the 1964 PONTIAC

Chassis Shop Manual

1964 PONTIAC

CHASSIS SHOP MANUAL

SUPPLEMENT TO 1963 PONTIAC CHASSIS MANUAL

GENERAL

This manual supplements the 1963 Pontiac Chassis Shop Manual and contains all information on components of Pontiac models which are new for 1964 with the exception of the air conditioning and body. Some procedures and specifications which apply to both 1963 and 1964 models are repeated in this manual for convenience of the user.

Information on 1964 Tempest models and on 1964 bodies and air conditioning systems is contained in separate manuals. New Vehicle Warranty and other information pertaining to Pontiac models is contained in the Owner Protection Plan booklet which accompanies each vehicle.

CONTENTS

The material is arranged in sections as shown by the table of contents on the right-hand side of this page which also correspond with sections in the 1963 manual. The section numbers at right register with black tabs on the first page of each section. An index is included in the back of the manual.

AIR CONDITIONING CAUTION

It is extremely important that proper methods and precautions be observed when disconnecting any refrigerant lines or units. Check information published concerning air conditioning prior to performing operations of this nature. Failure to observe this caution may result in injury to personnel or cause extensive damage to the air conditioning system.

PONTIAC MOTOR DIVISION
GENERAL MOTORS CORPORATION
PONTIAC 11, MICHIGAN

S-6404 August 1963 Litho in U.S.A.

TABLE OF CONTENTS

This Manual is a SUPPLEMENT
to the 1963
PONTIAC SHOP MANUAL
It Covers only the
Service Information
UNIQUE TO THE
1964 MODELS.

BOTH THE 1963 AND 1964
PONTIAC SHOP MANUALS are needed
to have COMPLETE COVERAGE
for the 1964 LARGE PONTIACS

GENERAL INFORMATION

CONTENTS OF THIS SECTION

CAR MODEL INFORMATION

General information and specifications appear in this section. Detailed specifications are given on major units at the end of each section of this manual.

VEHICLE IDENTIFICATION PLATE

Series identification can be made by the Manufacturer's Motor Vehicle Identification Number embossed on a metal strip (Fig. 1-1) fastened to the left front hinge pillar post which is visible when the left front door is open.

BODY IDENTIFICATION PLATE

Information as to body style, etc., is stamped on a plate (Fig. 1-2) attached to the left side of cowl just under the rear edge of the hood. Body styles, as available on various series cars, are described in the 1964 Pontiac and Tempest Body Shop Manual.

CAR MODEL IDENTIFICATION

Certain publications carry "series" numbers to identify models and others carry sales department names. Fig. 1-3 below shows both methods of identification.

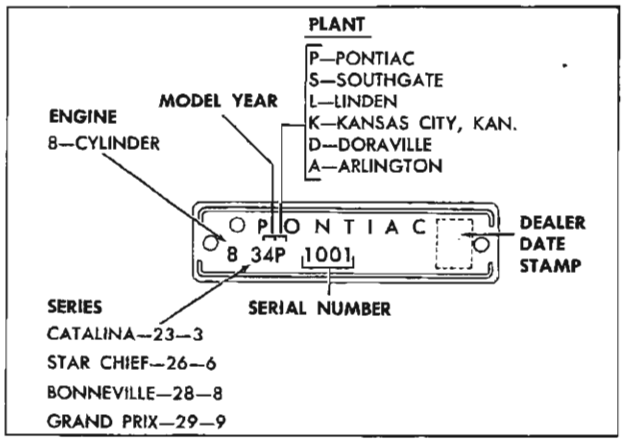


Fig. 1-1 Vehicle Identification Number Plate

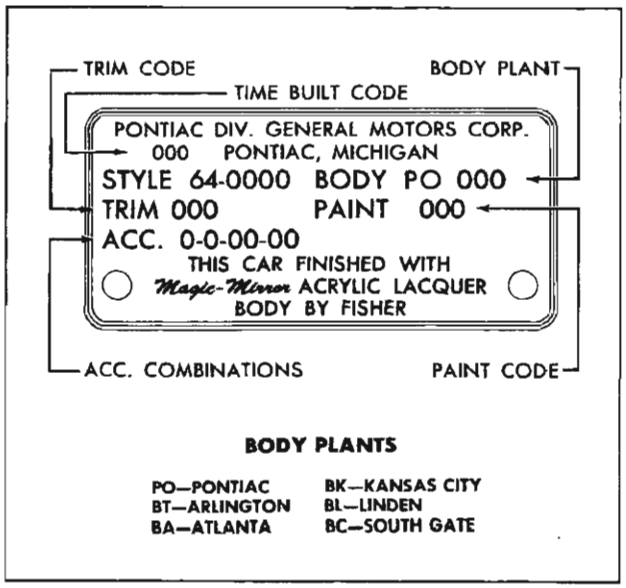


Fig. 1-2 Body Identification Plate

MODEL AND BODY STYLE	BODY STYLE NUMBER	MODEL AND BODY STYLE	BODY STYLE NUMBER
Catalina 2 Door Sport Sedan	2311	Star Chief 4 Door Sedan	2669
Catalina 2 Door Sport Coupe	2347	Star Chief 4 Door Vista Sedan	2639
Catalina 4 Door Sedan	2369	Bonneville Safari—2-seat	2835
Catalina 4 Door Vista Sedan	2339	Bonneville 4 Door Vista Sedan	2839
Catalina Convertible Coupe	2367	Bonneville 2 Door Sport Coupe	2847
Catalina Safari—2-seat	2335	Bonneville Convertible Coupe	2867
Catalina Safari—3-seat	2345	Grand Prix 2 Door Sport Coupe	2957

Fig. 1-3 Car Model Identification

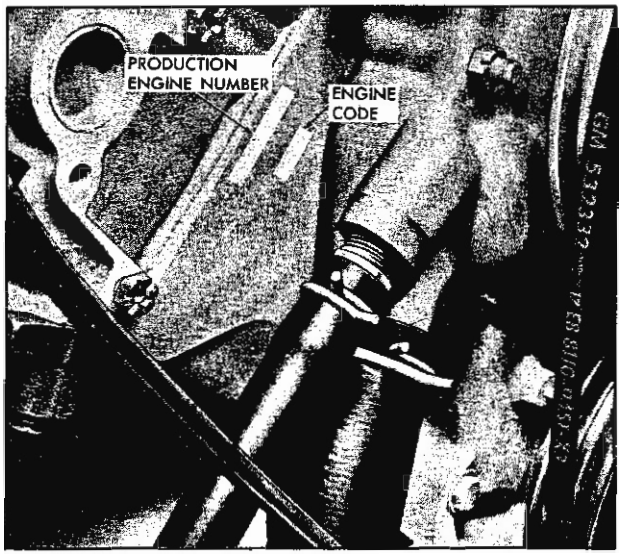


Fig. 1-4 Engine Serial Number Location

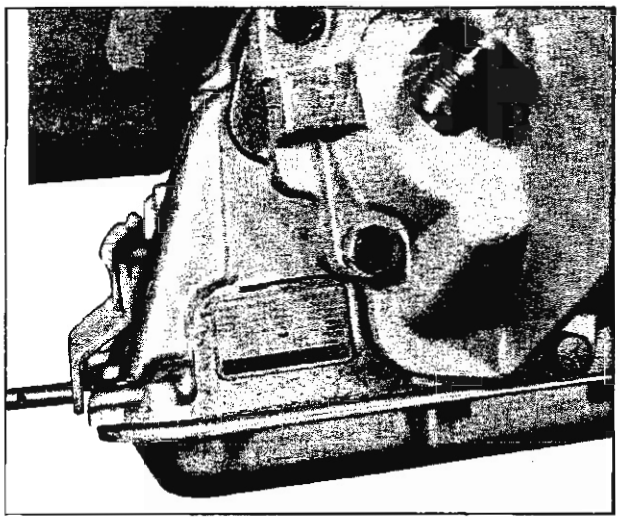


Fig. 1-5 Super Hydra-Matic Serial Number Location

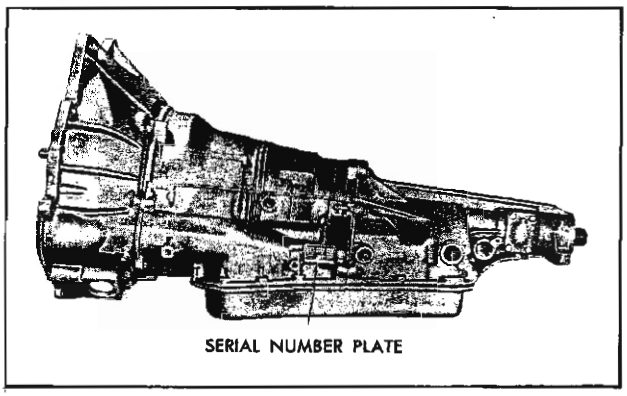


Fig. 1-6 Roto Hydra-Matic Serial Number Location

ENGINE SERIAL NUMBERS

The manufacturer's motor vehicle identification number is located on a machined pad on the front of the right-hand bank of the block (Fig. 1-4).

The production engine number will also be found in the same area. This number is used for production control purposes during manufacture.

HYDRA-MATIC SERIAL NUMBERS

The serial number plate is located at the left side of rear face of the Super Hydra-Matic transmission case (Fig. 1-5) and at the center of the left side of the Roto Hydra-Matic transmission case (Fig. 1-6). The serial numbers begin with P (for standard two barrel installation) followed by number 64 (year). The letters (immediately after P) designate the transmission model. See the Hydra-Matic section for details. The Super Hydra-Matic transmission is indicated by the letter S, which follows above letters. The above model designations and the year (64) are followed by the numerical serial number.

TOWING PRECAUTIONS

Always place a rubber mat or other suitable material between the bumper and the tow chains or cables. For front end lifting, place the chains or cables around the ends of the frame side rails at both sides. All models can be towed without disconnecting the propeller shaft except in cases where the transmission or propeller shaft has possibly been subject to failure or damage. In such cases, the propeller shaft must be disconnected from the differential and wired to the tail pipe or the car must be towed with the rear wheels off the ground. If the propeller shaft is disconnected and the "U" joint bearing retaining strap is broken, wrap tape around the bearing caps to prevent loss. When towing with the rear wheels off the ground, the steering wheel must be centered and held in position by a steering wheel holding clamp or by tying it to the window division channel. Tire to ground clearance should not exceed 6 inches while towing the car and speeds should not exceed 30 MPH.

CODING SIDE BAR LOCK

The side bar lock used on the ignition, front door and rear deck lid lock. Uncoded side bar locks may be coded to match the keys used on the car. Locks are received without tumblers, springs or retainers

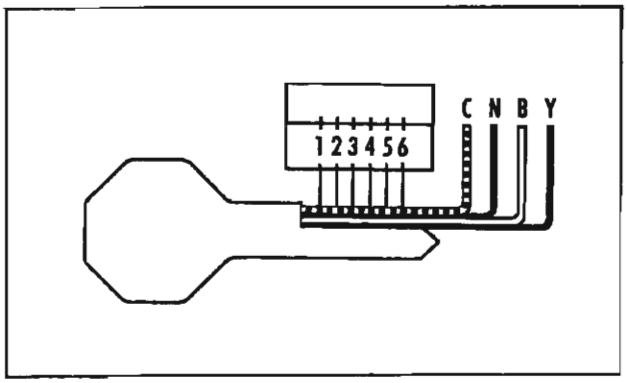


Fig. 1-7 Key Coding Diagram

LETTER	COLOR	DEPTH SET AT
C	Copper	.000
N	Nickel	.025
B	Black	.050
Y	Yellow	.075

Fig. 1-8 Tumbler Color Chart

which are available separately. Four different tumblers are available, only approved parts should be used.

Before the lock may be coded the code of the key must be determined. If the numbered blank surrounding the hole in the key head has not been removed the code may be determined by consulting lock manufacturers code book. Should the blank be missing from the key the coding sequence may be readily determined as follows:

1. Place key on diagram (Fig. 1-7) with bottom, head and point aligned.

2. Starting at the head of the key, code each of six cuts either C-N-B or Y by recording which area the bottom of the cut leaves exposed. Example: If the first line from the top is the only line exposed the cut would be coded C.

After the key code has been determined the correct tumblers should be installed as follows:

1. The letters determined from coding the key indicate different colored tumblers to be installed in slots of the lock (Fig. 1-8).

2. Beginning with slot next to head (number one position) install tumbler of color coinciding with letter determined from key code. Install correct tumblers in remaining five slots.

3. Insert spring in each round cavity in each tumbler lock between slots.

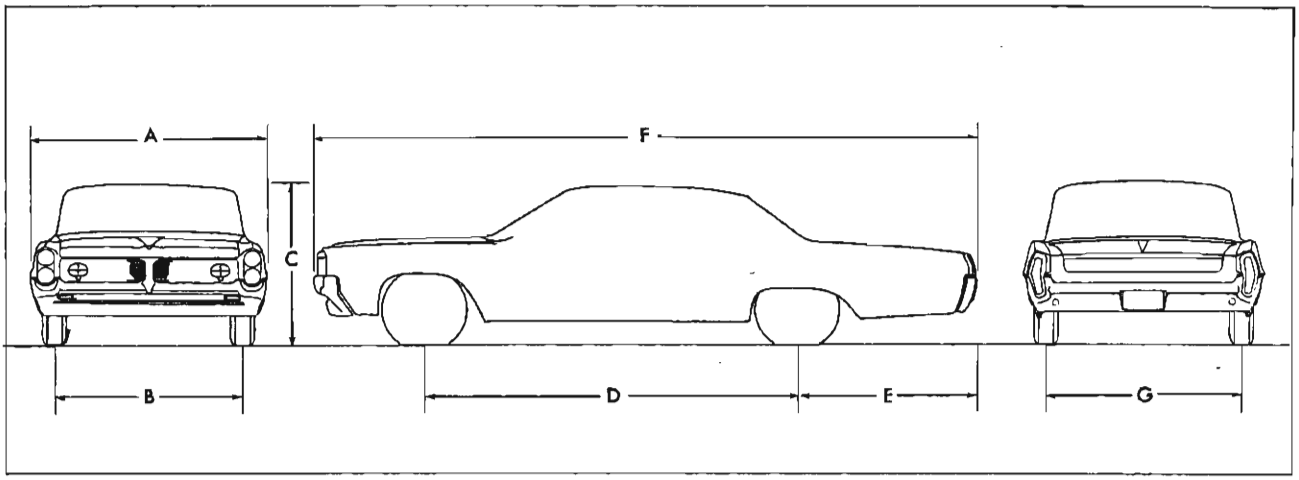
NOTE: Do not pull springs apart, twist them apart.

4. Install spring retainer over springs with ends inserted in slots.

5. Side bar will now drop in place when key is inserted if correct tumblers have been installed.

6. Stake spring retainer in place using screwdriver and light hammer.

GENERAL SPECIFICATIONS



DIMENSION	KEY	23 SERIES	26 SERIES	28 SERIES	29 SERIES	23 and 28 SERIES SAFARI
Overall Length						
Catalina, all except Safari	F	213.0"	-	-	-	-
Star Chief	F	-	220.0"	-	-	-
Bonneville, all except Safari	F	-	-	220.0"	-	-
Grand Prix Sport Coupe	F	-	-	-	213.0"	-
Catalina and Bonneville Safari	F	-	-	-	-	213.8"
Width (Overall)	A	79.2"	79.2"	79.2"	79.2"	79.2"
Height (With Passengers) Series No.						
Catalina Sport Sedan 2311	C	55.8"	-	-	-	-
Catalina 4 Door Sedan 2369	C	55.8"	-	-	-	-
Catalina Convertible Coupe. 2367	C	55.2"	-	-	-	-
Catalina Sport Coupe 2347	C	54.7"	-	-	-	-
Catalina Vista Sedan 2339	C	55.2"	-	-	-	-
Catalina Safari—2 seat 2335	C	-	-	-	-	56.7"
Catalina Safari—3 seat 2345	C	-	-	-	-	56.7"
Star Chief 4 Door Sedan 2669	C	-	55.8"	-	-	-
Star Chief Vista Sedan 2639	C	-	55.2"	-	-	-
Bonneville Safari 2835	C	-	-	-	-	56.7"
Bonneville Sport Coupe 2847	C	-	-	54.7"	-	-
Bonneville Convertible Coupe 2867	C	-	-	55.2"	-	-
Bonneville Vista Sedan 2839	C	-	-	55.2"	-	-
Grand Prix Sport Coupe 2957	C	-	-	-	54.6"	-
Wheelbase (Nominal)	D	120"	123"	123"	120"	119"
Tread Front	B	63"	63"	63"	63"	63"
Rear	G	64.0"	64.0"	64.0"	64.0"	64.0"
Turning Circle						
Curb to Curb		42.8"	43.7"	43.7"	42.8"	42.5"
Wall to Wall		46.0"	46.9"	46.9"	46.0"	45.7"
Road Clearance (Minimum) All except Safari (5 passenger load at rear lower control arm)		5.9"	5.9"	5.9"	5.9"	-
Safari		-	-	-	-	6.3"
Overhang (Rear)						
Catalina	E	56.6"	-	-	-	-
Star Chief	E	-	60.6"	-	-	-
Bonneville	E	-	-	60.6"	-	-
Grand Prix	E	-	-	-	56.6"	-
Safari	E	-	-	-	-	58.4"

RELATION OF CAR SPEED TO ENGINE RPM

CAR SPEED MPH	REAR WHEEL RPM		ENGINE RPM FOR GIVEN AXLE RATIOS AND TIRES											
			2.56		2.69		2.87		3.08		3.23		3.42	
	8.00	8.50	8.00	8.50	8.00	8.50	8.00	8.50	8.00	8.50	8.00	8.50	8.00	8.50
10	125	123	320	315	336	331	358	353	384	379	403	398	426	421
20	250	247	640	632	672	662	716	706	769	758	806	795	853	841
30	375	370	960	947	1107	993	1173	1061	1152	1138	1210	1193	1279	1262
40	499	492	1277	1259	1342	1223	1431	1411	1535	1514	1612	1590	1705	1681
50	624	616	1597	1577	1677	1656	1789	1766	1920	1896	2016	1990	2132	2105
60	749	739	1917	1892	2013	1986	2147	2119	2305	2274	2420	2388	2559	2525
70	874	862	2237	2207	2349	2317	2506	2471	2689	2652	2824	2785	2986	2945
80	999	986	2557	2524	2685	2650	2864	2827	3074	3034	3228	3186	3417	3369
90	1124	1109	2877	2839	3021	2981	3223	3180	3459	3412	3632	3583	3841	3789
100	1248	1231	3195	3151	3355	3309	3578	3529	3840	3788	4032	3977	4264	4206

AXLE RATIO	N/V RATIO*	
	TIRE SIZE	
	8.00-14	8.50-14
2.56	32.0	31.6
2.69	33.6	33.1
2.87	35.8	35.3
3.08	38.4	37.9
3.23	40.3	39.9
3.42	42.7	42.1
3.64	45.7	44.8

*N = Engine RPM: V = Car Speed MPH

MISCELLANEOUS DATA

Tire Size	8.00-14	8.50-14
Rolling Circumference	84.60"	85.74"
Rolling Radius	13.46"	13.64"

Alternator to Engine Ratio:

Standard (42 amp)	2.49:1
Heavy Duty (62 amp)	2.04:1
Air Conditioned Cars (52 amp)	2.85:1

Fan to Engine Ratio:

Standard	.91:1
Air Conditioned Car	1.13:1

SPEEDOMETER GEAR USAGE

REAR AXLE RATIO		NO. OF DRIVE GEAR TEETH	NO. OF DRIVEN GEAR TEETH	DRIVEN GEAR COLOR	ADAPTER RATIO
SUPER HYDRA-MATIC TRANSMISSION - 8.00 x 14 TIRES					
41:9	(4.55)	8	19	Brown	.6944
43:10	(4.30)	8	19	Brown	.7333
41:10	(4.10)	8	19	Brown	.7692
39:10	(3.90)	8	19	Brown	.8092
40:11	(3.64)	8	19	Brown	.8653
41:12	(3.42)	8	20	Dk. Gray	Not Req'd.
42:13	(3.23)	8	19	Brown	Not Req'd.
40:13	(3.08)	8	18	Yellow	Not Req'd.
43:15	(2.87)	8	17	Orange	Not Req'd.
43:16	(2.69)	8	15	Green	Not Req'd.
41:16	(2.56)	8	15	Green	Not Req'd.
STANDARD 3-SPEED SYNCHRO-MESH TRANSMISSION - 8.00 x 14 TIRES					
40:11	(3.64)	8	21	Red	Not Req'd.
41:12	(3.42)	8	20	Blue	Not Req'd.
42:13	(3.23)	8	19	Natural	Not Req'd.
40.13	(3.08)	8	18	Brown	Not Req'd.
43:15	(2.87)	8	19	Natural	1.1250
43:16	(2.69)	8	18	Brown	1.1250
ROTO HYDRA-MATIC TRANSMISSION - 8.00 x 14 TIRES					
41:9	(4.55)	10	21	Orange	.6190
43:10	(4.30)	10	21	Orange	.6500
41:10	(4.10)	10	21	Orange	.6862
39.10	(3.90)	10	21	Orange	.7222
40:11	(3.64)	10	21	Orange	.7692
41:12	(3.42)	10	21	Orange	.8215
42:13	(3.23)	10	24	Brown	Not Req'd.
40:13	(3.08)	10	23	Yellow	Not Req'd.
43:15	(2.87)	10	21	Orange	Not Req'd.
43:16	(2.69)	10	20	Red	Not Req'd.
41:16	(2.56)	10	19	Dk. Gray	Not Req'd.
4-SPEED SYNCHRO-MESH TRANSMISSION - 8.00 x 14 TIRES					
40:11	(3.64)	8	21	Red	Not Req'd.
41:12	(3.42)	8	20	Blue	Not Req'd.
42:13	(3.23)	8	19	Lt. Green	Not Req'd.
40:13	(3.08)	8	18	Brown	Not Req'd.
43:10	(4.30)	6	19	Steel	Not Req'd.
39:10	(3.90)	6	17	Steel	Not Req'd.
39:10	(3.90)	8	22	Green	Not Req'd.
HEAVY-DUTY, 3-SPEED SYNCHRO-MESH TRANSMISSION - 8.00 x 14 TIRES					
41:9	(4.55)	8	19	Lt. Green	.6944
43:10	(4.30)	8	19	Lt. Green	.7333
41:10	(4.10)	8	19	Lt. Green	.7692
39:10	(3.90)	8	22	Yellow	Not Req'd.
40:11	(3.64)	8	21	Red	Not Req'd.
41:12	(3.42)	8	20	Blue	Not Req'd.
42:13	(3.23)	8	19	Lt. Green	Not Req'd.
40:13	(3.08)	8	18	Brown	Not Req'd.
43:15	(2.87)	8	19	Lt. Green	1.1250
43:16	(2.69)	8	18	Brown	1.1250

MISCELLANEOUS INFORMATION

DECIMAL EQUIVALENTS

1/64 015625	17/64 265625	33/64 515625	49/64 765625
1/32 03125	9/32 28125	17/32 53125	25/32 78125
3/64 046875	19/64 296875	35/64 546875	51/64 796875
1/16 0625	5/16 3125	9/16 5625	13/16 8125
5/64 078125	21/64 328125	37/64 578125	53/64 828125
3/32 09375	11/32 34375	19/32 59375	27/32 84375
7/64 109375	23/64 359375	39/64 609375	55/64 859375
1/8 125	3/8 375	5/8 625	7/8 875
9/64 140625	25/64 390625	41/64 640625	57/64 890625
5/32 15625	23/32 40625	21/32 65625	29/32 90625
11/64 171875	27/64 421875	43/64 671875	59/64 921875
3/16 1875	7/16 4375	11/16 6875	15/16 9375
13/64 203125	29/64 453125	45/64 703125	61/64 953125
7/32 21875	15/32 46875	23/32 71875	31/32 96875
15/64 234375	31/64 484375	47/64 734375	63/64 984375
1/4 25	1/2 5	3/4 75	1 . . . . . 1.

WEIGHTS AND MEASURES

LINEAR MEASURE

1/12 foot (ft.) . . . . . =1 inch (in.)
12 inches . . . . . =1 foot
3 feet . . . . . =1 yard (1 yd.)

AREA MEASURE

1/144 square foot (sq. ft.) . . =1 square inch (sq. in.)
144 square inches . . . . . =1 square foot
9 square feet . . . . . =1 square yard (sq. yd.)

LIQUID MEASURE

1/16 pint (pt.) . . . . . =1 ounce (oz.)
1 pint . . . . . =16 ounces
2 pints . . . . . =1 quart (qt.) =32 ounces
4 quarts . . . . . =1 gallon (gal.)
31 1/2 gallons . . . . . =1 barrel (bbl.)

DRY MEASURE

1/2 quart (qt.) . . . . . =1 pint (pt.)
2 pints . . . . . =1 quart (qt.)
8 quarts . . . . . =1 peck (pk.)
4 pecks . . . . . =1 bushel (bu.)
105 quarts . . . . . =1 barrel

CUBIC MEASURE

1,728 cubic inches . . . . . =1 cubic foot
27 cubic feet . . . . . =1 cubic yard

COMMON WEIGHT

16 ounces . . . . . =1 pound
100 pounds . . . . . =1 hundred weight (cwt.)
2000 pounds . . . . . =1 ton

COMMON U.S.A. EQUIVALENTS LENGTH

1 inch . . . . . =25.4001 millimeters
1 millimeter . . . . . =0.03937 inches
1 foot . . . . . =0.304801 meters
1 meter . . . . . =3.28083 feet
1 yard . . . . . = 9.914402 meters
1 meter . . . . . =1.093611 yards
1 mile . . . . . = 1,609347 kilometers
1 kilometer . . . . . =0.621370 miles

LIQUID CAPACITY

1 quart . . . . . =0.94633 liters
1 liter . . . . . = 1.05671 quarts
1 gallon . . . . . =3.78533 liters
1 liter . . . . . =0.26418 gallons

DRY CAPACITY

1 quart . . . . . =1.1012 liters
1 liter . . . . . =0.9081 quarts
1 peck . . . . . =3.310 liters
1 liter . . . . . =0.11351 pecks

DRILL SIZES

Letter Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches
Z	0.413	1	0.2280	28	0.1405	55	0.0520
Y	0.404	2	0.2210	29	0.1360	56	0.0465
X	0.397	3	0.2130	30	0.1285	57	0.0430
W	0.386	4	0.2090	31	0.1200	58	0.0420
V	0.377	5	0.2055	32	0.1160	59	0.0410
U	0.368	6	0.2040	33	0.1130	60	0.0400
T	0.358	7	0.2010	34	0.1110	61	0.0390
S	0.348	8	0.1990	35	0.1100	62	0.0380
R	0.339	9	0.1960	36	0.1065	63	0.0370
Q	0.332	10	0.1935	37	0.1040	64	0.0360
P	0.323	11	0.1910	38	0.1015	65	0.0350
O	0.316	12	0.1890	39	0.0995	66	0.0330
N	0.302	12	0.1850	40	0.0980	67	0.0320
M	0.295	14	0.1820	41	0.0960	68	0.0310
L	0.290	15	0.1800	42	0.0935	69	0.0292
K	0.281	16	0.1770	43	0.0890	70	0.0280
J	0.277	17	0.1730	44	0.0860	71	0.0260
I	0.272	18	0.1695	45	0.0820	72	0.0250
H	0.266	19	0.1660	46	0.0810	73	0.0240
G	0.261	20	0.1610	47	0.0785	74	0.0225
F	0.257	21	0.1590	48	0.0760	75	0.0210
E	0.250	22	0.1570	49	0.0730	76	0.0200
D	0.246	23	0.1540	50	0.0700	77	0.0180
C	0.242	24	0.1520	51	0.0670	78	0.0160
B	0.238	25	0.1495	52	0.0635	79	0.0145
A	0.234	26	0.1470	53	0.0595	80	0.0135
		27	0.1440	54	0.0550		

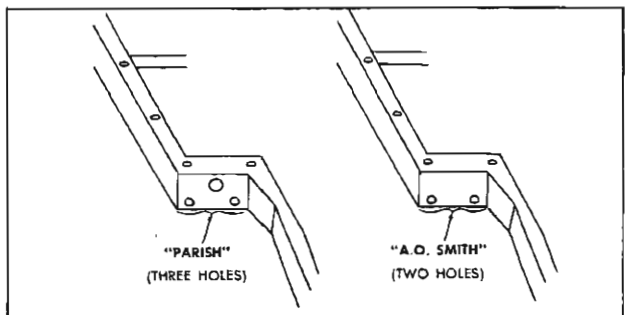
FRAME AND BODY MOUNTINGS

GENERAL DESCRIPTION

FRAME

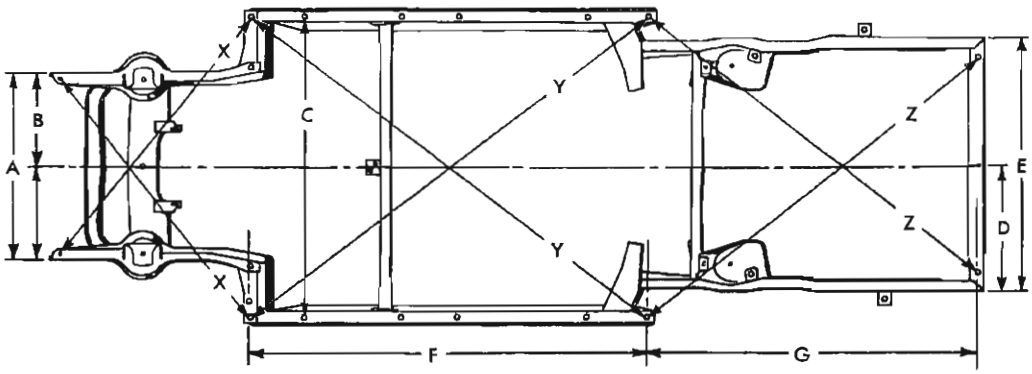
Nine basic frame designs are available to meet demands of particular body styles. These frames, referred to as the perimeter design, have the passenger compartment encircled by heavy steel side members, which permit lowering the floor in the passenger area and provide marked improvement in seat height. Five cross members join parallel side bars of the frame to provide for mounting engine and chassis components and for structural rigidity.

Material thickness of frame members provides ideal balance of beaming and torsional strength without compromising ride quality. This new



LOCATION—RIGHT FRONT OF FRAME DIRECTLY BEHIND RIGHT FRONT WHEEL LOWER SPLASH GAURD. ALL STATION WAGONS USE "PARISH" FRAMES. ALL CONVERTIBLES USE "A.O. SMITH" FRAMES. BOTH TYPE FRAMES ARE USED ON OTHER 1964 PONTIAC MODELS.

Fig. 1A-1 Identification of Frames



BODY STYLES		A	B	C	D	E	F	G
23 SERIES	Exc. Conv. and Station Wagon	38.00	19.00	60.56	26.10	52.20	79.48	68.18
23 SERIES	Convertible	38.03	19.015	60.56	26.10	52.20	79.48	68.18
23 SERIES	Station Wagon	38.06	19.03	60.56	23.54	47.08	79.48	70.60
26 SERIES	All	38.03	19.015	60.56	26.10	52.20	79.48	75.18
28 SERIES	Exc. Station Wagon	38.03	19.015	60.56	26.10	52.20	79.48	75.18
28 SERIES	Station Wagon	38.06	19.03	60.56	23.54	47.08	79.48	70.60
29 SERIES	All	38.03	19.015	60.56	26.10	52.20	79.48	68.18

BODY STYLES	H	I	J	K	L	M	N	O
2311, 2369	3.59	4.77	11.08	6.43	12.43	16.51	3.69	10.22
2339, 2347	3.59	4.79	11.09	6.44	12.45	16.53	3.70	10.23
2957	3.62	4.77	11.11	6.45	12.45	16.53	3.70	10.26
2669	3.62	4.78	11.11	6.45	12.45	16.53	3.70	10.26
2639, 2839, 2847	3.62	4.78	11.11	6.45	12.45	16.53	3.70	10.26
2367	3.62	4.86	11.19	6.53	12.53	16.61	3.78	10.34
2867	3.62	4.86	11.19	6.53	12.53	16.61	3.78	10.37
2335, 2345, 2835	3.66	4.75	11.11	6.45	12.43	15.94	3.72	9.29

Fig. 1A-2 Frame Checking Chart

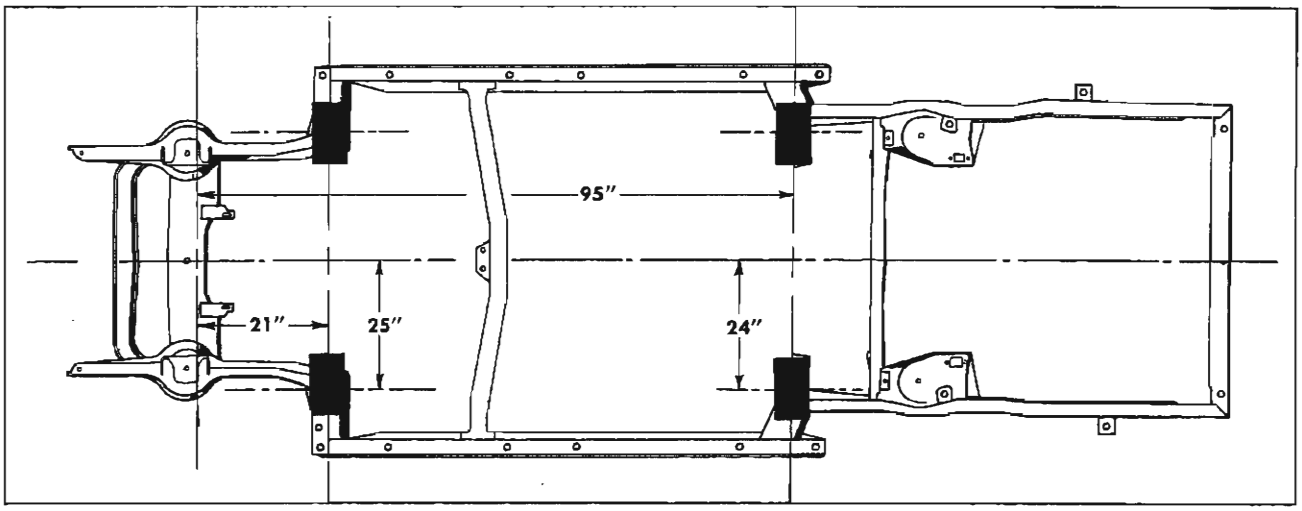


Fig. 1A-3 Proper Location for Adapters

perimeter design permits easier servicing because of the rails at the side. It also permits use of a simplified two joint propeller shaft and simplified exhaust system.

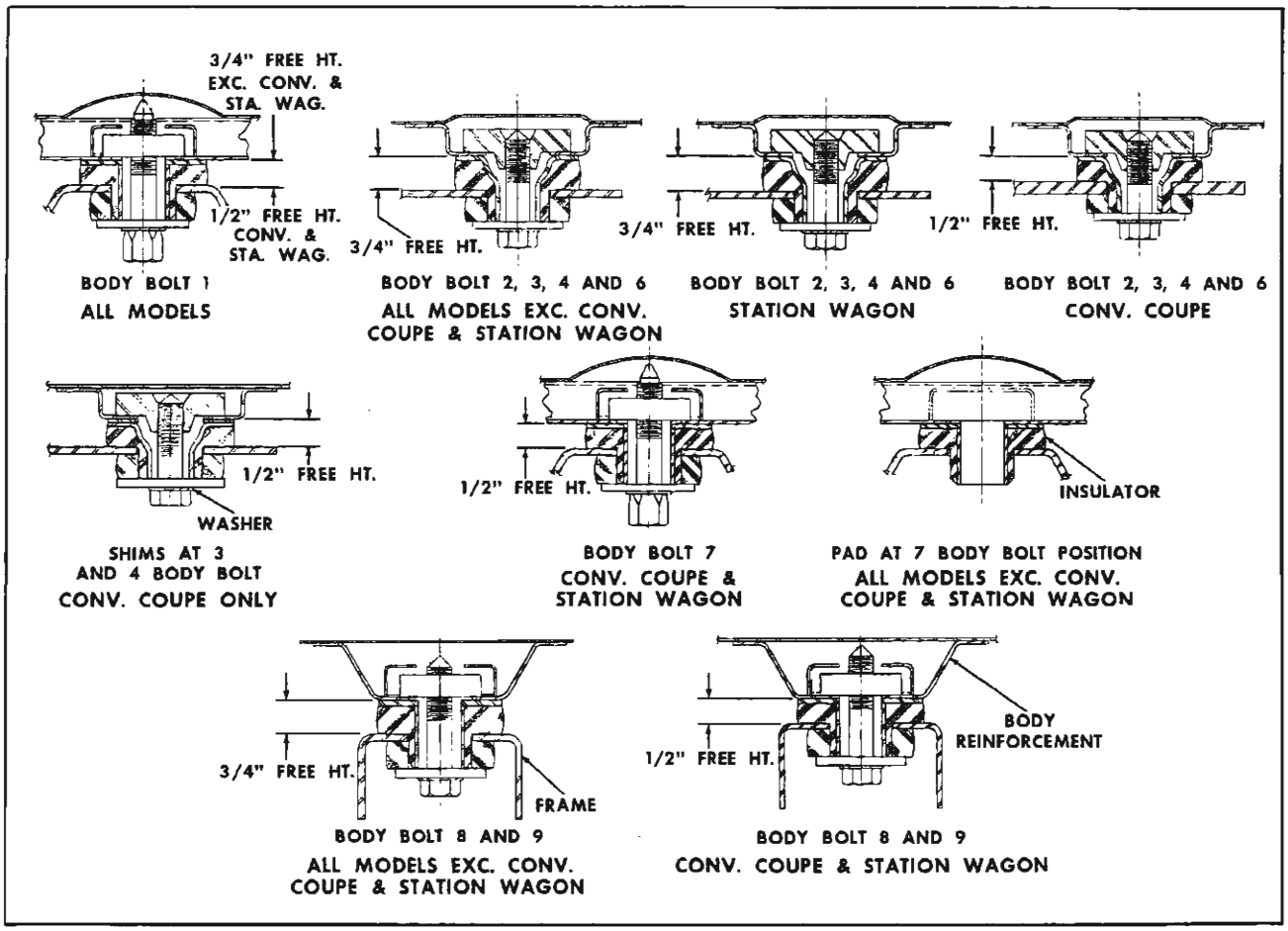


Fig. 1A-4 Body Bolt Installation

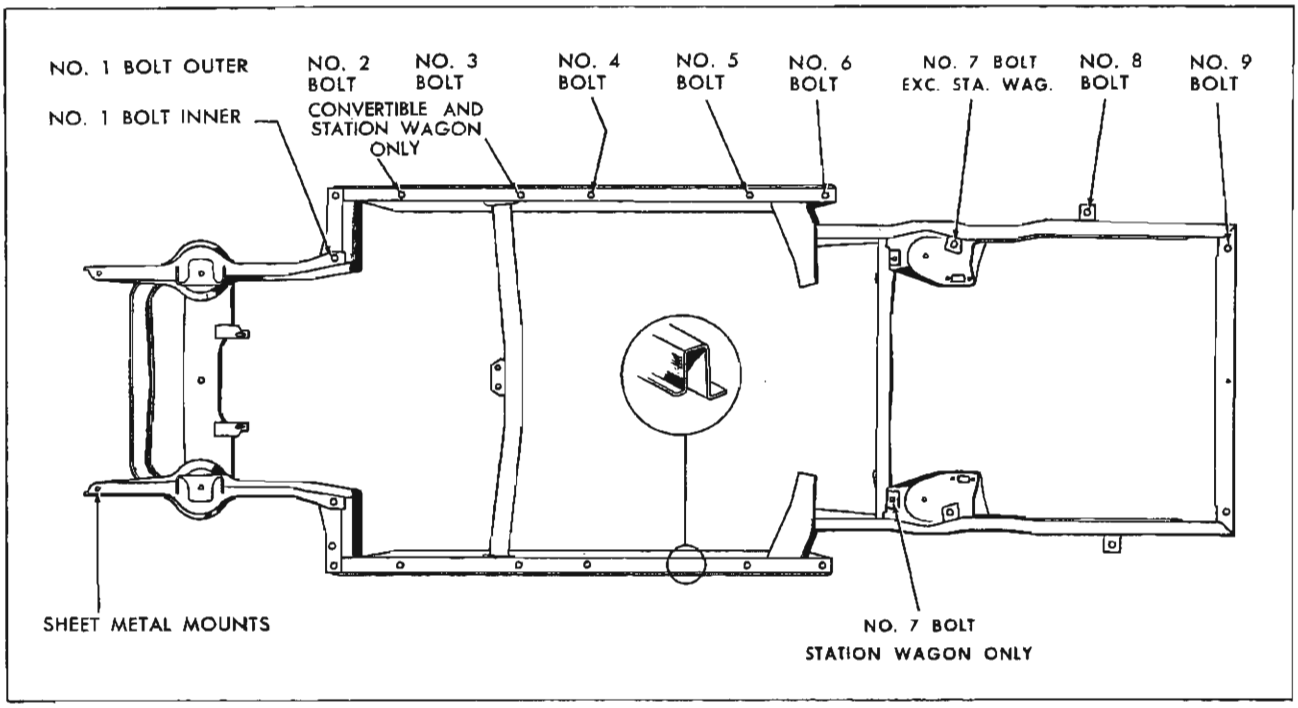


Fig. 1A-5 Location of Body Bolts on Frame

Two types of frames are used on 1964 Pontiac models. All convertibles are equipped with A.O. Smith frames while station wagons are equipped with Parish frames. Other models utilize both types.

The frames can be identified by the number of holes located at right front of frame behind front wheel lower splash guard (Fig. 1A-1).

The dimensions given in Fig. 1A-2 may be used in checking frames.

Dimensions for X, Y and Z are not given, but are used merely to illustrate the points for taking diagonal measurements for checking the squareness of a frame. Holes or rivet heads are located on the frame at the approximate terminal point of the arrowheads, and can be used for this purpose.

LIFTING PONTIAC CARS WITH HOISTS

Lifting can be accomplished without adapters with drive-on type or twin post type hoists, or with hoists or lifts making contact with the front suspension lower arms or rear axle. Since the frame is the perimeter type, some hoists designed to contact side rails require adapters to raise the car without damage to parts of the exhaust system, body, floor, etc. Suppliers of the original lifting equipment should have information on adapters to use with Pontiac cars.

Fig. 1A-3 shows the proper location for placing adapters so that they correctly contact the perimeter type frame. At front end of car, the supports should be 21" behind the center line of the front wheels and 25" to each side of the center line of the car. The rear supports should be placed 95" from the center line of the front wheels and 24" to each side of the center line of the car. The clearance at these points is 7-1/2" at front and 6" at rear.

BODY TO FRAME MOUNTINGS

The perimeter type frame permits use of better and more durable body mounts. As many as twenty body bolt mounts are used, depending on body style, and each is insulated with rubber to reduce transmission of vibration to the body.

The installation detail and position of body bolts are shown in Figures 1A-4 and 1A-5.

The size of body bolts varies with location and model. A 7/16-14 x 1-13/16 hex bolt is used at positions 2, 3, 4, and 6 on all models. A 7/16-14 x 2-5/16

hex bolt is used at position 1 & 7 on all models. A 7/16-14 x 2-1/8 hex bolt is used at position 8 and 9 on all models.

On all models, except convertibles and station wagons the rubber body to frame insulators are installed on the compression side only at No. 7 bolt.

Body bolts at positions 7, 8 and 9 should be tightened to 40-60 lb. ft. torque and all others tightened to 25-60 lb. ft. torque.

All other information concerning the body, such as removing glass, trim, hardware, etc., is covered in the Pontiac Body Shop Manual.

GENERAL LUBRICATION

CONTENTS OF THIS SECTION

ENGINE OIL CHANGE

The crankcase of the Pontiac is filled at the factory with high quality MS oil, specially compounded to ensure proper lubrication of all engine parts during break-in. This oil should be changed after 60 days. Succeeding oil changes should also be made at 60 day intervals, but never to exceed 6,000 miles.

NOTE: The 1964 Pontiac is equipped with specially engineered chromium plated piston rings. These rings allow oil to flow freely on the cylinder walls during the break-in period. Therefore oil consumption may be higher during the break-in period than it will be afterward.

Oil which according to the label on the can is intended for service MS, DG, or HD should be used.

Atmospheric Temperature Expected	Recommended SAE Viscosity Number	Acceptable Alternate
Above Freezing (+32° and above)	20W	10W-30
Below Freezing (0° to +32°F.)	10W	10W-30
Below 0°F.	5W	5W-20

LUBRICATION

All Pontiacs are thoroughly and completely lubricated at the factory with a special long lasting chassis lubricant. Under normal conditions chassis lubrication will not be required for 30,000 miles or one year whichever occurs first For additional extended lubrication periods, use Pontiac special grease.

This grease has been specially formulated for your new car, and is available at Pontiac dealers. If conventional chassis lubricant is used, relubrication at 6 months or 6,000 miles, whichever occurs first, is necessary.

1964 PONTIAC ITEMS REQUIRING LUBRICATION OR SERVICE AT 6,000 MILE INTERVALS

Manifold Heat Control Valve	Observe for freedom of movement—Lubricate with graphite in alcohol if sticky.
Power Steering System and Pump Reservoir	Add fluid as necessary — Fill reservoir only to mark. Use power steering fluid. Replace fluid only if necessary to disassemble.
Differential Standard	Check for leaks. Refill with hypoid lubricant SAE 90. Change lubricant only when necessary to disassemble.
Differential Safe-T-Track	Check for leaks. Use only Pontiac Special Safe-T-Track differential lubricant.
Manual Steering Gear	Add lubricant as necessary. Change lubricant only when necessary to disassemble. Use all-season steering gear lubricant.
Synchro-Mesh Transmission	Check for leaks. Use multi-purpose SAE 90 lubricant. Change lubricant only when necessary to disassemble.
Clutch-Linkage	Check lash and adjust as required at pre-delivery inspection and every 6,000 miles. Engine oil at pivot points, grease at push rod to clutch fork joint, chassis grease at cross shaft pressure fitting.
Synchro-Mesh Transmission Shift Linkage, Column Shift	Engine oil at all joints below steering column shift levers.
Synchro-Mesh Transmission Shift Linkage, Floor Shift	Engine oil at all joints under body.
Tires	Rotate tires every 6,000 miles, and balance in new position.
Brake System and Master Cylinder Reservoir	Check system for adequate brake pedal reserve and for evidence of leaks, correct, use GM or Delco Super II or any SAE 70R1 Brake Fluid.

1964 PONTIAC ITEMS REQUIRING LUBRICATION OR SERVICE AT 6 MONTHS OR 6,000 MILE INTERVALS, WHICHEVER OCCURS FIRST

Engine Oil Filter	Replace oil filter every 6 months or 6,000 miles, whichever occurs first.
Standard Carburetor Air Cleaner Element	Clean and re-oil using engine oil. Clean and re-oil after each occasion of driving under severe dust conditions.

NOTE: Heavy-duty type recommended for continuous operation under severe dust conditions.

Hood Latch Assembly	Engine oil on pivots and spring anchor points, light grease on release pawl, every 6 months and as required.
Hood Hinges	Engine oil on hinge pins and spring anchor points every six months and as required.

1964 PONTIAC ITEMS REQUIRING LUBRICATION OR SERVICE AT SIX MONTHS OR 12,000 MILE INTERVALS, WHICHEVER OCCURS FIRST

Accelerator Linkage	Engine oil at all pivot points. Do not lubricate the linkage which is a part of the carburetor assembly.
T. V. Linkage	Engine oil, do not lubricate carburetor linkage.
Hydra-Matic Shift Linkage	Lubricate with engine oil at all joints below steering column except rubber grommets.
Air Conditioning	Check refrigeration system sight glass for proper quantity of Freon charge (with engine running, A.C. turned on, and over 70° ambient air temperature). A clear glass indicates a solid column of Freon in a system which is operating properly.

1964 PONTIAC ITEMS REQUIRING LUBRICATION OR SERVICE YEARLY OR 12,000 MILES, WHICHEVER OCCURS FIRST

Fuel Filter (Tri-Power only)	Replace filter yearly or every 12,000 miles, whichever occurs first. If premature plugging is experienced, change brand of fuel.
Crankcase Inlet Vent and Oil Filler Cap	Clean and re-oil with engine oil. *NOTE: Clean and re-oil after each occasion of driving under severe dust conditions.*
Positive Crankcase Vent	Replace valve assembly yearly or every 12,000 miles, whichever occurs first.
Heavy Duty Air Cleaner	Wash element in solvent and re-oil with 10W-30 engine oil. *NOTE: Clean and re-oil after each occasion of driving under severe dust conditions.*
Heavy Duty Air Cleaner (Paper element - Tri-Power only)	Clean or replace yearly or every 12,000 miles. *NOTE: Clean or replace after each occasion of driving under severe dust conditions.*
Fuel Filter - Integral (All except Tri-Power)	Clean yearly.

1964 PONTIAC ITEMS REQUIRING LUBRICATION OR SERVICE EVERY TWO YEARS OR 24,000 MILES, WHICHEVER OCCURS FIRST

Hydra-Matic Transmission	Replace transmission oil. Refill with Hydra-Matic Fluid AQ-ATF, Type "A". Under heavy duty operation conditions or excessive stop and go driving replace transmission oil at 12,000 mile intervals.

1964 PONTIAC ITEMS REQUIRING LUBRICATION OR SERVICE YEARLY OR EVERY 30,000 MILES, WHICHEVER OCCURS FIRST

Chassis Lubrication	For additional extended chassis lubrication periods, Special Pontiac Chassis Grease is recommended. This grease has been specially formulated for your new car, and is available at Pontiac dealers. If conventional chassis lubricant is used, relubrication at six months or 6,000 miles is necessary.

1964 PONTIAC ITEMS REQUIRING LUBRICATION OR SERVICE AT SPECIAL INTERVALS

Parking Brake Cable	Clean and relubricate at time rear brake drums are removed for major brake service — Use light grease.
Speedometer Cable	If noise or needle flicker occurs — lubricate — use speedo cable grease.
Front Wheel Bearings	Lubricate only when wheels are off for other service — Use special hi-temperature wheel bearing grease, use only enough lubricant to thoroughly coat the rollers, do not fill the wheel hub cavity.
Body Door Locks and Strikers	Stick type lubricant - Use sparingly as required.
Door Hinge Hold-Opens	Light grease on friction surfaces — Use sparingly as required.
Body Door Hinge Pins	Engine oil as required.
Station Wagon Tail Gate Hinge and Linkage	Engine oil as required.
Station Wagon Folding Seat	Engine oil on pivots (use sparingly as required).
Fuel Door Hinge	Engine oil on hinge pin and spring anchor points as required.
Battery	Add distilled water every 30 days. May require more frequent additions during high ambient temperatures and or extended trip operation. Clean terminals yearly and apply petrolatum.
Air Conditioning	Operate air conditioning system for a minimum of 5 minutes every month, even in winter. This will supply oil to the compressor shaft seal.
Air Conditioning Condenser Core	Clean off leaves, bugs, etc. and flush outside of condenser and radiator core to remove dirt — yearly and each spring. *CAUTION: Do not use steam.*

SUSPENSION

The service information in section 3 of the 1963 Pontiac Chassis Shop Manual also applies to the 1964 models except for the information listed below.

