IMPERIAL

1958 SERVICE MANUAL

CHRYSLER

CHRYSLER SERVICE MANUAL

MODELS

LC-1 (WINDSOR) LC-2 (SARATOGA)
LC-3 (NEW YORKER) LC-4 (CHRYSLER C300D)
LY-1 (IMPERIAL)

This Manual is compiled as a reference and guide to provide Chrysler service men with proper adjustment and repair procedures for servicing the 1958 Chrysler Cars.

An understanding of the material compiled herein, and in the supplementary service bulletins, will assist the service personnel to maintain the quality standards built in Chrysler Cars.

In order to use this Manual to best advantage the corresponding or superseding car models must be understood. The supersedence of these models is as follows:

	1956	1957	1958
Windsor	C-71	C-75-1	LC-1
Saratoga	—	C-75-2	LC-2
New Yorker	C-72	C-76	LC-3
Chrysler 300 D.........	C77-C300	C76-C300	LC-4
Imperial	C-73	IM1-1-2-4	LY-1
Crown Imperial	C-70	—	—

The service tools referred to in this Manual are available through the Miller Manufacturing Company, 17638 Grand River Avenue, Detroit 27, Michigan, U.S.A. unless otherwise specified.

Extra copies of this Manual are available at $4.00 each, under Part Number D-16350. Order from Chrysler Division, P. O. Box 1658, Detroit 31, Michigan.

CHRYSLER DIVISION
Chrysler Corporation
DETROIT 31, MICHIGAN

D-16350

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Fig. 1—Model LC-1 Windsor

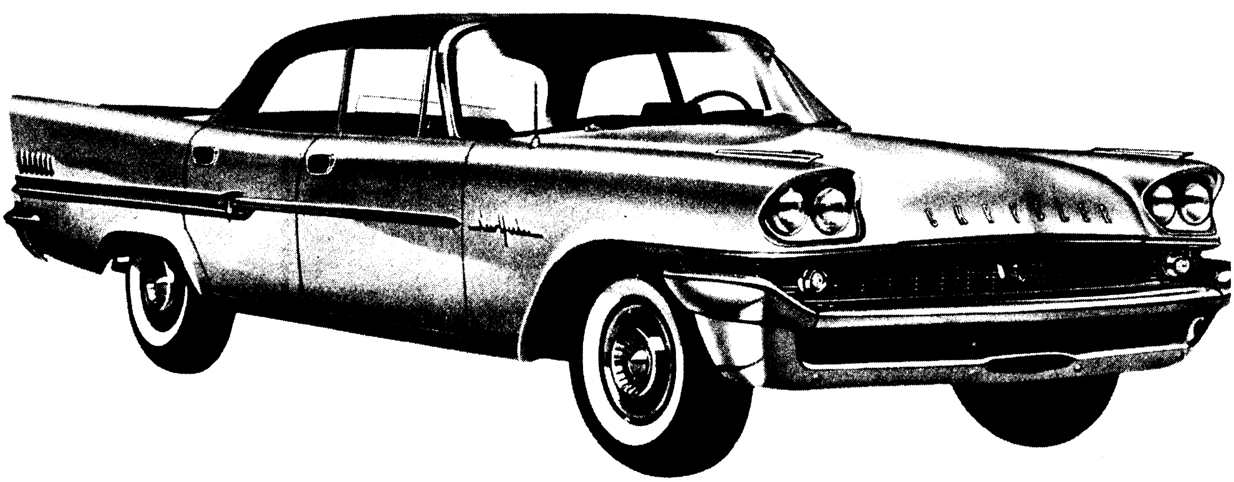
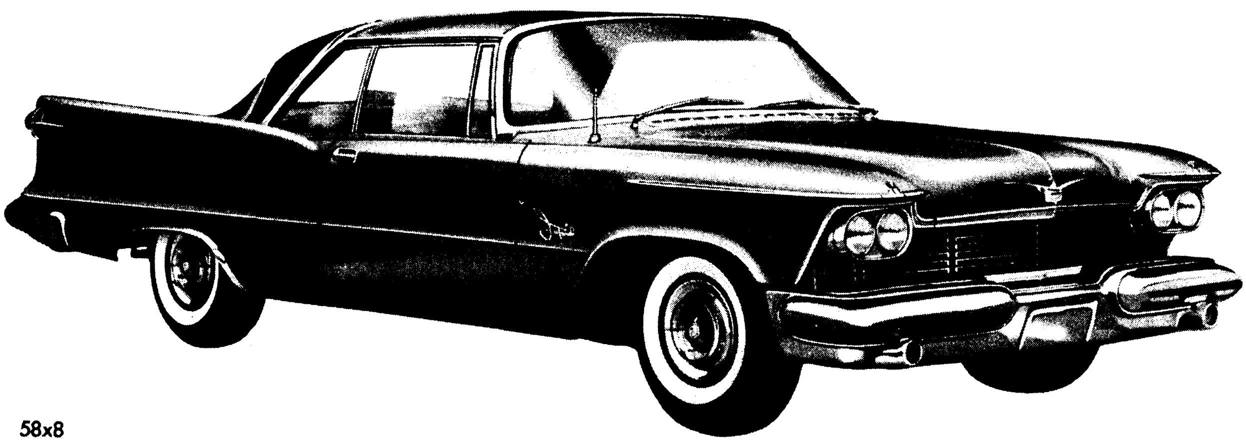


Fig. 2—Model LC-3 New Yorker



58x8

Fig. 3—Model LY-1 Imperial

FACTORY CONTACT

The following outline of the proper procedure to use in contacting the factory for assistance or advice on any matter applying to Service will insure your inquiries receiving prompt attention and handling. Make certain those members of your organization who might have the occasion to contact the factory, are thoroughly familiar with this procedure.

Do not withhold action on any matter pending contact by a Factory Service Representative as his scheduled contact may be delayed by special assignments. When in doubt as to the proper procedure to follow in the handling of a claim or complaint, prompt results can be obtained through a letter, telegram or phone call to the proper Factory Service Department—making certain to include the necessary information. If the aid of a Service Representative is necessary, the Factory Division involved will arrange for his contact as promptly as circumstances permit.

CHRYSLER DIVISION

All correspondence, telegrams, or phone calls, pertaining to Chrysler Cars, EXCEPT THOSE COVERING PARTS ORDERS, as well as orders or requests for Chrysler Service Bulletins, Owners Manuals, Shop Manuals, Time Schedule Manuals or other Chrysler Service literature, should be addressed to:

(Letters)
Chrysler Corporation
Chrysler Division
Service Department
P. O. Box #1658
Detroit 31, Michigan

(Telegrams)
Chrysler Division
Attention,
(Name of person to whom sent)
WUX
Detroit 31, Michigan

(Phone) VAlley 2-4700

NOTE: Please make certain to include the code WUX on all telegrams to either the Chrysler Division or Plymouth Division as this insures delivery direct to our Teleprint Room thus eliminating delay.

Letters or telegrams should be confined to one subject only and should include the following information:

Car Serial Number
Date of Sale
Owner's Name
Mileage

Complete description of difficulty, corrective action taken, your recommendations as to what should be done and the reason for so doing.

Include Paint and Trim Code Numbers where finish, upholstery, body or sheet metal is involved, and estimate of net cost of repairs.

PLYMOUTH DIVISION

All correspondence, telegrams, or phone calls, pertaining in any way to Plymouth cars, as well as orders or requests for Plymouth Service Bulletins, Owner Manuals, Time Schedule Manuals or other Plymouth Service literature, should be addressed to:

(Letters)
Chrysler Corporation
Plymouth Division
Service Department
P. O. Box #1518
Detroit 31, Michigan

(Telegrams)
Plymouth Division
Attention,
(Name of person to whom sent)
WUX
Detroit 31, Michigan

(Phone) WAlnut 1-8240

MASTER TECHNICIANS SERVICE CONFERENCE

All correspondence concerning enrollment in the M.T.S.C. Program, changes in enrollment records (the adding or dropping of personnel), issuance of awards, status of enrolled personnel, orders for additional material, the return of questionnaires, or any other matters relating to this program should be addressed to:

Master Technician Service Conference
Chrysler Corporation Training Center
Service Development and Training Department
P. O. Box 2119
Detroit 31, Michigan

PARTS DIVISION

General

ALL orders for parts or accessories, emergency or otherwise, should be forwarded direct to your usual source of supply or to the parts plant listed below serving the area in which you are located.

To insure your receiving the parts required by you more promptly, close attention should be given to the procedure listed under "Ordering Information" and "Your Parts Orders" in the introductory front pages of all MoPar Parts Lists. Particularly where parts are ordered for a specific car, it is very essential that your order include the car serial and engine numbers, and, in the case of body parts, the body number.

ATLANTA
Chrysler Corp., Parts Division
Station A, P. O. Box 206
Atlanta, Georgia
Phone—Plaza 5-2531

DELAWARE
Chrysler Corp., Parts Division
South College Avenue
Newark, Delaware
Phone—Newark 2521

KANSAS CITY
Chrysler Corp., Parts Division
Chrysler and Funston Roads
Kansas City 15, Kansas
Phone—Fairfax 3300

PACIFIC COAST
Chrysler Corp., Parts Division
1950 Davis Street
San Leandro, California
Phone—Sweetwood 8-6200

Centerline

Chrysler Corp., Parts Division
P. O. Box 779
Detroit 31, Michigan
Phone—Jefferson 9-3000

Parts Division Literature

Request for Parts Division literature such as Parts Books, Parts Price Lists, Parts Bulletins, etc., should be forwarded direct to:

Chrysler Corporation, Parts Division
P. O. Box 1718
Detroit 31, Michigan
Attention: Parts Advertising Department

Shortage of Accessories or Other Equipment on New Cars

Before placing an order for missing accessories, other parts or equipment, on new cars received, examine the vehicle for the presence of a "back order" notice, which if present, will be found attached to the bracket for the inside rear view mirror. Such back-ordered short items will be shipped from the assembly plant as soon as stock is available, and should not be ordered from the Parts Division.

Emergency Orders

Where a part required for an "Emergency" is not readily available from your usual parts source, an order plainly marked "Emergency Order" and including complete details on the need for the material, should be placed with the above parts plant serving the area in which you are located. Orders so marked and which are, in the opinion of the Parts Division, for a bona fide immediate emergency need, will receive emergency handling. Emergency orders *should not* be forwarded to the Division Service Department.

Should the occasion arise that the part required is not available at the plant ordered from, you will be notified that the part is on back-order. In the meantime, your order will continue to receive emergency handling by the Parts Division with shipment being made as promptly as it is available.

LICENSE DATA

The following revised method of numbering vehicles and their engines made in Detroit and Los Angeles production Plants will be used on the 1958 Models.

This revision will provide the Sales Department with the information desired as to model, year built and the serial number.

For Detroit built cars, the vehicle number will be revised as follows:

Windsor	LC-1	1001
Saratoga	LC-2	1001
New Yorker	LC-3	1001
Chrysler 300D	LC-4	1001
Imperial	LY-1	1001

Model

Serial Number

For L. A. built cars, the vehicle will be revised as follows:

Windsor	LC-1	L	1001
Saratoga	LC-2	L	1001
New Yorker	LC-3	L	1001

L. A. Identification

The Engine number will be revised as follows:

Windsor	58	W	1001
Saratoga	58	S	1001
New Yorker	58	N	1001
Chrysler 300D	58	N3	1001
Imperial	58	C	1001

Year Built

Model

Serial Number

VEHICLE NUMBER

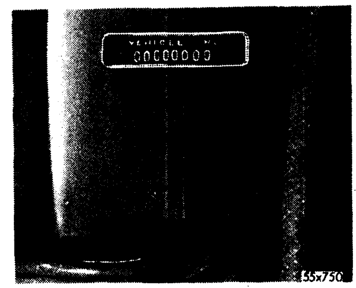


Fig. 4—Vehicle Number

The vehicle number is stamped on a metal plate attached to the left front door body hinge post, as shown in Figure 4.

ENGINE NUMBER

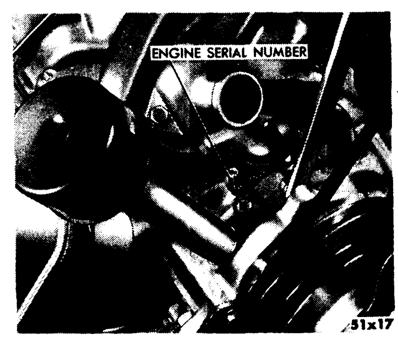


Fig. 5—Engine Number

The engine number is stamped on a boss on the top side of the cylinder block just back of the water pump, as shown in Figure 5.

BODY NUMBER

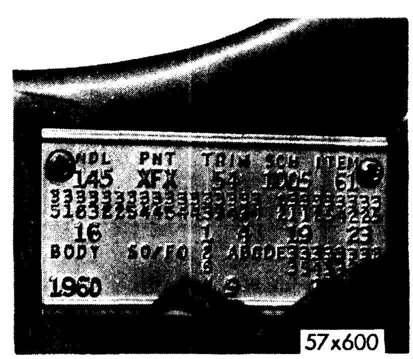


Fig. 6—Body Number

The body number is stamped on a metal plate attached to the top side of the radiator yoke, as shown in Figure 6.

GENERAL DATA AND SPECIFICATIONS

Item	Body Style	Starting Vehicle Numbers: Detroit	Los Angeles	1958 Models: LC-1	LC-2	LC-3	LY-1
	Four Door Sedan	LC-1-1001	LC-1L1001	Windsor	——	——	——
	Four Door Sedan	LC-2-1001	LC-2L-1001	——	Saratoga	——	——
	Four Door Sedan	LC-3-1001	LC-3L-1001	——	——	New Yorker	——
	Four Door Sedan	LY-1-1001	....	——	——	——	Imperial
Wheelbase	Four Door Sedan	....	....	122	126	126	129
	Convertible Coupe	....	....	——	——	126	129
	Two Door (hard top)	....	....	122	126	126	129
	Town & Country Wagon	....	....	122	——	126	——
	Four Door (hard top)	....	....	122	126	126	129
Tread (Front)	Four Door Sedan	....	....	60.9	60.9	61.2	61.8
	Convertible Coupe	....	....	——	——	61.2	61.8
	Two Door (hard top)	....	....	60.9	60.9	61.2	61.8
	Town & Country Wagon	....	....	60.9	——	61.2	——
	Four Door (hard top)	....	....	60.9	60.9	61.2	61.8
Tread (Rear)	Four Door Sedan	....	....	59.8	59.8	60.0	62.4
	Convertible Coupe	....	....	——	——	60.0	62.4
	Two Door (hard top)	....	....	59.8	59.8	60.0	62.4
	Town & Country Wagon	....	....	59.8	——	60.0	——
	Four Door (hard top)	....	....	59.8	59.8	60.0	62.4
Length with Bumper	Four Door Sedan	....	....	218.0	220.2	220.2	225.7
	Convertible Coupe	....	....	——	——	220.2	225.7
	Two Door (hard top)	....	....	218.0	220.2	220.2	225.7
	Town & Country Wagon	....	....	217.7	——	219.9	——
	Four Door (hard top)	....	....	218.0	220.2	220.2	225.7
Width with Bumper	Four Door Sedan	....	....	79.6	79.6	79.6	81.2
	Convertible Coupe	....	....	——	——	79.6	81.2
	Two Door (hard top)	....	....	79.6	79.6	79.6	81.2
	Town & Country Wagon	....	....	79.6	——	79.6	——
	Four Door (hard top)	....	....	79.6	79.6	79.6	81.2
Rear Axle with Torque-Flite Trans.	Four Door Sedan	....	....	2.93	2.93	2.93*	2.93*
	Convertible Coupe	....	....	——	——	2.93*	2.93*
	Two Door (hard top)	....	....	2.93	2.93	2.93*	2.93*
	Town & Country Wagon	....	....	3.18	——	3.18	——
	Four Door (hard top)	....	....	2.93	2.93	2.93*	2.93*
Tire Size	Four Door Sedan	....	....	8.00x14	8.50x14	9.00x14	9.50x14
	Convertible Coupe	....	....	——	——	9.00x14	9.50x14
	Two Door (hard top)	....	....	8.00x14	8.50x14	9.00x14	9.50x14
	Town & Country Wagon	....	....	8.50x14	——	9.00x14	——
	Four Door (hard top)	....	....	8.00x14	8.50x14	9.00x14	9.50x14

*Air Conditioned Cars use next highest Ratio

Shipping Weight (Estimated) Four Door Sedans (Dry)

LC-1 3922 Pounds including TorqueFlite Transmission

LC-2 4145 Pounds including TorqueFlite Transmission

LC-3 4298 Pounds including TorqueFlite Transmission

LY-1 4738 Pounds including TorqueFlite Transmission

Section I

TORSION-AIRE
FRONT WHEEL SUSPENSION

CONTENTS

DATA AND SPECIFICATIONS

MANUAL STEERING

Caster	Camber	Steering Axis Inclination	Toe-In
$-3/4° \pm 3/4°$	$0° \pm 1/4°$ (right) $+1/4° \pm 1/4°$ (left)	5° to 7° At 0° Camber	1/8″ ± 1/32″ (1/8″ Preferred)

WITH POWER STEERING

Caster	Camber	Steering Axis Inclination	Toe-In
$+3/4° \pm 3/4°$	$0° \pm 1/4°$ (right) $+1/4° \pm 1/4°$ (left)	5° to 7° At 0° Camber	1/8″ ± 1/32″ (1/8″ Preferred)

SPECIAL TOOLS

C-3553................................Remover and Installer—Shock Absorber Lower Bushing

C-3557................................Installer—Lower Control Arm Bushing

C-3558................................Remover and Installer—Upper Control Arm Bushing

C-3561................................Wrench—Ball Joint Assembly to Upper and Lower Control Arm

C-3564................................Remover—Ball Joint Stud

C-3608................................Gauge—Front-End Height and Level

TIGHTENING SPECIFICATIONS

	Foot-Pounds
Shock Absorber Upper Mounting Nut	25
Shock Absorber Lower Mounting Nut	40
Sway Eliminator Shaft Link Nuts	15
Sway Eliminator Insulator Retainer Nuts	25
Lower Ball Joint Stud Nut	135
Strut to Lower Control Arm Mounting Bolts	65
Lower Control Arm Strut Bushing Nut	35
Shaft to Lower Control Arm Bushing Retainer Nut (Inner)	125
Upper Ball Joint Stud Nut	135
Lower Control Arm Shaft to Crossmember Mounting Nut	200
Upper Control Arm to Support Bracket Mounting Bolt Nuts	55-65
Control Arm Support Bracket to Frame Bolt (½")	70
Steering Knuckle to Brake Support Bolt	55
Steering Knuckle to Steering Knuckle Arm Nut	50

