, in accordance with procedure given in Note 2b. Add fluid if necessary to bring level to "Full" mark.

(37) Removal and Disassembly of Manual Controls

1. Remove steering gear assembly as explained in Section 7.

2. Remove directional signal lever and pull 6 feed wires out of connectors. Remove 4 cross head screws holding directional signal switch assembly to upper bearing retainer and lift switch wires and housing off. Remove selector lever and anti-rattle spring.

3. Disconnect wires for indicator light.

4. Remove three cap screws holding upper bearing retainer to jacket.

5. Disconnect manual control rod from shift lever.

6. Remove long screw from lever and remove dust seal.

7. Remove clamp bolt from lever and slide retainer, carrier and shift tube out of steering jacket.

8. Remove neutral switch from steering jacket.

9. Remove shift lever from slot in steering jacket.

10. Remove two washers, felt seals, split composition bushing, and lower ring from slot.

11. Remove 2 screws holding selector indicator to carrier and remove indicator.

12. Remove bearing from carrier.

13. Remove retainer from carrier.

(38) Assembly and Installation of Manual Controls

1. Apply lubriplate to the threads and stop plate. Screw bearing and retainer into carrier assembly approximately 4-1/2 turns until the top face of the retainer is 21/32 inches above the shoulder on the rim of the carrier.

2. Install washer and composition bushing in slot in steering jacket with the counterbore in bushing toward lower end of steering jacket and split in bushing on bottom side.

3. Apply lubriplate on inside surface of bushing.

4. Saturate felt seals with engine oil and install seals and washers above and below slot in jacket.

5. Install lower shift lever.

6. Install shift tube and carrier in steering jacket and through felt seals, washers and shift lever, being sure shift tube notch is located in groove in lever.

7. Install pinch bolt in lever and tighten to 14-18 ft. lbs. torque.

8. Install bearing retainer to jacket bolts and tighten 7-9 ft. lbs. torque.

9. Install shift indicator and lamp.

10. Install anti-rattle spring, selector lever and pivot pin after it has been lubriplated.

11. Install directional signal switch and wires through steering jacket and install 4 cross head screws.

12. Install steering gear. See Section 7.

13. Connect manual control rod to lower shift lever.

14. Install neutral switch on steering jacket and adjust position of switch so that switch is off when transmission manual valve is in a position to move the car when the car is started.

CAUTION: Do not move the neutral switch so far in the neutral direction that the travel of the lower lever in the reverse position is limited by the switch arm.

15. Install steering wheel and horn ring as explained in Section 7.

(39) Installation of Gear Shift Knob

When it is necessary to replace the gear shift knob the knob should be placed in a pan of water heated to 120-130°F. and left there for a few minutes. The knob should then be removed, pressed on the lever, and tapped solidly with a rubber mallet.

OTHER NOTES AND REFERENCES

HYDRA-MATIC DRIVE

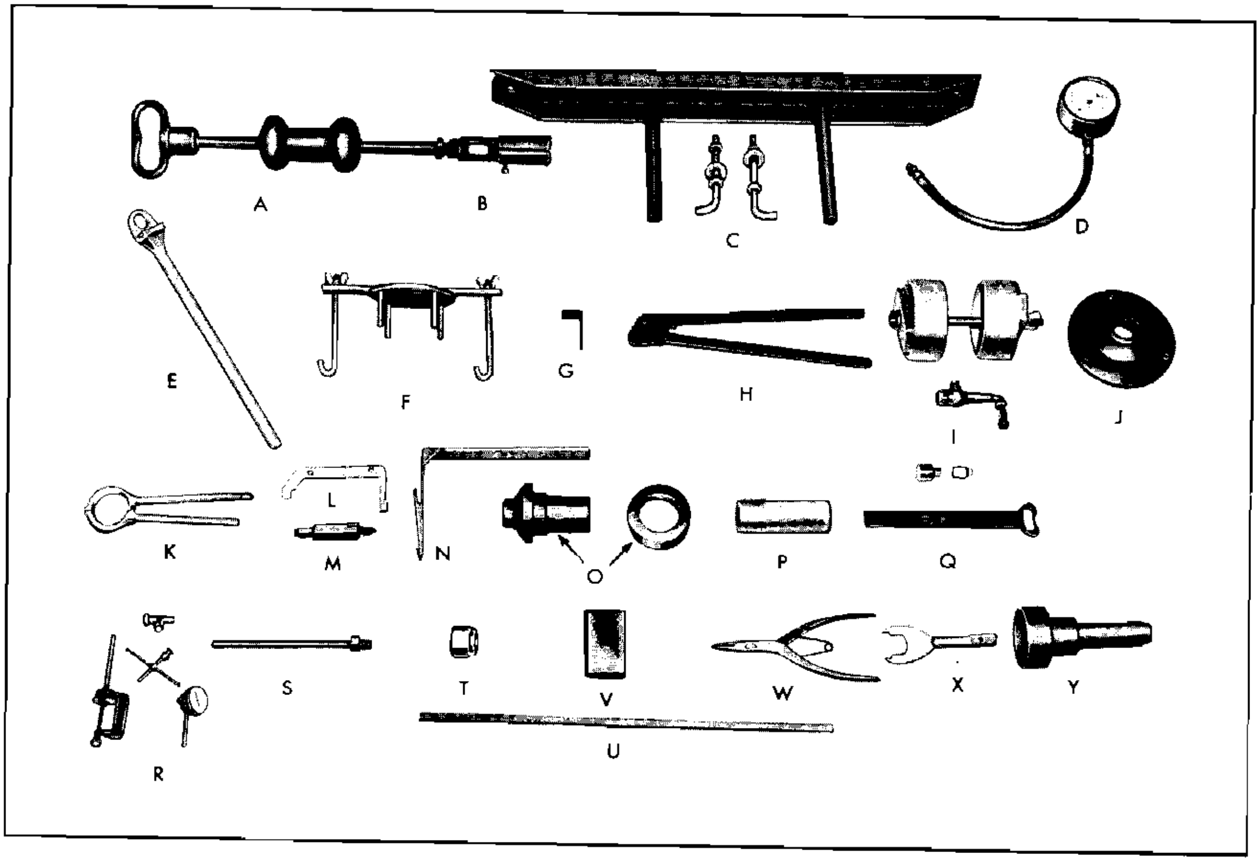


Fig. 14-83 Hydra-Matic Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-2619-A	Slide Hammer	O	J-1776-A	Front Pump Cover Oil Seal Installer
B	J-2623	Ext. Housing Oil Seal Remover Collet	P	J-2587-B	Transmission Mainshaft End Play Gauge
C	J-3068	Engine Support Fixture	Q	J-2184-A	Front Pump Holder and Socket
D	J-2540-A	Pressure Checking Gauge		J-2184-1	Holder
E	J-1459-A	Drum Holder		J-2184-2	Socket
F	J-4670-A	Clutch Spring Compressor	R	KMO-30	Dial Indicator Set
G	J-2174	Rear Clutch Hub Retainer Bracket	S	J-1465	Mainshaft End Play Dial Indicator Extension Rod
H	J-2029	Throttle Lever Bending Tool	T	J-4731	Governor to Sleeve Aligning Tool
I	J-4353-5	Clutch Piston Actuator	U	J-4752	Piston to Drum Installing Tool
	J-4535-1	Blow Gun	V	J-5157	Regulator End Casting Assembly Clamp
J	J-2187	Front Planet Carrier Assembly Holder	W	KMO-410	Snap Ring Pliers
K	J-1537	Oil Delivery Sleeve Ring Compressor	X	J-2182	Transmission Bearing Retainer Remover
L	J-5071	Rear Servo Gauge	Y	J-1942-A	Extension Rear Oil Seal Installer
M	J-1693-A	Front Servo Gauge			
N	J-3065-A	Throttle Lever Checking Gauge			

SPECIFICATIONS

Subject and Remarks	All Series
FLYWHEEL COVER AND TORUS ASSEMBLIES	
Flywheel Cover, maximum runout of hub	0.005"
Backlash between splines of cover and front unit drive gear	0.001" to 0.004"
Torus members, maximum runout of face	0.015"
Drive Gear backlash between gear and planetary pinions	0.005" to 0.008"
Planet Carrier Pinions, end play	0.005" to 0.026"
GOVERNOR ASSEMBLY	
Maximum runout of governor sleeve	0.005"
Maximum runout of governor drive flange face	0.002"
REAR OIL PUMP	
End play of gears	0.001" to 0.004"
Backlash of gears	0.006" to 0.010"
Mainshaft, end play	0.004" to 0.018"
REVERSE ASSEMBLY	
End play of planet carrier pinions	0.005" to 0.026"
Backlash of internal gear pinions	0.008" to 0.012"
OUTPUT SHAFT ASSEMBLY	
Backlash of pinions	
Internal Gear	0.0006" to 0.0008"
Sun Gear	0.0003" to 0.0005"
End Play of pinions	0.0005" to 0.026"

TORQUE TIGHTNESS

Application	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Band adjusting screw lock nut	1/2-20	40	50
Extension housing to case	3/8-16	28	33
Extension housing to reverse unit support	3/8-16	28	33
Flywheel to crankshaft	7/16-20	80	85
Front cover retaining screws	5/16-18	10	13
Front oil pump cover to body	1/4-20	12	15
Front servo assembly	1/4 pipe	6	7
Front servo body plug	1/8 pipe	6	7
Front servo body to cylinder	1/4-20	6	8
Front servo to case	3/8-16	23	28
Governor body to drive flange	1/4-20	6	8
Governor bushing retainer to governor body	10-24	3	4
Internal gear to rear drum	10-24	3	4
Lever, shift on transmission	5/16-24	18	22
Lever, shift on tube	5/16-24	14	18
Mainshaft, retaining nut	7/8-16	30	35
Manual lever clamp screw	5/16-24	10	13
Oil pan to case	5/16-18	10	13
Oil pan drain plug	5/8-18	35	45
Oil pressure take-off at case	1/8 pipe	15	18
Outer valve body to inner body	10-24	3	4
Pressure regulator valve plug	1-1/16-16	40	50
Rear oil pump to case	5/16-18	15	18
Rear pump cover to body	1/4-20	6	8
Rear servo to case	3/8-16	23	28
Reverse unit drive flange to rear unit drum	5/16-18	10	13
Shifter bracket to case	5/16-18	15	18
Side cover to case	1/4-20	10	12
Throttle lever clamp screw	1/4-28	10	12
Torus cover to flywheel	3/8-24	--	45
Torus cover drain plug	1/8 pipe	6	7
Valve body to case	1/4-20	6	8

Band Adjustment — External Method

Before adjusting either front or rear band, set car hand brake, then chock wheels, making certain car does not move during adjustment.

To expose floorboard access cover over band-adjusting screws, remove accelerator pedal and lift floor mat on left (driver's) side. Remove access cover. Start engine. Run until normal operating temperature is reached.

Connect electrical tachometer.

For car models up to and including 1951, place Shift Lever in Low Range. For 1952 and later models, place Shift Lever in Drive Range.

Adjust carburetor idle screw until tachometer reads 700 RPM.

Adjustment of Front Band

1. Insert Wrench End of Band Adjusting Tool in floorboard access hole (Fig. 4). Place Outer Socket over adjusting-screw lock nut. Engage adjusting screw by slowly rotating finger-grip Adjustment Knob until Inner Socket is seated.

Fig. 4. Adjusting bands external method

2. Holding Adjustment Knob stationary, loosen lock nut by turning Wrench Handle in counter-clockwise direction.

3. Turn Adjustment Knob slowly in counter-clockwise direction, loosening adjusting screw, until engine speed reaches 900-1000 RPM.

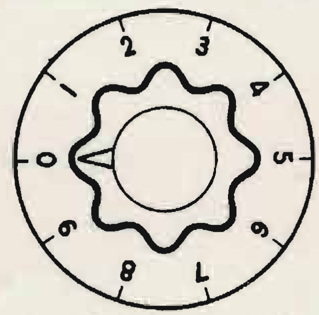


Fig. 5. Indicator dial

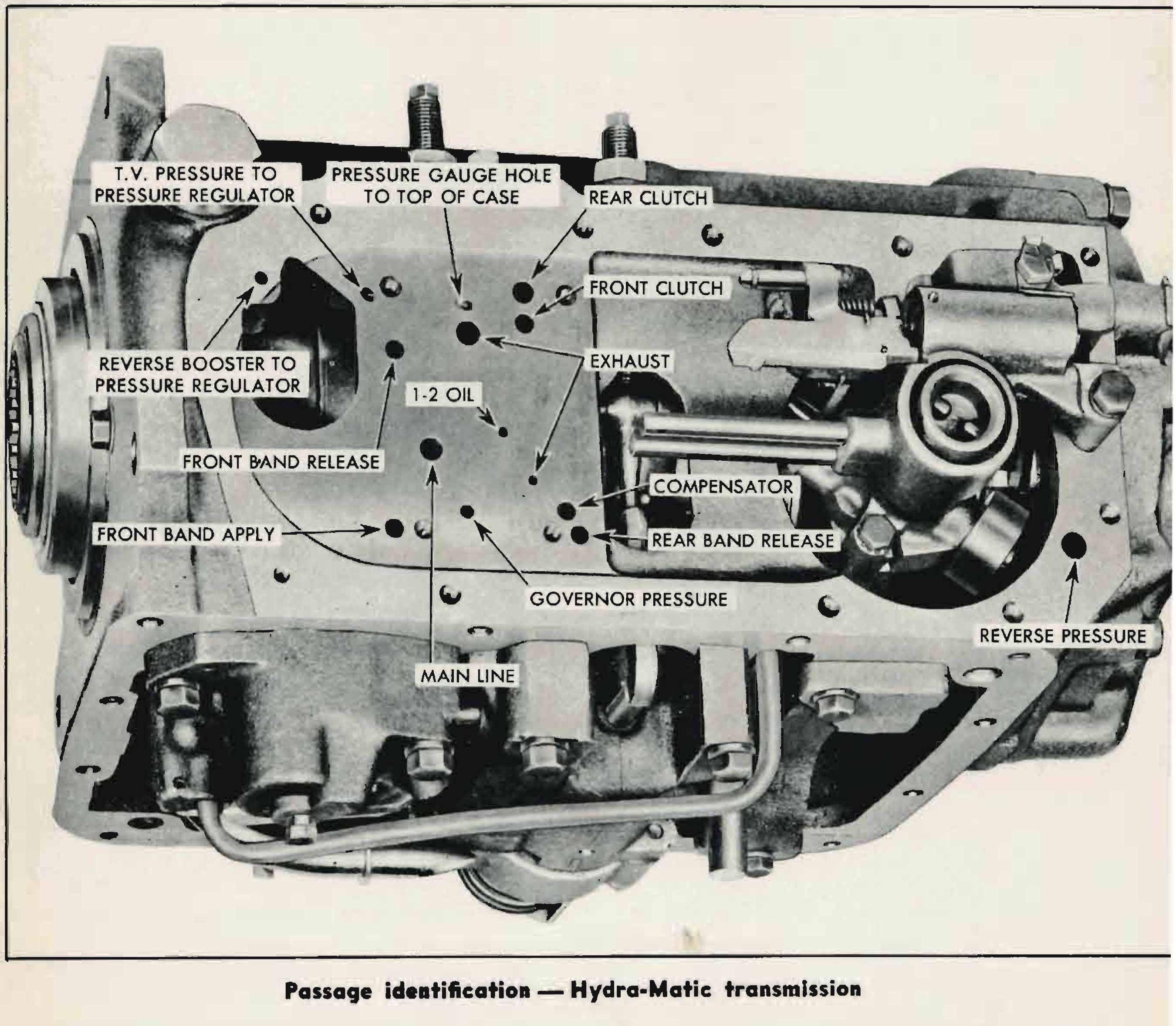
4. Reduce engine speed to exactly 700 RPM by slowly retightening adjusting screw. Observe tachometer for 30 seconds. If tachometer reading creeps up beyond 700 RPM, tighten adjusting screw 1/10th of a turn (one marking on Indicator Dial) and again observe tachometer. Continue this process until tachometer reading remains at 700 RPM for 30 seconds.

5. Without turning Wrench Handle or Adjustment Knob, rotate Indicator Dial until Zero mark is directly under arrow pointer (Fig. 5).

6. For car models up to and including 1951, hold Wrench Handle stationary and tighten adjusting screw 6½ turns by rotating adjustment knob in a clockwise direction. For 1952 and later models, tighten adjusting screw 7-7/10th turns.
7. Holding adjustment Knob stationary, tighten lock nut.

Adjustment of Rear Band

1. Repeat operations 1 through 5, as in front-band adjustment procedure.
2. Place Shift Lever in Neutral position.
3. Hold Wrench Handle stationary and tighten adjusting screw 2 turns by rotating Adjustment Knob in a clockwise direction.
4. Holding Adjustment Knob stationary, tighten lock nut.
5. Re-adjust carburetor for proper engine-idling speed.



Passage identification — Hydra-Matic transmission

CHASSIS ELECTRICAL

TABLE OF CONTENTS

GENERAL INFORMATION

"Sealed Beam" headlights are used on all 1954 series cars. The filament, reflector, lens, and gasket in these lights are all assembled in one sealed unit. When a filament burns out or a lens is broken, the entire unit is discarded and a new one installed. This assures maximum lighting efficiency throughout the entire life of the lamp and simplifies maintenance. The headlamps provide two separate beams, selected by a foot switch:

1. A country (upper) beam, which illuminates the road evenly for a considerable distance ahead of the car.

2. A traffic (lower) beam, which is low enough on the left side of center of the road to avoid glare in the eyes of oncoming drivers.

The "Sealed Beam" reflector unit is mounted on a sub-body within the lamp housing and is held to the housing by two coil springs and adjusting screws. With this type of mounting, the horizontal light beam adjustment can be made without disturbing the vertical light beam setting, and vice-versa.

Back-up lights, which are installed in the tail lamp on all 1954 models, operate when the ignition switch is turned on and the shift lever is in the reverse position.

A map light is located under the instrument panel overhang directly over the radio dial. It is manually controlled by a switch at the light. On sedan models it is also automatically operated by a switch on each front door hinge pillar. It serves, therefore, as a courtesy light when either front door, on these models, is opened.

On coupe style bodies, the dome light serves as a courtesy light when either front door is opened. The map light must be operated manually.

The front parking and directional signal lights located in the radiator grille incorporate a double filament bulb. The double filament bulb consists of a 3 c.p. filament which is operated by the first position of the headlight switch when parking lights are desired, and a 21 c.p. filament which is operated by the directional signal switch to indicate a right or left turn.

The directional indicator control lever is mounted on the left side of the steering column. When the lever is actuated for a right or left turn, the corresponding front and rear directional signal light and dash indicator light will flash on and off when making the turn. At the same time, a clicking noise made by the flasher unit will be heard to indicate that the system is operating.

CHASSIS ELECTRICAL

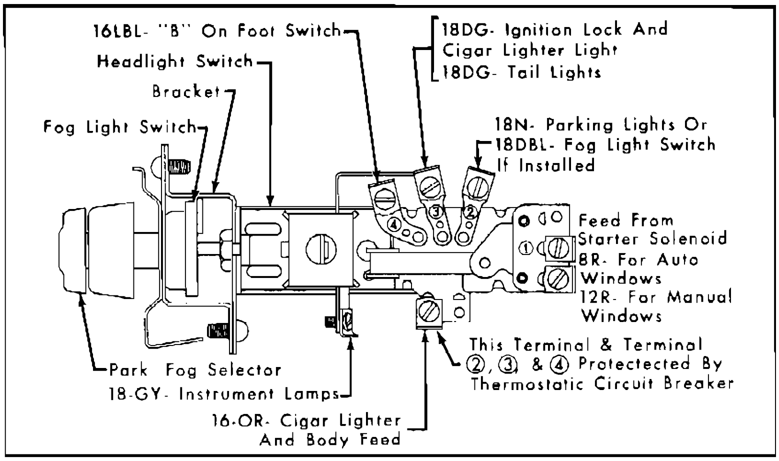


Fig. 15-1 Headlamp Switch

The 1954 clock is a spring driven, electrically wound type. The clock winds every three or four minutes, but draws only a few amperes for a fraction of a second each time it winds.

The headlight control switch, Fig. 15-1, is located on the instrument panel at the left of the instrument cluster. In addition to the headlights, it also controls operation of the parking lights, instrument panel lights, and fog lights on cars so equipped.

The parking lights come on as the knob is pulled half way out. The headlights operate when the knob is pulled all of the way out. The instrument panel lights are on when the knob is in either position. They can be turned down in intensity or "OFF" by rotating the knob to the right. Fog lights, on cars so equipped, are turned on by pulling the headlight knob to the halfway position and turning the fog light control switch, located directly behind and concentric with the headlight knob, to the right.

Twin air-tone horns of the "sea shell" type, matched in tone, are used on all series cars. They are mounted between the radiator and radiator grille on brackets on the radiator support and are positioned so that they face each other. The horn ring, when depressed, permits a small current to pass through a relay mounted on the engine side of the dash. This current closes the circuit for the heavier current that operates the horns.

The starter switch is combined with the ignition switch which is located just below the right side of the instrument cluster, and enables the driver to start the car by turning the key to the right against spring tension to energize the starter solenoid. When the engine is started, releasing the key will permit it to return to the "ON" position. The key may be turned to the left to permit the use of accessories with the ignition "OFF".

The instrument cluster on all 1954 Cadillac cars feature the "telltale" type of oil pressure and generator indicators. These indicators light up to warn the driver that the oil pressure or the generator charging rate are below normal when the engine is operating at speeds above idle.

The parking brake warning light, with the word "BRAKE" stamped on the lens, lights up when the ignition switch is turned "ON" if the hand brake is in the "ON" position. This will caution the driver to release the hand brake before moving the car.

A fuse panel is mounted under the instrument panel on the cowl insulating board just to the left of the center line of the car. The heater, radio, directional signal, back-up light, and windshield washer circuits have their fuses located on this panel. Fig. 15-2. In addition, the directional signal flasher unit is mounted on the fuse panel.

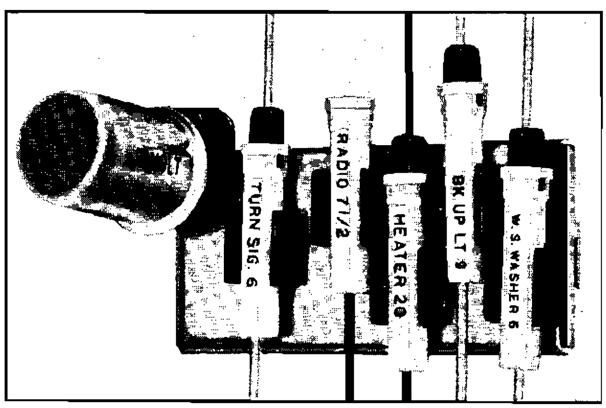


Fig. 15-2 Fuse Panel

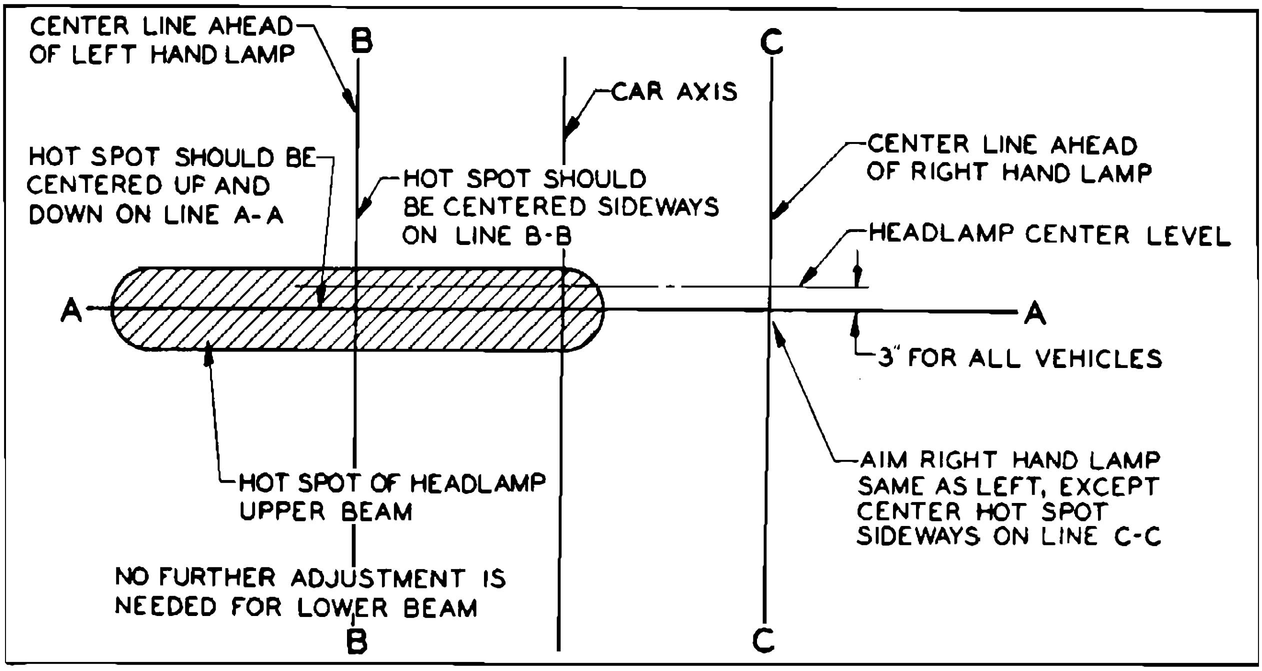


Fig. 15-3 Headlamp Aiming Diagram

SERVICE INFORMATION

(1) Headlamp Aiming Adjustments

Independent adjustment of both horizontal and vertical aim is provided in "Sealed Beam" headlamps. The adjustment screws are accessible from the front of the lamp after first removing door rim.

If a headlamp aiming screen is to be used in the service station, it should be marked according to the following dimensions (refer also to Fig. 15-3).

	Distance Between Lamp Centers	Lamp Centers to Ground
54-62,60S	63"	30-3/8"
54-75	63"	31"
54-86	63"	32-9/32"

To make the adjustment:

1. Turn on lights and set foot control to produce the country (upper) beam.

2. Place car so that headlamps are 25 feet from screen.

3. Bounce car to normalize springs.

4. Cut two sticks to "A" length. Fig. 15-4.

5. Sight over sticks as shown in Fig. 15-4 to locate headlamp center level on screen.

6. Sight through rear window and line up hood ornament and moulding to locate car axis on screen.

7. Remove headlamp door.

8. Cover one lamp and then adjust beam from other lamp both up and down, and sideways, Fig. 15-5, as required until center of zone of highest intensity falls on the intersection of the horizontal line (3 inches below the headlamp center) and the vertical line directly ahead of lamp. Fig. 15-3.

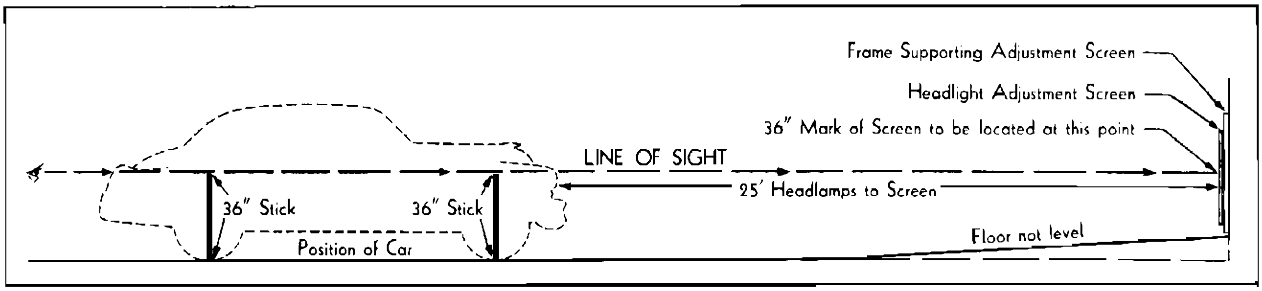


Fig. 15-4 Locating Headlamp Aiming Screen

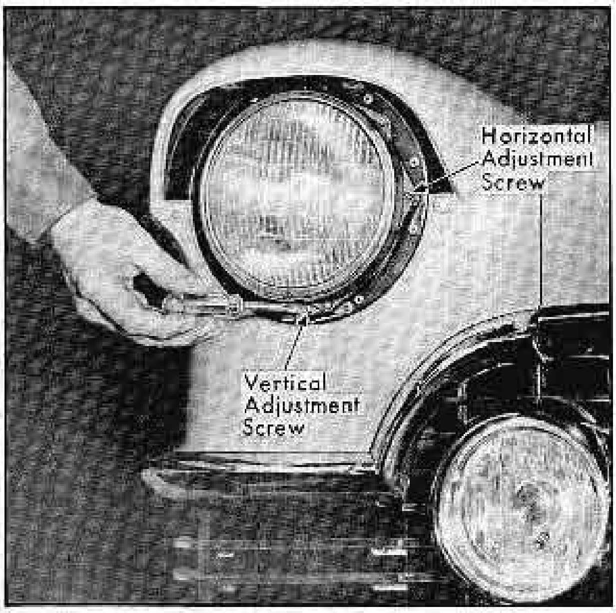


Fig. 15-5 Sealed Beam Aiming Adjustments

(2) Replacement of Headlamp Unit

Two types of "Sealed Beam" headlamp units are used. One is made entirely of hard glass, and the other is a composite unit consisting of a metal reflector and a glass lens. Both are completely interchangeable from the standpoint of electrical connections, beam patterns, and physical dimensions. Furthermore, they are so designed that they cannot be installed improperly, nor connected incorrectly. The same unit is used in both right and left hand headlamps. To replace a unit:

1. Remove three headlamp door rim screws, and remove rim by pulling out at top.
2. Remove three screws holding retaining ring.
3. Remove retaining ring and sealed beam unit.
4. Remove connector plug from sealed beam unit.
5. Install new unit by reversing above operations.