BALL JOINTS

The front suspension upper control arm ball joint has a nickel-plated steel ball in a phenolic-teflon lines housing with a rubber preload cushion (Fig. 3-1). The lower ball joint (Fig. 3-2) also has a phenolic - teflon liner. Both upper and lower ball joints have a fixed boot rubber grease seal. The seal offers protection from dirt and water entry and is not serviced. Removal or damage to the seal necessitates replacement of the complete ball joint assembly. The grease seal has been designed with a one-way relief valve so that service lubrication can be performed as in past — refer to lubrication section.

It is permissible to have a maximum of 0.010" end play on a lower control arm ball joint when it is new and 0.060" end play when checking a used or worn lower ball joint.

WHEEL AND TIRE BALANCE AND RUNOUT

Procedure for wheel and tire balance and runout are covered in section 3A.

FRONT SUSPENSION ALIGNMENT

Reference to setting suspension at curb height perior to performing front suspension alignment is no longer applicable.

The suspension parts must be at normal curb load position before alignment. Curb load is defined as car with full tank of gasoline and unoccupied.

To determine whether car is at normal curb load, compare height measurement on the car in question with others of the same body style and having comparable equipment. The front and rear of car should be jounced up and down, decreasing the amoung of movement until the suspension parts are equalized, before any measurements are made.

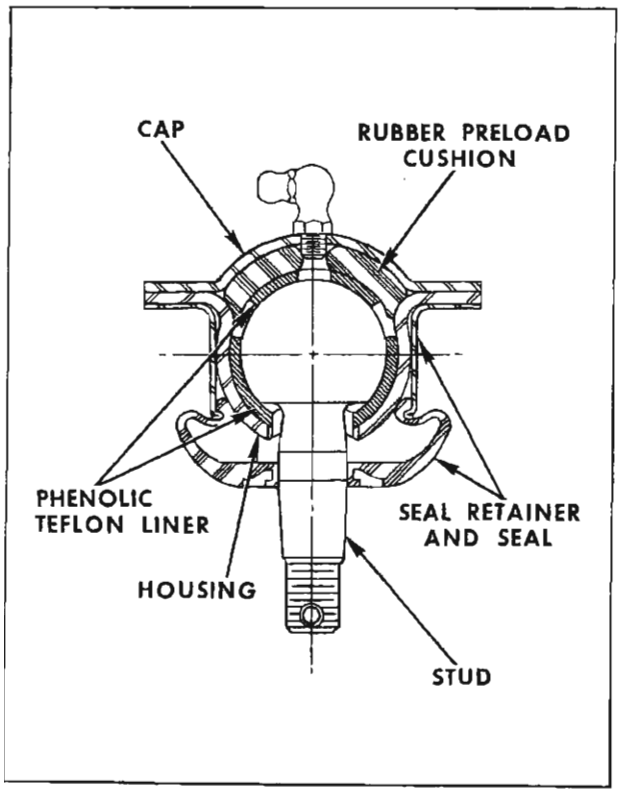


Fig. 3-1 Upper Ball Joint

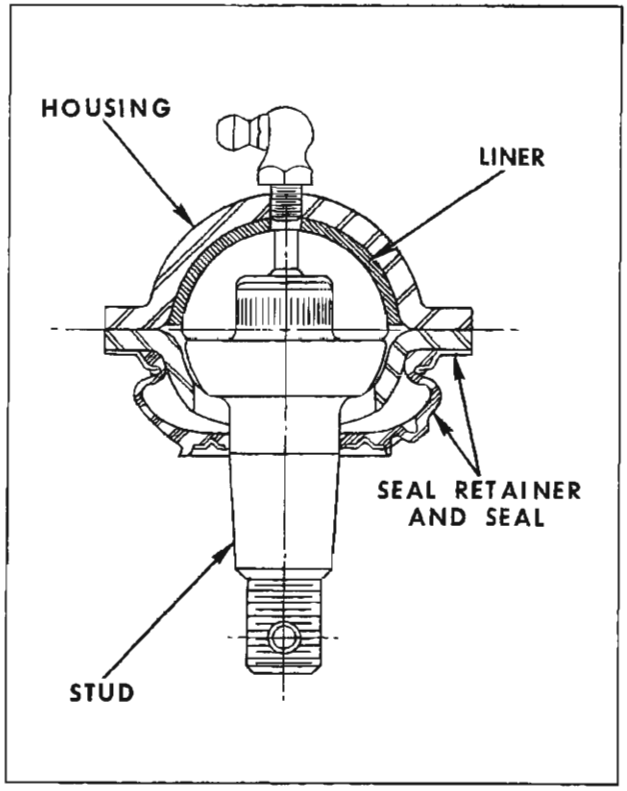


Fig. 3-2 Lower Ball Joint

TORQUE SPECIFICATIONS

Torque in lb. ft. unless otherwise specified

APPLICATION	TORQUE
FRONT STABILIZER	
Nut - Upper Control Arm Pivot Shaft	70-90
Nut - Upper Control Arm Shaft to Upper Control Arm Frame Bracket	65-80
Nut - Lower Control Arm Assy.	55-70
Nut - Lower Control Arm Frame Bumper to Arm	60-120 lb. in.
Nut - Steering Knuckle to Ball Stud Assembly	55-70
FRONT WHEELS, HUBS AND BEARINGS	
Nut - Wheel to Hub -- R.H.	70-85
FRONT SUSPENSION	
Bolt and Nut - Stabilizer Bracket to Frame	20-35
Nut - Stabilizer Link	60-120 lb. in.
REAR SPRING INSTALLATION PARTS	
Nut - Upper Control Arm Assy. to Axle Hsg.	55-70
Nut - Lower Control Arm Assy. to Axle Hsg.	55-70
Nut - Lower Control Arm Assy. to Frame	55-70
Nut - Upper Control Arm Assy. to Frame	55-70
Screw - Axle Bumper to Frame	10-20
Bolt and Nut - Spring Lower Clamp	45-55
Bolt and Nut - Spring Upper Clamp	45-55
REAR SHOCK ABSORBERS	
Nut - Upper Shock Absorber	15-25
Bolt and Nut - Shock Absorber to Frame	55-75
FRONT SHOCK ABSORBERS	
Nut - Shock Absorber to Frame	60-120 lb. in.
Bolt - Shock Absorber to Lower Arm	15-25

WHEELS AND TIRES

The service information in Section 3A of the 1963 Pontiac Chassis Shop Manual also applies to the 1964 models except for the information listed below:

Tire Size	Starting Pressure (After Car Has Been Standing For Three Hours)	City Pressure (After Driving Car Three Miles or More Below 40 mph)	Highway Pressure (After Driving Car Three Miles or More Above 40 mph)
8.00 x 14—4 Ply Rating Sedans and Coupes			
Front	24	27	29
Rear	22	25	27
8.50 x 14—4 Ply Rating Sedans and Coupes			
Front	24	27	29
Rear	22	25	27
8.50 x 14—4 Ply Rating Wag.			
Front	22	25	27
Rear	26	27	29

NOTE: It is normal for air pressure to build up in a tire due to driving conditions; therefore, do not let air out of tires to reduce this increase in pressure.

WHEEL STUD

Remove & Replace

1. Press the damaged stud out or carefully drive out with hammer.

2. Insert the new stud taking utmost care to realign the serrations of the stud with the serrations in the drum.

CAUTION: Proper serration alignment is necessary to avoid distortion and breaking out of metal around the machined flat surface that contacts the wheel rim lugs.

3. Using a wheel nut and several large flat washers, pull the stud into place by tightening the nut.

NOTE: Wheels are secured by right hand thread nuts on both sides of car.

WHEEL BALANCE

All four tires and wheels should be checked for radial runout at the points indicated on the diagram, see Figs. 3A-1 and 3A-2.

NOTE: Wheels and tires are beyond tolerance and should be replaced before proceeding if runout exceeds the following Wheel radial runout .035" or wheel and tire assembly radial runout .050".

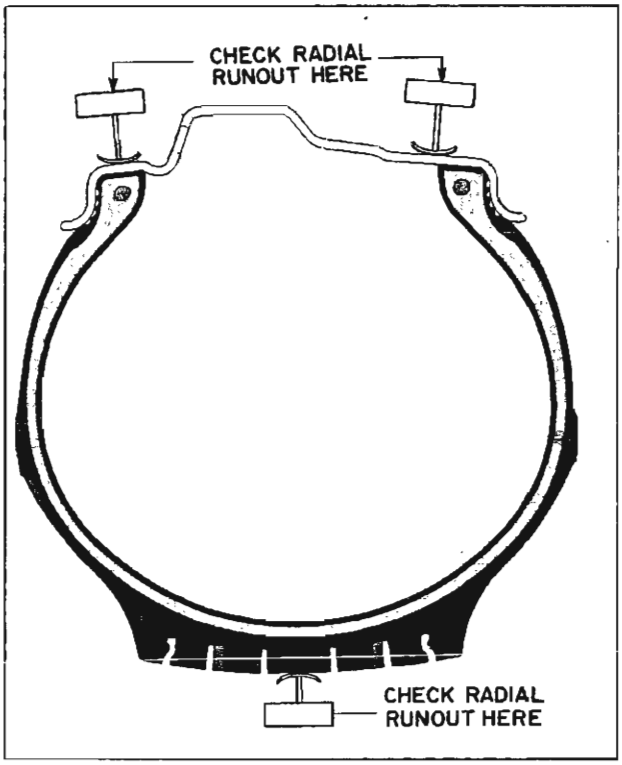


Fig. 3A-1

Lateral run out of each front wheel and tire may be checked by placing a dial indicator against either of the tire buff ribs. Make the check on the inside buff rib if the outside is worn or distorted due to hard curbing.

The maximum allowable lateral run out of each front wheel and tire is 1/8". The following corrective steps are taken if this is not obtainable.

1. Rotate tire on wheel.

2. Make wheel and tire run out check.

3. Make wheel run out check is lateral wheel and tire run out exceeds 1/8" after tire rotation.

4. Excessive run out is in wheel if run out obtained in step three is greater than 1/8", and in tire if run out obtained in step 3 is less than 1/8".

Balance all tire and wheel assemblies on the car with tires at normal operating temperatures as follows:

1. Spin wheel assembly with balancer spinner to locate heaviest point. Mark point with chalk.

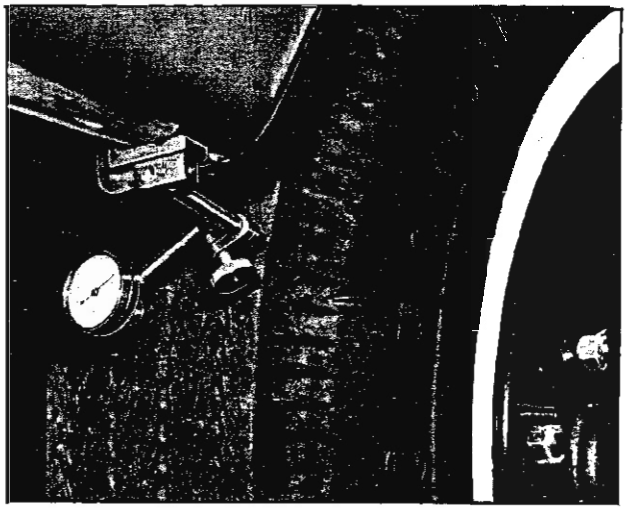


Fig. 3A-2

2. Remove wheel and tire assembly and rotate on drum until heaviest point of the assembly indexes with lightest point on the drum (the weight on the outer rim of the drum face marks the lightest point on the drums are balanced light at manufacture, see Fig. 3A-3.

3. Proceed to balance tire and wheel assembly in manner recommended by manufacturer of equipment being used.

NOTE: Amount of weights needed to compensate for static unbalance should be evenly divided and half added to inside of rim and half outside. This will eliminate the necessity of adding weight during dynamic balance to compensate for weights added during static balance.

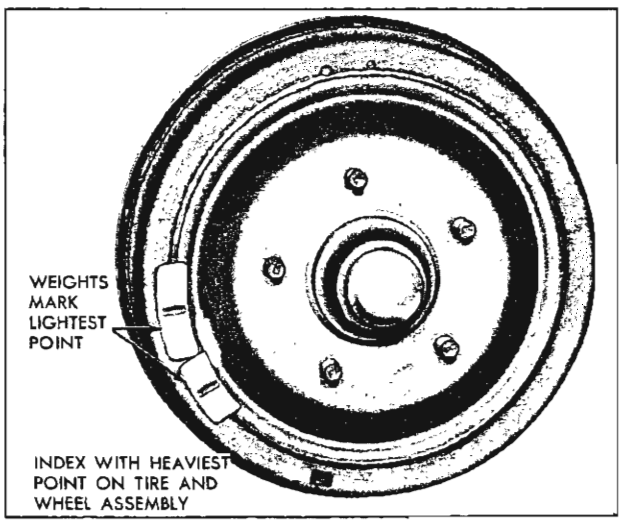


Fig. 3A-3

REAR AXLE

No major changes affecting service procedures have been made on the Rear Axle for 1964 models except the addition of a second type Safe-T-Track differential. Therefore, the operation and service information in Section 4 (Rear Axle) of the 1963 Pontiac Chassis Shop Manual also applies for 1964 Models, except for the following additions.

An optional differential side bearing adjusting nut lock is used on 1964 models to more accurately set preload. When used with the 1963 nut lock it doubles the number of adjusting positions (Fig. 4-1).

The ring gear to differential case bolts from 1964 differentials are not interchangeable with 1963 differentials.

Three differential cases which differ in ring gear mounting dimensions are used on 1964 models: one for 2.56 ratio; one for 2.69, 2.87, 3.08, and 3.23 ratios and one for 3.42, 3.64, 3.90 and 4.10 ratios. When changing axle ratios be sure and use the proper differential case.

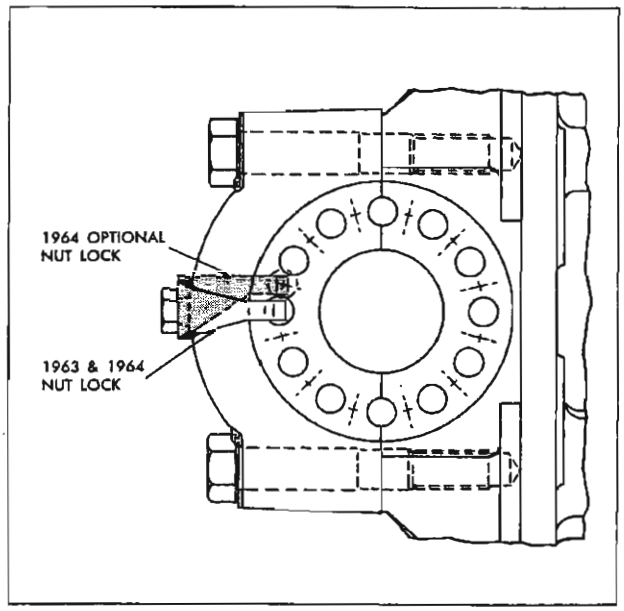


Fig. 4-1 Side Bearing Nut Lock

SAFE-T-TRACK DIFFERENTIAL
(SECOND TYPE)

DESCRIPTION

Like the first type Safe-T-Track differential, (see 1963 Manual), the second type Safe-T-Track differential Fig. 4-3, is similar to and interchangeable with the standard differential case assembly (the ring gear and side bearings are identical). (As in 1963,) Safe-T-Track differentials are identified by a metal tag next to the filler plug and a daub of green paint at the end of the axle shaft.

The case is of one piece design and houses the conventional side gears, pinion gears, thrust washers, and pinion shaft. In addition it also retains four removeable case hardened steel guides which in turn house a nine piece clutch pack behind each side gear. Five disc's are retained with tabs in the guides, and thus to the case. The remaining four alternate disc's are splined to the side gear which in turn is splined to the axle shaft. Between the side gears is a two piece thrust block which houses two calibrated preload springs which apply a force on the side gears and thus to each clutch pack. Some units also have one or more shims behind the clutch pack to obtain the proper backlash between the differential gears.

OPERATION

The Safe-T-Track differential operates in reverse and deceleration as well as all forward speeds. Torque is applied by the drive pinion to the ring gear which is bolted to the case assembly thereby causing it to rotate. The preload force from the springs plus the inherent separating force between the pinion gears and side gears as the case rotates, forces the side gears against their respective clutch pack. Since each disc is alternately attached to the case and side gear which is splined to the axle shaft, each shaft is frictionally connected to the case and the shafts in effect are locked together and rotate at the same speed.

When turning corners, the axles are automatically unlocked as torque created by differential action overcomes the frictional forces between the clutch discs allowing them to turn with respect to each other.

When the rear wheels are under extremely unbalanced tractive conditions, such as one wheel on

REAR AXLE WITH STANDARD BRAKES

Rear Axle Gear Comb Ratio	USAGE: Model: CA T. S E D.	Cat Cpe Exc Cust Spts Opt.	Cat Cpe with Cust Spts Opt.	Cat Sta Wag	Star Chief	Bonn Sed and Cpe	Bonn Sta Wag and Conv	Grand Prix	TAX I	Trans.: 3 Spd SMT	4 Spd SMT	H-M	Ratio Release: ECON	STD	PERF	Engine: 389	425 E	421	Tri-Carbs: 389	421	421 H.O.	Trailer Prov.: w/o	with	Air Cond.: w/o	with	DIFFERENTIAL: Standard Code: Color	No.	Safe T Track Code: Color	No.
41:16 2.56	X			X	X	X						X		X		X	X					X		X	X	Gray	3	Gray & Green	3
		X		X	X	X						X	X			X						X		X					
		X	X	X	X	X			X			X		X			X					X		X	X				
							X	X				X	Special Order			X							X		X	X				
43:16 2.69		X		X								X		X		X							X		X	X	Red	2	Red & Green	2
					X	X						X		X		X							X		X	X				
							X	X				X	X			X							X		X					
							X	X				X		X			X						X		X	X				
									X			X		X		X							X		X	X				
43:15 2.87	X	X		X		X	X	X				X	Special Order			X							X		X	X	Orange	7	Orange & Green	7
40:13 3.08			X				X	X				X		X		X							X	X	X	X	Yellow	0	Yellow & Green	0
	X	X	X	X	X	X	X	X	X			X		X				X	X	X			X	X	X	X				
	X	X		X	X	X						X			X	X							X	X	X	X				
	X	X		X	X	X	X			X			X			X							X		X					
42:13 3.23	X	X	X	X	X	X	X	X				X		X							X		X	X		X	Brown	9	Brown & Green	9
	X	X		X	X	X	X	X	X	X				X		X		X		X			X		X	X				
								X				X			X	X							X		X					
	X	X		X	X	X	X	X	X	X				X					X				X		X	X				
	X											X	Special Order			X							X	X	X					
	X	X	X	X	X	X	X	X				X						X	X	X			X	X	X					
			X									X				X							X	X	X					
		X		X	X	X						X				X							X	X	X					
							X					X				X							X	X	X					
41:12 3.42	X	X	X	X	X	X	X	X				X		X							X		X	X	X		White	8	White & Green	8
	X	X		X	X	X	X	X		X				X							X		X		X	X				
	X	X	X	X	X	X	X	X	X		X			X		X		X	X	X	X		X	X	X	X				
								X		X					X	X							X		X	X				
			X								X		Special Order					X	X	X			X	X	X	X				
	X	X		X	X	X	X			X						X							X	X	X*					
	X											X				X							X	X	X*					
		X		X		X						X				X							X	X	X*					
							X	X				X				X							X	X	X*					
	X	X	X	X	X	X	X	X				X						X	X	X			X	X	X*					
			X									X											X	X	X*					
	X	X		X	X	X	X	X		X						X					X		X	X	X	X				
40:11 3.64	X	X		X	X	X	X	X	X	X				X		X		X	X	X	X			X	X	X	Blue	6	Blue & Green	6
	X	X	X	X	X	X	X	X				X	Special Order					X	X	X			X		X*					
	X	X	X	X	X	X	X	X				X									X		X		X*					
								X		X						X							X		X*					
	X	X		X	X	X	X	X		X								X	X	X	X		X		X*					
	X	X	X	X	X	X	X	X			X					X		X	X	X	X		X	X	X*					
39:10 3.90	X	X	X	X	X	X	X	X				X	Special Order								X		X		X*			4	Green	4
								X		X						X							X	X	X*					
	X	X		X	X	X	X	X		X									X				X	X	X*					
	X	X		X	X	X	X	X		X										X	X		X	X	X*					
	X	X	X	X	X	X	X	X			X					X							X	X	X*					
	X	X	X	X	X	X	X	X			X							X	X	X	X		X	X	X*					
41:10 4.10	X	X	X	X	X	X	X	X				X	Special Order						X				X		X*		Black	0	Black & Green	0L
	X	X		X	X	X	X	X		X									X				X	X	X*					
			X								X								X				X	X	X*					

*Special Radiator Required

REAR AXLE WITH HEAVY DUTY BRAKES

Comb Ratio	Police: Cat Sed	Cat Sta Wag	Heavy Duty Chassis	SM	HM	Ratio Release: ECON	STD	PERF	389	w/o	with	Color	No.	Code: Color	No.
40:13 3.08	X	X	X		X		X		X		X	Yellow	0	Yellow &Green	0
42:13 3.23	X	X		X			X		X		X	Brown	9	Brown & Green	9
			X		X			X	X		X				
	X	X			X	Special Order			X		X				
41:12 3.42	X	X		X				X	X		X	White	8	White & Green	8
	X	X			X	Special Order			X		X*				
39:10 3.90			X	X			X		X		X		4	Green	4

Fig. 4-2 Chart - Rear Axle Usage and Identification

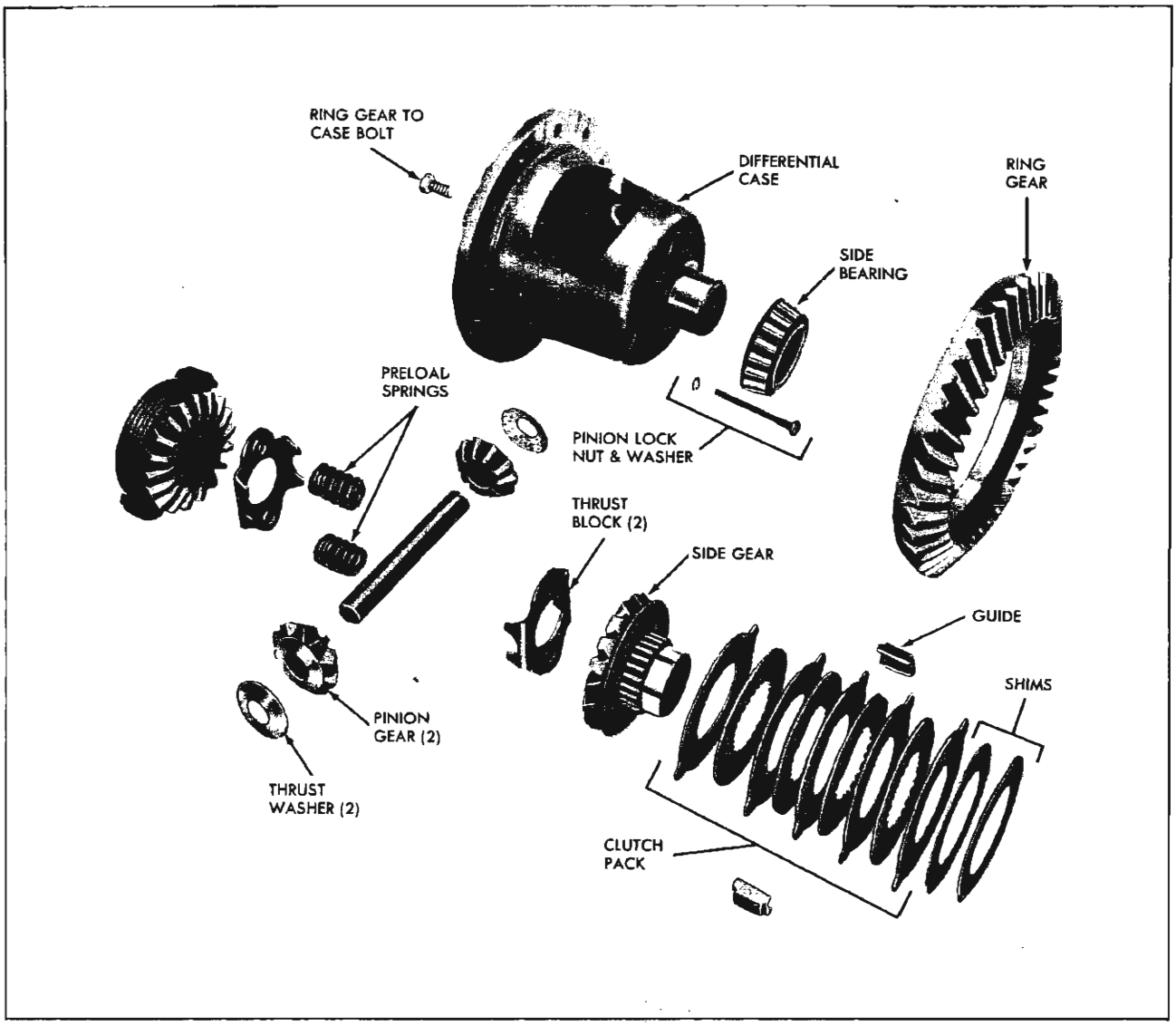


Fig. 4-3 Exploded View - Safe-T-Track (2nd Type)

dry pavement and the other on ice, wheel spin may occur if over acceleration is attempted. However, even when wheel spin does occur, the major driving force is directed to the non-spinning wheel.

LUBRICATION

The differential should be checked for leaks and level every 6000 miles. Maintain level to bottom of the filler plug opening. No periodic lubricant change is recommended. However, if necessary to add lubricant, use only Special Lubricant (Part No. 531536).

IMPORTANT: Never use any other lubricant in a Safe-T-Track differential or a severe chatter may result, especially when turning corners. If the wrong lubricant is added, remove it from housing, flush with clean engine oil and add the proper lubricant. It may be necessary to drive the car several miles to allow the lubricant to work through the clutches and eliminate the chatter. If chatter persists, drain and refill again to eliminate contamination. Capacity of the rear axle housing is 5-3/4 pints.

SERVICE PROCEURES

All rear axle service procedures are the same for the Safe-T-Track as for the conventional differential, except for servicing the case assembly.

NOTE: Two precautions must be observed when working on cars with Safe-T-Track differentials:

1. Never raise one wheel and run the engine with the transmission in gear. The driving force to the wheel on the floor may cause the car to move.

2. Do not use "on the car" type wheel balancers on the rear wheels, unless both wheels are off the floor.

TESTING FOR CORRECT OPERATION

If there is any doubt as to the proper functioning of the Safe-T-Track differential, the following simple test should be performed.

1. Place the car on a hoist with engine off and the transmission selector lever in park if automatic and in lower gear if synchromesh.

2. Attempt to turn either wheel.

3. The average man will find it extremely difficult, if not impossible, to manually turn either wheel. This is because one wheel will provide approximately 400 lbs. draw bar pull with zero traction at the opposite wheel.

DIFFERENTIAL CASE—DISASSEMBLE

NOTE: Keep side bearing outer races with side bearings so these mating parts can be correctly replaced during build-up.

1. Before disassembling differential case, inspect differential side bearings for visible damage of rollers and outer races.

2. Place one outer race onto its mated inner race and roller assembly and turn slowly, applying hand load.

3. If bearing outer race turns smoothly and no visible damage is found, bearing can probably be reused.

4. Repeat above operations with other outer race and mated bearing and check for smoothness.

NOTE: Both side bearings and their outer races are mated parts. If either bearing is to be replaced, its mating outer race must also be replaced.

5. Inspect fit of inner races on case hubs by prying against shoulders at puller recesses. Bearing inner races must be tight on case hubs.

NOTE: If either bearing is loose on case, the entire case must be replaced.

6. If bearing inspection indicates that bearings should be replaced, insert differential case in vise and using side bearing puller J-986-P and adapter J-8107, remove side bearing (Fig. 4-4).

CAUTION: Make certain ends of puller arms are firmly seated in recesses in sides of hubs and fully against inner race of bearing.

7. Turn differential case in vise and remove other side bearing in same manner.

8. If ring gear is to be removed, clamp case in vise so jaws are 90° to pinion shaft holes and remove ten ring gear retaining bolts.

9. Partially re-install two bolts on opposite sides of ring gear.

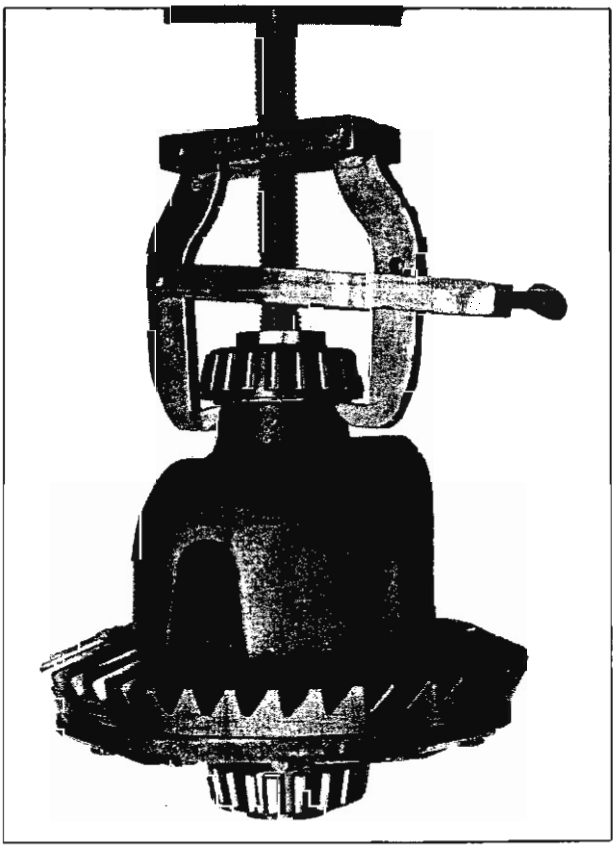


Fig. 4-4 Removing Differential Side Bearing

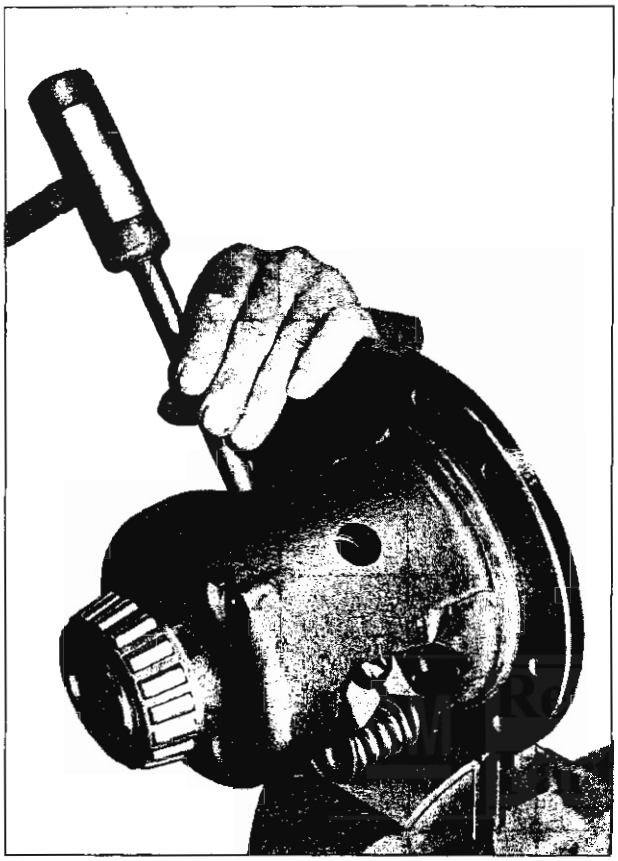


Fig. 4-5 Removing Preload Springs and Retainer

10. Remove ring gear from case by alternately tapping on bolts.

CAUTION: Do not pry between case and ring gear.

11. Remove pinion shaft lock screw and washer and tap out pinion shaft from case.

12. Remove pinion shaft lock screw and lockwasher, then remove pinion shaft from case.

13. Remove the preload spring retainer and springs from the case. (Fig. 4-5).

14. Rotate side gears until the pinions are in the open area of the case. Remove the pinions and thrust washers.

15. Remove a side gear, clutch pack and shims from the case, noting its location in the case to aid in reassembly. Remove the side gear clutch pack and shims from the opposite side.

NOTE: If a side gear or clutch pack cannot be readily removed from the case, drive out with a brass drift (Fig. 4-6).

Fig. 4-6 Removing Clutch Pack

16. Remove the clutch plate guides and separate the shims and clutch plates from the side gears.

NOTE: Keep the clutch plates in their original location in the clutch pack.

CLEANING AND INSPECTION OF CASE

1. Thoroughly clean differential case and inspect, paying particular attention to ring gear mounting flange, ring gear pilot, and side bearing hubs.

2. Remove nicks and burrs with mill file.

NOTE: If new case is to be used, thoroughly clean new case in suitable solvent, making certain bolt holes and bolts are clean of steel filing and foreign material.

3. Clean side gears, pinion gears and thrust washers with suitable solvent and inspect for excessive wear.

4. Clean side bearings thoroughly in clean solvent (do not use a brush). Examine bearings visually and by feel. Bearings should feel smooth when oiled and rotated while applying as much hand pressure as possible.

NOTE: Minute scratches and pits that appear on rollers and races at low mileage are due to the initial preload, and bearings having these marks should not be rejected.

5. Thoroughly clean ring gear and inspect back side for any adhering material which may effect runout.

Examine the ring gear and drive pinion teeth for nicks, burrs, or scoring. Any of these conditions will require replacement of the gear set.

6. Position ring gear on case and check fit of gear on flange and pilot. Should be .002 tight to .001 loose. If ring gear easily falls into position, it must be replaced.

NOTE: If ring gear is replaced, pinion gear must also be replaced as they are only serviced in matched sets.

7. Check the press fit of the side bearing inner race on the differential case. Side bearings must be a tight press fit on the hub.

8. Inspect clutch plates for scored, worn, cracked or a distorted condition. If any of these conditions exist, new clutch plates must be installed.

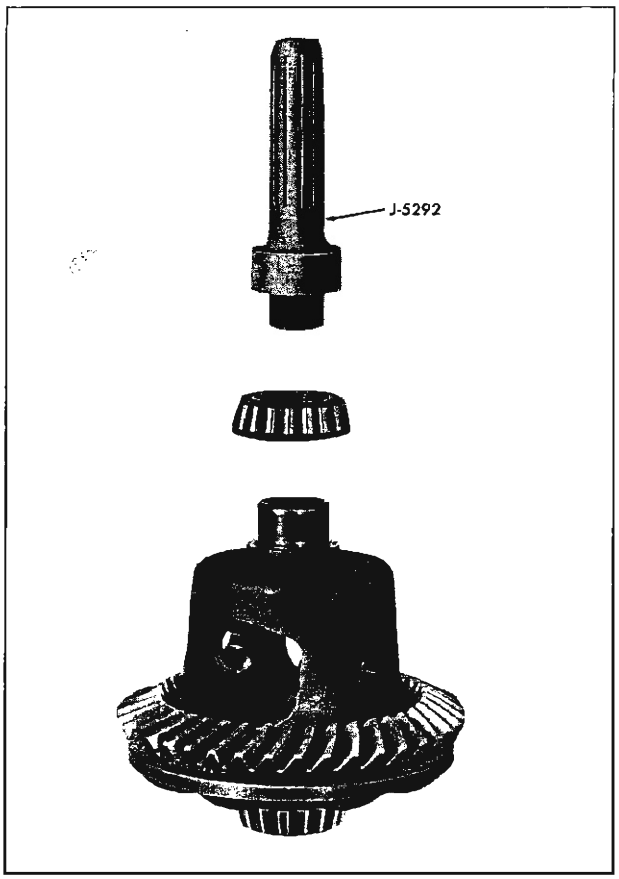


Fig. 4-7 Installing Differential Side Bearing

9. Replace parts as necessary and coat with clean engine oil before installing in case.

DIFFERENTIAL CASE—ASSEMBLY

1. After making sure that mating surfaces are clean and free of burrs, position ring gear on case so holes are in line.

2. Lubricate attaching bolts with clean engine oil and install.

3. Pull ring gear onto case by alternately tightening bolts around case. When all bolts are snug, tighten bolts evenly and alternately across diameter to 55-65 lb. ft. torque.

CAUTION: Do not use hammer to force ring gear on case.

4. If side bearings were removed, lubricate the bearings and install on case hubs as shown in Fig. 4-7 using tool J-5292.

5. Apply special lubricant, Part No. 531536, to the clutch plates.

6. Assemble the clutch packs as follows:

a. Alternately position nine clutch plates on the side gear, starting and ending with a clutch plate with the external lugs.

b. Install the two clutch guides over the clutch plate lugs.

c. Install the same shims which were removed or an equal amount on the clutch plate.

d. Repeat steps A, B, and C on the other clutch pack.

7. Check the pinion to side gear clearance as follows:

a. Install one side gear with clutch pack and shims in the case.

b. Position the two pinion gears and thrust washers on the side gear and install the pinion shaft.

c. Compress the clutch pack by inserting a screwdriver or wedge between the side gear and the pinion shaft.

d. Install dial indicator KMO-30 with the contact button against the pinion gear (Fig. 4-8).

e. Rotate pinion gear. Clearance should be .001" to .006".

f. If clearance is more than .006", add shims between clutch pack and case. If clearance is

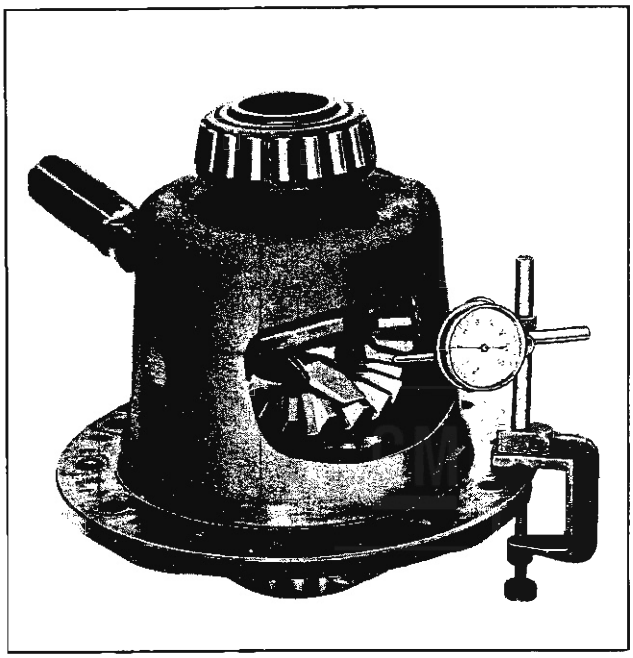


Fig. 4-8 Checking Pinion to Side Gear Clearance

less than .001", remove shims. A .002" shim will change clearance approximately .001". Recheck clearance after adding or subtracting shims.

g. Remove side gear and repeat procedure with opposite clutch pack, on opposite side of case.

8. Remove pinion shaft, pinions and thrust washers.

9. Install the remaining side gear and clutch pack with correct shims in the case.

10. Place the pinion gears on the side gears and rotate into correct position.

11. Compress the preload springs as shown in Fig. 4-7 and drive the preload retainer and springs between the side gears.

12. Insert the thrust washers behind the pinion gears.

13. Install the pinion shaft and retain with the lock bolt. Tighten lock bolt to 15-25 lb. ft.

14. Check the side gear splined hole to be certain it is in line with the hole in the preload spring retainer. The spring retainer can be moved slightly to correct misalignment.

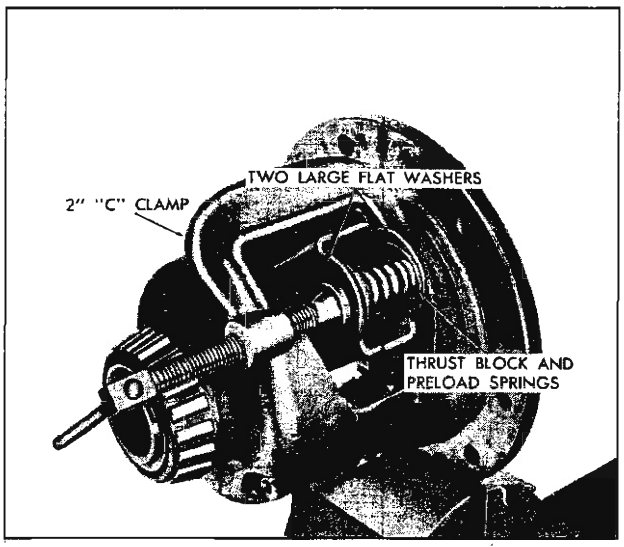


Fig. 4-9 Compressing Preload Springs

PROPELLER SHAFT

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

The propeller shaft is the connecting link between and transmits power from the transmission to the differential. Two basic designs are used; a "solid" type which is of one piece tubular steel construction and a "rubber" type which incorporates the use of rubber torsional dampeners (Fig. 4A-1) between two concentric tubes of steel.

The nineteen propeller shafts (including high speed) used on all models also differ in length, diameter of shaft, and splined yoke so as to accommodate the different transmission and wheel base combinations. A comparison of propeller shafts and their usage is shown in Fig. 4A-2. Each one attaches to the transmission and differential in the same manner.

All shafts have a universal joint and a splined yoke on the transmission end and are held in alignment by a bushing in the transmission rear bearing retainer (or rear extension housing), and a universal joint at the differential end (Fig. 4A-3).

A U-bolt type clamp and locking plate is used to attach the universal joint to the companion flange at the differential. The front joint attaches to the output shaft of the transmission by means of a splined yoke which permits fore and aft movement of the propeller shaft when the rear axle assembly moves up and down. This splined connection is lubricated from the transmission. An oil seal pressed into the transmission rear bearing retainer protects the transmission yoke from dust as well as loss of transmission lubricant.

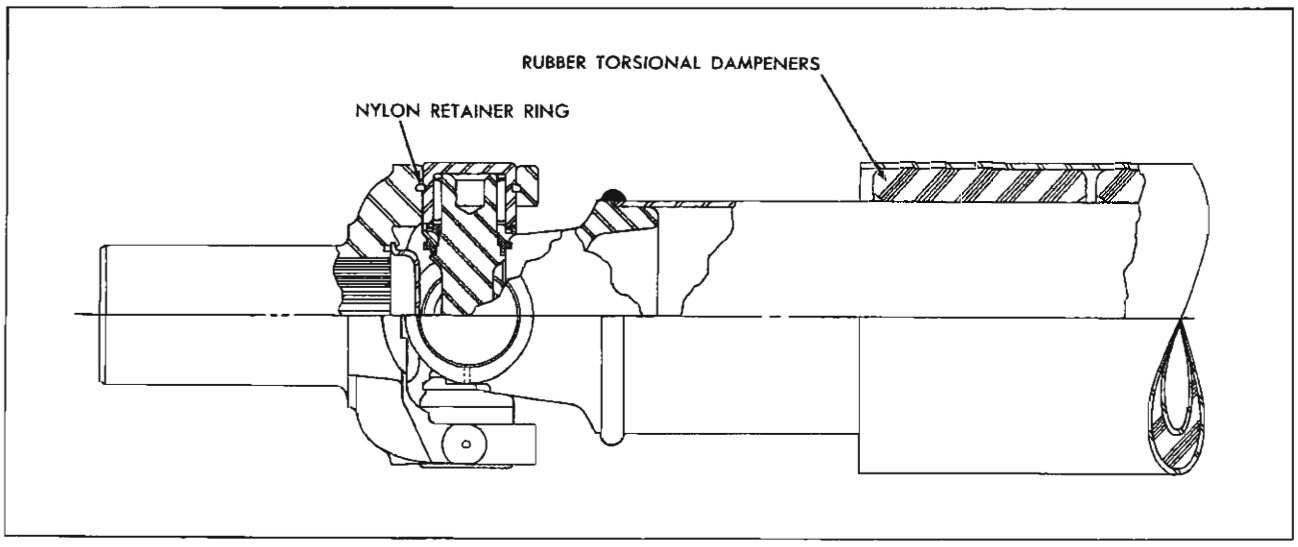


Fig. 4A-1 Insulated Propeller Shaft

Transmission	Color Code	Wheel Base	Type Insulator	Usage	Length (Inches)	Diameter (Inches)
Synchromesh 3-Speed	1 Orange 1 Gray	119"	Solid	23-28 Safari	60.48	3.25
	1 Orange 1 Black	119.8"	Solid	23-29 Series	61.28	3.25
Synchromesh Heavy Duty 3-Speed	1 Green	119"	Solid	23-28 Safari	54.84	3.00
	1 Green 1 White	119.8"	Solid	23-29 Series	55.64	3.00
	1 Gray	123"	Solid	26-28 Series	58.84	3.25
	1 Brown	119.8"	Solid	23-29 Series Hi Speed Shaft	55.64	3.00
	1 Purple	123"	Solid	26-28 Series Hi Speed Shaft	58.84	3.25
Synchromesh 4-Speed	1 Orange	119"	Solid	23-28 Safari	60.48	3.25
	2 Orange	119.8" & 123"	Solid	26-28 Series 23-29 Series	61.28	3.25
	2 Purple	119.8" & 123"	Solid	23-29 Series 26-28 Series Hi Speed Shaft	61.28	3.25
Roto Hydra-Matic	1 Blue	119"	Rubber	23-28 Safari	57.28	3.00
	1 Black	119.8"	Rubber	23-29 Series	58.08	3.00
	2 Blue	119.8"	Solid	23-29 Series Hi Speed Shaft	58.08	3.00
Super Hydra-Matic	1 Blue 1 White	119"	Rubber	23-28 Safari	57.28	3.00
	2 Black	119.8"	Rubber	23-29 Series	58.08	3.00
	2 White	123"	Rubber	26-28 Series	61.28	3.38
	2 Yellow	123"	Solid	26-28 Series Hi Speed Shaft	61.28	3.25

Fig. 4A-2 Propeller Shaft Usage and Comparison Information

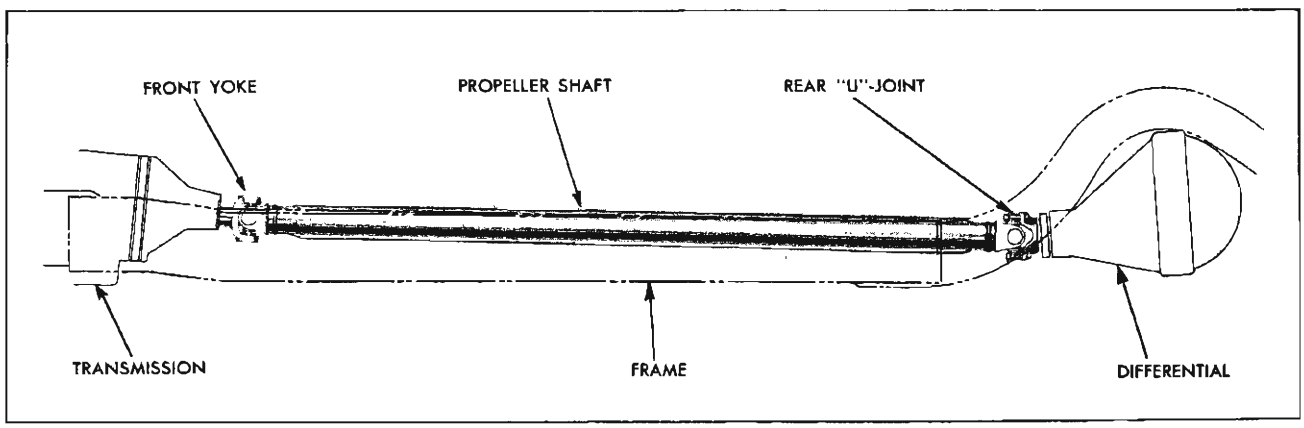


Fig. 4A-3 Relationship of Propeller Shaft to Transmission, Differential and Frame

Two methods are used to retain U-joint bearings to the yoke. Conventional snap rings are used at the companion flange of the differential. The remaining six bearings are held in place with nylon rings.

The nylon composition material is injection molded into an annular groove in the yoke and bearing shell through a small hole in the yoke. It then hardens forming a permanent internal retainer.

INSPECTION

No periodic inspection of the propeller shaft assembly is required. Since the propeller shaft assembly is a balanced unit, it should be kept free of undercoating and other foreign material which could upset shaft balance.

MINOR SERVICES AND REPAIRS

ALIGNMENT OF ENGINE AND PROPELLER SHAFT

Adjustment of the propeller shaft angle, such as shimming, cannot be made at the rear axle and is not required at the front (engine and transmission).

All necessary differential pinion angle requirements are designed and built into the rear upper and lower control arm geometry. Slots in the engine front motor mounts provide for fore and aft movement of the engine and transmission assembly to give allowance for variation of the positioning of the transmission rear crossmember. The relationship of engine crankshaft angle to propeller shaft angle is maintained within specification by design.

MAJOR REPAIRS

REMOVE PROPELLER SHAFT DRIVE LINE ASSEMBLY

1. Remove U-bolt nuts, lock plates and U-bolts from rear axle drive pinion flange.

2. Use a suitable rubber band to hold bearing onto journals if tie wire has been removed to prevent loss of needle bearings when rear joint is disconnected (Fig. 4A-4).

3. Remove complete drive line assembly by sliding rearward to disengage from splines on transmission main shaft.

DISASSEMBLE PROPELLER SHAFT UNIVERSAL JOINTS

NOTE: Because of the elastic properties of the nylon retainer, it is not possible to drive the bearings out in the conventional manner. They must be pressed out, which shears the nylon retainers in half, rendering the bearings and journal unsuitable for reuse. Therefore, upon assembly a new bearing and journal assembly employing the conventional snap ring retainer must be used. Consult parts book for repair kit part number. Do not attempt to replace the U-joints of propeller shafts from cars equipped with 421 H.O. engines and axles ratio of 3.42 and over. They are high speed balanced assemblies (balance speed 6000 rpm) and replacement of composite U-joint will destroy balance.