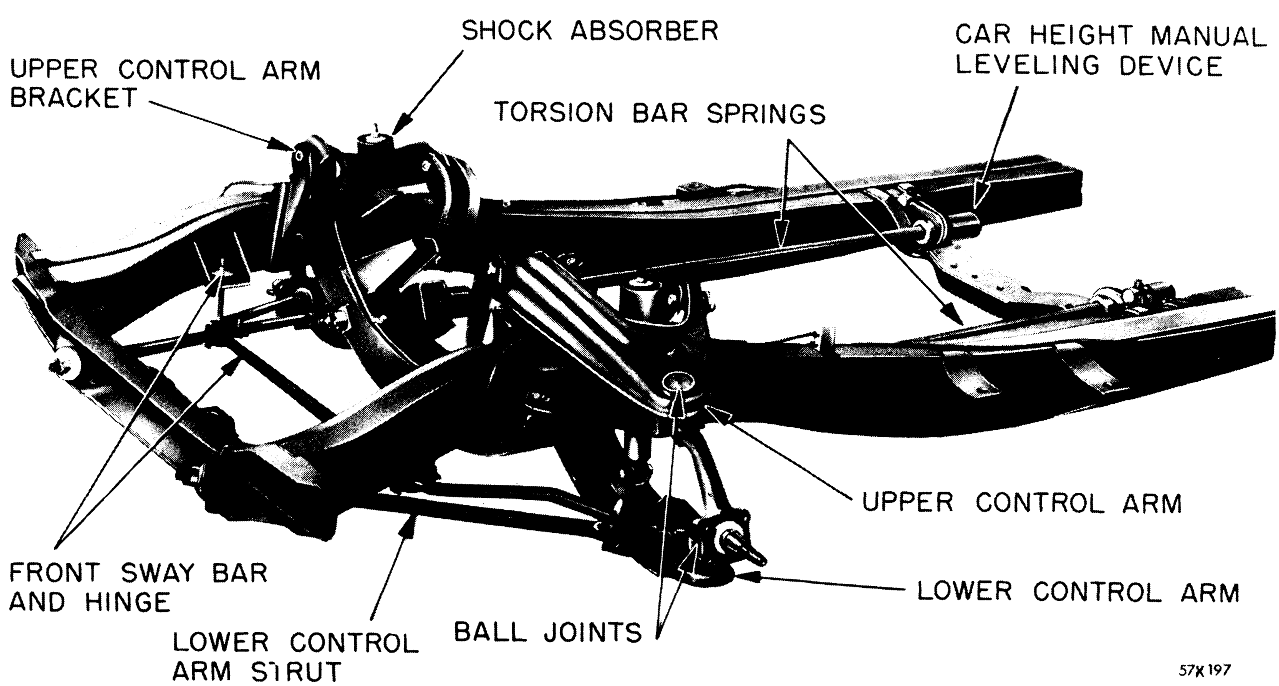


Fig. 1—Frame and Front Suspension

Section I

TORSION-AIRE

FRONT WHEEL SUSPENSION

The Torsion-aire Front Suspension System Figures 1, 2 and 3 is retained on the 1958 cars. This new suspension gives improved steering and directional stability with the anti-brake dip principle built into the design, the tendency of the nose of the car to dip when braking is reduced to a minimum. Torsion bar springs also permit relocating of steering linkage and control arm inner pivot points, so that their steering geometrics are more nearly matched resulting in less wheel fight because the vertical movements of the road wheels have little effect on the steering linkage. The new system also offers a number of other advantages in terms of longer part life and ease of servicing.

1. LUBRICATION

The suspension points requiring lubrication are effectively sealed against entry of dirt, dust, and water, however, the upper and lower ball joints should be carefully lubricated. The following lubricating procedure is recommended:

Raise the front of the car in such a manner that the weight of the car is on both lower control arms as close as possible to the ball joints.

NOTE: When this has been properly executed, the lower ball joint will be unloaded and the upper control arm rebound bumper will be away from the stop bracket on the frame.

Apply grease gun to fitting on lower ball joint and lubricate generously. Trigger the grease gun so that pressure is applied intermittently. Applying the grease in this manner will cause an up and down motion in the ball joint assembly to assist in thoroughly lubricating the joint. It is also advisable to turn the steering gear to left and right to allow the grease to penetrate the whole assembly.

NOTE: The upper ball joint cannot be unloaded, but grease should be applied generously while turning the steering and front wheel assembly from left to right to allow the lubricant to penetrate the joint.

CAUTION

Leaded compounds of more than 10% leaded powder in the lubricant should never be used, also the ball joints should not be heated or reworked. They should be replaced if found not serviceable.

SERVICE PROCEDURES

2. SERVICING THE FRONT SUSPENSION SYSTEM

The upper control arms are mounted on removable brackets which are bolted to the frame sub side-rail. Shim packs are mounted between brackets and frame side-rail to establish caster and camber settings for each front wheel, as shown in Figure 4.

The lower control arms are assembled to pivot shafts and mounted to frame crossmember in replaceable rubber bushings, as shown in Figures 5 and 6. The pivot shafts extend through the crossmember and from the axis of lower control arms. The steering knuckles are connected, as shown in Figures 7 and 8, to upper and lower arms through ball joints, thus eliminating the king pins. This also eliminates the king pin inclination procedures and the term "Steering Axis Inclination" will be used hereafter.

To prevent the possibility of any fore and aft movement of the lower control arms, a strut is attached from frame crossmember to

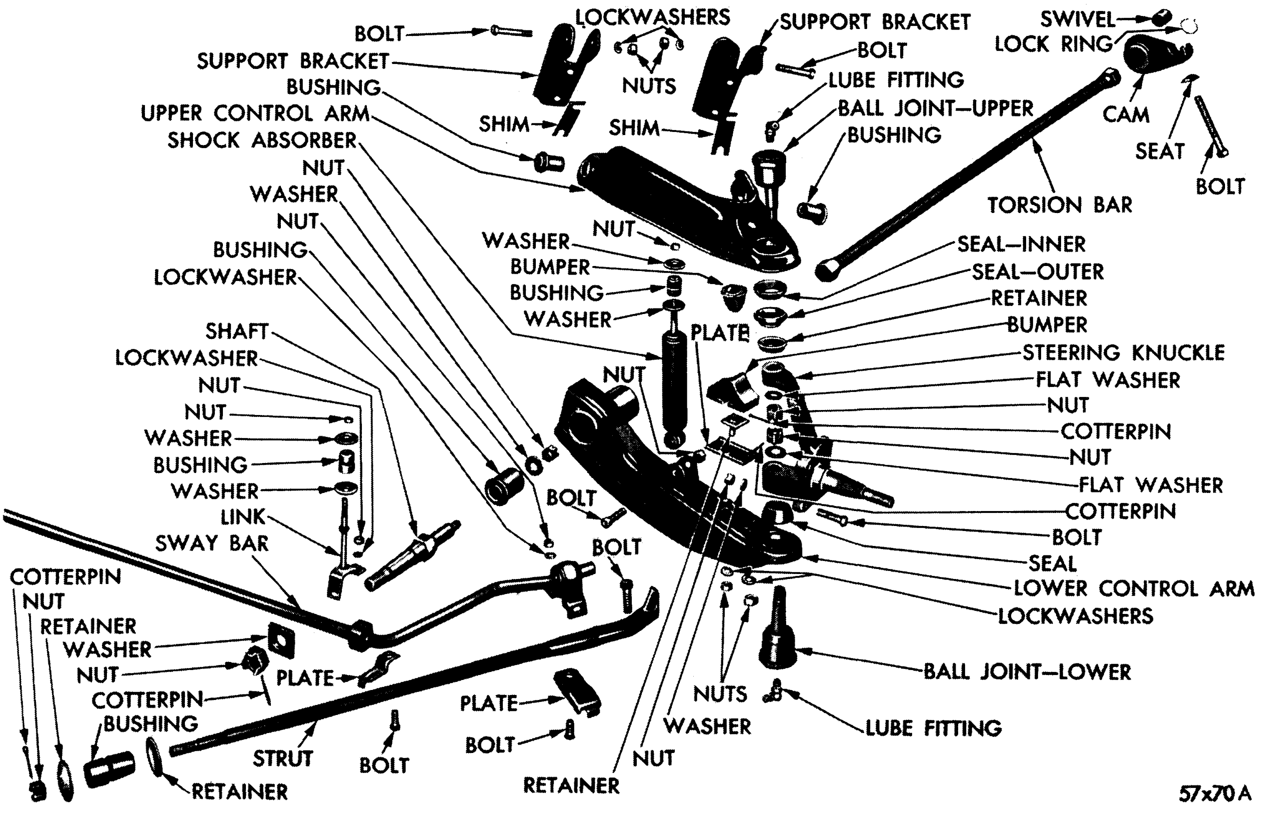


Fig. 2—Front Suspension (Disassembled View)

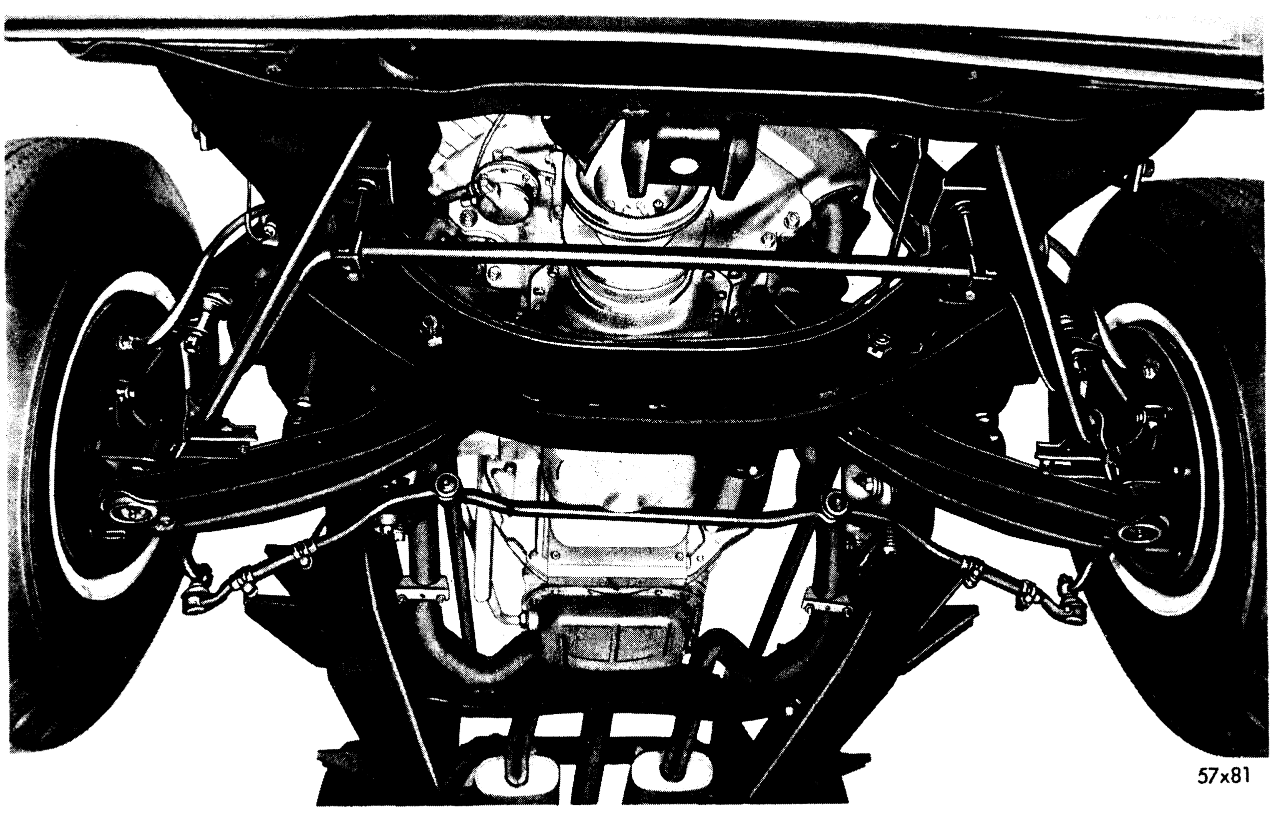


Fig. 3—Lower View Front Suspension Assembly

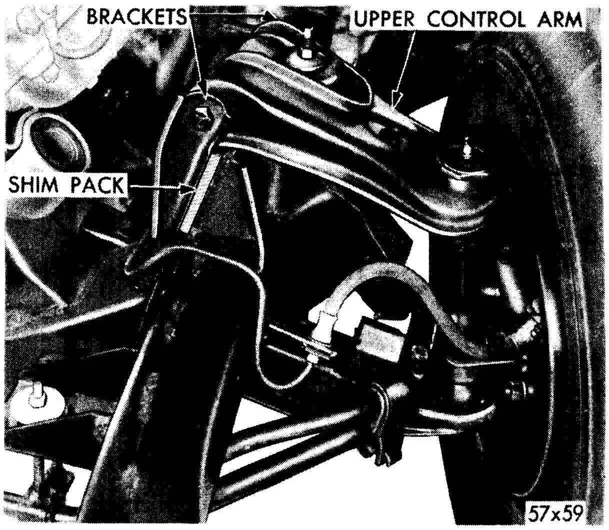


Fig. 4—Upper Control Arm, Shim Pack and Bracket

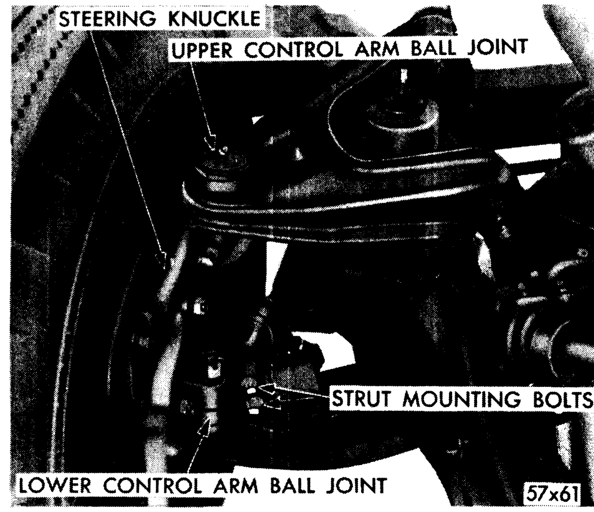


Fig. 7—Steering Knuckle and Ball Joint Assembly

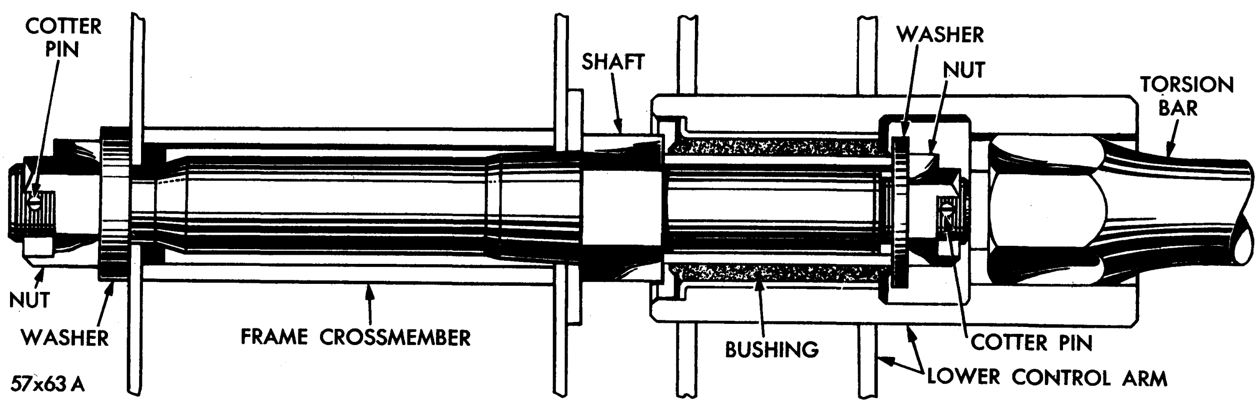


Fig. 5—Lower Control Arm Pivot Shaft and Bushing Assembly

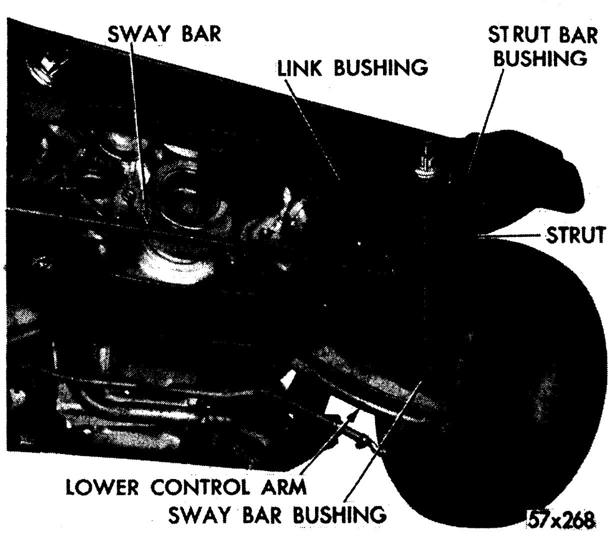


Fig. 6—Lower Control Arm, Strut and Sway Bar Assembly

lower control arm, as shown in Figure 6. The forward end of the struts are mounted in the front crossmember with replaceable rubber bushings, as shown in Figure 9.

The sway bar shaft is insulated and mounted to frame and the lower control arm. (Figs. 6 and 10.)

The front end of the torsion bars are indexed with lower control arms at frame front crossmember pivot points (Figs. 1 and 2). The rear end of torsion bars are indexed in anchors which are supported by brackets welded to frame side-rails and crossmember, as shown in Figure 11. The torsion bar springs (Fig. 12).