(3) Replacement of Bulbs

The complete list of replacement bulbs required for the 1954 series cars is given in the bulb chart, Page 15-13. Procedures for making bulb replacements are as follows:

a. Parking or Front Signal Lamps (Standard Lamps)

Remove the two lamp door retaining screws from front of lamp and remove the bezel and lens. Replace the bulb and install retaining parts. Both right and left lamps are interchangeable as to lens and other parts. The lens has no special top and bottom position.

NOTE: The lamp body itself must always be installed with the feed wire outlet on the bottom side of the lamp.

b. Rear Lamps

Remove the lucite lens after taking out two screws, one at the top and one at the bottom. The lamp contains one 32-4 c.p. bulb, which constitutes the tail light, stop signal, and directional signal light.

c. License Plate Lamps

Remove the two screws, retainer, and lens in the lamp assembly which is located in the rear bumper guard.

d. Instrument Lamps

CAUTION: Before doing any work behind the instrument panel, always disconnect the negative terminal from the battery to prevent accidental shorting of the 12 volt wiring.

To replace bulbs in the instrument cluster, it is necessary to remove the instrument panel cover as described in Section 3, Note 1. When replacing bulbs on the left side, remove the defroster duct at the cowl. After replacing instrument bulbs, (see Fig. 15-6 for correct location) check their operation to make sure they are in their proper places.

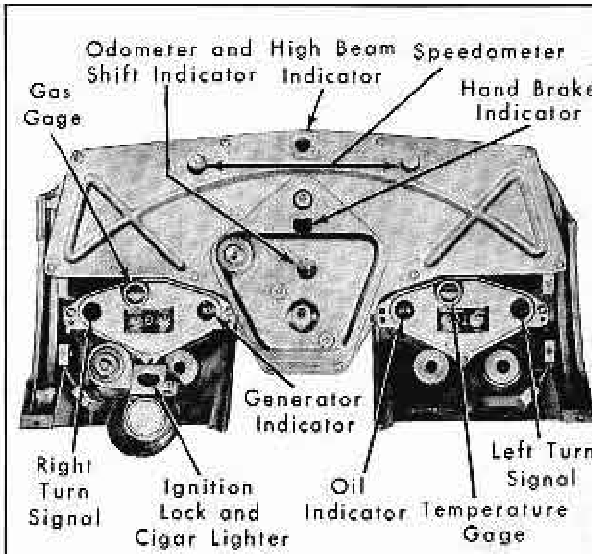


Fig. 15-6 Instrument Bulb Location

e. Map Light

The map light bulb can be removed by removing the two screws from the lens and removing the lens.

f. Back-Up Lights

Remove the retaining screws, sleeves, and lens. Replace bulb and retaining parts in reverse order of removal.

(4) Operation of Directional Signal Indicator

The directional indicator control lever is mounted on the left side of the steering column, and the switch is located below the steering wheel hub. The flasher unit and fuse are mounted on the fuse panel assembly on the dash, and the connectors are on a bracket just above the hand brake handle. The circuit diagram of the system is shown in Fig. 15-7.

When a right turn is to be signalled, the control lever is moved upwards, and the signal filament 21 cp in the right front parking lamp bulb and the 21 cp filament in the right rear lamp begin flashing, as does an arrow shaped indicator lamp in the right portion of the speedometer face. When a left turn is to be made, the lever is moved downward and the left lamps and the indicator flash. After the turn is completed, the return of the steering wheel to the straight ahead position automatically turns off the signal.

The automatic turn-off is achieved by means of a pair of pins, intergral with the steering wheel, and a special ratchet. When steering wheel is turned in the direction for which the control is set, the pin passes over the cam without engaging, but when the wheel is turned in the opposite direction, the pin engages the cam and turns off the signal.

When the signal system is operating properly, the lights flash about 90 times per minute. If either front or rear signal bulb burns out, the reduced current in the circuit will double the flashing speed of the remaining bulb. If a rear bulb is burned out, both indicator bulbs will flash in unison at approximately double speed and at very low brilliance. If a front bulb is burned out and the signal switch is set to indicate a turn on the side of the burned out bulb, the action will be the same as above. If the switch is set to indicate a turn on the opposite side from the burned out bulb, the front and rear signal lights will operate correctly but the indicator bulbs will not operate at all. If both signal bulbs are burned out, the indicator bulbs will not light.

In addition to the indicator lights, a clicking noise in the flasher unit makes an audible signal when the circuit is on. This is purposely created as an additional warning that the signal is operating, and flashers should not be replaced for this noise.

The signal flasher is a sealed unit and is non-adjustable. If inoperative, it must be replaced.

(5) Removal and Disassembly of Directional Signal Switch

1. Disconnect signal switch wires at connectors under dash where wires come out of steering column cover.

2. Disconnect horn wire from connector at lower end of steering column.

3. Press down on horn button, turn, and remove button and spring.

4. Remove steering column nut and horn ring retainer.

5. Remove horn ring.

6. Remove directional signal switch by unscrewing it from carrier housing.

7. Remove the steering wheel using Puller, Tool No. J-1859, as described in Section 7, Note 8.

8. Remove two screws holding the directional signal carrier to the shift lever carrier.

9. Attach a cord or wire to the directional signal switch wires so that when the wires are pulled out of the steering cover, the cord or wire can be used to pull them back down into position.

10. Pull the carrier with switch and wires out of steering column cover and remove cord from wires. Tie cord to shift lever so that it will not slip back out of column.

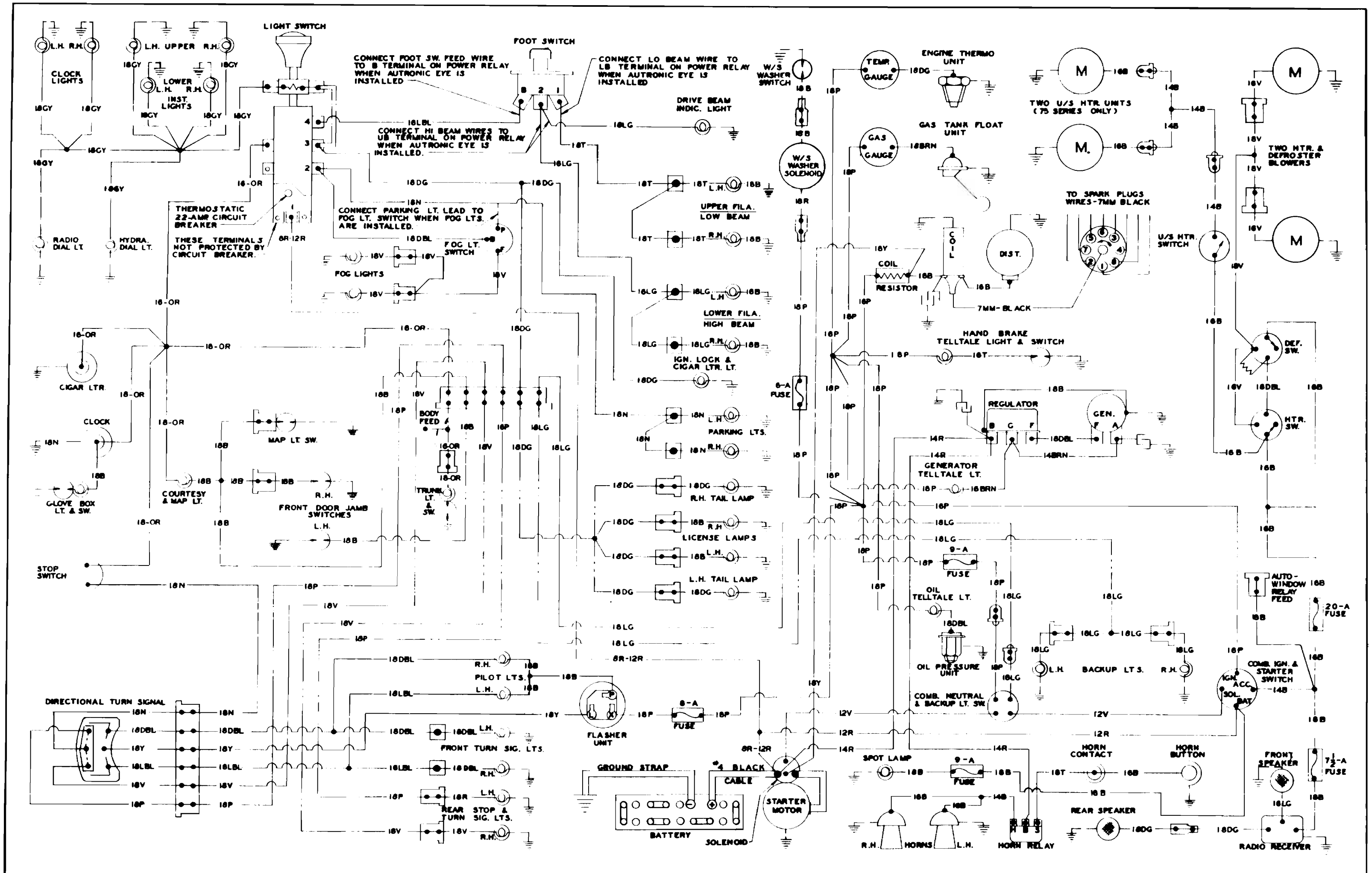
11. Remove switch cable clamp from carrier and remove switch back screws from carrier.

12. Remove switch back and wires from switch carrier assembly.

(6) Assembly and Installation of Directional Signal Switch

1. Install switch back with wires in switch carrier assembly and install two attaching screws.

2. Install switch cable in clamp.



WIRE IDENTIFICATION

N-NATURAL	V-VIOLET	DBL-DARK BLUE
B-BLACK	Y-YELLOW	LBL-LIGHT BLUE
R-RED	OR-ORANGE	DG-DARK GREEN
T-TAN	GY-GRAY	LG-LIGHT GREEN
P-PINK	BRN-BROWN	

SYMBOLS

- BULB
- BAYONET TYPE CONNECTOR
- DOUGLAS CONNECTOR
- LOCK-ON TYPE CONNECTOR (PACKARD)
- LOCK-ON TYPE CONNECTOR (WADE)
- TERMINAL BLOCK CONNECTOR
- MULTIPLE CONNECTOR
- BODY WIRING
- INTERNAL GROUND

Fig. 15-7 Circuit Diagram

3. Connect upper end of cord to switch wires and pull wires down through steering column cover and through opening in lower end of cover. Remove cord from wire.

4. Install carrier in position and install two screws.

5. Install steering wheel, aligning mark on steering wheel with mark on steering shaft.

6. Position horn ring over steering wheel, install large washer and steering wheel retaining nut. Tighten nut to 45 to 50 ft. lbs. torque.

7. Install horn button spring and horn button, being sure emblem is in correct position.

8. Connect directional signal wires at their proper connectors.

9. Connect horn wire at lower end of steering column.

(7) Removal and Installation of Tail Light Assembly

a. Removal

1. Disconnect tail light and back up light wires at their connectors inside the trunk.

2. Remove back up light lens.

3. Remove four screws that hold tail light assembly to fender.

4. Remove assembly, feeding wires through grommet in fender. Remove tail light wire from clip.

b. Assembly

1. Install tail light assembly, feeding wire through grommet.

2. Connect wires at their connectors inside trunk.

NOTE: On left hand tail light, wire should be positioned in the clip so that wire will flex smoothly when lamp is raised or lowered.

3. Install four screws that hold assembly to fender.

4. Install back up light lens.

(8) Installing Electrical Accessories

When installing additional electrical equipment, such as heaters or auxiliary lights, they should ordinarily be connected to the accessory terminal on the ignition switch or the accessory terminal on the light switch.

Cadillac Fog Lights should, however, be connected to the parking lamp terminal on the lighting switch, and Spot Light to the battery terminal on the ignition switch.

If the owner installs so much electrical equipment to the protected terminals of the light switch that the total normal load causes the circuit breaker to vibrate, it will be necessary to connect some of the equipment to the unprocted side of the light switch. Equipment so connected will not have circuit breaker protection.

(9) Gasoline Gauge Service

The first thing to do when checking a gasoline gauge is to determine whether the unit wiring is at fault. To check for a defective tank unit, disconnect dash unit to tank unit wire at tank unit and connect red lead on AC Gasoline Gauge Tester, Part No. 1516000, to wire from dash unit. The tester black lead should be grounded. See Fig. 15-8.

With ignition switch "On", the tester arm should be moved from "full" to "empty" position. If dash unit then works correctly, tank unit is at fault. A

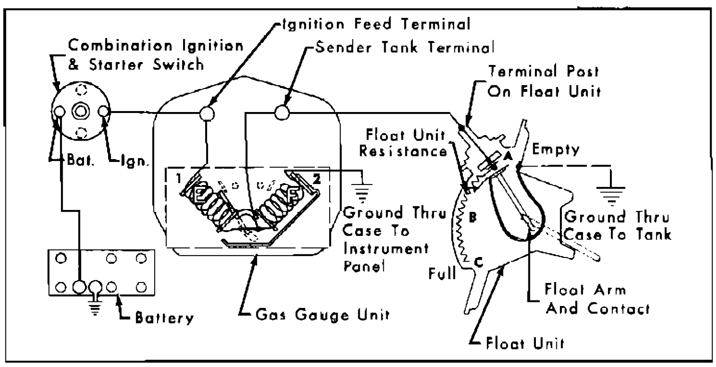


Fig. 15-8 Fuel Gauge Circuit

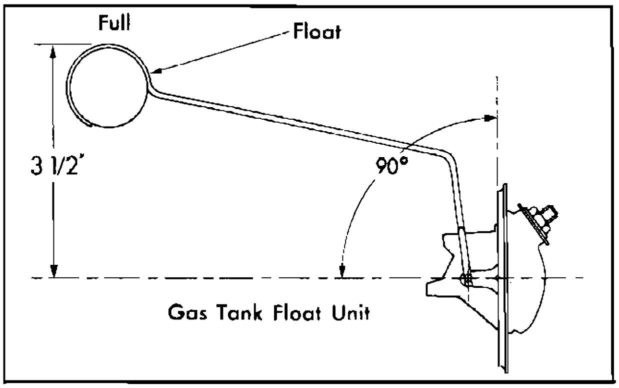


Fig. 15-9 Checking Gage Float Arm

gauge whose needle just touches either edge of "full" or "empty" marks on the dial may be considered as satisfactory.

If dash unit operates incorrectly, the difficulty is either due to dash unit or to wiring from dash unit to tank unit. Faulty wiring may be checked by connecting tester directly to tank unit terminal on dash unit. If the gauge dash unit then operates correctly, the wiring is either grounded or open.

Although above tests will show which unit or wiring is at fault, other checks should be made before replacing either unit.

Before replacing a tank unit, make sure that mounting screws are tight and that gasoline tank is grounded to body. Check tank unit or a bent float arm by measuring the distance from top of float to a line perpendicular to float mounting boss surface at the float arm pivot. This distance should be 3-1/2". Fig. 15-9.

If gasoline gauge does not register when ignition switch is turned on, check for:

1. Open circuit between dash unit and ignition switch.

2. Open circuit in No. 1 coil of panel gauge, Fig. 15-8.

If the gauge shows full under all conditions, check for:

1. Open circuit between dash unit and tank unit.

2. Tank unit burned out. Replace tank unit.

3. Tank unit improperly grounded or tank itself not grounded.

If gauge shows empty under all conditions, check for:

1. Wires reversed on dash unit.

2. Ungrounded dash unit.

3. Grounded lead to tank unit or grounded tank unit rheostat.

4. Open circuit in No. 2 coil, Fig. 15-8.

(10) Temperature Gauge Service

Some difficulties with the temperature gauge system are due to the thermogauge unit on the engine, not the gauge on the instrument panel. When checking either unit, however, a definite series of tests should be employed to determine the correct nature of the difficulty and what should be done to repair it.

To check engine thermogauge unit:

1. Disconnect wire to thermogauge unit at the unit.

2. Connect a test light consisting of a 3 candlepower bulb and a pair of test leads in circuit by clipping one lead to battery terminal on starter and other lead to terminal of thermogauge unit. Test bulb should not light; if it does light when connected in this manner, thermogauge is shorted and should be replaced.

3. Remove test lead from gauge terminal and touch it to body of unit. Bulb will light if unit is grounded properly. If it does not light, check for presence of sealing compound around threads of unit, remove compound, and repeat test.

NOTE: Never use any sealing compound on thermogauge unit to stop water leaks. If tightening unit does not stop leakage, it should be replaced.

4. Remove test light and install dash gauge wire on thermogauge unit if it tests satisfactorily.

Check following items according to nature of difficulty:

a. If dash unit does not register when ignition switch is turned on, it may be caused by a break in the line between dash unit and the ignition switch.

b. If gauge shows "High Temperature" under all conditions, it may be caused by left coil wire in dash unit being broken, poor dash unit ground, or the wire leading from dash unit to engine unit may be shorted to ground.

c. If gauge registers "Low Temperature" under all conditions, the lead to engine unit or the right coil wire in dash unit may be broken.

(11) Removal of Instrument Panel Cluster

1. Remove negative terminal from battery.

2. Remove two rear screws that hold steering gear housing to frame. Loosen front screw.

3. Pull floor mat away from steering column area.

4. Remove three screws holding triangular steering column cover plate to toe riser.

5. Remove five screws holding square cover plate to toe riser.

6. Remove stop light brake switch.

7. Remove lower steering column cover.

8. Remove steering column "U" clamp and lower the steering column.

9. Disconnect vent cables from firewall and vent.

10. Disconnect trip odometer reset stem.

11. Remove three cluster mounting screws.

12. Place a cloth over the steering column and pull cluster out far enough for access to defroster and heater control arms.

13. Remove defroster and heater knobs from control arms and remove control arms.

14. Cluster may now be pulled out further for instrument service.

(12) Disassembly of Instrument Panel Cluster Assembly

1. Remove three screws which hold temperature gauge base plate to instrument cluster casting and remove gauge assembly.

2. Remove screws that hold fuel gauge to cluster casting and remove fuel gauge assembly.

3. Remove ten screws which hold speedometer assembly to cluster casting and remove speedometer assembly.

4. Remove three screws which hold backing plate stamping to speedometer cluster and remove cluster from backing plate.

5. Remove six screws which hold speedometer backing plate casting to cluster casting and remove backing plate.

NOTE: Further disassembly of the speedometer is not recommended because it involves removal of speedometer pointer, an operation which should be performed by a United Motors Service Station. In order to protect the delicate pointer which protrudes when the assembly is removed from the cluster, a shipping guard should be used. This guard is available from the factory Parts Department under Part No. 1581194. All distributors should obtain a supply of these guards to take care of their own and larger dealers requirements.

6. Remove plastic speed indicator, glass lens, and two rubber insulators from casting.

7. Remove three screws which hold Hydra-Matic indicator backing plate to cluster casting and remove backing plate.

8. Remove plastic Hydra-Matic indicator lens and plastic bracket.

(13) Assembly of Instrument Panel Cluster Assembly

1. Install Hydra-Matic indicator lens and plastic bracket.

2. Install Hydra-Matic indicator backing plate on cluster casting.

3. Install rubber insulators, glass lens, and plastic speed indicator in cluster casting.

4. Install speedometer backing plate on cluster housing.

5. Install speedometer cluster on backing plate stamping.

6. Install speedometer assembly in cluster casting.

7. Install fuel gauge assembly on cluster casting.

NOTE: Fuel gauge should be on the right side of cluster when looking at the rear of the cluster.

8. Install temperature gauge assembly on cluster casting.

(14) Installation of Instrument Panel Cluster

1. With a cloth placed over the steering column, place the cluster assembly in position in front of the opening in the instrument panel, and connect gauge wires to gauge terminals according to the wiring code on the gauge plates.

2. Install instrument cluster lights in cover making sure lights are in correct holes. Fig. 15-6.

3. Connect speedometer cable to speedometer head.

4. Connect ignition switch wire, windshield wiper control, and vent controls on cluster.

5. Install defroster and heater control arms.

6. Install cluster in opening in instrument panel with three mounting screws.

7. Connect trip odometer reset stem.

8. Connect vent cables to firewall and vent. Check for free operation of the cables.

9. With rubber insulator in place in instrument cluster, raise steering column into position and install "U" clamp.

10. Install lower steering column cover.

11. Install stop light brake switch with switch lever above brake pedal.

12. Install square cover plate to toe riser.

13. Position brake grommet bracket between the two plates and install triangular cover plate to toe riser.

14. Replace floor mat.

15. Install two rear screws that hold steering gear housing to frame. Tighten front screw.

(15) Resetting and Starting Clock

The clock hands are reset by pulling out the reset knob and turning hands to proper position. The clock starts automatically when it is connected to a source of direct current of proper voltage.

(16) Regulation of Clock

The accuracy of automobile clocks operating on direct current should not be compared too closely with that of electric clocks operating on alternating current. The cycles of alternating current are controlled and corrected daily at the power house, thereby eliminating accumulation of errors. Direct current, in contrast, flows continuously in one direction and time errors in clocks operated on this type of current are accumulated day by day.

An automobile clock is considered a good timepiece when the consistent gain or loss does not exceed seven minutes per week. Accumulation of this error, during a month may amount to as much as thirty minutes.

The owner must, therefore, anticipate resetting the hands occasionally to the correct time. This should be explained to owners at the new car delivery. It is possible to regulate the clock so that the variation will be less than seven minutes weekly if extreme care is taken in adjusting the regulator as described below.

A small regulating screw is located above the numeral "12". If clock loses time, turn screw to the right with a screw driver. If clock gains time, turn screw to the left.

> CAUTION: Turn screw slowly and listen for a clicking noise. Each click adjusts the clock approximately 30 seconds in twenty-four hours.

(17) Back-Up Light Switch

a. Location

The safety (neutral) switch and back-up light switch are combined into one unit which is mounted on the steering column just below the floor.

b. Removal

1. Loosen mounting screw and rotate switch to clearance hole in bracket.

2. Remove switch from steering column.

3. Disconnect wires from switch.

c. Installation

1. Connect wires to switch, as shown in wiring diagram, Fig. 15-7.

2. Position switch on steering column and tighten screw. Switch should be located on the steering column in such a position that when the shift lever is in the reverse position, the back-up lights will work.

> CAUTION: By placing the shift lever in any position except neutral, it should be impossible to start the car. Neutral is the only starting position.

(18) Oil Pressure Indicator Service

The "telltale" oil pressure indicator light is connected in a circuit with the ignition switch and

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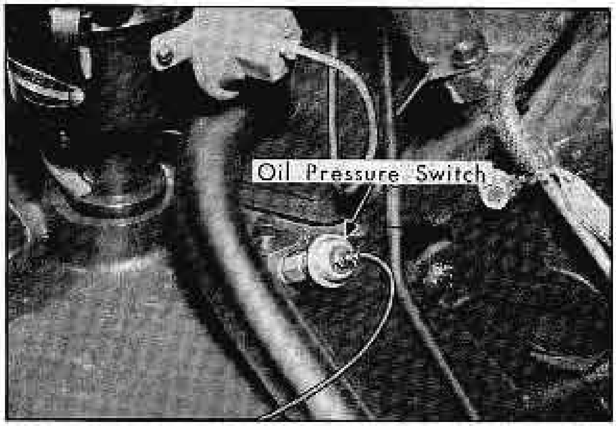

Fig. 15-10 Oil Pressure Switch

a pressure operated switch, Fig. 15-10, threaded into the oil header galley at the rear of the engine to warn the driver when the oil pressure is below seven pounds.

If the light does not come on when the ignition switch is turned on, or if the light stays on after the engine is started, either the pressure is low or one of the units or the wiring is defective and should be checked as follows:

a. Light On—Engine Running

1. Circuit grounded between "telltale" light and pressure switch.

2. Switch shorted. Replace switch.

3. Switch improperly calibrated. Increase engine speed slightly and check to see if light goes off with increased pressure.

4. Oil pressure too low. Remove switch and test pressure with a reliable pressure gauge. Repair as necessary.

b. Ignition On—Engine Not Running— Light Off

1. Bulb burned out--replace bulb.

2. Open circuit between ignition switch and light or light and pressure switch.

3. Switch not grounded--check for presence of sealing compound on threads of switch.

4. Switch stuck--Replace switch.

(19) Generator Charging Indicator Service

The generator "telltale" light is connected in a circuit with the battery and generator, Fig. 15-11.

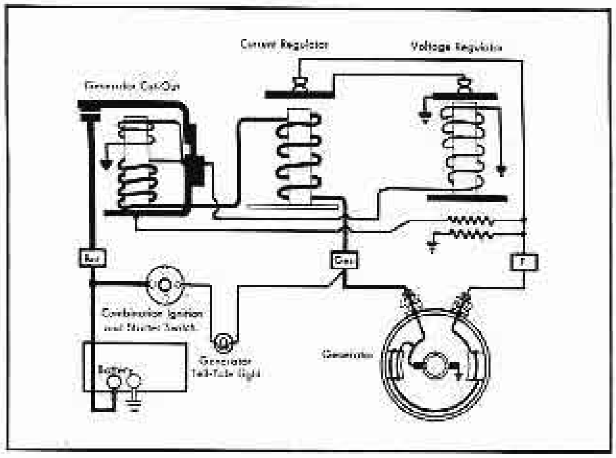

Fig. 15-11 Generator Tell Tale Light Circuit

When the generator begins to charge, the voltage built up in the circuit opposes the battery voltage to the indicator light and as the differential between these two voltages decreases, the light goes out. If the indicator light stays on after the engine is started, the generator should be checked.

If the light does not go on when the ignition switch is turned on before the engine is started, the indicator bulb should be checked and also the "telltale" light circuit should be inspected for the possibility of an open circuit or loose connections.

(20) Horn Operation and Testing

Conditions which may affect horn performance and the procedure for checking these conditions are listed below.

a. Horn Inoperative

1. Connect a voltmeter between the horn terminal or lead and the horn ground, checking the voltage at the horn when the horn button is pressed down.

2. If there is no voltage at the horn, the trouble is in the horn button, the relay, the wiring, or the ground circuit.

3. If the voltage is less than 6.5 volts, the trouble is defective wiring or poor electrical connections. Check all horn wiring and connections for condition and proper grounding.

Specifications:

Horns must start to blow at 6.5 volts or less.

Low note unit Current Draw - 10 - 12 amps. (minimum) at 13 volts

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High note unit Current Draw - 9 - 11 amps. (minimum) at 13 volts

4. If the voltage is between 6.5 and 8.5 volts, the horn is sticking due to foreign material in the air gap or improper current adjustment. Remove from car and adjust as specified in Note 3c.

5. If the voltage is about 8.5, the horn is open due to a broken coil lead. If current adjustment as given in Note 3c does not correct condition, replace horn.

b. Horn Tone Poor

1. If horn only operates part of the time, the cause may be improper current adjustment. Remove horn and adjust as specified in Note 3c.

2. If horn tone is weak, remove from car and test for proper current adjustment and tone. If current and tone are satisfactory, reinstall in the car and check voltage at the horn. If reading is less than 10 volts, check for cause of voltage drop.

c. Current Adjustment

Adjustment Procedure

1. Remove horn cover.

2. Inspect air gap for steel burrs or other foreign material, and clean if necessary.

3. Connect ammeter in horn circuit and adjust current consumption by varying the position of the adjusting nut.

4. Loosen the adjusting lock nut, Fig. 15-12, and turn adjusting nut to the left to increase current, or the right to decrease the current.

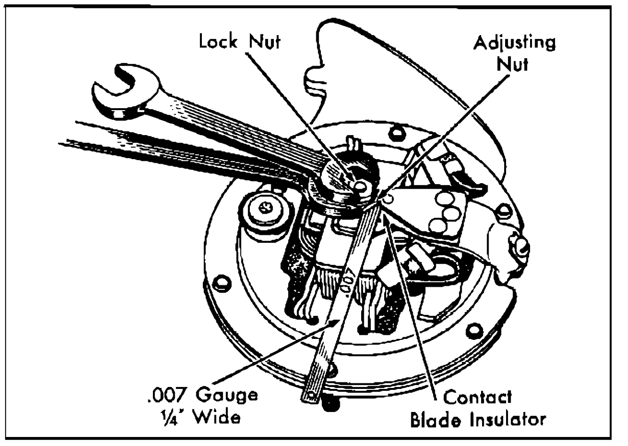

Fig. 15-12 Horn Contact Adjustment

CAUTION: Increasing the current, increases the volume. Too much current will cause the horn to have a high cut-in voltage. The nut, therefore, should be moved only 1/10 of a turn each time and locked in position each time before trying the horn.

Alternate Adjustment Procedure

1. Insert a feeler gage. .007" thick (not more than 1/4" wide) between adjusting nut and contact blade insulator, Fig. 15-12. Do not allow gage to touch contact points.