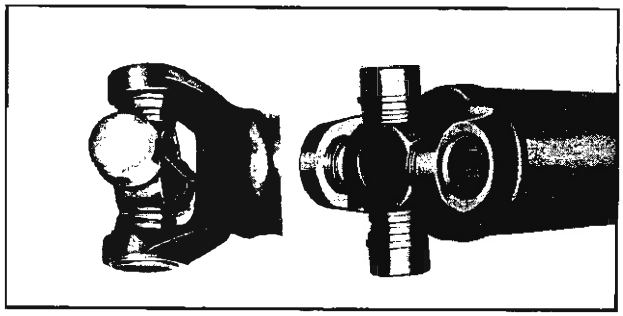


Fig. 4A-4 Bearings Held in Place by Tie Wire

A. FIXED YOKE (Differential End)

1. Support journal on a press bed in a manner that will allow yoke to be moved downward. Support

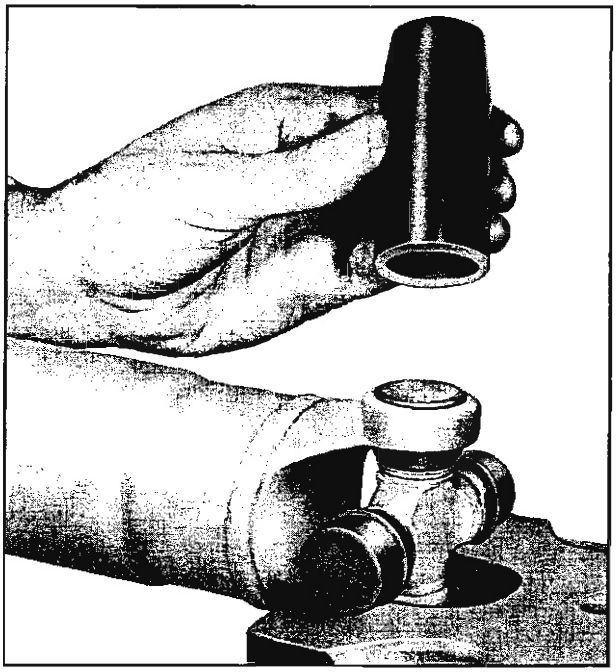


Fig. 4A-5 Removing Bearing from Yoke with 1-1/8 Dia. Pipe (Typical)

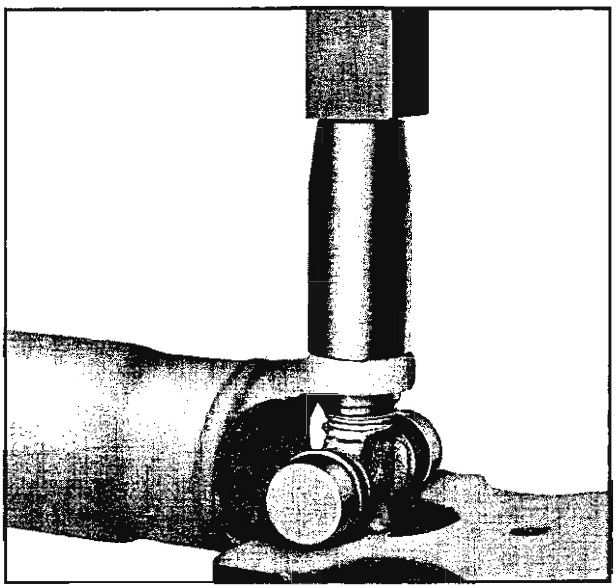


Fig. 4A-6 Pressing Out Bearing (Typical)

front of propeller shaft on a stand so propeller shaft is horizontal.

2. Using a piece of pipe or similar tool with a diameter sufficiently large to encircle bearing (slightly larger than 1-1/8 inches) Fig. 4A-5, apply force on yoke around bearing until nylon retainer breaks (Fig. 4A-6). Continue to apply force until the downward movement of the yoke and the stationary position of the journal forces the bearing almost completely out of yoke. Fig. 4A-7.

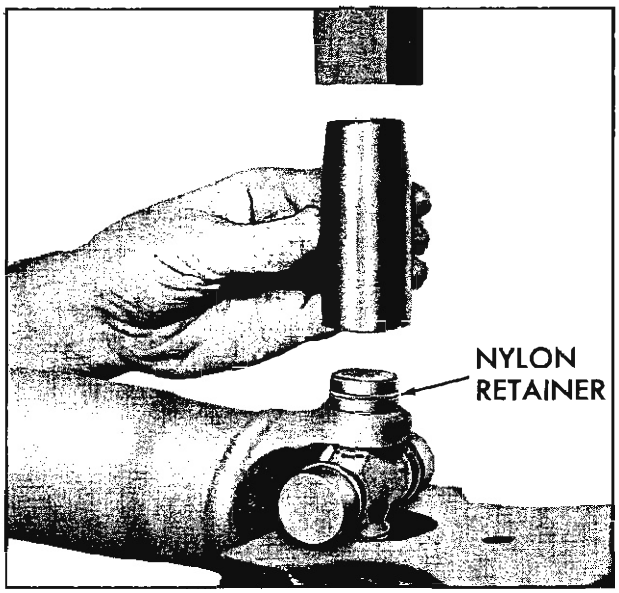


Fig. 4A-7 Bearing Partially Removed (Typical)

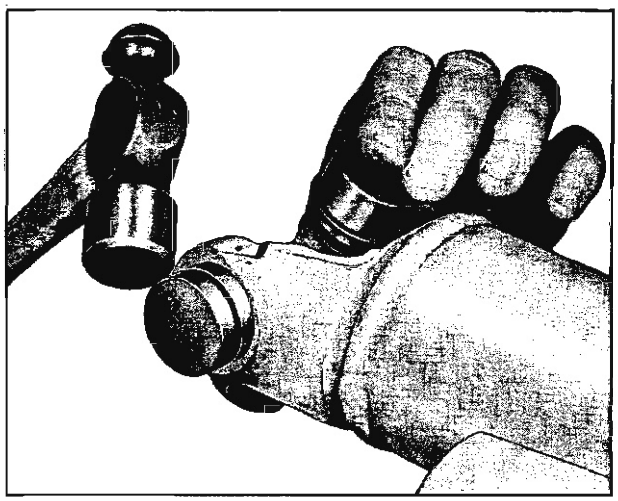


Fig. 4A-8 Tapping Out Bearing (Typical)

3. Rotate propeller shaft 180° and repeat above step to partially remove opposite bearing.

4. Complete removal of each bearing by tapping around circumference of exposed portion with a small hammer. Fig. 4A-8.

5. Remove journal from yoke.

B. SPLINED YOKE (Transmission End)

1. Support splined yoke on a press bed and the rear of the propeller shaft on a stand so shaft is horizontal. Be sure the weight is evenly distributed on each side of the splined yoke and the fixed yoke half of the U-joint is free to move downward. Fig. 4A-9.

2. Using a piece of pipe or similar tool with a diameter sufficiently large to encircle bearing

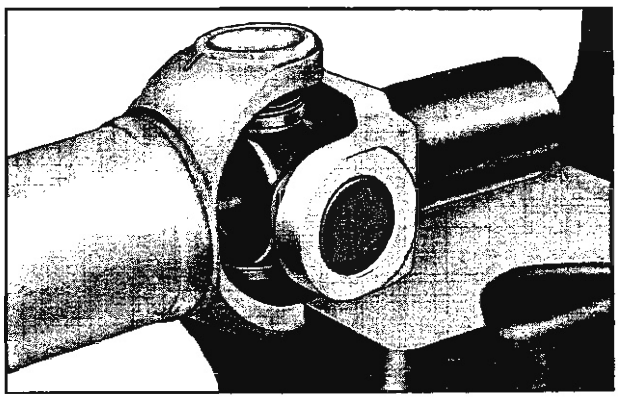


Fig. 4A-9 Supporting Splined Yoke

(slightly larger than 1-1/8 inches), Fig. 4A-5 apply force on fixed yoke until nylon retainer breaks. Fig. 4A-6. Continue to apply force until the downward movement of the yoke and the stationary position of the journal forces the bearing almost completely out of yoke. Fig. 4A-7.

3. Rotate the propeller shaft 180° and repeat above step to partially remove opposite bearing.

4. Completely remove bearings by tapping around circumference of exposed portion with a hammer. Fig. 4A-8.

5. Remove splined yoke and journal from fixed yoke.

6. Remove bearings and journal from splined yoke in a similar manner.

CLEANING AND INSPECTION

Inspect outer surface of propeller shaft splined yoke to insure that it is not burred since burrs will damage seal. Also inspect splines for freedom from dirt.

ASSEMBLE PROPELLER SHAFT UNIVERSAL JOINTS

A. FIXED YOKE (Differential End)

1. Install bearing about one quarter way in on one side of yoke with a soft faced hammer. Check for proper alignment.

2. Insert journal into yoke. Fig. 4A-10.

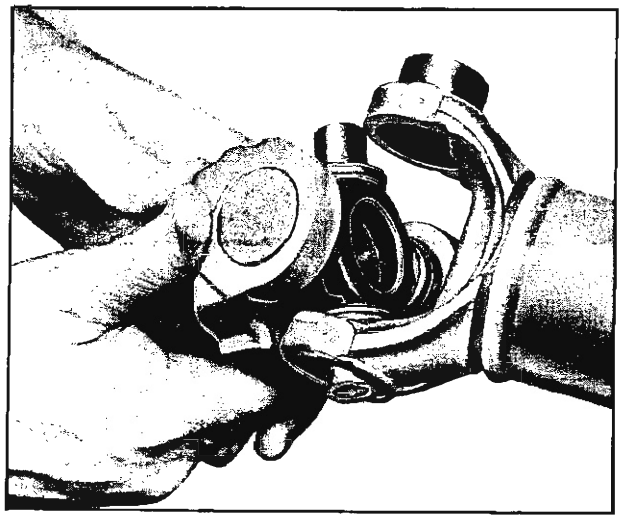


Fig. 4A-10 Installing Journal (Typical)

3. Firmly seat journal into bearing cup and complete installation of bearing using a soft faced hammer.

4. Install opposite bearing ensuring that bearing rollers do not jam on journal. Check for free movement of U-joint.

5. Install snap rings with gap towards yoke. Fig. 4A-11.

B. SPLINED YOKE (Transmission End)

1. Install bearing about one quarter way in one side of splined yoke using a soft faced hammer. Check for proper alignment.

2. Insert journal into splined yoke, Fig. 4A-10.

3. Firmly seat journal into bearing cap and completely install bearing.

4. Install opposite bearing ensuring that bearing rollers do not jam on journal. Check for free movement of U-joint.

5. Install snap rings with gap towards yoke, Fig. 4A-11.

6. Install bearings and splined yoke to fixed yoke in a similar manner.

INSTALL PROPELLER SHAFT DRIVE LINE ASSEMBLY

1. Inspect outer diameter of splined yoke to ensure that it is not burred, as this will damage transmission seal.

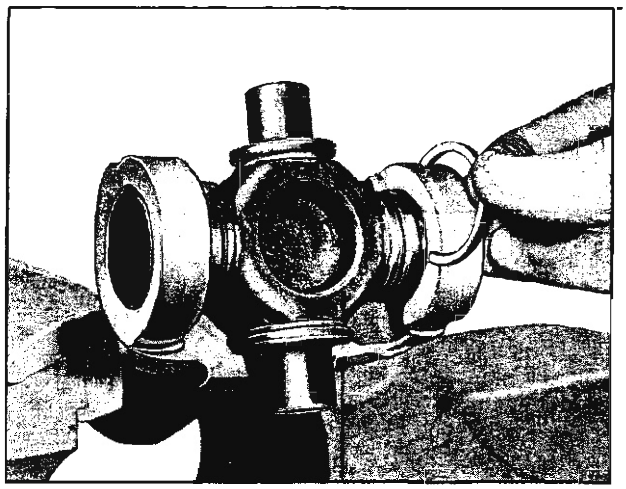


Fig. 4A-11 Installing Snap Ring (Typical)

2. Apply engine oil to spline and outside diameter of yoke and slide propeller shaft front joints onto transmission output shaft.

3. Position rear universal joint to rear axle companion flange making sure trunnion bearings are properly aligned in companion flange yoke.

4. Install U-bolts, lock plates and nuts and tighten U-bolt nuts to 14-20 lb. ft. torque. Ensure that ears of lock plates are bent up against flat side of nuts.

TROUBLE DIAGNOSIS AND TESTING

OIL LEAK AT FRONT YOKE

CAUSE	REMEDY
Rough outside surface on splined yoke or defective transmission rear oil seal. An occasional drop of oil dripping from the spline yoke is normal and requires no correction.	Replace seal if cut by burrs on yoke. Replace yoke if outside surface is rough and burred badly. Minor burrs can be smoothed by careful use of crocus cloth or honing with a fine stone.

KNOCK IN DRIVE LINE

CAUSE	
Worn universal joints. *NOTE: "Clunking" noise when car is operated under "floating" condition at approximately 10 mph in high gear or neutral.*	Disassemble universal joints, inspect and replace worn parts.

PROPELLER SHAFT VIBRATION

If vibration comes in at definite speed while car is moving, check by driving car at speed above which vibration came in, shutting off engine and coasting in neutral down through speed where vibration came in. If vibration comes in at same speed when coasting, it is probably caused by propeller shaft or tires. Tires may give a vibration at certain high speeds which could be mistaken for propeller shaft vibration. By inflating tires above normal pressure and retesting, it may be possible to distinguish tire noise from propeller shaft vibration. When it has been established that the tires are not the cause of vibration, then check propeller shaft assembly for balance and replace shaft.

WRENCH TORQUE SPECIFICATIONS

TORQUE	SIZE	APPLICATION
14-20	5/16-24	Nut, Rear Universal Joint Companion Flange Clamp

STANDARD AND HEAVY DUTY BRAKES

The service information contained in section 5 of the 1963 Pontiac Chassis Shop Manual also applies to the 1964 models except for the information listed below.

MASTER CYLINDER ASSEMBLY

The brake master cylinder has a rubber diaphragm covering the brake fluid reservoir to hermetically seal the brake system from contamination and prevent corrosion and subsequent leakage. The cover is retained on the fluid reservoir with a heavy duty stiff wire clamp which replaces the wing nut and washer used previously.

BRAKE DRUMS

Front and rear brake drums of cast iron construction (on steel back) with fins for increased cooling are used on all models except Catalina with 2.69 to 1 and 2.56 to 1 rear axle ratio (automatic transmission only) which will use the carry-over smooth stamped exterior shell drums. Rear brake drums of cast iron construction (on steel back) with fins for increased cooling are also used on heavy duty in conjunction with massive aluminum finned drums (used with 15" wheel only).

MAJOR BRAKE ADJUSTMENT
(24 TOOTH ADJUSTING SCREW)

A manual brake shoe adjustment is required only when new linings are installed or whenever the length of the brake shoe adjusting screw has been changed.

Remove all four wheels and brake drums and blow out dust from all drums and brake assemblies.

INSPECTION

1. Inspect drums for scoring. Road dirt frequently cuts grooves in drums which do not impair operation of brakes unless grooving is extremely severe. When drums are badly scored, inspect lining carefully for imbedded foreign material. Replace or recondition drums only when drums are badly scored.

CAUTION: Removing material from brake drum reduces strength of drum and also the ability of drum to absorb heat.

2. Inspect front wheel bearings and oil seals and replace as necessary.

3. Carefully pull edges of wheel cylinder boots away from cylinders and note whether interior is wet with brake fluid. Excessive amounts of fluid at this point indicates leakage past piston cups.

NOTE: A slight amount of fluid is nearly always present and acts as lubricant for the piston.

4. If an excessive amount of fluid is present, overhaul wheel cylinder.

5. Inspect hoses and hydraulic lines for wear or damage and replace as necessary. Pull all shoe assemblies away from backing plate and apply a small amount of petroleum base lubricant to pads where brake shoes contact backing plates. Remove adjusting hole covers from backing plates.

6. Reinstall brake drums and wheels.

CAUTION: Take extreme care to prevent oil, grease or brake fluid from getting on linings or drums. Even oily finger prints on linings may upset an otherwise perfect brake adjustment.

7. Remove adjusting hole covers from backing plates.

8. Install drums, checking for proper installation of front wheel bearings. Retain rear drums during adjustment with one wheel nut.

9. Adjust front wheel bearings with brake shoes free.

ADJUSTMENT

1. Proper lining to drum gap is .015" measured between secondary lining and drum while primary lining is against drum. Proper gap is required at both ends of the secondary lining. A five to ten lb. drag on a .015" feeler during initial withdrawal from full lining width insures holding primary against drum.

2. Change clearance at adjusting screw end of lining by shortening or lengthening adjusting screw.

3. Change clearance at anchor pin end of lining by rotating anchor pin. Rear brakes having fixed anchors require replacement of any parts preventing proper clearances.

4. Interaction of adjustments requires rechecking clearance after large changes.

5. The rear fixed anchor brake having drum with no feeler slot may be adjusted by lengthening adjusting screw to create a heavy drag (14-20 lb. on O.D. of drum as it is rotated) then backing off 24 notches.

6. At completion of adjustment the following should be true.

a. Drum rotation free from drag.

b. Anchor pin lock nut (with adjustable anchor) tightened to 60-90 lb. ft. torque.

c. Plug in adjusting slot.

STOP LAMP SWITCH

The stop lamp switch has a slip fit in the mounting sleeve which permits positive adjustment by pulling the brake pedal up firmly against the stop. The pedal arm forces the switch body to slip in the mounting sleeve bushing to properly position switch.

REMOVE

1. Disconnect wires from switch.

2. Remove switch by pulling out of bracket.

REPLACE

1. Position stop light switch in bracket and push in to maximum distance.

2. Brake pedal arm moves switch to correct distance on rebound. Check if pedal is in full return position by lifting slightly by hand.

3. Connect switch wires by inserting plug on switch.

WHEEL CYLINDER LINKS

Cold headed wheel cylinder to brake shoe links are used on all models. They can be identified by their "T" shape.

BENDIX POWER BRAKE

The service information in section 5A of the 1963 Pontiac Chassis Shop Manual also applies to the 1964 models except for the information listed below.

MASTER CYLINDER ASSEMBLY

The brake master cylinder has a rubber diaphragm covering the brake fluid reservoir to hermetically seal the brake system from contamination and prevent corrosion and subsequent leakage.

STOP LAMP SWITCH

The stop lamp switch has a slip fit in the mounting sleeve which permits positive adjustment by pulling the brake pedal up firmly against the stop. The pedal arm forces the switch body to slip in the mounting sleeve bushing to properly position switch.

REMOVE

1. Disconnect wires from switch.

2. Remove switch by pulling out of bracket.

REPLACE

1. Position stop light switch in bracket and push in to maximum distance.

2. Brake pedal arm moves switch to correct distance on rebound. Check if pedal is in full return position by lifting slightly by hand.

3. Connect switch wires by inserting plug on switch.

DELCO-MORAINE POWER BRAKE

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

The Delco Moraine Power Brake Unit is a combined vacuum and hydraulic unit which utilizes engine intake-manifold vacuum and atmospheric pressure to provide power assisted application of vehicle brakes. The Unit takes the place of a conventional brake system's master cylinder. From the master cylinder connection outward to the wheel units, there is no other change in the brake system. In addition to the master cylinder connections, the Unit requires a vacuum connection to the engine intake-manifold (through a vacuum check valve) and a mechanical connection to the brake pedal. The Unit is self-contained with no external rods or levers exposed to dirt or moisture.

The Power Brake Unit provides lighter pedal pressures. These lighter pedal pressures are obtained with reduced pedal travel, making it possible to bring the brake pedal down to the approximate height of the accelerator pedal when at closed throttle position. Thus, the driver, after closing the throttle, can shift his toe from one pedal to the other without lifting his heel from the floor.

The vacuum check valve shown in Fig. 5B-1 permits several applications of the Power Brake Unit with vacuum assist after the engine has stopped or because of any other loss of vacuum. After the vacuum stored in the Unit has been lost, or in case of vacuum failure at the Unit or its vacuum connections, the brakes can be applied in the conventional manner. Since the vacuum assist is not available, the pedal pressure will be higher.

DESIGN

The Unit is composed of two main sections: the vacuum power cylinder and the hydraulic master cylinder.

The vacuum power cylinder contains the power piston assembly which houses the control valve and reaction mechanism, and the power piston return spring. The control valve is composed of the air valve and the floating control valve assembly. This control valve is operated by a push rod that projects through the end of the power cylinder housing. An air filter element is assembled around the push rod and fills the cavity inside the hub of the power piston. A rubber boot protects this air filter.

The reaction mechanism consists of a hydraulic piston reaction plate and a series of levers. An air filter element is assembled around the push rod and fills the cavity inside the hub of the power piston. The push rod, which operates the air valve, projects out of the end of the power cylinder housing through a boot. A vacuum check valve assembly is mounted in the front housing assembly for connection to the vacuum source.

A fluid reservoir is integrally cast with the master cylinder and supplies fluid to the space between the primary and secondary seals through a hole in the casting.

Connection is made to the wheel cylinder through the hydraulic outlet and a conventional check valve.

PRINCIPLES OF OPERATION

RELEASED POSITION (Fig. 5B-1)

A line from the engine intake-manifold is connected to the vacuum check valve in the front housing of the power brake. This check valve is to prevent loss of vacuum when manifold vacuum falls below that in the power brake system.

In the release position the air valve is seated on the floating control valve. The air under atmospheric pressure, which enters through the filter element in the tube extension of the power piston, is shut off at the floating control valve. The vacuum, which is present at all times in the space to the left of the power piston, is free to evacuate any existing air on the right side of the power piston. This air is drawn over the floating control valve seat and through two small passages in the power piston then into the space at the left of the power piston. It is then drawn through the check valve to the vacuum source.

In this position there is vacuum on both sides of the power piston, which is held against the rear housing by the piston return spring. At rest, the hydraulic reaction plate and the reaction levers are held back against the reaction retainer by the air valve spring. The air valve return spring holds the air valve back so its retaining ring rests against the power piston.

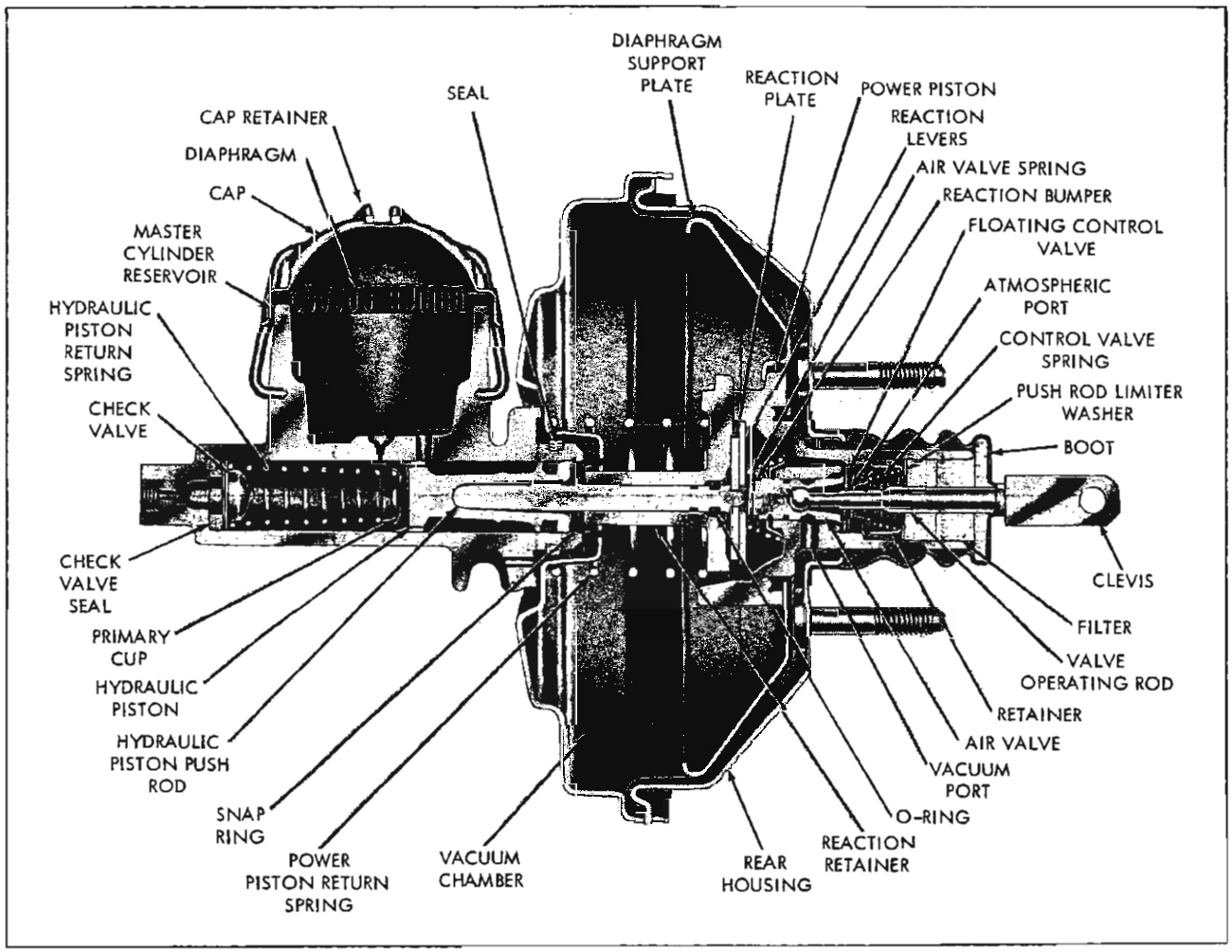


Fig. 5B-1 Released Position

The floating control valve assembly is held against the air valve seat by the control valve spring.

In this position, the compensating port in the hydraulic master cylinder is open to the reservoir and fluid can flow freely in either direction between the hydraulic cylinder and the fluid reservoir.

A residual pressure is maintained in the brake lines by the hydraulic check valve and its spring in the master cylinder.

APPLYING POSITION (Fig. 5B-2)

As the pedal is depressed, the push rod carries the air valve away from the floating control valve. The floating control valve will follow until it is in contact with the raised seat in the power piston. When this occurs, the vacuum is shut off to the right hand side of the power piston, and air under atmospheric pressure rushes through the air filter and travels past the seat of the air valve and through two passageways into the housing on the right of the power piston.

Since there is still vacuum on the left side of the power piston, the force of the air at atmospheric pressure on the right of the piston will force the power piston to travel to the left.

As the power piston travels to the left, the piston rod carries the master cylinder piston into the bore of the master cylinder. As the master cylinder piston primary cup passes the compensating port, hydraulic pressure starts to build up in the hydraulic system. As the pressure builds up on the end of master cylinder piston, the hydraulic reaction plate

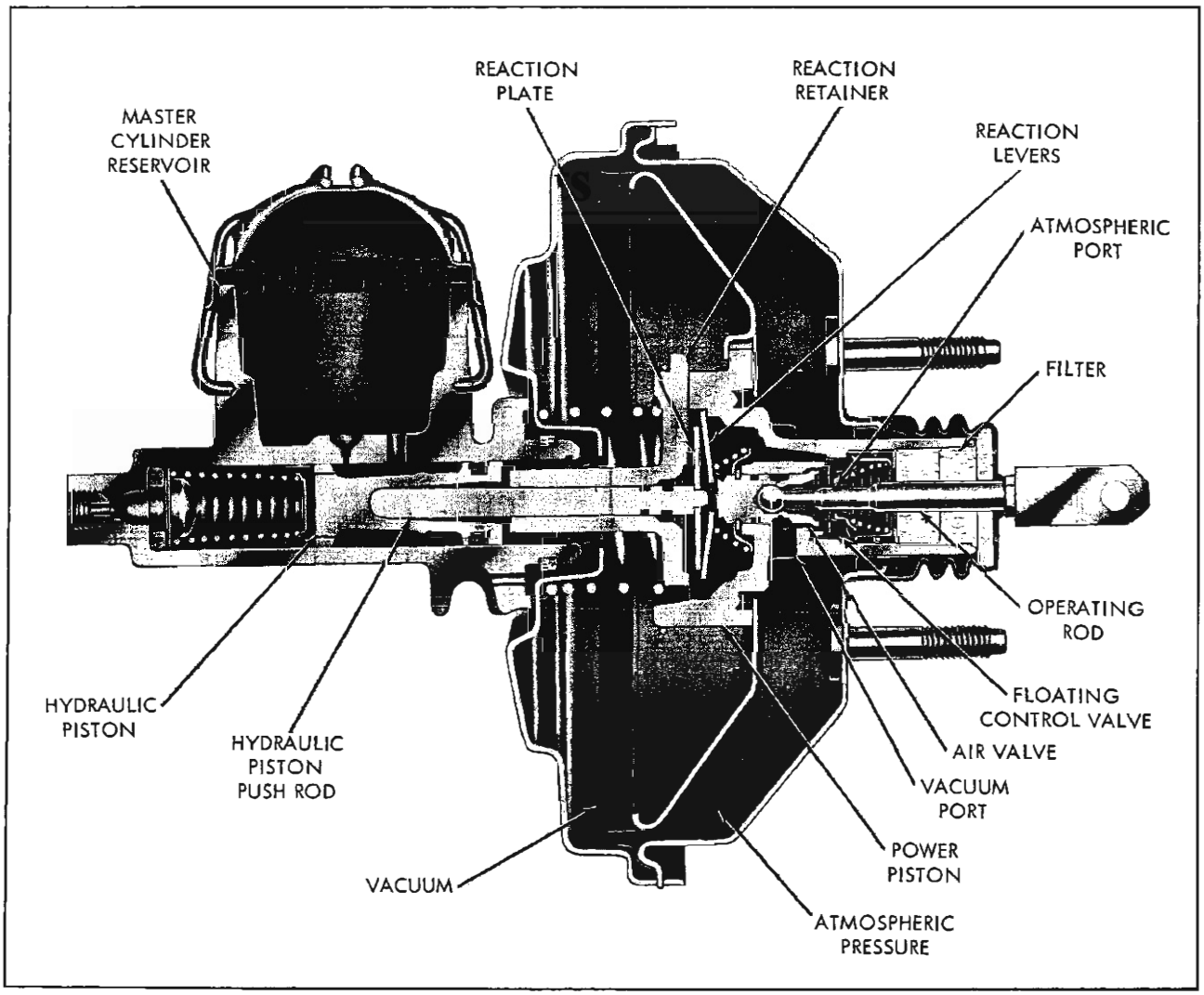


Fig. 5B-2 Applying Position

is moved off its seat on the reaction retainer and presses against the reaction levers.

The levers, in turn, swing about their pivots and bear against the end of the air valve-push rod assembly.

In this manner, approximately 30% of the load on the piston is transferred back through the reaction system to the brake pedal. This gives the operator a feel which is proportional to the degree of brake application.

HOLDING POSITION (Fig. 5B-3)

When the desired pedal pressure is reached, the power piston moves to the left until the floating control valve, which is still seated on the power piston, again seats on the air valve. The power brake will now remain stationary, until either pressure is applied or released at the brake pedal.

RELEASING (Fig. 5B-4)

As the pressure at the pedal is released, the air valve spring forces the air valve back until its snap ring rests against the power piston. As it returns, the air valve pushes the floating control valve off its seat on the power piston.

The air valve, seating on the floating control valve has shut off the outside air source. When it lifts the floating control valve from its seat on the power piston, it opens the space to the right of the power piston to the vacuum source.

Since both sides of the power piston are now under vacuum, the power piston return spring will return

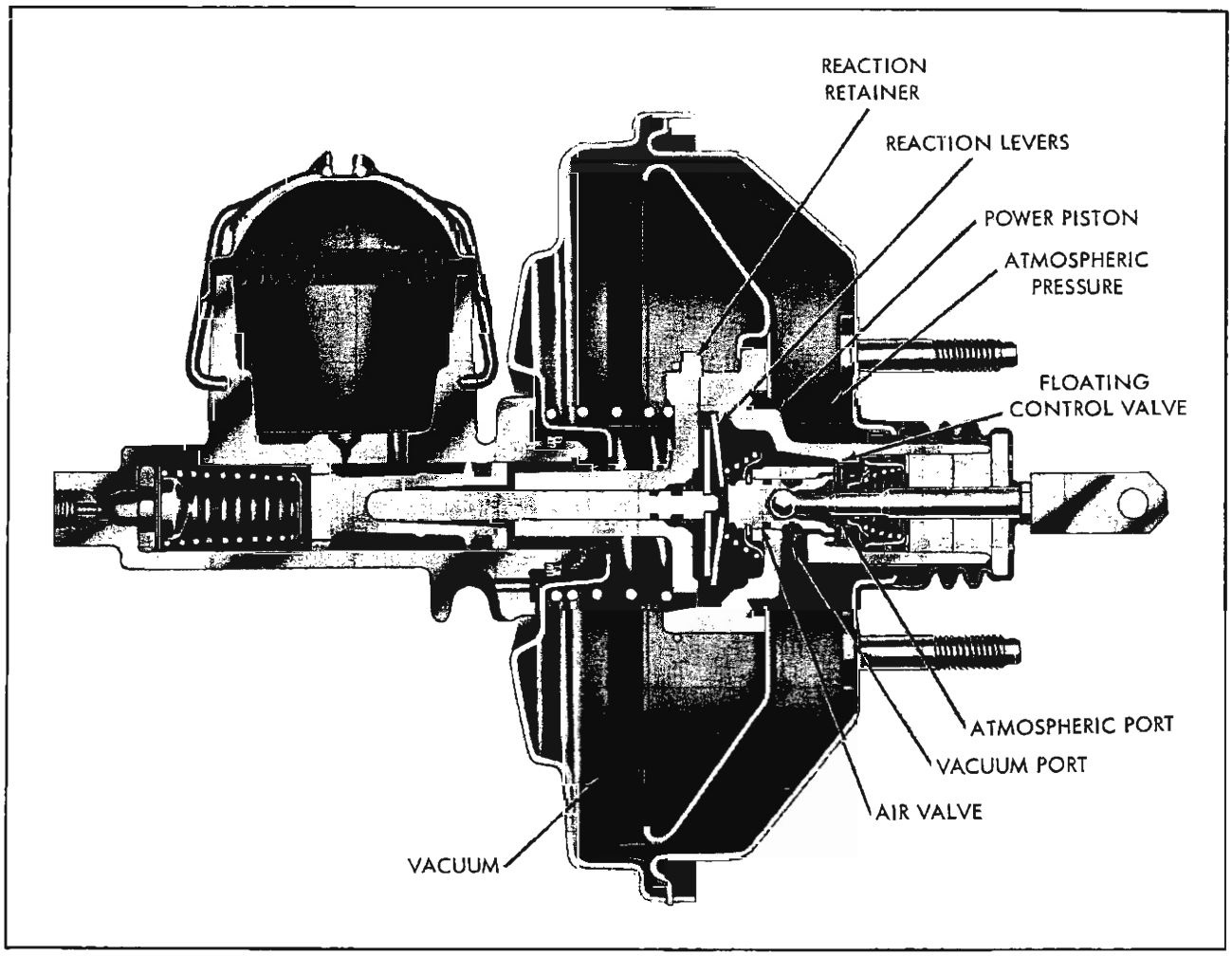


Fig. 5B-3 Holding Position

the piston to its released position against the rear housing. As the power piston is returned, the hydraulic master cylinder piston moves back, and the fluid from the wheel cylinders flows back into the master cylinder around the check valve.

If the brake pedal is released quickly, the master cylinder piston immediately returns to the released position. If the fluid in the lines cannot return as quickly as the piston, compensation is provided for by the flow of fluid from the space between the primary cup and the secondary seal through the holes in the piston. The excess fluid in the system can flow back to the fluid reservoir through the small by-pass holes in the master cylinder bore after the brake is released.

VACUUM FAILURE

In case of vacuum source interruption, as the pedal is pushed down the end of the air valve contacts the reaction levers and forces them, in turn, against the hydraulic reaction plate. Since the hydraulic reaction plate is fastened to the piston, it forces the piston rod against the master cylinder piston, which builds up the hydraulic line pressure.

The pedal pressure required for a manual application, such as described, is considerably greater than with vacuum assist.

CHECKS AND ADJUSTMENTS ON CAR

1. Check for free operation of brake pedal. If binding exists, check pivot points for binding and lubricate as required.

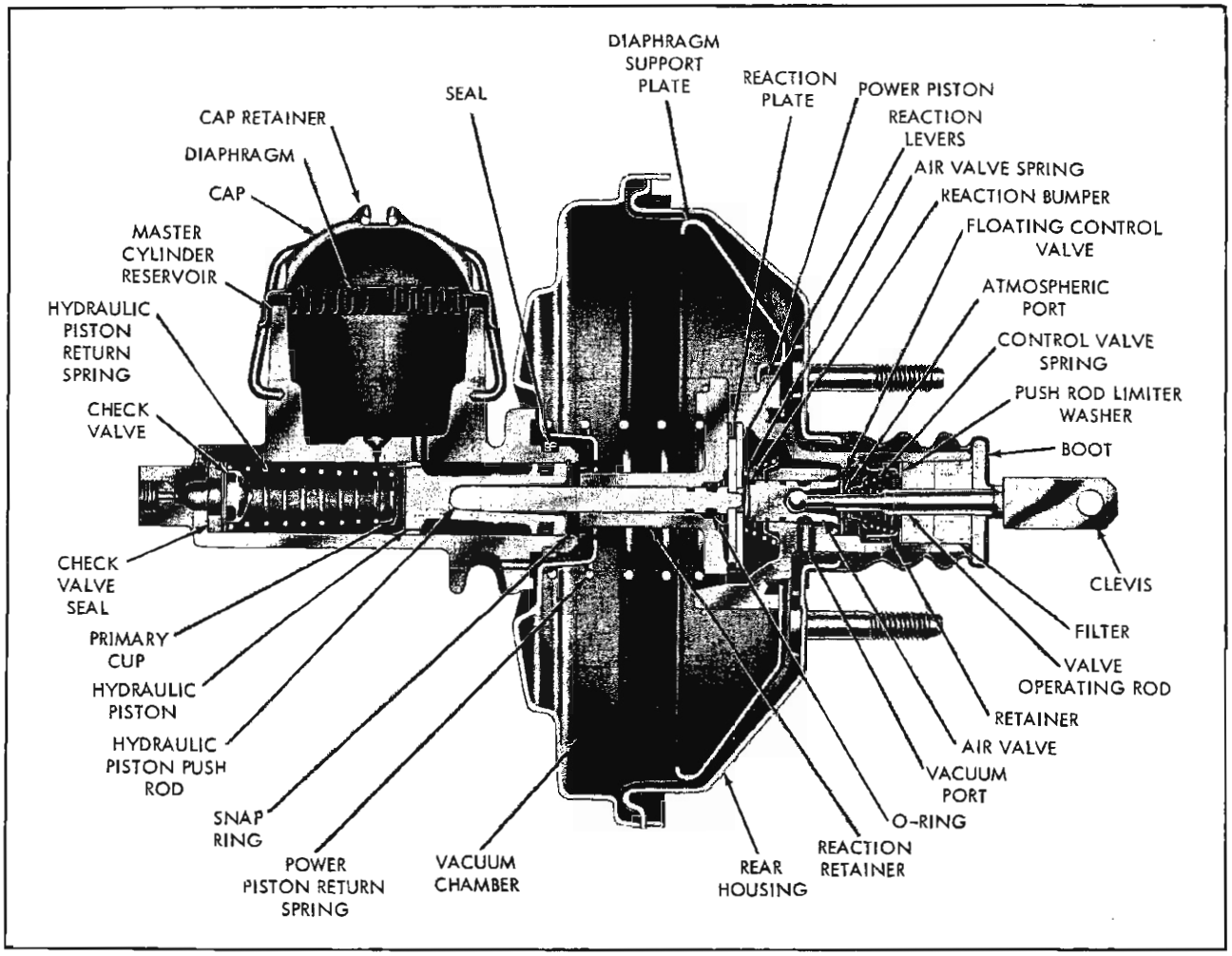


Fig. 5B-4 Releasing

2. Check stop light switch for proper setting and operation.

3. Check fluid level in hydraulic cylinder reservoir. Fluid level should be 1/2" from top of filler opening.

4. Check vacuum line and connections between carburetor and vacuum power cylinder for possible vacuum leaks.

5. Check engine for good stall-free idle. Correct as required.

MINOR REPAIRS

BLEEDING BRAKES

Brakes should be bled in the same manner as standard brakes.

STOP LIGHT SWITCH—REMOVE AND REPLACE

REMOVE

1. Disconnect switch wires by removing plug at stop light switch.

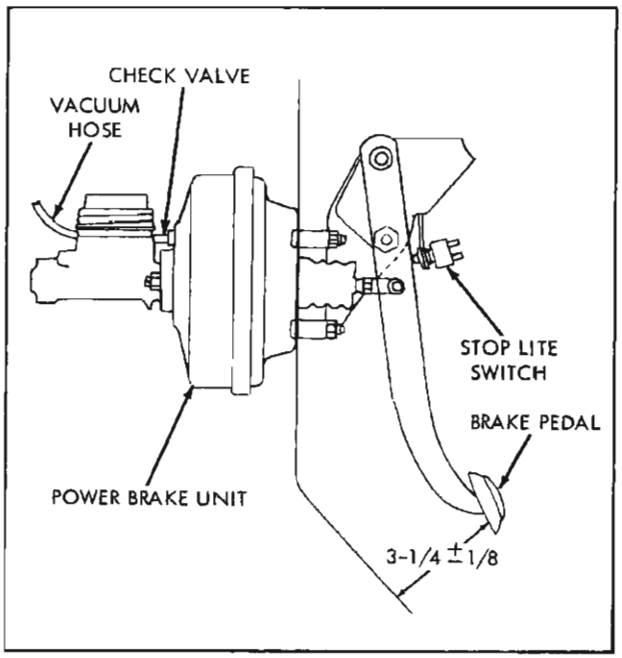


Fig. 5B-5 Power Brake System Schematic

2. Remove switch by turning out of bracket.

REPLACE

1. Position stop light switch in bracket and push in to maximum distance.

2. Brake pedal arm moves switch to correct distance on rebound. Check if pedal is in full return position by lifting slightly by hand.

3. Connect switch wires by inserting plug on switch.

OVERHAUL DELCO-MORAINE POWER BRAKE

MASTER CYLINDER ONLY—REMOVE

Certain repair operations, such as replacement of master cylinder internal parts, permits the master cylinder to be removed by itself, leaving the power cylinder pedal and brackets in the car.

1. Remove hydraulic connection from master cylinder, pump fluid from cylinder, into a container and dispose of fluid. Plug opening and cover pipe end to exclude dust, dirt, etc.

2. Remove master cylinder attaching nuts and lockwashers and remove master cylinder from vacuum power section.

POWER BRAKE AND MASTER CYLINDER ASSEMBLY—REMOVE

1. Disconnect vacuum hose at vacuum check valve. Plug hose and cover valve opening to exclude dust, dirt, etc. (Fig. 5B-5).

2. Disconnect pipe from master cylinder hydraulic port and cover opening and pipe end to exclude dust, dirt, etc.

3. Remove clevis pin from brake pedal inside car.

4. Remove nuts and lockwashers from rear half housing and remove power cylinder assembly.

5. Clean exterior of power brake assembly and drain reservoir of hydraulic fluid.

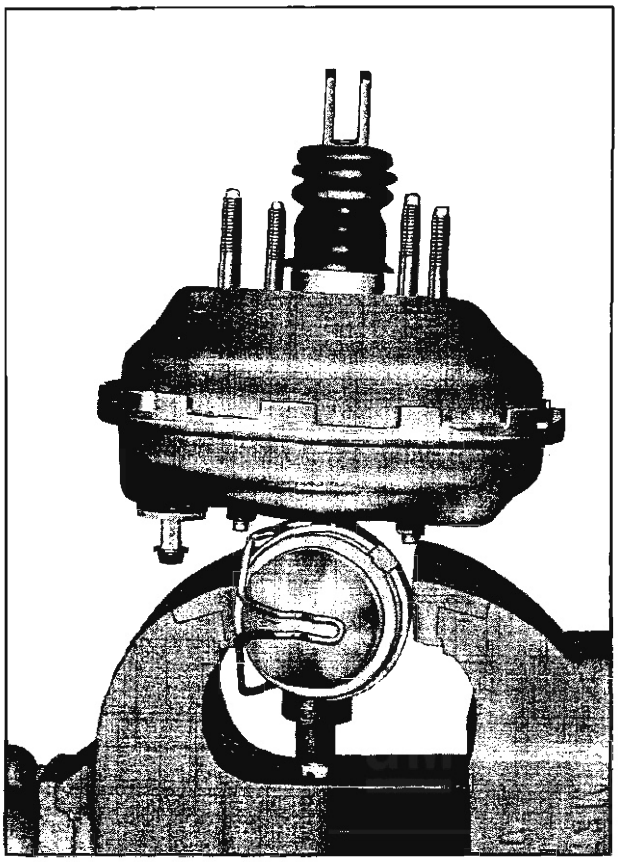


Fig. 5B-6 Brake Unit Mounted in Vise

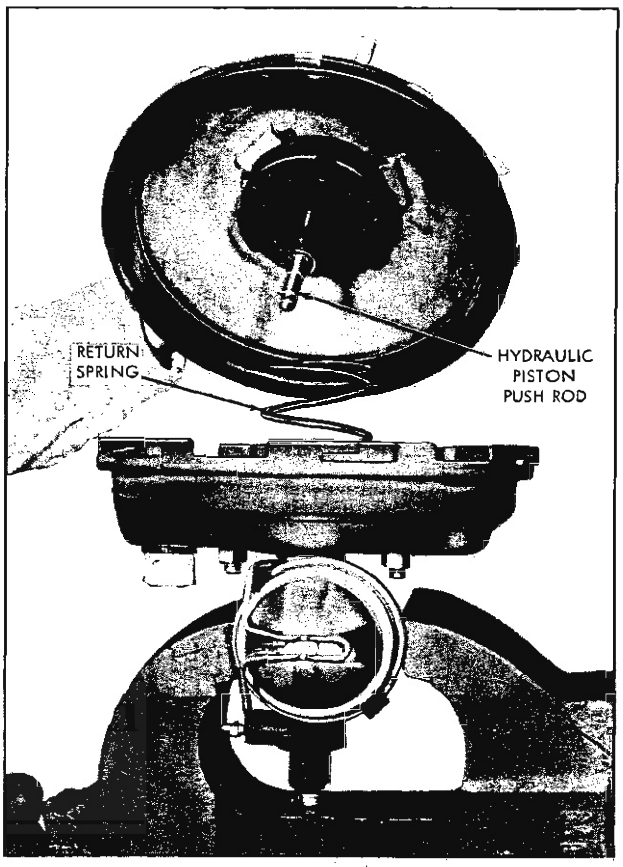


Fig. 5B-7 Removing Rear Housing

OVER-ALL BRAKE UNIT—DISASSEMBLE

1. Put power brake unit in a vise, clamping on sides of master cylinder reservoir with push rod up (Fig. 5B-6).

2. Scribe a line across the front and rear housings to facilitate reassembly.

3. Remove clevis and jam nut from push rod.

4. Remove clevis and boot from rear housing.

5. Using tool J-9504, rotate rear half housing counterclockwise to unlock rear half from front housing.

NOTE: Rotate slowly as housing is under spring load.

6. Remove rear housing and power piston assembly by lifting straight up slowly and lay it aside on a clean smooth surface (Fig. 5B-7).

7. Remove power piston return spring.

8. Reposition master cylinder in vise. Scribe a line across front housing and master cylinder assembly and remove nuts and lockwashers from master cylinder studs. Remove master cylinder assembly from front housing.

9. Remove front housing seal, vacuum check valve and grommet from front housing (Fig. 5B-8).

POWER PISTON GROUP—DISASSEMBLE (Fig. 5B-9)

CAUTION: Care must be taken in handling diaphragm of power piston group. Diaphragm should be guarded against grease, oil and foreign matter and must be protected from nicks or cuts that might be caused by rough surfaces, damaged tools or dropping the piston.

1. Remove lock ring from power piston by prying from under locking lugs.

2. Remove reaction retainer, piston rod, reaction plate, three reaction levers and air valve spring.

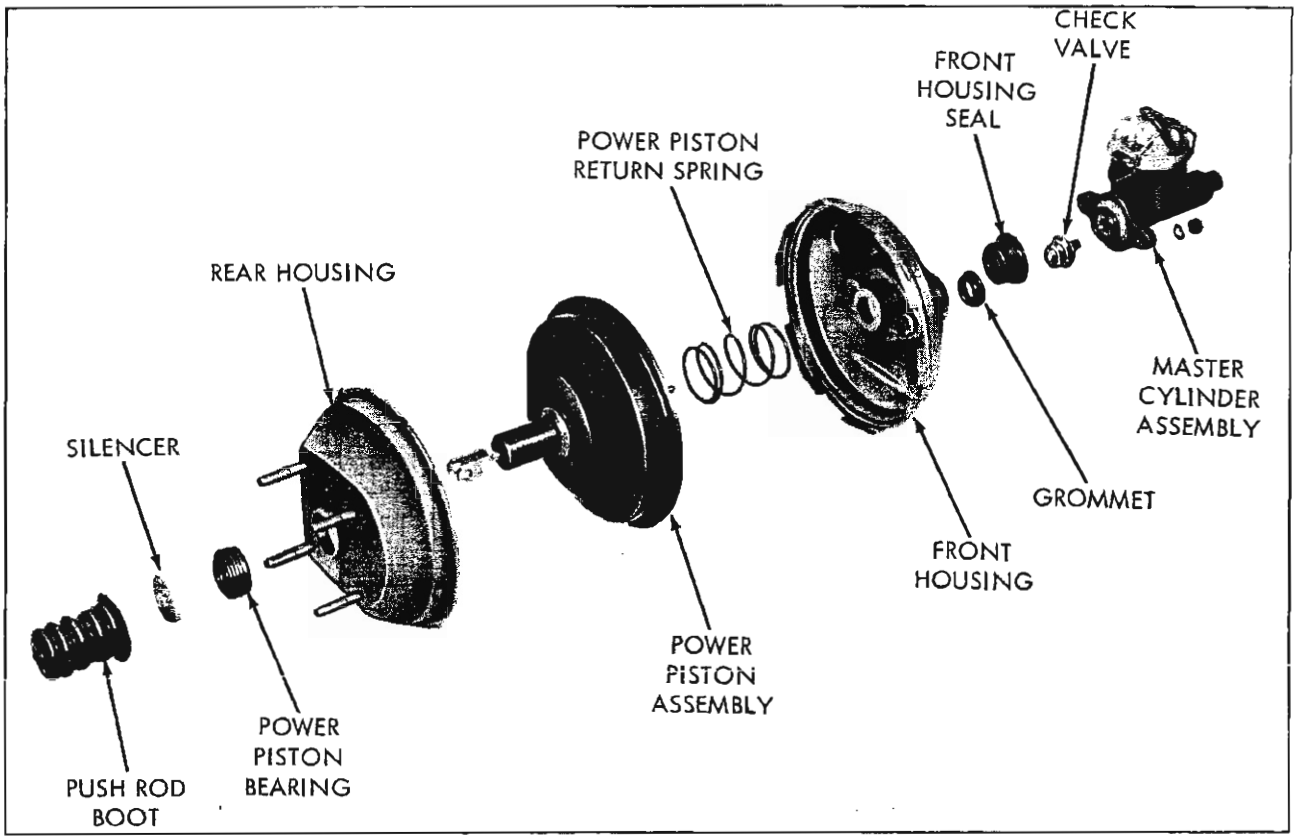


Fig. 5B-8 Power Brake Units - Exploded View

3. Remove small reaction bumper and air valve spring retainer from air valve.

4. Place square end of tool J-21524 in vise holding support plate and power piston with tube end of piston facing up.

5. Pull diaphragm edges away from support plate and position on tool J-21524 so that three lugs on tool fit into three notches in power piston.