3. SERVICING THE SWAY BAR (FIGS. 6 and 10)

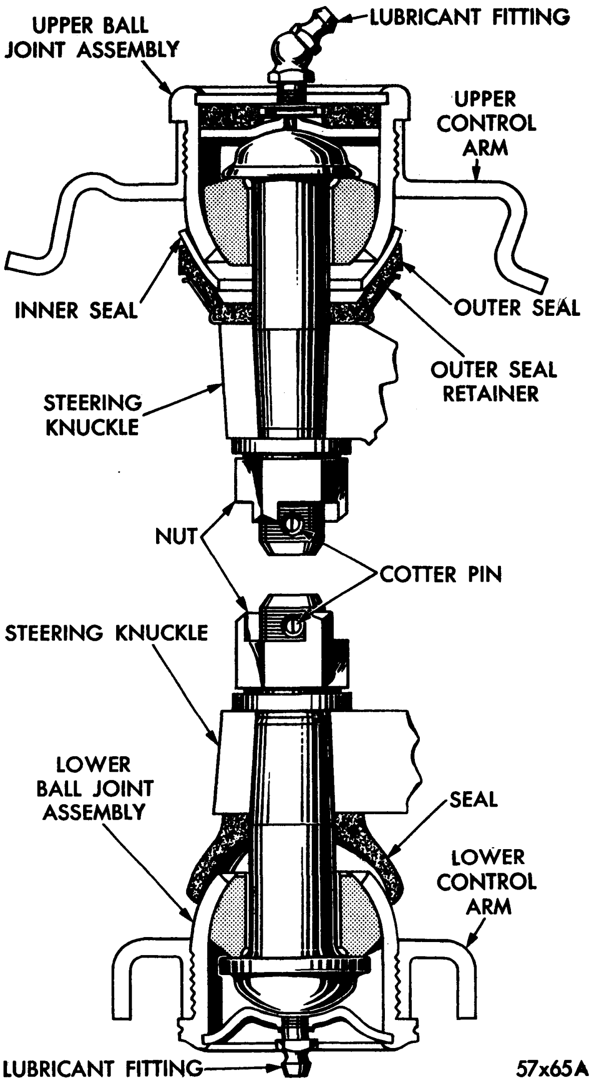


Fig. 8—Upper and Lower Steering Knuckle Ball Joint Assembly

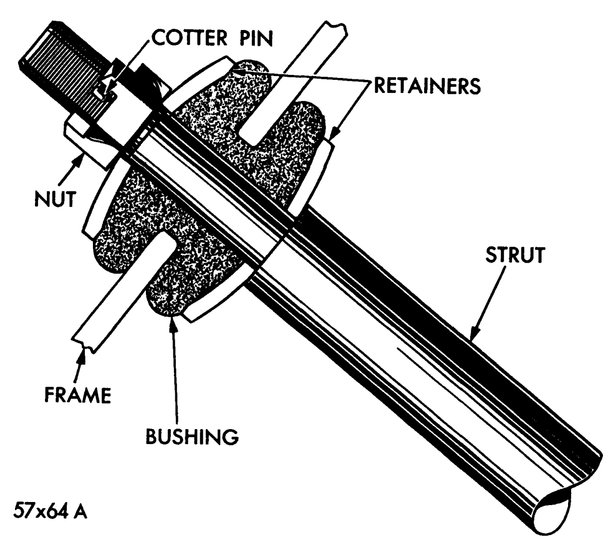


Fig. 9—Front Strut Bar Bushing Assembly

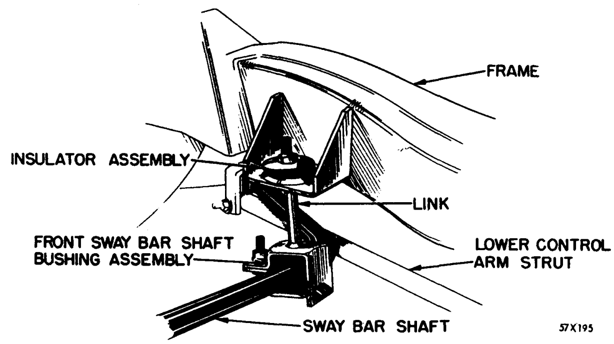


Fig. 10—Front Sway Bar to Frame Attachment

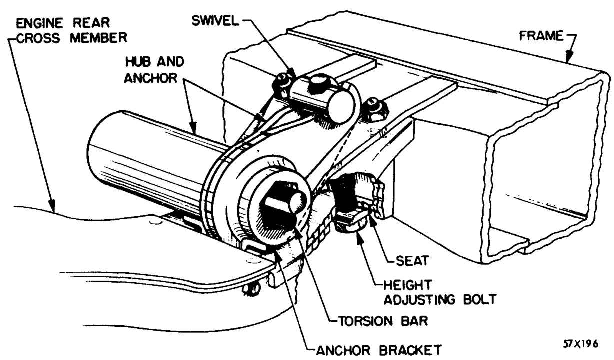


Fig. 11—Torsion Bar Spring Cam and Height Adjustment Bolt Assembly

a. Removal

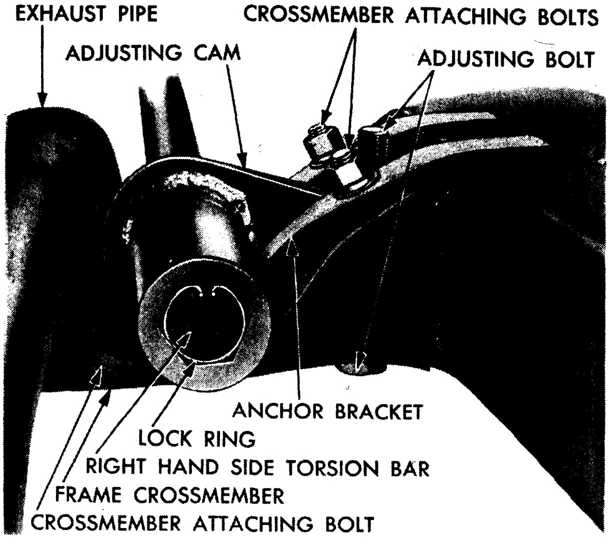
The front sway bar is attached to frame and strut bars through insulated rubber mounting brackets. To remove the sway bar proceed as follows:

Remove two sway bar link retaining nuts and concave washers. Remove two sway bar cushion retaining nuts, lockwashers and bolts, (one on each strut). Slide sway bar out through control arm struts and away from vehicle. **The sway bar cushions are not serviced separately. If replacement is necessary, install new sway bar assembly.**

Remove lower concave washers. Remove sway bar link insulating bushings from frame bracket by forcing out of position. If bushings are worn or deteriorated, install new ones as required.

b. Installation

Dip new sway bar link bushing in water, install in opening in frame bracket, using a twisting motion. When installed properly, the groove



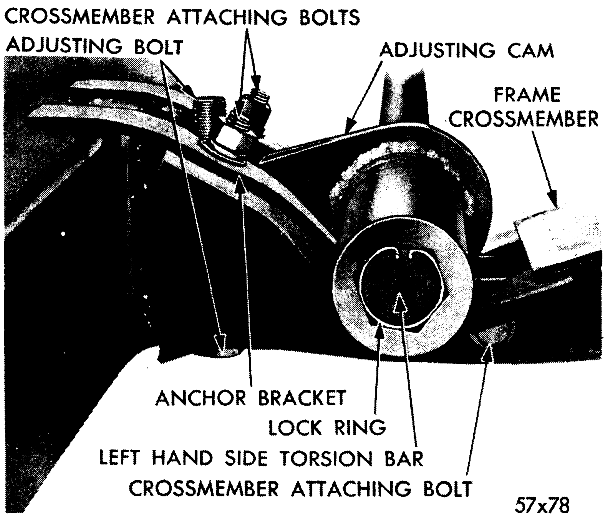


Fig. 12—Torsion Bar Spring (Rear Mounting)

in bushing will index with opening in frame bracket.

Thread sway bar into position over top of lower control arm struts. Engage sway bar cushion housings with struts and install lockplates. Insert bolts, lockwashers and nuts. Tighten to 25 foot-pounds torque. Install washers over ends of links (concave side up), then slide links up through bushings. Install washers (concave side down), over ends of links and down on bushings. Install nuts and tighten to 15 foot-pounds torque.

4. SERVICING THE UPPER CONTROL ARM

a. Removal (FIG. 2)

Place a jack under frame crossmember and lift front wheel off floor. Remove wheel and tire

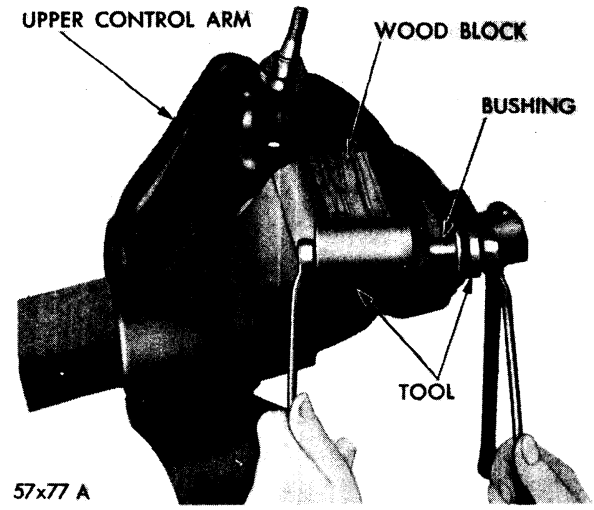


Fig. 13—Removing Upper Control Arm Bushing

assembly. Remove cotter pin, nut, and washer from upper ball joint stud. Install tool and load studs. Using a hammer, remove ball joint stud from steering knuckle by striking the ball joint boss on knuckle sharply. Do not hammer on threaded section of stud.

Remove upper control arm front and rear pivot bolt. Remove control arm from support mountings. Do not remove brackets from frame.

b. Installation

Position upper control arm in support mounting bracket and install front and rear mounting bolts, washers, and nuts. With control arm in **normal position** tighten nuts to 60 to 70 foot-pounds torque. Place upper ball joint stud in steering knuckle and install washer and nut. Tighten nut to 135 foot-pounds torque and secure with cotterpin.

5. UPPER CONTROL ARM BUSHING—REPLACEMENT

Remove upper control arm. Refer to "Upper Control Arm—Removal", Paragraph 4.

Remove bushings by either pressing them out with Tool C-3558 (Fig. 13) or using a hammer and suitable drift.

NOTE: Make definitely sure control arm is properly supported when removing bushings. If hammer and drift are used, extreme care must be exercised to avoid damaging bushing surface in the control arm.

When installing new bushings, always make sure control arm is supported squarely at the point bushing is being pressed in. Position flange end of new bushing in Tool C-3558 (Fig. 14), and support control arm squarely. Using an arbor press, install bushings (flange out) into control arm until the flanged portion of bushings seat on arm.

Install upper control arm. Refer to "Control Arm—Installation", Paragraph 4.

6. UPPER CONTROL ARM SUPPORT MOUNTING BRACKETS

The upper control arm support mounting brackets are bolted to the frame side-rails and should not be removed unless they have been damaged due to accident, etc. When removing the mounting brackets, extreme care should be taken so not to lose the alignment shim pack located between the bracket and frame side-rail. In event a shim pack is lost, a selection of shims $\frac{5}{16}$ inch thick **may be used as a starting point** when reassembling.

7. SERVICING THE LOWER CONTROL ARM (FIGS. 5 and 6)

a. Removal

Raise car by placing jack under frame crossmember. Remove wheel and tire assembly. Remove torsion bar spring from lower control arm to be removed. Refer to "Servicing Torsion Bar—Removal", Paragraph 17. Remove shock absorber lower eye attachment nut and bolt from mounting bracket. Push lower portion of shock absorber up into frame opening. Remove the two struts to lower control arm mounting bolts and nuts. Remove cotter pin, nut, and washer from lower ball joint stud. Remove lower ball joint stud from knuckle (Refer to Paragraph 16 (a). Remove cotter pin, nut and washer from lower control arm shaft assembly. With washer removed, reinstall nut (to protect threads) until it is flush with end of shaft. The lower control arm shaft is a tapered fit in front crossmember. Use a hammer and brass drift for loosening, then remove nut from shaft. Slide lower control arm and shaft assembly from rear of crossmember.

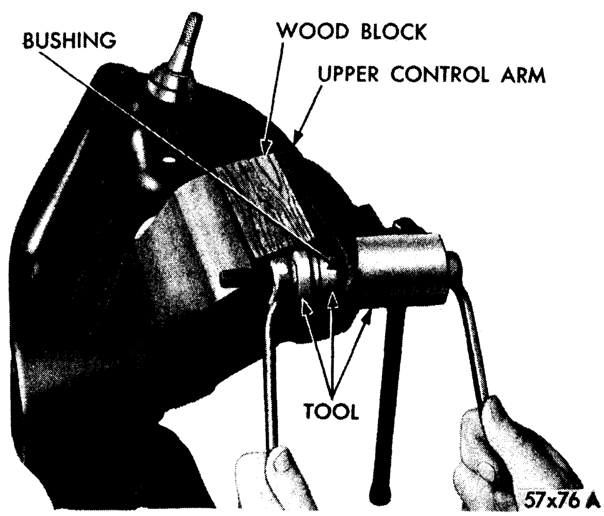


Fig. 14—Installing Upper Control Arm Bushing

b. Installation

Position shaft and lower arm assembly in crossmember in **normal position;** and install washer and nut. Tighten 175 to 200 foot-pounds torque and secure with cotter pin. Position lower ball joint stud in steering knuckle and install washer and nut. Tighten nut 135 foot-pounds torque and secure with cotter pin. Place shock absorber in position in lower mounting bracket and install bolt and nut. Tighten to 40 foot-pounds torque. Install wheel and tire assembly. **Do not lower front of vehicle at this time.** Install torsion bar spring. Refer to "Servicing Torsion Bar Installation", Paragraph 17.

8. SERVICING THE LOWER CONTROL ARM STRUT (FIGS. 6 and 9)

a. Removal

Remove the nuts, lockwashers, and bolts that attach the sway bar bushing housing to struts. Disconnect sway bar from struts. Remove the strut to lower control arm mounting bolts and nuts. Remove the cotter pin, nut and bushing retainer from forward end of strut at front crossmember. Slide strut and inner bushing retainer from bushing in frame, as shown in Figure 9. Using a knife, cut bushing out front of frame.

b. Installation

Dip new bushing in water and with tapered portion toward rear of vehicle, install in opening in frame using a twisting motion until groove in bushing indexes properly with frame. With cupped side out, slide washer over threaded end of strut. Push strut through bushing in frame (Fig. 9). Slide outer washer

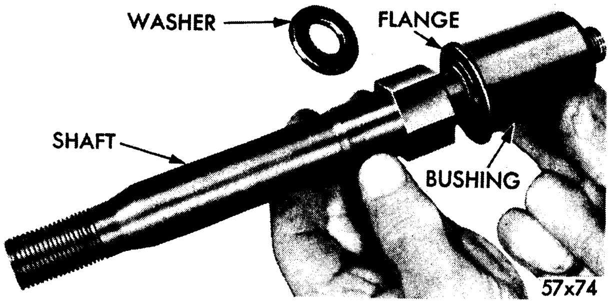


Fig. 15—Removing or Installing Lower Control Arm Pivot Shaft Bushing

over end of strut (cupped side in). Install nut. Tighten nut sufficiently to install strut to lower control arm mounting bolts. Install bolts, lock-washers and nuts, and tighten to 65 foot-pounds torque. Tighten strut nut to 30 foot-pounds torque and install cotter pin. Check caster and camber.

9. LOWER CONTROL ARM PIVOT SHAFT BUSHING—REPLACEMENT (FIGS. 15 and 16)

Remove lower control arm assembly. Refer to "Lower Control Arm—Removal", Paragraph 7. Remove torsion bar spring cushion (small disc) from end of shaft assembly.

a. Disassembly

Support lower control arm assembly in an arbor press; and using a brass drift, press shaft and bushing assembly from control arm. Remove cotter pin, nut, and washer; and slide bushing **assembly from shaft.**

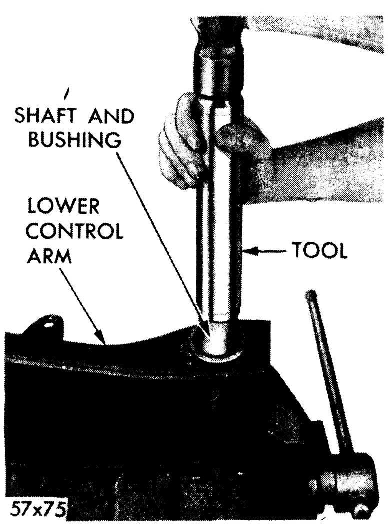


Fig. 16—Installing Lower Control Arm Pivot Bushing

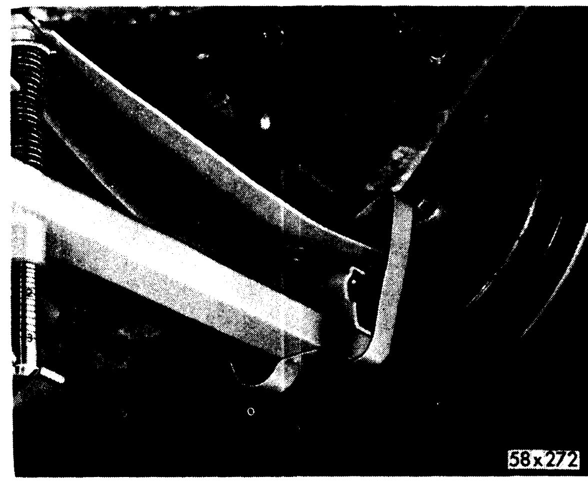


Fig. 17—Front Suspension Height and Level Gauge Installed

b. Assembly

Position new bushing (flanged end of bushing first) on shaft and install washer and nut. Tighten nut 100 to 150 foot-pounds torque and install cotter pin.

With lower control arm supported, install shaft and bushing assembly by using Tool C-3557 and pressing bushing into the lower control arm until flanged portion of bushing is seated all the way into control arm. Install lower control arm. Refer to "Lower Control Arm —Installation", Paragraph 7.

10. CHECKING FRONT SUSPENSION HEIGHT

Front suspension height should be checked when front wheels are aligned or whenever any service work is performed on the torsion bars. If the suspension height is not up to specifications the height should be checked and reset. The suspension height can be checked with or without Tool C-3608. To check the height with Tool C-3608 proceed as follows: Place vehicle on alignment equipment or on a

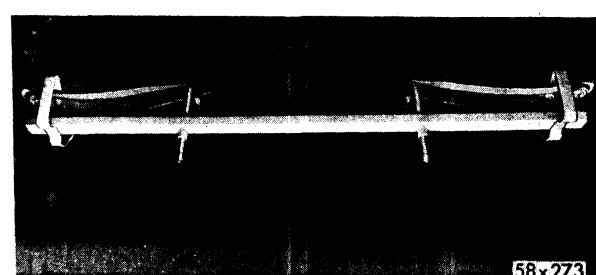


Fig. 18—Front Suspension Height and Level Gauge Measuring Pins and Clips

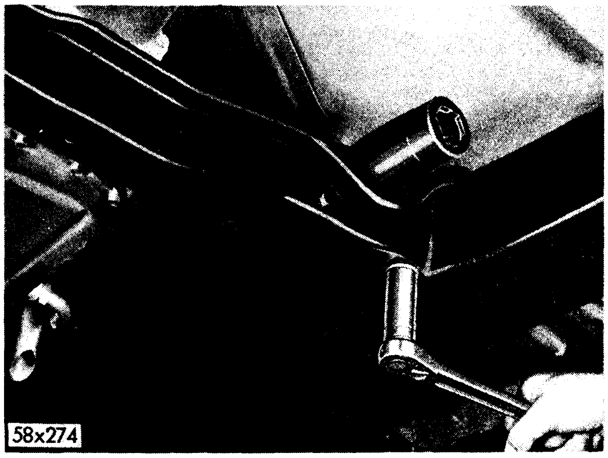


Fig. 19—Adjusting Torsion Bar Cam Bolt

level floor. Inflate tires to recommended pressures, with only the vehicle weight on the torsion bar springs (no passenger or unusual weight in vehicle). Grasp front bumper and jounce car up and down several times to settle the suspension system. When the vehicle is settled, refer to Figures 17 and 18 and install leveling tool as follows:

For accurate gauge reading make sure the lower control arm ball joints at the steering knuckle and control arm bushing housings are clean, free from grit and dirt. Before assembling tool to control arm, retract the tool measuring pin and while under tension lock tool securely in this position. With measuring pin retracted, assemble tool to control arms, as shown in Figure 18 making sure the stops on the ends of tool are up against the control arm ball joints.