2. Loosen lock nut and turn adjusting nut to position where the horn will just operate.

3. Lock in position and check horn performance with feeler gage removed.

SPECIFICATIONS

FUSE LOCATIONS

Unit	Type	Location	Unit	Type	Location
Headlight			Windshield Washer	6A	Fuse Panel*
Cigar Lighter			Back-Up-Light	9A	Fuse Panel*
Clock			Automatic Heating System	20A	Fuse Panel*
Map and Courtesy			Radio (all)	7.5A	Fuse Panel*
Glove Box			Spotlight	9A	Under Hood, Defroster Mounting Screw
Dome Light	None	22A Circuit Breaker			
Fog Light					
Inst. Lights			Air Conditioner	2A/20A	Under Dash, Side of Glove Box
Parking Light					
Stop Light			Turn Signal	6A	Fuse Panel*
Trunk Light			Autronic Eye	14A	Amplifier
Hydro-Lectric	None	15A Circuit Breaker			

*Fuse panel located under instrument panel, on cowl insulation board, just to left of center of car.

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SPECIFICATIONS (Cont'd)

BULB DATA CHART

Unit	c/p	Contact	No.	Unit	c/p	Contact	No.
Headlamp	Sealed	Beam Unit		Dome Lamp (except 6267, 6267S)	15	Single	1004
Parking and Signal	32-4	Double	1034	Bow Dome Lamp (6267, 6267S)	6	Single	90
Glove Compartment	2	Single	57	Rear Door Courtesy Lamp (75)	6	Single	90
Clock	2	Single	57	Corner Lamp (75)	6	Single	90
Instrument Lights	2	Single	57	Radio Dial	2	Single	57
Oil Telltale	2	Single	57	Hydra-Matic Shift Indicator Dial	2	Single	57
Generator Telltale	2	Single	57	Back-Up Light	32	Single	1073
Brake Emergency	2	Single	57	Map and Courtesy	6	Double	90
Beam Indicator	2	Single	57	Spotlight	Sealed	Beam Unit	
Direct, Signal Ind.	2	Single	57	Fog Lamp	32-32	Double	1026
Ignition Lock and Cigar Lighter	1	Single	53	Parking Lamp Bulb in Fog Lamp	3	Single	67
Trunk	6	Single	89				
Tail Lamps	32-4	Double	1034				
License Plate Lamp	3	Single	67				

SPEEDOMETER PINION APPLICATION CHART

Car Model	Speedo Pinion Part No.	Axle Ratio	No. of Teeth	Ident. Marking	Tire Size
60-62	1460172	3.07	17	S-8	8.00-15
60-62	1457320	3.36	19	S-1	8.00-15
75	1457322	3.77	21	S-3	8.20-15 (6 ply)
86	1457324	4.27	23	S-5	8.90-15 (6 ply)

OTHER NOTES AND REFERENCES

OTHER NOTES AND REFERENCES

ACCESSORIES

AIR CONDITIONER

TABLE OF CONTENTS

GENERAL DESCRIPTION

The 1954 Cadillac Air Conditioner is available as a factory installed assembly or as a package kit which may be installed by distributors and dealers.

Operating on the same basic principles as the modern home air conditioner, the main function of the Cadillac Air Conditioner is to filter, cool, dehumidify, and circulate the air within the car. In addition, a controlled amount of outside air is supplied through air scoops located in each side of the body, for comfortable ventilation. The fresh air control knob is located on the left side of the package shelf.

Cool air is delivered to the passenger compartment through grilles located at each side of the package shelf. Concealed roof ducts which distribute cool air from the package shelf to the front and rear compartments are also available on sedans only. Four individually controlled outlets in the roof ducts (six on series 75 cars) direct cool air as desired.

The conditioning unit, located in the luggage compartment below the package shelf, consists of an insulated housing, two blowers, baffles, drain pan, cooling coil, thermostatic expansion valve, two air filters, and outlet air ducts. Fig. 16A-1.

Heat laden air from the passenger compartment passes under the rear seat cushion, up behind the seat back, then into the evaporator case where it picks up a quantity of outside air. It is then directed through two filters and across the cooling coils. Heat and moisture are removed from the air and blowers direct the cool air to the passenger compartment.

Condensation formed when warm air contacts the cooling coil is caught in the drain pan and directed to outlets which extend through the luggage compartment floor pan.

The thermostatic expansion valve, located in the conditioning unit behind the cooling coil, regulates

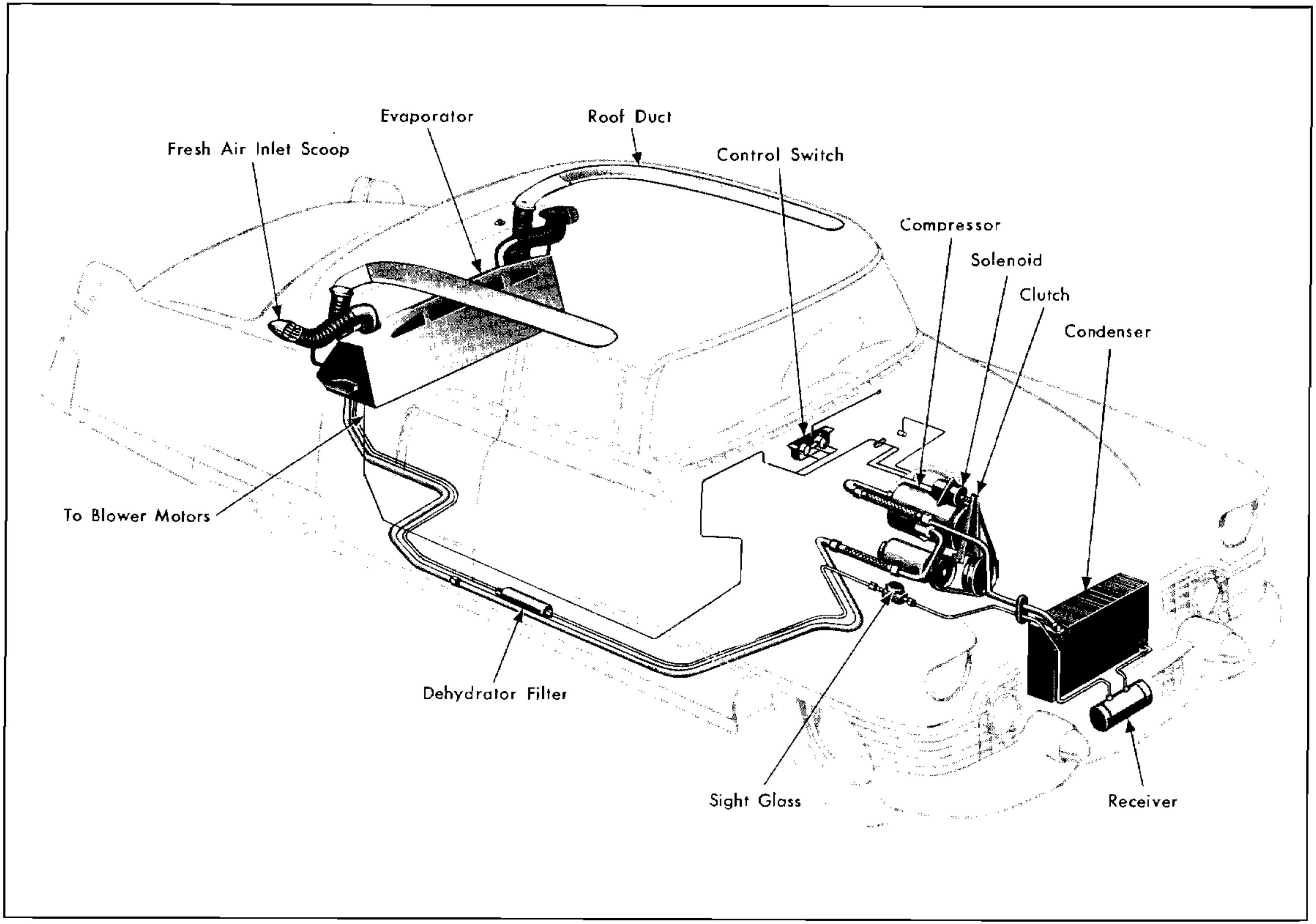

Fig. 16A-1 Location of Air Conditioner Units

AIR CONDITIONER

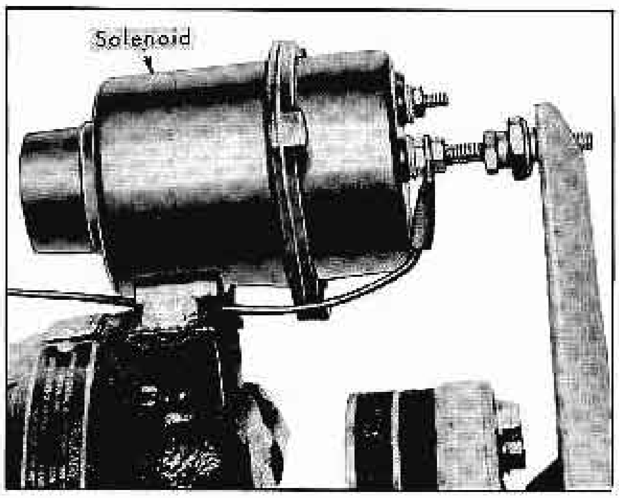

Fig. 16A-2 Clutch Solenoid

the supply of refrigerant according to the requirements of the cooling coil.

The condensing unit, located under the hood, consists of the compressor, condenser, and receiver.

The compressor is rigidly mounted on brackets at the front of the right cylinder block and is driven by two belts off the crankshaft pulley. Here, low pressure refrigerant vapor from the cooling coil is compressed to a high pressure, high temperature vapor and directed to the condenser.

In the condenser, located in front of the radiator core, the high temperature vapor is cooled by outside air and converted to a liquid. This liquid refrigerant collects in the receiver which is mounted below the lower radiator air deflector. The liquid refrigerant is stored in the receiver and is available for use in the cooling coil when required. Fig. 16A-1.

The 1954 compressor is controlled by a solenoid operated clutch-pulley assembly, mounted at the front end of the compressor, Fig. 16A-2.

The clutch assembly is splined to the compressor shaft and drives the compressor when the clutch is engaged by the action of the solenoid.

The assembly consists of the pulley housing, clutch plates, bearing, teaser spring, actuating balls and front cover, Fig. 16A-3.

Pulley Housing - acts as a clutch housing and has a sealed ball bearing pressed into the inner diameter of the pulley. The ball bearing is retained at the rear side by a shoulder in the bearing cavity. The outer (front) race of bearing is retained by a Truarc lock ring. When pulley and bearing are installed on the compressor shaft, the pulley is free to rotate without turning the shaft. Another retainer ring is snapped into a groove in the shaft to retain the bearing and pulley assembly on the shaft.

Clutch Plates - two clutch plates are used: One clutch plate is counterweighted, and the other is known as the clutch plate-actuator. The counterweight plate has a splined center which matches the splines on the compressor shaft. A flat ring of friction material is bonded to one face of the plate which, when pressed against its mating surface in the pulley housing, transmit the driving power to the compressor shaft. Weights are riveted to the plate to balance the pulley end of the compressor.

The actuator plate is similar to the counterweight plate. It also has a flat ring of frictional material bonded to one face of the plate, which engages the front cover of the clutch. The clutch counter-weight plate and actuator plate is constructed with three tear drop type depressions. In the center of the actuator plate is a pin, the small diameter end of which fits in the compressor shaft hole. A TEASER SPRING which fits in the shaft hole keeps the pin from going all the way into the hole, except under pressure applied to the large end of the pin.

Actuating Balls - When the clutch actuator plate is installed on the shaft, three balls which fit in the tear drop depressions space the two clutch plates in relation to each other. As can be visualized, when the balls are in the deepest portion of the depressions, the two plates are close together, and when the actuating plate is rotated, the balls

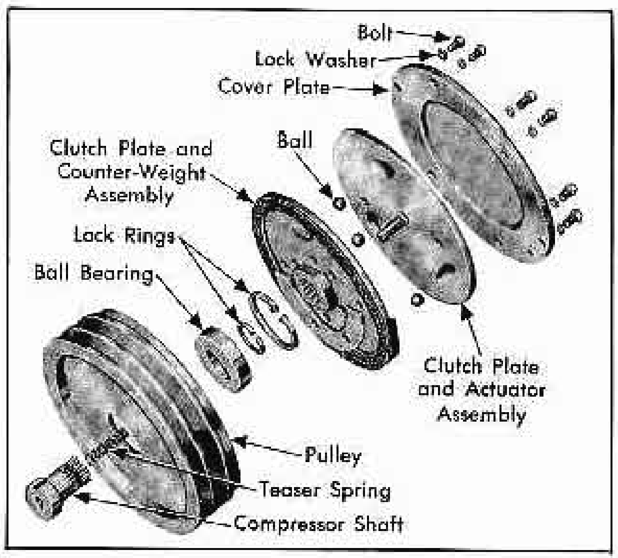

Fig. 16A-3 Clutch Disassembled

are rolled by centrifugal force toward the shallow end of the depressions, forcing the clutch plates farther apart.

Front Cover Plate - The clutch cover plate is bolted to the open face of the pulley and has a hole in its center, through which the pin of the actuating plate projects. The pin is free to move in the hole without contacting the cover plate.

Operation of Clutch - The clutch is actuated by a solenoid (mounted on top of the compressor) that is connected to a pivoted lever which in turn contacts the large end of the clutch actuating plate pin, projecting through the clutch cover. In the "off" (de-energized) position of the solenoid, a spring within the solenoid pulls the actuating arm lever in against the pin, keeping the pin depressed and the clutch disengaged. Thus, the pulley is free to rotate without driving the compressor.

When cooling is desired, the air conditioning control switch in the car is turned "on" and the solenoid is energized. This in turn moves the pivoted arm outward and relieves the pressure on the clutch plate pin. When pressure is removed from the actuating plate pin, the teaser spring pushes the actuating plate far enough forward to engage the cover plate. The outward movement permits the three balls located between the two clutch plates, to roll toward the shallow end of the tear drop type depressions in the plates and thus force the two plates apart with great force. This results in full engagement of the two plates with their mating surface on the pulley and cover plate. As the clutch plates are engaged, the pulley and clutch assembly then drives the compressor shaft. Turning the control switch "Off", pushes the actuating clutch pin in and releases the clutch. The pulley then again rotates freely without driving the compressor.

The operating controls are located on a panel mounted in the center of the instrument panel lower flange. Fig. 16A-4. The toggle switch has three positions: VENT, ON, and OFF.

VENT - Blowers operate to provide ventilation without refrigeration. Clutch solenoid is de-energized, disengaging the clutch at the pulley. Knobs on each side of the panel permit control of blower speed.

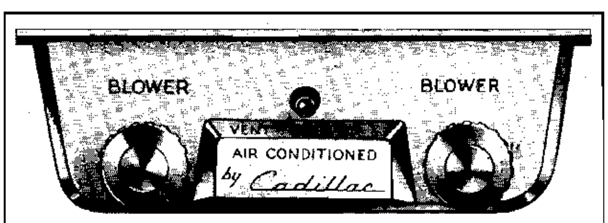

Fig. 16A-4 Control Panel

ON - Blowers are turned on, clutch solenoid is energized, engaging the clutch and compressor to the pulley. The system is now in operation for maximum cooling. The blower speed may be decreased if the car becomes too cool.

OFF - Compressor clutch is disengaged from the pulley and the blowers are inoperative for no cooling or ventilation.

Cycle of Operation - Fig. 16A-5 illustrates a schematic arrangement of all the components in the system. With control switch "On" and the engine and compressor (clutch engaged) operating, here is what takes place to secure cooling.

Low pressure vapor in the compressor is compressed and discharged into the condenser. Here the vapor changes from a high pressure vapor into a high pressure liquid and, as liquid, flows into the receiver under pressure.

The high pressure liquid leaves the receiver, passing through the sight glass and the dehydrator-filter to the expansion valve. At the orifice (or restriction) of the expansion valve, the liquid changes to low pressure liquid and enters the cooling coil.

Heat enters the evaporator unit housing from the passenger compartment and from the outside air by the action of the blowers. Because the cooling coil is colder than this air, some of the heat passes through the refrigerated tubes of the coil into the liquid refrigerant, causing the liquid to vaporize. This vapor is drawn through the low pressure line to the compressor.

NOTE: When the clutch is dis-engaged ("Off" or "Vent" position) the compressor and the refrigerant action in the system stop functioning for no cooling.

SERVICE INFORMATION

(1) Precautions in Handling Freon-12

While Freon-12 was selected as the safest and best refrigerant to use in the Cadillac Air Conditioner, it is very important that the following precautions be observed to avoid serious accidents and personal injury.

a. Do not leave drum uncapped. The metal cap furnished with the drum when it is shipped is to protect the valve and safety plug from damage. It should be replaced after each use of the drum.

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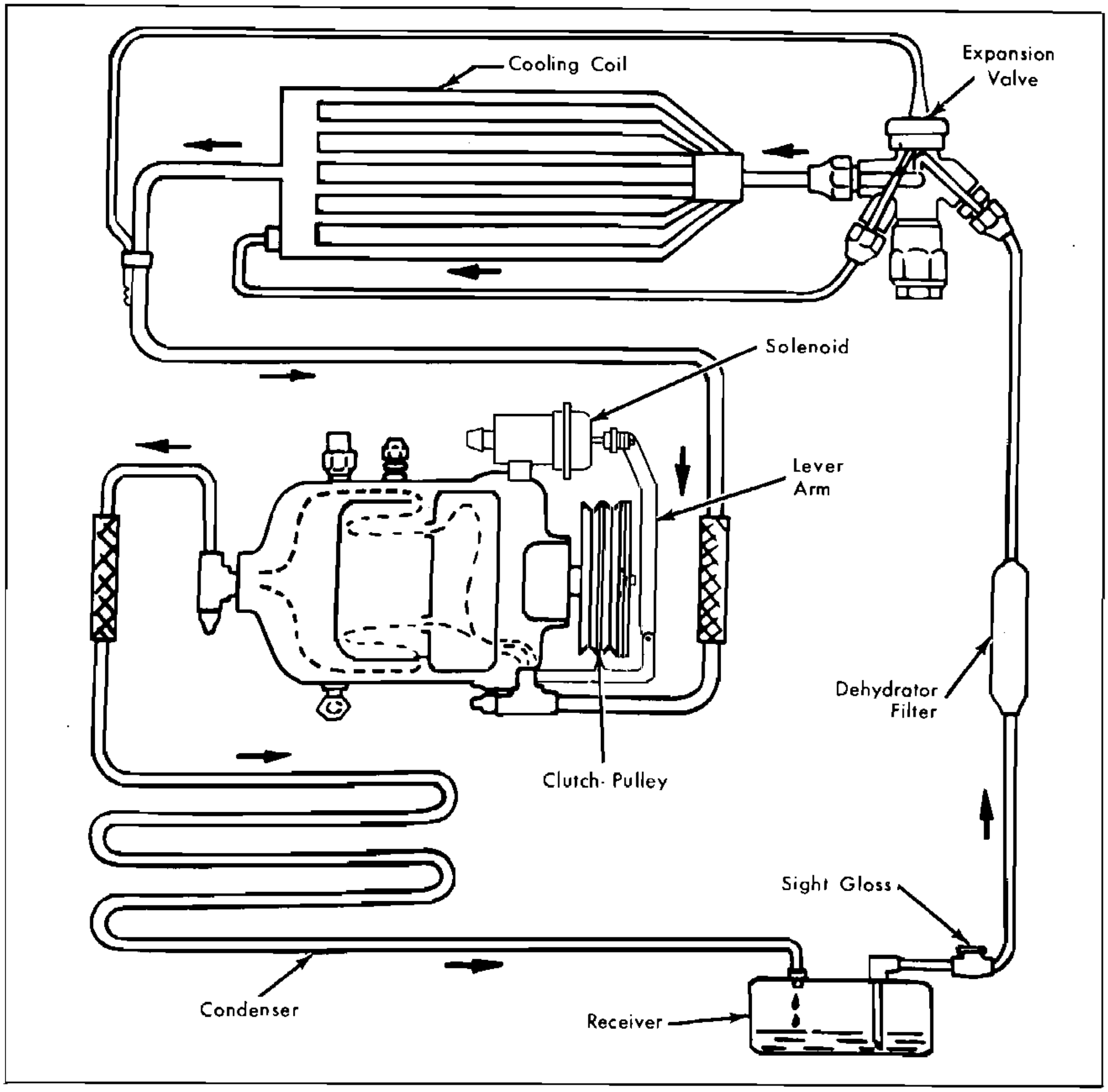

Fig. 16A-5 Cycle of Operation

b. Do not carry the drum in the passenger compartment of a car. Always place drum in luggage compartment of car or if in an open truck, cover drum to protect it from radiant sun heat. The resultant increase in pressure may cause safety plug to release or drum to burst.

c. Do not subject drum to high temperature when charging system. Use water no warmer than 125°F. to heat drum. Never place drum on radiator, stove, or use torches for heating during charging.

d. Do not fill drum completely--when filling one drum from another, always allow space above liquid for expansion.

e. Do not discharge Freon-12 into a room having an exposed flame -- concentrations of this gas in contact with an open flame will produce a toxic gas.

f. Do not expose the eyes to liquid -- protect them with glasses or goggles. If Freon-12 liquid should strike the eyeballs:

1. Apply a few drops of sterile mineral oil to the eyes as an irrigator.

2. If irritation continues wash the eyes with a weak solution of boric acid.

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3. See an eye specialist at once.

If liquid Freon-12 comes in contact with the skin, the injury should be treated for frostbite.

(2) Precautions in Handling Lines

a. Refrigerant pipe lines should be carefully stored to avoid crushing or kinking. If a line is kinked, it should not be used as the flow of refrigerant will be restricted and will result in poor air conditioner operation.

b. Lines should be kept sealed and dehydrated in stock. Do not remove caps from lines until just before installation.

c. When tightening fittings, use the proper size wrenches to avoid over or under tightening. Always use two wrenches, when tightening fittings, to prevent twisting the soft copper tubing. A drop of Frigidaire oil on the pipe flare will allow the flare nut to be tightened without twisting the pipe.

d. Close ends of lines, which have been disconnected for any reason, to prevent entrance of moisture or dirt.

e. Gage set and lines should be kept clean and free from moisture.

f. Do not leave Frigidaire oil container open any longer then necessary, as the special oil is moisture-free and will absorb moisture from the air if left uncapped.

g. Use the Vacuum Pump, Tool No. J-5428, to remove any air or moisture which may have entered the system when it was opened to replace a part.

(3) Maintenance and Inspection

a. Preliminary Check

1. High and low pressure shut-off valves on compressor must be fully open.

2. Drive belts must be installed properly to prevent slippage.

3. Listen to clutch solenoid to make certain clutch is engaging and disengaging when operating the "On" and "Off" switch. Make certain clutch is not slipping.

4. Using the Leak Detector, Tool No. J-5419, test the entire system for Freon leaks, and make necessary repairs.

5. If there is evidence of oil leaks, check oil level in compressor.

6. Check both blower fans to see that they are operating properly at all control knob positions.

b. Seasonal Operation

1. Winter Operation

During the winter or when outside temperature is below 45°F, the clutch should be disengaged. Outside air intake ducts should also be closed.

2. Summer Operation

To start the Air Conditioner after the winter season, the following operations should be performed:

Leak test complete system and make necessary repairs.

Check all parts of unit for trace of oil, which might indicate a leakage of Freon.

If leak is found, check compressor oil level.

Check belts for proper tension.

Check clutch solenoid to see that the clutch engages and disengages when the "On" and "Off" switch is operated. Make certain clutch is not slipping.

Place toggle switch in "On" position and operate engine for fifteen minutes at 1300 RPM.

Check sight glass for absence of bubbles which would indicate that system has sufficient Freon-12 charge.

Open outside air intake ducts.

Check conditioning unit blower fans for variable speed control at panel.

Check the conditioning unit outlet air temperature differential with the temperature outside the car.

c. 2000 Mile Inspection

The procedure outlined below may be used as a guide to check the Air Conditioner system when the car is brought in for the 2000 mile inspection.

1. Check unit for an indication of leaks and make necessary repairs.

2. If there is an indication of an oil leak, check compressor for proper oil level.

3. Tighten compressor mounting brackets and check belt tension.

4. Check sight glass for absence of bubbles indicating proper charge of Freon-12. This should only be done after running engine at a speed of 1300 RPM for fifteen minutes in the "On" position - clutch engaged.

(4) Service Precautions

a. Collision Service

It is very important that the Air Conditioner system be inspected as soon as possible whenever a car, so equipped, has been involved in a collision. If the system has been opened as a result of the collision, it will permit the entrance of air, moisture, and dirt which will cause internal damage. As the length of time the system has been open and the extent of damage to the components will govern the replacement of parts and the service operations required, a definite procedure cannot be recommended which will cover all cases. The following procedure, however, may be used as a guide:

1. Make certain clutch is disengaged if car is to be operated before repairs are made. Disconnect solenoid lead wire if necessary.

2. Close both valves at compressor.

3. Inspect all units and pipes, noting any damage.

a. If the condenser is damaged, it should be replaced. No repairs such as soldering, brazing, or welding should be attempted.

b. Replace receiver if welded joints are fractured.

4. Check compressor and clutch pulley for cracks. If compressor does not show evidence of external damage, it may be used.

5. The dehydrator filter should be replaced if it is damaged, leaks, clogged, restricted, or if the system has been open for any period of time.

b. Steam Cleaning and Welding

Excessive heat applied at any section of the refrigerant lines will create excessively high pressures. For this reason, steam cleaning or welding should not be performed on any portion of the car adjacent to the refrigeration units or lines.

c. Undercoating

To facilitate service operations, under-coating should not be applied to any connections on the refrigeration system. While it is permissible to undercoat the copper refrigerant lines, all flare joints and connections should first be masked.

(5) Purging the System

In replacing any of the air conditioning components, (except compressor) the system must be completely purged (drained) of refrigerant. The purpose is to lower the pressure inside the system so that a component part can be safely removed.

To save time and repetition, we will cover the step-by-step procedure for purging the system of refrigerant and then, in future operations which require this, only a reference to it will be made.

1. Connect lines of gage set to the high and low pressure gage connections on the compressor. Fig. 16A-6.

2. Remove protective caps from high and low pressure shut-off valves on the compressor.

3. Remove plug from end of line connected to the center fitting on gage set.

4. Purge the refrigerant from the system by opening the valves on the gage set.

NOTE: Do not open valves wide until pressure in the system has been lowered. Otherwise, refrigerant under pressure will force oil out of the compressor.

5. Close valves on gage set from time to time for the purpose of allowing 5 pounds of refrigerant pressure to remain in the system, then close both valves on gage set.

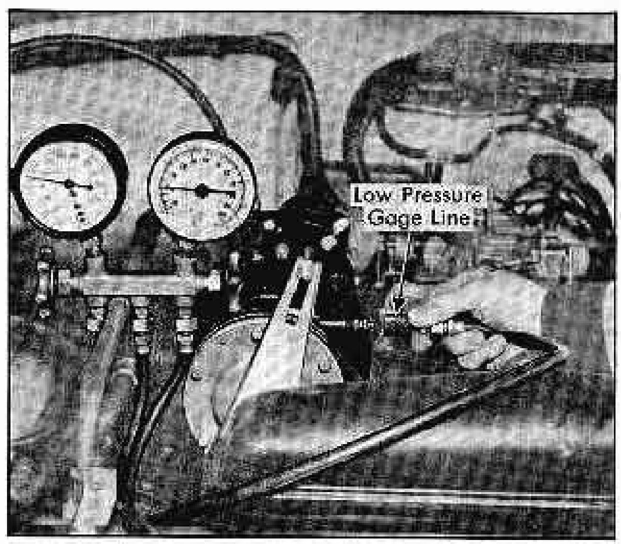

Fig. 16A-6 Connecting Low Pressure Gage

AIR CONDITIONER

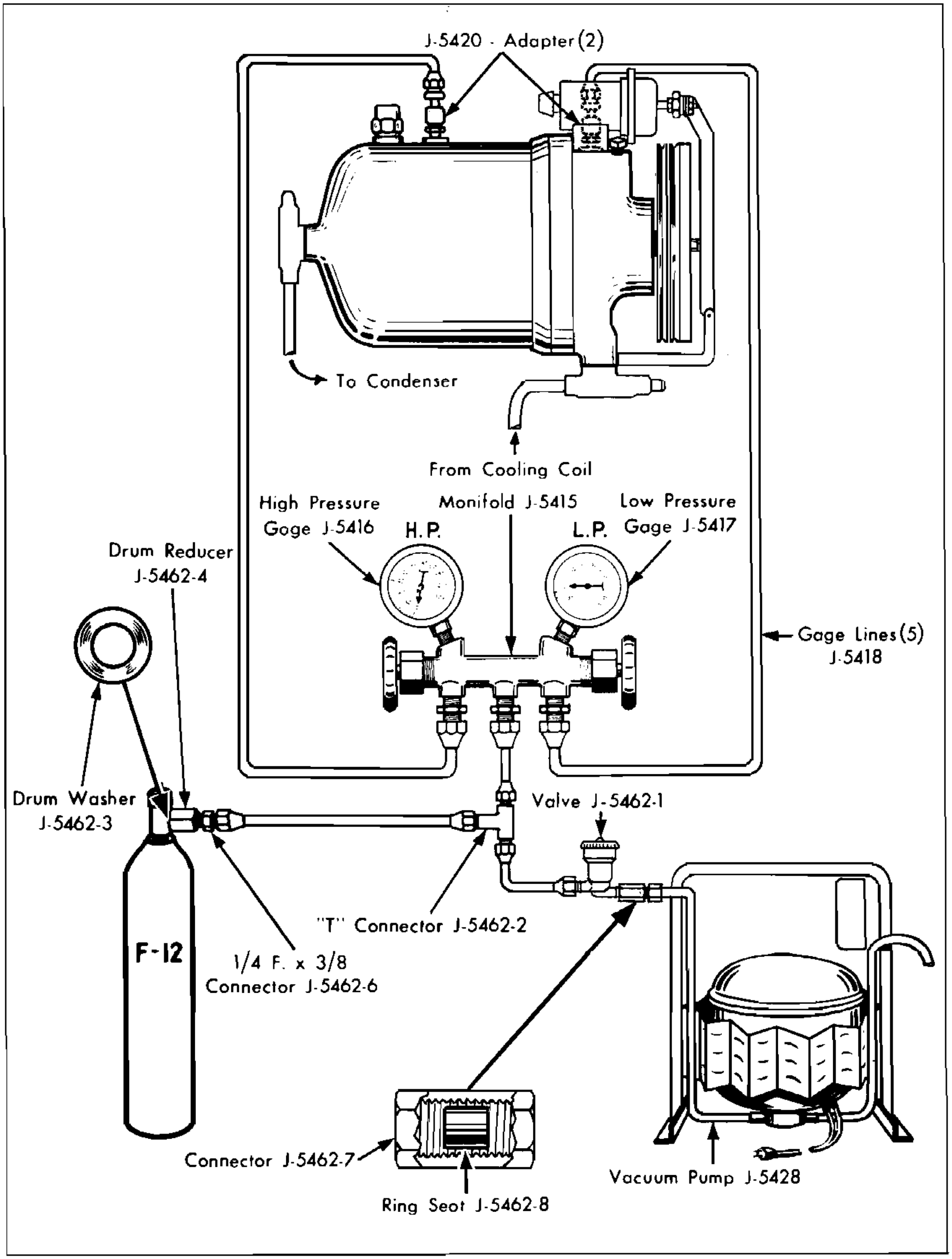

Fig. 16A-7 Gage Connections for Evacuating or Adding Refrigerant

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NOTE: Allowing 5 pounds of refrigerant pressure to remain in system will prevent air and dirt from entering the system when a part is replaced.