6. Press down on support plate and rotate counterclockwise until support plate separates from power piston (Fig. 5B-10).

7. Remove diaphragm from support plate.

8. Remove silencer from neck of power piston tube.

9. Position power piston in vise padded with shop towels with tube end down.

CAUTION: Do not clamp on tube as outside surface of tube acts as bearing surface.

10. Remove snap ring on air valve using Truarc Pliers and place power piston with tube end down in arbor press.

11. Press air valve from power piston using rod not exceeding 1/2 in. diameter. Removal of valve releases floating control valve, floating valve retainer, push rod limiter washer and air filters (Fig. 5B-11).

NOTE: The floating control valve cannot be removed from push rod. It will be necessary to service complete push rod air valve assembly.

12. Remove master cylinder push rod from center of reaction retainer and two O-rings from grooves in master cylinder piston rod.

MASTER CYLINDER—DISASSEMBLE (Fig. 5B-12)

1. Remove filter from groove on O.D. of open end of master cylinder.

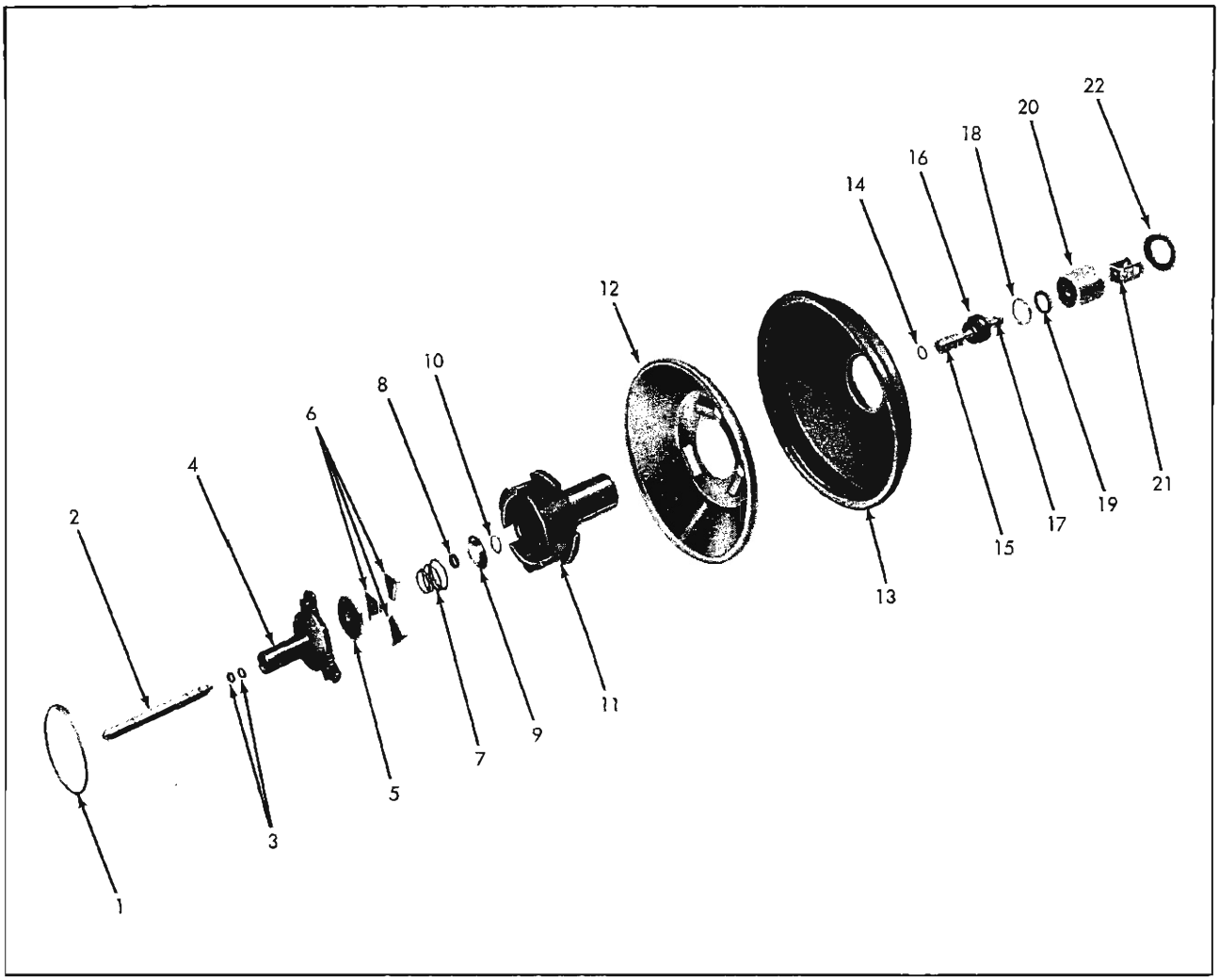


Fig. 5B-9 Power Piston - Exploded View

1. Lock Ring
2. Hydraulic Piston Push Rod
3. "O" Ring Seal
4. Reaction Retainer
5. Reaction Plate
6. Reaction Levers
7. Air Valve Spring
8. Reaction Bumper
9. Retainer, Air Valve Spring
10. Retaining Ring
11. Power Piston
12. Support Plate
13. Diaphragm
14. "O" Ring
15. Air Valve
16. Floating Control Valve
17. Valve Operating Rod
18. Floating Valve Retainer
19. Push Rod Limiter Washer
20. Filter
21. Clevis
22. Silencer

2. Remove lock ring, master cylinder piston assembly, primary cup, spring end retainer, check valve and check valve washer.

3. From master cylinder piston, remove secondary seal. Check small by-pass holes in end of piston to make sure they are open.

4. Remove filler cap and diaphragm from fluid reservoir.

INSPECTION—CLEANING

Thoroughly wash all parts in alcohol and air dry. Blow dust and cleaning fluid out of all internal passages. If inside of front housing is slightly scored or scratched, clean with crocus cloth or fine emery cloth. If scratches in front housing cannot be removed, replace housing.

CAUTION: It is important that all parts be placed on a clean paper or cloth after being cleaned to

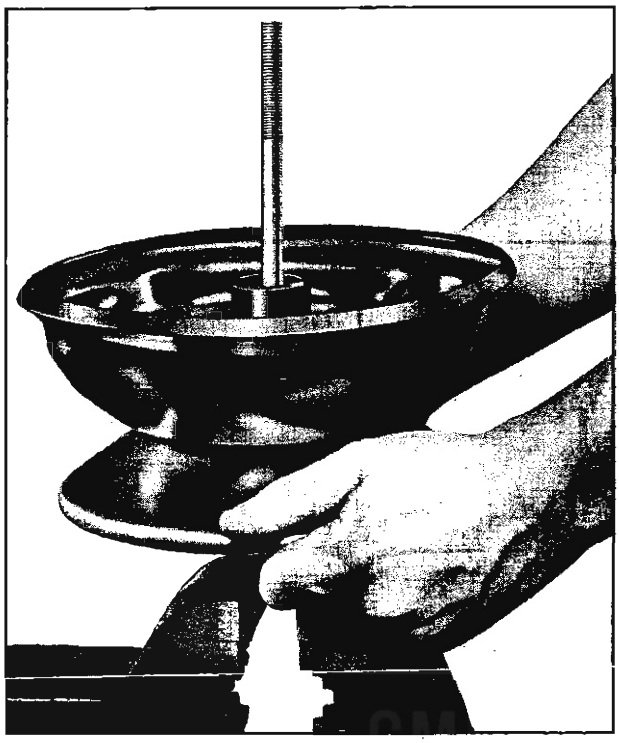


Fig. 5B-10 Removing Support Plate

prevent the possibility of dirt being assembled into unit or grease contacting any rubber parts.

POWER BRAKE ASSEMBLY

Inspect all parts for scoring, pitting, dents or nicks. Small imperfections can be smoothed out with fine emery cloth. Replace if badly nicked, scored or otherwise damaged.

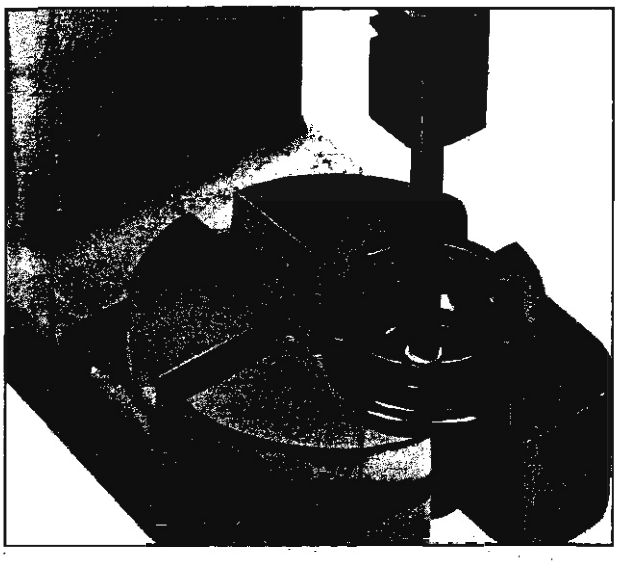


Fig. 5B-11 Removing Air Valve

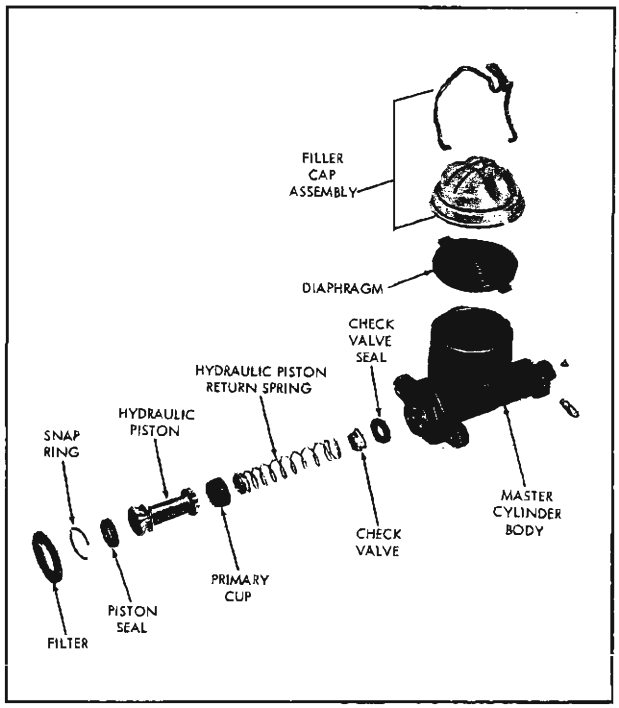


Fig. 5B-12 Master Cylinder - Exploded View

MASTER CYLINDER ASSEMBLY

Inspect bore from the open end. The bore should be free from scores, deep scratches and corrosion. If it appears that corrosive brake fluid has damaged the bore, replace damaged parts and flush out entire brake system including wheel cylinders.

The sealing surfaces should be clean and smooth. Check for cracks and damaged threads. Be sure that the by-pass and compensating ports to the master cylinder are not restricted.

Check for distortion of all springs and deterioration of all rubber parts. Any evidence of soft or swollen rubber parts indicates contaminated brake fluid requiring flushing of the entire brake system and replacement of wheel cylinder cups, as well as all rubber parts in master cylinder.

AIR FILTER

Replace air filter element if dirty. Do not clean.

BRAKE ASSEMBLY—ASSEMBLE

MASTER CYLINDER—ASSEMBLE

1. Install new reservoir diaphragm in reservoir cover, place cover in position and snap on wire bail.

2. Place master cylinder in vise with open end of bore accessible and position check valve washer in bottom of bore so that it lies flat.

3. Press check valve in open end of spring retainer and position in bore against valve seat washer.

4. Dip primary cup in clean brake fluid and position in bore with lips over spring and retainer assembly.

5. Assemble secondary seal in groove on master cylinder piston so that lip faces toward end of piston which contains small by-pass holes.

6. Press master cylinder piston into bore so that flat end of piston, which contains by-pass holes, lies against flat surface of piston cup.

7. Install snap ring in groove of cylinder.

8. Place a new filter in groove on open end of master cylinder.

9. Position master cylinder on front housing studs and tighten nuts finger tight.

POWER PISTON—ASSEMBLE

1. Place two new "O" rings in grooves on master cylinder piston rod. Wipe thin coat of power brake lubricant on "O" rings.

2. Insert piston rod through reaction retainer so that round end of rod protrudes from end of tube on reaction retainer.

3. Place power piston wrench, J-21524, in vise and position power piston on wrench with three lugs fitting into notches in piston.

4. Install new "O" ring on air valve in second groove from push rod end.

NOTE: A new air valve push rod assembly must be installed since floating control valve is a component part of this assembly and cannot be disassembled from push rod.

5. Wipe thin film of power brake lube on large O.D. of floating control valve and on O-ring of air valve.

6. Press air valve - push rod assembly, air valve first, to its seat in tube of power piston.

7. Place floating valve retainer over push rod so that flat side seats on floating control valve.

8. Start floating valve and its retainer into power piston tube. A five inch long piece of 1-1/8" O.D. tubing can be used to press floating valve to seat in tube by placing tubing on top of retainer and pressing down.

9. Position push rod limiter washer over push rod to floating control valve and install two air filter elements over end of push rod and into power piston tube.

10. Assemble power piston diaphragm to support plate from side of plate opposite locking tangs and press raised flange of diaphragm through hole in center of plate.

NOTE: Be sure that edge of center hole fits into groove in flange of diaphragm.

11. Pull diaphragm away from O.D. of support plate so that it can be gripped with hands and wipe power brake lubricant on all surfaces of small bead of diaphragm which contacts power piston.

12. Holding support plate on bare metal, with locking tangs down, place support plate and diaphragm assembly down over tube of power piston. Flange of diaphragm will fit into groove on power piston.

13. Press down and rotate support plate clockwise until lugs on power piston come against stops on support plate.

14. Invert assembly and place in padded vise with tube end down and insert snap ring on air valve using Truarc Pliers.

15. Place air valve spring retainer to seat on snap ring and assemble reaction bumper into groove in end of air valve.

16. Position air valve return spring, large end down, on spring retainer.

17. Position three reaction levers in slots on power piston. Narrow ends will rest on top of air valve return spring.

18. Position reaction plate, with numbered side up, on top of reaction levers and press down on plate until large ends of reaction levers pop up so that plate rests flat on levers. Be sure that reaction plate is centered.

19. Place small end of piston rod in hole in center of reaction plate and line up ears on reaction retainer with notches in power piston and push reaction retainer down until ears seat in notches.

20. Maintain pressure on reaction retainer and position large lock ring down over master cylinder push rod so that one end of lock ring goes under lug on power piston raised divider.

NOTE: Lock ring is positioned around power piston so that it goes alternately over ear of reaction retainer and under lug on power piston until end of ring is seated under lug with raised divider.

CAUTION: Make sure that both ends of lock ring are securely under large lug.

21. Place new front housing seal in center of front housing so that flat surface of cup lies against bottom of depression in housing.

22. Replace vacuum check valve using new grommet if old one is cracked or damaged.

23. Place new power piston bearing in center of rear housing so that flange on center hole of housing fits into groove of power piston bearing. Large flange on power piston bearing will be on stud side of housing.

24. Coat inside of power piston bearing with power brake lube.

25. Place air silencer over holes on tube of power piston and wipe tube with power brake lube.

26. Assemble power piston to rear housing by pushing tube of power piston through rear housing from side opposite studs.

27. Wipe tube of reaction retainer with power brake lube and lay assembly aside.

28. Place front housing in vise with master cylinder down. Position power piston return spring over inset in front housing. Lubricate I.D. of support plate seal with power brake lube.

29. Lubricate beaded edge of diaphragm lightly with talcum powder. Hold rear housing and power piston assembly over front housing with master cylinder push rod down and position rear housing so that scribe marks on housings will be in line when it is rotated into locked position.

30. Place rod in position on rear housing. Press down to check that bead of diaphragm is positioned between edges of housings. If this is satisfactory, apply additional pressure on rear housing and, at the same time rotate housing clockwise into locked position. If housings are not easily locked, hold housing together and apply vacuum to check valve in front housing. This will draw housings together and will ease locking procedure.

CAUTION: Do not put pressure on power piston tube when locking housings and be careful not to break studs in rear housing.

31. Place felt silencer in end of push rod boot. Stretch boot over push rod and rear housing flange, clevis can now be re-assembled on push rod.

PUSH ROD ADJUSTMENT

1. Place power brake assembly in vise so that master cylinder is up. Remove master cylinder from front housing. Master cylinder push rod is now exposed.

2. Place gauge J-7723 over piston rod so that it fits between the two studs on front housing (Fig. 5B-13). It should be parallel to studs and resting

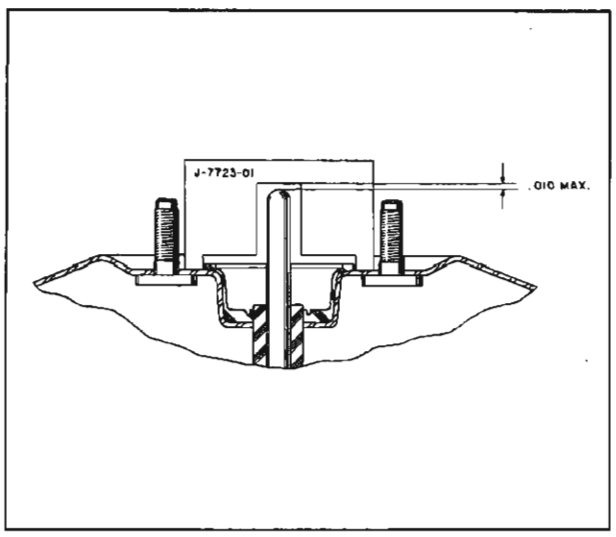


Fig. 5B-13 Push Rod Adjustment

on surface of housing. Cutout portion of gauge should never be lower than end of piston rod, and gap between cutout in gauge and end of piston rod should never be more than 0.010 inch.

NOTE: Any variation beyond these two limits must be compensated for by obtaining service adjustable piston rod and adjusting screw in end to match height of gauge.

3. Replace master cylinder on front housing studs. Install lockwashers and nuts on studs. Torque to 15-20 lb. ft.

CAUTION: After replacing unit on vehicle, start engine and allow vacuum to build up before applying brakes.

POWER BRAKE ASSEMBLY—INSTALL

1. Place power brake into position and install four rear housing to dash attaching lockwashers and nuts from inside of car. Tighten nuts 20-35 lb. ft. torque.

NOTE: Pedal height should be 3-1/8" to 3-3/8" clearance from floor mat to bottom of pedal pad. Clevis is not adjustable.

2. Check stop light switch adjustment.

3. Attach vacuum line.

4. Attach hydraulic line.

5. Bleed brakes as necessary and fill fluid reservoir to provide a distance of 1/2" from top of filler hole.

SYSTEM TESTS

Road test the brakes by making a brake application at about 40 MPH to determine if the vehicle stops evenly and quickly. If the pedal has a spongy feel when applying the brakes, air may be present in the hydraulic system and bleeding of brakes may be required.

When the engine is stopped and the transmission is in neutral, apply brakes several times to deplete all vacuum reserve in the system. Depress brake pedal, hold light-foot pressure on the pedal, and start the engine. If the vacuum system is operating, the pedal will tend to fall away under foot pressure, and less pressure will be required to hold pedal in applied position. If no action is felt, the vacuum system is not functioning.

Stop engine and deplete all vacuum reserve in the system. Depress the brake pedal and hold foot pressure on the pedal. If the pedal gradually falls away under foot pressure, the hydraulic system is leaking.

If the brake pedal travels to within one inch of the toe-board, the brake shoes require adjustment or relining.

Start engine with brakes off, run to medium speed and turn off the ignition. Immediately close the throttle to build up vacuum. Wait at least 90 seconds, then try brake action. If not vacuum assisted for two or more applications, vacuum check valve is faulty or leak exists in vacuum system.

TROUBLE DIAGNOSIS

The same types of brake trouble are encountered with power brakes as with standard brakes. Before checking the power brake system for the source of trouble, refer to the trouble diagnosis of standard brakes in the shop manual. After these possible causes have been eliminated, check for the cause as outlined below:

HARD PEDAL

(a) Vacuum failure due to:

1. Faulty vacuum check valve.

2. Collapsed vacuum hose to manifold.

3. Plugged or loose vacuum fittings.

(b) Tight pedal linkage.

(c) Power brake unit trouble.

1. Jammed air valve.

2. Vacuum leaks in unit caused by: faulty air valve seal or support plate seal, damaged, floating control valve, faulty seal of

master cylinder, or power cylinder mounting sutds in housings, faulty seal on master cylinder push rod or a faulty seal of the diaphragm bead between the housings, or at power piston. It is also possible to have faulty vacuum check valve grommet.

3. Defective rolling diaphragm.

4. Restricted air filter elements.

5. Worn or badly-distorted reaction plate or levers.

6. Cracked or broken power piston or reaction retainer.

GRABBY BRAKES (APPARENT OFF-AND-ON CONDITION)

(a) Power brake unit valve trouble.

1. Sticking air valve.

2. Restricted diaphragm passage.

(b) Reaction system.

1. Dislodged reaction levers.

2. Broken air valve spring.

3. Worn or distorted levers or plates.

PEDAL GOES TO THE FLOOR OR ALMOST TO THE FLOOR

(a) Fluid reservoir needs replenishing.

(b) Power brake hydraulic system leakage.

1. Defective primary or secondary cups.

2. Cracked master cylinder casting.

3. Leaks at wheel cylinder, pipes, hoses or connections.

(c) Faulty master cylinder check valve has permitted air to enter system, causing spongy pedal.

BRAKES FAIL TO RELEASE

(a) Faulty hydraulic check valve.

(b) Blocked passage in power piston.

(c) Air valve sticking.

(d) Broken piston return spring.

(e) Broken air valve spring.

(f) Tight pedal linkage.

TORQUE SPECIFICATIONS

	Lb.-Ft.
Power Cylinder Housing-to-Master Cylinder Nuts	15-20
Rear Housing to Dash Nuts	20-35

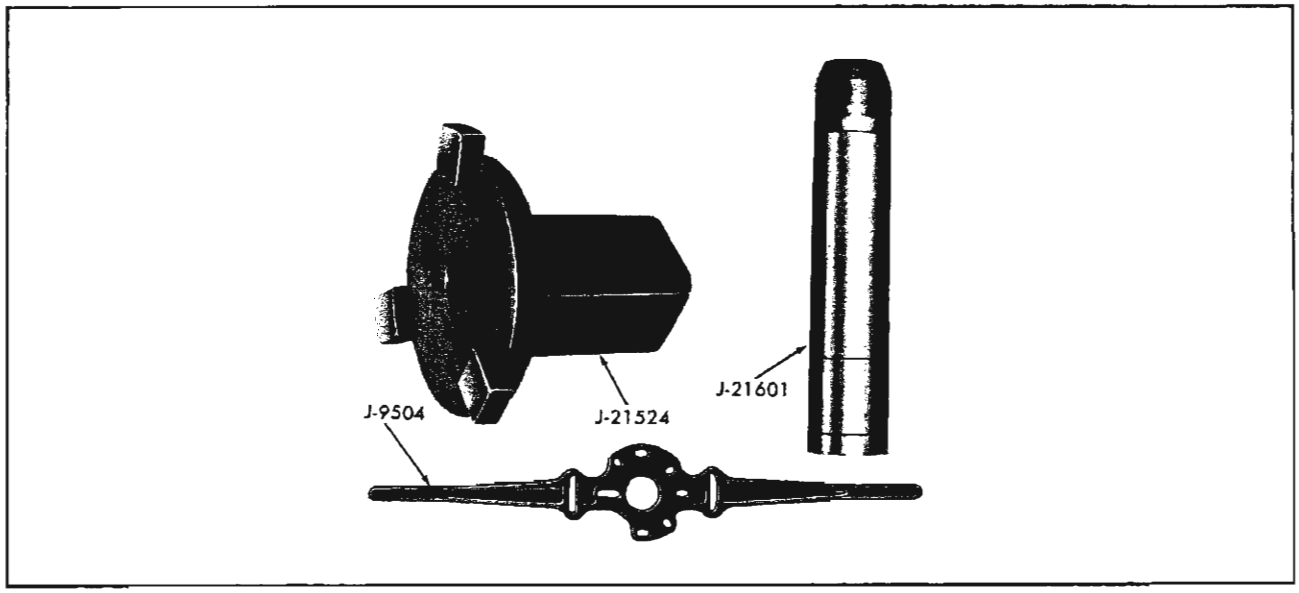


Fig. 5B-14 Tools

ENGINE MECHANICAL

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

Pontiac V-8 engine is used in all models. Displacement is 389 cubic inches provided by 4-1/16" bore and 3-3/4" stroke in all models. A 421 and 421 High Output is available on special order. Displacement in these special order engines is 421 cubic inches provided by 4-3/32" bore and 4" stroke.

Three compression ratios are available. 10.5:1 is standard on Hydra-Matic equipped models, all 29 models and 421 engines with four barrel carburetor. An 8.6:1 ratio is standard on synchromesh 23, 26, and 28 models and all models with the economy Hydra-Matic option. A 10.75:1 ratio is available only on the 421 High Output engines and the 421 engine with the tri-power option.

Thirty-seven different engine combinations are available; these combinations and the major components of each are shown in Fig. 6-1.

CYLINDER BLOCK

The alternator is mounted on the left side except for 62 amp. models.

CRANKSHAFT AND BEARINGS

Two cavities are drilled (not cast as in 1963) in the cylinder block and cap seal groove to prevent seal rotation (Fig. 6-2).

CAMSHAFT AND DRIVE

Five different camshafts are used. The engine chart (Fig. 6-1) illustrates the application of each. Camshafts can be identified by a digit stamped on the front end of the shaft. Correct identification is as follows:

A = 518111
B = 519640
C = 524009
D = 529472
L = 9770543

Use is shown on chart, Fig. 6-1.

VALVE TRAIN

Valve guide seals are installed on exhaust as well as intake valve guides on 421 High Output engines only (Fig. 6-3).

OIL PUMP INLET SCREEN

A fine mesh screen in the oil pump inlet, introduced in mid-year 1963 production to more effectively prevent foreign material from interfering with pressure regulator valve operation, is carried over to 1964 oil pump assembly.

ROCKER ARM COVER

Oil filler cap is on the right side cover.

SERVICE OPERATIONS ON CAR

ENGINE INSULATORS—REMOVE AND REPLACE

Front Insulators—All Models

CAUTION: Disconnect battery ground strap before raising engine. When the engine is raised, the starting motor solenoid terminals may contact the

Horsepower	Engine Code	Disp. 389 Cu. In.	Disp. 421 Cu. In.	Type Trans.	Model Application: Usage	23	W51 OPT.	29	26	2835	2839, 2847, 2867	2840, 2850, 2890	Comp. Ratio: Taxi	Police	10.75:1	10.5:1	8.6:1	7.9:1	45 Spark Plug	44 Spark Plug	H.D. Starter	11110 54 Dist.	11110 52 Dist.	Carburetor: S.M. 2 BBL. H.M. 1 1/16 Bore H.M. A/C	S.M. 2 BBL. H.M. 7/8 Bore H.M. A/C	S.M. 4 BBL. Carb. H.M.	S.M. Triple 2 BBL. H.M.	Camshaft: 524009	518111 S.M.	519640	529472	9770543 421 H.O.	Valve: Single Spring	Std. Two Springs	H.D. Two Springs	Special Lifter Assembly	4 Bolt Brg. Caps (3 Centers)	Special Exhaust Manifolds	High Output Fuel Pump	H.D. Clutch	H.D. Trans.
215	01A	●		SM	Standard	●											●		●						●				●			●						
215	01A	●							●								●		●						●				●			●						●
215	02B	●			1—R.P.O.	●											●		●						●				●			●					●	●
215	02B	●															●		●						●				●			●					●	●
215	02B	●			Std. Police								●				●		●						●				●			●					●	●
215	02B	●			Std. Taxi												●		●						●				●			●					●	●
215	02B	●			Trail Prov.	●			●								●			●					●				●			●				●	●	●
239	03A	●			Export	●											●		●						●						●		●					
239	03A	●							●								●		●						●						●		●					●
306	23B	●			Spec. Police								●		●				●	●	●					●			●				●			●		●	●	●
306	23B	●			Standard			●		●	●					●			●	●	●					●			●				●			●		●	●	●
306	23B	●			1—R.P.O.	●	●		●							●			●	●	●					●			●				●			●		●	●	●
235	22B	●			Standard							●					●		●							●			●					●				●	●	●
350	32B	●			1—R.P.O.	●	●	●	●	●	●				●				●	●	●					●			●				●			●		●	●	●
320	35B		●		421	●	●	●	●	●	●					●			●	●	●					●							●			●	●	●	●	●
350	44B		●		421	●	●	●	●	●	●				●				●	●	●							●				●			●		●	●	●
370	45B		●		421 H.O.	●	●	●	●	●	●				●				●	●	●							●				●			●		●	●	●
283	10A	●			1—R.P.O.	●										●			●	●	●			●								●			●				
283	10A	●			1—R.P.O.				●							●			●	●	●			●								●			●				●
283	10A	●			Standard	●	●		●							●			●	●	●			●								●			●				
350	49N		●	315	421				●	●	●				●				●	●	●							●				●			●		●	●	
370	50Q		●	HM	421 H.O.				●	●	●				●				●	●	●							●				●			●		●	●	
350	34N	●			1—R.P.O.				●	●	●				●				●	●	●							●				●			●		●	●	
230	08R	●			2—425E				●	●	●		●	●			●		●	●						●						●						
230	09R	●			2—425E A/C				●	●	●		●				●		●	●						●						●						●
303	27P	●			Standard					●	●					●			●	●	●					●						●						
303	27P	●			1—R.P.O.				●							●			●	●	●					●						●						
303	27P	●			Standard							●				●			●	●	●					●						●				●		
303	28P	●			Air Cond.				●	●	●					●			●	●	●					●						●				●		
303	28P	●										●				●			●	●	●					●						●				●		
306	29N	●			1—R.P.O.							●	●			●			●	●	●					●						●				●		
276	30P	●			Export					●	●				●				●	●						●						●						
283	17M	●			Standard				●							●			●	●	●					●						●						
283	17M	●											●	●		●			●	●	●					●						●						
283	18M	●			Air Cond.				●							●			●	●	●					●						●				●		
283	18M	●											●	●		●			●	●	●					●						●						●
257	19M	●			Export				●							●			●	●	●					●						●						●
320	43N		●		421				●	●	●					●			●	●	●					●						●				●		●
230	04L	●		375	2—425E	●	●	●									●		●	●						●						●						
230	05L	●		RHM	2—425 A/C	●	●	●									●		●	●						●						●						●
370	46G		●		421 H.O.	●	●	●							●				●	●	●							●				●			●		●	●	
350	47S		●		421	●	●	●							●				●	●	●							●				●			●		●	●	
303	25K	●			1—R.P.O.	●	●									●			●	●	●					●						●						●
303	25K	●			Standard			●								●			●	●	●					●						●						●
303	26K	●			Air Cond.	●	●									●			●	●	●					●						●						●
303	26K	●						●								●			●	●	●					●						●						●
267	11H	●			Standard	●	●									●			●	●	●					●						●						●
267	12H	●			Air Cond.	●	●									●			●	●	●					●						●						●
240	13H	●			Export	●	●	●								●			●	●						●						●						
320	38S		●		421	●	●	●								●			●	●	●					●						●				●		●
350	33G	●			1—R.P.O.	●	●	●							●				●	●	●							●				●			●				●

Transmission Code Stamped at Engine Assy. Plant

3-Speed SM Transmission

A 3 Speed Synchro-mesh
B 3 Speed H.D. Synchro-mesh

375 RHM Trans. (Roto)

G PC
H P
K PB
L PE
6 PG
S PAH

315 HM Trans. (Super)

M PS
N PAS
P PBS
R PES
Q PCS

4-Speed SM Transmission

2 26 & 28 with 421 & 421-HO Engs. (exc. 2835 or 39:10 R/Axle)
3 26 & 28 421 & 421-HO Engs. (with 39:10 Ratio Axle exc. 2835)
C 23, 2835 & 29 (exc. 39:10 Ratio Axle, 421 & 421-HO Engs.)
D 26 & 28 (exc. 39:10 Ratio Axle, 2835 or 421 & 421-HO Engs.)
E 23, 2835 & 29 (with 39:10 Ratio Axle exc. 421 & 421-HO Engs.)
F 26 & 28 (with 39:10 Ratio Axle exc. 2835 or 421 & 421-HO Engs.)
T 23, 2835 & 29 with 421 & 421-HO Engs. (exc. 39:10 Ratio Axle)
U 23, 2835 & 29 with 421 & 421-HO Engs. (with 39:10 Ratio Axle)

1—Regular production option.
2—425 is torque rating.

For engine horsepower qualifications consult page 6-50, 1963 Pontiac Chassis Shop Manual.
The letter stamped after the engine code indicates transmission code.
For transmission code description (P-PE, etc.) consult Hydra-Matic Section of 1963 Pontiac Chassis Shop Manual.

Fig. 6-1 Engine Combinations

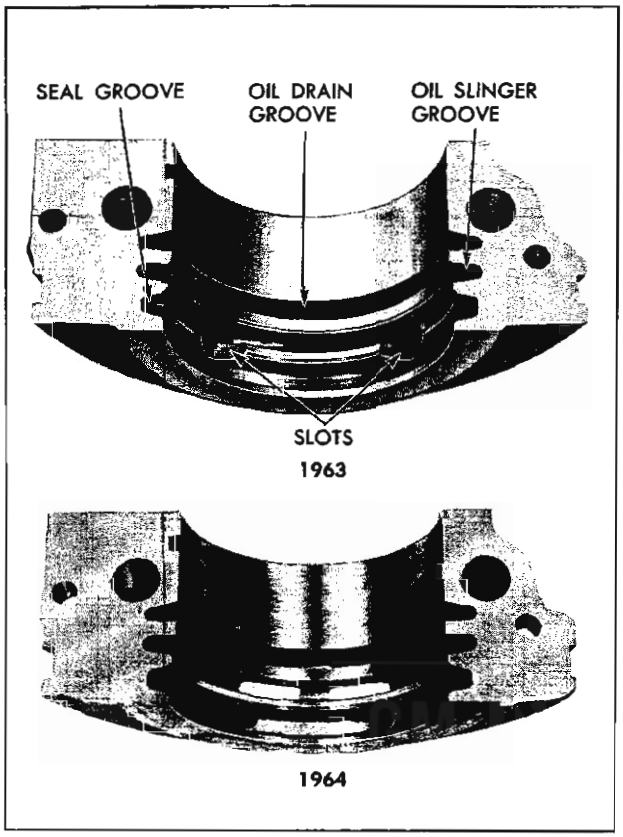


Fig. 6-2 Rear Main Bearing Cap

steering gear which could energize the starting motor if the ground cable is not disconnected.

1. Raise hood and, using suitable engine lifting equipment, take weight of engine off the LH front insulator.

NOTE: The front LH insulator should be installed first since it locates the engine.

2. Remove bolts which fasten LH insulators to frame.

3. Remove bolts fastening LH engine insulators to engine.

4. Raise engine just clear of LH insulator.

5. Remove LH insulator.

6. Position new LH insulator against engine and install attaching screws and washers. Tighten to 40-55 lb. ft. torque.

7. Lower engine.

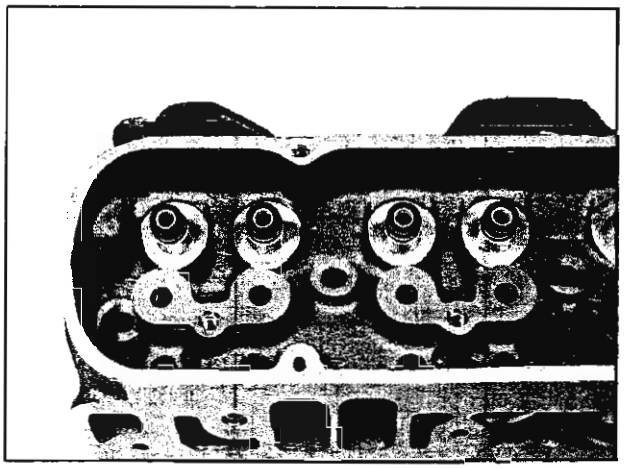


Fig. 6-3 Valve Guide Seals

8. Install frame to insulator bolts with lockwashers and plain washers and tighten to 40-55 lb. ft. torque.

9. Remove bolt which fastens RH insulator to frame.

10. Remove bolts fastening RH engine insulator to engine.

11. Raise engine just clear of RH insulator.

12. Remove RH insulator.

13. Position new RH insulator against engine and install attaching screws and lockwashers. Tighten to 40-55 lb. ft. torque.

14. Lower engine.

15. Install frame to insulator bolts with lockwashers and tighten to 40-55 lb. ft. torque.

Rear Insulator

Applies to all models except 3 and 4 speed synchromesh short wheel base. Consult 1963 Pontiac Shop Manual for 3 and 4 speed synchromesh short wheel base instruction.

NOTE: The front LH insulator locates the engine. For this reason, anytime the front LH insulator is replaced, the rear insulators must be allowed to re-position on the cross member support.

1. Support engine at rear to remove engine weight from rear insulator, using suitable engine lifting equipment.

2. Remove two transmission engine rear mounting insulator lower retainer cross member support nuts and raise engine until retainer studs are disengaged from lower cross member support.

3. Remove engine rear mounting insulator upper retainer bolts from transmission extension.

4. Remove insulator assembly.

5. Install new insulator between transmission extension and cross member support.

6. Install upper retainer to transmission extension bolts. Tighten to 15-24 lb. ft. torque.

7. Lower engine until lower retainer studs engage lower cross member support. Install flat washers, lockwasher and nuts and tighten to 25-35 lb. ft. torque.

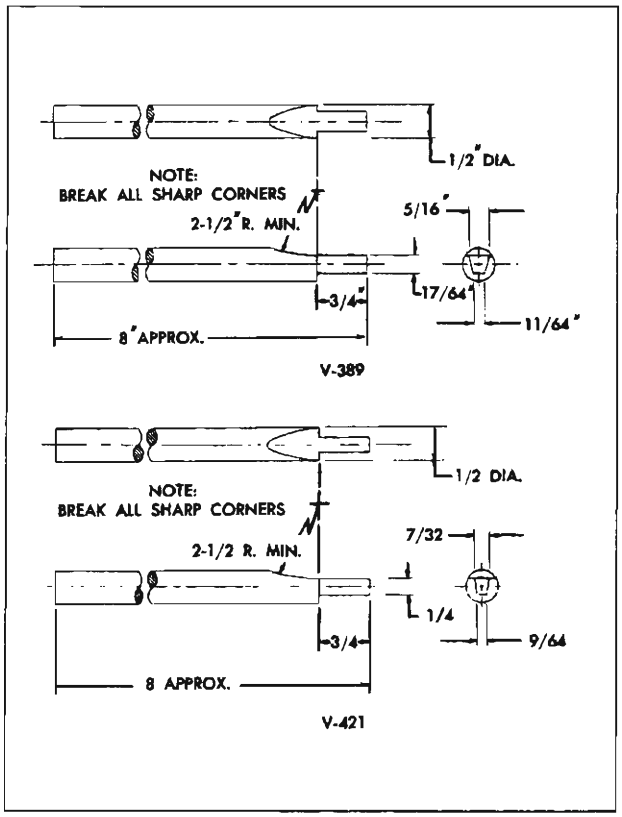


Fig. 6-4 Rear Main Bearing Seal Tool

REAR MAIN BEARING OIL SEAL— REMOVE AND REPLACE

1. Remove oil pan. (See "Oil Pan - Remove and Replace", 1963 Chassis Shop Manual.)

2. Remove oil pump and oil pump drive shaft.

3. Remove oil baffle and cylinder block to oil baffle tube.

4. Remove rear main bearing cap.

5. Use tool shown in Fig. 6-4 made from brass bar stock to pack upper seal as follows:

a. Insert tool against one end of the oil seal in the cylinder block and drive the seal gently into the groove until the tool bottoms.

b. Remove the tool and repeat at the other end of the seal in the cylinder block.

6. Clean the block and bearing cap parting line thoroughly.

7. Form a new seal in the cap (Fig. 6-5).

8. Remove the newly formed seal from the cap and cut four (4) pieces approximately 3/8" long from this seal.

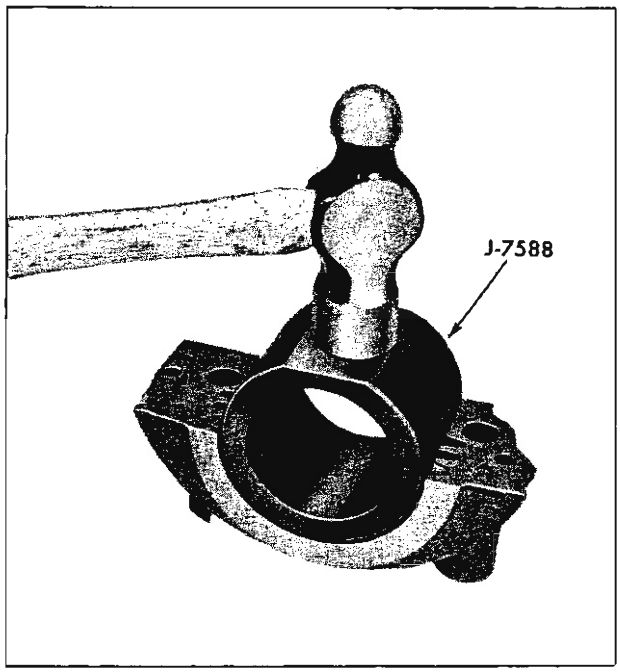


Fig. 6-5 Compressing Lower Seal in Bearing Cap with J-7588

9. Work two 3/8" pieces into each of the gaps which have been made at the end of the seal in the cylinder block. Without cutting off the ends, work these seal pieces in until flush with the parting line and no fibers are protruding over the metal adjacent to the groove.

10. Form another new seal in the cap (Fig. 6-5).

11. Assemble the cap to the block and tighten to 110-130 lb. ft. torque.

12. Remove the cap and inspect the parting line to insure that no seal material has been compressed between the block and the cap. Clean as necessary.

13. Apply a 1/16" bead of sealer from the center of seal across to the external cork groove.

14. Reassemble the cap. Tighten to 110-130 lb. ft. torque.

15. Install baffle and oil pump.

16. Install oil pan. (See "Oil Pan - Remove and Replace".)

Plastigage Method of Determining Main Bearing Clearance

1. Place a .002" brass shim between the crankshaft journal and the lower bearing in each bearing cap next to the one being checked. Tighten all cap bolts to proper torque as follows: rear 110-130 lb. ft. all others 90-110 lb. ft. This causes the crankshaft to be forced against the upper bearing and insures an accurate measurement of the total clearance.

2. Remove the bearing cap of the bearing to be checked. Wipe the bearing and the journal free of oil.

3. Place a piece of type PG-1 plastigage, the length of the bearing (parallel to the crankshaft) on the journal or bearing surface. Install the cap and tighten cap bolts to proper torque.

NOTE: Do not turn crankshaft with plastigage in place.

4. Remove bearing cap and using plastigage scale on envelope, measure width of compressed plastigage before removing it from the bearing or journal. If clearance is not over .002", standard size main bearings should be used; if clearance is over .002", use .001" undersize bearing and recheck. Main bearing inserts .002" undersize are available for cases where use of the .001" undersize bearing results in excessive clearance.

Plastigage Method of Determining Connecting Rod Bearing Clearance

1. Place a piece of type PG-1 plastigage the length of the bearing (parallel to the crankshaft) on the crankpin or bearing surface. Install the cap and tighten cap bolts to 45 lb. ft. torque.

NOTE: Do not turn crankshaft with plastigage in place.

2. Remove bearing cap, and using plastigage scale on envelope, measure width of compressed plastigage before removing it from the crankpin or bearing. If the bearing clearance is not over .00225", standard size connecting rod bearing should be used; if over .00225", use .001" undersize bearing and recheck. Connecting rod bearing inserts .002" undersize are available for cases where use of the .001" undersize bearing results in excessive clearance.

FITTED BLOCK

Partial engines will no longer be available for service replacement in 1964. The following procedure outlines the replacement of the fitted block.

NOTE: Blocks are fitted with pistons, piston pins and rings, camshaft bearings and main bearings.

Remove

1. Remove engine assembly (pg. 6-10 of 1963 Pontiac Chassis Shop Manual) also consult section 6 1963 Pontiac Chassis Shop Manual concerning the following procedures.

2. Remove flywheel housing and clutch assembly.

3. Remove flywheel and mount engine in holding stand.

4. Remove motor mounts and linkage bracket.

5. Remove generator and mounting bracket.

6. Remove fuel pump.

7. Remove harmonic balancer.

8. Remove timing chain cover, fan and pulley. Remove timing cover mounting studs.

9. Remove fuel pump eccentric and bushings.

10. Slide timing chain and sprockets off end of camshaft and crankshaft.

11. Remove camshaft thrust plate.

12. Remove exhaust crossover pipe.

13. Remove distributor and high tension wires.

14. Remove starting motor assembly.

15. Remove intake manifold.

16. Remove push rod cover.

17. Remove oil level indicator.

18. Remove rocker arm covers.

19. Loosen rocker arm nuts, rotate rocker arms and remove push rods. Store push rods so they may be reinstalled in the same position as removed.

20. Remove cylinder heads and exhaust manifolds.

21. Remove cylinder head gaskets.

22. Remove oil filter assembly.

23. Remove valve lifters; use J-2049 if necessary. Place valve lifters in storage box J-5763 so lifters can be reinstalled in original location.

24. Remove camshaft.

25. Remove oil pan assembly.

26. Remove oil pump assembly and drive shaft.

27. Remove baffle and oil indicator tube extension.

28. Remove rod and piston assemblies.

29. Remove crankshaft and flywheel assembly.

30. Using pin remover (consult pg. 6-34 of 1963 Pontiac Chassis Shop Manual) remove connecting rods from pistons. Mark rods so they may be installed in original locations.

31. Remove old block from holding fixture.

32. Install new fitted block in holding fixtures.

33. Remove pistons, pins and bearing, caps and bearing shell from new block and store so they may be installed in original location.

Assemble

1. Assemble new pistons to connecting rods.

2. Install new rear main bearing oil seal.

3. Install camshaft using care not to damage bearings.

4. Install camshaft thrust plate indexing oiling slot in plate with oil groove in block.

5. Measure crankshaft journals for bearing size using plastigage methods.

6. Install upper main bearing shells in block and lower main bearing shells in caps.

7. Install crankshaft and flywheel assembly.

NOTE: Torque all caps (except rear main) to 90-110 lb. ft. Torque rear main bearing cap to 110-130 lb. ft.

8. Install connecting rod and piston assemblies in original order. Torque to 40-46 lb. ft.

9. Make certain keys are in place in crankshaft and camshaft. Install timing chain and sprockets making sure marks in sprockets are aligned exactly on a straight line passing through the shaft centers. Alignment can be simplified by first installing sprockets without chain to align timing marks. If timing chain is excessively loose, a new chain or a new chain and sprockets should be used.

10. Position fuel pump eccentric bushing over eccentric with flange toward camshaft sprocket.

11. Install fuel pump eccentric and bushing on camshaft sprocket, indexing tang on eccentric with key way cut out in camshaft sprocket.

12. Position timing cover gasket over mounting studs and dowels on block.

13. Install timing cover water pump, fan and pulley. Do not install stud nuts at this time.

14. Slide harmonic balancer onto crankshaft, and install harmonic balancer to crankshaft bolt and washer. Place hammer handle between block and crankshaft counterweight to keep crankshaft from turning and tighten harmonic balancer to crankshaft bolt 160 lb. ft. torque.

15. Install baffle and oil indicator tube extension.

16. Insert oil pump drive shaft with dimpled end toward block.

17. Install oil pump and gasket.

18. Cement new gaskets to oil pan and rear main bearing cap; use retainers to hold gasket. Install oil pan except for two rear screws. Position flywheel housing front shield and gasket against oil pan and install two rear oil pan bolts.

19. Position new cylinder head gaskets on block.

20. Position cylinder heads and exhaust manifolds on locating pins. Install head bolts and torque to 85-100 lb. ft.

NOTE: Three different length bolts are used. When inserted on proper holes, all will project an equal amount from their respective bosses.

21. Install lifters in bosses from which they were removed.

22. Install push rods in same location as originally removed and with same end facing valve lifter.

23. Tighten rocket arm ball retaining nuts to 15-25 lb. ft. torque.

24. Install distributor as follows:

a. Turn crankshaft to firing position of number one cylinder (number one exhaust and intake valve lifters both on base circles of their cams and timing mark on harmonic balancer indexed with pointer). NOTE: Number one intake must have just closed.

b. Position new distributor to block gasket on block.

c. Install distributor (without cap and wires) so that vacuum diaphragm faces the left side of the engine and rotor arm points toward contact in cap for number one cylinder. It will also be necessary to turn the oil pump drive shaft so it will index with distributor shaft.

25. Install distributor hold down clamp and special bolt and tighten enough to hold distributor in place.

26. Cement new gaskets to push rod covers. Install push rod covers with screws and flat washers and tighten to 5 lb. ft. torque.

27. Cement new gaskets to rocker arm cover and install cover.

28. Install intake manifold gasket with plastic locating sleeves in cylinder head.

29. Start intake manifold to timing cover draw bolt into intake manifold.

30. Position intake manifold and install retaining screws finger tight.

31. Tighten draw bolt to 10-20 lb. ft. torque to obtain metal to metal contact between manifold and timing cover.

32. Tighten manifold screws to 30-45 lb. ft. torque.

33. Install oil filter assembly and gasket.

34. Install oil level indicator.

35. Install throttle linkage.

36. Install starter assembly.

37. Install fuel pump.

38. Install exhaust crossover pipe.

39. Install generator and bracket.

40. Install fan belt and adjust belt tension as covered in section 6-A.

ENGINE COOLING AND LUBRICATION

CONTENTS OF THIS SECTION

RADIATOR

The radiators are of the down-flow tube and center type and are constructed of copper.

A pressure vent type cap is used on the radiator to allow a build-up of 14 to 17 psi of pressure in the cooling system. This pressure raises the boiling point of water from 212°F. to approximately 250°F. at sea level.