Latch the tool retaining springs securely to the flange of the control arm and release the measuring pins so that they contact the lower surface of control arm bushing housing.

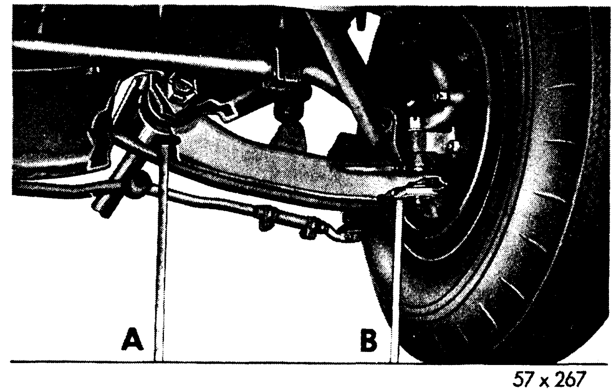


Fig. 20—Measuring Front Suspension Height

NOTE: The measuring pins are spring loaded and scaled in 1/8 inch increments. These readings are direct measurements and indicate the difference in height between the low point of the control arm ball joints and the lower surface of the control arm housing.

These readings can be equalized or adjusted by raising or lowering of the torsion bar anchor adjusting bolt (Fig. 19) to the specified height. See Table 1 for height specification.

NOTE: These reading are direct measurements and indicate the difference in height between the low point of the control arm ball joints and the lower surface of the control arm housing.

If Tool C-3608 is not available, car height can be set in the following manner:

Compare the differences of the two measurements between "A" and point "B" (Fig. 20). The difference between these two measurements should be 1/4 + 1/8 inch, on the Passenger Car, 2 3/4 on the Town and Country Wagon and 1 3/4 inch on the C-300D models. If the difference between the two sides of the vehicle are within 1/8 inch of each other and are with-

TABLE I

CAR HEIGHT SPECIFICATION

Standard Passenger Cars	2 1/4 ± 1/8 inch
Town and Country Wagon	2 3/4 ± 1/8 inch
C-300D	1 3/4 ± 1/8 ihcn

in the limits specified, they may be considered acceptable. If these values differ more than 1/8 inch or if one or both of them are outside of the specified limits, the front suspension height on both sides must be reset by tightening or loosening the adjusting bolt at the torsion bar (Fig. 19). See Table 1 for Height Specifications.

11. FRONT WHEEL ALIGNMENT (CASTER AND CAMBER)

Correct front wheel alignment produces easy, positive steering with a minimum of scuffing action between tire and load. Normally, when checking front wheel alignment, car should be empty (all luggage or load should be removed). If a constant load is carried, such as when a car is used by salesman for carrying samples, etc., car should be loaded with its normal amount of weight before checking front wheel alignment.

All factors of front wheel alignment are interrelated, but each angle has specific purpose. Four different angles are used in positioning front wheels for proper steering under varying conditions of weight and speed.

When making adjustments or installing new suspension parts, the alignment angles in both front wheels should be checked in the following order: Caster, (Fig. 21), Camber, (Fig. 22), Steering Axis Inclination and Toe.

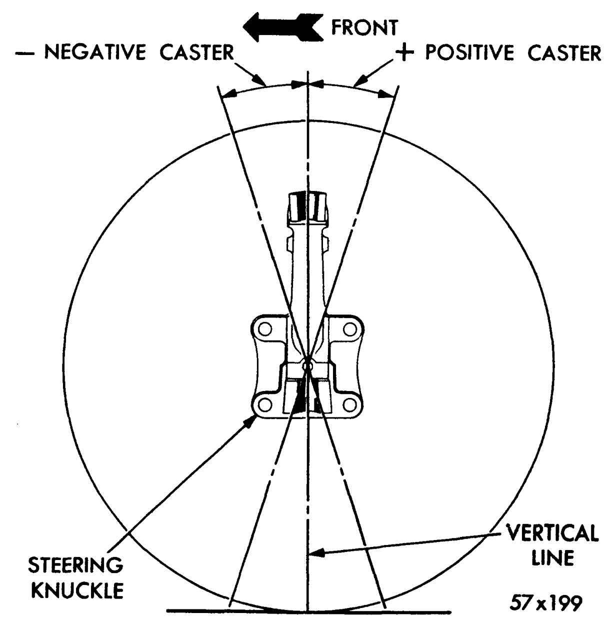


Fig. 21—Caster Angle

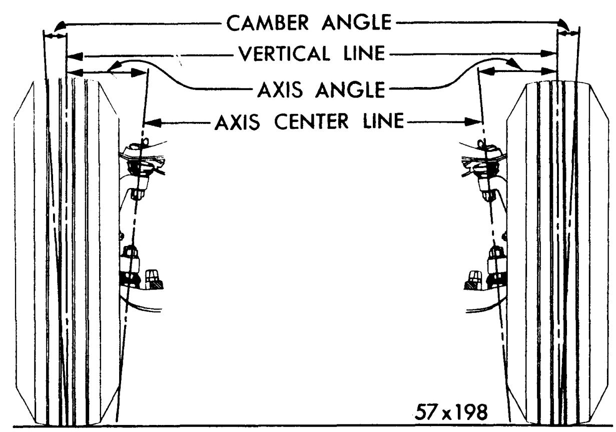


Fig. 22—Camber Angle Axis Inclination

NOTE: Front suspension parts are heat treated, if they are damaged or bent, they should be replaced. Under no circumstances should these parts be heated in order to straighten.

The method of checking front wheel alignment settings on the subject models, which incorporate Torsion-Aire front suspension, remains the same as the method used on previous models. However, the procedures for adjusting camber and caster settings and front spring heights differ.

After alignment is once checked and adjusted, it should only be necessary to check the alignment once a year, under normal operating conditions. However, new cars or cars which have had the front suspension reconditioned and new suspension bushings installed, may require realigning after a short period of operation. This is due to the relatively stiff operation of new bushings, which will take a normal set after a short period of driving.

Inspection

When checking front wheel alignment, the following inspection should be made to determine the necessity for repairs or replacement of suspension or steering parts and the necessary repairs made before proceeding further:

1. Check type of tire wear.

2. Check adjustment of front wheel bearings as follows:

   a. Remove any burrs or nicks on the spindle thread.

b. Tighten wheel bearing adjusting nut to 90 inch-pounds while rotating the wheel.

c. Selectively position the nut lock over the adjusting nut so that one set of slots in the nut lock is in line with the cotter pin hole in the spindle.

d. Without removing the nut lock, back off the nut until the next set of slots in the nut lock is lined up with the cotter pin hole.

e. Insert and bend the cotter pin to secure the nut lock. Check all suspension and steering linkage pivot points for excessive looseness.

3. Check rear springs for "U" bolt tightness and proper positioning on axle spring seat.
4. Check for bent frame or suspension parts by measuring wheel base (both sides) from center to center of axles with front wheels in straight ahead position.

When the above points have been checked and the necessary repairs made, check and correct front wheel alignment as follows:

Inflate all tires to recommended pressure. (Should have tires with equal wear on front wheels). Position the car on a level floor with only the weight of the vehicle on the springs.

Grasp the front bumper at the center and jounce the front of the car up and down several times to place the front springs and shock absorbers in their normal position.

NOTE: The car must remain in this normal position while checking all alignment settings.

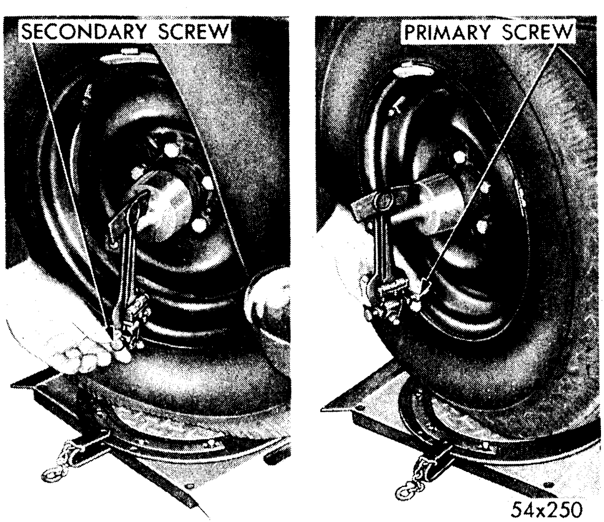


Fig. 23—Checking Caster—Right Wheel

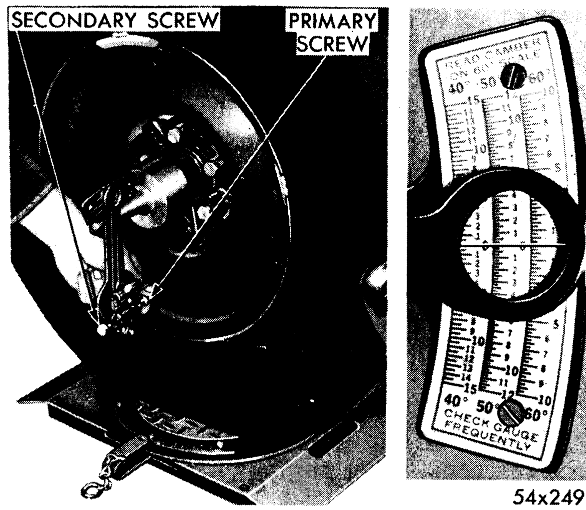


Fig. 24—Checking Camber (Tool C-3409)

Check front suspension height by finding the difference in height between the floor and the two measuring points on each lower control arm. The measuring point at the inner end is from the underside of the lower control arm bushing housing (located between the flanges of the control arm) to the floor, ("A" Fig. 20). This measuring point at the outer end is from the lowest point of the lower ball joint housing to the floor, ("B" Fig. 20). The difference in the two should be $2\frac{1}{4} \pm \frac{1}{8}$ inch, on the Passenger car, $2\frac{3}{4}$ Town and Country Wagon and $1\frac{3}{4}$ on the C-300D models. If the difference between the two sides of the vehicle are within $\frac{1}{8}$ inch of each other and are within the limits specified, they may be considered acceptable. If these values differ more than $\frac{1}{8}$ inch or if one or both of them are outside of

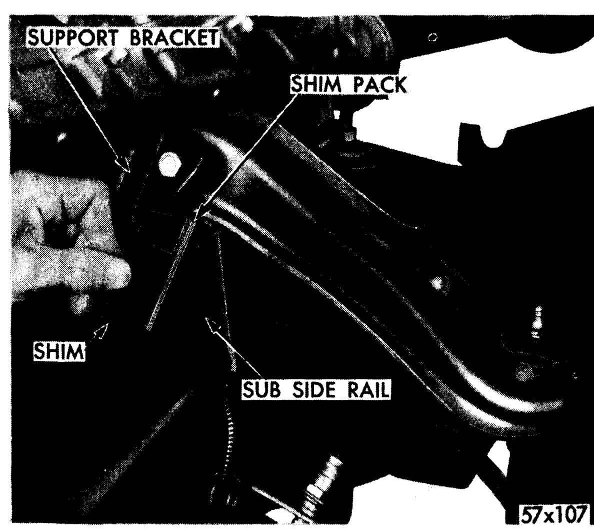


Fig. 25—Removing Shims to Adjust Camber or Caster

the specified limits, the front suspension height on both sides must be reset by tightening or loosening the adjusting bolt at the torsion bar (Fig. 19).

Compare the measurements that have been taken on both the right and left sides of the car. The two results should be within 1/8 inch of each other.

If the spring heights are not within the specified measurements, or if the right and left measurements differ by more than 1/8 inch, correct by tightening or loosening the height adjusting bolts at the torsion bar spring rear anchors. Tightening a spring height adjusting bolt, (one located at each end of the engine rear crossmember) will increase spring height; loosening the bolt will decrease height.

NOTE: Always check front wheel alignment and aiming of headlights after adjusting spring heights.

Caster and camber angles and king-pin inclination can be checked with Gauge Tool C-3409, Turntable Tool DD-435 and Gauge Tool DD-428 with new leg attachment for small wheels (Figs. 21, 22, 23 and 24).

Negative Caster is the tilting of the top of the steering knuckle toward the front of car.

Positive Caster is the tilting of the top of the steering knuckle toward the rear of the car.

Camber is amount that front wheels lean outward or inward from the vertical, when viewed from front of car. With positive camber, wheels are farther apart at top than at bottom. With negative camber, this condition is reversed.

NOTE: Caster and camber are adjusted by removing or adding shims (Fig. 25) between the upper control arm support brackets and frame sub-side rails.

Adding shims at the rear bracket or removing shims at the front bracket will increase positive caster. One shim 1/16 inch thick will change caster approximately 3/8°.

Removing shims equally at both front and rear brackets will increase positive camber. One shim 1/16 inch thick at each bracket will change camber approximately 5/16°. The total thickness of each shim pack should not exceed 9/16 inch.

NOTE: Should any front suspension parts become bent, they should be replaced. Under no circumstances should these parts be heated to straighten or bend.

12. ADJUSTING CASTER AND CAMBER WITH TORSION-AIRE SHIM CHANGE CHART (FIG. 26)

Both caster and camber can be adjusted at the same time by the use of the attached chart on pages 14 and 15.

The shim chart is designed to operate much in the same manner as the mileage charts found on most road maps. The chart may be used for either left or right wheels, as well as for cars equipped with manual or power steering. The camber figures for the right wheel will be found across the top of the chart and the figures for the camber reading for the left will be found across the bottom of the chart. Figures for the caster on a power steering equipped car will be found along the left side. The figures for the manual steering car will be found along the right side.

To use the shim chart, the following procedures should be followed:

The car should be jounced so as to allow it to assume its normal setting. The car height should be checked and adjusted if it's not within the specifications. THE FRONT SUSPENSION MUST ALWAYS BE SET AT THE PROPER HEIGHT BEFORE ALIGNMENT CHECKS OR WORK ARE PERFORMED.

A wheel alignment reading should be taken to determine the present caster and camber settings for each wheel. These settings should be recorded so they will not be forgotten.

Locate on the chart, the camber reading for the right wheel using the camber figures across the top of the chart. Also locate the caster reading for the right wheel using either the caster figures at the left side if the car is equipped with power steering or right side of the chart, if the car is equipped with manual steering. Follow the caster column across until it intersects with the camber vertical column indicating the shim change necessary to bring the right wheel within preferred setting range.

TORSION-AIRE SHIM CHANGE CHART

CAMBER—RIGHT WHEEL +¼ TO –¼ DEGREES, 0° PREFERRED

+1½ TO 0 DEGREES (Set right and left sides the same)

RT.➤	–3.00	–2.75	–2.50	–2.25	–2.00	–1.75	–1.50	–1.25	–1.00	–.75	–.50	–.25	0°	+.25	+.50	+.75	+1.00	+1.25	+1.50	+1.75	+2.00	+2.25	+2.50	+2.75	+3.00	
+8.00													+18–18													+6.50
+7.75													+17–17													+6.25
+7.50												–15+18	+16–16	+18–15												+6.00
+7.25												+14–17	+16–16	+17–14												+5.75
+7.00												+14–17	+15–15	+17–14												+5.50
+6.75											+12–18	+13–16	+15–15	+16–13	+18–12											+5.25
+6.50											+11–17	+13–16	+14–14	+16–13	+17–11											+5.00
+6.25										+ 9–18	+11–17	+12–15	+13–13	+15–12	+17–11	+18– 9										+4.75
+6.00										+ 9–18	+10–16	+11–14	+13–13	+14–11	+16–10	+18– 9										+4.50
+5.75										+ 8–17	+ 9–15	+11–14	+12–12	+14–11	+15– 9	+17– 8										+4.25
+5.50									+ 6–18	+ 7–16	+ 9–15	+10–13	+11–11	+13–10	+15– 9	+16– 7	+18– 6									+4.00
+5.25									+ 5–17	+ 7–16	+ 8–14	+ 9–12	+11–11	+12– 9	+14– 8	+16– 7	+17– 5									+3.75
+5.00								+ 3–18	+ 5–17	+ 6–15	+ 7–13	+ 9–12	+10–10	+12– 9	+13– 7	+15– 6	+17– 5	+18– 3								+3.50
+4.75								+ 2–17	+ 4–16	+ 5–14	+ 7–13	+ 8–11	+10–10	+11– 8	+13– 7	+14– 5	+16– 4	+17– 2								+3.25
+4.50								+ 2–17	+ 3–15	+ 5–14	+ 6–12	+ 8–11	+ 9– 9	+11– 8	+12– 6	+14– 5	+15– 3	+17– 2								+3.00
+4.25							0–18	+ 1–16	+ 3–15	+ 4–13	+ 6–12	+ 7–10	+ 9– 9	+10– 7	+12– 6	+13– 4	+15– 3	+16– 1	+18 0							+2.75
+4.00							– 1–17	+ 1–16	+ 2–14	+ 4–13	+ 5–11	+ 7–10	+ 8– 8	+10– 7	+11– 5	+13– 4	+14– 2	+16– 1	+17+ 1							+2.50
+3.75						– 3–18	– 1–17	0–15	+ 1–13	+ 3–12	+ 4–10	+ 6– 9	+ 7– 7	+ 9– 6	+10– 4	+12– 3	+13– 1	+15 0	+17+ 1	+18+ 3						+2.25
+3.50						– 4–17	– 2–16	– 1–14	+ 1–13	+ 2–11	+ 4–10	+ 5– 8	+ 7– 7	+ 8– 5	+10– 4	+11– 2	+13– 1	+14+ 1	+16+ 2	+17+ 4						+2.00
+3.25					– 6–18	– 4–17	– 3–15	– 1–14	0–12	+ 2–11	+ 3– 9	+ 5– 8	+ 6– 6	+ 8– 5	+ 9– 3	+11– 2	+12 0	+14+ 1	+15+ 3	+17+ 4	+18+ 6					+1.75
+3.00					– 6–18	– 5–16	– 3–15	– 2–13	0–12	+ 1–10	+ 3– 9	+ 4– 7	+ 5– 5	+ 7– 4	+ 9– 3	+10– 1	+12 0	+13+ 2	+15+ 3	+16+ 5	+18+ 6					+1.50
+2.75					– 7–17	– 5–16	– 4–14	– 2–13	– 1–11	0– 9	+ 2– 8	+ 3– 6	+ 5– 5	+ 6– 3	+ 8– 2	+ 9 0	+11+ 1	+13+ 2	+14+ 4	+16+ 5	+17+ 7					+1.25
+2.50				– 9–18	– 8–16	– 6–15	– 5–13	– 3–12	– 2–10	0– 9	+ 1– 7	+ 3– 6	+ 4– 4	+ 6– 3	+ 7– 1	+ 9 0	+10+ 2	+12+ 3	+13+ 5	+15+ 6	+16+ 8	+18+ 9				+1.00
+2.25				–10–17	– 8–16	– 7–14	– 5–13	– 4–11	– 2–10	– 1– 8	+ 1– 7	+ 2– 5	+ 4– 4	+ 5– 2	+ 7– 1	+ 8+ 1	+10+ 2	+11+ 4	+13+ 5	+14+ 7	+16+ 8	+17+10				+ .75
+2.00			–12–18	–10–17	– 9–15	– 7–14	– 6–12	– 4–11	– 3– 9	– 1– 8	0– 6	+ 2– 5	+ 3– 3	+ 5– 2	+ 6 0	+ 8+ 1	+ 9+ 3	+11+ 4	+12+ 6	+14+ 7	+15+ 9	+17+10	+18+12			+ .50
+1.75			–12–18	–11–16	–10–14	– 8–13	– 6–12	– 5–10	– 3– 9	– 2– 7	– 1– 5	+ 1– 4	+ 2– 2	+ 4– 1	+ 5+ 1	+ 7+ 2	+ 9+ 3	+10+ 5	+12+ 6	+13+ 8	+14+10	+16+11	+18+12			+ .25
+1.50			–13–17	–12–15	–10–14	– 9–12	– 7–11	– 6– 9	– 4– 8	– 3– 6	– 1– 5	0– 3	+ 2– 2	+ 3 0	+ 5+ 1	+ 6+ 3	+ 8+ 4	+ 9+ 6	+11+ 7	+12+ 9	+14+10	+15+12	+17+13			0°
+1.25		–15–18	–14–16	–12–15	–11–13	– 9–12	– 8–10	– 6– 9	– 5– 7	– 3– 6	– 2– 4	0– 3	+ 1– 1	+ 3 0	+ 4+ 2	+ 6+ 3	+ 7+ 5	+ 9+ 6	+10+ 8	+12+ 9	+13+11	+15+12	+16+14	+18+15		– .25
+1.00		–16–17	–14–16	–13–14	–11–13	–10–11	– 8–10	– 7– 8	– 5– 7	– 4– 5	– 2– 4	– 1– 2	+ 1– 1	+ 2+ 1	+ 4+ 2	+ 5+ 4	+ 7+ 5	+ 8+ 7	+10+ 8	+11+10	+13+11	+14+13	+16+14	+17+16		– .50