(6) Evacuating the System

Whenever the air conditioning system is opened for any reason, it should not be put into operation again until it has been evacuated. For this operation, use Vacuum Pump, Tool No. J-5428, to remove air and moisture which may have entered the system when it was opened to replace a part.

In discussing service operations requiring evacuating, only a reference to it will be made. The following step-by-step procedure will explain the complete evacuating process.

a. Connection of Gage Lines

1. Install the low and high pressure lines of gage set to gage connections on compressor if this has not previously been done.

2. Install gage line from center connection of gage set to a tee connector, Tool No. J-5462-2, Fig. 16A-7.

3. Install female connector, Tool No. J-5462-7, at the inlet side of the vacuum pump.

4. Insert flare seat, Tool No. J-5462-8, in the connector, Tool No. J-5462-7, at the vacuum pump.

5. Install hand shut-off valve, Tool No. J-5462-1, to the connector at the vacuum pump.

6. Install a gage line from one side of tee connector to the valve at the vacuum pump. Valve should be closed.

NOTE: Make sure dust cap on discharge side of vacuum pump has been removed. Check fluid level. This should be between the high and low screws in the side of the pump, Fig. 16A-8. Add Frigidaire 75 viscosity oil to bring to proper level. Change oil in pump every 250 hours of operation by removing top and laying pump on its side with discharge oil trap up. Hold rotor firmly in position to prevent its coming out while draining oil. Do not use the vacuum pump as an air compressor as it will not receive proper lubrication under such usage. Keep suction and discharge fittings capped when not in use. A small amount of 75 viscosity oil may be drawn into the pump occasionally to insure protection of internal parts during periods of disuse. If the pump should fail to start; check capacitor, relay, or remove the top and turn the rotor by hand to relieve a temporary stuck condition.

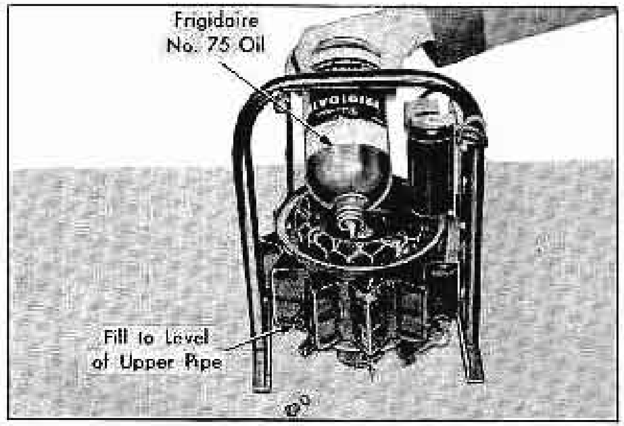

Fig. 16A-8 Adding Oil to Vacuum Pump

7. Install connectors, Tool Nos. J-5462-4 and J-5462-6, on one end of a gage line, J-5418.

8. Insert lead washer, Tool No. J-5462-3, in large end of the drum connector, Tool No. J-5462-4.

9. Install this gage line from the remaining tee connection to a drum of Freon-12.

NOTE: Whenever gage lines are installed for the purpose of adding a small charge of refrigerant or checking pressure, the AIR in the lines must be removed by purging - that is, allowing refrigerant pressure to blow the air out to the atmosphere. This is accomplished by slightly opening and closing the valves on the gage set.

b. Evacuating the System

1. Make certain low and high pressure shut-off valves at the compressor are open.

2. Open low and high pressure gage valves on gage set.

3. Connect and start vacuum pump.

4. Slowly open the two-way shut-off valve at the vacuum pump to avoid forcing oil out of pump.

5. Operate to obtain approximately 28" vacuum for 10 minutes. If vacuum cannot be obtained, vacuum pump or gage may be faulty. Close the shut-off valve at the pump and then stop the pump. Check gage to see if vacuum holds.

6. Open the Freon drum valve and allow system to come to drum pressure. Close drum valve. Leak test complete system, including gage fittings, with leak detector, Tool No. J-5419; if leak cannot be found, the vacuum pump or gage may be faulty.

NOTE: If oil is blown out of vacuum pump, it should be refilled to proper level with Frigidaire 75 viscosity oil, Fig. 16A-8.

7. If a leak is found, fix the leak and operate pump to obtain the vacuum again as in Step 5. Watch the gage and see if vacuum will hold for 5 minutes. If not, repeat Step Number 6.

8. With all leaks eliminated, open Freon drum and bring the system to drum pressure again. Both gages should equalize. Close drum valve.

9. Evacuate the system once again as previously described. This second charging and evacuating is for the purpose of picking up any air or moisture that may have remained in the system.

10. Close gage valves.

11. The system is now ready for a complete charge of refrigerant.

(7) Adding Refrigerant

If the diagnosis indicated a shortage of refrigerant, add Freon-12 as outlined in procedure "c" below.

If the entire charge of refrigerant has been lost through accident, or in the replacement of any of the components, a complete charge will be necessary. Procedure "b", below, outlines the steps to be followed.

An important rule to follow in charging is that refrigerant should always be added to the low pressure side of the compressor in a vapor state. Another important rule is never to add a complete charge of refrigerant until the system has been leak tested and properly evacuated.

In order to charge refrigerant in the vapor state, the Freon-12 drum will require the use of heat. This can best be accomplished by placing the drum in a bucket of hot water. The temperature of the water should not exceed 125°F. Since the temperature of the water and drum will decrease, as the vapor leaves the drum, the water and drum will be cooled. This may result in a lowering of the drum pressure and temperature to the extent where it will be necessary to replenish or reheat the water.

Both the Freon-12 drum and bucket of hot water should be placed on suitable scales, with the drum in an upright position. Note the scale reading before opening the valve on the drum so you can determine when a complete charge of seven (7) pounds of refrigerant has been added to the system.

a. Charging Precautions

In all refrigerant charging procedures where the compressor is in operation, the following cautions should be observed:

1. Always wear goggles whenever handling Freon-12. This is also necessary when breaking line connections.

2. The high pressure should not exceed 275 pounds.

3. The low pressure hand shut-off valve on the gage set should be closed completely at frequent intervals to make certain the pressure in the low side of the compressor is always maintained above 12 pound gage pressure. When the low side hand shut-off valve on the gage set is closed, the gage will then indicate the low side pressure in the compressor. When the low side hand shut-off valve on the gage set is open, the gage indicates drum pressure.

4. The drum pressure should not exceed a maximum of 90 pounds.

5. Since the system would have been prepared by evacuating as recommended, the gage set would be connected according to procedures previously described in Note 6a. See Fig. 16A-7.

b. Adding Refrigerant—Complete Charge

1. Evacuate complete system as described in Note 6b.

2. Open low pressure valve on gage set.

3. Open drum valve to obtain a maximum pressure of 90 pounds.

4. Freon-12 vapor under pressure will flow into the system without operating the compressor. This amount should not exceed 7 pounds.

> NOTE: If it is not possible to charge the total of seven pounds by the method just described, it is permissible after 1-1/2 to 2 pounds has been forced into the system, to operate the engine and compressor at slow idle. The hand shut-off valve on the high pressure side of gage set should be CLOSED. Continue to operate engine and compressor at slow idle until the 7 pounds is charged into the system.

5. Close drum valve.

6. Close low pressure shut-off valve on gage set.

7. Operate the engine at 1500 RPM with compressor clutch engaged to observe the high and low pressure gages as well as sight glass and general performance of the system. Fig. 16A-9.

8. Stop engine and remove gage line connections.

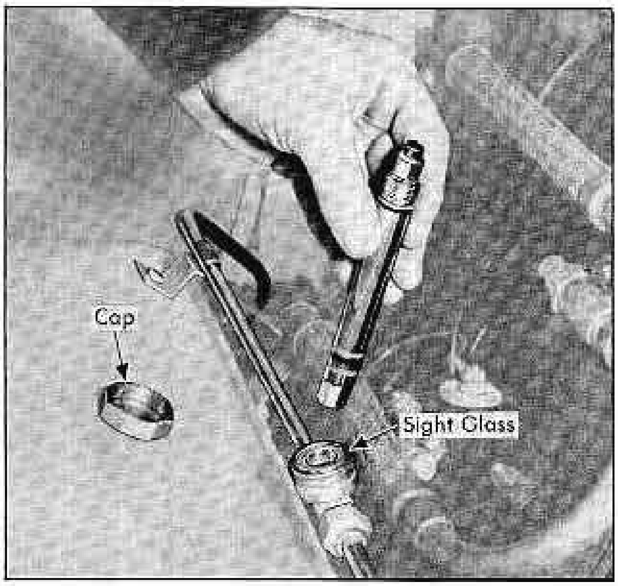

Fig. 16A-9 Checking Sight Glass

c. Adding Refrigerant—Partial Charge

This operation is performed when a shortage of refrigerant is noted without any evidence of leakage or necessary part replacement.

1. Connect gage set lines to compressor and Freon-12 drum.

2. Purge air from gage lines, Fig. 16A-10.

3. Operate the engine and compressor at slow idle.

4. Open the low pressure valve on gage set. High pressure valve on gage set must be closed.

5. Open drum valve to obtain a maximum pressure of 90 pounds.

6. Watch sight glass until solid column of liquid appears without bubbles, Fig. 16A-9.

7. Note scales and allow compressor to operate until 1 additional pound of Freon-12 has been charged into the system.

8. Close drum valve.

9. Close low pressure hand shut-off valve on gage set.

10. Operate engine at 1500 RPM with the compressor clutch engaged.

11. Observe gages, sight glass, and entire system for proper performance.

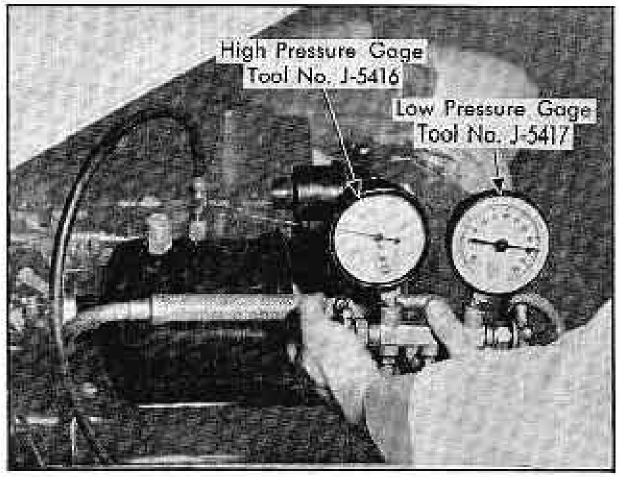

Fig. 16A-10 Purging Gage Lines

12. After five minutes of operation, should bubbles reappear at sight glass, add 1 more pound of refrigerant.

13. Remove the gage connections on the compressor and disconnect Freon drum.

14. Cap the gage connections on the compressor.

(8) Checking and Adding Oil

The compressor was originally charged with 20-22 ounces of 525 viscosity Frigidaire oil. During normal operation, due to the affinity of Freon-12 for oil, a certain amount of oil will circulate throughout the system along with the liquid and vapor.

To determine if the compressor has sufficient oil, an elbow fitting has been placed on the underside of the compressor housing, Fig. 16A-11. It has a Schrader valve core, and is capped with a flare nut.

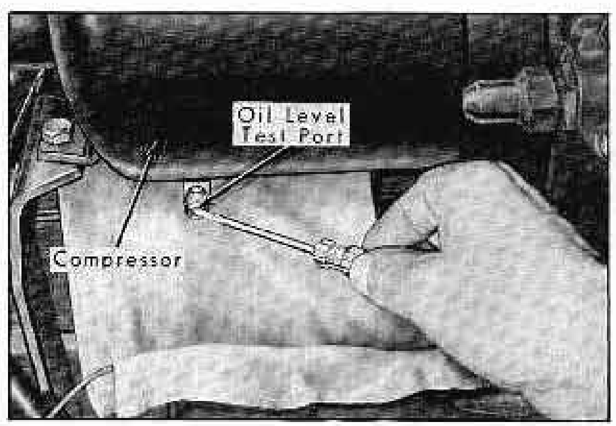

Fig. 16A-11 Checking Oil Level

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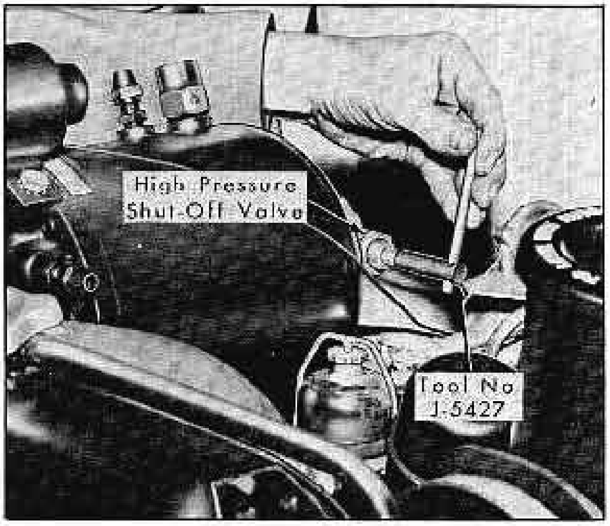

Fig. 16A-12 Closing High Pressure Valve

a. Checking Oil Level

1. Start the engine and operate at 1700 RPM for ten minutes with cooling control switch "On" and blowers on high speed.

NOTE: It may be necessary to place a 12 or 15 inch electric fan in front of car grille and direct a flow of air over the condenser. This will eliminate excessive engine temperatures which would reduce the efficiency of the condensing unit.

2. Stop the engine.

3. Remove flare nut from the oil test fitting.

4. Depress the Schrader core allowing the first surge of oil to escape. If oil continues to escape with Freon vapor, the oil level of the compressor is to be considered satisfactory. Fig. 16A-11.

NOTE: It is desirable to allow the escaping oil and vapor to blow against a clean white cloth. The cloth should become oily.

5. If oil does not continue to escape from test fitting, the oil is below the minimum level, and therefore, oil will have to be added.

b. Adding Oil—Minor Loss

If the oil level is low, 525 viscosity Frigidaire oil should be added as outlined below:

1. Shut off high and low pressure hand shut-off valves at the compressor, using 1/4" key, Tool No. J-5427. Figs. 16A-12 and 16A-13.

2. Depress Schrader valve core on high pressure test connection to purge Freon until a low audible hiss is heard. Allow to stand a few minutes and repeat purging.

3. Remove high pressure relief valve and gasket.

4. Pour from the graduated bottle four ounces of 525 viscosity Frigidaire oil into the high pressure relief valve opening. Fig. 16A-14.

5. Install high pressure relief valve using a new copper gasket.

6. Open high pressure hand shut-off valve. Fig. 16A-12.

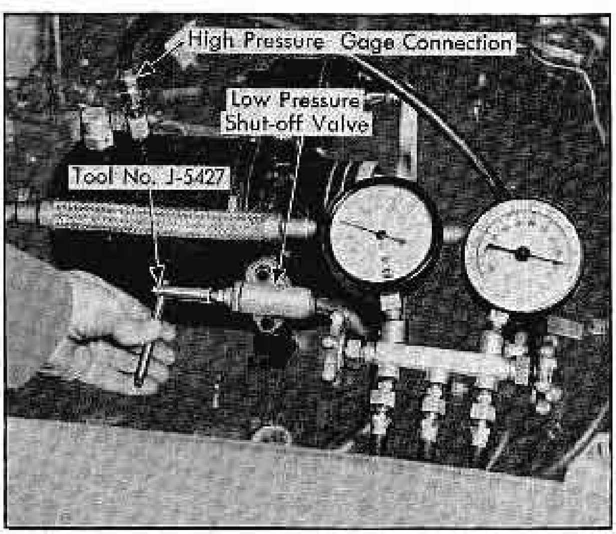

Fig. 16A-13 Closing Low Pressure Valve

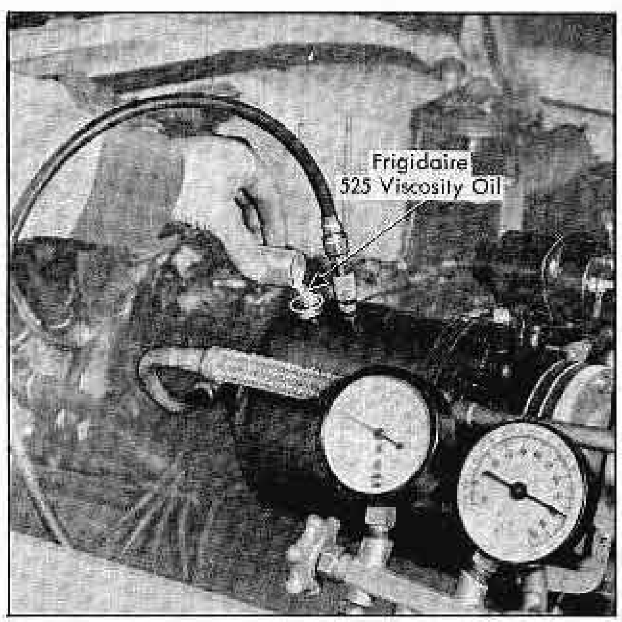

Fig. 16A-14 Adding Oil to Compressor

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7. Purge air from compressor by depressing valve stem in high pressure gage connection of compressor.

8. Recheck oil level as indicated in Step 4 of Note 8a above. Open low pressure shut-off valve. Fig. 16A-13.

9. If oil is still below minimum level, continue to add four ounces at a time until satisfactory level is reached by following the steps outlined above.

10. When proper level is reached, make certain both high and low pressure shut-off valves are completely open, then replace protective caps over valve stems.

11. Replace flare nuts on both the oil test fitting and high pressure gage fitting connections.

12. Leak test all connections which have been disturbed. Fig. 16A-15.

c. Adding Oil—Major Loss

If a major loss of oil has occured, such as compressor shaft seal leak, line breakage, etc., add oil as outlined below after repairs have been made:

1. Close both high and low pressure hand shut-off valves at the compressor.

2. Depress Schrader core on the high pressure gage connection of the compressor. Purge pressure until only a slight audible hiss can be heard. Repeat if necessary to be sure pressure is at a minimum.

3. Remove valve flange mounting screw, and remove hand shut-off valves from bore of compressor. Fig. 16A-16.

4. Remove compressor as described in Note 10a and b.

5. Remove high pressure relief valve and gasket.

6. Invert compressor and drain oil into a clean container.

NOTE: Examine the condition of the oil to determine whether or not it is contaminated with any foreign material, such as metal chips, water, sludge, etc. This oil should be discarded and new oil used. If an excessive amount of water is found, install a new liquid dehydrator filter in the high pressure liquid line.

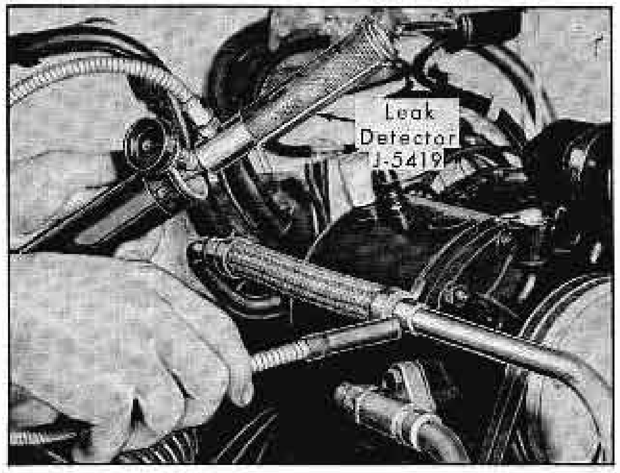

Fig. 16A-15 Testing for Leaks

7. Pour sixteen ounces of 525 viscosity Frigidaire oil from a graduated bottle into the high pressure relief valve opening in the compressor. Fig. 16A-14.

8. Install high pressure relief valve using a new copper gasket.

9. Install compressor as described in Note 13a.

10. Open high pressure hand shut-off valve and, by depressing the valve stem in the high pressure gage connection, purge the air from the compressor.

11. Open low pressure hand shut-off valve. Fig. 16A-13.

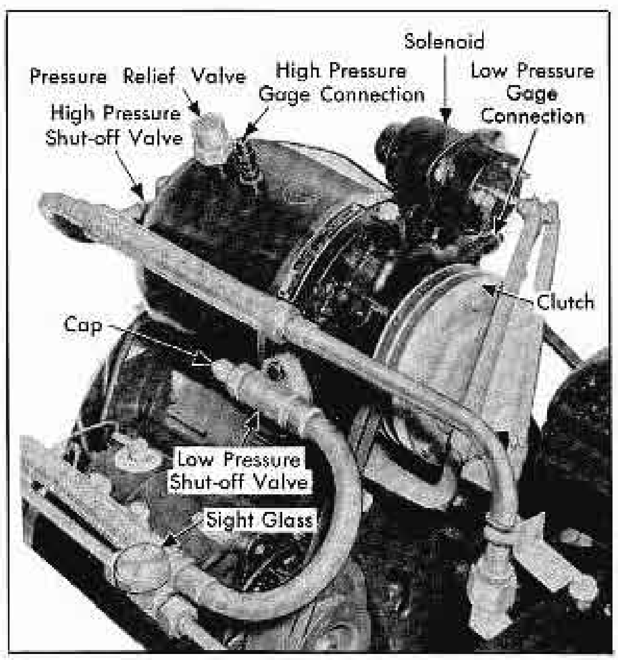

Fig. 16A-16 Compressor Fittings

12. Leak test all connections which have been disturbed or repaired.

(9) Purging Air or Excess Refrigerant From the System

Air or excess refrigerant in the system results in high operating pressure with only partial cooling. No matter where or how air enters, it will always end up in the condenser. Air displaces refrigerant vapor in the condenser and takes up valuable condensing space. The following procedure explains how to remove air or excess refrigerant from the system.

1. Connect gage set to the gage connections on the compressor. Fig. 16A-7.

2. With the compressor not operating, open the high pressure valve on the gage set slightly and allow the vapor and air mixture to exhaust SLOWLY through the center connections of the gage set to the atmosphere, then close valve.

NOTE: One method of determining whether all of the air which was trapped in the condenser has been exhausted is by placing a small flame (cigar lighter or match) at the point of discharge - Freon vapor will put out the flame - air will cause the flame to move but will not put it out.

3. Operate the engine and compressor at 1300 RPM for about five minutes. This will tend to concentrate any air or excessive refrigerant in the condenser.

CAUTION: Do not allow the high pressure to exceed 275 pounds.

4. Observe gage readings. If they are excessively high, open high pressure valve on gage set slowly and allow vapor to exhaust at center connection on gage set, until proper operating pressures are obtained, as indicated below.

Ambient Temp. (Temp. of surrounding Air)	Low Pressure Pounds/ Square Inch	High Pressure Pounds/ Square Inch
$65^{\circ}F$	1-8	100-110
$70^{\circ}F$	2-11	105-125
$75^{\circ}F$	4-13	115-140
$80^{\circ}F$	6-16	125-155
$85^{\circ}F$	8-18	135-175
$90^{\circ}F$	10-21	140-190
$95^{\circ}F$	12-23	150-205
$100^{\circ}F$	14-26	155-220

NOTE: Use of an electric fan (12 inch minimum) in front of the car grille may be necessary to direct a flow of air over the condenser. This will eliminate excessive engine temperatures and provide more accurate pressure readings.

5. Disconnect the gage set, replace the flare nuts, and tighten all fittings.

(10) Compressor Removal

Since there are several reasons for removing a compressor from the car, each of which requires a somewhat different service procedure, this note is divided into two major subnotes which cover the removal procedures for each condition.

a. To Perform Engine Disassembly Operations and/or Shaft Seal Replacement

1. Remove shut-off valve caps from ends of both the low and high pressure lines where they are connected to the compressor. Fig. 16A-16.

2. Using a 1/4 inch key, Tool No. J-5427, close both hand shut-off valves tightly by turning clockwise. This removes the compressor from the system.

CAUTION: Do not operate compressor with shut-off valves closed. REMOVE IGNITION KEY.

3. Loosen two high pressure valve fitting to compressor attaching screws about seven turns. Tap fitting to free it from the "O" ring flange opening. The valve fitting should come back firmly against heads of screws. This permits the automatic shut-off valve in the compressor to close quickly, preventing an excessive escape of Freon from the compressor.

NOTE: A momentary release of vapor should be expected as the fitting leaves its bore in the compressor. If vapor continues to escape, the spring loaded automatic valve in the compressor is not seating properly. If this is the case, purge the Freon vapor pressure by depressing the Schrader core in the high pressure gage connection until a low audible hiss is heard. Any air in the compressor must be forced out when the unit is reinstalled as explained in the installation procedure, Note 13a, Step 10.

4. Remove screws and fitting from compressor.

5. Repeat operations 3 and 4 on low pressure line fitting.

6. Cover the low and high pressure openings in both the compressor and pressure line fittings with masking tape to keep out dirt.

7. Disconnect clutch solenoid wires.

8. Loosen generator belt adjusting bracket and link and move generator in toward engine to release tension on belts. Disconnect clutch actuating lever at solenoid by loosening lower bracket mounting screws and sliding lever away from solenoid. Remove belts from pulley.

9. Remove compressor rear mounting nut, lock washer and cap screw.

10. Remove compressor front mounting nuts, lock washers, and carefully remove compressor.

b. To Replace A Damaged Compressor

This includes compressors which have been internally damaged as indicated by seizing, extreme vibration, noises, etc. Also included are those compressors which are externally damaged, as indicated by cracks resulting in refrigerant and oil leakage. Replacement of compressor is necessary.

NOTE: A compressor may seize up (stall) temporarily due to excessively high operating pressure-temperature conditions (sometimes resulting in shaft seal leakage). When pressure-temperature conditions are brought down to normal, the stalling difficulty in many cases will be eliminated. These compressors should not be replaced.

1. Remove compressor from car as described in Note 10a.

2. Remove pulley-clutch assembly from damaged compressor and install on replacement compressor as described in Note 11.

(11) Precautions, Disassembly, Assembly, and Adjustment of Compressor Pulley and Clutch

a. Precautions

1. Use only a clean, dry cloth to wipe off clutch parts. Do not use any type of solvent. This is a dry type clutch.

2. Do not clean the pulley bearing with any type of solvent as it will wash the grease out of the bearing. Shaft ball bearings are supplied with the correct lubricant or grease when assembled by the manufacturer and require no other lubricant at any time.

3. Prevent finger marks, dirt, grease, oil, or any type of foreign matter from coming in contact with ball bearings, frictional and mating surfaces of the clutch plates.