CAUTION: As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while the engine is hot and the pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over the engine, fenders, and the person removing the cap. If the solution contains inflammable anti-freeze, such as alcohol, there is also the possibility of causing a serious fire. When removing filler cap,

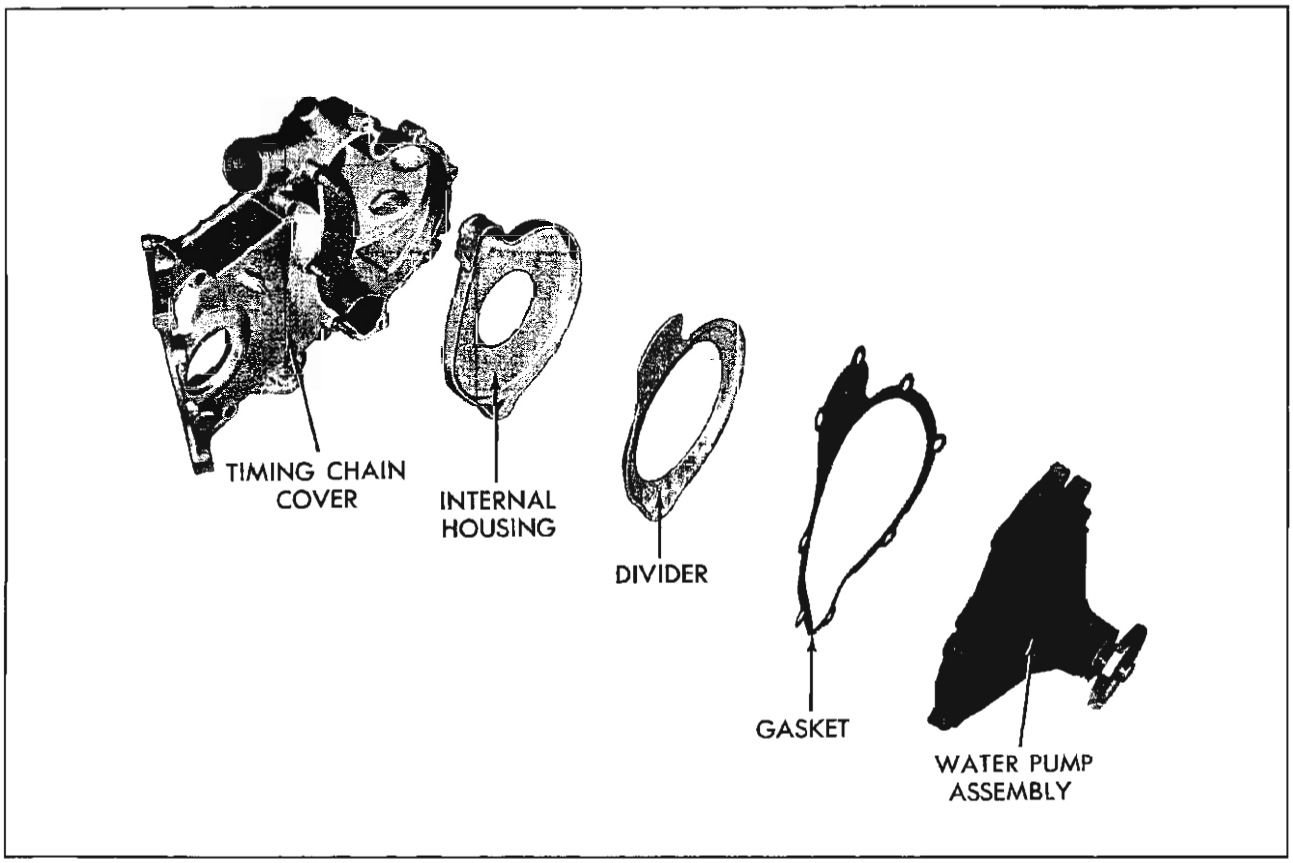


Fig. 6A-1 Water Pump

rotate cap toward left very slowly; if hissing of vapor is encountered, tighten cap immediately and wait for system to cool sufficiently to allow removal of cap. After pressure in the system has been relieved, turn cap more forcibly to left and remove. Turn cap all the way to the right when installing. It should not be necessary to check coolant level unless temperature gauge shows over-heating and then not until engine is stopped and allowed to cool to normal.

WATER PUMP AND TIMING CHAIN COVER (Fig. 6A-1)

The cast iron water pump housing (which carries the impeller, seal bearing, and shaft) on a die cast aluminum timing chain cover released mid-year 1963 is carried over to 1964. Two additional loose pieces are part of this assembly. One of the loose pump pieces, of die cast aluminum, is the back side of the pump (inner housing), while the aluminum coated steel baffle (held in place by the water pump) is the pump divider.

OIL PUMP

A finer mesh screen has been introduced for improved protection.

POSITIVE CRANKCASE VENTILATION

The semi-sealed positive crankcase ventilation system will be a carry-over of the 1963 systems except that the left rocker arm cover breather cap is omitted. The crankcase is ventilated with the air that enters through the rocker arm cover breather cap into the crankcase, through the valve at the push rod cover and into the intake manifold.

PERIODIC SERVICE

Checking and Filling Cooling System

The Pontiac cooling system requires little care except for maintaining an adequate coolant level. GM ethylene glycol type inhibited coolant has been installed at the factory and has been adjusted to give freeze protection to 20°F. below zero.

It is not necessary to drain the coolant for summer driving because this coolant has been especially formulated to last 24 months in the engine. After two years of service, the cooling system should be drained, by removing pipe plug, flushed with water and refilled with an inhibited year-around coolant

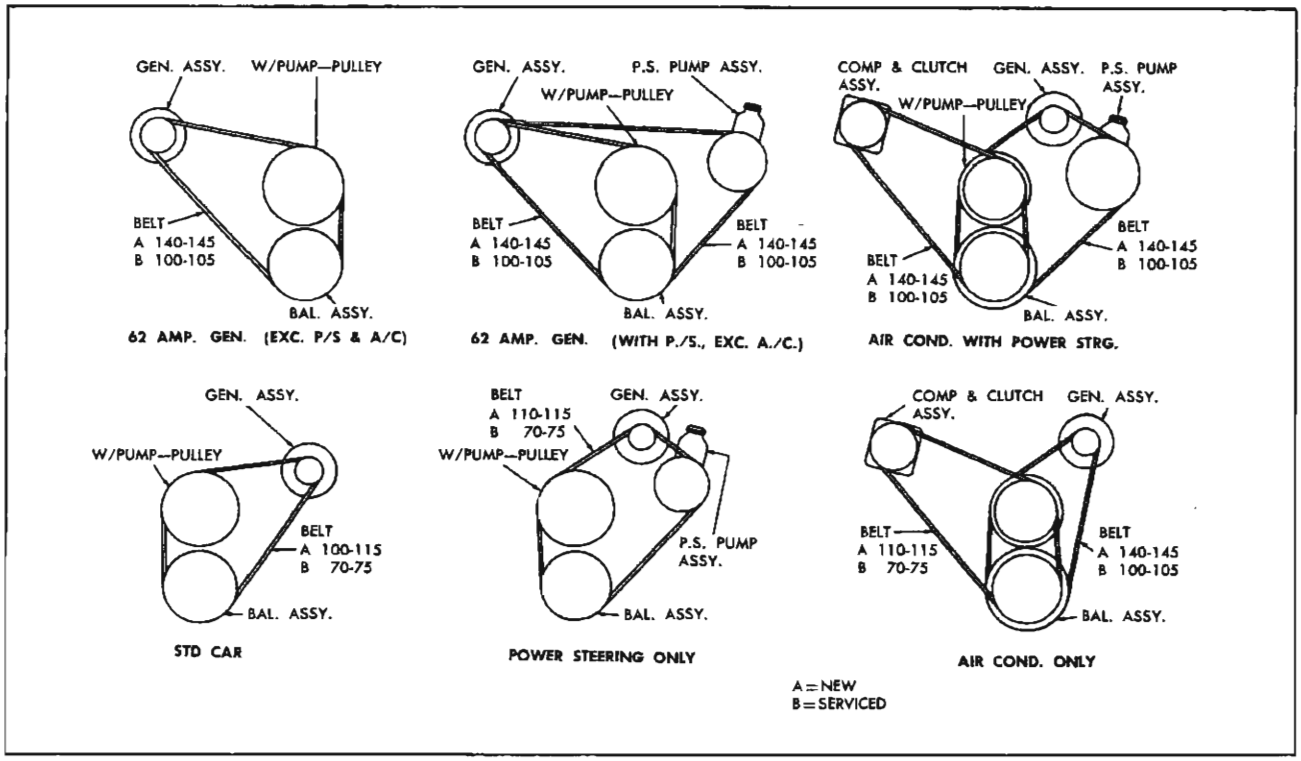


Fig. 6A-2 Belt Tension Chart

meeting GM 1899M specifications. The coolant level should be 1/2" to 1" below filler cap opening.

NOTE: Alcohol should not be used in Pontiac automobiles. When only water is used, a good corrosion inhibitor must be added to the system. Failure to use an inhibited coolant may result in severe corrosion damage to the cooling system components.

Oil Filter Cartridge

Install a new oil filter at each six months or 6000 miles, whichever occurs first.

ENGINE AND ACCESSORY DRIVE BELT COMBINATIONS

Consult Fig. 6A-2 for Drive Belt Combinations.

ENGINE FUEL

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

Service procedures on carburetors and fuel pump are the same as 1963.

THROTTLE RETURN CHECK

The throttle return check is designed to open the throttle valve to increase engine speed slightly and prevent stalling when engine vacuum drops. It also acts to retard throttle closing when the driver suddenly takes his foot off the accelerator pedal. The following Pontiac models do have the throttle return check installed in production:

1. All Roto Hydra-Matic transmission equipped models - except tri-power engine.

2. All Super Hydra-Matic transmission equipped models with four barrel carburetor.

3. NOTE: Pontiac models equipped with tri-power or Synchromesh transmission and 2 bbl engines with Super Hydra-Matic transmission, do not have factory installed throttle return check.

ROCHESTER 2GC CARBURETORS

The 1964 Rochester 2GC carburetor specifications have been changed to accommodate a new gauging method.

Two basic models of 2GC carburetors are used. The first model (large) incorporates 1-11/16" throttle bores and has the choke housing located on the throttle flange. This model is used as standard equipment on all Hydra-Matic models except the Bonneville series.

The second model (small) has 1-7/16" throttle bores and the choke housing is attached to the bowl cover. This type is used as standard equipment on all Synchromesh except Bonneville series, and in the tri-power installations as an economy option on Hydra-Matic models.

The carburetor model number can be used to identify specific 2GC carburetors. This model number is found on a tag attached to a bowl cover screw. The chart below gives model number and usage information.

Carburetor Model No.	Carburetor Usage	Throttle Bore Diameter
7023060	Hydra-Matic, except Bonneville	1-11/16"
7023061	Hydra-Matic w/Circ-L-Aire Conditioning, except Bonneville	1-11/16"
7023066	Synchromesh, except Bonneville	1-7/16"
7023063	Hydra-Matic -- economy option	1-7/16"
7023064	Hydra-Matic -- economy option, w/Circ-L-Aire Conditioning	1-7/16"
7024078	Tri-Power -- front carburetor -- 421 Engine	1-11/16"
7024079	Tri-Power -- rear carburetor -- 421 Engine	1-11/16"
7023161	Tri-Power -- center carburetor -- synchromesh 421 Engine	1-7/16"
7023162	Tri-Power -- center carburetor -- Roto Hydra-Matic 421 Engine	1-7/16"

ROCHESTER 2GC CARBURETOR (1 1/16" THROTTLE BORE DIAMETER) MODELS 7023060, 7023061, 7024078, 7024079

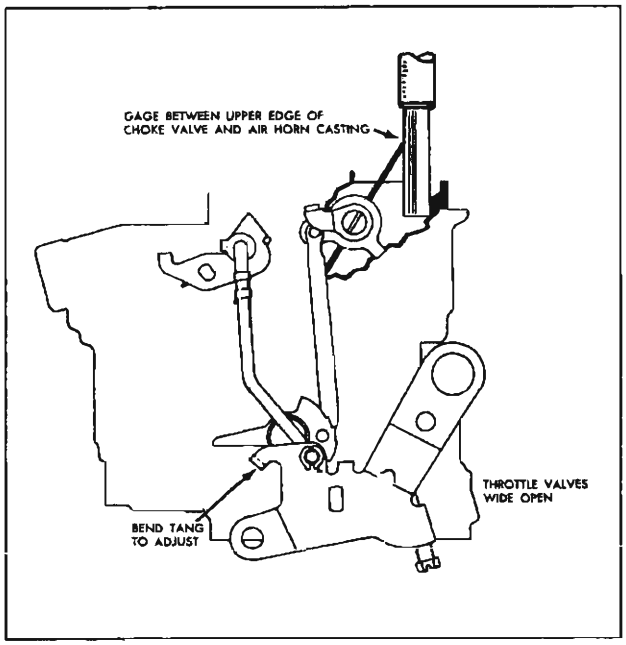


Fig. 6B-1 Unloader Adjustment

ADJUSTMENTS

UNLOADER ADJUSTMENT (Fig. 6B-1)

NOTE: Unloader adjustment cannot be made correctly unless linkage is properly adjusted.

1. Remove carburetor air cleaner assembly.

2. Depress accelerator pedal forcibly to floor (this should be done by person sitting in driver's seat of car to simulate driving conditions). Check to see that accelerator pedal is not hitting "hump" over transmission.

3. With accelerator pedal depressed as in Step 2, bend tang on throttle lever to give a clearance of .160" (specification .130 to .190) between the top of the choke valve and the inside of the air horn.

4. Replace air cleaner assembly.

The above procedure will eliminate variance in linkage, floor mat, pedal location, etc., and should ensure correct unloader action.

FLOAT LEVEL ADJUSTMENT (Fig. 6B-2)

With air horn inverted and gasket in place and needle seated, there should be 5/8" ± 1/16" clearance between the lower edge of float seam (sharp edge) at the toe end and air horn gasket. To adjust, bend float arm at rear of float. Visually check float alignment after adjusting float.

FLOAT DROP ADJUSTMENT (Fig. 6B-3)

With the air horn right side up so that float can hang free, the distance from the gasket surface to

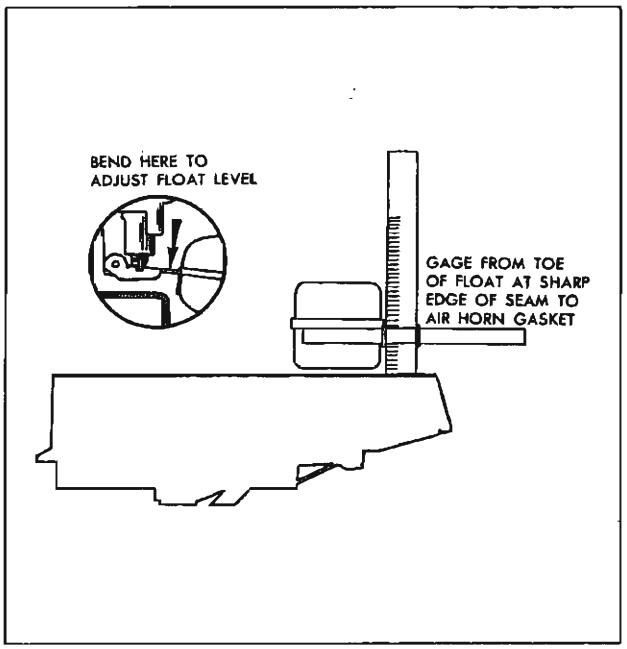


Fig. 6B-2 Float Level Adjustment

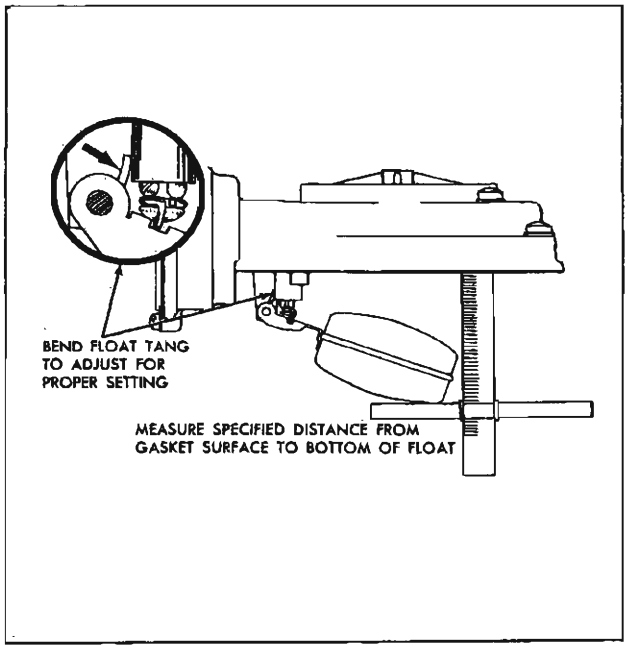


Fig. 6B-3 Float Drop Adjustment

the lowest point of the float should be adjusted to the following specifications:

Minimum Drop -- 1-3/4"

Maximum Drop -- can be any amount that will retain needle for installation. Needle must not wedge at maximum drop. To adjust, bend tang at rear of float toward needle seat to decrease float drop and away from needle seat to increase float drop.

PUMP ROD ADJUSTMENT (Fig. 6B-4)

To adjust pump rod, place tool on top of cleaner mounting ring as shown in Fig. 6B4; then with throttle valves fully closed, the top surface of the pump rod should just touch the end of the gauge. Measurement should be 1-21/64" ± 1/32". Bend pump rod to adjust.

CHOKE ROD ADJUSTMENT (Fig. 6B-5)

1. With the thermostat cover set at index and the choke trip lever in contact with the fast idle lever, locate the fast idle screw on the second stop of the fast idle cam, next to the shoulder of the high step.

2. Bend the tang on the fast idle lever so that the small end of .080" ± .010" wire gauge or drill just fits between the inner side of the air horn and the upper edge of the choke valve.

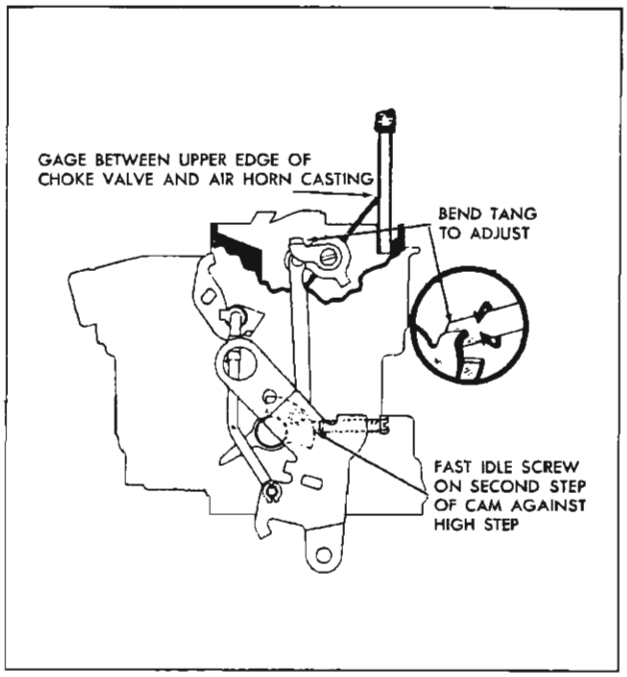


Fig. 6B-5 Choke Rod Adjustment

IDLE VENT ADJUSTMENT (Fig. 6B-6)

NOTE: Pump rod setting must always be made before making the idle vent adjustment. With the idle vent valve just closed, bend the tang on the pump lever as necessary to obtain a dimension of 1-17/64" ± 1/64" between top of pump rod and top of air cleaner ring.

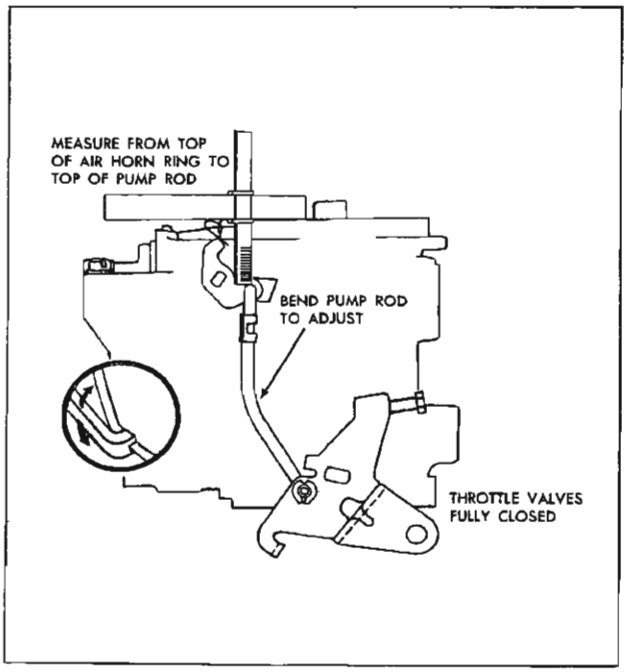


Fig. 6B-4 Pump Rod Adjustment

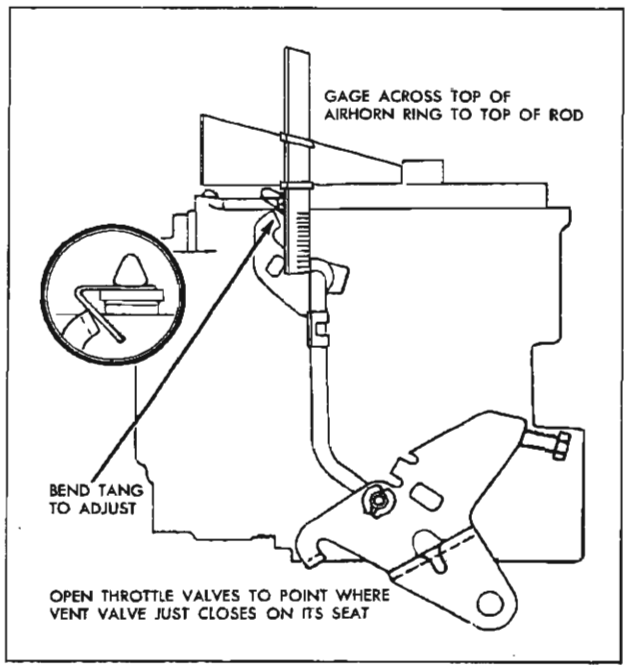


Fig. 6B-6 Idle Vent Adjustment

ROCHESTER 2GC CARBURETOR (1 7/16" THROTTLE BORE DIAMETER) MODELS 7023063, 7023064, 7023066, 7023161, 7023162

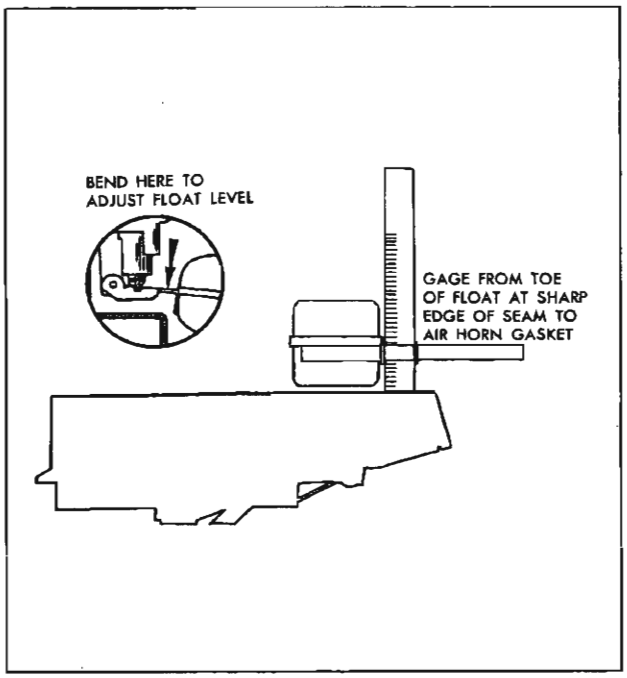


Fig. 6B-7 Float Level Adjustment

DESCRIPTION

The 7023066 carburetor is standard equipment on Synchromesh models except the Bonneville, the 7023063 and 7023064 are the economy option carburetors on Hydra-Matic models, and 7023161 and 7023162 are used on tri-power 421 engine models with Synchromesh and Roto Hydra-Matic transmissions respectively.

These carburetors are essentially a smaller version of the Hydra-Matic carburetor previously described. The primary differences are in the smaller throttle bore, the location of the choke housing on the bowl cover instead of on the throttle body, and location of fuel inlet. The overhaul procedures remain basically the same except for those areas connected directly with choke housing location. Each carburetor is calibrated for its specific application.

ADJUSTMENTS

FLOAT LEVEL ADJUSTMENT (Fig. 6B-7)

With air horn inverted, gasket in place and needle seated, there should be 11/16" ± 1/16" clearance between bottom of float seam at toe end and the air horn gasket. To adjust, bend float arm. Recheck float alignment after adjusting float.

FLOAT DROP ADJUSTMENT (Fig. 6B-8)

With the air horn right side up so that float can hang free, the distance from the gasket surface to

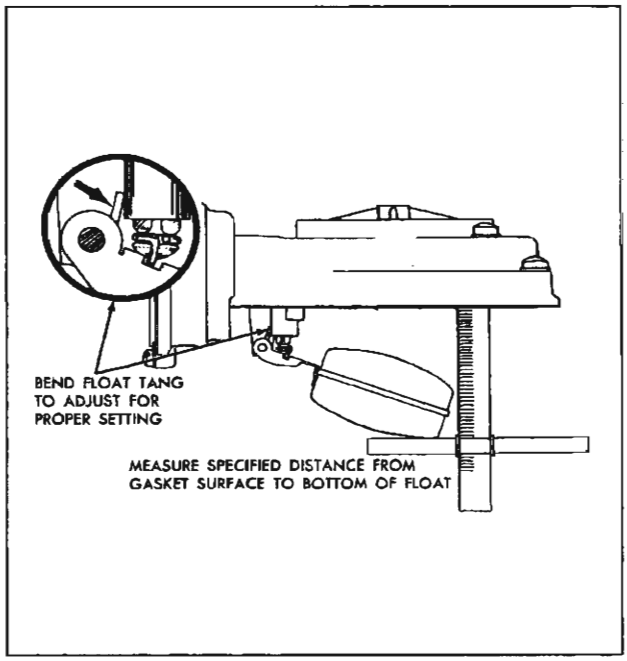


Fig. 6B-8 Float Drop Adjustment

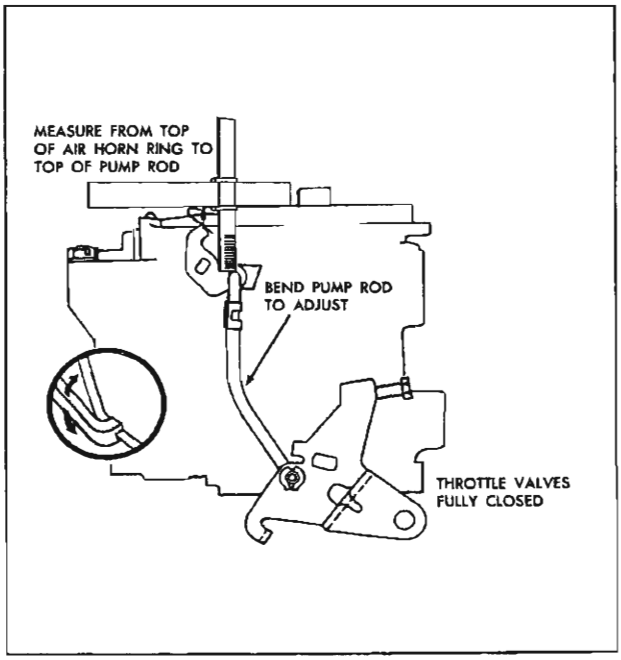


Fig. 6B-9 Pump Rod Adjustment

the lowest point of the float should be adjusted to the following specifications:

Minimum Drop -- 1-3/4"

Maximum Drop -- can be any amount that will retain needle for installation. Needle must not wedge at maximum drop. To adjust, bend tang at rear of float toward needle seat to decrease float drop and away from needle seat to increase float drop.

PUMP ROD ADJUSTMENT (Fig. 6B-9)

Place end of gauge in position on top of air cleaner mounting ring as shown. With throttle valves fully closed, adjust from air cleaner mounting ring to top of pump rod. Adjust pump rod to obtain a dimension of 1-1/8" ± 1/32".

CHOKE ROD ADJUSTMENT (Fig. 6B-10)

With thermostatic cover set at index and choke trip lever in contact with fast idle lever, locate the fast idle adjusting screw on the second stop of the fast idle cam and against the shoulder of the high step. Bend the tang so that the .055" ± .010" wire gauge just fits between the inner side of the air horn and the upper end of the choke valve.

IDLE VENT VALVE ADJUSTMENT (Fig. 6B-11)

NOTE: Pump adjustment must always be made before making the idle vent adjustment.

With the idle vent valve just closed, bend the tang on the pump lever as necessary to obtain a dimension of 1-5/64" ± 1/64" between top of pump rod and top of air cleaner ring.

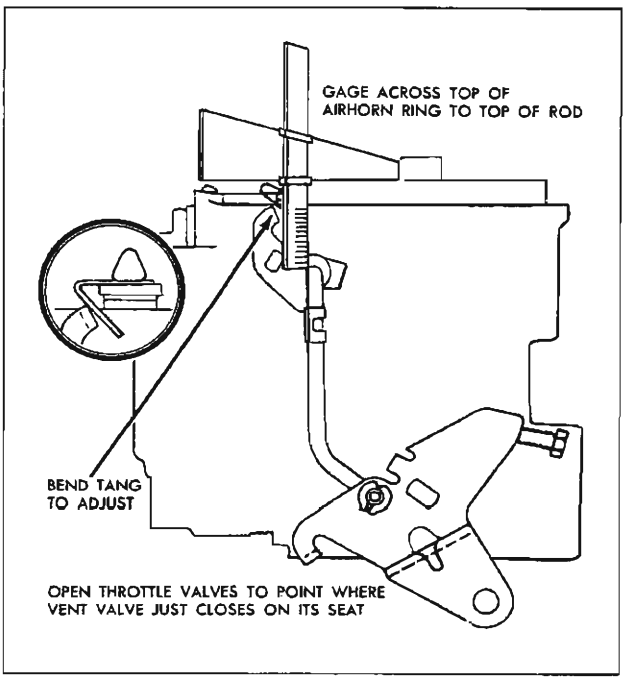


Fig. 6B-11 Idle Vent Valve Adjustment

UNLOADER ADJUSTMENT (Fig. 6B-12)

NOTE: Unloader adjustment cannot be made correctly unless linkage is properly adjusted.

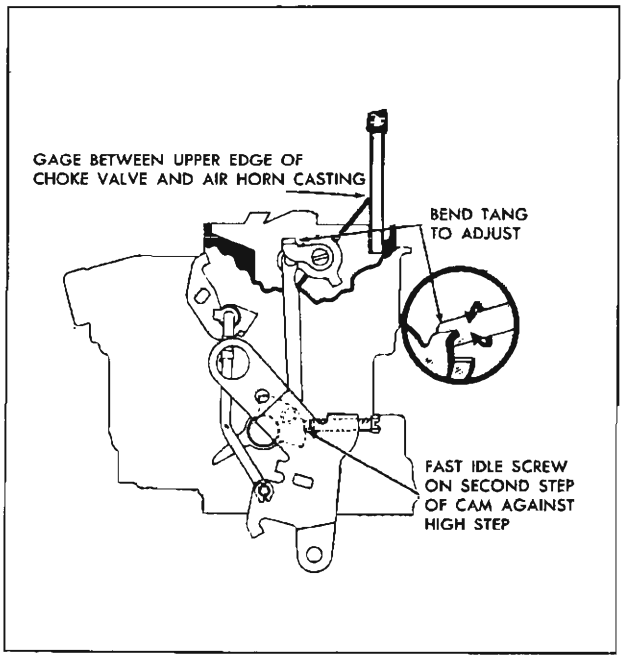


Fig. 6B-10 Choke Rod Adjustment

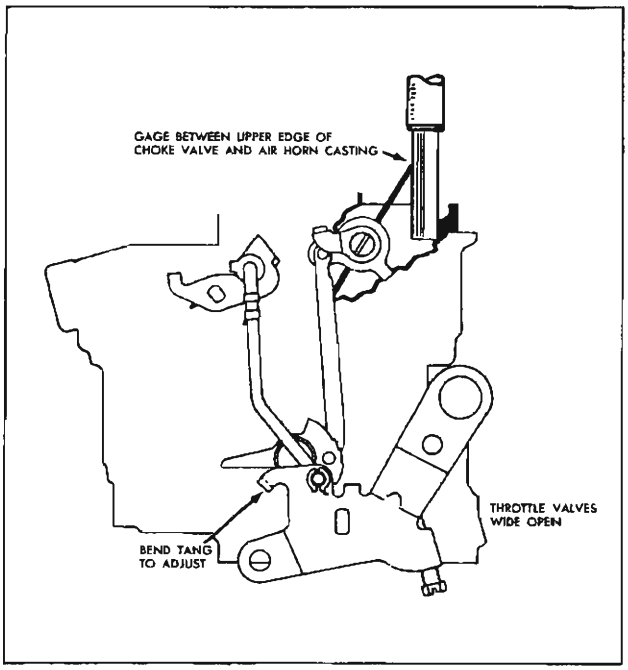


Fig. 6B-12 Unloader Adjustment

1. Remove carburetor air cleaner assembly.

2. Depress accelerator pedal forcibly to floor. (This should be done by person sitting in driver's seat of car to simulate driving conditions.) Check to see that accelerator pedal is not hitting "hump" over transmission.

3. With accelerator pedal depressed as in step 2, bend tang on throttle lever to give a clearance of .170" (specifications .130 to .190") between the top of the choke valve and the inside of the air horn.

4. Replace air cleaner assembly.

The above procedure will eliminate variance in linkage, floor mat, pedal location, etc., and should ensure correct unloader action.

IDLE SPEED AND MIXTURE ADJUSTMENT

With the engine at operating temperature, adjust idle speed to the following specifications:

Whenever idle speed screw is turned, the throttle should be opened slightly then closed to seat screw properly on cam.

Synchromesh, exc. Air Conditioning	480-500 rpm
Hydra-Matic, exc. Air Conditioning	480-500 rpm (in Drive range)
Air Conditioning	540-560 rpm (H/M drive range - air conditioning off) (S/M neutral - air conditioning off)

The idle mixture should be adjusted to give a smooth idle at the specified idle speed. Missing is a sign of too lean an idle mixture while "rolling" or "loping" indicates too rich a mixture. Turning the idle mixture screw in, leans out the mixture; one and one-half turns out from the lightly seated position may be used as a preliminary setting of the mixture screws.

NOTE: All cars equipped with Circ-L-Aire Conditioning, two barrel carburetor and Hydra-Matic transmission have a hot idle compensator. During idle adjustment, make sure the hot idle compensator is closed by depressing the spring loaded button.

ROCHESTER 2GC TRIPLE TWO BARREL CARBURETOR

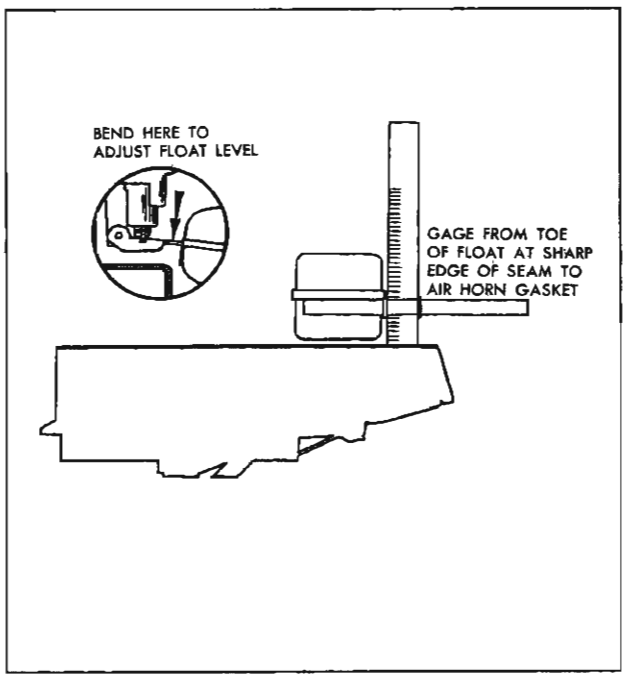


Fig. 6B-13 Float Level Adjustment

ADJUSTMENTS

FLOAT LEVEL ADJUSTMENT —(Fig. 6B-13)

NOTE: All float adjustments should be made with bowl cover gasket in place.

1. Remove air horn with gasket from carburetor bowl.

2. With bowl cover inverted in a flat surface, place float level gauge on bowl cover as shown.

3. With one edge of the float gauge lying flat across the air horn gasket, the other edge should just touch the "sharp" edge of the float seam. Dimensions: center carburetor 11/16" ± 1/16" end carburetors 5/8" ± 1/16".

FLOAT DROP ADJUSTMENT (Fig. 6B-14)

With the air horn right side up so that float can hang free, the distance from the gasket surface to tne lowest point of the float should be adjusted to the following specifications:

Minimum Drop -- 1-3/4"

Maximum Drop -- can be any amount that will retain needle for installation. Needle must not wedge at maximum drop. To adjust, bend tang at rear of float toward needle seat to decrease float drop and away from needle seat to increase float drop.

PUMP ROD ADJUSTMENT. (Fig. 6B-15)

1. On the center carburetor, back off idle speed adjustment screw until throttle valves are completely closed.

NOTE: When checking the pump rod adjustment, make sure that the throttle valves are completely closed.

2. Place gauge across top of air horn ring with leg marked "pump" next to top of pump rod. Fig. 6B-15.

3. With the throttle valves closed, check the distance from top of air horn ring to top of pump rod. Gauge should just touch top of pump rod. This scale dimension should be 55/64" ± 1/16" on the end carburetors and 1-1/8" ± 1/16" on center carburetor.

4. If adjustment is required, bend lower section of pump rod to obtain proper adjustment.

NOTE: Both "center" and "end" carburetor pump rod settings can be made with the combination float, pump and vent gauge. Use side of leg marked "center" for center pump rod setting and side of gauge leg marked "end" for end carburetor pump setting.

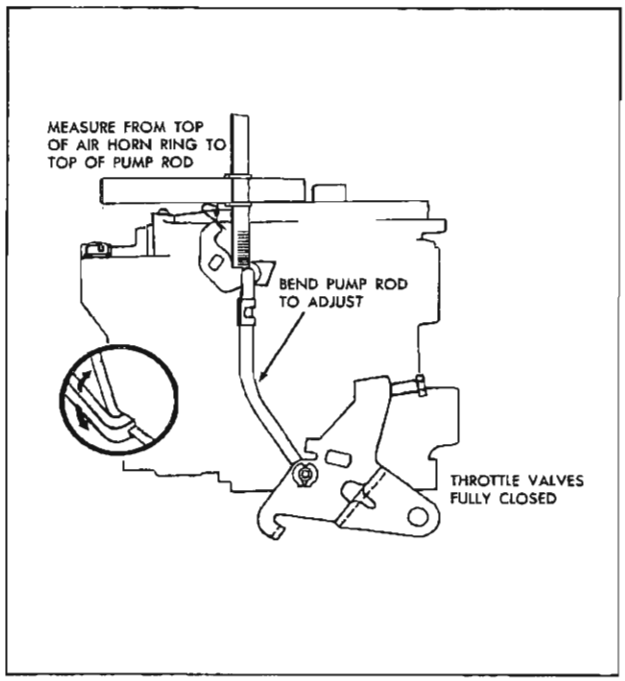


Fig. 6B-15 Pump Rod Adjustment

IDLE VENT VALVE ADJUSTMENT CENTER CARBURETOR—(Fig. 6B-16)

1. To check and adjust the atmospheric idle vent valve, always make the accelerator pump rod adjustment first.

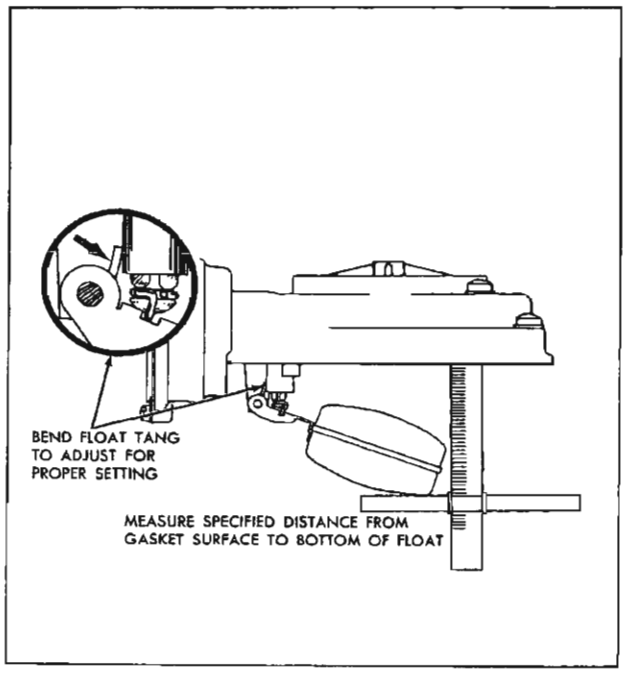


Fig. 6B-14 Float Drop Adjustment

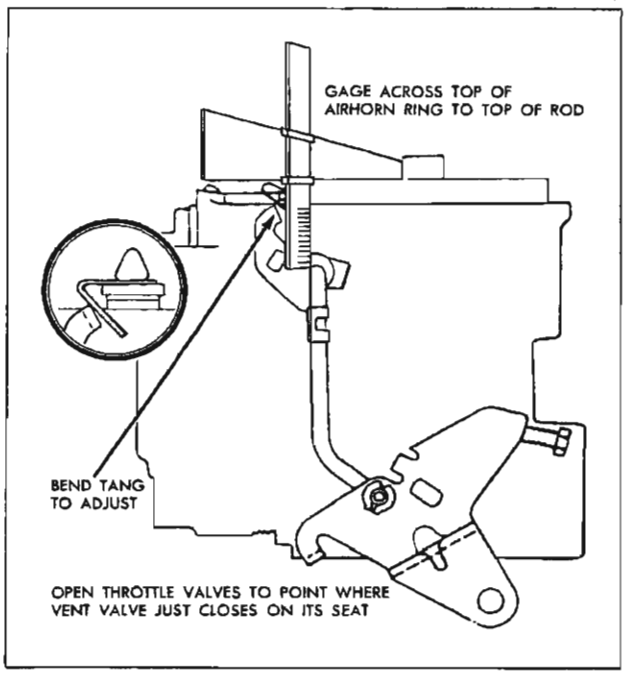


Fig. 6B-16 Idle Vent Valve Adjustment (Center Carburetor)

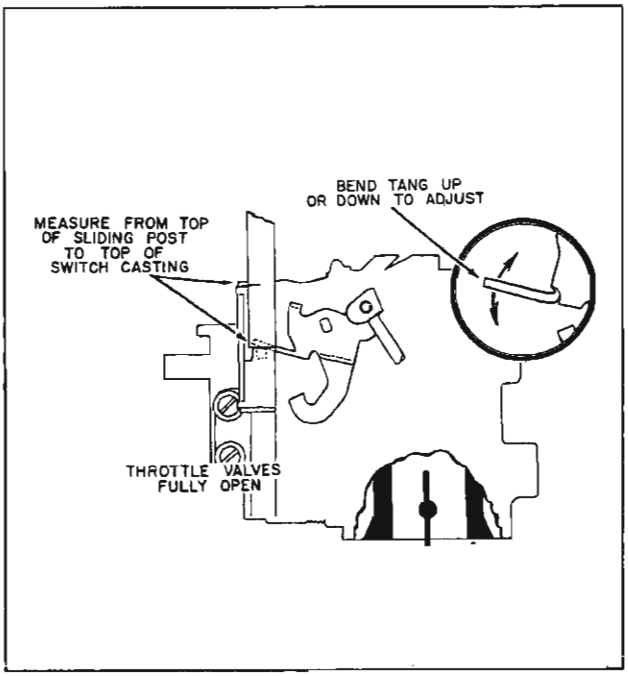


Fig. 6B-17 Vacuum Switch and Adjustment (Center Carburetor)

2. Slowly open the throttle valves to the point where the idle vent just closes.

3. With the throttle held in this position, place gauge on the top of the air horn ring as shown in Fig. 6B-16. The bottom of the gauge should just touch the top of the pump rod. The scale dimension should be 1-1/32" ± 1/64".

4. To adjust, bend vent valve actuating tang on pump lever up or down to obtain specified dimension.

VACUUM SWITCH ALIGNMENT AND ADJUSTMENT CENTER CARBURETOR (Fig. 6B-17)

1. Open throttle to the wide open position and measure the distance from the top of the post to the top of the vacuum switch. Fig. 6B-17. This distance should be 1-3/32" ± 1/64".

2. If adjustment is required, loosen switch attaching screws and move switch up or down to correct.

CAUTION: Be careful not to bump or bend lever after adjustment has been made.

3. Open and close throttle to make sure that arm on pump lever does not bind the post on the vacuum switch.

ADJUST CHOKE ROD CENTER CARBURETOR ONLY (Fig. 6B-18)

Place the idle screw on the second stop of the fast idle cam and against the shoulder of the high step

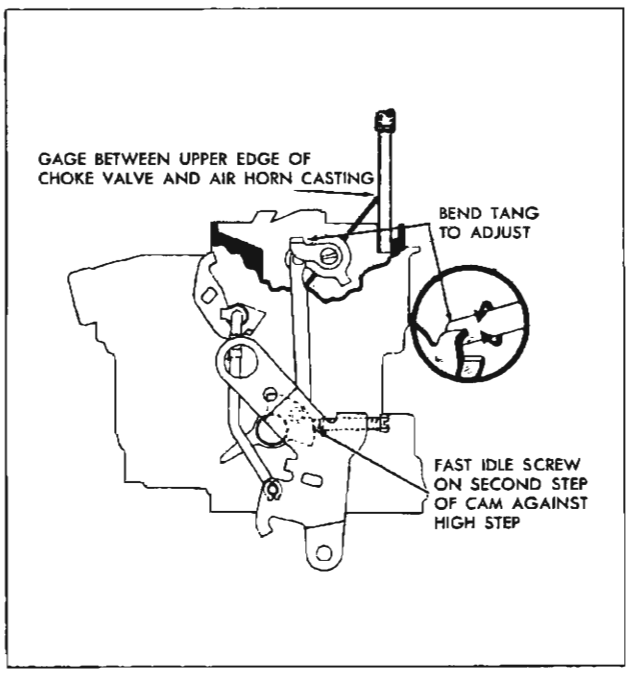


Fig. 6B-18 Adjust Choke Rod (Center Carburetor Only)

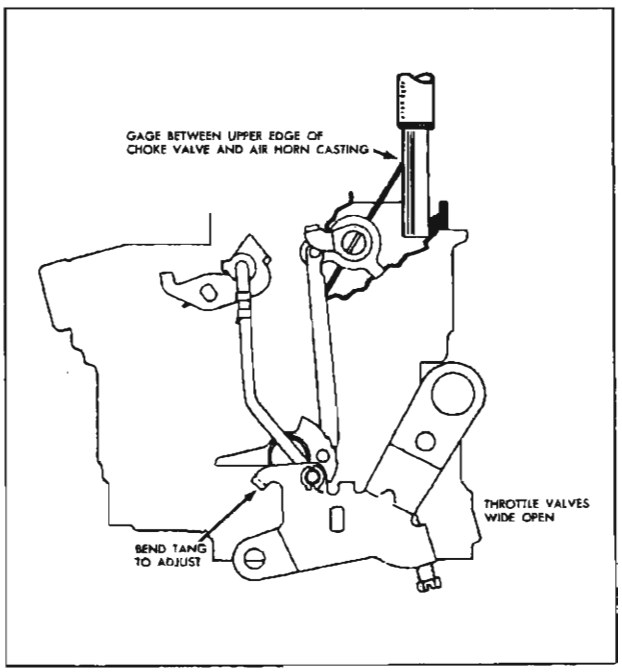


Fig. 6B-19 Adjust Unloader (Center Carburetor Only)

as shown in Fig. 6B18. Make sure that choke trip lever is in contact with the choke counterweight lever. Bend counterweight tang so that wire gauge just fits between the upper edge of the choke valve and the air horn wall. The adjustment specification is .055" ± .010".

ADJUST UNLOADER CENTER CARBURETOR ONLY (Fig. 6B-19)

With the throttle valves held wide open (preferably by person sitting in driver's seat and depressing accelerator pedal) the choke valve should be open enough so that gauge will fit freely between wall of air horn and choke valve. Bend the unloader tang on the throttle lever to adjust. The adjustment specification is .170" (specifications .130" to .190").

ADJUST THROTTLE ACTUATING ROD

Disconnect the end of throttle actuating rod which connects the throttle levers on the front and rear carburetors. With both throttle valves closed on the front and rear carburetors the rod should center in the slot in the throttle lever. Bend the throttle rod to adjust. Connect throttle rod after adjustment.

ADJUST IDLE SPEED AND AIR MIXTURE

With the engine at operating temperature adjust the idle speed on the center carburetor only to the following specification.

NOTE: Depress hot idle compressor (spring loaded valve) while making idle adjustment on H-M equipped cars.

HOT IDLE SPEED SPECIFICATIONS

	V-389 - 421	421 H.O.
A-Automatic transmission in Drive Position	480-500 rpm	640-660 rpm
B-Automatic transmission with Air Conditioning in Drive position A/C Off	540-560 rpm	690-710 rpm
C-Synchromesh	480-500 rpm	640-660 rpm
D-Synchromesh with Air Conditioning A/C Off	540-560 rpm	690-710 rpm

Adjust mixture on center carburetor to give smoothest possible idle at specified idle speed.