CASTER—MANUAL STEERING

CASTER—POWER STEERING

0 TO −1½ DEGREES (Set right and left sides the same)

LT. ➤	−2.75	−2.50	−2.25	−2.00	−1.75	−1.50	−1.25	−1.00	−.75	−.50	−.25	0"	+.25	+.50	+.75	+1.00	+1.25	+1.50	+1.75	+2.00	+2.25	+2.50	+2.75	+3.00	+3.25	
+ .75	−18−18	−16−16	−15−15	−13−13	−12−12	−10−10	− 9− 9	− 8− 8	− 6− 6	− 4− 4	− 3− 3	− 1− 1	0 0	+ 1+ 1	+ 3+ 3	+ 4+ 4	+ 6+ 6	+ 8+ 8	+ 9+ 9	+10+10	+12+12	+13+13	+15+15	+16+16	+18+18	− .75
+ .50		−17−16	−16−14	−14−13	−13−11	−11−10	−10− 8	− 8− 7	− 7− 5	− 5− 4	− 3− 3	− 2− 1	− 1+ 1	+ 1+ 2	+ 3+ 3	+ 4+ 5	+ 5+ 7	+ 7+ 8	+ 8+10	+10+11	+11+13	+13+14	+14+16	+16+17		−1.00
+ .25		−18−15	−16−14	−15−12	−13−11	−12− 9	−10− 8	− 9− 6	− 7− 5	− 6− 3	− 4− 2	− 3 0	− 1+ 1	0+ 3	+ 2+ 4	+ 3+ 6	+ 5+ 7	+ 6+ 9	+ 8+10	+ 9+12	+11+13	+12+15	+14+16	+15+18		−1.25
0°			−17−13	−15−12	−14−10	−12− 9	−11− 7	− 9− 6	− 8− 4	− 6− 3	− 5− 1	− 3 0	− 2+ 2	0+ 3	+ 1+ 5	+ 3+ 6	+ 4+ 8	+ 6+ 9	+ 7+11	+ 9+12	+10+14	+12+15	+13+17			−1.50
− .25			−18−12	−16−11	−14−10	−13− 8	−12− 6	−10− 5	− 9− 3	− 7− 2	− 5− 1	− 4+ 1	− 3+ 3	− 1+ 4	+ 1+ 5	+ 2+ 7	+ 3+ 9	+ 5+10	+ 6+12	+ 8+13	+10+14	+11+16	+12+18			−1.75
− .50			−18−12	−17−10	−15− 9	−14− 7	−12− 6	−11− 4	− 9− 3	− 7− 2	− 6 0	− 5+ 2	− 3+ 3	− 2+ 5	0+ 6	+ 2+ 7	+ 3+ 9	+ 4+11	+ 6+12	+ 7+14	+ 9+15	+10+17	+12+18			−2.00
− .75				−17−10	−16− 8	−14− 7	−13− 5	−11− 4	−10− 2	− 8− 1	− 7+ 1	− 5+ 2	− 4+ 4	− 2+ 5	− 1+ 7	+ 1+ 8	+ 2+10	+ 4+11	+ 5+13	+ 7+14	+ 8+16	+10+17				−2.25
−1.00				−18− 9	−16− 8	−15− 6	−13− 5	−12− 3	−10− 2	− 9 0	− 7+ 1	− 6+ 3	− 4+ 4	− 3+ 6	− 1+ 7	0+ 9	+ 2+10	+ 3+12	+ 5+13	+ 6+15	+ 8+16	+ 9+18				−2.50
−1.25					−17− 7	−16− 5	−14− 4	−13− 2	−11− 1	− 9 0	− 8+ 2	− 6+ 3	− 5+ 5	− 3+ 6	− 2+ 8	0+ 9	+ 1+11	+ 2+13	+ 4+14	+ 5+16	+ 7+17					−2.75
−1.50					−18− 6	−16− 5	−15− 3	−13− 2	−12 0	−10+ 1	− 8+ 2	− 7+ 4	− 6+ 6	− 4+ 7	− 2+ 8	− 1+10	0+12	+ 2+13	+ 3+15	+ 5+16	+ 6+18					−3.00
−1.75					−18− 6	−17− 4	−15− 3	−14− 1	−12 0	−10+ 1	− 9+ 3	− 7+ 4	− 6+ 6	− 4+ 7	− 3+ 9	− 1+10	0+12	+ 1+14	+ 3+15	+ 4+17	+ 6+18					−3.25
−2.00						−17− 4	−16− 2	−14− 1	−13+ 1	−11+ 2	−10+ 4	− 8+ 5	− 7+ 7	− 5+ 8	− 4+10	− 2+11	− 1+13	+ 1+14	+ 2+16	+ 4+17						−3.50
−2.25						−18− 3	−17− 1	−15 0	−13+ 1	−12+ 3	−10+ 4	− 9+ 6	− 8+ 8	− 6+ 9	− 4+10	− 3+12	− 1+13	0+15	+ 1+17	+ 3+18						−3.75
−2.50							−17− 1	−16+ 1	−14+ 2	−12+ 3	−11+ 5	− 9+ 6	− 8+ 8	− 6+ 9	− 5+11	− 3+12	− 2+14	− 1+16	+ 1+17							−4.00
−2.75							−18 0	−16+ 1	−15+ 3	−13+ 4	−11+ 5	−10+ 7	− 9+ 9	− 7+10	− 5+11	− 4+13	− 3+15	− 1+16	0+18							−4.25
−3.00								−17+ 2	−15+ 3	−14+ 5	−12+ 6	−11+ 8	− 9+ 9	− 8+11	− 6+12	− 5+14	− 3+15	− 2+17								−4.50
−3.25								−17+ 2	−16+ 4	−14+ 5	−13+ 7	−11+ 8	−10+10	− 8+11	− 7+13	− 5+14	− 4+16	− 2+17								−4.75
−3.50								−18+ 3	−17+ 5	−15+ 6	−13+ 7	−12+ 9	−11+11	− 9+12	− 7+13	− 6+15	− 5+17	− 3+18								−5.00
−3.75									−17+ 5	−15+ 6	−14+ 8	−12+ 9	−11+11	− 9+12	− 8+14	− 6+15	− 5+17									−5.25
−4.00									−18+ 6	−16+ 7	−15+ 9	−13+10	−12+12	−10+13	− 9+15	− 7+16	− 6+18									−5.50
−4.25										−17+ 8	−15+ 9	−14+11	−12+12	−11+14	− 9+15	− 8+17										−5.75
−4.50										−18+ 9	−16+10	−14+11	−13+13	−11+14	−10+16	− 9+18										−6.00
−4.75										−18+ 9	−17+11	−15+12	−14+14	−12+15	−11+17	− 9+18										−6.25
−5.00											−17+11	−16+13	−14+14	−13+16	−11+17											−6.50
−5.25											−18+12	−16+13	−15+15	−13+16	−12+18											−6.75
−5.50												−17+14	−15+15	−14+17												−7.00
−5.75												−17+14	−16+16	−14+17												−7.25
−6.00												−18+15	−17+17	−15+18												−7.50
−6.25													−17+17													−7.75
−6.50													−18+18													−8.00

CAMBER—LEFT WHEEL +½ TO 0 DEGREES, ⅜ PREFERRED

58x264

Fig. 26—Torsion-Aire Shim Change Chart

SHIM TABLE II

	Direction	Front Bracket	Rear Bracket
Camber	**Increase**	**Remove Shims**	**Remove Shims**
	Decrease	Add Shims	Add Shims
Caster	**Increase**	**Remove Shims**	**or Add Shims**
(Positive)	Decrease	Add Shims or	Remove Shims

The first figure in the square indicates the shim change necessary at the front bracket. The second figure indicates the shim change necessary at the rear bracket. A plus mark (+) indicates the addition of shims, a minus mark (—) indicates the removal of shims.

NOTE: The chart is based on a 1/32 inch shim to enable more accurate settings to the preferred specifications. It is advisable to use 1/16 inch shims where possible to reduce the number of shims that have to be handled. The shim pack should NOT exceed 9/16 inch. (Eighteen 1/32 inch shims or nine 1/16 inch shims.)

The same procedure should be repeated using the appropriate figures for the left wheel. After the shims have been changed as indicated by the chart, the alignment should be rechecked with the gauges, to complete the operation.

13. ADJUSTING FRONT WHEEL TOE-IN

Toe-In means that wheels are closer together at front than they are at rear. To measure, spin front wheels and scribe a thin line in center of tread of each tire (Fig. 27). Jounce front end up and down several times and position wheels in straight-ahead position. Gauge and scriber

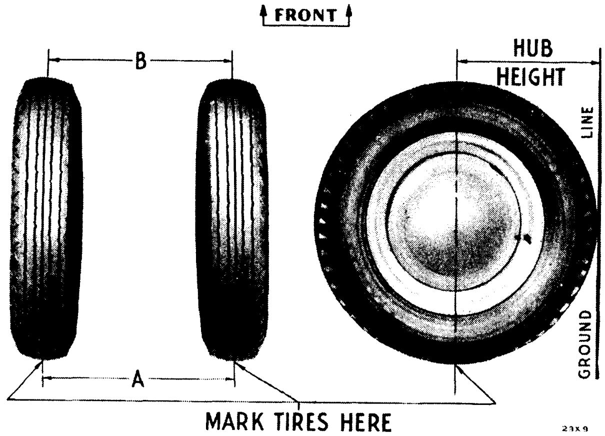


Fig. 27—Front Wheel Toe-In

Tool C-695 can be used for scribing tire treads and measuring toe.

Measure distance at hub height between points A and B, Fig. 27. The distance between point B should be ⅛ inch less than distance between point A. To adjust toe, lengthen or shorten the tie rods an equal amount until the wheels toe-in ⅛ inch, plus or minus $\frac{1}{32}$ inch (⅛ inch preferred) and recheck measurements at points A and B. Make sure the rods are centered and U-clamps are down before the tie rod clamp bolts are tightened.

NOTE: The steering wheel hub, steering gear arm, steering tube and steering gear roller shaft are machined with master serrations to place front wheels straight-ahead when steering

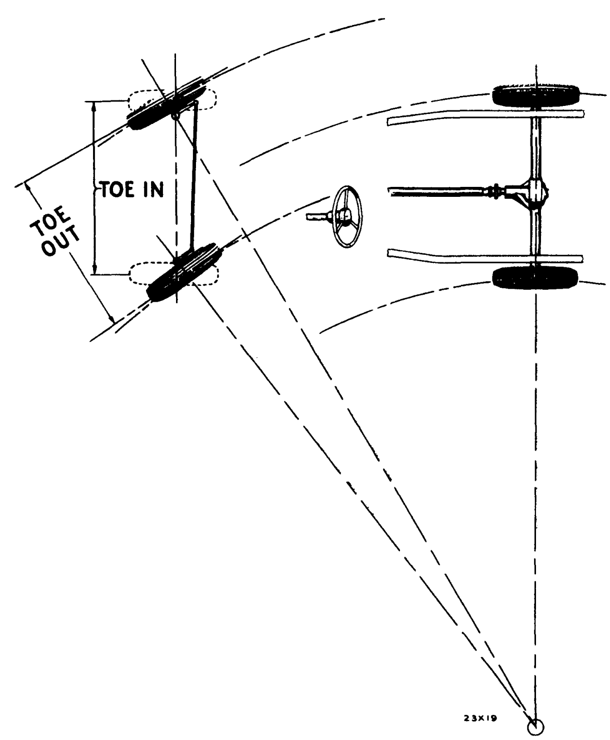


Fig. 28—Steering Geometry on Turns

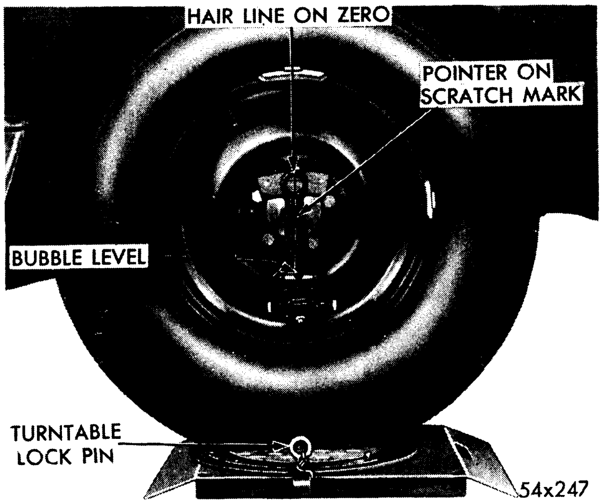


Fig. 29—Gauge C-3409 and Turntable DD 435 on Right Wheel

wheel is in center position. Do not alter these serrations to change position of these parts. Improper position of steering wheel must be corrected by adjusting tie rod lengths.

Toe-out turns.

When car makes a turn, front wheels travel in circles which have a common center (Fig. 28). The arc of circle traveled by the inside front wheel is smaller than arc of circle traveled by outside front wheel. Consequently, when turned to right or left, the wheels will be farther apart at front than at rear. The amount that front wheels toe-out depends upon how far they are turned.

With front wheels on turntables, set right wheel to 20 degrees. The turntable under left wheel should indicate 21½ degrees, plus or minus 1 degree. If reading is not within these limits, the steering knuckle arm or steering gear arm may be bent. Before above check is made, make sure that camber, caster, steering axis inclination and toe-in are within limits.

14. CHECKING STEERING AXIS INCLINATION

Steering axis inclination is amount in degrees that axis of the ball joints lean away from vertical toward center of car (Fig. 21). If camber can be adjusted within the recommended limits, it is unnecessary to check steering axis inclination.

To check axis inclination refer to Figs. 21 and 22 and proceed as follows:

Inflate tires to recommended pressure, place front wheels in straight-ahead position on turntables and set foot brakes. Grasp front bumper at center and move front end of car up and down several times to permit front suspension parts to settle in "normal" unloaded position.

Assemble gauge to right wheel (Fig. 29) and pull out turntable lock pins. Turn front wheels to left until right wheel has turned more than 20 degrees then return to 20 degrees. Adjust secondary screw (Fig. 30), which controls the short pointer until bubble is centered in spirit level. **Do not disturb gauge setting or release brakes.**

Turn front wheels to right until right wheel is turned to an angle of more than 20 degrees mark. Allow wheel to back off to exactly 20 degrees. Adjust primary screw (Fig. 30) until bubble centers in spirit level. The reading on 40-degree scale of gauge will be steering axis inclination for right wheel.

To check angle of left front wheel, place gauge on left wheel, turn front wheels to right and repeat procedure outlined above.

NOTE: If the steering axis inclination does not conform with limits listed in Specifications, check for bent frame, steering knuckle or control arms or damaged ball joints.

15. SERVICING THE STEERING KNUCKLES (FIG. 31)

a. Removal

Remove wheel, tire and drum. Cover brakes

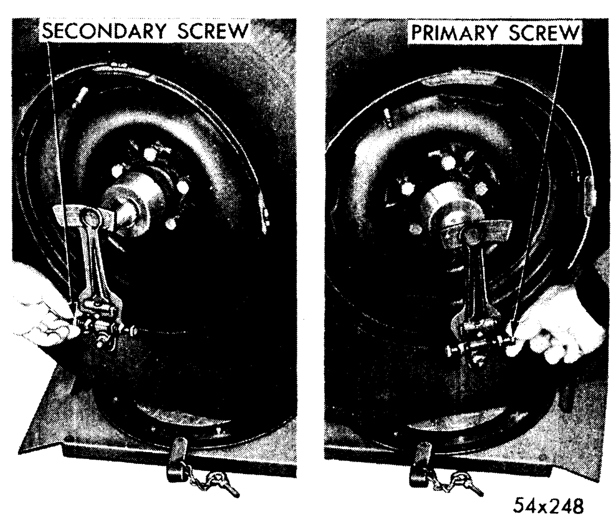


Fig. 30—Checking Steering Axis Inclination (Gauge C-3409)

with clean cloth to protect lining from being covered with grease. Remove the cotter pins, nuts and lockwashers attaching the steering arm and brake dust shield to steering knuckle. Remove steering arm, and brake assembly from steering knuckle but leaving the brake hose attached. Do not allow assembly to hang by the brake hose. Remove ball joint studs from steering knuckles as described in "Servicing the Upper and Lower Ball Joints," Paragraph 16, using Tool C-3564. Lift steering knuckle out and away from vehicle.

b. Installation

To install steering knuckle, refer to Fig. 31, and slide upper and lower ball joint studs into steering knuckle and install lockwashers and nuts. Tighten the ball joint stud nut to 135 foot-pounds torque. Install cotter pins.

Slide brake assembly over knuckle and into position. Install lockwashers and nuts on upper rear and lower front bolts. Install upper front and lower rear bolts through dust shield and steering knuckle, then slide steering arm over bolts. Install lockwashers and nuts. Tighten nuts evenly to 55 foot-pounds torque. Install cotter pins. Remove covering from brake shoes, replace wheel, tire and drum assembly. Adjust front wheel bearings as per "Front Wheel Bearing End Play Adjustment", Paragraph 18. Refer to "Front Wheel Alignment (Caster and Camber)", Paragraph 11.