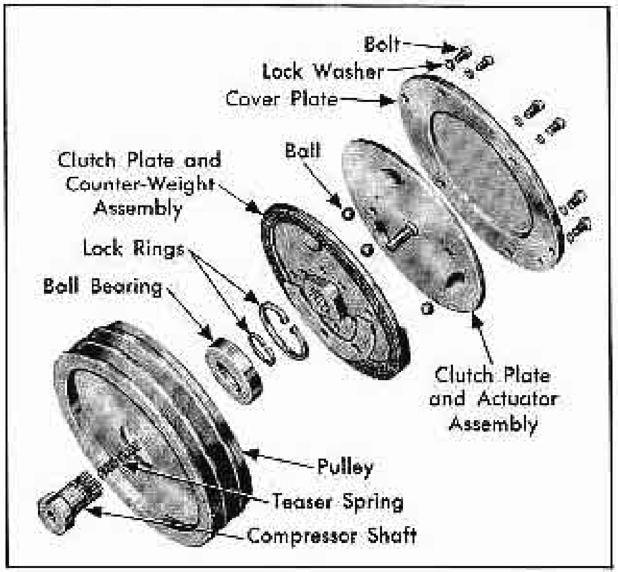

Fig. 16A-17 Clutch Assembly - Disassembled

4. It is important that no attempt is made to dress off the frictional lining material on clutch plates as this will result in improper operation.

b. Disassembly

1. If necessary, remove compressor from car as described in Note 10a and b - may be disassembled on car.

2. Disconnect and remove clutch actuating arm at compressor and solenoid.

3. Remove the clutch cover plate screws and remove plate.

4. Pull out two clutch plates, being careful not to lose the three actuating steel balls. Fig. 16A-17.

5. Using Truarc Pliers, No. J-4880, remove the snap ring retaining the pulley housing on the shaft. Fig. 16A-18.

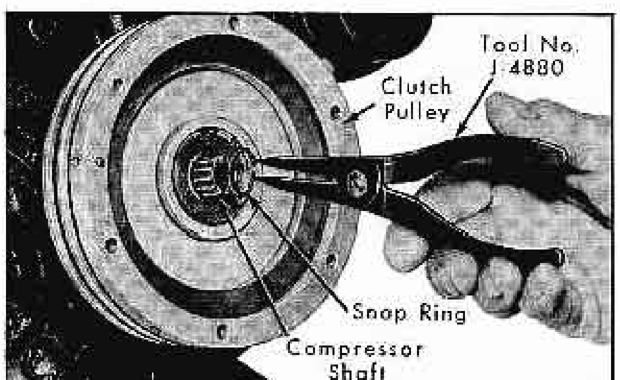

Fig. 16A-18 Removing Pulley Snap Ring

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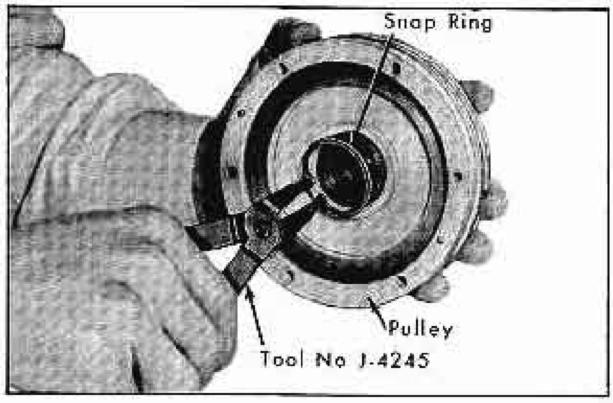

Fig. 16A-19 Removing Pulley Bearing Snap Ring

6. Remove pulley from compressor shaft.

7. If pulley housing bearing requires replacement, remove tru-arc snap ring, using Tool No. J-4245. Fig. 16A-19.

8. Remove bearing from pulley housing. Fig. 16A-20.

c. Assembly

1. Clean all clutch parts observing the precautions listed above.

2. Using a socket or short length of pipe, carefully press new bearing into pulley hub (at the outer race) and install snap ring using Tool No. J-4245. This ring should be installed with bevelled side out.

3. Install pulley and bearing assembly in position on shaft.

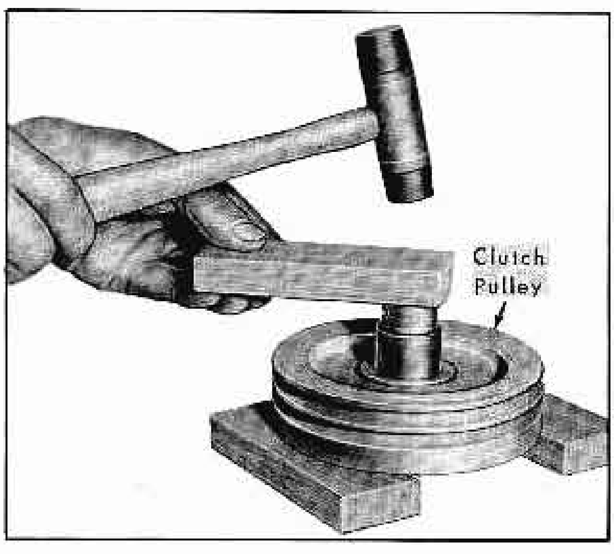

Fig. 16A-20 Removing Pulley Bearing

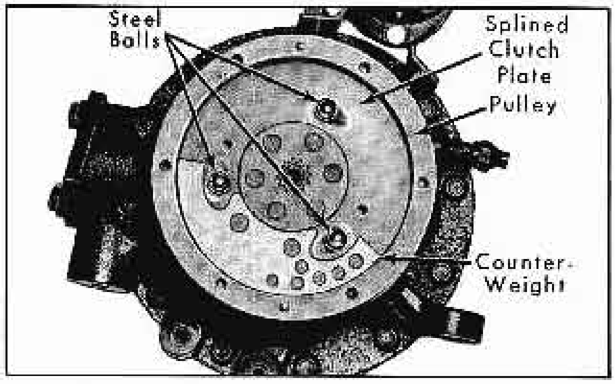

Fig. 16A-21 Splined Clutch Plate - Installed

4. Install pulley housing snap ring on compressor shaft, using Tool No. J-4880. Fig. 16A-18. This ring should be installed with the concave side out.

5. With the compressor in an upright position, install the counter-weight clutch plate on splined shaft, frictional lining towards compressor. To do this, it will be necessary to position the one blind spline of the shaft with the open spline of the inner clutch plate hub. This is necessary since the inner clutch plate will only fit on the shaft in one position. Fig. 16A-21.

6. Place the three steel balls in the tear drop depressions of the counterweight plate.

7. Insert teaser spring in bore of compressor shaft. Fig. 16A-22.

8. With friction lining outward, place actuator

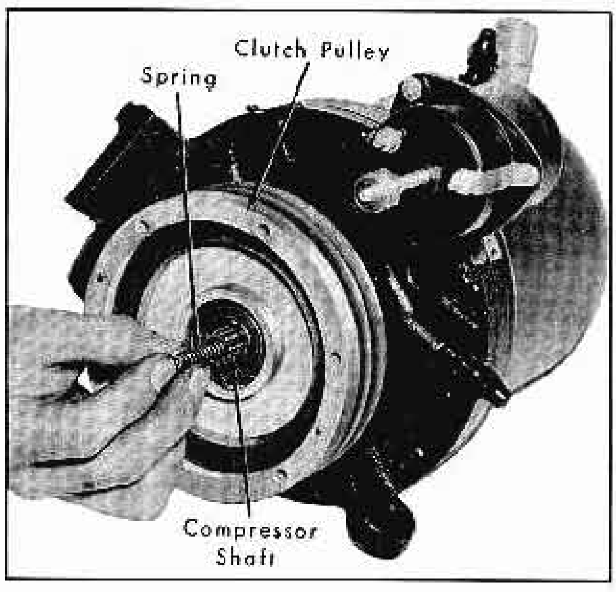

Fig. 16A-22 Installing Teaser Spring

plate on top of steel balls, making certain balls are located in the tear drop depression of both plates. Plates and steel balls can be installed as an assembly if compressor is not removed.

9. Install the clutch cover plate, being sure that the two small holes in the cover plate line up with the two locating dowel pins in the pulley.

10. Install cover plate to pulley lock washers and screws. Tighten to 12-14 foot pounds.

NOTE: Make sure all lock washers are in place to assure proper balance.

11. Install clutch actuating arm bracket to the compressor.

12. Install compressor on the car as described in Note 13a.

d. Clutch Adjustment

1. Energize the solenoid by placing the toggle switch on the control panel in the "On" position (ignition on, engine off). Make certain solenoid is energized. If necessary connect a jumper wire from the solenoid to the battery.

2. Using a feeler gage, check the clearance between the clutch actuating pin and the lever arm. This clearance should be .015" to .020". Adjust to .018". Fig. 16A-23.

3. If adjustment is not correct, loosen lock nut at the solenoid plunger and turn the adjusting nut to secure proper clearance. Tighten lock nut.

e. Checking Clutch Operation

With the engine idling, turn the air conditioning switch "On" and "Off" a number of times to burnish the clutch plates until the clutch properly engages.

NOTE: Proper engagement can be observed by watching the actuating pin to be sure it turns in relationship to the pulley when the clutch is engaged. Pin should rotate at pulley speed.

(12) Replacing Compressor Seal

1. Remove compressor as described in Note 10a.

2. Relieve pressure in compressor through two gage connections to two to five pounds or until a low audible hiss is evident.

3. Remove clutch and pulley assembly from compressor as described in Note 11.

4. Remove seal retaining plate and bellows seal. Fig. 16A-24.

5. Remove nitralloy ring from shaft using Tool No. J-5425. Fig. 16A-25.

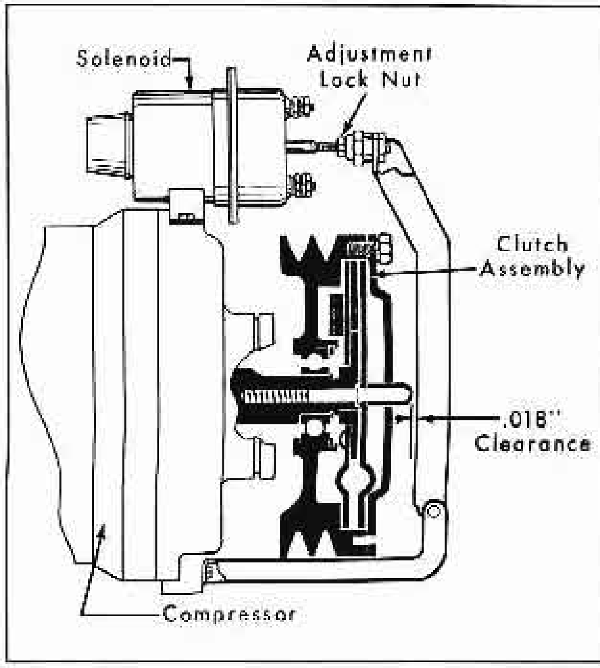

Fig. 16A-23 Clutch Adjustment

6. Make certain shaft is polished and free of paint, corrosion, nicks, burrs, tooling marks, etc. This care is necessary to avoid excessive wear and failure of new seal.

7. Flush seal cavity with Frigidaire oil.

8. Wet a cleaning tissue with a good grade of lighter fluid and allow tissue to dry. Remove any trace of oil or lint. The shaft and shoulder, also, must be clean and dry.

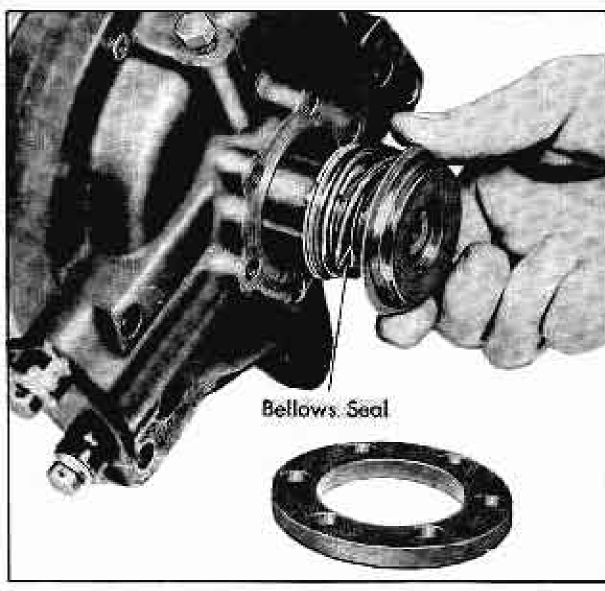

Fig. 16A-24 Removing Bellows Seal

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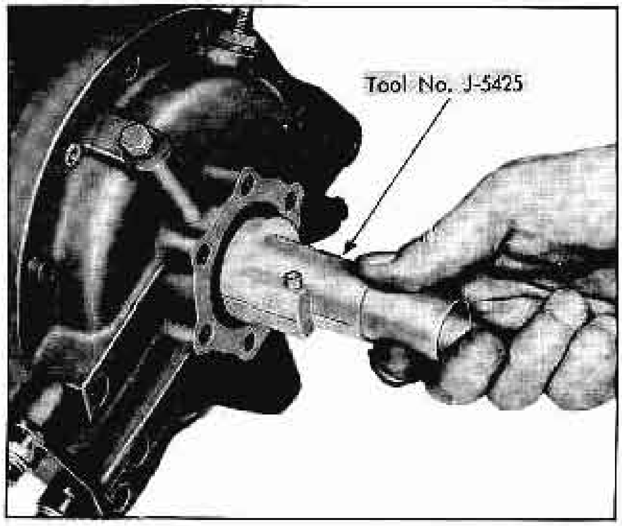

Fig. 16A-25 Removing Nitralloy Ring

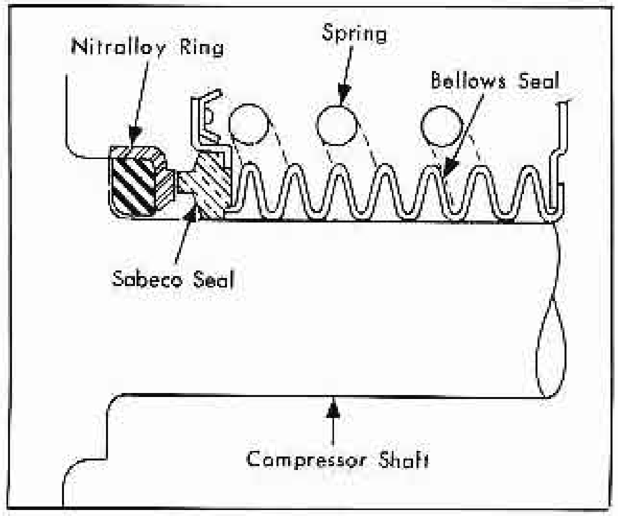

Fig. 16A-27 Location of Nitralloy Ring on Compressor Shaft

9. Insert nitralloy ring in Seal Centering Tool No. J-5425 so that synthetic rubber is visible.

NOTE: Extreme care must be taken not to handle the surfaces of the nitralloy ring with the fingers. Fig. 16A-26.

10. Apply lighter fluid to another cleaning tissue and, using wetted tissue, wipe entire rubber surface, including inner diameter and radius of seal, until all the protective oil coating is removed and the rubber is completely clean and dry. The purpose of cleaning the shaft and neoprene surface of this seal is to obtain maximum driving friction.

11. Install nitralloy ring on the shaft, making certain the neoprene rests evenly and firmly against the shaft shoulder. Fig. 16A-27.

NOTE: This can be done by reversing the tool so that the small tubular end is pressed firmly by hand against the inner ring of synthetic rubber. This will assure a better contact between the radius of the seal and the shaft shoulder.

12. Apply clean Frigidaire oil to the nitralloy ring, seat, bronze seal that contacts the nitralloy ring, and the first three turns of the bellows seals.

13. Using the special seal centering tool, install the new bellows seal and gasket. Install retainer plate and screws. Screws should be tightened alternately to insure even pressure against the seat. Do not remove the centering tool until all screws are tightened. If a major loss of oil has occurred, add oil as described in Note 8c. Fig. 16A-28.

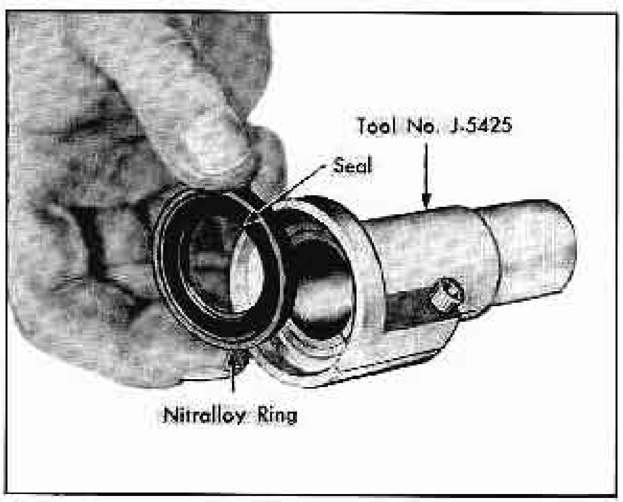

Fig. 16A-26 Installing Ring in Centering Tool

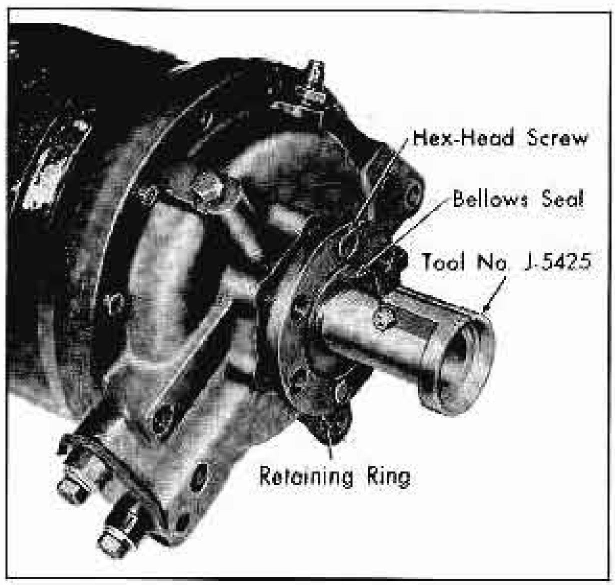

Fig. 16A-28 Installing Bellows Seal

AIR CONDITIONER

(13) Installing Compressor

a. After Engine Operations Are Performed and/or Compressor Seal Replacement

1. Place compressor in position on front and rear mounting brackets.

2. Install rear mounting screw, lock washer and nut.

3. Install front mounting washers and nuts. Tighten 25 to 30 ft. lbs. torque.

4. Place belts on pulley and adjust tension at generator. Tighten adjusting bracket screw.

5. Connect clutch actuating lever to solenoid plunger and tighten lower bracket screws. Check lever adjustment as described in Note 11d. Fig. 16A-23.

6. Install new "O" rings and flange gaskets on high and low pressure line valve fittings. Apply a slight amount of Frigidaire oil to "O" rings before installing fittings into bores.

7. Insert high and low pressure line fittings into their bores in compressor. Use care to be sure that "O" ring seals are not damaged.

8. Insert screws in fittings and tighten evenly.

9. Using the 1/4" key, Tool No. J-5427, open both the high and low pressure line valves all the way (counter-clockwise).

NOTE: These valves open against a seal type seat and, therefore, must be turned open all the way against stop to prevent leaks.

10. If either automatic valve in the compressor leaked after the line fittings were removed, it will be necessary to depress the valve stem in the high pressure gage fitting 5 seconds to force out any air in the compressor.

11. Test for leaks at all connections on the compressor.

12. If leaks are indicated in above test, connection must be removed and "O" rings and gaskets replaced.

CAUTION: It is very important that all leaks be repaired. Under no circumstances should the compressor be run when a leak exists, as a complete loss of refrigerant would damage the compressor.

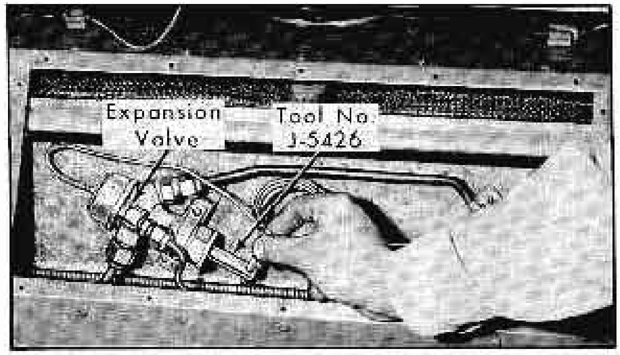

Fig. 16A-29 Adjusting Expansion Valve

b. After Shaft Seal Is Replaced

1. Assemble and install clutch on compressor shaft as described in Note 11c.

2. Install compressor as described in Note 13a.

3. Purge the air from the compressor by depressing the valve stem in the high pressure gage connection for a few seconds.

4. Start the engine and allow it to operate for several minutes, then repeat purging operation as explained in Step 3 above. This will remove the air that entered during the seal replacement.

(14) Adjusting the Expansion Valve

If the expansion valve is out of adjustment (ineffective cooling by either starving the cooling coil of refrigerant, or by flooding the cooling coil with refrigerant) proceed as follows:

1. Remove the access plate located centrally on the evaporator housing in the trunk compartment.

2. Using a 1" socket, while supporting the mating parts (to prevent distortion), remove the cap nut from the expansion valve.

3. Using a 3/16" valve key, Tool No. J-5426, on the adjusting stem of the expansion valve, first CLOSE the valve completely then, OPEN (counter-clockwise) 5 complete turns. Fig. 16A-29.

4. Install access plate.

(15) Replacing the Expansion Valve

1. Purge the system as described in Note 5. (have the replacement valve within reach for immediate installation).

2. Remove the access plate from the evaporator housing.

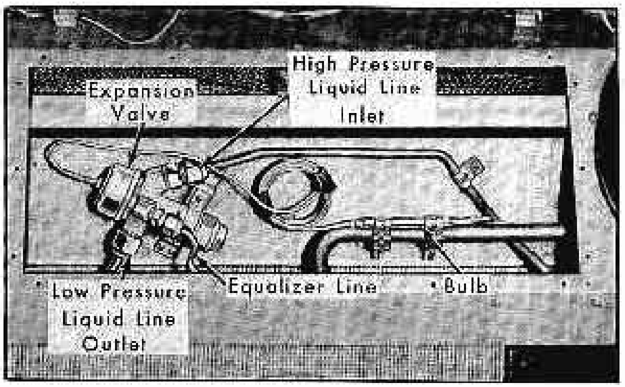

Fig. 16A-30 Expansion Valve Connections

3. Disconnect the power element bulb from the low pressure line. Fig. 16A-30.

4. Remove the equalizing, low pressure and high pressure line flares in that order at the valve.

5. Remove the expansion valve clamp.

6. Remove the valve assembly with power element bulb.

7. Install the new valve by connecting the lines, and clamp the power element of the new valve to the TOP or SIDE of the LOW PRESSURE LINE.

NOTE: Under no circumstances should the smaller high pressure liquid line contact the bulb.

8. Open gage and Freon drum valves and bring system up to drum pressure for checking leaks.

9. Leak test the three expansion valve connections carefully for leaks.

10. Evacuate the system as previously described in Note 6a and b.

11. Add refrigerant as previously described in Note 7b.

12. Replace access plate. Check operation of system.

(16) Replacing Blower Motor

1. Disconnect the electrical lead to the blower motor.

2. Remove flat rubber pad at rear of motor housing, six screws, and motor assembly from motor housing.

3. Remove the fan and mounting plate from the motor and install it on the new motor. Make certain that the fan is in the corresponding position on the new shaft.

4. Install the new motor and its assembly in reverse order of removal.

(17) Replacing the Cooling Coil

1. Purge the system as previously described in Note 5.

2. Remove spare tire and disconnect all of the air ducts from the evaporator.

3. Disconnect blower motor leads.

4. Remove access panel and disconnect the refrigerant line connections at the evaporator unit housing.

5. Remove the evaporator unit mounting nuts and bolts and remove unit from the luggage compartment.

6. Remove the panels from the unit housing, including blower assemblies.

7. Disconnect and remove the expansion valve as described in Note 14, and install it on the new cooling coil.

8. Remove the cooling coil, and install the new one. Installation is reverse of removal procedure.

9. Evacuate the system. Note 6b.

10. Add refrigerant to the system. Note 7b.

11. Test for leaks.

(18) Removal and Installation of Filters

Two filters are located on top of the evaporator housing in the return air stream. Air inside the car is filtered before passing across the cooling coil and then back into the interior of the car. The air filter must be cleaned regularly during those months in which the air conditioner is in operation. This should be done every two months or 2000 miles, or more frequently in those areas of the country which are extremely dusty. To remove the filters for cleaning or replacement purposes, proceed as follows:

1. Remove access panel on the evaporator housing in the trunk compartment.

2. Remove one filter at a time through opening in evaporator housing, Fig. 16A-31.

3. The filter may be cleaned in solvent or by washing in a soapy solution made with household detergent. After filter is cleaned, it should be rinsed and dried with compressed air. Then apply (spray) a light coating of an SAE 30 detergent-free, non-odorous, engine oil or RP filter coat to the entire filter surface.

4. To install filter, reverse above procedure.

(19) Replacing the Dehydrator-Filter

The purpose of the dehydrator-filter is to absorb moisture and to trap foreign matter (dirt, solder, filings, etc.) that may not have been removed during the installation or during service operations. When the filter becomes saturated with moisture or clogged with foreign matter, replacement is necessary. No service should be performed on the dehydrator-filter. To replace the filter, proceed as follows:

1. Purge the system as described in Note 5.

2. Raise the car and disconnect the flare fittings at the dehydrator, located along the right frame side bar in the high pressure liquid line.

NOTE: Do not uncap the new dehydrator until it is in position for installing as it will quickly absorb moisture from the air and decrease its efficiency in the system.

3. Remove mounting clamp and dehydrator filter.

4. Install the new dehydrator, making certain refrigerant flow through it will be in the direction of the arrow on the label or the letters "IN" stamped on inlet fitting. Flow is towards the rear of the car.

5. Before evacuating the system, apply sufficient drum pressure to the system to obtain a good leak test of the dehydrator connections.

6. Evacuate the system as described in Note 6b.

7. Add refrigerant as described in Note 7c.

8. Check performance of system, then remove the evacuating and charging equipment. Be sure all shut-off valves in the system are fully open.

(20) Replacing the Sight Glass

The sight glass provides a quick and sure way of determining whether or not the refrigerant charge in the system is sufficient. It is so designed that a shortage of refrigerant in the receiver and liquid line will be indicated by the appearance of bubbles or foam beneath the glass. A screw-on metal cap protects the glass. Whenever replacement of the sight glass is required, proceed as follows:

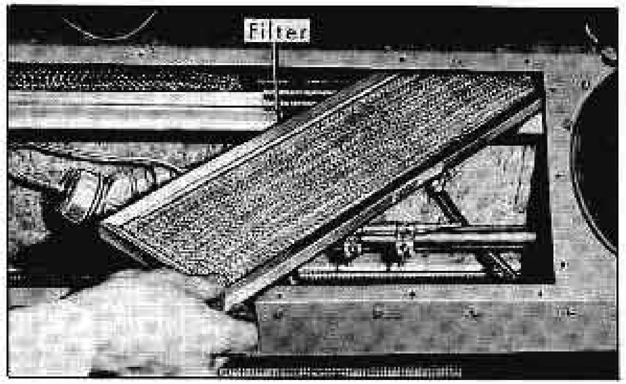

Fig. 16A-31 Removing Filter

1. Purge the system as outlined in Note 5. Have replacement sight glass within reach for immediate installation.

2. Disconnect the flare fittings at the sight glass and remove sight glass.

3. Install the new sight glass.

4. Before evacuating the system, apply sufficient drum pressure to the system to obtain a good leak test.

5. Evacuate the system as described in Note 6b.

6. Add refrigerant as described in Note 7b.

(21) Replacing the Condenser

1. Purge the complete system down to 5 lbs. maximum as described in Note 5.

2. Remove the hood lock plate support and baffle.

3. Disconnect the high pressure line (flared connection at the condenser inlet).

4. Disconnect the condenser outlet lines at the flared connection alongside the condenser and at the inlet elbow on the receiver.

5. Remove the condenser mounting screws and the condenser.

6. Install new condenser by reversing the procedure for removal.

7. Evacuate the entire system as previously described and completely recharge it with refrigerant. Notes 6b and 7b.

8. Test for leaks.

(22) Replacing the Receiver

1. Purge the system as described in Note 5.

2. Disconnect the high pressure inlet line flare at the receiver.

3. Disconnect the high pressure outlet line from the receiver.

4. Remove the receiver mounting nuts, washers, and receiver.

5. Install the new receiver by reversing the procedure for removal. Inlet line must be connected to "IN" fitting of receiver.

6. Evacuate the entire system and recharge with refrigerant. Note 6b and 7b. Test for leaks.

AIR CONDITIONER SERVICE DIAGNOSIS

CONDITION	CAUSE	CORRECTION
A. POOR COOLING		
Blowers not operating	20 Amp. fuse blown A/C Switch in "off" position A/C Switch inoperative Blower rheostats inoperative Wire broken or loose connections Blower motor defective Blower motor rotates in wrong direction	Check for short, Replace fuse Instruct owner Replace switch Replace rheostats Inspect connections and wires Repair or replace motor Replace motor
Restricted air flow	Filter(s) in evaporator clogged with dirt and/or other foreign material Outside air scoops restricted Roof ducts restricted Air flow under rear seat restricted Condenser clogged or restricted.	Remove and clean filters Clean out scoops Remove restriction Remove restriction Remove obstruction
Incorrect quantity of refrigerant in system	Not enough refrigerant Too much refrigerant	Check for leaks - add partial charge - Note 7c Bleed off excess refrigerant - Note 9
Refrigerant flow to cooling coil incorrect	Expansion valve improperly adjusted Power element does not contact pressure line properly Restriction on liquid line between receiver and cooling coil Power element discharged	Check adjustment - Note 14. Replace if necessary Position element correctly and tighten securely. Replace line or receiver tank Replace expansion valve.