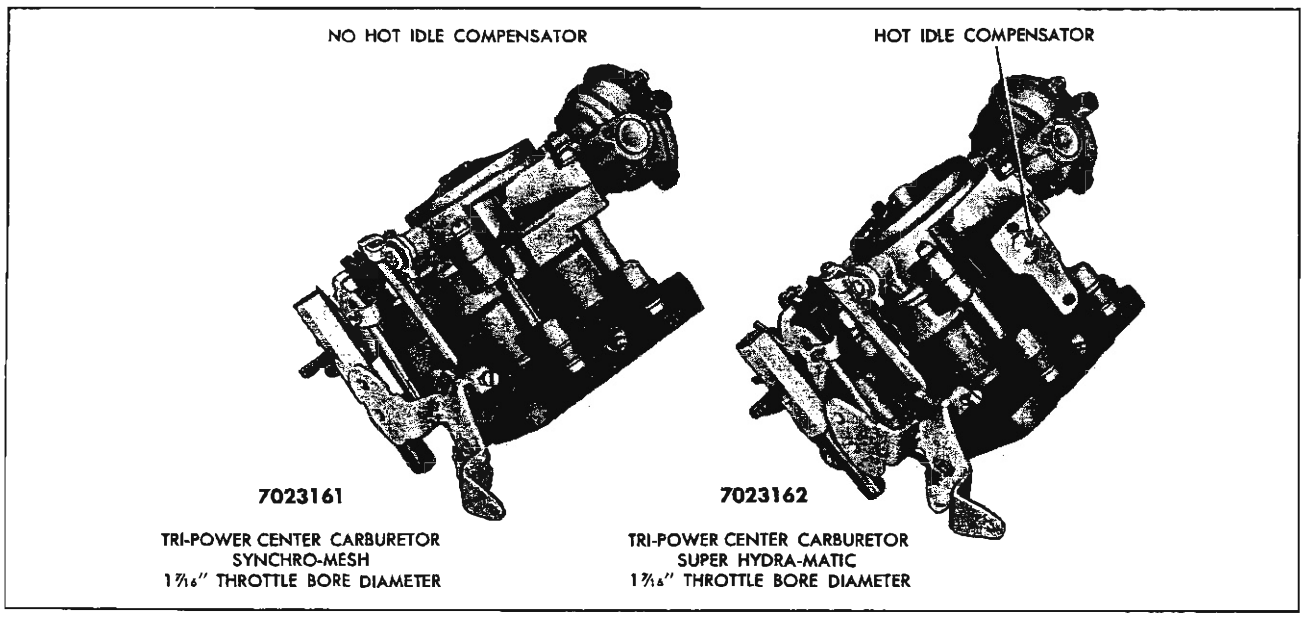


Fig. 6B-20 Comparison of Carburetors 7023161 and 7023162 Showing Hot Idle Compensator. Neither is Equipped with Throttle Return Check.

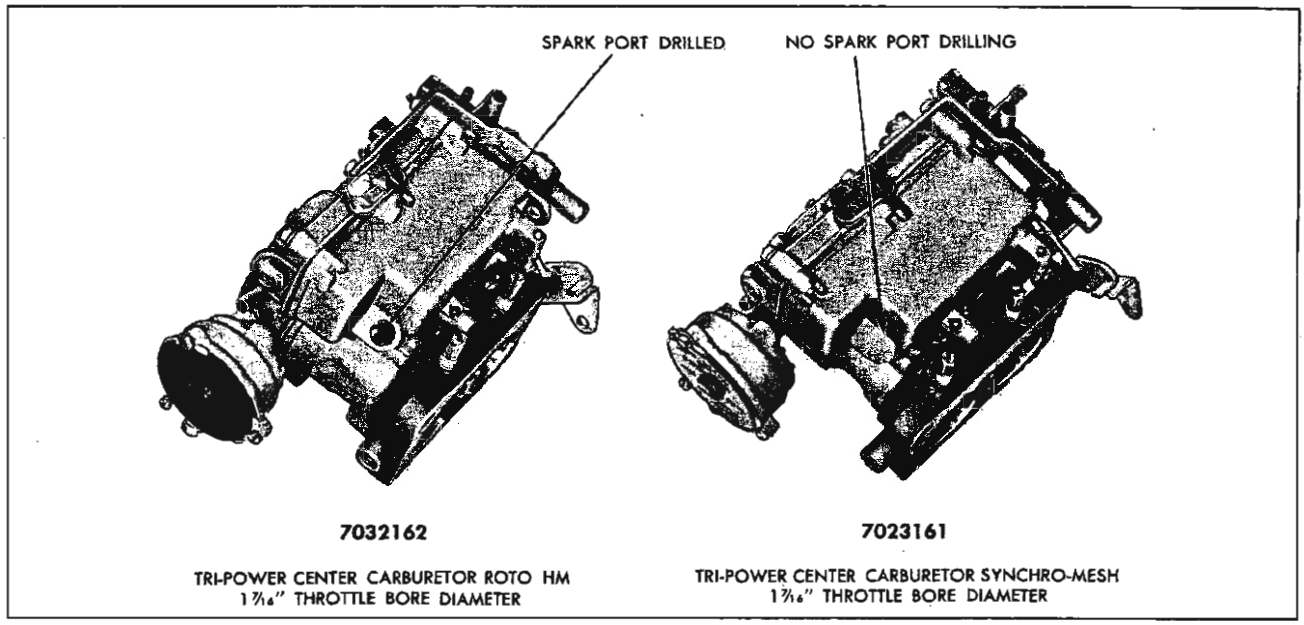


Fig. 6B-21 Comparison of Carburetors 7023161 and 7023162 Showing Spark Port Drilling. Neither is Equipped with Throttle Return Check.

CARTER AFB FOUR BARREL CARBURETOR

The Carter AFB (Aluminum Four Barrel) for 1964 is basically the same as 1963, except for the following changes:

The carburetor has been redesigned to direct all bowl vents internally and toward the air cleaner for improved hot and cold weather starting and for more complete combustion of fuel fumes.

It is also equipped with a viton needle seat and an all metal needle which improves sealing and needle durability.

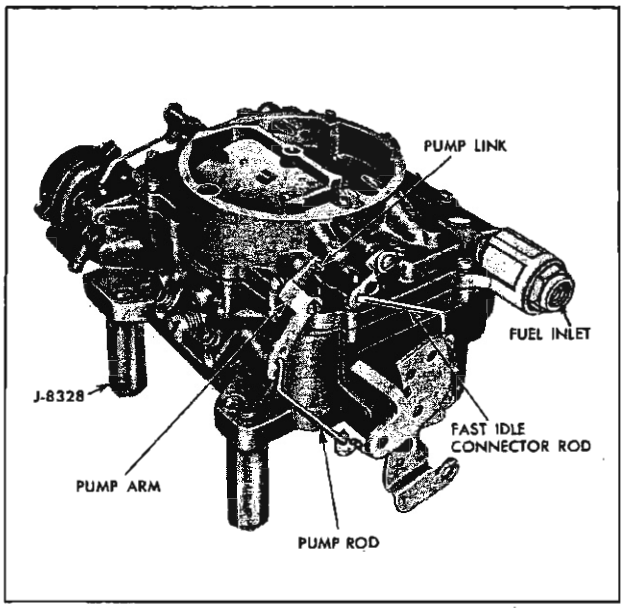


Fig. 6B-22 Carter AFB Four Barrel Carburetor

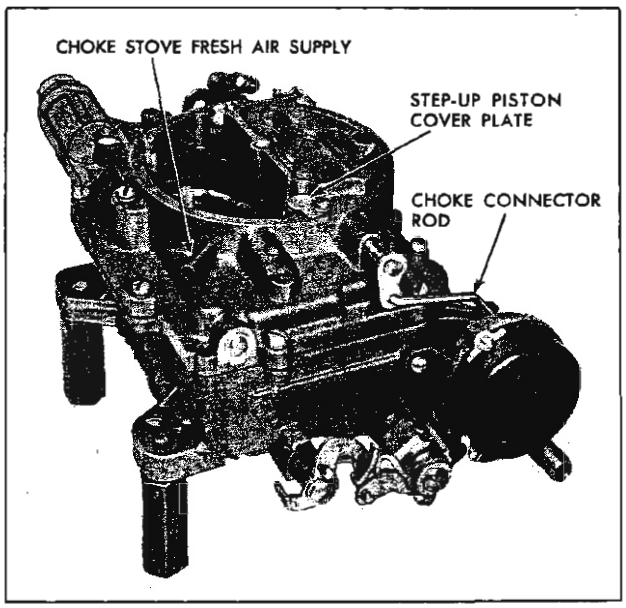


Fig. 6B-23 Carter AFB Four Barrel Carburetor

The hot idle air valve is calibrated to open when the air temperature in the bore of the carburetor is between 110 and 120 degrees Farenheit with 15" vacuum applied to the valve seat.

Hydra-Matic models are equipped with a secondary baffle plate which is located in the choke housing to distribute the warm air evenly over the thermostatic coil thereby insuring gradual relaxation of the coil.

ADJUSTMENTS

IDLE SPEED AND MIXTURE ADJUSTMENT

1. As a preliminary setting turn air screw out 1-1/2 turns from lightly seated position and mixture screws out 1 turn.

2. Set hand brake securely, place transmission in neutral and connect tachometer to engine.

3. Start engine and warm up thoroughly. Make sure choke is fully open and carburetor is completely off fast idle.

CAUTION: When adjusting idle make sure hot idle compensator is held manually closed during adjustment.

4. Adjust the air screw to obtain correct idle rpm. (Use drive range on Hydra-Matic equipped cars.)

5. Turn mixture screws to best quality (highest rpm) idle.

6. Reset air screw to correct rpm if mixture adjustment changed setting.

7. Recheck mixture adjustment to insure smoothest possible idle.

NOTE: Always recheck idle mixture setting after making idle rpm adjustment with air screws.

HOT IDLE SPEED SPECIFICATIONS

	V-389 - 421	421 H.O.
A-Automatic transmission in Drive position	480-500 rpm	640-660 rpm
B-Automatic transmission with Air Conditioning in Drive position A/C Off	540-560 rpm	690-710 rpm
C-Synchromesh	480-500 rpm	640-660 rpm
D-Synchromesh with Air Conditioning A/C Off	540-560 rpm	690-710 rpm

CAUTION: Be sure that the hot idle compensator is closed during adjustment on carburetors equipped with same.

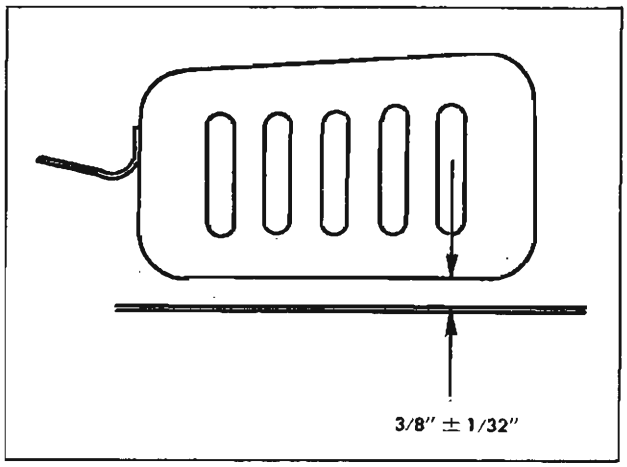


Fig. 6B-24 Float Level Adjustment

FAST IDLE ADJUSTMENT

The fast idle setting must be made after the idle speed and mixture adjustment has been made. With the engine completely warmed up and the fast idle screw on highest step of fast idle cam, set fast idle screw to give an engine speed of 2500 rpm.

UNLOADER ADJUSTMENT

1. Remove carburetor air cleaner assembly.

2. Depress accelerator pedal forcibly to floor. (This should be done by person setting in driver's seat of car to simulate actual driving conditions.)

3. With accelerator pedal depressed as in step 2, bend tang on throttle lever to give a clearance of .150" ± .030" between the top of the choke valve and the inside of the air horn.

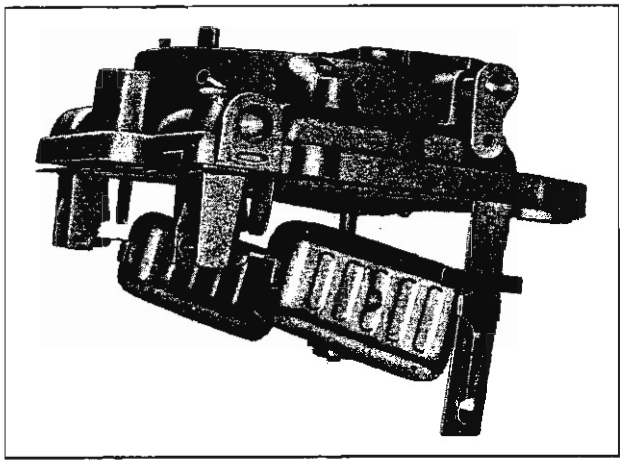


Fig. 6B-25 Float Drop Adjustment

4. Replace air cleaner assembly.

The above procedure will eliminate variance in linkage, floor mat, pedal location, etc. and should ensure correct unloader action.

FLOAT LEVEL (Fig. 6B-24)

With air horn inverted, gasket in place and needle seated, adjust float to 3/8" ± 1/32" clearance between float at point below first indentation on side of float from toe end and air horn gasket. Fig. 6B-21 illustrates point where 3/8" ± 1/32" dimension should be checked. Bend float arm to adjust. Adjust both floats and recheck float alignment.

FLOAT DROP (Fig. 6B-25)

With bowl cover held in upright position and measuring from outer end of each float, the distance between top of floats and bowl cover gasket should be a minimum of 23/32" ± 1/32". To adjust, bend stop tabs on float brackets.

NOTE: Maximum float drop can be any amount which will retain needle for installation. Needle must not wedge at maximum drop.

ADJUST PUMP (Fig. 6B-26)

1. Be sure choke is wide open so fast idle cam does not hold throttle valves open.

2. Adjust the distance from the top of the bowl cover to bottom of "S" pump link to .300 ± .030.

NOTE: The Super Hydra-Matic carburetor is drilled for distributor vacuum spark advance but plugged with a pipe plug. In no case should the throttle return check diaphragm be connected to this passage.

3. To adjust, bend throttle connector rod at lower angle.

ADJUST CHOKE PISTON LEVER

1. Remove three choke coil housing screws and choke coil housing and thermostatic coil.

2. Remove coil housing gasket and baffle plate.

3. Completely close choke valve.

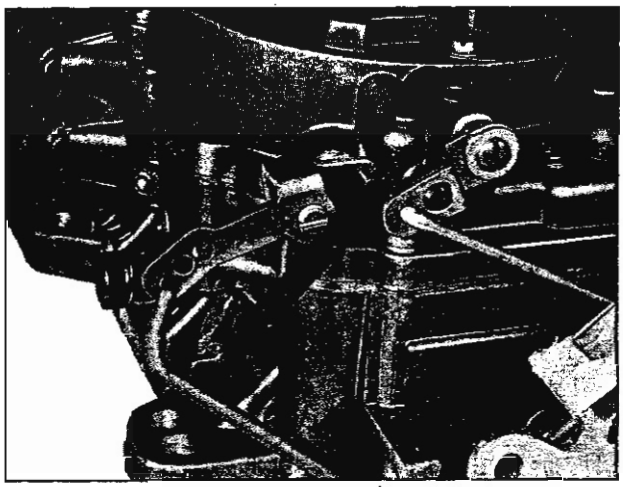


Fig. 6B-26 Pump Rod Adjustment

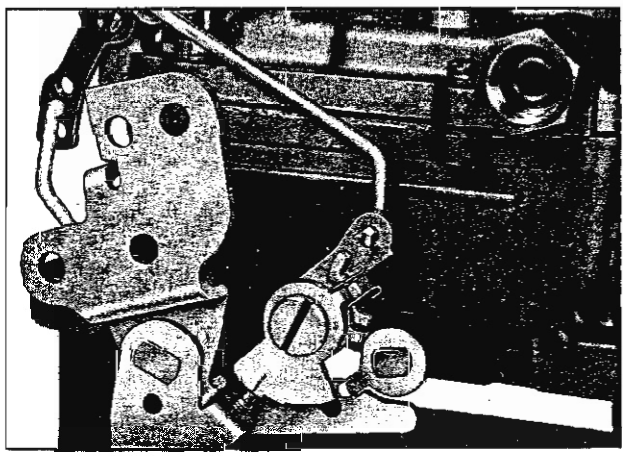


Fig. 6B-27 Choke Shaft Lever Adjustment

4. Choke piston should be flush within ± .015" with outer lip of cylinder.

ADJUST CHOKE SHAFT LEVER (Fig. 6B-27)

With choke valve fully closed and choke lever and arm in contact, bend choke connector rod to align cam index mark on fast idle cam with fast idle screw.

ADJUST SECONDARY THROTTLE LEVER (Fig. 6B-28)

1. Fully open both sets of throttle valves. (In this position the stop lugs on primary and secondary throttle levers should contact the boss on the flange.)

2. To adjust, bend secondary throttle operation rod at angle.

NOTE: Primary throttle valves will be a few degrees past vertical and secondary throttle valve will be a few degrees from vertical at wide open throttle.

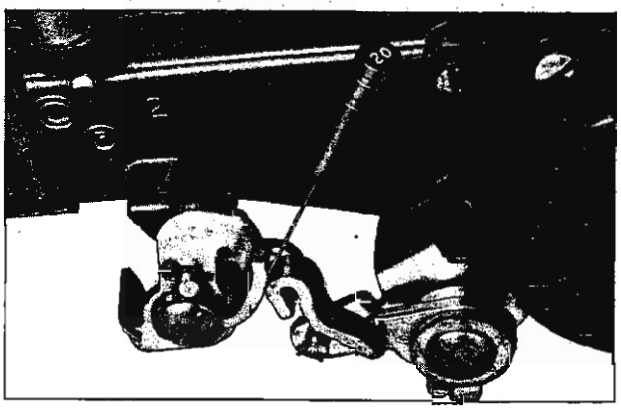


Fig. 6B-28 Secondary Throttle Lever Adjustments

3. Now close primary and secondary throttle valves.

4. There should be .020" ± .010" clearance between positive closing shoes on primary and secondary throttle levers at their closest position.

5. To adjust, bend shoe on primary lever.

CARBURETOR USAGE & DISTRIBUTOR VACUUM CONNECTION

Carburetor	Usage	Distributor Vacuum Connection
3651-S (Green Tag)	V-421 Roto	To Spark Port
	V-421 Super	To Back of Carburetor Spark Port Plugged
	V-421 H.O. Roto & Super	To Back of Carburetor Spark Port Plugged
3650-S (Brown Tag)	All V-421 SMT.	To Back of Carburetor Spark Port Plugged
3648-S (Red Tag)	V-389 Roto	To Spark Port
3649-S (Gold Tag)	V-389 Super	To Back of Carburetor Spark Port Plugged
3647-S (Black Tag)	V-389 SMT.	To Back of Carburetor No Spark Port

	Rochester 2GC 7023060 7023061	Rochester 2GC 7023063 7023064 7023066 7023161 7023162	Rochester Tri-Power Center Carb.	Rochester Tri-Power End Carb.	Carter AFB
Float Level	5/8" ± 1/16"	11/16" ± 1/16"	23/32" ± 1/16"	23/32" ± 1/16"	21/64" ± 1/32"
Float Drop	1-3/4" min.	1-3/4" min.	1-3/4" min.	1-3/4" min.	23/32" min.
Choke Rod	.080" ± .010"	.055" ± .010"	.055" ± .010"		
Unloader	.160 (.130-.190)	.160 (.130-.190)	.160 (.130-.190)		.150 ± .030"
Stat Setting	Index	Index	Index		1 Notch Rich
Pump Rod	1-21/64" ± 1/32"	1-1/8" ± 1/32"	1-1/8" ± 1/16"	55/64" ± 1/16"	In Center Hole .300" ± .030
Idle Vent	1-17/64" ± 1/64"	1-5/64" ± 1/64"	1-1/32" ± 1/64"		
Vacuum Switch			1-3/32" ± 1/64"		
Secondary Throttle Lever					.020" ± .010"
Fast Idle Speed					2500 rpm
Throttle Return Check Setting and rpm	1050 rpm .062"-.067"*	1050 rpm .090"-.095"*			1050 rpm

*With Screw on Next to High Step on Cam

ENGINE TUNE-UP

CONTENTS OF THIS SECTION

HOT IDLE SPEED AND MIXTURE ADJUST

The following adjustment procedure outlined in the ENGINE FUEL SECTION, adjust carburetor idle speed and mixture to give the smoothest idle at the following specifications.

HOT IDLE SPEED SPECIFICATIONS

	V-389 & 421	421 H.O.
A-Automatic Transmission in Drive Position . .	480-500 rpm	640-660 rpm
B-Automatic Transmission with Air Conditioning in Drive position Air Conditioning Off . . .	540-560 rpm	690-710 rpm
C-Synchromesh	480-500 rpm	640-660 rpm
D-Synchromesh in Neutral with Air Conditioning, Air Conditioning Off .	540-560 rpm	690-710 rpm

FAST IDLE SPEED ADJUST

Following procedures outlined in the ENGINE FUEL SECTION, adjust fast idle speed to the following (with fast idle screw at highest step of fast idle cam):

Carter 4-Barrel Carburetor --
H.M. and S.M. Transmission . . . . 2500 rpm

CARBURETOR—CLEAN AIR CLEANER AND CRANKCASE VENTILATOR AIR CLEANERS

The entire air cleaner should be removed from the car for cleaning. The metal cover and shell of the air cleaner should be cleaned on the inside surfaces.

Remove filter element from standard carburetor air cleaner for cleaning every 6000 miles or 6 months, whichever occurs first, wash dirt from filter element and from crankcase ventilator inlet (oil filler cap) by plunging up and down several times in suitable solvent, re-oil, use engine oil. Clean and re-oil after each occasion of driving under severe dust conditions.

POLYURETHANE HEAVY DUTY CLEANER

Clean or replace every 12,000 miles or yearly.

NOTE: Clean or replace after each occasion of driving under severe dust conditions.

Remove the cleaner assembly from the engine, remove the cleaner element from the cleaner assembly, and remove the screen from the cleaning element. Wash the element in suitable solvent such as kerosene at room temperature to remove oil and dirt. Squeeze element (do not wring) dry. Dip in SAE 10W-30 oil and squeeze to remove excess oil.

SPECIFICATIONS

Specifications remain the same as outlined on pages 6-49 through 6-66 of the 1963 Pontiac Chassis Shop Manual, except for the following changes.

Page 6-49
1 - Compression ratio 10.25:1 becomes 10.5:1 for 1964.
2 - Add 425E engines to 8.6:1 compression ratio.
3 - 10.75:1 Compression ratio on 421 H. O. and 421 equipped with Tri-power only.

Page 6-50
1 - Include in the horsepower and torque section, the following specifications for the 421 Tri-power engine: 346 horsepower at 4600 rpm - torque 454 at 3200 rpm.
2 - Compression pressure at cranking

speed for the 10.5:1 compression ratio premium fuel 4 barrel 389 and HM (except economy and special engines) 155-165 psi @ 155-165 rpm.

Page 6-53 1 - Delete crankcase ventilator pipe bracket bolt torques - all three lines.

ENGINE CLUTCH

No changes affecting service procedures have been made on the engine clutch for 1964. Therefore, the operation and service information in section 6D of the 1963 Pontiac Chassis Shop Manual also applies for 1964 models.

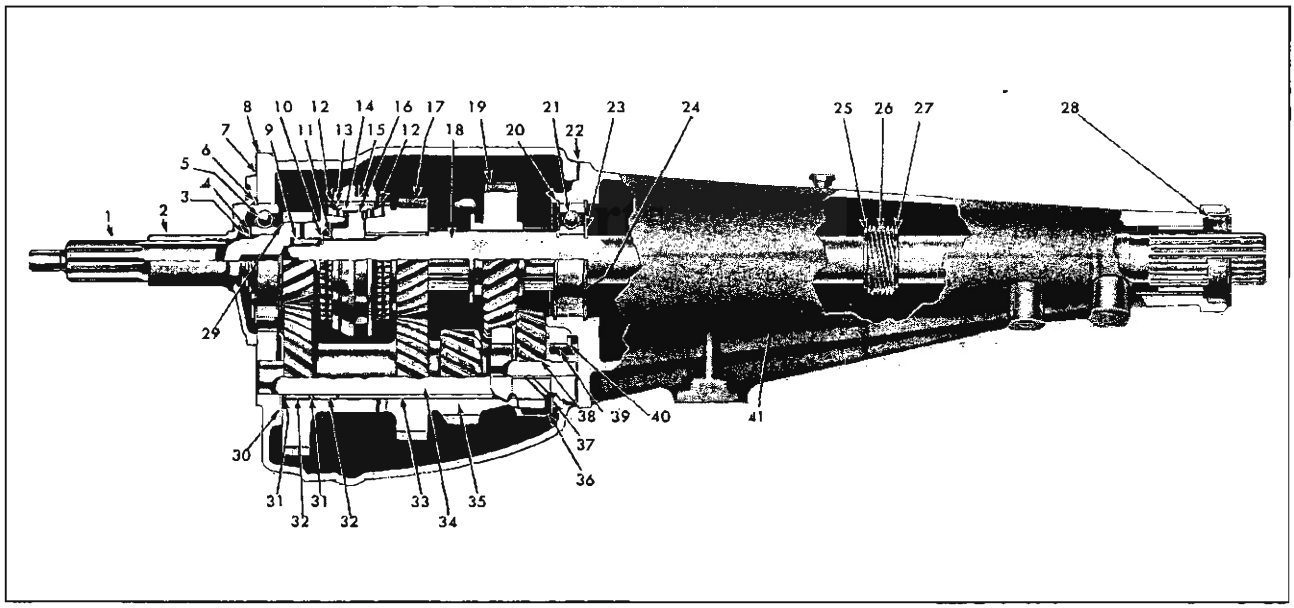
STANDARD TRANSMISSION AND GEARSHIFT CONTROL

No changes affecting service procedures have been made on the standard transmission and gearshift control for 1964. Therefore, the operation and service information in section 7 of the 1963 Pontiac Chassis Shop Manual also applies for 1964 models.

HEAVY DUTY TRANSMISSION AND GEARSHIFT CONTROL

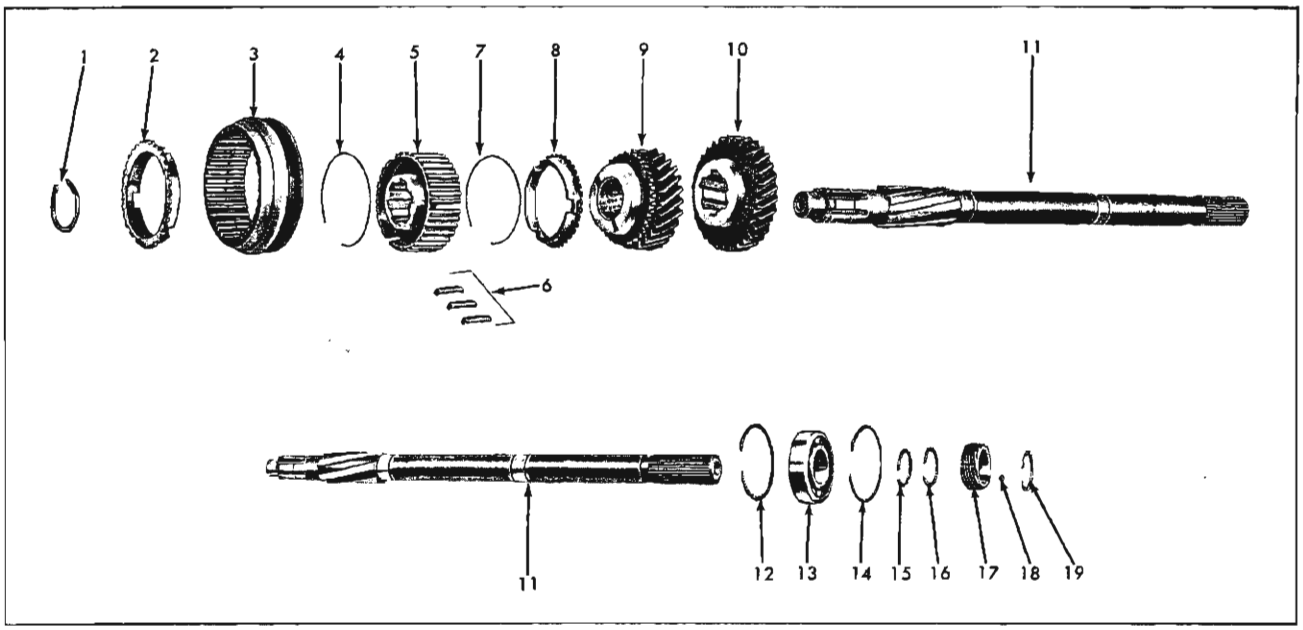
No changes affecting service procedures have been made on the heavy duty transmission and gearshift control for 1964. Therefore, the operation and service information in section 7A of the 1963 Pontiac Chassis Shop Manual also applies for 1964 models except for the following corrections.

1. Figure 7A-1 (7A-2 in 1963 manual) has been revised to show a large rear bearing rear snap ring (No. 24) the same size as the front snap ring (No. 20). The original rear bearing rear snap ring (No. 23) is now referred to as the small snap ring.



1. Main Drive Gear
2. Main Drive Gear Bearing Retainer
3. Main Drive Gear Snap Ring
4. Main Drive Gear Washer
5. Main Drive Gear Bearing
6. Main Drive Gear Bearing Snap Ring
7. Bearing Retainer Gaskets
8. Transmission Case
9. Mainshaft Front Roller Bearings
10. Bearing Spacing Washer
11. Clutch Hub Retaining Snap Ring
12. Synchronizing Rings
13. Clutch Key
14. Clutch Key Springs
15. 2nd and 3rd Speed Clutch Sleeve
16. 2nd and 3rd Speed Clutch Hub
17. Second Speed Gear
18. Mainshaft
19. First and Reverse Sliding Gear
20. Mainshaft Rear Bearing Front Snap Ring
21. Mainshaft Rear Bearing
22. Retainer Extension Gasket
23. Mainshaft Rear Bearing Rear Snap Ring (Small)
24. Mainshaft Rear Bearing Rear Snap Ring (Large)
25. Speedometer Drive Gear Front Snap Ring
26. Speedometer Drive Gear
27. Speedometer Drive Gear Rear Snap Ring
28. Retainer Extension Oil Seal
29. Oil Retaining Washer
30. Countergear Front Thrust Washer (Bronze)
31. Countershaft Bearing Retainer Washers
32. Countershaft Roller Bearings
33. Countershaft Bearing Spacer
34. Countershaft
35. Countergear
36. Countergear Rear Thrust Washer (Bronze)
37. Countergear Rear Thrust Washer (Steel)
38. Reverse Idler Gear
39. Reverse Idler Gear Shaft
40. Reverse Idler Gear Shaft Lock Key
41. Rear Bearing Retainer Extension

Fig. 7A-1 Gross Section of Three-Speed, Heavy Duty, Synchromesh Transmission



1. Snap Ring
2. Front Synchronizer Ring
3. 2nd and 3rd Speed Clutch Sleeve
4. Clutch Key Spring
5. Clutch Hub
6. Clutch Keys
7. Clutch Key Spring
8. Rear Synchronizer Ring
9. Second Speed Gear
10. First and Reverse Sliding Gear
11. Mainshaft
12. Mainshaft Rear Bearing Front Snap Ring
13. Mainshaft Rear Bearing
14. Mainshaft Rear Bearing Rear Snap Ring (Large)
15. Mainshaft Rear Bearing Rear Snap Ring (Small)
16. Speedometer Drive Gear Front Snap Ring
17. Speedometer Drive Gear
18. Detent Ball
19. Speedometer Drive Gear Rear Snap Ring

Fig. 7A-2 Mainshaft and Gears—Exploded View

2. The (large) rear bearing rear snap ring is removed from the case extension after step 26, page 7A-10 under Transmission - Disassemble.

3. Step 29 same page should read: Remove (small) rear bearing rear snap ring.

4. Step 2 under Mainshaft Assembly - Assemble and Install, page 7A-12 should read: Install (small) rear bearing rear snap ring on mainshaft.

5. The (large) rear bearing rear snap ring is installed after step 5.

6. Step 6 Under Main Drive Gear - Assemble and Install, page 7A-13 should be deleted along with the following portion of step 7. Remove bearing retainer, select gasket combination of proper thickness and . . .

7. Figure 7A-2 (7A-18 in 1963 manual) has also been revised to reflect this change.

FOUR SPEED TRANSMISSION AND SHIFT LINKAGE

No changes affecting service procedures have been made on the four speed transmission and shift linkage for 1964. Therefore, the operation and service information in section 7B of the 1963 Pontiac Chassis Shop Manual also applies for 1964 models except for the following correction.

Figs. 7B-2 and 7B-3 should be reversed.

ROTO HYDRA-MATIC TRANSMISSION

Only minor changes affecting service procedures have been made on the Roto Hydra-Matic transmission. The operation and service information in section 7C of the 1963 Pontiac Chassis Shop Manual will apply to the 1964 model transmission with the exceptions listed below.

1964 MODIFICATIONS

1. The gearshift indicator position designations have been changed. 'D is now D and D' is now S. Operation is the same.

2. The filler tube now contains a ball check and the dipstick is not locked in position.

3. Transmission locating dowels are now installed in the engine assembly.

4. The T.V. basic adjustment has been changed to 4-1/2 turns (see step 7, page 7C-37 of 1963 Pontiac Chassis Shop Manual).

5. Pressure relief ball, spring, and retaining pin have been eliminated (see Fig. 7C-110, 1963 Pontiac Chassis Shop Manual).

6. The case cover bushing has been omitted (see step 2, page 7C-54 of 1963 Pontiac Chassis Shop Manual).

7. The PG model compensator valve does not have a primary valve spring (see Fig. 7C-108, 1963 Pontiac Shop Manual).

MODEL USAGE

Engine	Car	375 Model
389 2-bbl. hi comp.	Catalina	P
389 2-bbl. lo comp.	Catalina	PE
389 4-bbl. hi comp.	Catalina	PB
389 4-bbl. hi comp.	Grand Prix	PG
421	Catalina	PAH
421 H.O.	Catalina	PC
Special order, heavy duty options, trailer provisions, police, and taxi.		
375, 2-bbl. lo comp.		PEH
375, all other engines		PAH

REAR AXLE RATIOS

Refer to Section 4.

SPEEDOMETER GEAR USAGE

Refer to Section 1.

SUPER HYDRA-MATIC TRANSMISSION

No changes affecting service procedures have been made on the Super Hydra-Matic transmission. The operation and service information in section 7D of the 1963 Pontiac Chassis Shop Manual will apply to the 1964 model transmission with the exceptions listed below.

1964 MODIFICATIONS

1. The gearshift indicator position designations have been changed. 'D is now D and D' is now S. Operation is the same.

2. The filler tube now contains a ball check and the dipstick is not locked in position.

3. The T.V. basic adjustment has been changed to 4-1/2 turns (see step 6, page 7D-34 of the 1963 Pontiac Chassis Shop Manual).

MODEL USAGE

Engine	Car	315 Model
389 2-bbl. hi comp.	Star Chief, Bonneville	PS
389 2-bbl. lo comp.	Star Chief, Bonneville	PES
389 4-bbl. hi comp.	Star Chief, Bonneville	PBS
389 4-bbl. Police	Police, Taxi	PAS
421 H.O.	Star Chief, Bonneville	PCS

Special order, heavy duty options, trailer provisions, police, and taxi.

All engines except 421 H.O.	PAS
421 H.O.	PCS

REAR AXLE RATIOS

Refer to Section 4.

SPEEDOMETER GEAR USAGE

Refer to Section 1.

FUEL TANK AND EXHAUST SYSTEM

The service information contained in section 8 of the 1963 Pontiac Chassis Shop Manual also applies to the 1964 models except for the information listed below.

MUFFLER SUPPORT HANGER

Support hangers have been improved from butyl rubber hangers to tire carcass type to provide better noise and vibration insulation on all models.

STANDARD STEERING GEAR

The 1964 Pontiac steering is similar to 1963. Maintenance and adjustments are the same as outlined in the 1963 Pontiac Shop Manual except for the following:

PERIODIC SERVICE

Periodic service consists of periodical lubrication as outlined in GENERAL LUBRICATION Section. The addition of the lubricant is to be made by removing the center side cover bolt. Fig. 9-1.

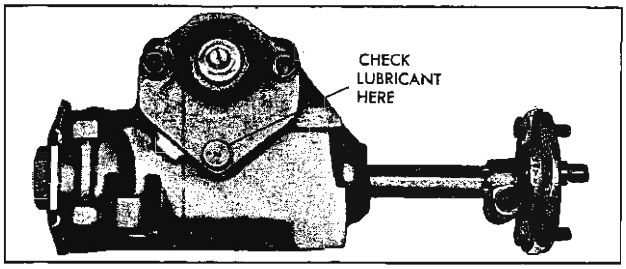


Fig. 9-1 Addition of Lubricant.

Adjust Worm Bearing Preload

1. Disconnect steering connecting rod from pitman arm.

2. Loosen pitman shaft adjusting screw lock nut and back off adjusting screw a few turns.

3. Remove horn button or horn ring and steering wheel.

4. With lb. in. torque wrench attached to a 5/8"-12 point socket, measure and record at least 30° off center.

NOTE: Do not use a torque wrench having maximum torque reading of more than 100 pounds inch. When taking following torque readings, take a reading pulling the torque wrench to the right and a reading pulling the torque wrench to the left. Total both readings and take one-half of this total as the average torque.

5. Torque required should be between 5-9 lb. ins. To correct, loosen worm bearing adjuster lock nut with brass drift and turn adjuster to bring torque within limits.

6. Retighten lock nut when adjustment is correct and recheck as in step 4 above.

Adjust Sector and Ball Nut Backlash

1. When worm bearing preload has been adjusted correctly, pitman shaft adjusting screw should be turned clockwise until a pull equal to the worm bearing preload plus 5-9 lb. ins. is required to turn the wheel through center. Total thrust bearing adjustment, pitman shaft adjustment, and drag not to exceed 14 lb. in.

3. Reassemble steering connecting rod to pitman arm. Set spokes of steering wheel in straight ahead position (mark on steering shaft up). If road wheels are not straight ahead, adjust steering tie rods.

STEERING GEAR—ASSEMBLE

For steering gear assembly refer to Section 9 of the 1963 Pontiac Shop Manual except for the following steps.

5a and 5b remain the same except the torque requirement is now 5-9 lb. in.

10. Install two cover attaching bolts. Tighten to 25 to 40 lb. ft.

11. Tighten pitman shaft adjusting screw so that teeth on shaft and ball nut engage but do not bind. Final adjustment will be made later.

12. Fill steering gear with all-season steering gear lubricant and install third cover attaching bolt. Tighten to 25 to 40 lb. ft.

13. Adjust sector preload and ball nut backlash as follows:

a. Place a 11/16"-12 point socket and lb. in. torque wrench over end of worm shaft.

b. Tighten pitman shaft adjusting screw as necessary to obtain a reading of 4-9 lb. in. in excess of thrust bearing preload when the worm gear is turned through the high point.

c. Tighten pitman shaft adjusting screw lock nut to 18 to 27 lb. ft. and recheck adjustment.

SPECIFICATIONS

Type	Saginaw Recirculating Ball Nut
Steering Gear Ratio Overall	29:1
Lubricant	See Lubrication Section
Lubricant Capacity	11 Fluid Ounces
Worm Bearing Preload	5-9 lb. in.
Sector and Ball Nut Back Lash	Worm Bearing Preload plus 4-9 lb. in.

(Total thrust bearing adjustment, pitman shaft adjustment and drag not to exceed 14 lb. in.)

WRENCH TORQUE SPECIFICATIONS

(Torque in lb. ft. unless otherwise specified)

APPLICATION	TORQUE
Steering Gear and Pitman Arm	
Bolt - Steering Gear Assembly to Frame	70-90
Nut - Pitman Arm Shaft (Standard Steering)	110-140
Bolt and Nut - Steering Column Jacket Clamp	15-20
Bolt - Cover Attaching	25-40
Steering Wheel	
Nut - Steering Wheel to Steering Column Shaft	20-35
Steering Column Bracket	
Nut - Steering Column Upper Bracket to Instrument Panel	10-35 Lb. In.
Screw - Steering Column Lower Bracket to Mounting Bracket	10-20
Screw - Steering Column Opening Cover Plate to Floor	10-35 Lb. in.
Bolt - Steering Column Shaft Jacket Lower Clamp	10-20
Steering Linkage	
Fitting - Steering Knuckle Tie Rod Ball Lubrication	*
Bolt and Nut - Steering Knuckle Tie Rod Tube Clamp	14-20
Bolt - Steering Connecting Rod Idler Lever Support to Frame	18-30
Nut - Steering Linkage (Ball Socket Stud) to Pitman Arm	40-50
Nut - Steering Connecting Rod to Tie Rod Ball Stud	50-70
Nut - Steering Connecting Rod to Idler Arm	40-50
Nut - Steering Tie Rod Ball Stud to Steering Knuckle	50-65

NOTE: (*) Torque not a requirement, other means of control and/or specifications used, checked for alignment, bottoming, height and/or leaks.

POWER STEERING GEAR

The power steering gears used on 1964 Pontiacs are similar to that used in 1963. The gear used on 26, 28, 29 series and 23 series with factory installed air conditioning is identical to 1963. That used on 23 series without factory installed air conditioning is basically the same except smaller in size.

Service Procedures remain the same except:

1. A new tool J-8947 is used in place of J-7576 on 23 series without factory installed air conditioning in the replacement of the rack piston.

2. The torque specifications for adjusting the thrust bearing preload and pitman shaft preload through center high point.

THRUST BEARING PRELOAD - ADJUST

Adjust thrust bearing so that preload is 0.5 to 2.0 lb. in. in excess of valve assembly drag. Total thrust bearing adjustment and seal drag not to exceed 7 lb. in.

PITMAN SHAFT PRELOAD THROUGH CENTER HIGH POINT - ADJUST

With gear on center, adjust pitman shaft thrust screw so that preload is 3 to 6 lb. in. in excess of total preload and drag. Total overcenter preload must not exceed 14 lb. in. through center high point when rotating worm shaft.

POWER STEERING VANE TYPE PUMP

The design and operation of the power steering pump used on all 1964 Pontiac series cars is similar to 1963, except that some system pressures have been revised and a new procedure used for the installation of the end plate.

Relief pressure under maximum conditions will control between 900 and 100 psi on 26, 28, 29 and 23 series with factory installed air conditioning, and between 1100 and 1200 psi on 23 series without factory installed air conditioning.

Tool J-7663 is not required for the installation of the end plate, the plate is now pressed in by using an arbor press.

CHASSIS SHEET METAL

Although the appearance of hood, fenders, grille and other components of the chassis sheet metal used on the 1964 Pontiac differ in appearance from those used on 1963 models the service procedures remain the same. Therefore, refer to either Section 10 of the 1963 Pontiac Chassis Shop Manual or to Section 1 of the 1964 Body Shop Manual for information on removal, replacement and adjustments.

ELECTRICAL AND INSTRUMENTS

CONTENTS OF THIS SECTION

The 1964 electrical system, and repair procedure, are carry-over from 1963 except for the following changes.

BATTERY

Battery model 568, 11 plate, 70 ampere hour is optional equipment that has been added supplement the heavy duty series.

STARTING MOTOR

The starter has been redesigned to incorporate a copper cadmium alloy washer that is cadmium plated to prevent contact sticking during starting for positive disengagement and added dependability during starting.

ALTERNATOR

There are four alternators used on the 1964 Pontiac.

The 42, 55, 60, 52 amp. alternators are installed on standard, Circ-L-Aire Conditioning, Heavy duty and transistor electrical systems respectively. (Consult specification sheet for model numbers.)

SECONDARY IGNITION CABLES

Secondary (spark plug) wiring is constructed of a graphite impregnated cotton core wrapped with a layer of inner insulation, nylon braid, and outer insulation, respectively. The full length of the wire for added strength to minimize "pull-off". The terminal connector tangs that attach to the secondary wire will also bite into, and pull against, the braid.

CHASSIS WIRING HARNESS

Redesign of the chassis harness to a 3-piece section, with a break at the dash, provides for easier servicing of the wire harness. One section of the harness services the instruments and includes the bulkhead connector and fuse block which face to the inside of the car when mounted on the dash. The twin male connector on the bulkhead connector facing the engine compartment accepts one section of the harness for the head lamp wiring system and one section of the harness for heater motor and engine wiring. (Fig. 11-5 and 11-6)