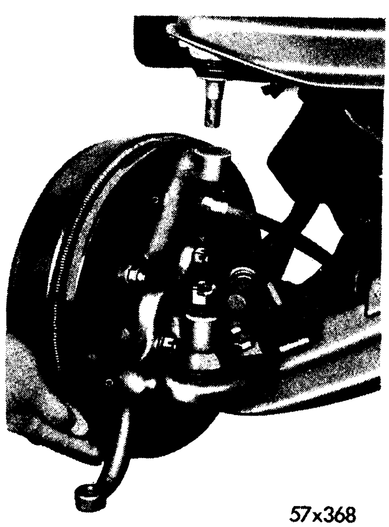


Fig. 31—Removing or Installing Steering Knuckle

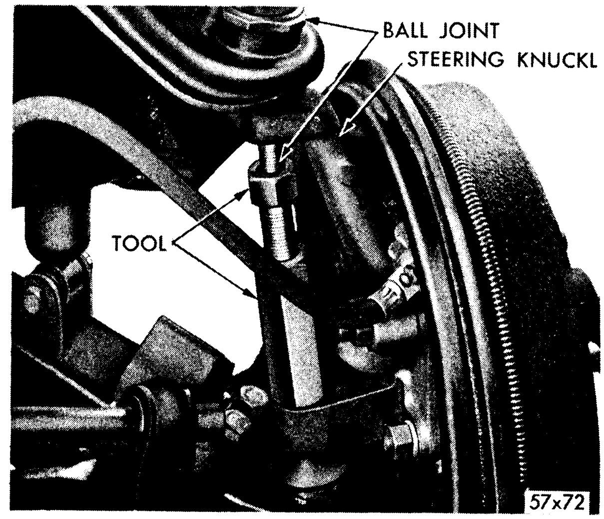


Fig. 32—Removing Upper Ball Joint—
(Removal Tool C-3564)

16. SERVICING THE BALL JOINTS—(UPPER AND LOWER) (FIGS. 32 and 33)

a. Removal of Upper Ball Joint

CAUTION

Upper and lower ball joints are not interchangeable. The upper ball joint is a preloaded joint and can not be used in the lower control arm. Remove wheel and tire assembly. With support under the lower control arm, remove upper and lower ball joint stud nuts. Install Tool C-3561 (Fig. 32). Apply load to studs and rap knuckles at ball joint boss sharply with a hammer to loosen stud. **To avoid damaging stud do not attempt to hammer stud out of knuckle.**

Remove tool, and disengage ball joint from

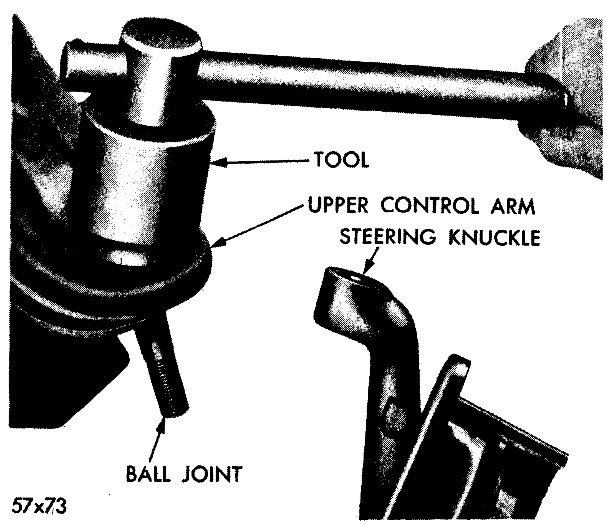


Fig. 33—Removing or Installing Upper Control Arm Ball Joints

knuckle. Remove ball joint dust cover and grease seal. Remove lubrication fitting from top of ball joint, using Tool C-3561, as shown in Figure 33, unscrew ball joint from upper control arm.

b. Installation of Upper Ball Joint

NOTE: When installing new ball joint, it is very important that the ball joint threads engage those of the control arm squarely.

With the lubrication fitting removed, screw ball joint into control arm as far as possible by hand. Using Tool C-3561, tighten until ball joint housing is seated on control arm. Slide seal and dust cover up into position, over stud and position stud in steering knuckle. Install washer and nut. Tighten 135 foot-pounds torque. Install cotter pin and lubrication fitting. Lubricate ball joint with a good grade of chassis lubricant, as specified in Lubrication, Paragraph 1.

c. Removal of Lower Ball Joint

Raise wheel off floor supporting weight under the lower control arm, allowing enough clearance to remove lower ball joint, and remove wheel and tire assembly. Remove upper and lower ball joint stud nuts, install Tool C-3564 (Fig. 34) as described in "Upper Ball Joint Removal" Paragraph 16 procedure. Rap knuckle at stud boss sharply with a hammer to loosen stud. **To avoid damaging stud do not attempt to hammer stud out of knuckle.** Remove grease fitting using Tool C-3561, screw out ball joint.

NOTE: When installing new ball joint, it is very important that the ball joint threads engage those of the control arm squarely.

d. Installation of Lower Ball Joint

To reinstall, screw ball joint into control arm as far as possible by hand. Using Tool C-3561, tighten until ball joint housing is seated on control arm. Slide seal and dust cover down into position, over stud then position stud in steering knuckle. Install washer and nut. Tighten 135 foot-pounds torque. Install cotter pin; lubricate fitting and lubricate ball joint, using a good grade of chassis lubricant and reinstall wheel and tire assembly.

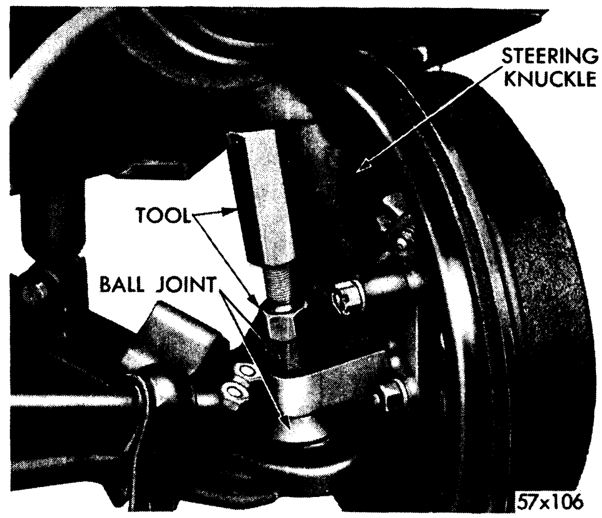


Fig. 34—Removing Lower Ball Joint

17. SERVICING THE TORSION BARS

The torsion bars are not interchangeable, side for side. The left hand bar cannot be used on the right side and vice versa. The bars will be marked left or right by (L) or (R) stamped on the end of the rod, as shown in Figure 12. The bars should always be installed with letters toward the rear of car.

a. Removal of Torsion Bar, Anchor Swivel and Bolt

To replace torsion bar anchor, refer to Fig. 2 and proceed as follows: Raise vehicle off floor by jacking under frame crossmember. Release load from torsion bar by unscrewing the anchor adjusting bolt partly out of swivel.

CAUTION

To prevent swivel from falling into frame bracket, do not loosen the swivel bolt all the way out until torsion bar is removed.

Remove the lock ring from rear of anchor (Fig. 12). Slide torsion bar rearward enough to disengage forward end of bar from lower control arm, then forward to disengage torsion bar from anchor. Remove bar, bolt, swivel and cam from frame bracket anchor.

b. Installation

With car raised off the floor, assemble anchor, swivel, bolt-seat (oval side up) and bolt in frame anchor bracket. Check for torsion bar cushion in lower control arm housing, with cam bolt barely entered in cam swivel, slide torsion bar into rear cam. Rotate anchor and torsion bar assembly until anchor is positioned as close as possible to floor pan. Engage front of torsion bar in lower control arm shaft assembly as far as bar will go.

CAUTION

Unless anchor blade is in the position just described when installing torsion bar, it will be impossible to adjust front suspension to the proper suspension height.

Center and install lock ring in rear of anchor housing. Pressure may have to be applied to torsion bar to enable lock ring to be installed in housing. After installation of lock ring, tighten cam bolt until approximately 1 inch of threads are showing above the anchor bolt swivel.

NOTE: This is an approximate setting and is to be used merely as a starting point when adjusting suspension height. This setting is also necessary to place load on the torsion bar spring before lowering vehicle to the floor.

Check and adjust suspension height. Refer to "Checking Front Suspension Height", Paragraph 10.

CAUTION

Caster and camber and front suspension height should always be checked whenever the torsion bars are replaced.

18. ADJUSTMENT OF FRONT WHEEL BEARINGS (FIGS. 35, 36 and 29)

Remove hub cap and grease cap, then jack up front of car. Remove cotter pin that retains nut lock. Remove nut lock. Using an inch-pound torque wrench, tighten adjusting nut to 90 inch-pounds, while rotating wheel. Remove torque wrench.

Selectively position the nut lock over adjusting nut so that the spindle cotter pin hole is in approximate alignment with one set of slots in nut lock, as shown in Figures 35 and 36, then back off (to next slot) adjustment (without removing nut lock) until the slots are aligned with cotter pin hole). Install cotter pin, grease cap and hub cap. Remove jack.

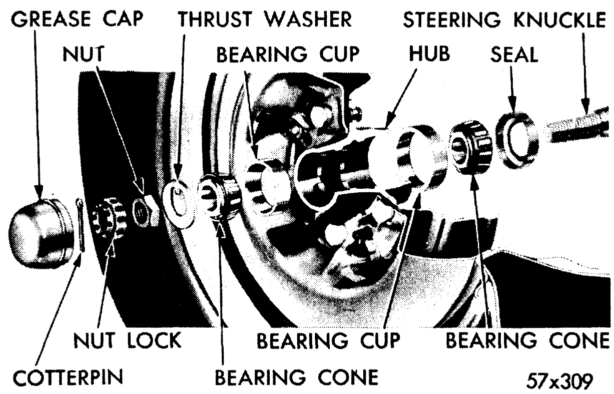


Fig. 35—Front Wheel Bearing Adjustment

Removing and Installing Front Wheel Bearing Races

Should it become necessary to remove the front wheel bearing races, remove drum then drive race out of drum as follows:

Remove inner oil seal and bearing. Invert drum, then using a suitable drift, drive the outer bearing race from the drum. (Driving slots are machined in drum for this operation.)

Again invert the drum and drive out the inner bearing race. Clean the drum and bearings, using a suitable solvent then blow dry with compressed air. (Do not spin bearings with air pressure.) Check bearings for pits or brinelling. Install new bearings as required.

Fig. 36—Installing Nut Lock

When installing new bearing races, be sure and start race evenly in drum. Drive down into position alternately, using (if possible) the old race. Be sure race is seated evenly.

Pack inner bearing with short fibre grease, then install in drum. Install new grease seal. Slide drum over spindle. Pack outer bearing with grease and slide over spindle and into drum. Install thrustwasher and nut, then adjust bearing as described above.

SERVICE DIAGNOSIS

19. FRONT END NOISY—POSSIBLE CAUSES AND CORRECTIONS

Lack of lubrication in ball joints or tie rod ends.

Worn upper or lower control arm pivot bushings (rubber) or loose mounting brackets—Tighten brackets or replace bushings.

Loose or worn strut mounting bushings (rubber)—Tighten mounting nut to proper torque or replace bushing.

Worn ball joints or tie rod ends—Replace as necessary.

Front shock absorber noisy—Tighten mounting nuts or replace bushing or shock absorber as required.

Sway eliminator noisy—Check attaching bolts for tightness and rubber bushings for wear. If rubber bushings are worn, replace sway eliminator assembly.

Worn or loose front wheel bearings—Adjust or replace as required.

20. BODY HAS TENDENCY TO PITCH AND ROLL

Low or uneven tire pressures—Inflate tires to proper pressure.

Shock absorber inoperative—Replace as required.

Loose sway eliminator—Tighten mounting bolts to proper torque.

Improper front suspension height—Adjust torsion bar springs as required.

21. TIRE WEAR

The same items which caused excessive tire wear in the previous suspension will also apply to the 1958 series suspension.

22. STEERING

The following is a list of steering problems which may be checked after it has definitely been established that difficulty is caused by the front suspension system.

23. WHEEL BOUNCE

Unequal tire pressure—Inflate tires to recommended pressure.

Unbalanced wheels, tires or brake drums—A wheel and tire assembly that is out of static balance can cause an up and down action which will affect steering ability and control.

Section II

REAR AXLE

CONTENTS

DATA AND SPECIFICATIONS

Rear Axle	LC-1, LC-2	LC-3, LY-1
Type	Semi-Floating	Semi-Floating
Gear Type	Hypoid	Hypoid
Ring Gear Diameter	8.75″	8.75″
Pinion Bearing	2	2
Type	Tapered Roller	Tapered Roller
Adjustment	Shim Pack	Shim Pack
Differential Bearings	2	2
Type	Tapered Roller	Tapered Roller
Adjustment	Threaded Adjuster	Threaded Adjuster

REAR AXLE

DATA AND SPECIFICATIONS (Continued)

Rear Axle	LC-1, LC-2		LC-3, LY-1
Drive Gear Pinion	Matched Sets		Matched Sets
Drive Gear Run-Out	.005″ Maximum		.005″ Maximum
Drive Gear and Pinion Backlash	.006″ to .008″		.006″ to .008″
Differential Side Gear Clearance	.0 to .008″		
Axle Ratio	Std. Model	T & C Wgn.	Standard
Torque Flite	2.93	3.18	2.93
No. Drive Gear Teeth	41	35	41
No. Drive Pinion Teeth	14	14	14

Type Recommended	Multi-Purpose Gear Lubricant
Summer	90
Winter	90
Extreme Cold	80
Capacity	3½ Pints
Wheel Bearings	
Type	Tapered Roller
Adjustment	Select Shims
Axle End Play	.013″ to .018″

Road Clearance (Full Load)	7.4″	7.6″
T & C Wagon	7.4″	—
Sedan	—	—
Tread (Rear)	59.62″	60.35″
T & C Wagon	59.62″	—
Sedan	—	—

SPECIAL TOOLS

Tool Number	Tool Name
C-637	Puller—Rear Axle Shaft and Inner Oil Seal
C-293	Puller Sets—Roller Bearing
C-406A	Wrench—Differential Bearing Adjusting
C-413	Driver—Axle Shaft Outer Bearing Cup
C-3339 or C-430	Dial—Indicator Set
C-452	Puller—Companion Flange or Yoke
C-499	Puller—Axle Shaft
C-549	Puller—Utility
C-745	Sleeve—Axle Shaft Oil Seal Outer
C-757	Sleeve—Axle Shaft Oil Seal Outer
C-758-D3	Gauge—Pinion Bearing Pre-Load and Cone Angle Setting
C-3281	Wrench—Companion Flange on Yoke Holding
C-839	Driver—Axle Shaft Inner Oil Seal
C-845 or C-319	Puller—Universal Wheel and Hub
C-3565	Driver—Axle Shaft Outer Seal
C-3566	Driver—Axle Shaft Outer Seal—End Brake Support
DD-996 or DD-955	Installing Sleeve—Pinion Bearing
DD-914-8	Ring—Medium Reducer (use with DD-914-89)
DD-921	Wrench—Differential Case Cap Remover and Installer
DD-993	Puller—Pinion Oil Seal
DD-999	Installing Tool—Companion Flange or Yoke
DD-1005	Driver—Differential Case Side and Cross Shaft Roller Bearing

TIGHTENING REFERENCE

	Foot-Pounds
Axle Shaft Nuts	145 (minimum)
Brake Support Plate to Housing Mounting Bolt Nuts	35
Differential Carrier to Axle Housing Bolt Nuts	45
Rear Axle Drive Gear Bolt Nuts	45
Differential Bearing Cap Bolt Nuts	110
Pinion Shaft Companion Flange Nut	240 (minimum)

Section II
REAR AXLE

1. DRIVE GEAR ASSEMBLIES

The rear axles (Figs. 1 and 2) are semi-floating type with two pinion differentials and hypoid drive gear and pinion. The drive gear and pinion on all models are serviced only in matched sets to insure smooth quiet operation.

Cleaning and inspection of parts after disassembly is very important. Metal chips not cleaned from housing and carrier after a failure may cause excessive part wear and future failures.

Bearing cones and cups should be carefully

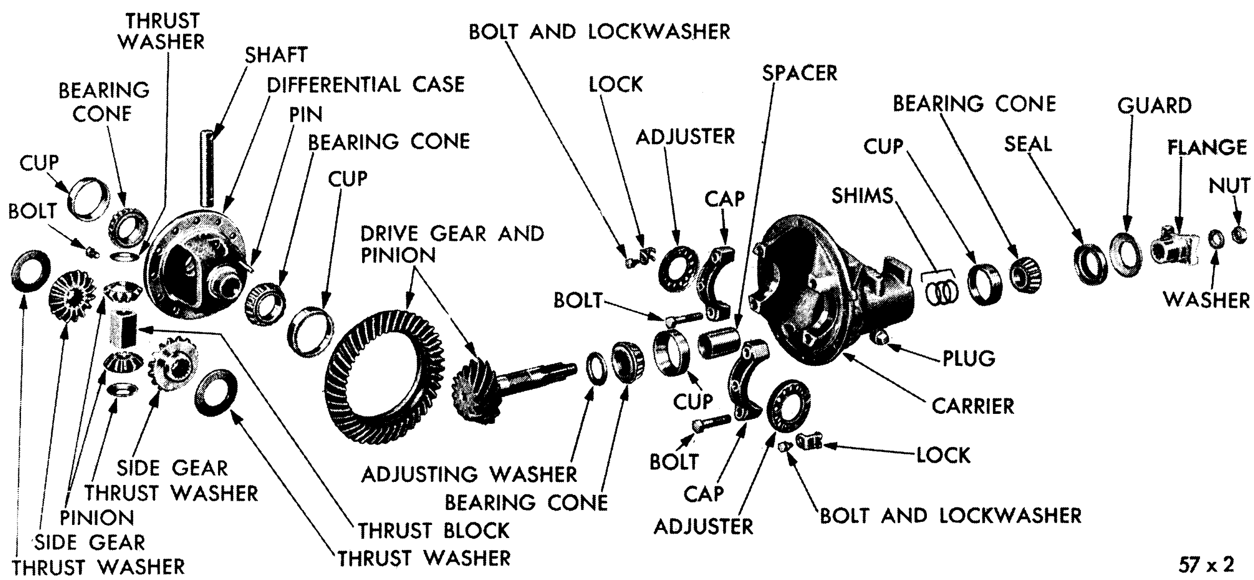


Fig. 1—Rear Axle (Exploded View) LC-1, LC-2

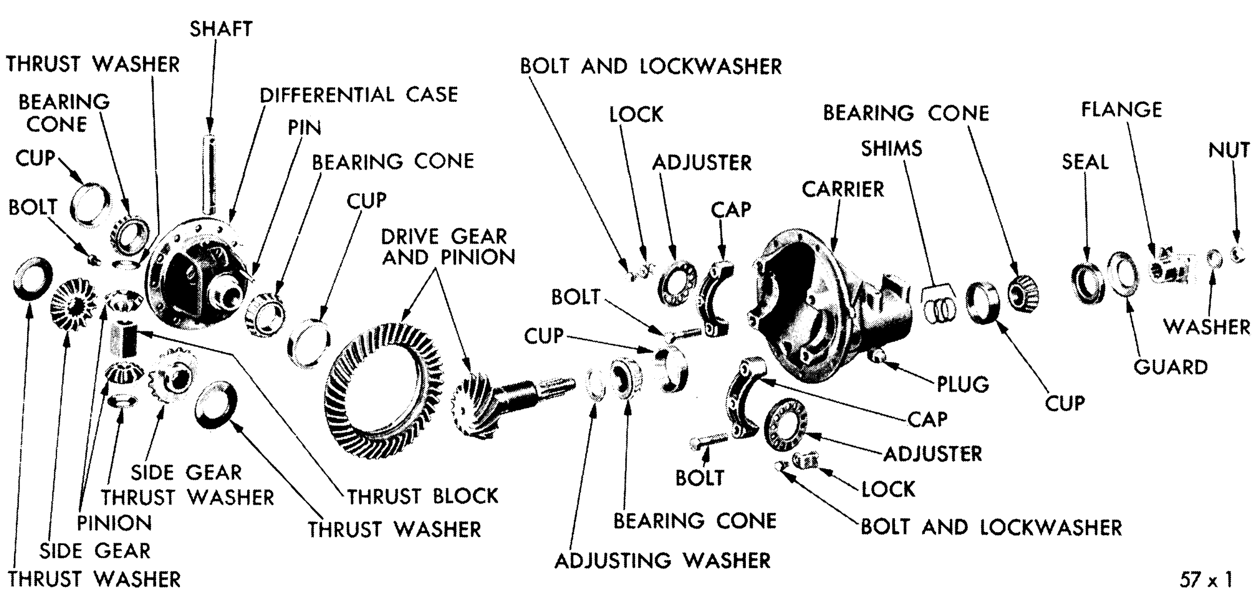


Fig. 2—Rear Axle (Exploded View) LC-3, LY-1

checked for discoloration due to overheating, and for surface wear. Axle housing should also be checked for broken welds or bent sections.