AIR CONDITIONER SERVICE DIAGNOSIS (Cont'd)

CONDITION	CAUSE	CORRECTION
Refrigerant not condensing properly	Air flow through condenser restricted High engine operating temperatures Air or excess refrigerant in system Restriction in high pressure and condenser	Clean foreign material out of core Check cooling system Bleed off air or excess refrigerant Replace line
Clutch does not engage	Defective solenoid Clutch plate lining worn or saturated with fluid causing slippage Toggle Switch defective Adjustment of clutch lever arm incorrect Spring in bore of compressor shaft broken	Replace solenoid Replace plates Replace switch Adjust properly - Note 11d Replace spring
Electrical	Toggle Switch not "on" Loose connections or broken wires between electrical units 20 Amp. fuse blown	Instruct owner Inspect and repair Inspect for short and replace fuse
B. TOO COLD		
Clutch does not disengage	Defective solenoid Toggle switch inoperative Clutch lever arm bent, broken or binding	Replace solenoid Replace switch Free-up-replace if necessary
Blower speed can not be reduced	Defective blower switch	Replace switch
C. VIBRATION—NOISE		
Tubing	Loose Chafing	Check grommets and tighten clamps Reposition lines
Blowers	Loose on shaft Striking housing Foreign material Motor bearings or mounts	Tighten screws Align blower on shaft Remove material Replace motor. Tighten mounting
Fan Blade and Pulley	Strikes shroud Pulley scrapes on water pump housing	Realign shroud Grind down housing and paint
Compressor	Mounting brackets loose Continuous internal noise	Tighten Replace compressor

AIR CONDITIONER SERVICE DIAGNOSIS (Cont'd)

CONDITION	CAUSE	CORRECTION
Air flow	Foreign material in air system	Remove foreign material
	Small slits or openings in ducts	Seal all unnecessary openings, Use tape around joints in roof ducts.
D. INCORRECT OPERATING PRESSURE (when checked with gage set)		
Excessive pressure in high pressure side	Air or excess refrigerant in system	Purge air or excess refrigerant from system until normal operating pressures are obtained. (See Note 9)
	Air flow through condenser core restricted	Clean condenser core with air or brush. DO NOT USE STEAM
	Kinks or restrictions in line on high pressure side	Check entire high pressure side to expansion valve for restrictions
	High engine temperature	Check cooling system
	Shut-off valve on high pressure side of compressor not fully open	Open valve all the way
	Insufficient air flow through cooling coil	Check for restricted air passage
	Incorrect expansion valve adjustment	Adjust valve. See Note 14.
Insufficient pressure on high pressure side	Shortage of refrigerant	Check for leaks, repair, and add refrigerant
	Incorrect expansion valve adjustment	Adjust expansion valve. See Note 14.
	Divider blocks in compressor not seating	Replace compressor
Excessive pressure on low pressure side	Expansion valve operation	Check power element bulb contact with suction line. See Note 14 for proper adjustment of expansion valve.
	Expansion valve needle stuck open or leaking	Open expansion valve several turns - Readjust valve. If trouble still exists, replace valve
Insufficient pressure on low pressure side	Restriction in lines	Check all lines for restrictions or kinks
	Shortage of refrigerant	Check for leaks, repair, and add refrigerant
	Expansion valve needle stuck shut	Open valve several turns - Readjust if trouble still exists. Replace valve.
	Expansion valve not open far enough	Adjust expansion valve. See Note 14

AIR CONDITIONER

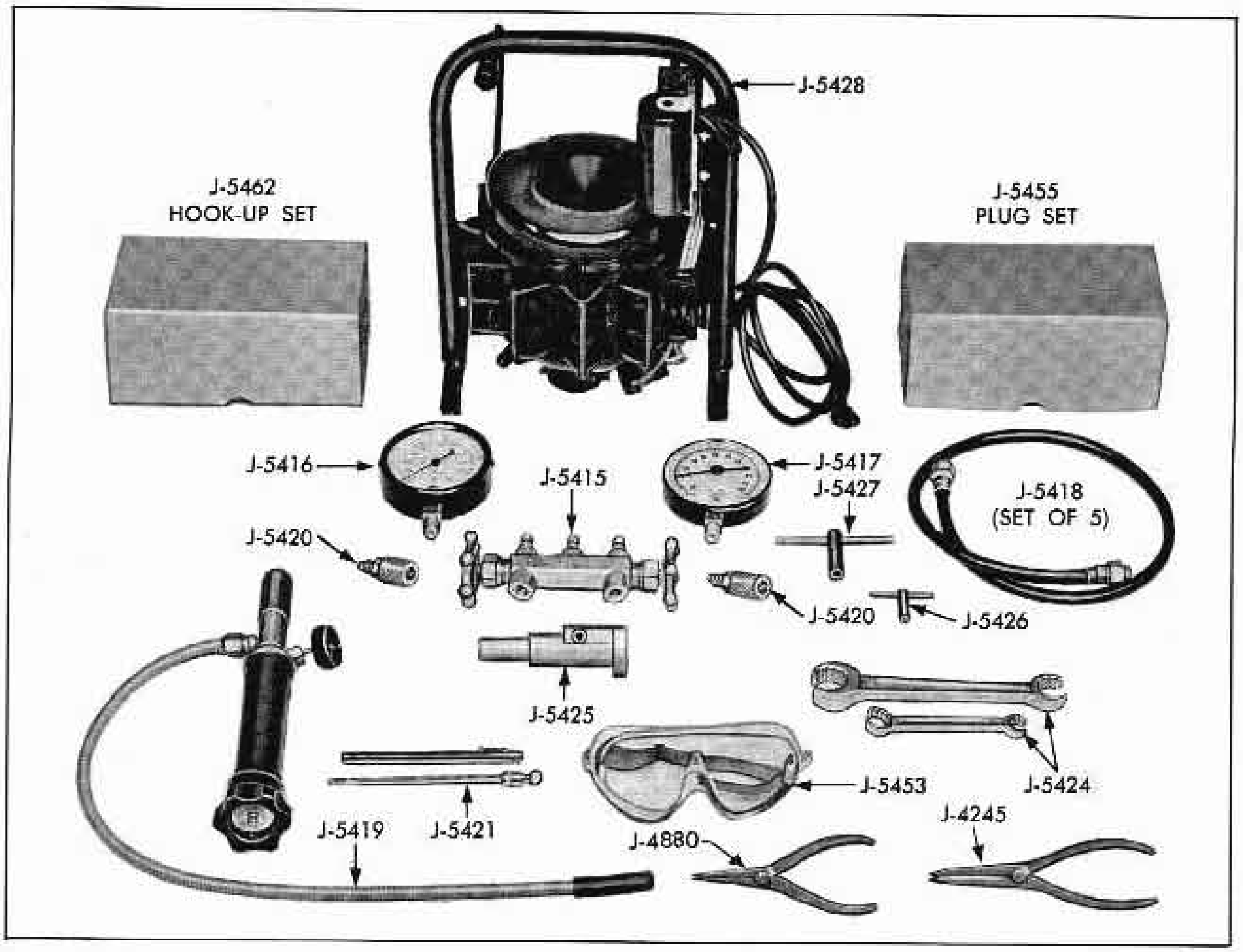

Fig. 16A-32 Cadillac Air Conditioner Tools

Tool No.	Description	Tool No.	Description
J-5415	Gauge Manifold	J-4880	Tru Arc Pliers #2
J-5416	High Pressure Gauge	J-5425	Seal Centering Tool
J-5417	Low Pressure Gauge	J-5426	3/16" Valve Key
J-5418	Gauge Charging Line (Set of 5)	J-5427	1/4" Liquid Valve Key
J-5419	Leak Detector With Anhydrous Alcohol	J-5428	Vacuum Pump 115v, 50-60 Cycle 1/7 HP, With Special Oil
J-5420	Gauge Adapters (Set of 2)		
J-5421	Pocket Thermometer (0°-220°)	J-5453	Goggles
J-5424	9/16" Tube Wrench-3/4" Tube Wrench	J-5455	Plug Set
J-4245	Tru Arc Pliers #3	J-5462	Gauge Hookup Set

OTHER NOTES AND REFERENCES

AIR CONDITIONER

OTHER NOTES AND REFERENCES

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AUTOMATIC HEATING SYSTEM

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GENERAL DESCRIPTION

The Cadillac Deluxe Automatic Heating System consists of two heater units, one behind each cowl kick pad, which circulate warm air at floor level. Warm air is circulated through the front compartment by means of outlet grilles located on each cowl kick pad, and through the rear compartment of 60S and 62 series cars by ducts leading from each heater unit, through the front doors, to outlet grilles located at the rear of the front door kick pads.

On 75 series cars, the front compartment is heated by warm air circulated through each cowl kick pad, the rear compartment by two heaters located under the rear seat.

Two blower motors, one under the top rear of each front fender, accessible through the engine compartment, provide a constant flow of air to the heater for warming and distribution to the car interior. Ouside air for the heater and for summer ventilation is scooped up through an air intake located horizontally along the outside cowl top panel between the rear of the hood and the lower windshield reveal molding. Air entering the intake is directed first against a series of two baffles which force any rain in the air to drop into a drain gutter provided for this purpose. The water thus collected is routed to the ground through four large drain hoses.

A dual thermostatic valve control unit mounted centrally on the engine side of the front cowl panel regulates the flow of water to the heaters and the temperature level of the car interior.

Two levers, one on each side of the instrument cluster assembly, control the operation of both heater units, the two blower units, and on the 75 series, the two recirculating heaters under the rear seat.

The left hand lever (Heat) controls the car interior temperature, the volume of intake air to both the front and rear compartments, both blower motors, and the two underseat heaters on the 75 series.

The right hand lever controls the operation of the two blower motors, upper level ventilation and defroster operation.

The above controls are connected through the ignition switch so that the system is turned on, if the levers are depressed, when the ignition switch is in either the "on" or accessory position.

Air intakes to the lower level of the driver's compartment are located on the left and right side of the inner cowl panel. They are controlled by valves operated by push-pull type knobs located to the right and left of the steering column in the instrument panel. The air intake valves are kept closed during cold weather and are used solely during warm weather when increased ventilation is desired inside of the car

SERVICE INFORMATION

(1) Water Flow

The flow of water through the automatic heating system is illustrated in Fig. 16B-1. The water flows from the right and left outlet sides of the water pump to the thermostatic control valves, from the control valves to the right and left heater cores, and then to the water pump intake. On 75 series the water is routed from the thermostatic control valves to the heater core units under the rear seat, and from these units back to the right and left cowl heaters.

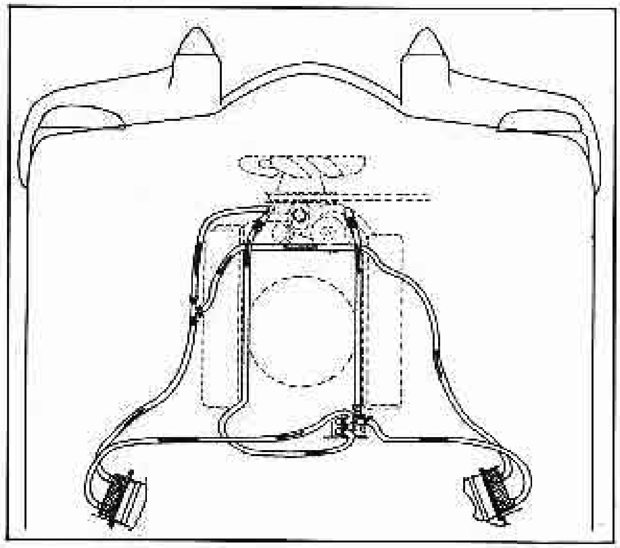

Fig. 16-B-1 Water Flow

(2) Air Flow

The flow of air through the heater and defroster system is illustrated in Fig. 16B-2. Outside air is drawn in through the cowl air scoop.

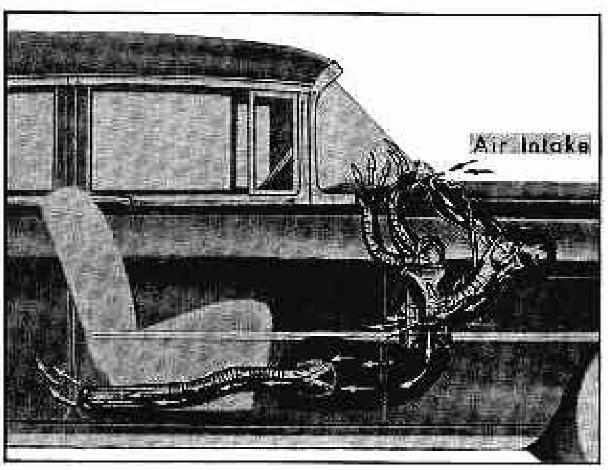

Fig. 16-B-2 Air Flow

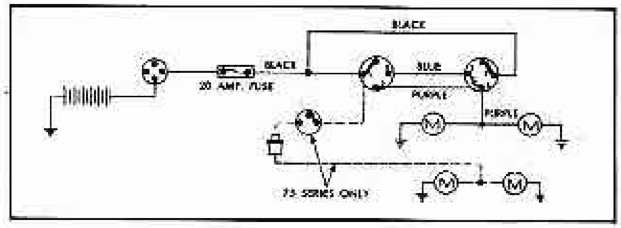

Fig. 16-B-3 Electrical Circuit

The heater lever regulates the temperature to which the car is heated by operating the thermostatic water valves. It also controls the amount of air delivered by regulating the heater air valve opening and by operating the two speed blower switch. As the lever is depressed to approximately 2/3 of its travel, a point is reached where the heater air valves are wide open. Beyond this point, the blower motors operate at "High" speed and the temperature continues to increase to the limit of the heater lever travel.

The "Defr" lever controls the air flow for upper level winter and summer ventilation and defrosting of the windshield. For upper level summer ventilation the blower motors turn "ON" when the "Defr" lever is moved from the "OFF" position. As the lever is depressed the ventilator valve in the heater unit begins to open, allowing fresh air to by-pass the heater cores, enter the defroster ducts, and over the windshield area. The upper vent valve reaches its maximum open position as the "Defr" lever is depressed to the "Vent" position; Beyond the "Vent" position the "Vent" valve begins to close and the defroster valve opens, until at the "Ice" position of the "Defr" lever the vent valve is completely closed and the defroster valve completely open.

At all times when interior temperatures are below 65° F, the thermostatic water valves permit circulation of water through the heater cores, regardless of the "Heat" lever position.

Upper level cool air is obtained during heater operation by depressing the "Defr" lever toward the "Vent" position, thus allowing a portion of the intake air to by-pass the heater cores and flow through the defroster ducts to the windshield area. With the heater lever moved from the "OFF" position, the "Defr" lever must be depressed beyond the "Vent" position to allow warm air through the defroster ducts for defrosting purposes.

(3) Electrical Circuit

The heater electrical circuit is illustrated in Fig. 16B-3. Both blower motors are turned "ON" to "Low" speed when either the "Heat" or "Defr" levers are moved from the "OFF" position. As

AUTOMATIC HEATING SYSTEM

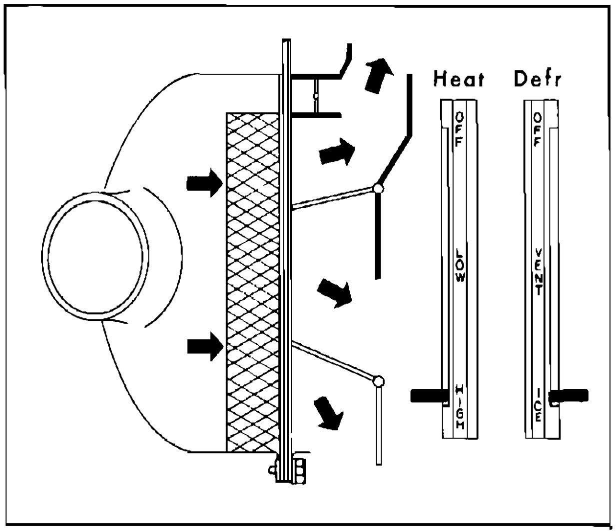

Fig. 16-B-4 Control Lever Position (Ice Removal)

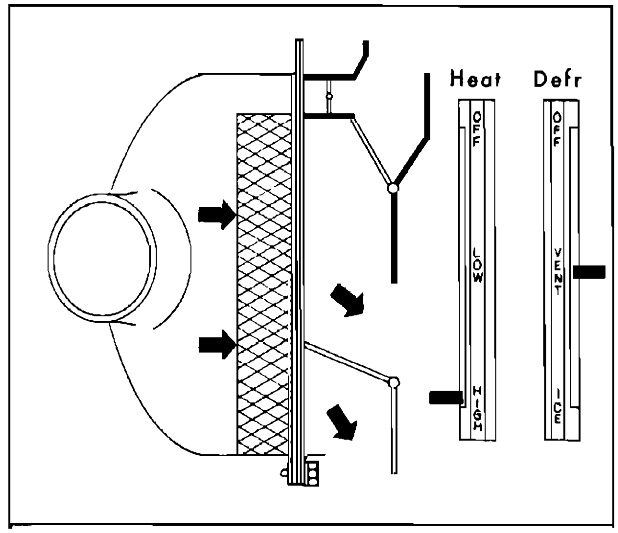

Fig. 16-B-5 Control Lever Position (Winter Ventilation)

either lever is depressed to approximately 2/3 of its travel, the blower motors operate at full speed.

In addition, the "Heat" lever automatically turns on the underseat heater motors on the 75 series as the lever is moved from the "OFF" position.

(4) Operation of "Heat" and "Defr" Control Levers

a. Warm-up

1. Both control levers should be left in the "OFF" position until the engine has warmed sufficiently to furnish hot water to the heater cores.

2. If it is necessary to defog before the water is warm, push the "Defr" lever down to "Ice" position.

b. Ice Removal

1. Depress "Heat" lever to "High" position to get maximum air temperature with high blower speed.

2. Depress "Defr" lever to "Ice" position to prevent any air from bypassing the heater cores, Fig. 16B-4.

NOTE: To remove ice while the engine is still cold, leave the "Heat" lever in "OFF" position, and depress "Defr" lever all the way down to the "Ice" position.

c. Summer Ventilation

1. "Heat and Defr" levers in "OFF" position.

2. Pull out both ventilator knobs at right and left of steering column below instrument cluster. These knobs operate the right and left fresh air intake valves on the lower inner cowl panel.

d. Winter Ventilation

1. Upper level ventilation is possible during winter operation of the heater by depressing the "Defr" lever no further than the vent position, Fig. 16B-5. This will allow fresh, unheated air to by-pass the heater core and circulate at breath level. By depressing the lever beyond the vent position the vent valve begins to close and the defroster valve open until the "Ice" position is reached. At this point, all intake air is passing through the heater core.

e. Summer Defogging

1. Depress "Defr" lever to vent position. Fig. 16B-6.

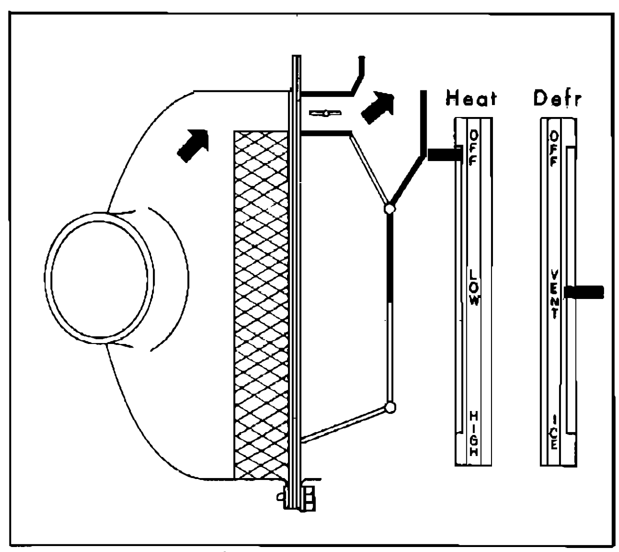

Fig. 16-B-6 Control Lever Position (Summer Defogging)

(5) Adjustment of Control Levers

For best appearance, the "Heat" and "Defr" levers should be in alignment with each other when both levers are raised to the "OFF" position. Adjustment can be made in the following manner.

a. "Heat" Control Lever

1. Remove right and left heater grilles and cowl kick pads.

2. Disconnect heater control cables at both heater units and at cowl clamps.

3. Disconnect thermostatic control valve cables at valves and at cowl clamps.

4. Move control lever to "OFF" position, 1/8" from cluster casting.

5. Fully close heater air valve at both heaters.

6. Turn both thermostatic control valves to full off position.

7. Connect and tighten cables in place without interfering with the pre-set position of the control lever, heater air valves or thermostatic control valves.

NOTE: Make certain that heater and thermostatic valves close completely in "OFF" position, and that blower switch will turn off.

b. "Defr" Control Lever

1. Remove right and left heater grilles and cowl kick pads.

2. Disconnect "Defr" lever cables at both heater units and at cowl clamps.

3. Move control lever to full "OFF" position, and in line with "OFF" position of "HEAT" lever, (1/8" from cluster casting.)

4. Fully close defroster valves and fresh air bypass valves in both heater units.

5. Connect and tighten cables in place without interfering with the pre-set position of the heater unit valves or control lever. Check to see that air valve and blower switch will turn off.

6. Install cowl kick pads and heater grilles.

c. Fresh Air Ventilator Knobs

1. Disconnect ventilator control cables at both fresh air intake valves and at cowl clamps.

2. Push both fresh air vent knobs in as far as possible.

3. Fully close both fresh air intake valves.

NOTE: It is essential that a perfect air tight seal be maintained at the fresh air intake valves as cold air leaks at this point will strike the thermostatic valve capillary tubes and affect heater operation during cold weather.

4. Connect and tighten cables in place without interfering with the pre-set position of the control knobs or air valves.

(6) Removal and Installation of Blower Motor (Left or Right)

1. Remove cowl air deflector to blower assembly air hose.

2. Remove blower assembly to heater air hose.

3. Remove blower motor feed wire connector from clip on fender and disconnect feed wire from connector.

4. Remove blower assembly to wheel housing extension brace nuts and lock washers and remove brace.

5. Remove three nuts and lock washers from upper mounting bracket of blower assembly and remove blower assembly from car.

6. Remove 5 phillips head screws, blower motor retaining plate to blower housing, and remove retaining plate, motor, and blower fan.

7. Loosen nut in blower fan hub and remove fan from motor shaft.

8. Remove motor to retaining plate attaching screws and remove motor.

9. To install, reverse above procedure.

(7) Removal and Disassembly of Heater Unit (Left or Right)

1. Drain cooling system.

2. Raise front end of car and place on stands.

3. Disconnect water hoses from heater assembly, using a special pliers for removing the spring type hose clamps.

4. Remove heater outlet grille and cowl kick pad.

5. Disconnect hand brake lever at instrument panel when removing left heater assembly. For right heater assembly remove glove box as outlined in Section 3, Note 4.

6. Remove three heater shroud duct retaining screws.

7. Loosen trim retainer in door hinge pillar and remove heater shroud duct.

8. Disconnect two defroster hoses from defroster adapter.

9. Remove two defroster adapter to heater assembly retaining screws.

10. Remove instrument panel to cowl brace and remove defroster adapter.

11. Disconnect heater control cables from heater assembly.

12. Remove six heater to cowl attaching screws.

13. Remove retainers (rubber tubing) from the four studs located at each corner of the heater assembly.

14. Remove three heater core to valve case retaining screws.

15. Remove valve case and lift core out of air inlet case.

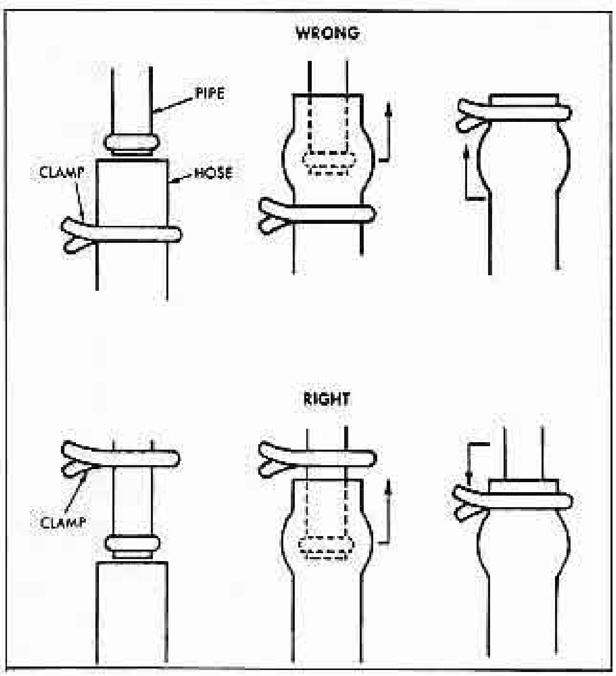

Fig. 16-B-7 Spring Type Hose Clamps

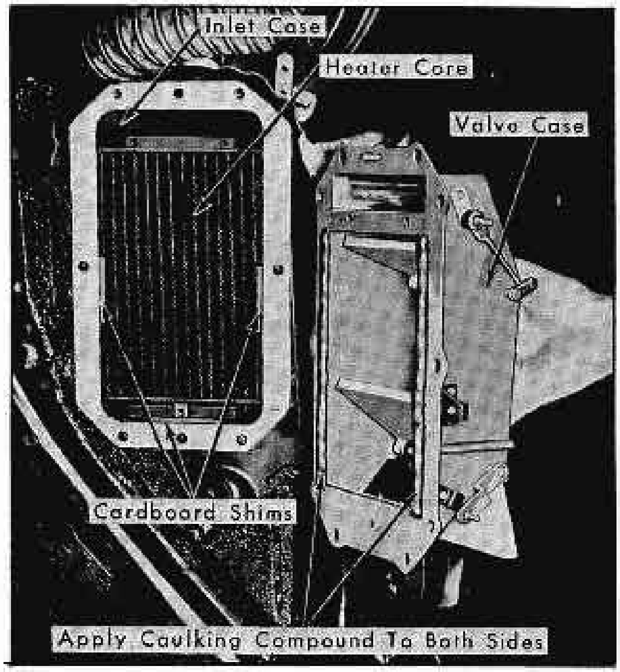

Fig. 16-B-8 Heater Core Alignment

16. Disconnect air intake duct from rear of inlet case and remove inlet case.

NOTE: When installing spring type clamps, slide the clamp over the pipe and then install hose over pipe, past enlarged portion of pipe. Using special pliers, slide clamp over hose so that it is positioned between the enlarged portion of pipe and end of hose as shown in Fig. 16B-7. NEVER PLACE THE CLAMP ON THE HOSE FIRST AND FORCE IT OVER THE ENLARGED PORTION OF THE PIPE AS THIS WOULD EXPAND THE SPRING CLAMP EXCESSIVELY, GIVING IT A SET WHICH IS TOO LARGE AND MAY CAUSE LEAKS. Special pliers, Tool No. 9A, available from the Snap-On Tools Corporation, are designed to fit the clamp properly and will not permit the clamp to be over expanded.

(8) Installation and Assembly of Left Heater Unit

1. Place core in position in inlet case and shim in place with cardboard shims to align core to valve case screw holes. See Fig. 16B-8.

2. Place inlet case in opening in cowl side panel.

3. Apply autobody sealer along both sides of valve case to seal valve case to sides of heater core. See Fig. 16B-8.

4. Position valve case over locating studs at each corner of inlet case and install three heater core to valve case retaining screws.

5. Install six heater to cowl attaching screws.

6. Connect heater control cables to heater assembly.

NOTE: See Note 5 for adjustment of control levers.

7. Slide defroster adapter onto top of heater assembly, making sure that it is held securely by the spring clip, and install defroster adapter to heater assembly retaining screws.

8. Connect defroster hoses to defroster adapter.

9. Install heater shroud duct and heater shroud duct attaching screws.

10. Tighten trim retainer on door hinge pillar.

11. Connect handbrake lever at instrument panel if left heater assembly is being replaced or replace glove box as outlined in Section 3, Note 4, if right heater assembly is being replaced.

12. Replace cowl kick pad and heater outlet grille.

13 Connect air intake duct to heater air intake case.

14. Connect water hoses to heater core nipples, using special snap-on pliers to install spring type hose clamps.

15. Lower front end of car.

16. Refill cooling system.

(9) Removal and Installation of Thermostatic Control Valve (Left or Right)

1. Disconnect capillary tube from clamp on cowl panel in interior of car.

2. Loosen thermostatic valve control cable clamp and slide cable out of clamp and off control arm on the valve.

3. Disconnect and plug water hoses from valve at the engine firewall, using special pliers to remove the spring type hose clamps.

4. Peel rubber insulator pad from thermostatic control valve retaining plate, using care to prevent damage to pad.

5. Remove three valve to retaining plate screws and remove thermostatic control valve. Carefully bend capillary tube to clear firewall during removal.

6. To install, reverse above procedure.

NOTE: Use 3M rubber cement to fasten the rubber insulator pad to the retaining plate when installing the thermostatic control valve assembly.

(10) Removal and Installation of Underseat Heater Core (75 Series Only) (Left or Right)

1. Disconnect battery ground strap at battery.

2. Drain cooling system.

3. Raise rear of car and place on stands.

4. Disconnect water hoses from heater assembly, using special pliers to remove spring type hose clamps.

5. Disconnect blower motor feed wire at clip on side of heater assembly.

6. Remove two blower unit to floor pan screws, and remove heater assembly.

7. Remove friction tape and four metal screws at junction of blower unit and heater core housing.

8. Remove twelve metal screws, joining the two heater housing sections and remove core.

9. To install, reverse above procedure.

NOTE: Make sure that seal around core is properly installed to prevent air leakage past core.