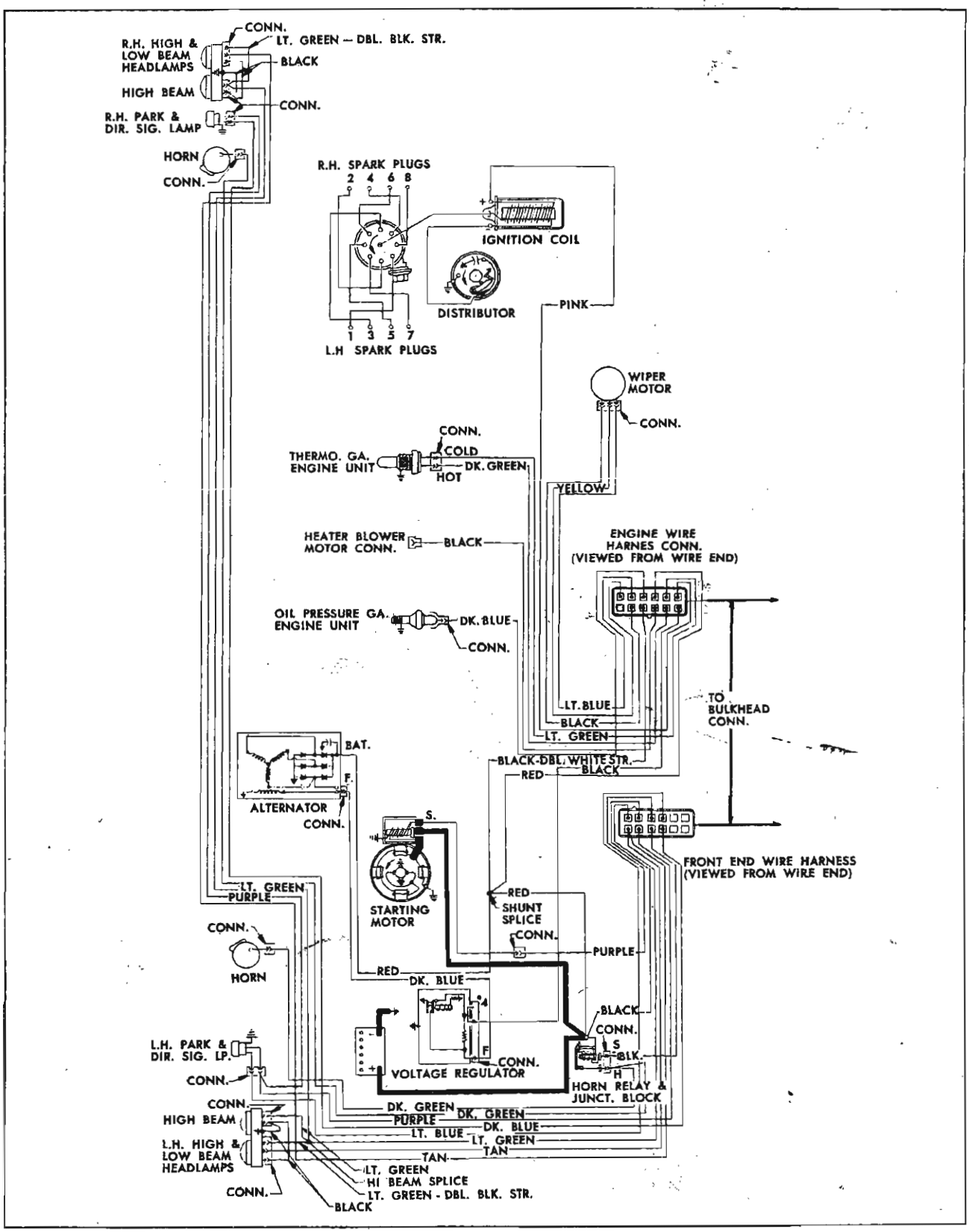


Fig. 11-1 Circuit Diagram-Dash Panel Forward

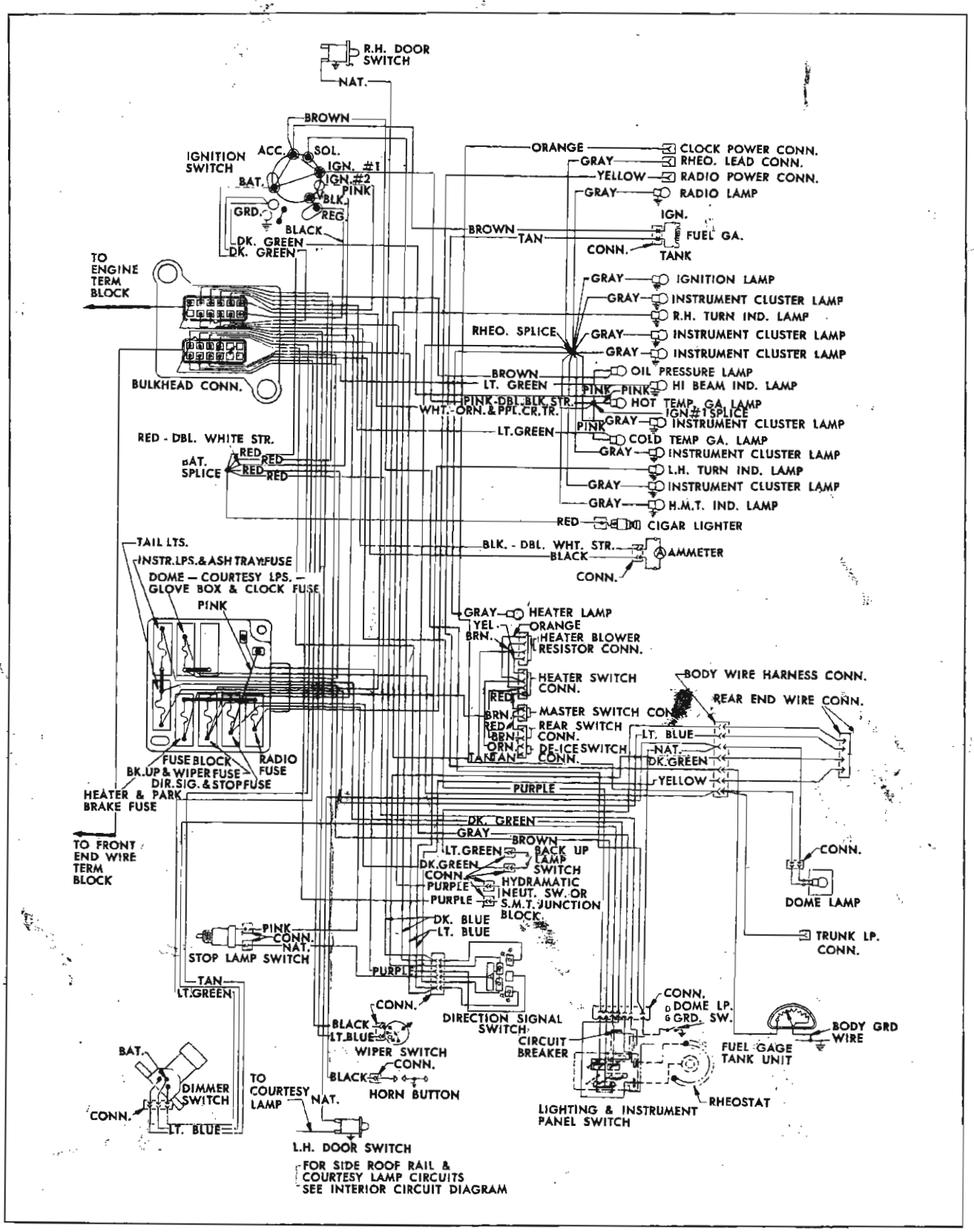


Fig. 11-2 Circuit Diagram-Dash Panel Rearward

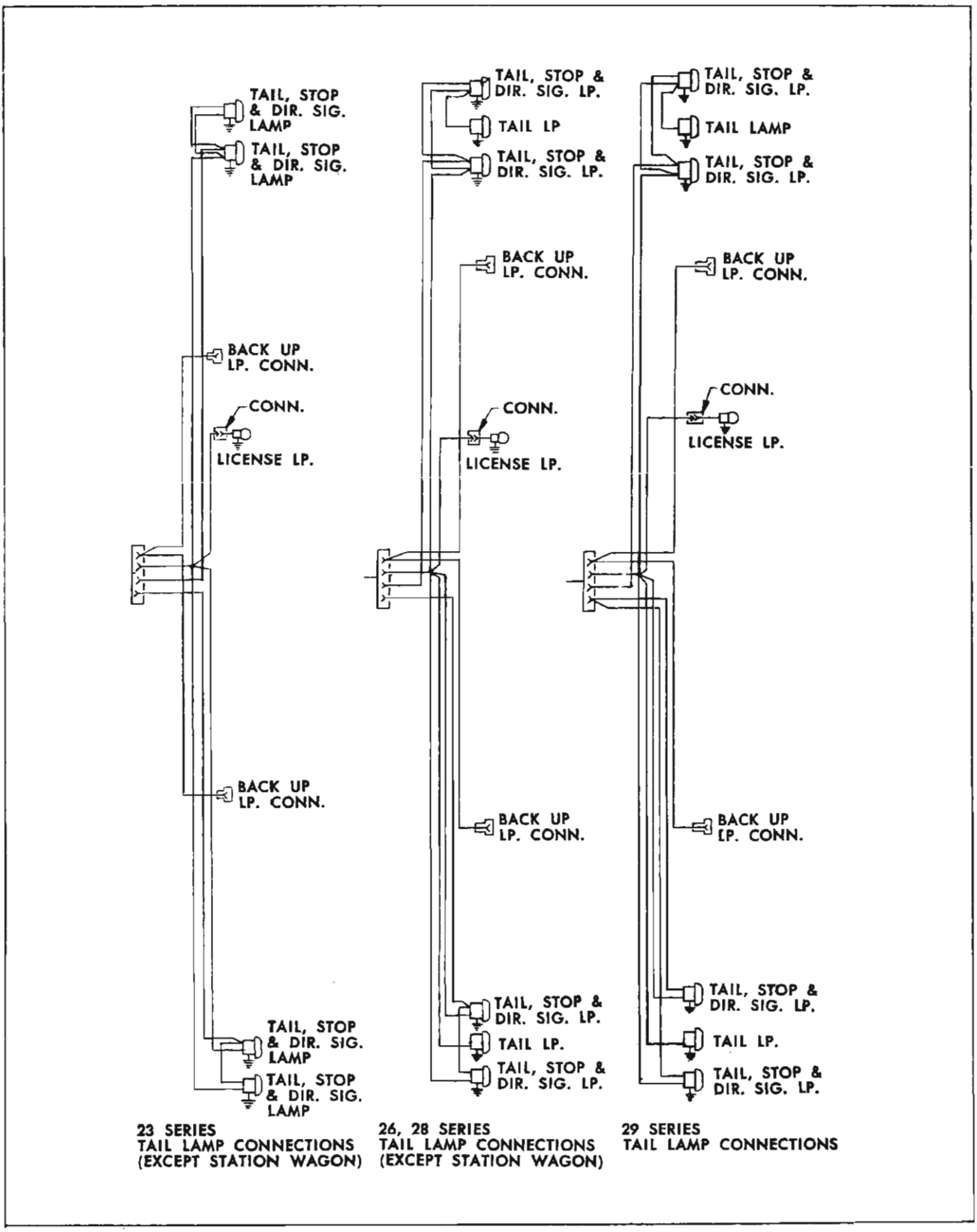


Fig. 11-3 Circuit Diagram-Taillights

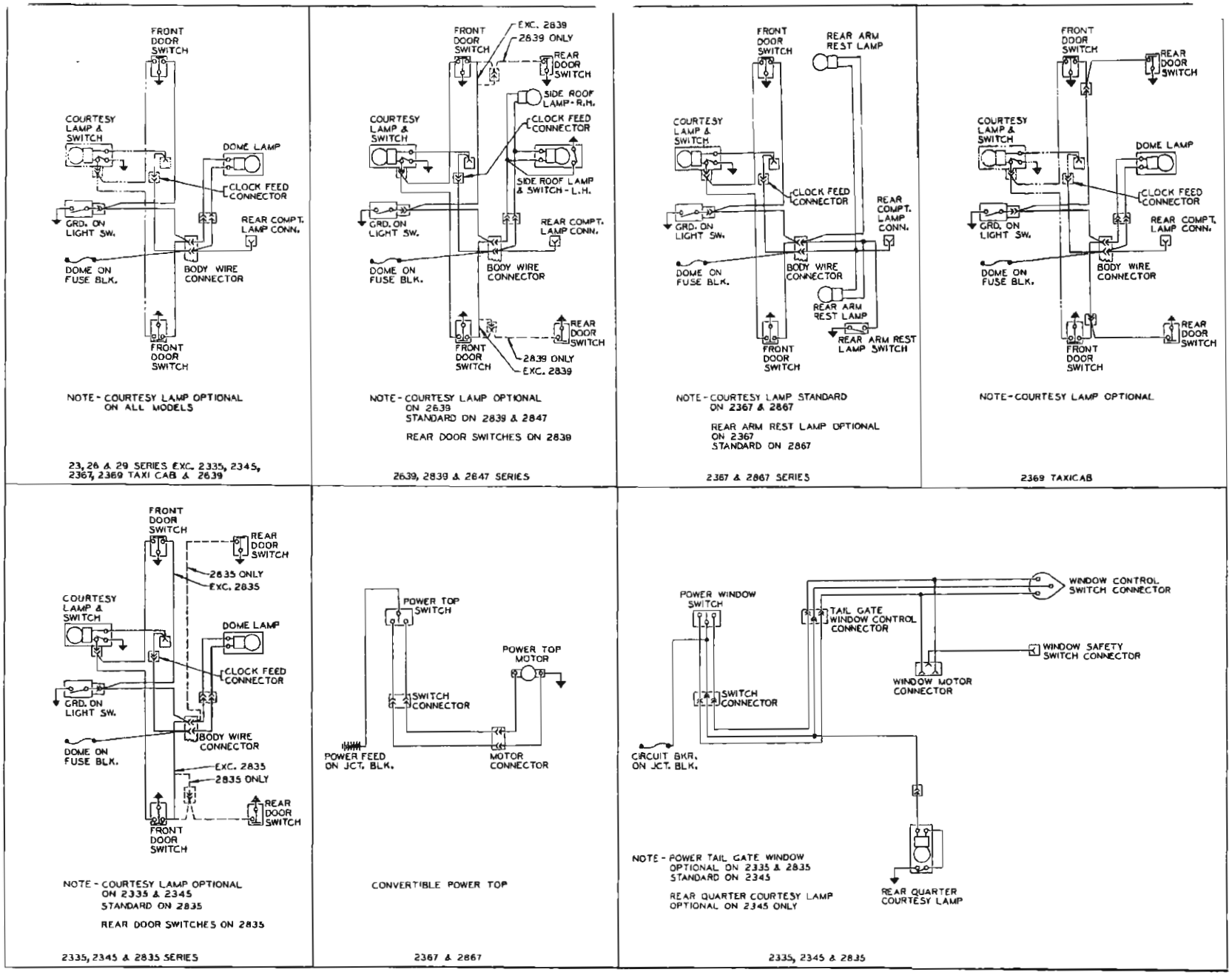


Fig. 11-4 Circuit Diagram Interior

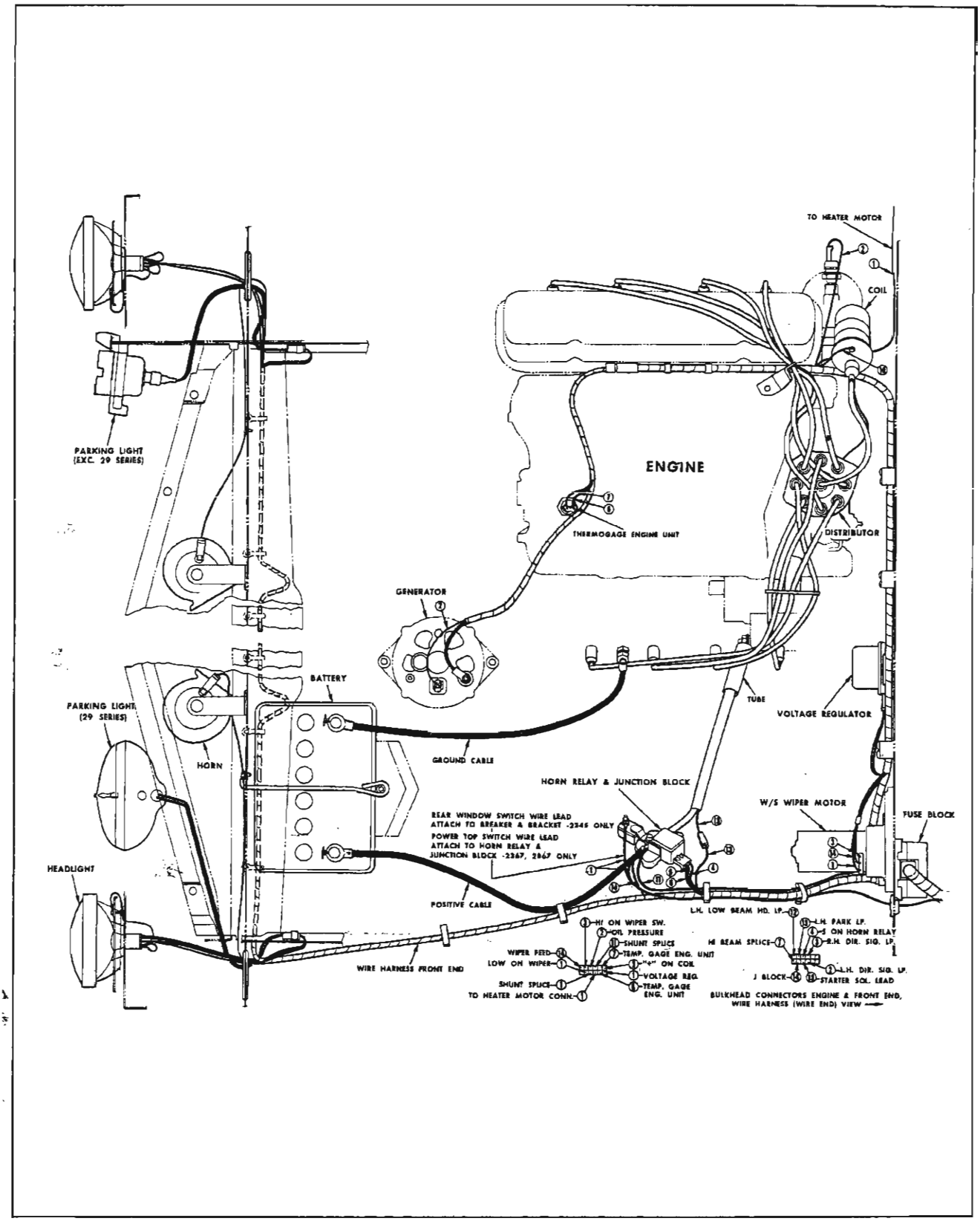


Fig. 11-5 Wiring Diagram–Engine Compartment

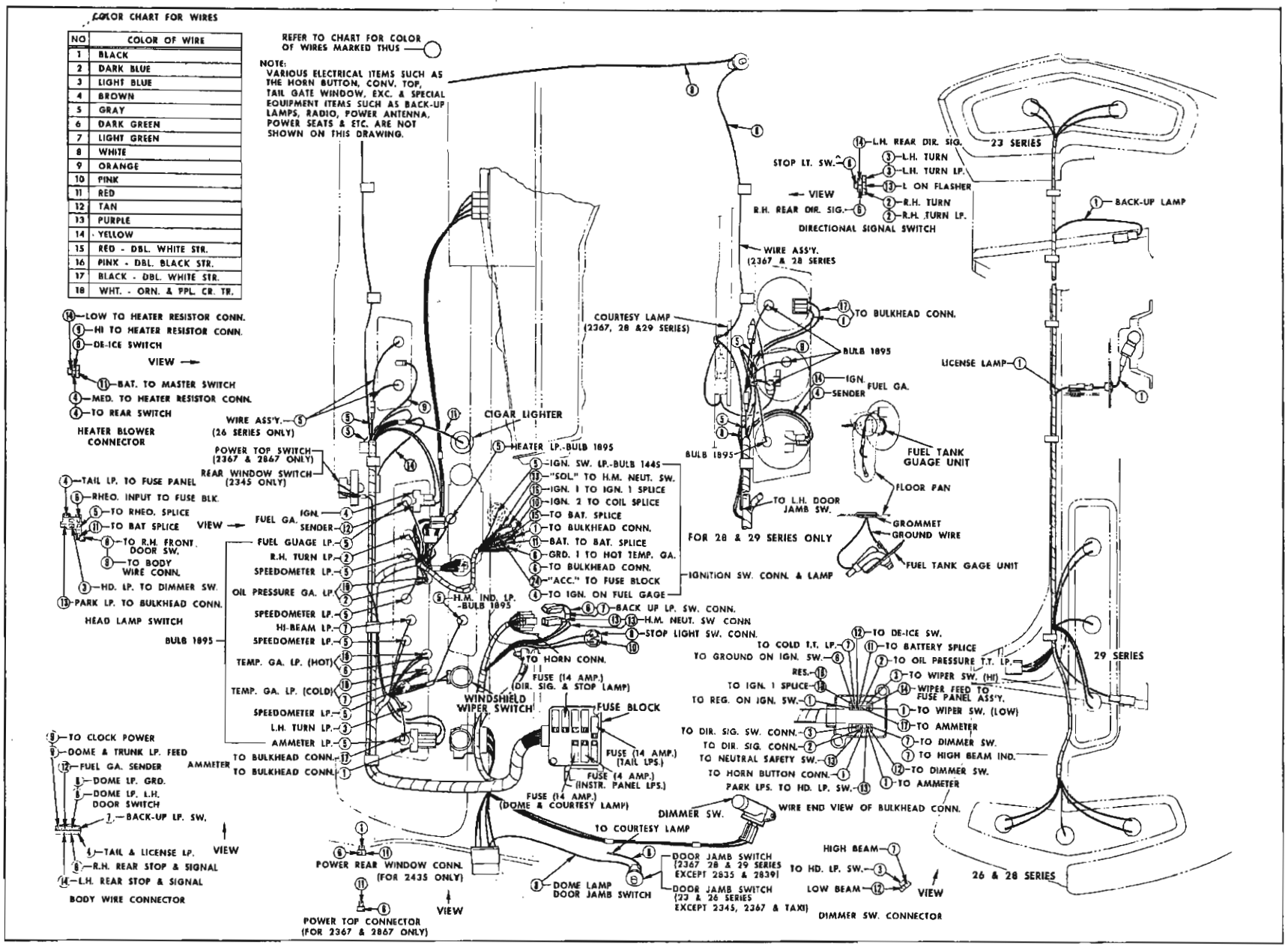


Fig. 11-6 Wiring Diagram-Dash Panel Rearward

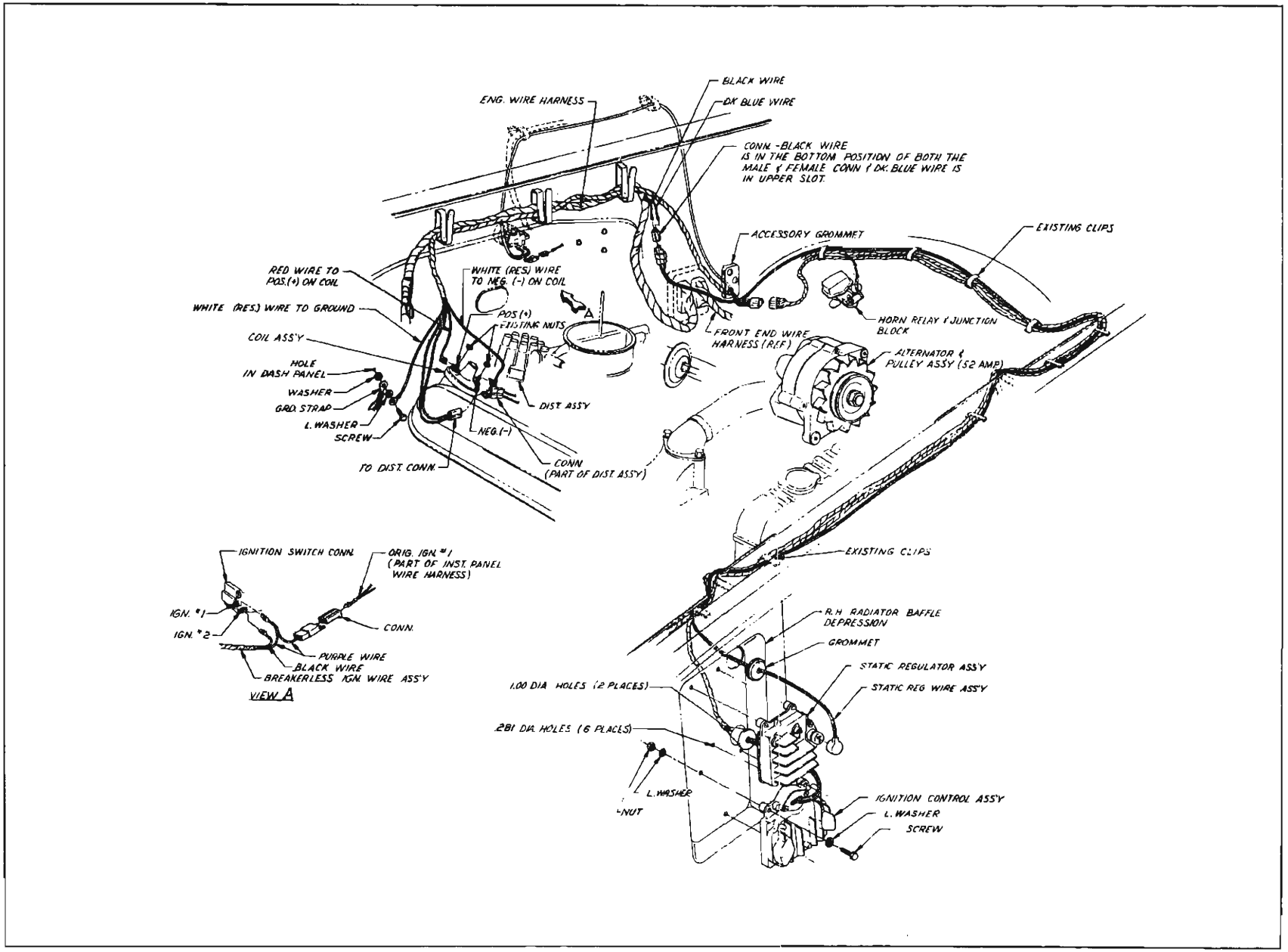


Fig. 11-7 Installation of Transistor Ignition System

TRANSISTOR IGNITION CIRCUIT

The two ballast resistors illustrated in figures 11-58 through 11-61 and 11-63 in the 1963 Pontiac Chassis Shop Manual, have been omitted for 1964. The resistance is distributed in the wire (Figs. 11-9 thru 11-11).

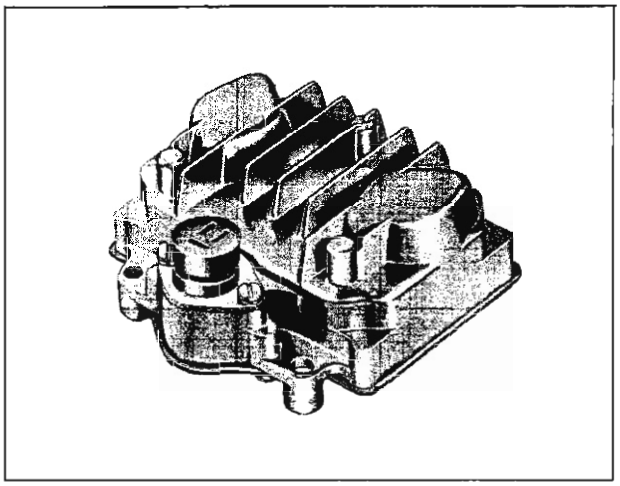


Fig. 11-8 Transistor Control Unit

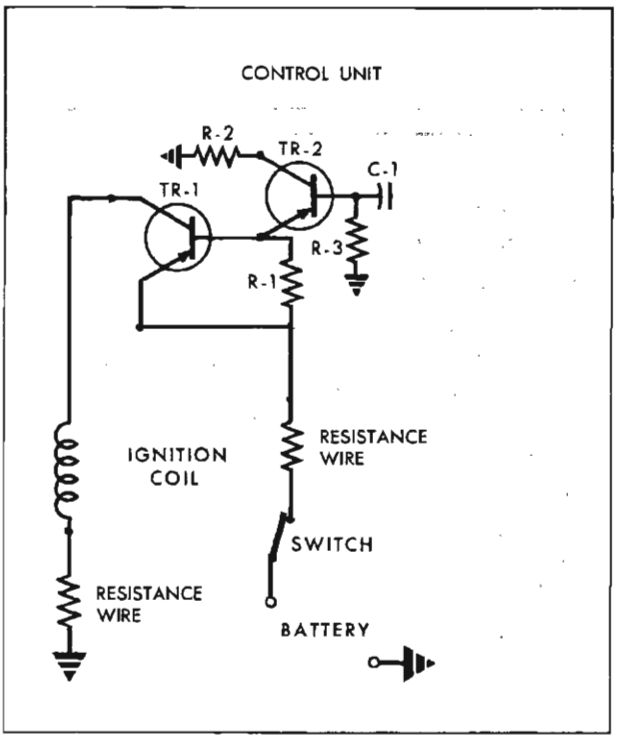


Fig. 11-10 Current Flow Schematic

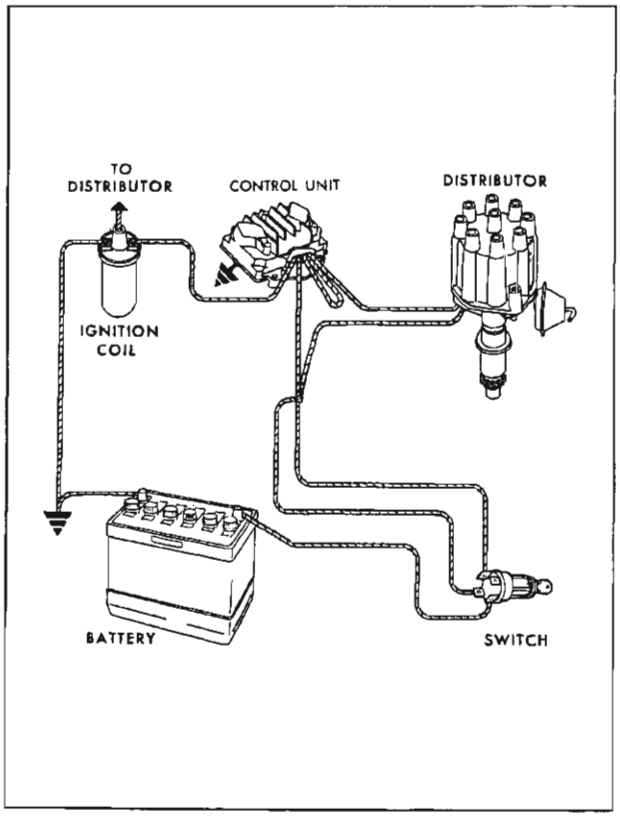


Fig. 11-9 Ignition Circuit Schematic

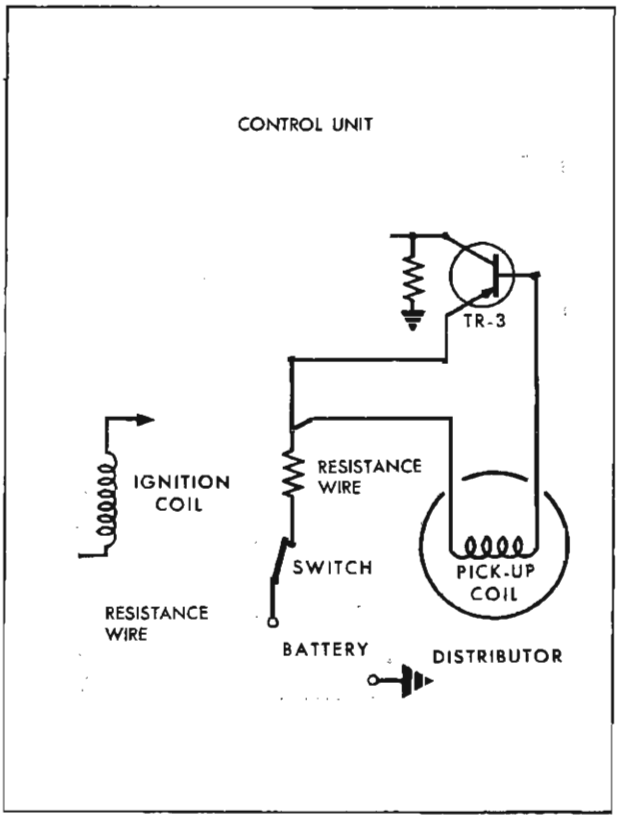


Fig. 11-11 Current Flow Schematic

PONTIAC FUSE CHART

Fuse Description	Fuse Type	Capacity (Amps.)	Opt. Std.
Air Cond. (Custom) Controls Lamp.	AGC	4	O
Air Cond. (Custom) Power & Blower Motor	AGC	20	O
Ash Tray Lamps	SFE	14	O
Back-Up Lamps	AGC	25	O
Cigar Lighter	--	--	O
Cigar Lighter Lamp	SFE	14	O
Clock Lamps	AGC	4	S
Clock Power	SFE	14	S
Compass Lamp	AGC	4	O
Console Compartment Lamp	SFE	14	S
Console Courtesy Lamp	SFE	14	S
Directional Signals & Stop Lamp	SFE	14	S
Dome, Rear Quarter or Rear Courtesy Lamp	SFE	14	S
Electrocruise & Low Fuel Lamp	AGC	20	O
Heater Controls Lamp	AGC	4	S
Heater Blower Motor	IAG	20	S
Hydra-Matic Indicator Lamp	AGC	4	O
Ignition Switch Lamp	AGC	4	S
Instrument Lamps	AGC	4	S
Instrument Panel Compartment Lamp	SFE	14	O
Instrument Panel Courtesy Lamps.	SFE	14	S
License Lamp	SFE	14	S
Lighting Switch Circuit Breaker	--	15	S
Luggage Compartment & Utility Lamp	SFE	14	O
Parking Brake Warning Lamp	AGC	20	O
Power Antenna	SFE	14	O
Power Seat Circuit Breaker	--	40	O
Power Tail Gate Window Circuit Breaker	--	40	S
Power Windows (Side) Circuit Breaker	--	40	O
Radio Dial Lamp	AGC	4	O
Radio Power.	AGW	2.5	O
Rear Window Defogger	AGC	20	O
Spot Lamp	SFE	14	O
Tachometer	IAG	1	S
Tail Lamps	SFE	14	S
Underhood or Underhood & Utility Lamp	SFE	14	O
Windshield Washer Pump	AGC	25	O
Windshield Wiper Motor	AGC	25	S

S - Standard Equipment
O - Optional Equipment

PONTIAC LAMP AND BULB CHART

EXTERIOR LAMPS			
Lamp Description	Trade No.	Std.	Qty.
Back-Up (Exc. 29)	1156	O	2
Back-Up (29)	1156	O	2
Head (Exp. & Dom.)	Type 1 (SB)	S	2
Head (Left Rule of Road).	Type 2X(SB)	S	2
Head (Right Rule of Road)	Type 2 (SB)	S	2
License	1155	S	1
Parking & Dir. Sig. (29)	1157A	S	2
Park. & Dir. Sig. (Exc. 29)	1157	S	2
Spot (Field)	4404 (SB)	O	1
Tail (2839, 47 & 67)	1155	S	2
Tail, Stop & Sig. (29)	1157	S	6
Tail, Stop & Sig. (Exc. 29).	1157	S	4
INTERIOR LAMPS			
Ammeter Illum.	1895	S	1
Ash Tray (Exc. HM Console)	1445	O	2
Ash Tray (With HM Console)	1445	S	1
Cigar Ltr. (Exc. HM Console)	1445	O	1
Cigar Ltr. (With HM Console)	1445	S	1
Clock (28 & 29)	1895	S	2
Clock (Exc. 28 & 29)	1895	O	2
Clock (Aux. Gauge)	1895	S	2
Compass (Field)	1445	O	1
Console Compt.	1895	S	1
Console Courtesy	89	S	1
Courtesy (2367, 28 & 29)	89	S	1
Courtesy (Exc. 2367, 28 & 29).	89	O	1
Courtesy Rear Compt.(2345).	89	O	1
Custom Air Cond. Controls	1895	O	1
Directional Sig. Ind.	1895	S	2
Dome Lamp	1004	S	1
Electrocruise ON	1895	O	1
Fuel Gauge Illum.	1895	S	1
Headlamp Beam Ind.	1895	S	1
Heater Controls	1895	S	1
Hydramatic Ind.	1895	O	1
Ignition Lock	1445	S	1
Instr. Panel Compt.	1895	O	1
Low Fuel Warning	55	O	1
Luggage Compt.	1003	O	1
Oil Pressure (Tell-Tale)	1895	S	1
Oil Pressure (Aux. Gauge)	1895	O	1
Parking Brake Warning	1895	O	1
Radio Dial	1895	O	1
Reading Lamp	94 IF	O	1
Rear Seat Arm Rest	68	S	2
Side Roof Rail or Sail	90	S	2
Speedo. Illum. (28 & 29)	1895	S	6
Speedo. Illum. (Exc. 28 & 29)	1895	S	4
Tachometer	1895	O	1
Temp. Gauge (Tell-Tale)	1895	S	2
Temp. Gauge (Aux. Gauge)	1895	O	1
Underhood & Utility	93	O	1
Vacuum Gauge	1895	O	1

SPECIFICATIONS

	Synchro-Mesh	Hydra-Matic	Heavy Duty	Heavy Duty
BATTERY MODEL	458	558	568	570
Capacity at 20 hr. rate amp.-hr.	53	61	70	72
	Standard with P.S.	C-L-A Condition	Transistor Ignition	Heavy Duty
GENERATOR MODEL	1100678 Standard without P.S. 1100680	1100681	1100674	1100682
Rated Output	42 amps., 14V	55 amps., 14V	60 amps., 14V	55 amps., 14V
Cold Output				
Amps. @ Alt. rpm	28 @ 2000	32 @ 2000	36 @ 2000	32 @ 2000
Amps. @ Alt. rpm	40 @ 5000	50 @ 5000	57 @ 5000	50 @ 5000
Field Current Draw	12V, 80°F. 1.9 - 2.3 amps.	12V, 80°F. 1.9 - 2.3 amps.		12V, 80°F. 2.8 - 3.2 amps.
REGULATOR MODEL	1119511	1119511	9000590	1116366
Air Gap, In.	.057	.057		
Upr. Contact Opening In.	.015	.015		
Normal Range (125°F.) V	13.5-14.4	13.5-14.4		

	Regular Fuel	Premium Fuel	"E" Eng. w/C-L-A
CRANKING (Starter) MOTOR MODEL	1107791	1107781	1107781
Brush Spring Tension oz.	35	35	35
Resistance Test (Armature Locked)			
Volts	3.5	2.0	2.0
Amperes	300-360	290-370	290-370
SOLENOID SWITCH MODEL	1119798	1114257	
Hold-In Winding (at 10V)	10.5 - 12.5 amps.	15.5 - 17.5 amps.	
Both Windings (at 10V)	42 - 49 amps.	47 - 54 amps.	

	421 Transistor		421 Standard		389 Transistor		389 Standard Low Comp.		389 Standard High Comp.	
DISTRIBUTOR MODEL	1111040		1111052		1111047		1111053		1111054	
Rotation Viewed from Cap End	C-C		C-C		C-C		C-C		C-C	
Cam Angle, set to			30°				30°		30°	
range			28°-32°				28°-32°		28°-32°	
Condenser Capacity, mfd.			.18-.23				.18-.23		.18-.23	
Centrifugal Advance (Dist. Degrees)	Deg.	RPM	Deg.	RPM	Deg.	RPM	Deg.	RPM	Deg.	RPM
Start	0-2	425	0-2	400	0-2	425	0-2	450	0-2	400
Intermediate	7-9	1000	4-6	750	7-9	1000	6-8	1050	4-6	750
Intermediate			7-9	1000					7-9	1000
Maximum	9-11	1600	8-10	1450	9-11	1600	9-11	1800	8-10	1450

	Regular Fuel	Premium Fuel	Transistor
VACUUM CONTROL MODEL	1116173	1116172	1116172
In. of Mercury to start advance	6-8	8-10	8-10
In. of Mercury for full advance	13-15	15-17	15-17
Maximum Advance (Dist.)	10°	10°	10°
IGNITION COIL MODEL	1115187	1115187	1115189
Primary Resistance, Ohms (75°F.)	1.81-1.95	1.81-1.95	.38-.51
Secondary Resistance, Ohms (75°F)	7200-9500	7200-9500	8200-12400
SPARK PLUGS	A.C.	A.C.	A.C.
Size	14 MM	14 MM	14 MM
Type	45S	45S	45S
Gap	.035"	.035"	.035"
Torque	15 - 25 lb. ft.	15 - 25 lb. ft.	15 - 25 lb. ft.
IGNITION RESISTOR WIRE			
Resistance, Ohms (80°F.)	1.32	1.32	1.32

HORNS	Model	Type	Ampere Draw
All	9000473	Low Note	8 - 11 amps. 12.5V
All	9000474	High Note	8 - 11 amps. 12.5V

RELAYS

Delco	Application	Type	Air Gap Point Closed	Point Opening	Voltage, V
537722	Air-Cond.	Control	.015"	.020"	7-9
1115833	All	Horn	.020"	.018"	1.5-9.5
1115820	All	Safeguard	-	.020-.030	*

*Adjust to buzz at .05-.07 amps. @ 13.5 - 14.5 volts.

HEATING AND ACCESSORIES

CONTENTS OF THIS SECTION

For information on accessories used in the 1964 Pontiac except that which follows refer to the 1963 Pontiac Chassis Shop Manual.

CIRC-L-AIRE HEATER

It is recommended in extremely cold weather that all snow be brushed from the hood and cowl air inlet; this will help minimize formation of ice on the inside of the windshield during warm-up.

There are no major changes in the design of the 1964 Pontiac heating system compared with the 1963 heating system affecting operation and maintenance.

ELECTRO-CRUISE

DESCRIPTION

The Electro-Cruise is a constant speed regulating system capable of accurate control of car speed over a wide range of road loads. Within the limits of the system, a speed range of 30 to 85 MPH can be accurately held within 3 MPH of the particular speed. setting. Unlike a constant throttle device which locks the throttle in a selected position resulting in speed variation according to the varying road conditions, the Electro-Cruise system compares a measurement of car speed with the selected speed to maintain the selected speed under varying road conditions.

The Electro-Cruise is an electronic-pneumatic system which consists of: a power unit mounted on the cowl in the engine compartment and connected to the throttle linkage through a ball chain; an amplifier and relay control assembly mounted on the brake pedal support arm bracket; a speed transducer which is an integral part of the speedometer; an engagement switch and a cruise lamp which are an integral part of the instrument cluster; and a cruise release brake switch located on the brake pedal arm support bracket. Fig. 12-1.

In operation, electrical signals from the speed transducer operate a vacuum switch which ports engine vacuum to the power unit. Through constant signals from the speed transducer, the power unit assumes its proper position to control the throttle opening. The electronic amplifier, engagement switch and cruise release brake release switch are the auxiliary components necessary to engage and disengage the system.

SPEED SETTING

The speed setting pointer moves over the existing speedometer scale and is set to the desired speed by rotating the Electro-Cruise knob on the face of the speedometer. The desired speed can be set either with the system engaged or disengaged; however, car speed will only be controlled by the Electro-Cruise when the system is engaged. If the speed setting is changed while the system is engaged, car speed will increase or decrease automatically to coincide with the desired setting.

ENGAGEMENT

The Electro-Cruise knob and cruise lamp are located on the face of the speedometer and fully control the engagement of the system. Fig. 12-2. To engage the system it is necessary only to depress the Electro-Cruise knob until the Cruise lamp lights indicating the Electro-Cruise is in operation. If car is at or above the speed setting when the Electro-Cruise knob is depressed, the Cruise lamp will come on immediately. If car is below the speed setting, it is necessary to depress the Electro-Cruise knob until the car has accelerated to the set speed to cause the Cruise lamp to light. Use of the

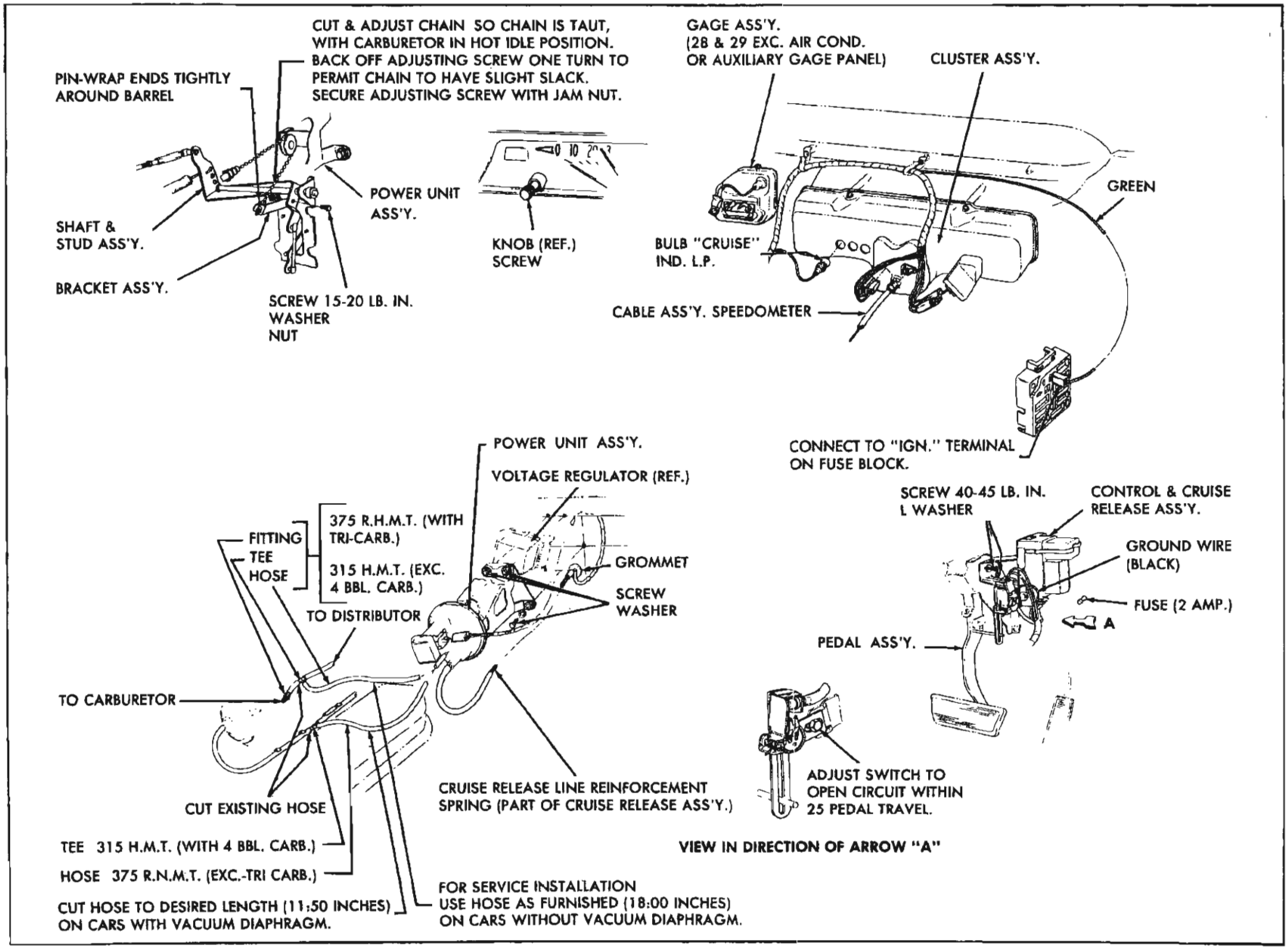


Fig. 12-1 Electro-Cruise Components

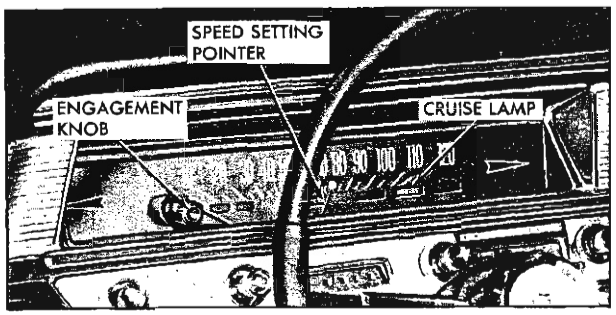


Fig. 12-2 Electro-Cruise Controls

accelerator pedal is not necessary to obtain the desired set speed with the Electro-Cruise knob depressed as the Electro-Cruise will automatically accelerate the car to this speed.

However, for faster acceleration to the set speed, the car may be brought up to speed by means of the accelerator pedal and then engaged by depressing the Electro-Cruise knob when the car is within 3 MPH of the set speed or above.

DISENGAGEMENT

The Electro-Cruise can be disengaged by a touch of the brake pedal, by pulling the Electro-Cruise knob rearward or by turning the ignition switch to the "OFF" position. Each of these will restore full accelerator pedal control to the driver. Once the Electro-Cruise has been disengaged, it is necessary to re-engage it again using the Electro-Cruise knob to restore operation of the system.

OVERRIDE

The Electro-Cruise system in no way prevents or hinders an increase in throttle angle through use of the accelerator pedal. Therefore, if a higher speed is momentarily desired when the system is in operation the accelerator pedal may be depressed in the normal manner to override the Electro-Cruise. When the accelerator pedal is released, the Electro-Cruise will again maintain the desired set speed without re-engagement.

SAFETY PRECAUTIONS

For obvious safety reasons, the Electro-Cruise should not be used in areas where conditions are not adapted to maintain a constant speed such as in heavy city-type traffic, winding or hilly roads, bad weather, etc. The Electro-Cruise should not be engaged when the car is being driven on snow, ice or mud.

OPERATION

Power Unit Fig.(12-3)

The power unit is basically a pneumatic chamber and modulating valve consisting of: a zinc housing and cover; a power diaphragm and ball chaim assembly; a diaphragm return and speed control compensating spring; an air orifice; a vacuum orifice; a modulating valve; a modulating valve return spring; a modulating valve coil; an air filter; and cruise release line fitting.

In operation, the power unit receives an electrical signal from the electronic control unit which, according to the dictates of the speed transducer, modulates engine vacuum by porting atmospheric air into the chamber to create the proper mixture or vacuum level to maintain a constant road speed. The signal which is received by the power unit during normal cruise operation, cycles the modulating valve armature between the atmosphere and vacuum ports allowing the armature to dwell on the ports for time intervals depending upon the shape of a square wave electrical output from the speed transducer.

When the modulating valve coil is energized, the "teeter-totter" armature of the control valve is pulled down against spring tension, closing the air port to atmosphere and opening the vacuum port to the diaphragm chamber. The vacuum admitted then tends to increase tension on the bead chain to open the throttle valve.

Similarly, when the control valve coil is not energized, spring tension positions the "teeter-totter" armature of the control valve to close the vacuum port and open the air port to the diaphragm chamber. The air admitted, then tends to reduce tension on the bead chain to close the throttle valve.

Thus, through continual cycling of the control valve, a vacuum level is produced in the diaphragm chamber proportional to the demands of the speed transducer and the tension of the bead chain balances the force of the existing throttle return spring to maintain the desired throttle angle. Maximum throttle angle allowed by the power unit is approximately 35°. The maximum cruise speed of the Electro-Cruise system is 85 MPH under normal road loads and conditions.

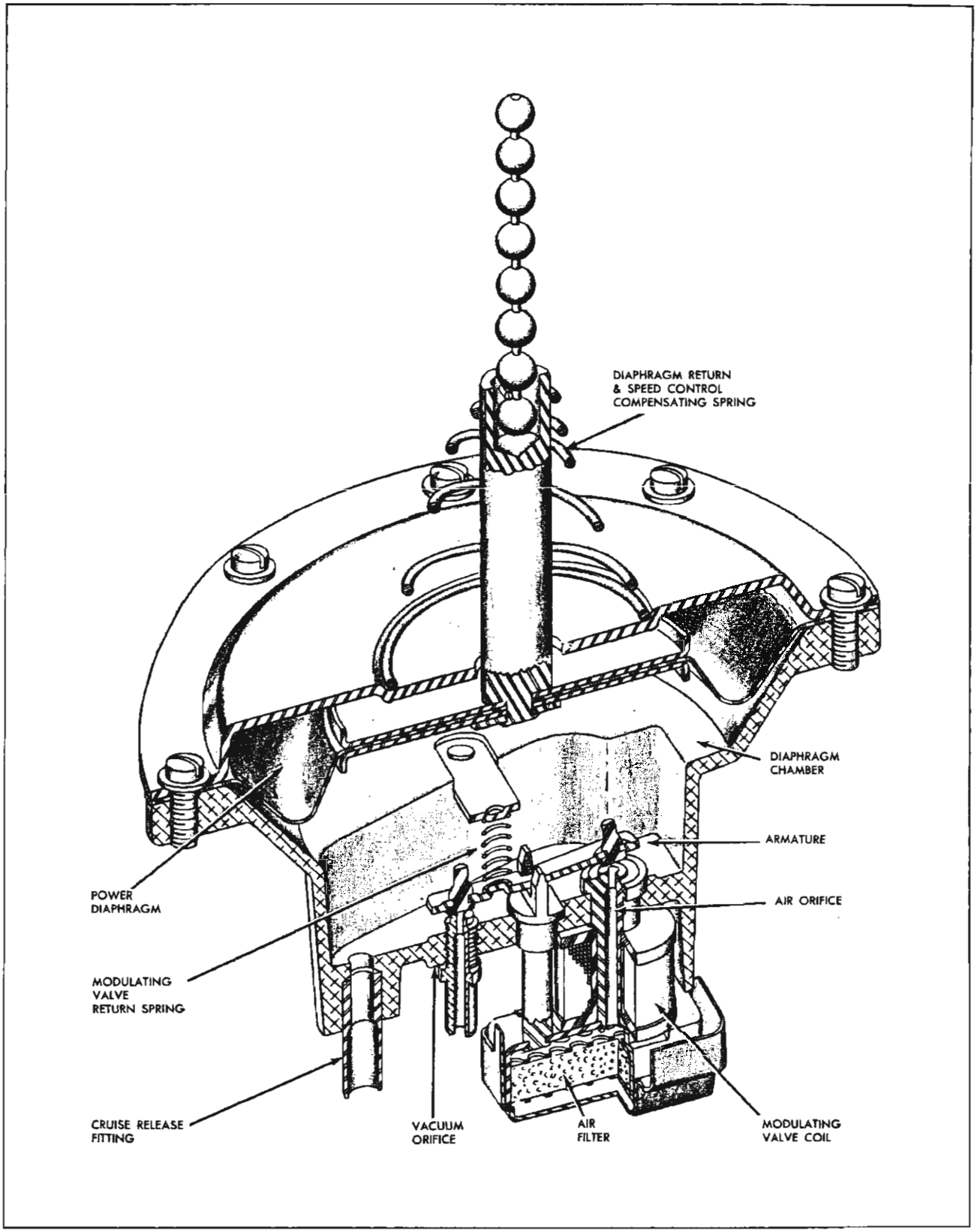


Fig. 12-3 Power Unit

SPEEDOMETER AND SPEED TRANSDUCER

The speed transducer is an integral part of the speedometer and its function is to generate an electrical signal proportional to the relation of the true road speed and that of the desired driving speed. This signal is generated by a set of contacts formed by a contact spring and pin combination. The pin, which is mounted on the speedometer pointer spindle makes constant contact with the contact spring when the car speed is below the desired operating speed. When the car speed exceeds the set speed, the contact spring is broken away from the contact pin by the cam follower arm so as to break the electrical circuit. In a range of 3 miles per hour either side of the set speed, the contacts are intermittently open and closed. In this range the period that the contacts are open or closed is proportional to the amount the speedometer pointer is above or below the set speed. Fig. 12-4.

When the Electro-Cruise is in operation at the desired set speed, the cam which is a part of the input shaft oscillates the cam follower arm. During one-half of the oscillation, the contact pin will contact the contact spring to complete an electrical circuit to the electronic control unit. During the other one-half of the oscillation, the contact spring is held away from the contact pin by the cam follower arm to open the electrical circuit to the electronic control unit. The range of contact oscillation or proportional control corresponds to a speed of 6 MPH and reflects a square wave electrical impulse to the electronic control unit, see Fig. 12-5.

As car speed increases within 3 MPH above the set speed, the cam follower arm moves the contact spring away from the contact pin to allow the circuit to the electronic control unit to remain open for a greater interval of time during one complete oscillation. Whenever car speed is more than 3 MPH above the set speed, the circuit to the electronic control unit will be open during the entire oscillation.

As car speed decreases within 3 MPH below the set speed, the cam follower arm moves away from the contact spring to allow the circuit to the electronic control unit to remain closed for a greater interval of time during one complete oscillation. Whenever car speed is less than 3 MPH below set speed, the circuit to the electronic control unit will be closed during the entire oscillation. Thus, the electrical signal which is sent to the electronic control unit is proportional to the interval of time during which the contacts are open or closed which in turn, is proportional to the amount the speedometer pointer is above or below the set speed.

AMPLIFIER AND RELAY

The electronic controls consist of a differential relay and a transistor amplifier assembly mounted on a common junction block which is an integral part of the system's wiring harness. Both assembles are designed to individually plug into the junction block; therefore, each can be serviced separately. A two ampere fuse is incorporated into the junction block to protect the entire electrical circuitry of the system. See Fig. 12-6.

The transistor amplifier serves as a power amplifier to increase the strength of the electrical signal from the speed transducer to the coil of the power unit modulating valve. Since high currents are not carried by the speed transducer contacts, their life is greatly increased. Design of the amplifier circuit is such that whenever the speed transducer contacts are closed, the circuit through the amplifier is completed and the power unit coil is energized. Likewise, whenever the speed transducer contacts are open, the circuit through the amplifier is open and the power unit coil is not energized.