Rear spring seats should be inspected to make sure they are not broken or loose. Axle shafts should be inspected and replaced if there is evidence of damage. The axle shaft should be free of nicks and burrs before assembly.

NOTE: Gaskets and other seals should be replaced whenever they are removed as an insurance against leakage. Bearings, thrust washers and differential pinion shaft should be thoroughly lubricated before final assembly.

SERVICE PROCEDURES

2. REMOVAL OF DIFFERENTIAL CARRIER ASSEMBLY (All models)

Raise car off floor and block the brake pedal so pedal cannot be depressed. Drain lubricant from housing. Back off brake shoes, with Tool C-845. Remove rear wheels, hub and drum assemblies, as shown in Figure 3. Disconnect the brake line at wheel cylinders. Remove rear axle drive shaft keys, install special sleeve Tool C-757 in axle outer oil seal (Fig. 4) and remove the brake backing plate. Remove the shims from each end of axle housing. Each set should be kept separate so that at reassembly, the

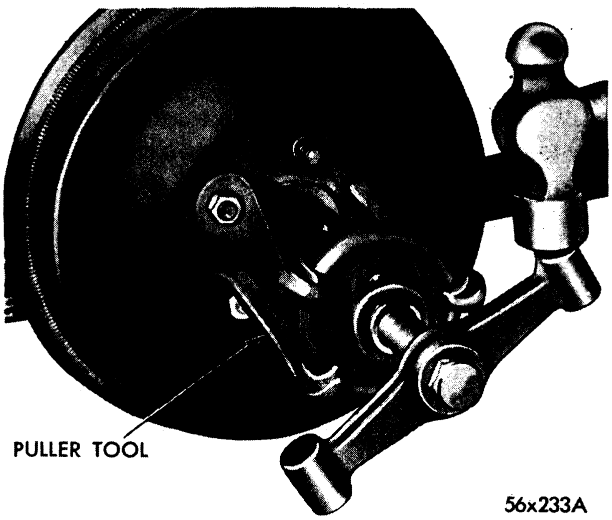


Fig. 3—Removing Hub and Drum Assemblies

Fig. 4—Removing or Installing Protective Sleeve

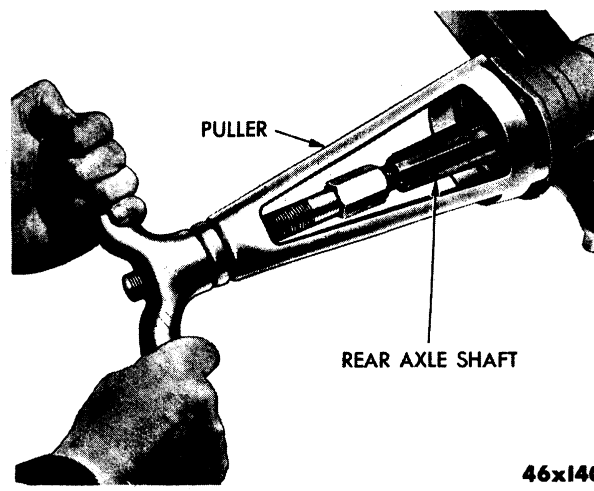


Fig 5—Removing Axle Shaft and Bearing

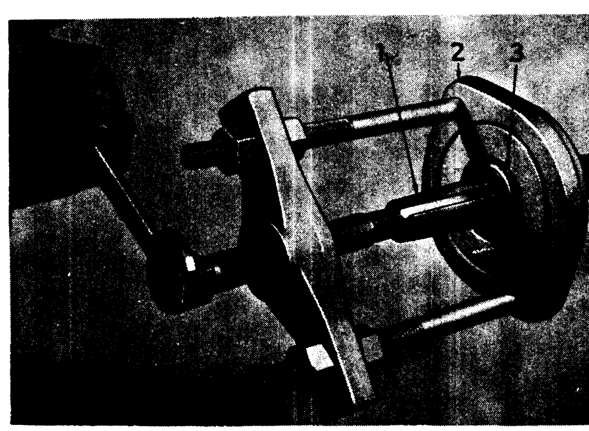


Fig. 6—Removing Bearing from Axle Shaft

central location of the axle, shafts, and thrust block will be maintained. Remove axle shafts and bearings from housing, using puller Tool C-499. (Fig. 5). If necessary, remove bearings from the axle shafts, using bearing puller Tool C-293 with adapter plate No. 13, as shown in Figure 6.

Remove the rear axle shaft inner oil seals, using puller Tool C-637 (Fig. 7) to remove the inner seal and Tool C-839 for the outer, as shown in Figure 8. Disconnect the rear universal joint and drop the prop shaft. Remove bolts attaching the carrier assembly to axle housing, and remove carrier assembly. Clean carrier assembly in suitable solvent.

3. REMOVING DRIVE GEAR AND CASE ASSEMBLY

Check gear tooth pattern on drive gear, drive gear to pinion backlash before disassembly (Fig. 9). With carrier assembly mounted in

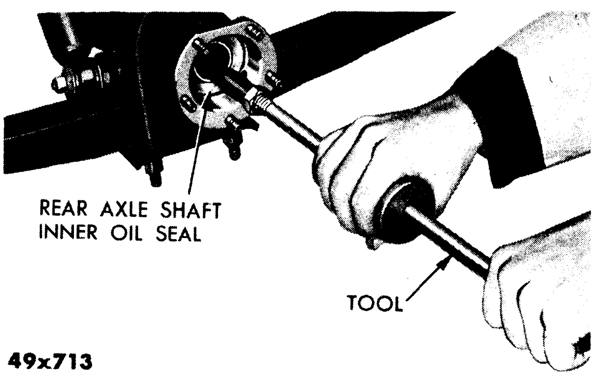


Fig. 7—Removing Inner Oil Seal Using Tool C-637

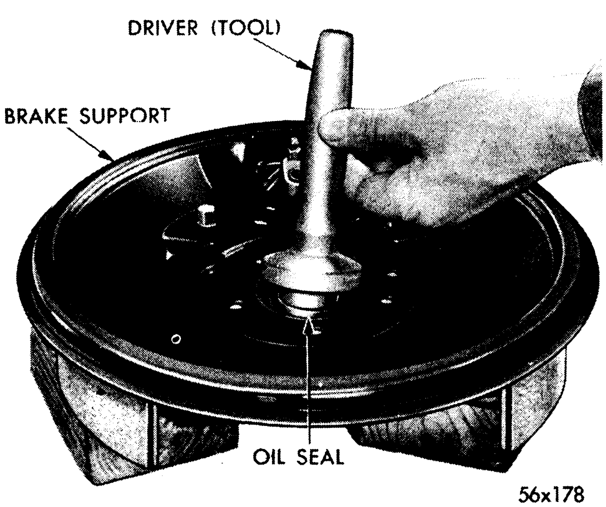


Fig. 8—Removing Outer Axle Shaft Oil Seal with Tool C-839

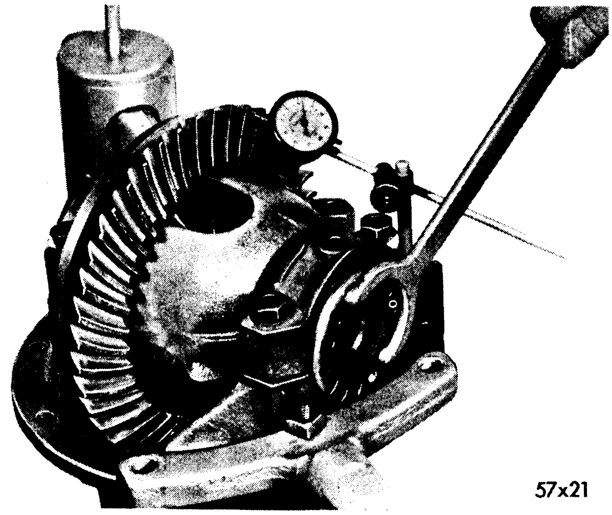


Fig. 9—Checking Drive Gear and Pinion Backlash

stand, mark both differential bearing caps and adjusters, if unit is to be checked for a specific noise condition, as shown in Figure 10, before removing caps, adjusters and drive gear assembly from carrier.

NOTE: The caps must NOT be interchanged as they are line bored with the carrier at manufacture.

4. DISASSEMBLY AND INSPECTION OF DIFFERENTIAL DRIVE GEAR AND CASE ASSEMBLY

Place differential case and drive gear assembly in a suitable fixture and remove the drive gear to case attaching cap screws and remove drive gear. **Drive gear to case bolts are left-hand**

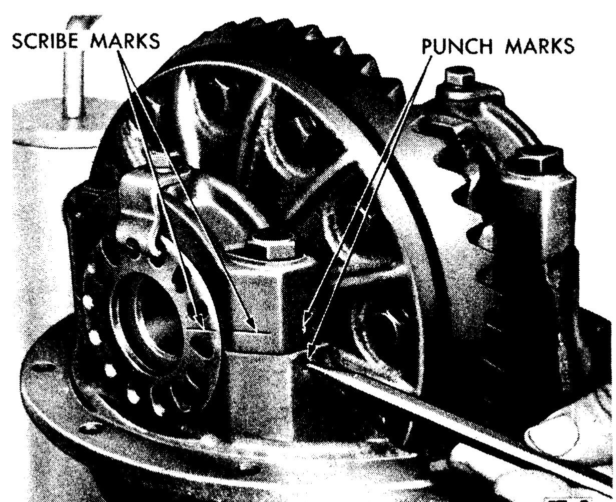


Fig. 10—Marking Caps and Adjusters

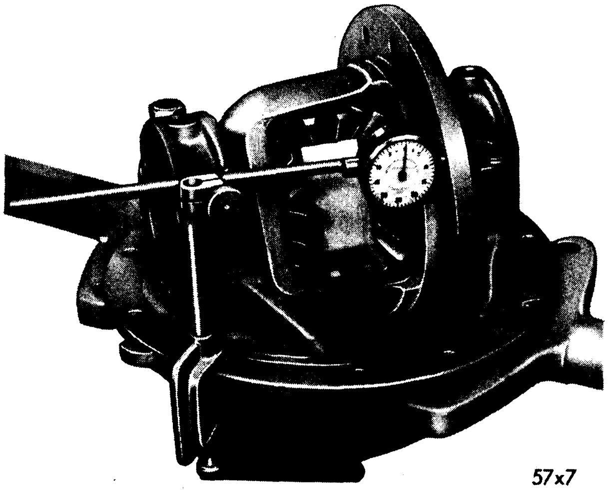


Fig. 11—Checking Drive Gear Mounting Flange

threads, turn clockwise to loosen. Tap drive gear off case, using a fibre hammer. To check differential case runout after removal of drive gear, mount differential case and bearings without drive gear in carrier and adjust. Remove excessive play from the bearings with adjusters. Mount a dial indicator on carrier mounting face and check the drive gear mounting flange

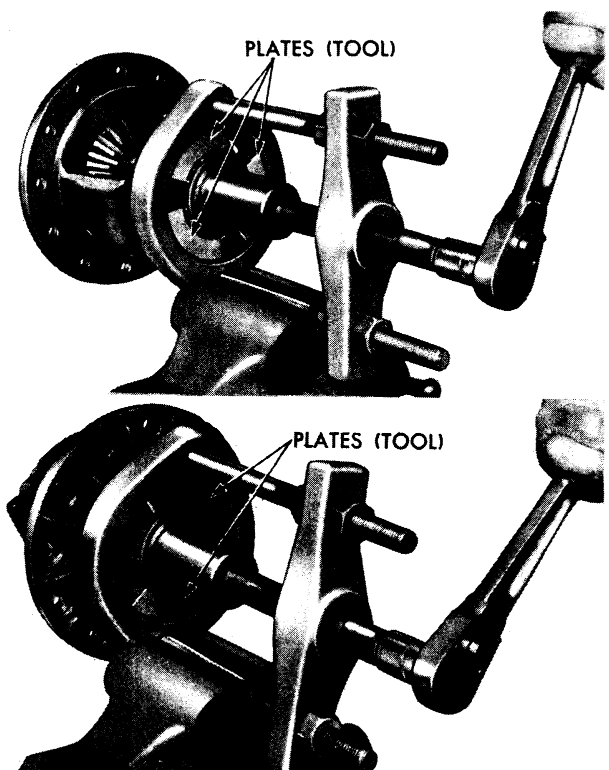


Fig. 12—Removing Differential Case Bearings

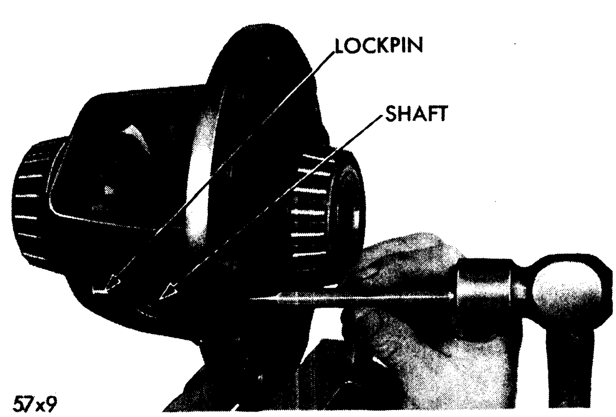


Fig. 13—Removing Differential Pinion Shaft Lock Pins

runout, as shown in Figure 11. Runout should not exceed .003 inch.

After checking the runout of the assembly, remove the differential case assembly from carrier. Use Tool C-293 in combination with 3 Number 18 adapter plates behind bearings to pull off the differential bearings from case, as shown in Figure 12. If axle is equipped with a Sure Grip differential, refer to Paragraph 23 for service procedure.

Remove differential pinion shaft lock pin by driving pin from case with a hammer and punch, as shown in Figure 13. Drive the differential pinion shaft out of differential case, using a brass drift and hammer. Rotate one differential gear until each pinion appears at the large opening of case. Remove each pinion and thrust washer one at a time, as shown in Figure 14. Lift out rear axle drive shaft thrust block.

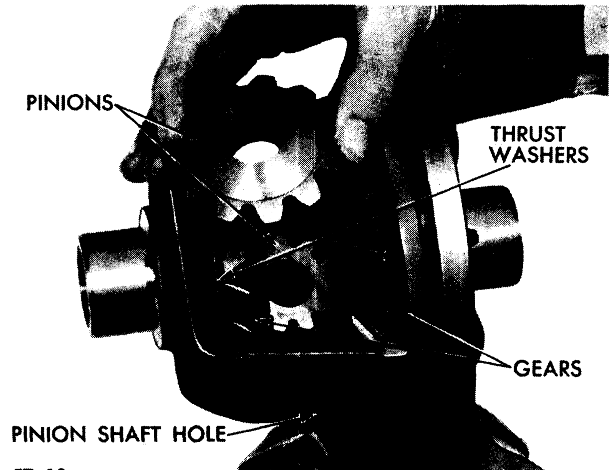


Fig. 14—Removing or Installing Pinion Gear

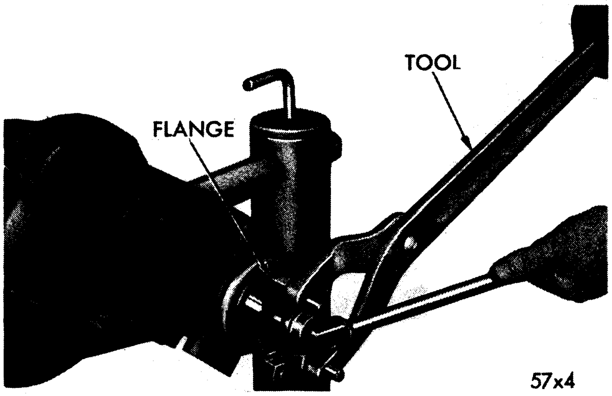


Fig. 15—Removing Companion Flange Nut

5. DISASSEMBLY OF DRIVE PINION AND BEARING ASSEMBLY

Remove the companion flange retaining nut and Belleville washer (Fig. 15) and with puller Tool C-452, and flange holding Tool C-784, remove the companion flange, as shown in Figure 16. Insert pinion oil seal puller Tool C-748 into seal and remove seal from carrier, as shown in Figure 17. Remove pinion bearing washer, bearing cone, and pre-load shims, or spacer (if so equipped). Remove pinion from carrier. If necessary, remove the rear bearing from pinion stem, with puller Tool C-293, and four adapter plates, as shown in Figure 18. Slide the pinion adjusting washer off stem. If necessary, remove both bearing cups from carrier housing, using a suitable drift. Place drift alternately in the two machined slots, in order to drive cups out evenly. Clean carrier, pinion and related parts in suitable solvent, inspect and replace parts as necessary.