(11) Removal and Installation of Underseat Heater Motor (75 Series Only) (Left or Right)

1. Proceed as outlined in steps 1 through 7, Note 10.

2. Bend back blower housing retainer tabs and separate the upper and lower blower housings, using care not to break tabs.

3. Loosen nut in blower fan hub and remove fan from blower shaft.

4. Remove blower motor to housing retainer screws and remove motor.

5. To install, reverse above procedure.

(12) Removal of Blower and Underseat Heater Control Switches

A blower motor control switch is mounted on

AUTOMATIC HEATING SYSTEM

each of the two heater control levers. To replace these switches it is necessary to first remove the instrument panel cover as outlined in Section 3, Note 1. Either switch may then be easily replaced by disconnecting the terminal wires and removing the two attaching screws.

The blower motor switch for the underseat heater blower on 75 series cars is a push type switch located on the "Heat" control arm lever mounting bracket. As the "Heat" lever is depressed, the underseat heater blower motors are turned on.

The instrument panel cover must be removed to replace this switch. See Section 3, Note 1.

HEATER DIAGNOSIS CHART

EFFECT	CAUSE	REMEDY
1. Insufficient heat	a. Failure of cooling system to warm up.	Check radiator thermostat and replace if required.
	b. Kinked heater hoses.	Remove kink.
	c. Obstructed underseat heater air outlets (75 Series)	Remove obstruction.
	d. Incorrect operation of controls.	Instruct operator.
	e. Dirt or lint in cores.	Remove lint and blow out dirt.
	f. Solder obstructing water flow in core.	Replace core.
	g. Defect in wiring circuit.	See cause and remedies 2b, 2c, 2f, 7, 8a, 8b, 14.
	h. Summer air vent not fully closed.	Push in air vent knob or adjust cable if required.
	i. Defective temperature control.	Replace unit.
	j. Obstructed front or rear compartment air ducts.	Remove obstruction.
	k. Obstruction in cowl air blister.	Remove obstruction.
	l. Control cables not properly secured to thermostatic valve.	Adjust control cables.
	m. Air leaks between heater valve case and heater core.	Seal the leaks with caulking compound.
2. Inadequate fog removal.	a. Obstructions in windshield outlets.	Remove obstruction.
	b. Blower motor not connected.	Connect wire.
	c. Defective blower motor.	Replace motor.
	d. Defective blower motor switch.	Replace switch.
	e. Defroster control not pushed down far enough.	Instruct operator
	f. Open or shorted electrical circuit.	Check circuit and repair..
	g. Defroster valve does not open fully.	Repair valve or readjust operating linkage.

AUTOMATIC HEATING SYSTEM

HEATER DIAGNOSIS CHART (Cont'd)

EFFECT	CAUSE	REMEDY
3. Inadequate ice removal.	a. Thermostatic valve control unit poppet valve not opened.	Check lever adjustment.
	b. Defective blower motor.	Replace.
	c. Defect in wiring.	Repair.
	d. See Trouble 2a.	
	e. See Trouble 1.	
	f. See Note 4b.	
4. Too warm in car.	a. Cold air leaks strike capillary tube.	Repair leaks or close air vent.
	b. Capillary tube touching dash.	Move tube away from dash.
	c. Obstruction in air duct to defroster outlets.	Check for air flow through this duct and repair if obstructed.
	d. Temperature unit defective.	Replace.
	e. Incorrect operation of controls.	Instruct operator.
5. Cold Floor.	a. Air leaks.	Repair leaks or close summer ventilator. Also see Trouble 1.
	b. Hoses routed incorrectly.	Connect as in Fig. 16a-1.
6. Blower fan will not run.	a. Blown fuse.	Replace fuse.
	b. Defective Motor.	Replace motor.
	c. Open circuit.	Repair circuit between ignition switch, blower switch, and blower motor.
	d. Defective Switch.	Replace Switch.
7. Underseat heater fan will not run. (75 series only)	a. Open circuit.	Repair circuit between switch and underseat heater motor.
	b. Defective Switch.	Replace switch.
	c. Defective motor.	Replace motor.
	d. Obstruction in fan blades.	Remove obstruction.
8. Control levers not aligned up and down.	a. Incorrect adjustment.	See Note 5.
9. Control knobs not aligned in and out.	a. Improperly adjusted.	Adjust knobs.
10. Coolant Leaks.	a. Hose leak at connections.	Replace or tighten clamps, replace hose, repair or replace nipple.
	b. Cores leak.	Repair if possible, otherwise replace.
	c. Temperature control unit leaks.	Replace.
11. Blown fuses.	a. Short in electrical system.	Disconnect at ignition switch, blower switches, and blower motors, connect progressively to locate short.

ACCESSORIES

RADIO

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GENERAL DESCRIPTION

A Signal Seeking, Pre-Selector radio, equipped with an automatic signal seeking tuner and five push buttons for favorite station selection, is available for use on all 1954 Cadillac cars.

By turning the sensitivity control ring to any of four positions, the radio will automatically receive signals from the weakest to the strongest stations as the selector bar is depressed. All receivable stations may be received in this manner.

The signal seeker tuner assembly is electroncially controlled. The operator can change stations by merely depressing a selector bar on the radio. The seeking operation is a uni-directional sweep of the broadcast band from low to high frequency with a near instantaneous return of the tuner pointer.

The "favorite station selector" feature of the 1954 Cadillac radio permits a choice of five different stations, selected by the owner, to be tuned in with push buttons located on the radio dial.

A foot control switch for remote control of the signal seeking selector bar is available for installation at the owners option. When the preselector radio is being operated with the push buttons, it is necessary to first depress the selector bar manually before operating the radio with the foot control.

A 6" x 9" elliptical, permanent magnet speaker is mounted separately from the radio. The speaker is located to the right of the radio with the grille opening on the front of the instrument panel and extending beneath the instrument panel overhang.

An auxiliary rear speaker, standard equipment with this radio (except on Convertible Coupes), is located under the parcel shelf in back of the rear seat.

SERVICE INFORMATION

(1) Signal Seeking Radio Controls

a. Switch, Volume, and Sensitivity Control

The ring and knob control at the left of the radio dial serves a dual purpose. The knob controls the "on" and "off", and "volume." The ring controls "sensitivity." By turning the ring to any of four positions, it is possible to receive the weakest to the strongest stations.

b. Tone, Speaker Volume, and Antenna Control

The ring and knob control at the right of the radio dial serves three functions. The ring is the radio tone control. Turn the tone control ring to the left for bass tones and to the right for treble tones. The knob is the speaker volume and antenna control. When the knob is turned to the left, the front speaker volume is predominant. As the knob is turned clockwise, the front speaker volume gradually decreases while the rear speaker volume increases. Thus, the sound can be balanced to please both front and rear seat passengers.

Pushing in the knob will raise the antenna, and pulling it out will lower the antenna. In metropolitan

RADIO

sections with strong broadcasting stations, the radio will operate with the antenna rod in the "down" position. The antenna should be raised to receive stations with weaker signals.

c. Automatic Tuning

To obtain accurate tuning, it is only necessary to touch the "selector" bar above the radio dial. Any particular station can be obtained by just holding the bar down until the dial pointer approaches the desired frequency and then releasing the bar.

d. Push Button Tuning

Once the five push buttons are set to the owners five station selections it is only necessary to push the correct button to dial the desired station.

(2) Minor Adjustments

a. Antenna Trimmer Adjustment

1. Turn radio on and allow it to play for approximately ten minutes to reach normal operating temperature.

2. Extend vacuum portion of antenna, set volume control at maximum, and sensitivity control at maximum (extreme clockwise position).

3. Tune in a weak station near 1400 KC and adjust the antenna trimmer, located on the left side of radio case near the antenna lead socket, to maximum volume. Fig. 16C-1.

NOTE: If, during adjustment, the station becomes strong, tune to a weaker station and continue adjustment.

b. Push Button Station Selection

1. Open the door directly below the dial to gain access to the five red plastic stops.

2. Use the selector bar to tune in the desired station with the lowest frequency.

3. Slide the first plastic stop on the left so that its pointer is directly beneath the dial pointer. The first push button will now tune that station.

4. Depress the selector bar again and tune the next desired station. Align the pointer of second plastic stop with the dial indicator. Push button number two is now set.

5. Repeat above procedure with remaining three buttons.

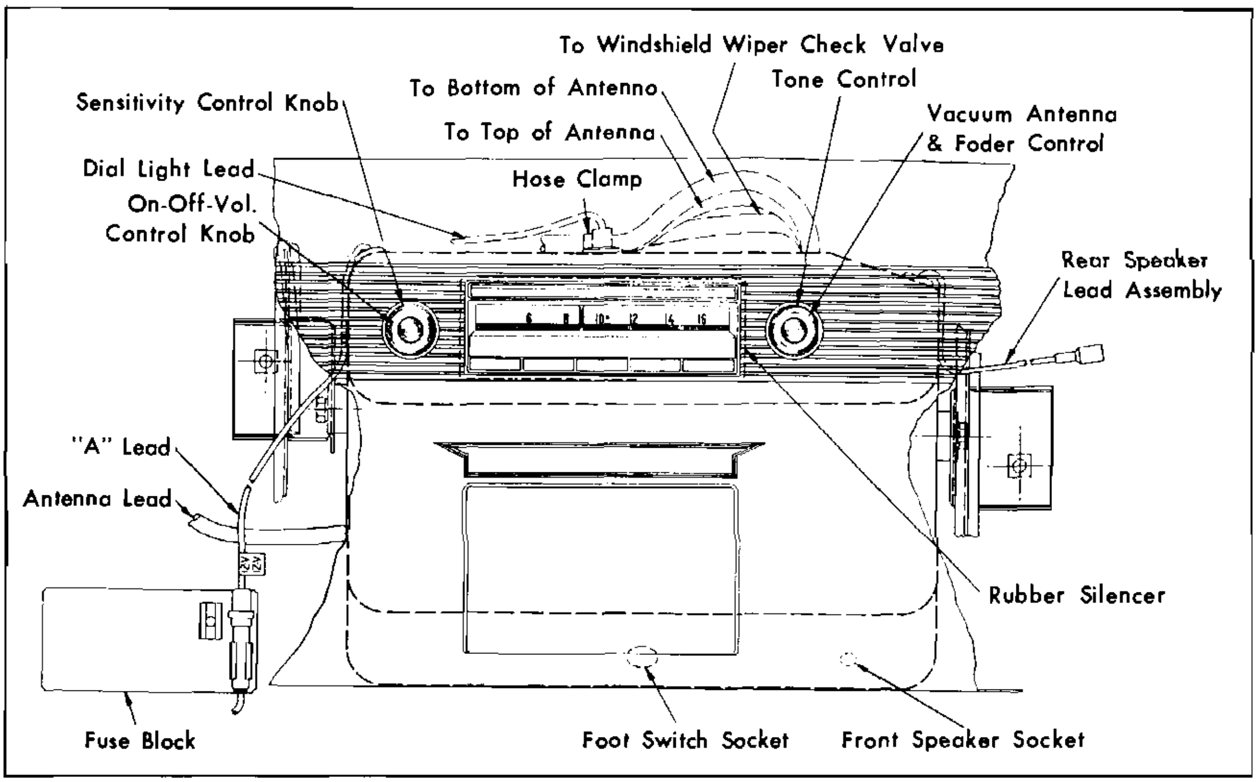

Fig. 16-C-1 Radio Assembly

RADIO

(3) Minor Repair Procedures

Many of the troubles which affect the satisfactory operation of the radio may be corrected without removing the set from the car. Check the condition and, with the aid of the diagnosis chart, Page 16-C-39, perform the operation or operations necessary to correct the trouble. If these minor repairs do not correct the condition, the radio should be removed from the car and repaired by an authorized radio service station.

a. Fuse

Turn radio on and check to see if the radio pilot light will light. If fuse is open or blown, replace with one of the correct amperage. This is generally caused by the vibrator points sticking. Replace fuse and jar radio when the radio switch is turned on. If fuse does not blow, leave set on a few minutes to remove any corrosion that may be formed on vibrator points. Turn radio off and on several times. Continued operation indicates the vibrator points are free and should give continuous service.

b. Vibrotor

Turn the radio on and listen for any unusual buzz or hum. A slight buzz is permissible, but if it is loud, irregular in tone, or intermittent as compared with a known good vibrator, replace with a new one. Defective vibrators may cause a noisy, weak, dead, intermittent, or poor toned radio.

c. Antenna

Use a test antenna and lead-in, plugged into the set, with the test antenna held outside the car. If the radio works satisfactorily with this test assembly the antenna should be checked for a short or ground and the lead-in should be checked for continuity. Test the antenna mast to ground while wiggling the antenna. If a ground is indicated in test, disassemble the antenna and check for defective insulators or presence of water or moisture in the cylinder. Test the antenna lead-in for continuity (test may be made on a volt-ohm meter or on some tube testers) at both tips of lead-in, which should give a reading on tester. Test of continuity from antenna end of lead-in tip to ground. This test should give no reading on the tester. If lead-in tests show a ground or open circuit replace the lead-in.

The conditions mentioned above will cause a weak or intermittent signal in the radio set and will cause the signal seeker in the radio to sweep back and forth across the dial continually, trying to pick up a station. The signal seeker will also sweep back and forth across the dial when the tuning bar is depressed while the car is in an unusually weak signal area such as in a building or under a viaduct. Do not remove the set to correct this condition until all previous checks on the antenna have been made with the car in a fair signal area.

d. Tubes

Check tubes by disconnecting antenna, turning volume on full, and tapping each tube with eraser end of a pencil. Noisy or intermittent tubes will give a cracking noise in the speaker. Replace all tubes that are found defective in this test. Check all tubes on tester and replace those that are not up to specifications. When replacing tubes be sure the correct tube is used.

e. Antenna Trimmer

If antenna is not peaked, it will cause the set to have weak reception. This operation should always be performed when the new car is delivered, or after any repair work is completed. See Note 2a.

f. Worn or Defective Parts

Static in the radio may be due to worn static collectors in the wheels, defective distributor rotor suppressor, or generator condenser. Static due to defective wheel static collectors will be noticed only when the car is in motion, while static due to a defective distributor suppressor will be timed with the ignition. Static due to the defective generator condenser is higher in frequency and tone.

(4) Removal of Radio

1. Disconnect antenna lead plug from left side of radio.

2. Disconnect rear speaker wire from connector at top of glove box.

3. Disconnect front speaker wire at right side of radio.

4. Disconnect ignition lead (black) wire at fuse connector.

5. Remove antenna control knob, spring, and tone control ring from right shaft. Following same procedure, remove volume control knob and sensitivity ring from left shaft.

6. Remove hex nut control escutcheon marked "tone". Following same procedure, remove hex nut escutcheon marked "sensitivity".

7. Remove mounting screws and washers from mounting bracket to the receiver.

8. Remove radio from under instrument panel. Disconnect dial light feed wire (brown) at connector.

9. Disconnect three vacuum antenna hoses from clip and nipples on top of radio.

10. Remove dial light from top of radio chassis.

(5) Installation of Radio

1. Install dial light in top of radio chassis.

2. Connect the vacuum antenna hoses to the nipples on the top of the radio and install under clip provided.

3. Install dial light feed wire (brown) at connector.

4. Install radio with the control bushings extending through instrument panel.

5. Assemble control escutcheon, marked "tone", and a hex nut loosely on the right control bushing. Following same procedure, assemble escutcheon marked "sensitivity" on left control bushing.

NOTE: The control escutcheons have locating pins on the back side which must fit in the matching holes in the instrument panel.

6. Assemble washers and screws loosely through the positioning bracket to receiver. Pull the radio case firmly toward the instrument panel and tighten positioning screws.

7. Tighten control escutcheon hex nuts.

8. Assemble the tone control ring, spring, and control knob on the right shaft. Assemble the sensitivity control ring, wave washer, and control knob on left shaft.

9. Connect the lead (black) wire to the accessory terminal of the ignition switch.

10. Connect rear speaker wire at left side of radio.

11. Connect front speaker wire at right side of radio.

12. Insert antenna lead-in wire at left side of radio.

13. Check operation of the radio.

(6) Replacement of Front Speaker

1. Remove radio, as outlined in Note 4, to provide access to front speaker attaching screws.

2. Remove attaching screws at top and bottom of speaker on left side.

3. Remove upper attaching screw and clip through clock access hole in top interior of glove box.

4. Remove speaker assembly.

5. To install, reverse above procedure.

(7) Replacement of Push Button Tuning Tabs

1. Remove radio as outlined in Note 4.

2. Remove radio dial escutcheon plate.

3. Remove control bushing spacer nuts.

4. Slide the tabs off either end of circuit board until defective tab has been removed.

5. Replace tabs in sequence indicated in Fig. 16C-2.

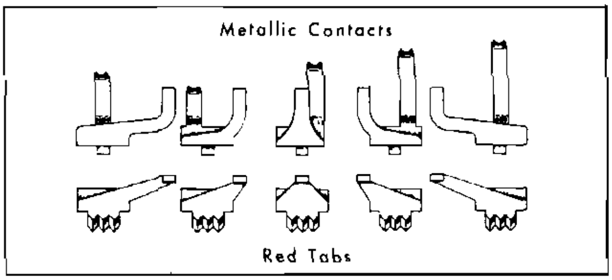

Fig. 16-C-2 Tuning Tab Sequence

To replace, hold the tab with its correct metallic contact together with a pair of long nose pliers and slide the tab on the end of the circuit board. Be careful not to bend the flexible contact out of shape.

6. Install control bushing spacer nuts and radio dial escutcheon plate.

7. Install radio as outlined in Note 5.

(8) Radio Noise Suppressors

a. Static Collectors

Static collectors are located on all four wheels of 1954 Cadillac cars. Their purpose is to discharge static electricity, which is generated while the car is in motion, back into the chassis of the automobile.

RADIO

An inoperative or inefficient static collector may cause a crackling noise in the radio when the car is in motion. This noise will stop when the brakes are applied or the car is brought to a stop.

Location, and possible reasons for inoperative static collectors are as follows:

Front Wheels

Front wheel static collectors consist of helical coil copper inserts installed between the steering knuckle and the front hub grease cap. The areas against which they are grounded must be free of grease or oil to assure proper operation. Also, care must be taken when installing the front wheel to bend the steering knuckle nut cotter key around the shaft, rather than over the end of the shaft, to prevent the static collector from catching on the cotter key end and breaking.

Rear Wheels

Rear wheel static collectors are an integral part of the rear brake oil drain shield. Their only service failure would be due to poor contact caused by oil leakage past the rear axle shaft oil seal.

b. Ignition Suppressors

Various types of ignition suppressors are used on 1954 Cadillac cars. In general, they all serve the same purpose, to eliminate spark noise from interfering with radio reception. Failure of any of these parts to function properly is accompanied by a "popping" noise. The noise increases as the engine is speeded up, varying with engine speed. If this interference is present, the suppressors should be checked in the following order:

Engine Ground Straps

Two ground straps, one from each cylinder head to cowl, should be checked for breaks and proper ground contact.

Hood Ground Clips

There are two hood ground clips located on the left fender near the vacuum antenna. Check for proper ground contact or replace if missing.

Coil Condenser

Mounted on outside of coil. Replace if necessary.

Distributor Rotor Suppressor

Built into distributor rotor. Replace rotor if necessary.

c. Generator—Regulator Condenser

A condenser mounted on the outside of the generator prevents generator - regulator operation from interfering with radio reception. A crackling noise, beginning at the time the regulator begins to control generator output, is an indication of condenser trouble. The noise does not occur at engine idle. To correct the condition, replace the condenser.

DIAGNOSIS OF MINOR RADIO TROUBLES

TROUBLE	CAUSE	REMEDY
Dead	Blown Fuse.	Check fuse. See Note 3a.
	Dead vibrator	Check vibrators. See Note 3b.
	Antenna open or shorted.	Check antenna. See Note 3c.
	Dead tube.	Check tubes. See Note 3d.
	Poor ground	Check all ground connections.
	Power supply to radio open.	Check connections at switch.
Weak	Antenna not extended.	Extend antenna.
	Station too weak.	Inform owner.
	Antenna trimmer not adjusted.	Adjust trimmer. See Note 3e.
	Antenna open, shorted.	Test antenna. See Note 3c.
	Weak tube.	Test tubes. See Note 3d.
	Worn vibrator.	Replace vibrator. See Note 3b.
	Low battery.	Charge battery.
	Poor ground.	Check ground connections.
	Poor antenna connection.	Push leads firmly together.
Noisy	Antenna not extended.	Extend antenna.
	Local interference.	Explain to owner.
	Station signal weak.	Explain to owner

RADIO

DIAGNOSIS OF MINOR RADIO TROUBLES (Cont'd)

TROUBLE	CAUSE	REMEDY
Noisy (Cont'd)	Antenna open, shorted. Noisy tube. Noisy vibrator. Static noise. Spark noise. Generator noise. Installation defects.	Check antenna. See Note 3c. Check tubes. See Note 3d. Replace vibrator. See Note 3f. Identify type of noise. Replace. Check distributor rotor. See Note 3f. Check generator condenser. See Note 4f. Check installation.
Intermittent	Loose antenna connection. Intermittent tube. Intermittent vibrator.	Check connections. Check tubes. See Note 3d. Replace vibrator. See Note 3b.
Poor Tone.	Defective tube. Worn vibrator. Low battery.	Check tubes. See Note 3d. Replace vibrator. See Note 3b. Charge battery.

OTHER NOTES AND REFERENCES

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VACUUM ANTENNA

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GENERAL DESCRIPTION

The radio antenna on 1954 series Cadillac cars is the piston and rod type, vacuum operated from the interior of the car through the tone and speaker control knob on the face of the radio. Pushing the speaker control knob in will raise the antenna, pulling it out will lower the antenna.

Vacuum is supplied to the antenna by a hose running from the vacuum check valve, mounted below the windshield wiper motor on the engine side of the cowl, to the control valve in the radio. From there, vacuum lines run to the base and the top of the antenna cylinder to raise or lower the antenna.

The antenna lead-in to the radio is in two sections to facilitate removal of the antenna assembly. The lead-in is separated by a plug-in connector at the rear of the left front fender dust shield. The short lead-in to the antenna is removed with the antenna assembly. Care should be taken to see that this connection is tight. Heavy ignition noise and a weak signal will be noticed if the connection is loose.

The antenna rod is removed without the necessity of disassembling the antenna assembly. The rod is screwed into the piston assembly which has four "dogs" on its bottom that slide into four recesses in the lower plug. This prevents the piston from revolving while the rod is being unscrewed.

SERVICE INFORMATION

(1) Removal and Installation of Vacuum Antenna

1. Separate lead-in cable at plug-in connector at rear of left front fender dust shield.

2. Raise antenna rod slightly by hand and lower it back into position slowly while rotating it until the "dogs" in the bottom of the piston can be felt to lock into position in the recessed grooves provided in the bottom plug, Fig. 16D-1.

The antenna rod may then be unscrewed from the piston and removed from the assembly.

NOTE: When using pliers to loosen or tighten the antenna rod, be sure to protect the chrome surface of the rod with a piece of leather or cloth.

3. Remove dome nut, insulator, and pad from top of antenna.

4. Disconnect both upper and lower vacuum hoses from vacuum cylinder.

5. Remove screw, lock washer, and flat washer holding lower end of antenna to support on front fender.

6. Remove antenna assembly.

7. To install antenna, reverse steps 1 through 6.

(2) Disassembly of Vacuum Antenna

1. Remove lower vacuum elbow.

2. Remove two screws holding shield cup to bottom of antenna and remove cup and shield cup to plug washers.

3. Remove drain plug and piston through bottom of cylinder.

4. Remove two screws holding antenna lead-in plug retainer to upper part of cylinder and disconnect lead-in wire.

5. Remove cylinder to head retaining screw and remove head assembly from top of cylinder, using a puller as shown in Fig. 16D-2. No attempts should be made to remove the lower seal retainer from the upper end of the vacuum cylinder; nor should the capacity coupler be removed from the head assembly

NOTE: An antenna head puller, made to the

VACUUM ANTENNA

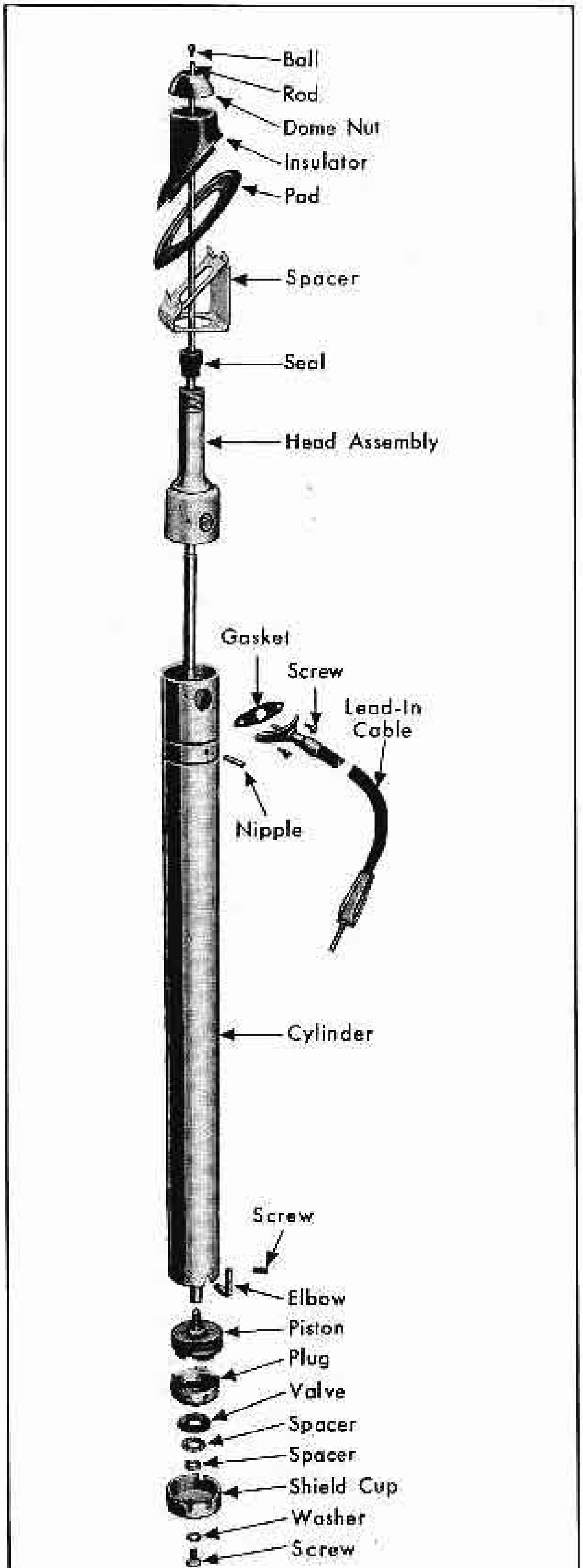

Fig. 16-D-1 Antenna Disassembled

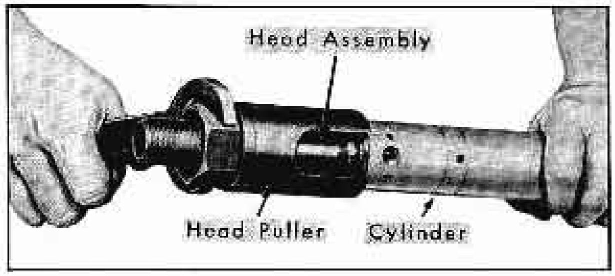

Fig. 16-D-2 Removing Antenna Head

dimensions specified in Fig. 16D-3, is applicable to all 1947 through 1954 vacuum antennas.

(3) Assembly of Vacuum Antenna

1. Coat outside of head assembly sparingly with Glyptol sealer and press head into top of vacuum cylinder until the three screw holes line up.

CAUTION: Do not damage insulator at top of head assembly.

2. Connect antenna lead-in plug to antenna head and install lead-in retainer screws. Install cylinder to head retaining screw.

3. Lubricate rubber cups on piston assembly sparingly with vaseline and guide lips of rubber cups into cylinder with a feeler gage to prevent damage to the piston.

4. Coat outer edge of bottom drain plug sparingly with Glyptol sealer and press plug in bottom of vacuum cylinder until screw holes line up.

5. Place large, thin copper washer and small steel washer in position on bottom of drain plug and then position shield cup over bottom of cylinder and install the two retaining screws.

6. Install lower vacuum elbow.

(4) Maintenance and Repair Procedures

Many antenna troubles can be prevented by cleaning the antenna rod on all cars at periodic intervals. This is easily performed during a lubrication period, or when a car is being washed, by wiping the rod with a soft cloth. It is essential that the rod be kept clean at all times to prevent dirt from damaging the seals as the rod is raised and lowered.

a. Moisture in Cylinder

Weak receiption or fading is often caused by moisture in the antenna cylinder due to condensation

VACUUM ANTENNA

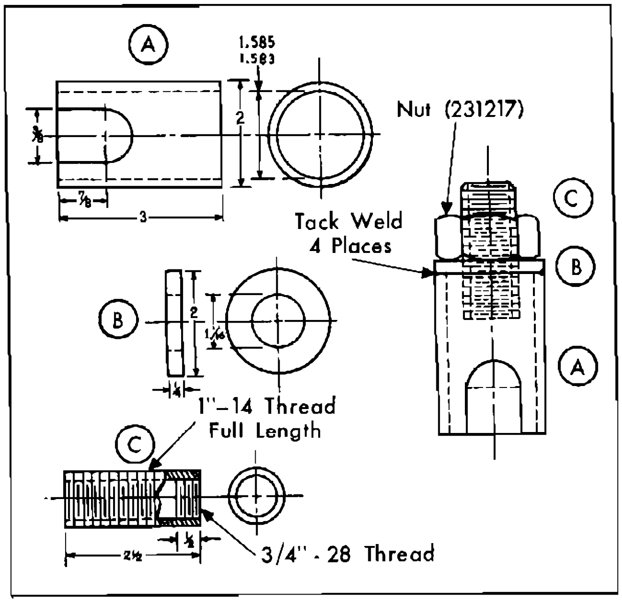

Fig. 16-D-3 Antenna Head Pulley

or leakage through the seals. Leakage is most apt to occur while the antenna is being operated with the rod wet and dirty. The presence of water can usually be determined by pulling the antenna rod up quickly by hand and noting if any moisture has been forced out of the cylinder where the rod passes through the upper insulator.