As long as the differential relay holding coil remains energized to hold the contact points in the DOWN position, the system will be "locked" in cruise operation and car speed will be controlled by the power unit in accord with the electrical signal produced by the speed transducer. Opening either the cruise release brake switch, the engagement switch, or the ignition switch, will "unlock" the system from cruise operation by allowing the relay contact points to return to the "up" position.

Two opposing coils and a double set of contact points within the relay function to control the "locking" and "unlocking" of the system in cruise operation. In addition, the relay controls operation of the Cruise lamp.

Normally the contact points are held in the "up" position by spring tension. Whenever car speed is below set speed and the Electro-Cruise knob is fully depressed, the holding coil is energized and since the speed transducer contact points are closed, the amplifier circuit is closed allowing the inhibiting coil and power unit coil to be energized. Since the magnetic attraction of the inhibiting coil opposes the attraction of the holding coil, the relay contact

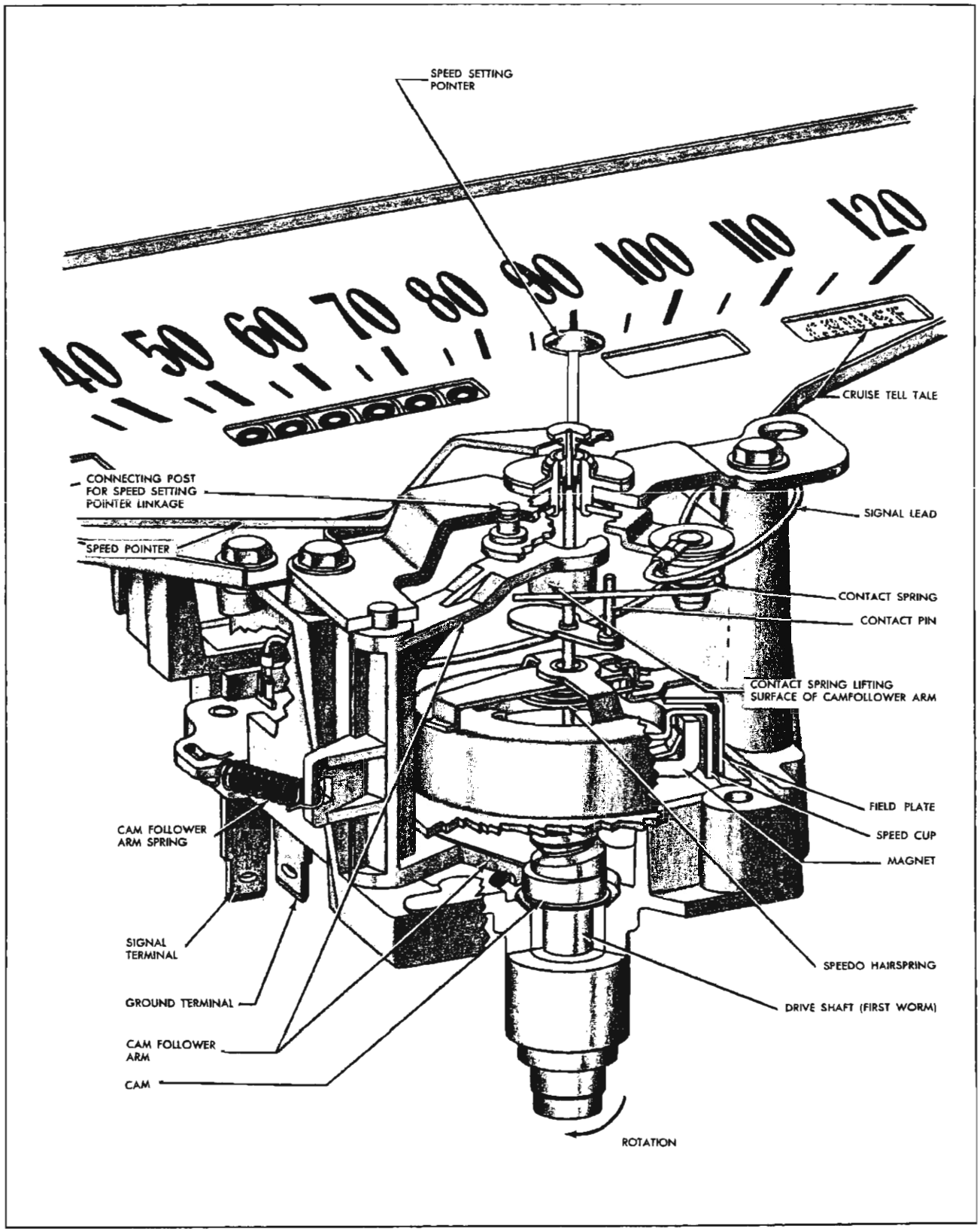


Fig. 12-4 Speedometer and Speed Transducer

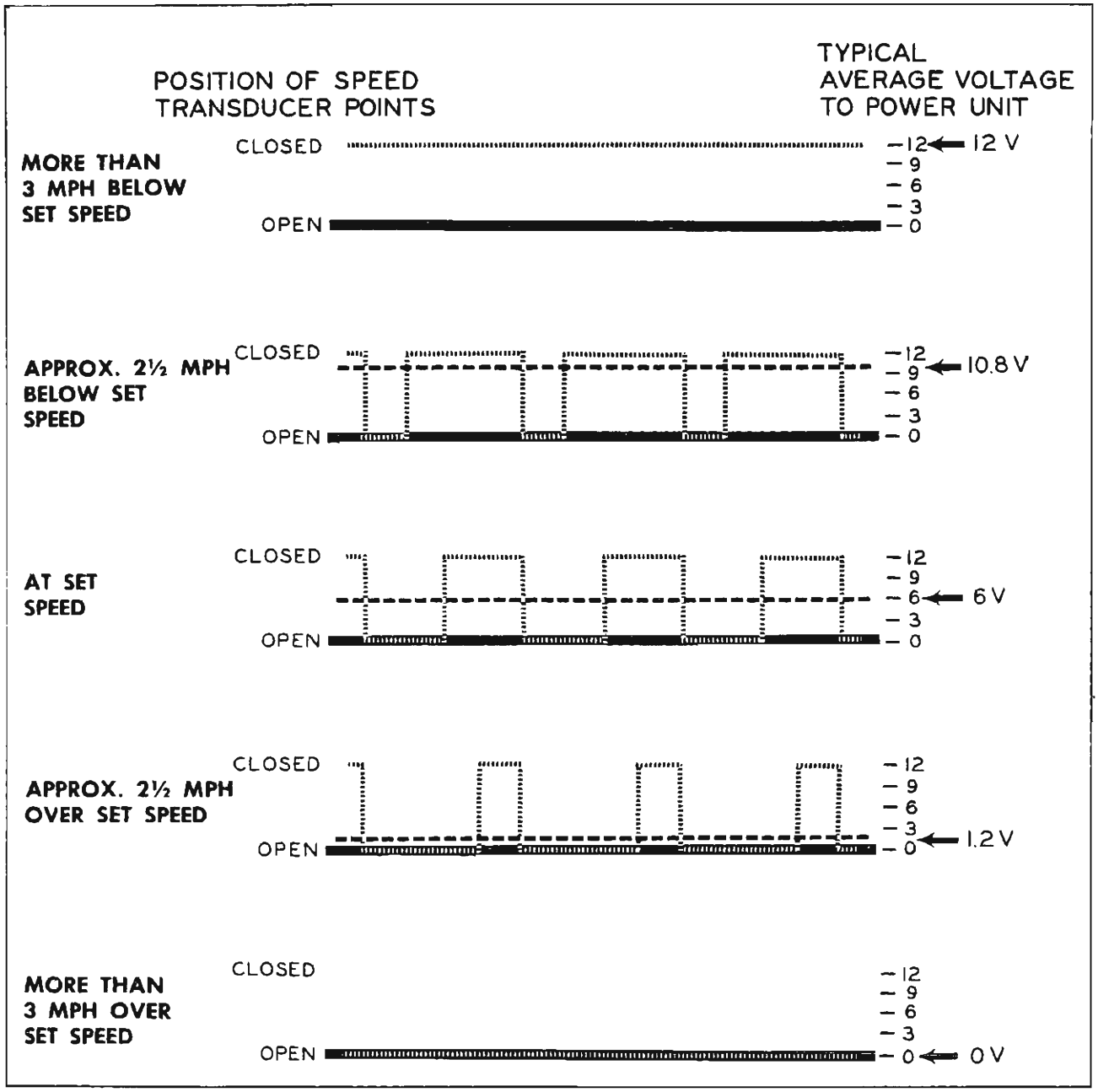


Fig. 12-5 Speed Transducer - Outputs

points will remain in the "up" position allowing the circuit to the power unit coil to be closed only by continually depressing the Electro-Cruise knob. With the relay contact points in the "up" position, the Cruise lamp circuit is open indicating the system is not "locked" in cruise operation.

When car speed is within 3 MPH of the set speed or above, the amplifier circuit is opened by opening of the speed transducer contact points and the inhibiting coil circuit will be opened allowing the holding coil to move the contact points to the "down" position. The Cruise lamp circuit will then be completed indicating the system is "locked" in cruise operation and the inhibiting coil circuit will be opened to prevent energizing of the inhibiting coil when the amplifier circuit is once again completed. In addition, a second supply circuit from the engagement switch will be completed enabling the system to function after the switch has been released to the neutral or Cruise position.

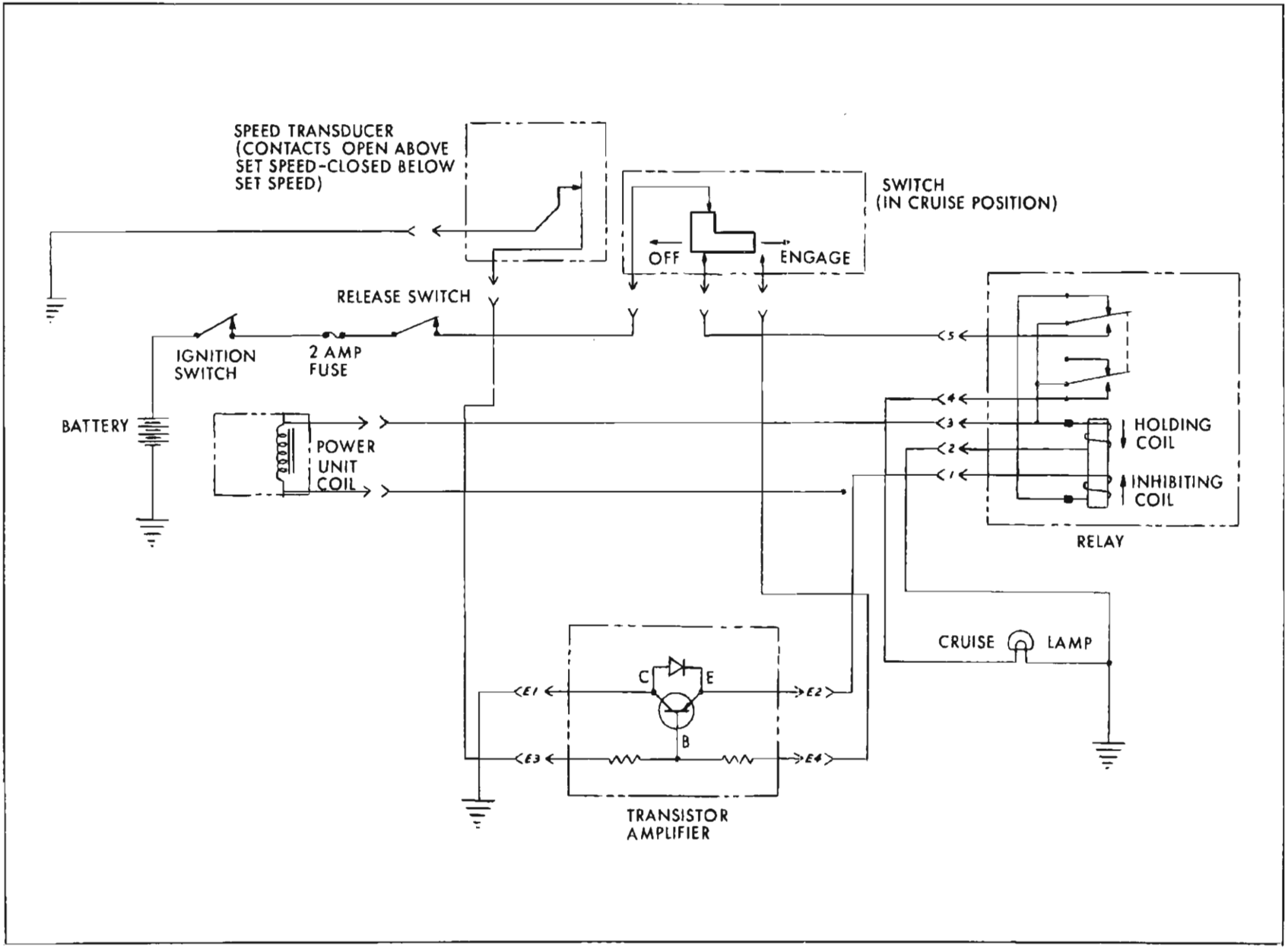


Fig. 12-6 Electro-Cruise Wiring Diaphragm

ENGAGEMENT SWITCH

The engagement switch is a three position switch connected in series with system circuitry. The switch is spring loaded and will always return to the neutral position. In the first, or "OFF" position, the circuit through the switch is open and the system is completely disengaged. In the "Neutral" or "Cruise" position, the circuit through the switch to the relay is closed and, providing the relay contacts are in the "DOWN" position, the system is energized. In the third, or "ENGAGE" position, the switch to relay circuit is completed as well as a by-pass circuit which, when the relay contact points are in the "UP" position, initially energizes the system.

CRUISE RELEASE SWITCH

The cruise release brake switch is an electric-pneumatic switch actuated by movement of the brake pedal arm. Since this switch is connected electrically in series with the system supply circuit, it will fully disengage and "unlock" the system from cruise operation when the switch is opened. Opening of the switch requires a maximum of 1/2" brake pedal travel. Additional pedal travel will open a "flap" type valve to vent the power unit diaphragm chamber to atmosphere assuring positive release of the power unit.

SERVICE PROCEDURES

IMPORTANT: Do not lubricate the power unit bead chain or its pulley.

The Electro-Cruise system requires no internal adjustments. However, at least once each five thousand miles, or oftener if dust conditions warrant it, the breather filter located on the back of the power unit should be cleaned or replaced. The procedure follows:

1. Loosen the hex washer head screw that retains the shield on the filter housing and remove shield.

2. Depress one side of the perforated metal filter-retaining screen and slide out from under the two tabs.

3. Remove the filter element and inner screen and clean both the filter and screens in a suitable cleaner such as kerosene. Squeeze cleaner out of element. DO NOT OIL ELEMENT.

4. Reinstall inner screen, filter element and outer screen.

5. Replace shield and tighten the retaining screw.

POWER UNIT BALL CHAIN ADJUSTMENT

1. Loosen the jam nut on the threaded stud that is attached to the end of the ball chain. Fig. 12-1.

2. With carburetor setting on the slow idle cam, rotate the threaded stud so that the chain is just taut without advancing the idle speed of the engine with the engine running, then back off one full turn.

3. Tighten jam nut against the rivnut on the throttle bracket.

4. The adjustment of the ball chain as given above should be checked whenever the carburetor linkage is adjusted as it is with an engine tune-up.

CRUISE RELEASE BRAKE SWITCH ADJUSTMENT

1. Disconnect wiring harness connector from the cruise release brake switch. Connect ohmmeter or test lamp across the terminals of the switch.

NOTE: If desired, the cruise lamp in the engagement switch may be used as a test lamp by unplugging connector to the speed transducer in speedometer and leaving release switch wiring connector on switch. Then, turn ignition switch on and press Electro-Cruise knob which will cause cruise light to be on.

2. Loosen the screw that retains switch to brake pedal support bracket. Position the switch to open the circuit at 1/2 inch brake pedal travel. An open circuit will be indicated by an unlit test lamp or infinite reading on ohmmeter. (If cruise lamp is used, an open circuit will be indicated when light goes out.)

3. When the brake pedal is at the released position, the circuit must be closed for Electro-Cruise to operate.

4. Tighten adjusting screw and recheck adjustment of the switch by depressing the brake pedal several times with the test lamp or ohmmeter connected.

5. Readjust as necessary and reconnect the wiring harness.

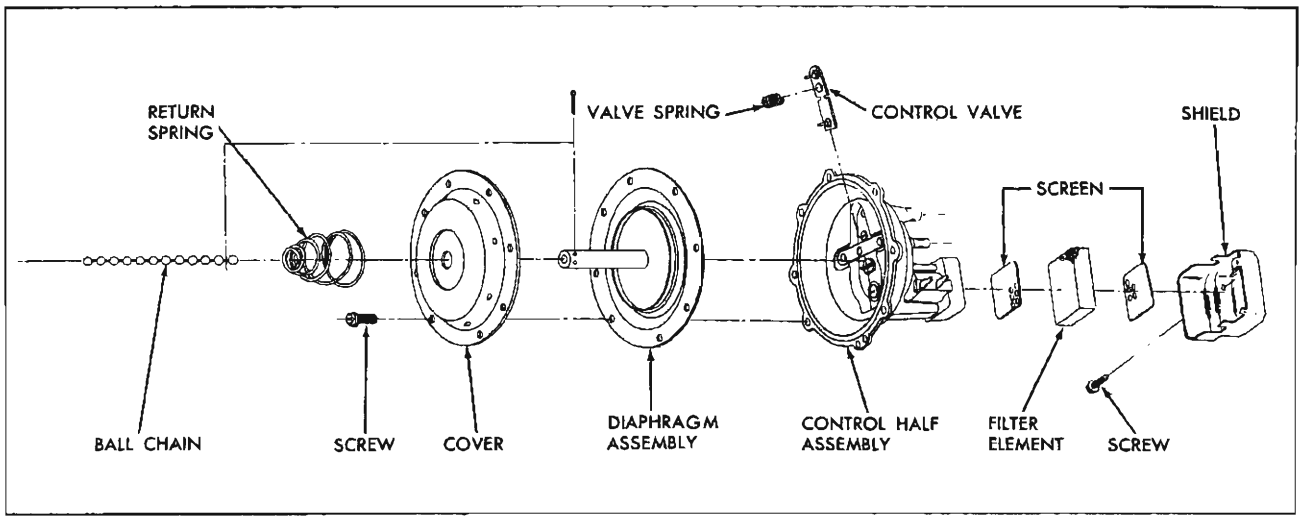


Fig. 12-7 Power Unit - Exploded View

DISASSEMBLY AND ASSEMBLY OF POWER UNIT (Fig. 12-7)

1. Disconnect the ball chain attached to the throttle linkage by removing the cotter pin from the end of the threaded stud.

2. Disconnect the wire harness connector to the power unit coil.

3. Disconnect both the engine vacuum and cruise release lines.

4. Remove the three screws holding the power unit and cover assembly to the power unit pulley and bracket assembly which is fastened to the fire wall. Fig. 12-8.

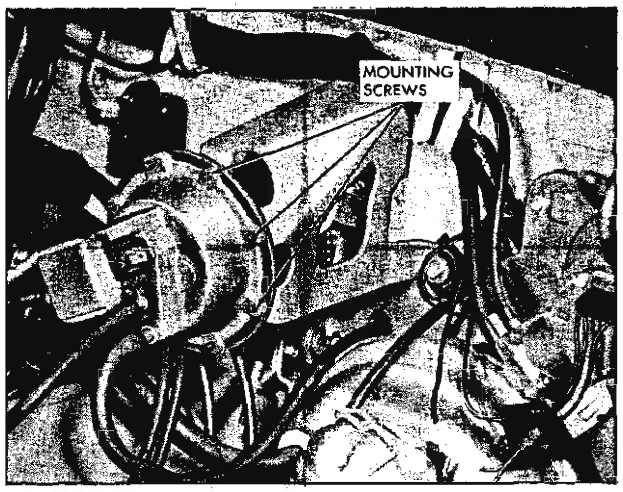


Fig. 12-8 Removal of Power Unit

5. Depress the diaphragm return spring and remove the ball chain by removing cotter pin from power unit actuator rod.

6. Remove the remaining five fillister washer head cap screws holding the power unit cover to the control half assembly.

7. Remove the armature return spring by depressing with a knife blade and push sideways.

8. Remove armature.

9. Remove filter shield by loosening the hex washer head screw that retains the shield on the filter housing.

10. Remove air filter by depressing one side of perforated metal filter retaining screen and slide out sideways from under the two tabs.

11. Wash power unit in a good detergent and blow dry.

12. Examine disphragm for cracks and pin holes and replace if necessary.

13. Check armature pads and their sealing surfaces for dirt, chips, pits, and burrs.

14. Clean or replace air filter element if necessary. DO NOT OIL ELEMENT.

15. Check for obstructions in air and vacuum orifices.

16. Replace by reversing above procedure.

NOTE: Care should be taken when the eight cap screws are replaced to tighten opposite sets of screws at a time and repeat this procedure until all are tight.

TROUBLE DIAGNOSIS

All electrical and vacuum connections and other obvious items, such as ball chain adjustment and cruise release brake switch adjustment, are to be checked and corrected prior to any type of testing.

Since the procedures outlined are performed with the car stationary, it may be necessary, in some cases, to road test the system to determine the specific complaint.

VACUUM AIR LEAK AND POWER UNIT TEST

1. Disconnect power unit ball chain from throttle rod bracket threaded stud.

IMPORTANT: Check all vacuum hoses for proper attachment at vacuum source, power unit and cruise release brake switch.

2. Pull "Electro-Cruise" knob to the "OFF" position.

3. Note position of power unit diaphragm pull rod.

4. Start engine and again note position of power unit diaphragm rod. Movement normally indicates leakage through the vacuum orifice and modulating valve. If maximum movement is noted, the wiring harness connector should be temporarily disconnected from the power unit to eliminate the possibility of an electrical problem. If diaphragm rod still moves into power unit, disassembly, inspection and repair of the power unit will be required.

5. With engine still running and ball chain still disconnected, depress Electro-Cruise knob and hold. If power unit rod diaphragm rod moves into unit, proceed with step 6. If rod does not move into unit, remove wiring connector from power unit. Using jumper wires, ground one terminal of unit and connect the other terminal to a 12 volt source and again observe diaphragm rod with engine running. If unit does not operate, remove hose which goes to Cruise release brake switch and plug release hose fitting on power unit. If power unit still does not operate properly, it is defective and should be repaired.

6. With power unit diaphragm rod pulled all the way into unit by engine vacuum and Electro-Cruise knob depressed, clamp off vacuum source hose. Leave hose clamped and Electro-Cruise knob depressed for 90 seconds. Any outward movement of rod in this period indicates leakage in the hose connections, in the cruise release brake switch, in the power unit diaphragm or through the power unit air orifice and modulating valve.

7. If leakage is noted, remove hose from the "release" hose fitting at the power unit, plug the "release" hose fitting and repeat Steps 5 and 6. If diaphragm rod now remains stationary for 90 seconds, leakage is indicated in the cruise release brake switch or the hose to it. If diaphragm rod still moves outward and all hose connections and the condition of the hoses is good, the power unit has an internal leak and should be repaired.

RELAY TESTS

If, through trouble diagnosis, trouble is indicated with the Electro-Cruise relay, the relay can be checked by two methods.

1. The first method or procedure is to substitute a known good relay and perform the procedure outlined in the Trouble Diagnosis Test Procedure test chart, or road test the car to determine whether or not the condition has been corrected.

2. The second method is to remove the relay and perform the Non-Pull-In and Pull-In checks as outlined below. These checks involve the use of a 12 volt battery, jumper wires and a 12 volt lamp such as a #53 lamp to check operation and continuity of the relay and will conclusively indicate a defective unit. A unit found to be defective will require replacement.

a. Non-Pull-In Check

1. Connect pins 1 and 2 to the negative terminal of a 12 volt battery. See Fig. 12-9.

2. Connect pin 3 to the positive terminal of battery.

3. When the connection to pin 3 is made, the relay should not pull in. A clicking sound will be noted if the relay pulls in and indicates the relay is defective and must be replaced.

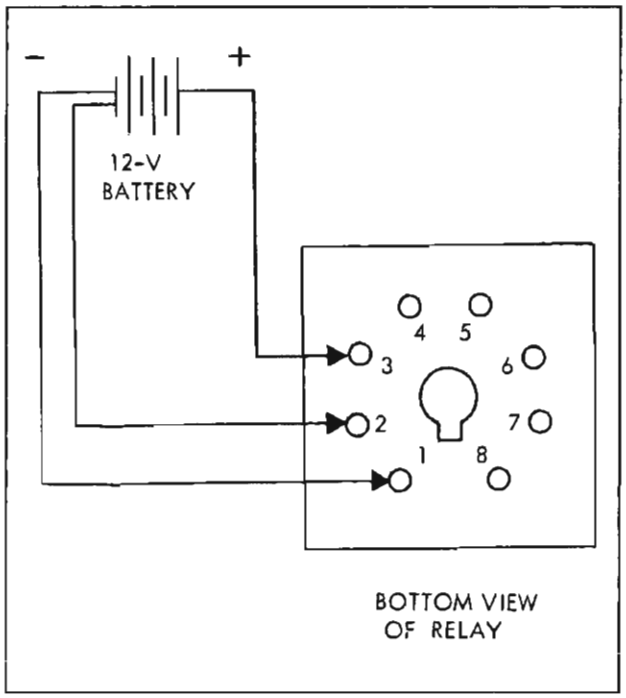


Fig. 12-9 Relay Non-Pull-In Check

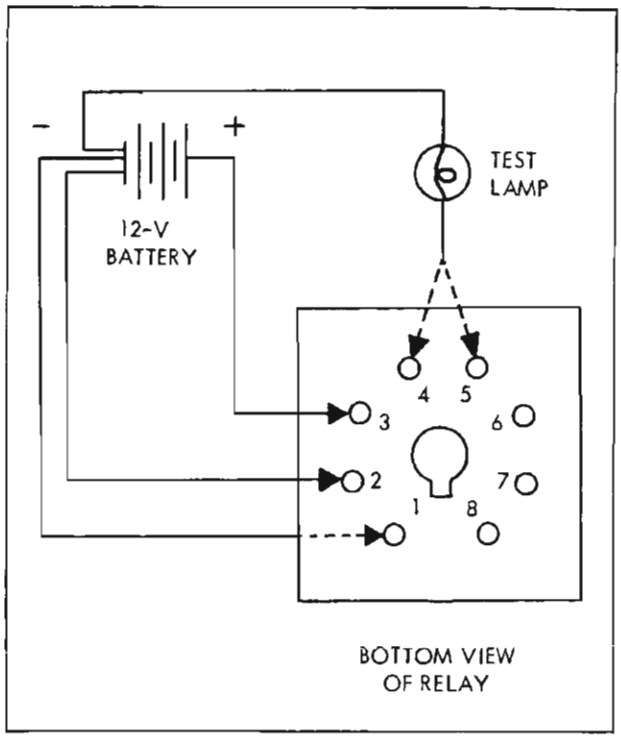


Fig. 12-10 Relay Pull-In Check

4. Perform Pull-In check.

b. Pull-In Check

1. Connect pins 1 and 2 to the negative terminal of a 12 volt battery. See Fig. 12-10.

2. Connect pin 3 to the positive terminal of the battery.

3. Connect a 12 volt test lamp such as a #53 lamp between the negative terminal of the battery and the relay, alternating the connection between pins 4 and 5.

4. During either of the above connections, the lamp must not light. If the lamp lights, a defective relay is indicated and must be replaced.

5. Disconnect connection to pin 1 and again alternate the test lamp lead between pins 4 and 5.

6. During either of the above connections the lamp should light. Failure of the lamp to light indicates a defective relay and must be replaced.

AMPLIFIER TEST

The amplifier can be checked using one of two methods similar to checking the relay. Fig. 12-11.

1. The first method is to substitute a known good amplifier and perform the procedure outlined in the Trouble Diagnosis Test Procedure chart. Fig. 12-12.

2. The second method is to remove the ampliffer and perform check as outlined below. This check involves the use of a 12 volt test lamp to check operation and continuity of the amplifier and will conclusively indicate a defective unit.

a. Connect terminal E1 to the negative terminal of the 12 volt battery.

b. Connect a 12 volt test lamp such as a #53 lamp between the terminal E2 and the positive terminal of the battery.

c. Connect terminal E4 to the positive terminal of the battery.

d. Momentarily connect terminal E3 to the ground terminal of the battery and observe the test lamp.

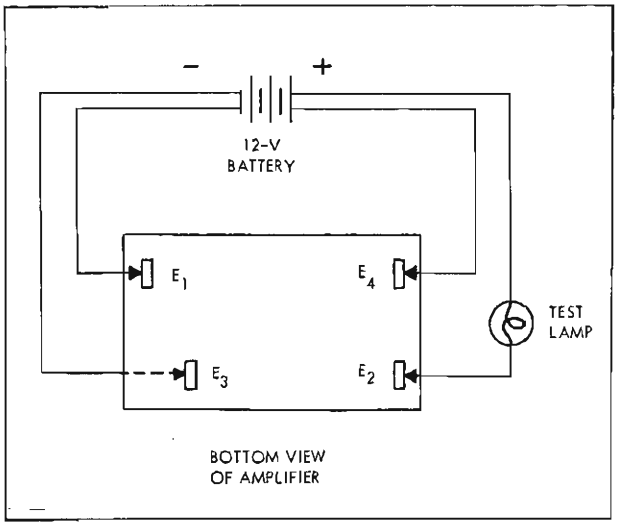


Fig. 12-11 Amplifier Test

e. The test lamp should light when terminal E3 is connected to the negative terminal of the battery and should go out when the terminal is disconnected. If the lamp remains lit when terminal E3 is disconnected, or lamp does not light when terminal E3 is connected, the amplifier is defective and must be replaced.

SPEEDOMETER TESTING

Speedometer testing is difficult since conclusive tests can only be performed with the unit in operation. Generally, then, the speedometer is assumed to be in satisfactory condition until all other components have been checked and found to be in satisfactory condition. If, after testing other components, wire harness continuity, electrical connections and vacuum leakage are found to be satisfactory, the speedometer should be removed and serviced by an authorized repair station.

CONTINUITY TESTS

Continuity of the entire "Electro Cruise" electrical system can be checked using the wiring diagram in Figs. 12-6 and 12-13.

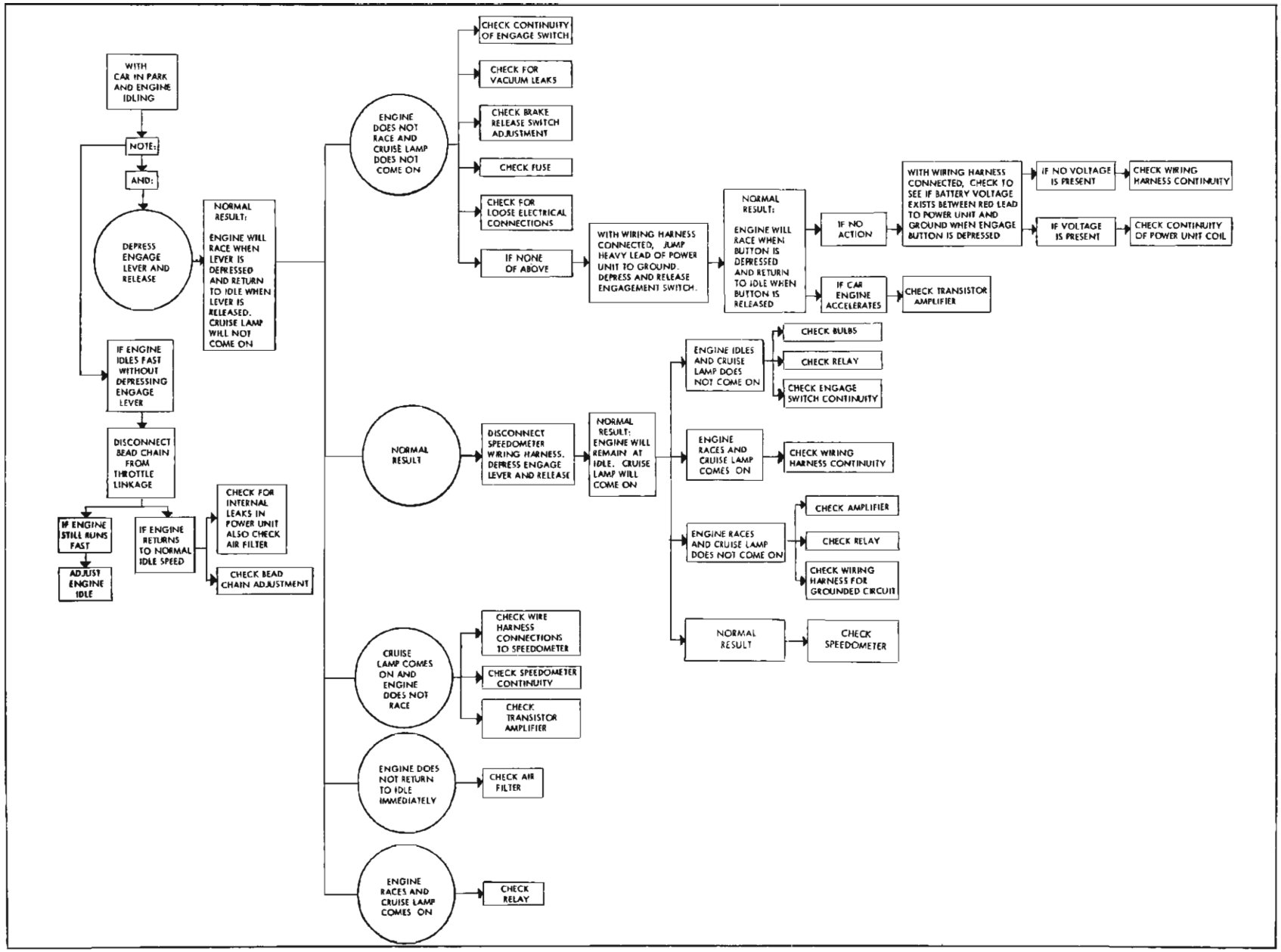


Fig. 12-12 Electro-Cruise Trouble Diagnosis Test Procedure Chart

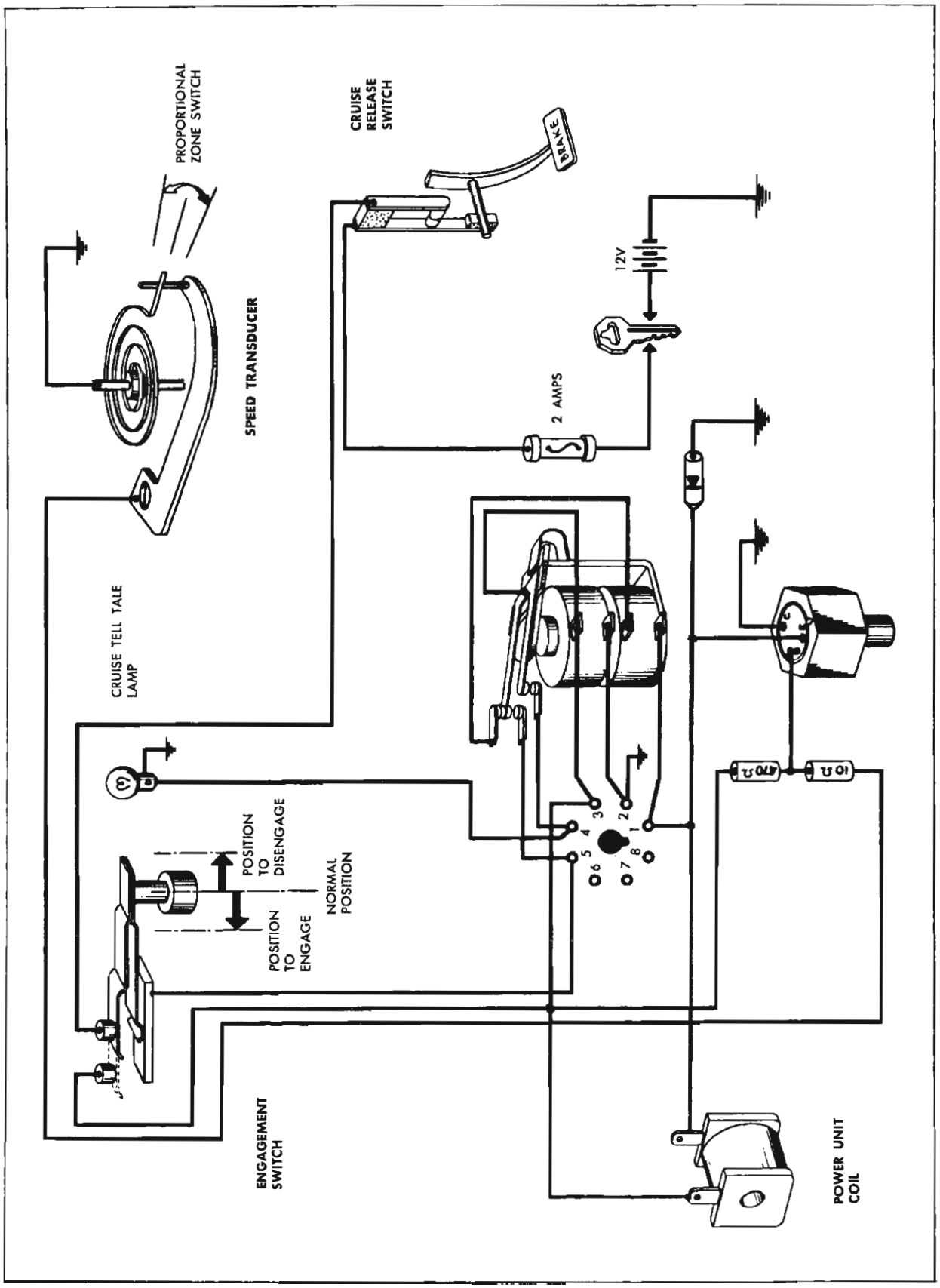


Fig. 12-13 Wiring Diagram

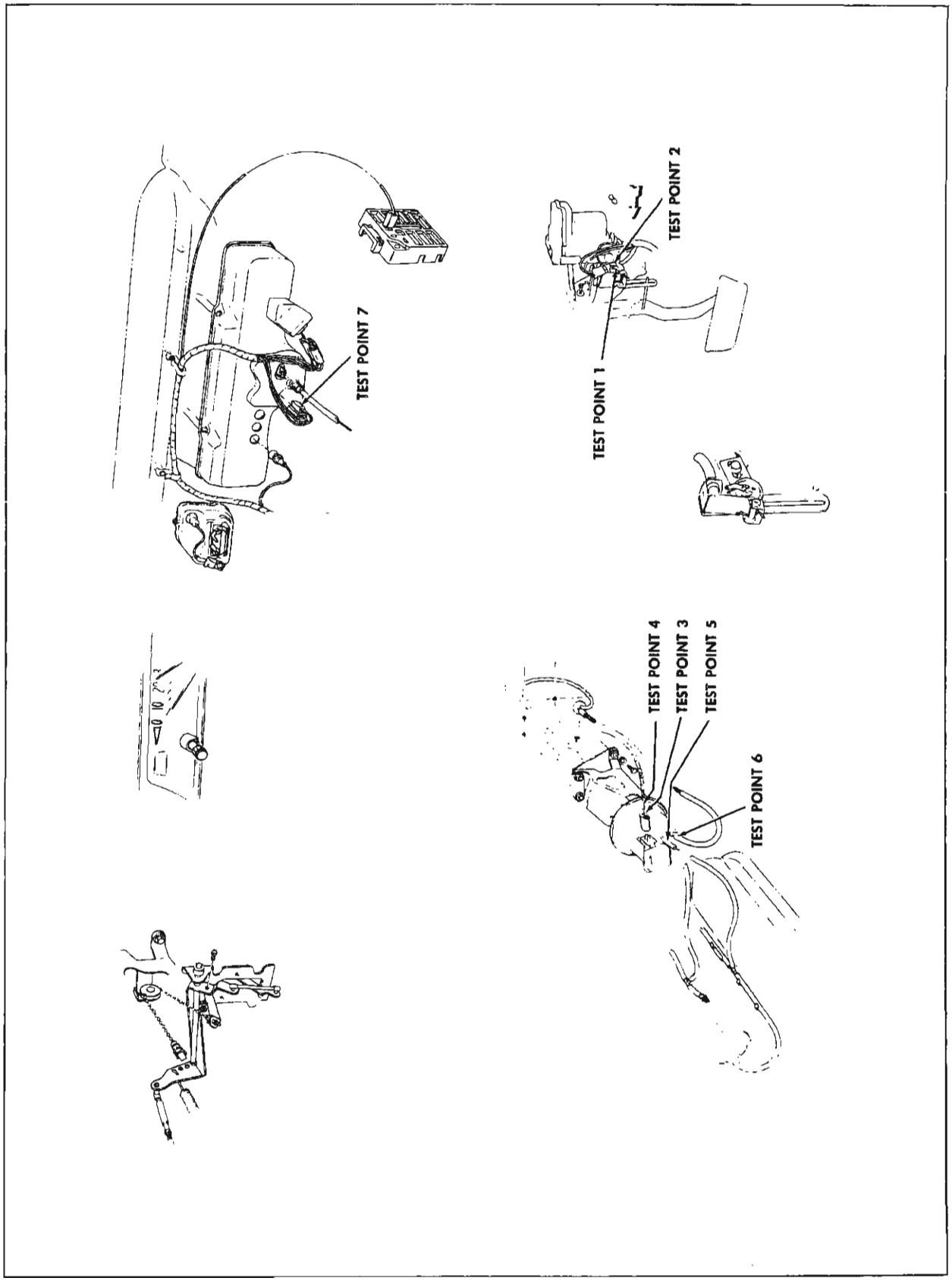


Fig. 12-14 Test Points - Rapid Check Out

RAPID CHECK-OUT PROCEDURE—ELECTRO-CRUISE SYSTEM

TEST	PRE-TEST CONDITIONS				ACTION NECESSARY FOR INDICATED TEST	RESULT OBTAINED	CONCLUSION	FURTHER TEST OR ACTION NECESSARY
	PARKING BRAKE SET	IGNITION ON	ENGINE RUNNING	TRANSMISSION SEL. POSITION				
A	Yes	Yes	Yes	Park	Depress Electro-Cruise knob.	Engine accelerates	All Electro-Cruise components probably operable.	Cruise release brake switch and ball chain should be checked for proper adjustment. See test B and manual.
						No engine response, cruise lamp does not light.	Electro-Cruise system not operable.	Proceed to test "B".
						No engine response, cruise lamp lights.	Open circuit in speed transducer.	Proceed to tests "H" and "I".
B	Yes	Yes	No	Park	Connect test lamp between each cruise release brake switch terminal (test points 1 and 2 in Fig. 14) and ground. Depress brake pedal for each lamp position.	Lamp lights in each position and goes out in one position when brake pedal depressed 1/2 inch.	Cruise release brake switch is properly adjusted.	1. Nothing if engine accelerated in test "A" and ball chain is properly adjusted. 2. Proceed to test "C" if no engine response was obtained in test "A".
						Lamp lights in one position only.	Cruise release brake switch not properly adjusted.	Adjust switch position so lamp lights in both positions and goes out in one position after 1/2 inch brake pedal travel. Repeat test "A", if no engine response proceed to test "C".
						Lamp does not light in either position.	Fuse blown or missing or power supply wire circuit open.	Check fuse on junction block in control and cruise release assembly adjacent to brake pedal. Also check related wiring back to fuse block. Repeat test "A" when trouble corrected, if no engine response, proceed to test "C".
C	Yes	Yes	No	Park	Remove connector from power unit coil, connect test lamp from red wire (test point 3) to ground, and depress Electro-Cruise knob.	Lamp lights.	Electrical circuit to power unit ok.	Proceed to test "D".
						Lamp does not light.	Open circuit in power unit electrical circuit (including engagement switch).	Check circuit for broken wires, open connector at engagement switch, and for proper operation of engagement switch. See schematic Fig. 12-6. Repeat test "A" when trouble corrected. If no engine response, proceed to test "D".
D	Yes	Yes	No	Park	Connect test lamp from red wire (test point 3) as in test "C" to the heavy black-natural wire in the same connector body (test point 4) and depress Electro-Cruise knob.	Lamp lights.	Power unit coil ground circuit through transistor amplifier and transistor amplifier itself are ok. Speed transducer contacts are closed.	Reconnect connector body to power unit coil and proceed to test "E".
						Lamp does not light.	Open circuit in power unit coil ground circuit through transistor amplifier or transistor amplifier defective.	Check circuit for broken wires. See Fig. 12-6. Check transistor amplifier as outlined. Repeat test "A" when trouble corrected. If no engine response, proceed to test "E".
E	Yes	Yes	Yes	Park	Disconnect vacuum supply hose from power unit (test point 5). Place thumb or finger over end of hose to detect engine vacuum.	Vacuum present.	Vacuum supply satisfactory.	Reconnect hose. Proceed to test "F".
						No vacuum present.	Vacuum supply lines plugged.	Check for pinched or broken hoses, back carburetor and all other vacuum hoses. Repeat test "A" when trouble corrected, if no engine response, proceed to test "F".
F	Yes	Yes	Yes	Park	Disconnect Cruise release hose from power unit (test point 6). (Use care not to loose reinforcing spring.) Place thumb or finger over end of cruise release fitting on power unit and depress engagement switch knob.	Engine accelerates.	Vacuum valve on cruise release brake switch or its connecting hose are leaking.	Repair or replace defective parts and reconnect cruise hose to power unit using care to insure that reinforcing hose is in Cruise release line. Repeat test "A".
						No engine response and tests "C", "D", and "E" had satisfactory results.	Control half of power unit is defective.	Replace control half of power unit. Repeat test "A" after replacement. If no engine response, proceed to test "G". Make sure reinforcement spring is in cruise release line.
G	Yes	Yes	No	Park	Disconnect the "T" connector body at the back of the cluster adjacent to the speedo cable connection. Depress the Electro-Cruise knob.	Cruise lamp lights.	Differential relay is ok.	Proceed to test "H".
						Cruise lamp does not light but click is heard.	Cruise lamp bulb defective.	Replace bulb. Repeat test.
						Cruise lamp does not light and no click is heard.	Differential relay defective, condition of Cruise lamp bulb not known.	Check relay as outlined. Replace if necessary. Repeat test "A" when trouble corrected. If no engine response, proceed to test "H".
H	Yes	Yes	Yes	Park	Jumper blue and black wires in Electro-Cruise harness (test point 7) together and depress engagement switch knob.	Engine accelerates.	Speed transducer circuit ok.	Proceed to test "I".
						Engine does not accelerate.	Open circuit in speed transducer circuit in harness.	Check circuit for broken wires. See schematic Fig. 12-6. Repeat test "A" after trouble corrected. If no engine response, proceed to test "I".
I	Yes	No	No	Park	Connect an ohmmeter between vertical and horizontal terminals on the back of the cluster adjacent to the speedo cable connection (test point 7).	Meter indicates continuity.	Speed transducer contacts are closed.	Reconnect harness to cluster and repeat test "A". If engine still does not accelerate all of the above tests have not been properly completed. Recheck, include any omitted tests.
						Meter indicates open circuit.	Open circuit within speedometer.	Remove instrument cluster from panel. Repair and reinstall.

ELECTRO-CRUISE TROUBLE DIAGNOSIS

SYMPTOM	CAUSE
No action when engagement switch knob is depressed.	1. Broken connection. 2. Blown fuses. 3. Cruise release brake switch out of adjustment. 4. Vacuum leak. 5. Power unit coil open. 6. Defective transistor amplifier.
Cruise light comes on when knob is depressed and no car response.	1. Harness to speedometer unplugged or loose. 2. Defective contacts on speed transducer.
Cruise light comes on when knob is depressed at speeds below 3 MPH of set speed.	1. Harness to speedometer loose. 2. Defective contacts on speed transducer. 3. Excessive road shocks. 4. Defective differential relay.
Electro-Cruise remains engaged when brake pedal is depressed.	1. Cruise release brake switch out of adjustment. 2. Shorted cruise release brake switch. 3. Shorted wire harness in cruise release line.
Blows fuses.	1. Shorted wiring. 2. Shorted differential relay, cruise tell-tale lamp or power unit coil. 3. Shorted transistor amplifier.
Engine races as soon as car is started when engage button is not pushed.	1. Shorted harness. 2. Shorted engage switch. 3. Shorted differential relay. 4. Vacuum orifice leak in power unit. 5. Accelerator linkage bound up.
Car will not lock in after set speed is attained.	1. Defective differential relay.
Car keeps accelerating up past set speed.	1. Shorted wire harness. 2. Shorted contacts on Electro-Cruise speedometer. 3. Defective differential relay.
Electro-Cruise system automatically locks in when car goes over bumps.	1. Defective differential relay. 2. Loose connection. 3. Brake cruise release switch set up too tight.
Electro-Cruise system drops out when car goes over bumps.	1. Defective differential relay. 2. Loose connection. 3. Cruise release brake switch set up too tight.
Erratic cruise speed.	1. Loose connection. 2. Defective contacts on Electro-Cruise speedometer. 3. Armature in power unit hanging up. 4. Vacuum leak.

SYMPTOM	CAUSE
Slow response.	1. Vacuum leak.
Hunts at slow speeds.	1. Erratic Electro-Cruise speedometer. 2. Excessive slack in ball chain. 3. Stiff accelerator linkage. 4. Vacuum leak. 5. Dragging brakes.
Does not disengage when engagement switch knob is pulled.	1. Shorted wire harness. 2. Shorted engagement switch. 3. Defective differential relay.
Hissing noise when engine is running.	1. Vacuum leak.
Indicator lamp does not light.	1. Lamp socket not plugged into cluster. 2. Burned out tell-tale lamp. 3. Defective differential relay. 4. Broken wire harness.
Car will not idle when Electro-Cruise is not engaged.	1. Vacuum leak. 2. Ball chain adjusted too tightly.
Car will not reach high cruise speeds.	1. Excessive slack in bead chain. 2. Beyond capabilities of car engine (extremely high alt. and/or excessive road grades). 3. Defective speedometer.
Pointer and odometer does not record.	1. Broken flexible shaft. 2. Defective speedometer.
Cruise pointer and speedometer do not coincide when car is in cruise.	1. Stiff throttle linkage. 2. Electro-Cruise speedometer out of calibration. 3. Wrong throttle return spring. 4. Vacuum leak.
Excessive power unit noise when in proportional zone.	1. Wrong or no sound dampening cushion between power unit to fire wall. 2. Worn or defective power unit armature. 3. Power unit mounting screws too tight.
Pedal noise when in cruise.	1. Worn accelerator linkage or pedal. 2. Accelerator pedal hinge stiff or worn.
Excessive overshoot condition.	1. Defective Electro-Cruise speed transducer. 2. Tight throttle linkage. 3. Vacuum leak. 4. Dragging brakes.
Whistling noise when brake or clutch pedal are touched.	1. Dirty or worn cruise release brake switch. 2. Foreign matter in cruise release line.

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