If trouble has been traced to moisture in the cylinder, the antenna must be removed, disassembled and thoroughly cleaned. All moisture can be removed by blowing it out with compressed air, then pushing a clean, dry cloth through the cylinder. Before assembling the antenna, check the drain holes in the bottom plug to be sure they are not obstructed.

NOTE: Cover bottom drain holes with masking tape before undercoating car.

b. Antenna Will Not Raise or Lower

Inability of the antenna rod to raise or lower is usually due to a defective antenna rod piston, vacuum hose leak, or a bent antenna rod. No attempt should be made to correct this condition by adding oil to the cylinder. If a check of the three possible causes listed above fails to correct the condition, disassemble the antenna and replace any defective parts.

c. Antenna Will Raise But Will Not Lower

Examine the neoprene drain valve washer on the bottom of the drain plug for excessive stiffness. The drain valve serves a dual purpose, permitting water to drain from the cylinder and preventing the entrance of dirt and road dust to the cylinder. This valve should be replaced if there is any question as to its serviceability.

OTHER NOTES AND REFERENCES

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AUTRONIC EYE

TABLE OF CONTENTS

GENERAL DESCRIPTION

The Autronic Eye is an electronic device that automatically switches the headlamps between the upper and lower beams in response to light from an approaching car. This device, which is optional equipment available as a factory installed accessory, consists of four separate units. The function and operation of each is described briefly in the following paragraphs.

The Phototube Unit, mounted on the top left side of the instrument panel, is an optical device equipped with a lens which picks up light from an approaching car and focuses it through a filter and mask to a phototube. This phototube converts the light into an electrical signal which is conducted, by a cable, to the Amplifier unit.

The Amplifier Unit is mounted under the hood on the left front fender dust shield and supplies voltage to both the phototube and the power relay.

In response to a signal from the phototube unit, the amplifier unit operates the power relay to lower the headlamp beams.

The Power Relay is mounted under the hood near the amplifier unit and switches the headlamps between the upper and lower beams. It is a heavy duty relay with special alloy contacts and is operated by the amplifier unit.

An Auxiliary Foot Control Switch is mounted on the toe board along side the standard foot dimmer switch and acts as an over-control switch, when pressed down and held, to provide an upper beam, regardless of light on the phototube unit.

The headlamps are controlled automatically in only one position of the standard foot dimmer switch.

The other position of the standard foot dimmer switch provides the lower beam only.

The auxiliary foot switch functions only in the "automatic" position of the standard foot dimmer switch. When pressed down and held, it provides the upper beam regardless of light on the phototube unit. This arrangement permits signaling if desired and provides a simple test for the "automatic" position of the standard foot dimmer switch.

In the "automatic" position of the standard foot dimmer switch, the autronic eye provides complete automatic switching of the headlamp beams. When a car approaches, the light from its headlamps strikes the phototube unit which causes the Autronic Eye to switch the headlamps to the lower beam. At this time, if the driver of the approaching car had on the upper beam, he would normally switch to the lower beam; thus, greatly reducing the amount of light falling on the phototube unit. The Autronic Eye is designed to maintain its vehicle headlamps on a lower beam even with this reduction in light. When light is removed from the phototube unit, the Automatic Headlamp Control returns the headlamps to the upper beam.

If the approaching vehicle fails to switch to its lower beam, the auxiliary foot switch may be operated to provide an upper beam for signaling purposes. Street lights and extraneous lights encountered in the city are sufficient to cause the Automatic Headlamp Control to maintain the vehicle headlamps on the lower beam.

At times, it may be desired to operate the standard foot dimmer switch to the "lower beam" position, when following a vehicle, to avoid glaring its driver through the rear window.

The Autronic Eye is disconnected from its vehicle headlamps in the "lower beam" position of the standard foot dimmer switch; however, the Autronic Eye is not turned off.

It continues to function as long as the headlamps are turned on, and is ready at all times to provide automatic control whenever the standard foot dimmer switch is returned to the "automatic" position.

AUTRONIC EYE

SERVICE INFORMATION

(1) Preliminary Checks Before Adjustment

The Automatic Headlamp Control device should hold its adjustment over a long period of time. There may be occasions, of course, when the adjustment of the device is questioned. Like any other electrical unit, loose or incorrect wire connections, or even a misunderstanding of the operation of the device, may lead one to believe that an adjustment is necessary. The following troubles may be reported:

Headlamps switch to the lower beam when an approaching car is too far away. Headlamps switch to the lower beam when approaching car is too close or will not switch to the lower beam at all.

Headlamps will not return to the upper beam when no car or other lights are ahead.

Headlamps return to the upper beam, after being depressed by the upper beam of an approaching car when the approaching car switches to the lower beam.

Headlamps switch back and forth rapidly between upper and lower beam.

While the above complaints may be corrected by simple aiming and sensitivity adjustments in most cases, a few preliminary tests should be made to indicate if the difficulty is more serious than can be corrected by simple adjustment. Check as described below:

1. Pull light switch knob to full "On" position. With car in lighted area, lights should remain on the lower beam, regardless of the position of the standard dimmer switch.

2. Depress auxiliary foot switch. The lights should change to the upper beam, if the standard dimmer switch is in the automatic position. If not, trip the dimmer switch and again depress the auxiliary switch. The lights should now change to the upper beam and back to the lower beam when the auxiliary switch is released.

If lights do not operate as described in steps 1 and 2, refer to Notes 4 and 5.

3. Cover the phototube unit lens with palm of the hand. The headlamps should switch to the upper beam and back to the lower beam when the hand is removed, if the standard foot switch is in the "automatic" position. If beam does not raise and lower as explained above, see Notes 4 and 5.

NOTE: If the headlamps operate as outlined in the above tests, the unit should operate correctly with the proper aiming and sensitivity adjustment. If the Autronic Eye cannot be serviced immediately, the lights can be quickly converted to manual foot dimmer switch operation, in most cases, by disconnecting the blue feed wire to the amplifier from the multiple plug inside the amplifier.

(2) Phototube Unit Aiming Procedure

NOTE: Due to normal settling of front and rear springs, it is recommended that the aiming procedure, outlined below, should be made with the 2,000 mile inspection.

1. The phototube unit aiming should be done with car unloaded, trunk empty, except for spare tire, gas tank at least half full, and with tires at correct pressure.

2. Locate car on a level floor (level within 1/4" fore and aft of car).

3. Rock car to normalize springs.

4. Adjust dial on aiming device to the number stamped on the name plate on bottom side of phototube unit. Fig. 16E-1.

5. Position aiming device on top of phototube unit, using care to center it on the raised ridge, and then move it to the rear until it contacts the lens.

6. Adjust phototube unit aiming screw until bubble is centered in the level. Fig. 16E-2.

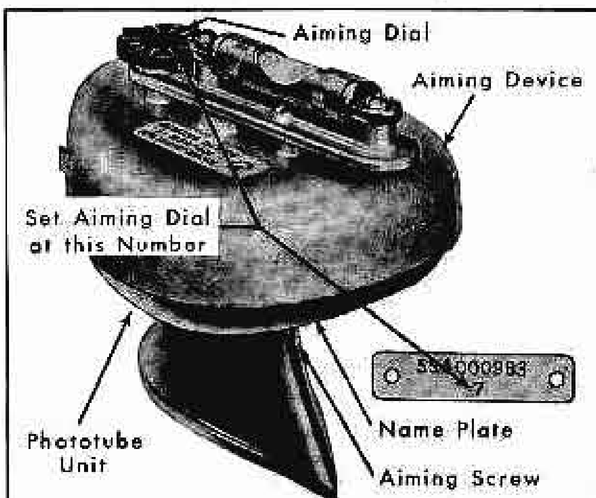

Fig. 16-E-1 Setting Leveling Device

NOTE: It is very important that the phototube unit is accurately aimed. If it is aimed too low,

AUTRONIC EYE

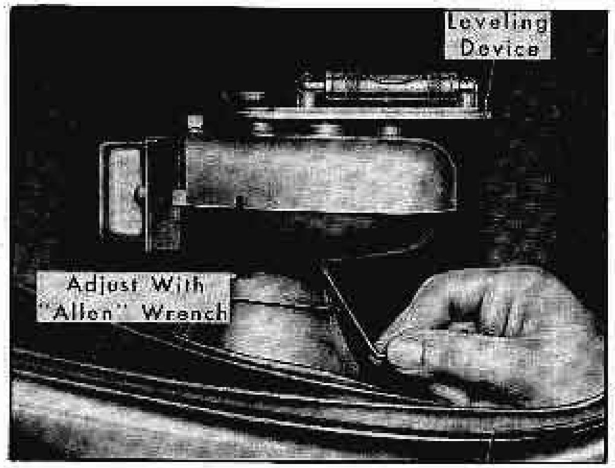

Fig. 16-E-2 Leveling Adjustment

back reflections from the headlamps of the car on which the Autronic Eye is installed will hold the lamps on the lower beam. Also, the unit must be aimed as low as possible to provide the maximum tolerance for car loading.

(3) Sensitivity Adjustments

a. "DIM" Sensitivity Adjustment

CAUTION: The Autronic Eye develops 1000 volts -- headlamps must be turned off before removing cover from phototube unit.

1. Remove two oval head screws from bottom of the phototube unit.

2. Lift off cover, remove lens and replace lens with test lamp. Fig. 16E-3.

3. Replace cover and screws.

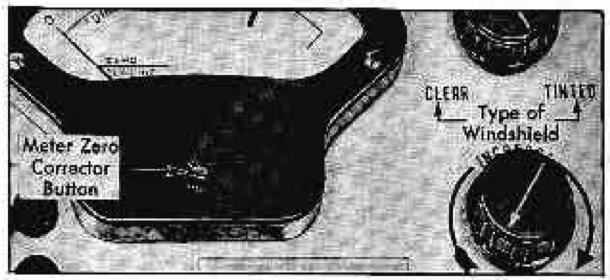

Fig. 16-E-4 Meter Zeroing Button

4. Turn headlamps "ON" and wait at least four minutes for amplifier to stabilize. Set standard foot dimmer switch to "Automatic" position. (Upper beam will then be on.)

5. Turn zero corrector on face of meter until meter pointer is on zero set line. Fig. 16E-4.

6. Turn the intensity rheostat all the way counter-clockwise. Fig. 16E-5.

7. Turn the selector switch to the "DIM" position.

NOTE: Be sure to use correct "DIM" position for clear or tinted windshields.

8. Insert the connector into the cigar lighter receptacle. (Sun Tester only.)

9. Check car battery voltage. If less than 12 volts, operate engine at fast idle when making sensitivity adjustment.

10. Turn intensity rheostat clockwise slowly just to the point where the headlamps switch to the lower beam. The meter pointer should fall within the "DIM" sensitivity adjustment line. Fig. 16E-5.

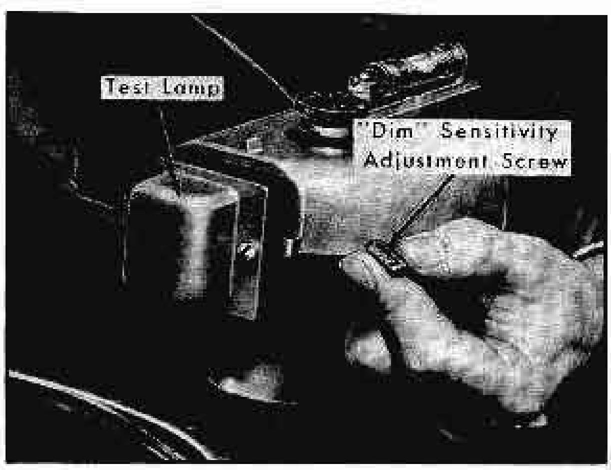

Fig. 16-E-3 Sensitivity Adjustment

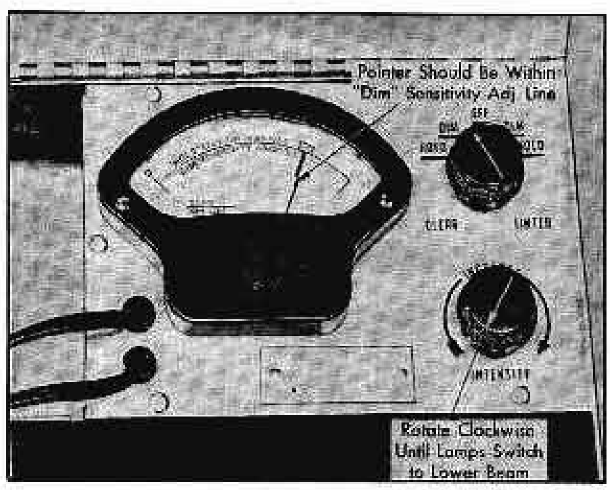

Fig. 16-E-5 Dim Sensitivity Meter

AUTRONIC EYE

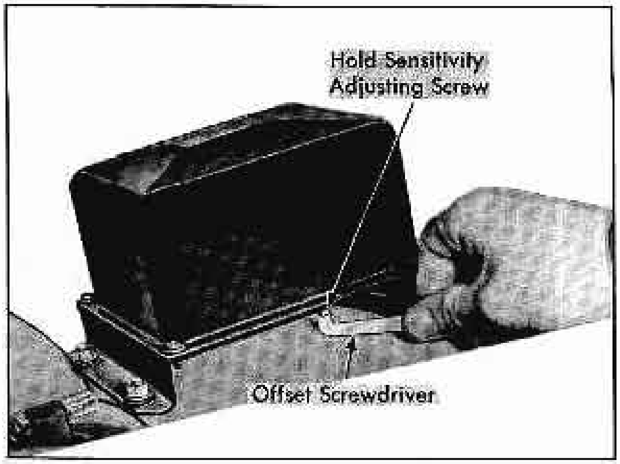

Fig. 16-E-6 Adjust Holding Sensitivity

11. If not, adjust intensity rheostat to the high side of the "DIM" sensitivity adjustment line.

12. Rotate phototube unit sensitivity control counterclockwise to end of adjustment, using a special 1/16" screw driver provided in tester. Fig. 16E-5. Momentarily switch selector switch to "off" position so that headlamps are on upper beam; then turn selector switch to "DIM" position.

13. Carefully and slowly turn phototube unit sensitivity control clockwise just to the point where the headlamps switch to the lower beam - DO NOT GO BEYOND THIS SETTING.

14. Turn intensity rheostat all the way counterclockwise, momentarily switch selector switch to "off" position and back to "DIM" position.

15. Turn intensity rheostat clockwise slowly just to the point where the headlamps switch to the lower beam. If "DIM" sensitivity has been adjusted correctly, the meter pointer should fall within the "DIM" sensitivity adjustment line. If not, repeat steps 11 through 15.

b. "HOLD" Sensitivity Adjustment

"HOLD" Sensitivity adjustments may be made by adjusting the potentiometer on the bottom (outside) of the amplifier unit. Fig. 16E-6. THIS ADJUSTMENT SHOULD NOT BE MADE UNTIL "DIM" SENSITIVITY IS ADJUSTED CORRECTLY AND "HOLD" SENSITIVITY ADJUSTMENT CHECKED TO SEE IF THE METER POINTER FALLS WITHIN "HOLD" SENSITIVITY ADJUSTMENT BAR.

Checking "HOLD" Sensititivy Adjustment

1. With "DIM" sensitivity correctly adjusted, turn selector switch to "DIM" position, and turn intensity rheostat clockwise to end of adjustment to obtain a lower beam.

2. Turn the selector switch to "HOLD" position.

NOTE: Be sure to use correct "HOLD" position for clear or tinted windshield.

3. Turn intensity rheostat counterclockwise carefully and slowly just to the point where the headlamps switch to the upper beam. The meter pointer should fall within the "HOLD" sensitivity adjustment bar on meter scale. If not, adjust amplifier for "HOLD" sensitivity, as follows:

Adjust Amplifier for "HOLD" Sensitivity

1. Turn on headlamps and wait four minutes to allow amplifier to stabilize.

2. Turn the "HOLD" control on the bottom (outside) of the amplifier unit clockwise to end of adjustment. Use small offset screwdriver, Fig. 16E-6.

3. Rotate intensity rheostat clockwise to end of adjustment.

4. Turn selector switch to "DIM" position momentarily to switch headlamps to lower beam; then turn selector switch to "HOLD" position.

NOTE: Be sure to use correct "HOLD" position for clear or tinted windshields.

5. Adjust intensity rheostat until meter pointer is in center of the "HOLD" sensitivity adjustment bar on meter scale. Fig. 16E-7.

6. Turn "HOLD" control on amplifier counterclockwise slowly just to the point where the headlamps switch to the upper beam. If the headlamps do not switch to upper beam when the "HOLD"

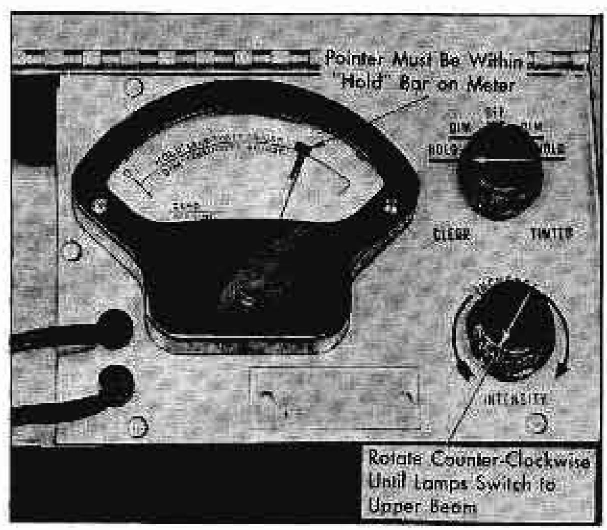

Fig. 16-E-7 Hold Sensitivity Meter

control is turned completely counterclockwise, rotate intensity rheostat counterclockwise until headlamps switch to upper beam. If the meter pointer is within the "HOLD" sensitivity adjustment bar, the amplifier unit is within tolerance.

7. Again check "HOLD" sensitivity adjustment by rotating intensity rheostat clockwise to end of adjustment.

8. Turn selector switch to "DIM" position momentarily to switch headlamps to lower beam; then turn selector switch to "HOLD" position.

NOTE: Be sure to use correct "HOLD" position for clear or tinted windshields.

9. Turn intensity rheostat counterclockwise carefully and slowly just to the point where the headlamps switch to the upper beam. The meter pointer should fall within the "HOLD" sensitivity adjustment bar on meter scale, if adjustment was made correctly.

10. Turn off headlamps.

11. Disconnect Autronic Eye tester from cigar lighter.

12. Remove two oval head screws from bottom of phototube unit.

13. Lift off cover, remove test lamp and replace lens.

14. Replace cover and screws.

(4) Minor Service Corrections (On Car)

CAUTION: Headlamps should be turned "off" before any connections are tightened, made, or broken. The battery ground strap must be disconnected before removing or tightening the phototube unit. The Autronic Eye develops 1,000 volts.

1. Check to see that all external connections are tight and properly made. Be sure to inspect plug-in connections of phototube unit under the instrument panel.

2. Turn on the headlamps and feel the amplifier for vibrator buzz. If vibrator does not buzz -

a. Be sure vibrator is firmly seated in socket.

b. Replace vibrator with new 12 volt vibrator. DO NOT USE RADIO 6 OR 12 VOLT TYPE VIBRATOR.

3. Inspect tube filaments for glowing, except the amplifier (large tube) and phototube. Check or replace one tube at a time in amplifier with known good tube. If tube is replaced, dimming sensitivity must be rechecked.

(5) Trouble Diagnosis (Units on Car)

NOTE: The following series of tests should be made to isolate the trouble to one of the four major components of the Autronic Eye before removing any of the units from the car.

a. Units Outside of Electronic Circuits

Disconnect blue feed wire in amplifier from multiple plug. The headlamps should switch between upper and lower beams by operating the standard foot dimmer switch. If not, trouble is in:

1. Power relay.

2. Standard foot dimmer switch.

3. Amplifier unit harness from standard dimmer switch to power relay in either the light blue or yellow wires, Fig. 16E-8.

b. Amplifier Unit (150 volt section) Test

1. Replace blue wire and disconnect the phototube unit and auxiliary foot switch from the amplifier unit. Headlamp should be on upper beam in "automatic" position of the standard foot dimmer switch.

2. If above test is satisfactory, connect a 2 megohm resistor between black wire and natural wire in the amplifier unit harness, Fig. 16E-8.

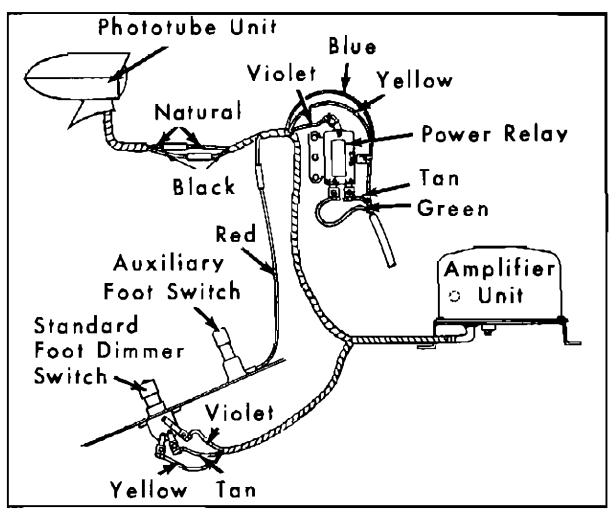

Fig. 16-E-8 Wiring Circuit

AUTRONIC EYE

Headlamp should remain on lower beam in both positions of the standard foot dimmer switch.

3. If headlamps remain on lower beam in Step 2, connect the red amplifier unit wire to ground (with the 2 megohm resistor connected between the black and natural wire). Headlamps should switch to upper beam in "automatic" position of standard foot dimmer switch.

NOTE: If the Autronic Eye fails in any one of the above steps, the trouble is usually in the 150 volt section of the amplifier unit.

c. Amplifier Unit (1000 volt section) Test

1. With phototube unit disconnected, connect a 2 megohm resistor from the black wire in amplifier unit harness to ground. With a 20,000 ohm per volt D.C. Voltmeter capable of measuring 1,000 volts, the voltage across the 2 megohm resistor should at least be 850 volts. If not, the trouble is probably in the 1,000 volt section of the amplifier.

NOTE: A high voltage control, adjusted and sealed at the factory, is provided inside the amplifier. If necessary, the seal may be broken and the control readjusted to the voltage marked inside the amplifier cover.

d. Phototube Unit

1. If the amplifier unit is functioning properly, connect the phototube unit to the amplifier unit. With light entering the phototube unit, the headlamps should be on lower beam in both positions of the standard foot dimmer switch. With no light entering the phototube unit, the headlamps should be on Upper Beam in one position of the standard foot dimmer switch ("automatic" position). If not, trouble is in the phototube unit.

2. If above test is correct, the auxiliary foot switch should be depressed and should cause the upper beam to be "on" in one position of the standard foot dimmer switch ("automatic" position).

NOTE: If the tests above indicate that the trouble is in either the phototube unit or the amplifier unit, they should be removed from the car and serviced.

Conversion to operation of the headlamps by the standard foot dimmer switch can be accomplished by disconnecting the wires 1, 2, and 3 from the power relay and connecting them to their respective terminals on the standard dimmer switch. If the auxiliary foot switch or power relay are defective, they should be replaced. When installing any one of the Autronic Eye Units, connections should be made in accordance with the installation wiring diagram, Fig. 16E-8.

OTHER NOTES AND REFERENCES

AUTRONIC EYE

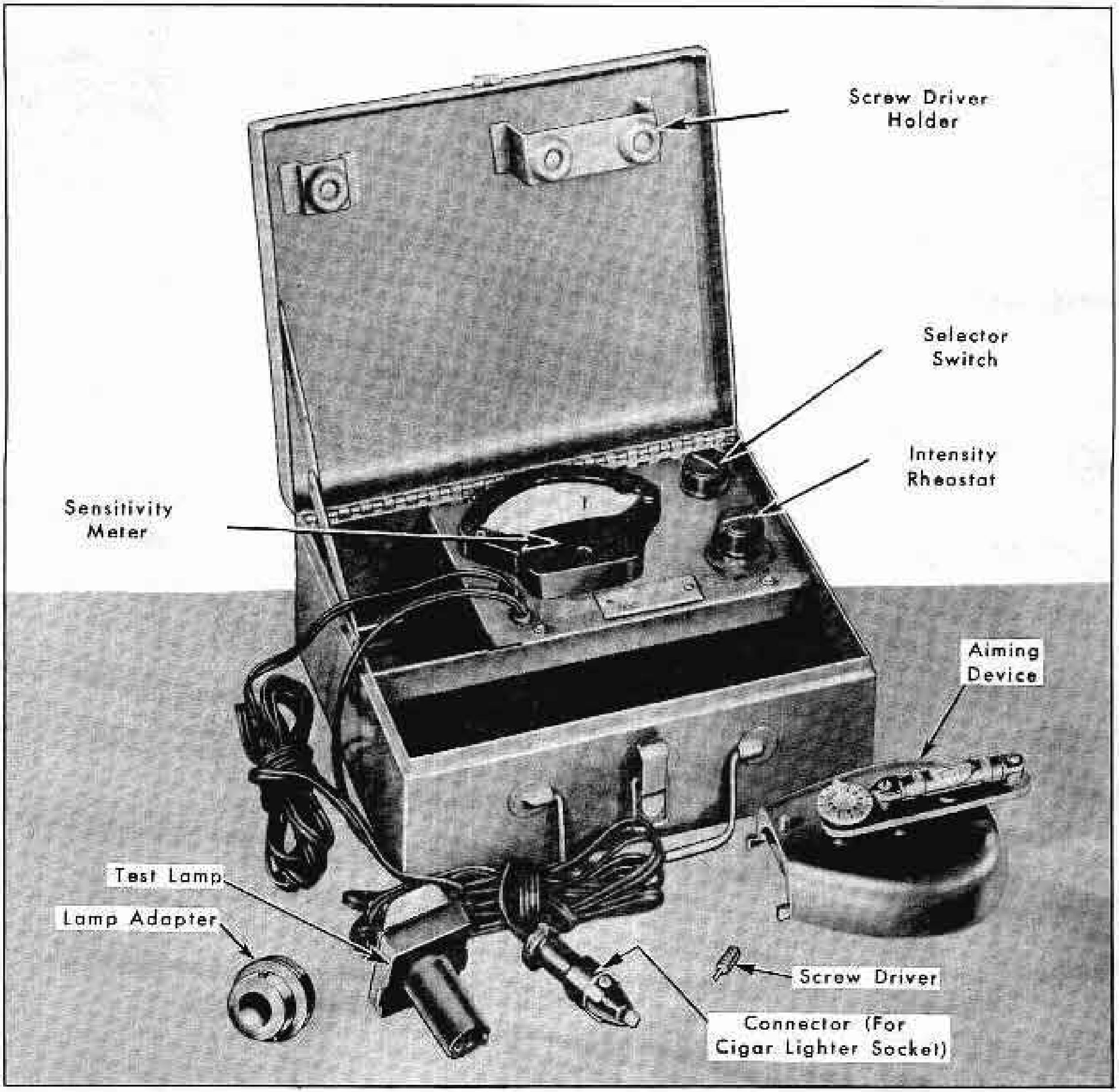

Fig. 16-E-9 Special Tools

ACCESSORIES

FOG LIGHTS

GENERAL DESCRIPTION

The Fog Lamps on all 1954 Cadillac cars are mounted in the radiator grille and incorporate the turn signal lights.

The Fog Lamp switch is controlled by a "ring" mounted behind the headlamp control knob at the extreme left side of the instrument panel. The switch is part of the headlamp switch system and is designed so that either parking lights or Fog Lamp may be used when the headlamp switch is adjusted to the parking light position. This is necessary in order to comply with the existing laws governing automobile lighting in effect in some states.

SERVICE INFORMATION

(1) Fog Lamp Aiming Procedure

1. Place car on a level floor, 25 feet from a wall or screen. Draw on this surface, a horizontal line at the same height at the centerline of the Fog Lamps.

2. Sight through the rear window over radiator ornament and draw vertical centerline of car.

3. Measure distance between lamp centers and draw vertical lamp centers on screen.

4. Loosen aiming screw, located at back of Fog Lamp housing, and adjust lamp until top of beam is four inches below horizontal centerline of Fog Lamp and centered on its vertical centerline.

5. Tighten aiming screw.

NOTE: The above aiming specifications comply with the minimum average state requirements. Where permissible by state law, the lighting may be improved somewhat by raising beam to parallel with the road or with center of Fog Lamp beam on horizontal center of lamps on the aiming screen.

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