6. CLEANING AND INSPECTION

Clean all parts thoroughly in a suitable solvent

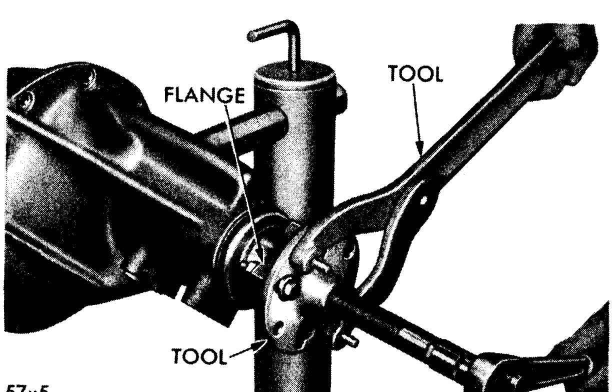


Fig. 16—Removing Companion Flange

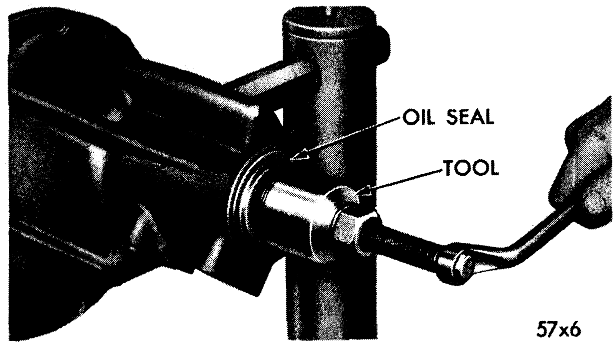


Fig. 17—Removing Drive Pinion Bearing Oil Seal

and blow dry with compressed air. Remove any chips or foreign material from carrier. Inspect all machined surfaces for nicks, burrs or scratches including inner and outer thrust shoulders of differential case. The thrust shoulder on adjusters must be free from burrs so that bearing cups will seat properly. Check differential case for cracks, fractures, distortion or damage. Install a new case if necessary. The bearings should be immersed in clean solvent and rotated by hand until clean. After cleaning, blow dry with compressed air. **Do not spin the bearings with air pressure when blowing them dry, as they are likely to score due to absence of any lubrication.** Check bearings for roughness, or brinelling. The bearings must run free and show no indication of roughness or wear. Examine bearing cups for pitting, scoring or wear. Inspect all gears for chipped or worn gear teeth. Check the fit of differential gears on axle shaft splines and pinions on pinion shaft. Check thrust washers for wear, and replace if necessary. Inspect axle shafts splines for wear, cracks or distortion. Replace necessary parts.

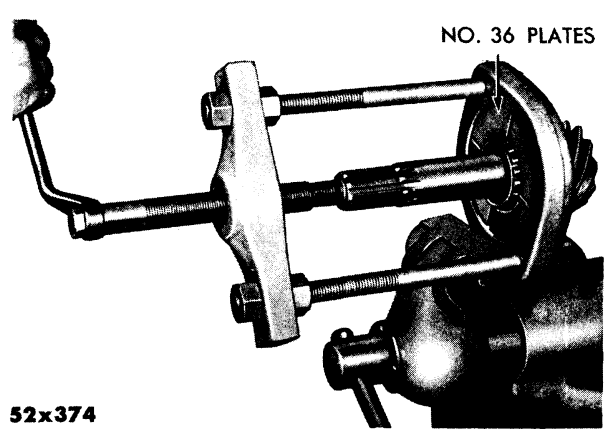


Fig. 18—Removing Pinion Bearing from Shaft (Puller C-293-F2)

7. ASSEMBLING THE DIFFERENTIAL CASE AND PINION GEARS

If new differential gears are to be installed, coat parts with Multi Purpose Gear Lubricant. Install a new thrust washer over hub of each gear and install in position in differential case.

Insert each of two pinions through the large side opening of case (Fig. 18) so that pinion shaft holes of two pinions and their thrust washers are properly aligned. Rotate gears 90 degrees so that pinion shaft holes of case are in exact alignment with holes in the two thrust washers and pinions. From the pinion shaft lock pin hole side of case, insert the slotted portion of pinion shaft through case; the conical thrust washer just through one pinion gear. Install the thrust block between two pinion gears.

IMPORTANT

The thrust block must be installed so that hole in block is aligned with pinion shaft and with the ground sides facing the two differential gears.

While keeping all of these parts in proper alignment, push the pinion shaft on through until locking pin hole in pinion shaft is in exact alignment with its respective hole in case.

NOTE: Before installing pinion shaft lock pin, rotate the differential gears. They must turn freely throughout the 360 degree revolution. The clearance between each gear and case ranges from .001 to .012 inch. This clearance has been established to ascertain free rotation.

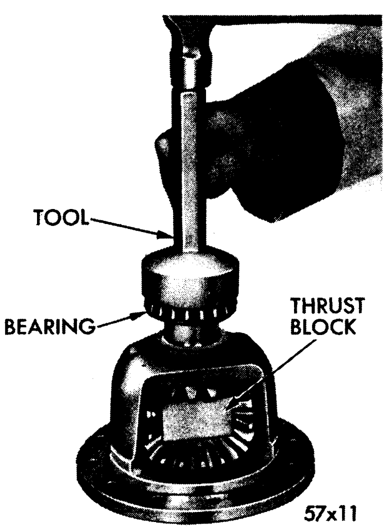


Fig. 19—Installing Differential Bearings

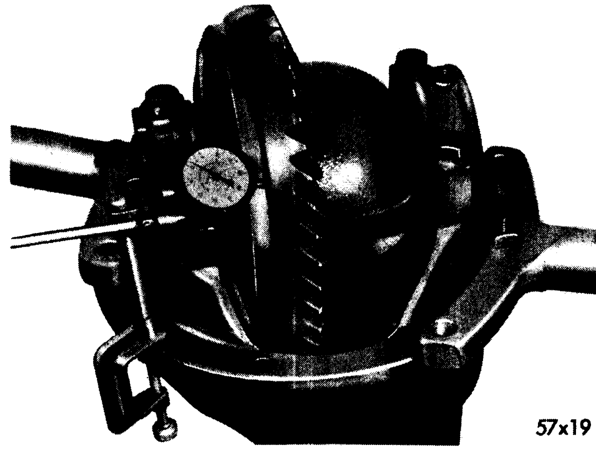


Fig. 20—Checking Drive Gear Runout

Install pinion shaft lock pin through hole in case from the pinion shaft side of the drive gear flange. Position each differential bearing cone on hub of case (Fig. 19) (taper away from drive gear) and with installing Tool DD-1005, install bearing cones. Make certain that contacting surfaces of drive gear and flange are clean and free from burrs. Position drive gear on case aligning the threaded holes of drive gear with those in the case flange. Insert drive gear cap screws through case flange and into drive gear. After it has been ascertained that all cap screws are properly started into their respective threads, tap gear onto case with a fiber mallet until it seats properly on case flange. Position drive gear between brass jaws of vise and alternately tighten each cap screw to 55 foot-pounds torque.

Place differential bearing cups over bearings, and install complete assembly in carrier. Seat the adjusting nuts in the cap pedestals of car-

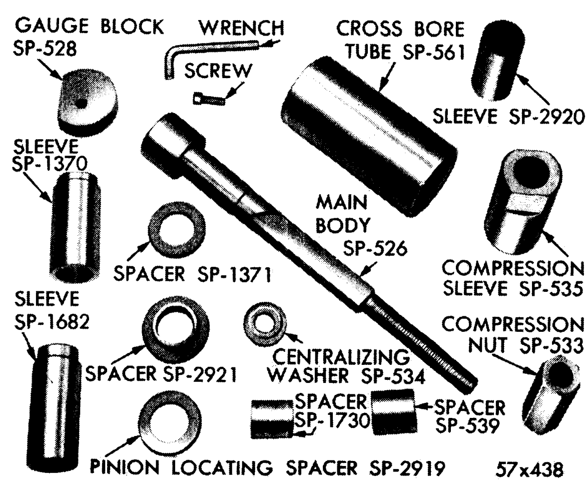


Fig. 21—Special Tool Set C-758-D-3

rier, and install caps and bolts. **Be sure caps are on the same side from which they were removed.** Adjust and remove excessive play from bearings. Check drive gear for runout, as shown in Figure 20.

NOTE: If there is more than .003 inch runout the differential case should be replaced.

8. INSTALLATION OF DRIVE PINION SHAFT, BEARING CONES AND CUPS

Place bearing cups in position in carrier, refer to Tool-set C-758-D-3 (Fig. 21) and proceed as follows: With bearing cups squarely in position in carrier, assemble Tool C-758-D-3 by placing pinion rear bearing over main screw of tool (Fig. 22) and insert tool into carrier from gear side. Place the pinion front bearing over main screw, followed by adaptor SP-535, washer SP-534 and nut SP-533 (Fig. 23). Press bearing cups into place by tightening tool nut, as shown in Figure 24. **Allow tool to rotate slightly in order not to damage bearings or cups during this operation.**

CAUTION

Do not install pinion oil seal during preload and pinion setting operations; otherwise, there will be added drag on pinion giving a false bearing preload on torque wrench.

Pinion Bearing Pre-load Adjustment

The importance of correct pinion bearing preload cannot be over-emphasized. The selection of adjusting washers to give the desired preload should be carefully made. When pinion

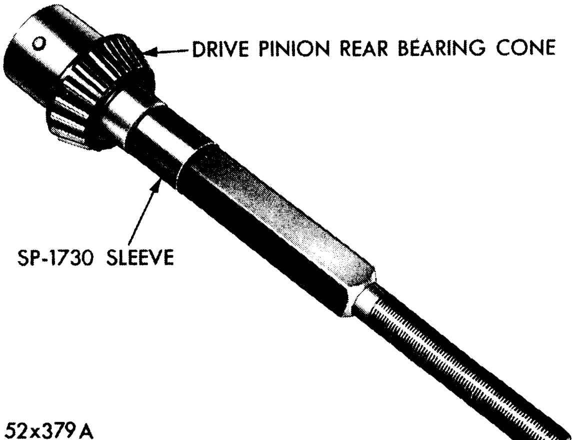


Fig. 22—Bearing Installed on Main Body of Tool C-758-D-3

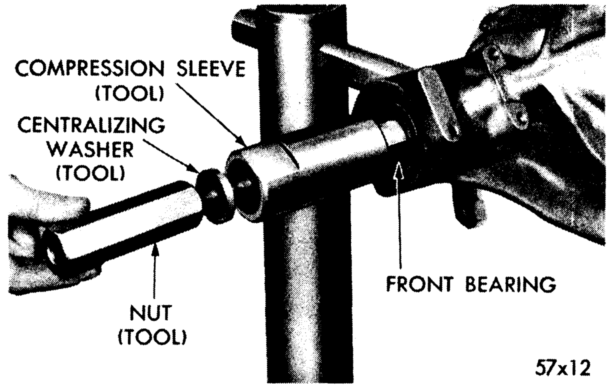


Fig. 23—Compression Sleeve and Centralizing Washer Positioned in Carrier

bearings are installed without pre-loading, the cones are not drawn far enough into their cups to bring the rollers in full contact with thrust ribs on cones. Bearings installed in this manner would allow pinion to "walk" backward and forward under operating loads. This causes a variation in tooth contact pattern, resulting in excessive wear and scoring of gears, and usually is accompanied by noise. On the other hand, where the pinion bearing cones are drawn too far into their cups, the bearings are overloaded even before they have to withstand operating loads imposed upon them by gears. They are apt to "burn up" under a driving load—the rollers might score the cups, causing bearings to gall or flake, resulting in premature axle failure.

Correct cone distance is obtained by use of a spacer and washer combination. **Do not install pinion oil seal during pre-load and pinion setting operations, otherwise, there will be an added drag on pinion shaft which would give a false bearing pre-load on the torque wrench.**

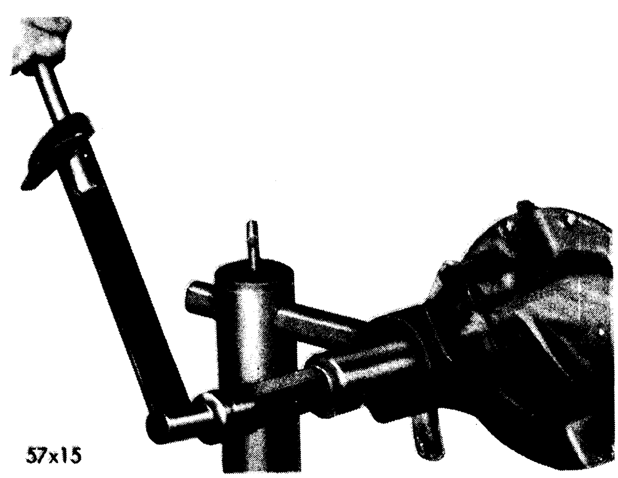


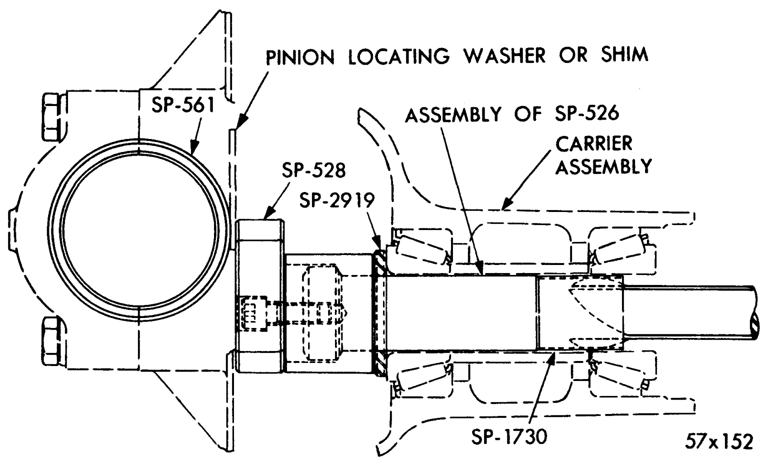
Fig. 24—Seating Bearing Cups and Checking Torque

9. PINION BEARING PRE-LOAD AND PINION SETTING (Without using special Tool C-758-D-3)

Correct drive gear and pinion adjustment consists of following: Pinion Bearing Pre-load, Pinion Setting, Differential Bearing Pre-load, and Backlash between Drive Gear and Pinion. The final inspection of these adjustments is performed by checking the tooth contact patterns, as described in Paragraph 13.

Pre-loading the pinion and differential bearing is important because it holds the drive pinion and differential in place and prevents back and forth movement which would create incorrect gear and pinion tooth contact.

NOTE: If the differential assembly was satisfactory from the standpoint of noise before being disassembled, the drive pinion may be assembled with the original adjusting washers



Used on Windsor

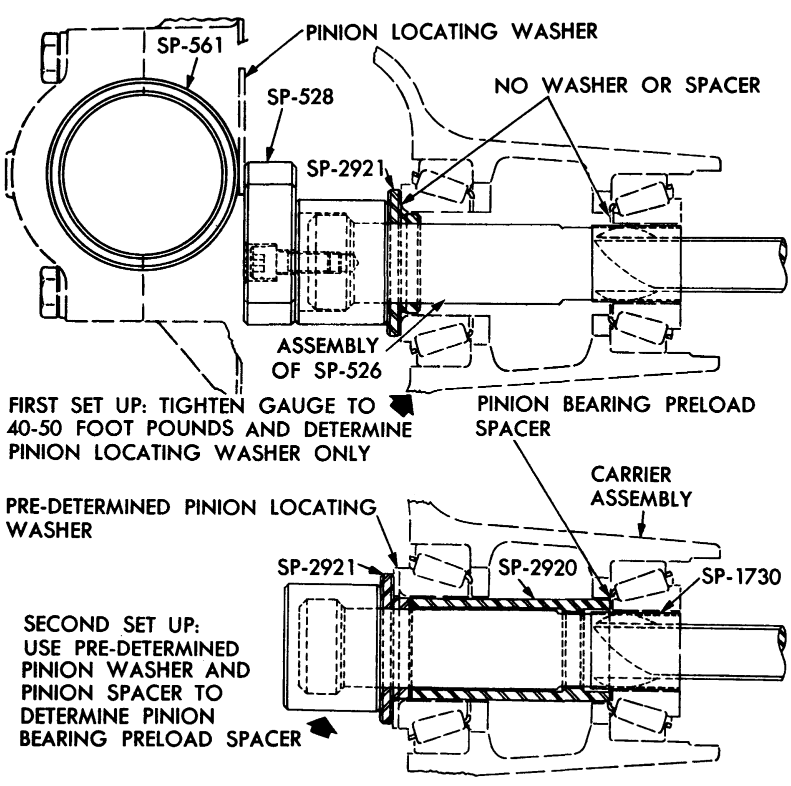


Fig. 25—Used on New Yorker—Imperial Tool C-758-D-3 Installed in Housing

and shims. If replacement parts are installed, or differential adjustment is necessary, the proper thickness washer must be installed between the pinion and rear bearing. The drive gear and pinion are manufactured and lapped in pairs. The position in which the best tooth contact is obtained is etched on end of pinion shaft.

To obtain proper pinion setting in relation to drive gear, the correct thickness thrust washer must be selected before drive pinion is installed in carrier. Pinion bearing adjusting washers are available from .084 inch to .100 inch in .002 inch steps. To select proper thickness thrust washer, proceed as follows: It will be noted that face of the drive pinion is etched with plus (+), or minus (—) sign, followed by a number ranging from 1 to 4, or zero, (0) marking.

If old and new pinion have the same marking and if old bearing is being used, use a thrust washer of same thickness. But if old pinion is marked zero (0) and new pinion is marked + 2, try a .002 **thinner** washer. If new pinion is marked — 2, try a .002 inch **thicker** washer.

If bearing cups are to be replaced, place the bearing cups in position in carrier and drive cups in place with suitable drift. After properly positioning bearing cups in carrier, assemble drive pinion thrust washer (chamfered side down toward gear) on drive pinion stem. Install rear bearing, spacer (if so equipped) and shims on pinion stem. Insert shaft into carrier. Install front pinion bearing and universal joint flange washer and nut. **Do not install oil seal.** Tighten rear axle drive pinion flange nut to 240 foot-pounds torque. Rotate drive pinion shaft after tightening flange nut

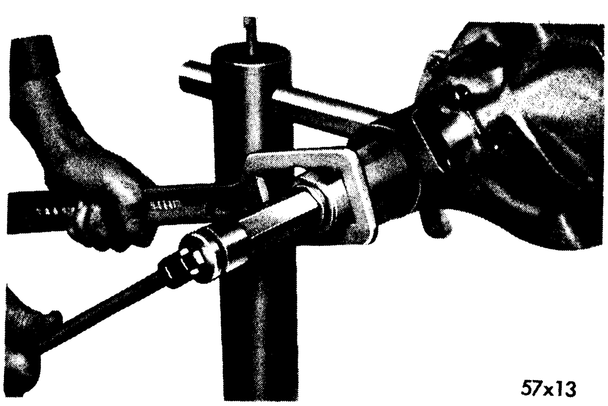


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Fig. 26—Tightening Compression Nut

with wrench to properly seat the bearing rollers in bearing cups. Pre-load torque required to rotate pinion shaft with bearings oiled should be 25 to 35 inch-pounds torque. Add shims to **decrease** torque or remove shims to **increase** torque. After correct pinion setting and bearing preload has been obtained, remove drive pinion flange, install oil seal and tighten drive pinion flange washer and nut to proper torque. Install drive gear with grease marking compound and adjust for correct tooth contact and backlash.

10. PINION BEARING PRE-LOAD AND PINION SETTING WITH TOOL C-758-D-3 LC-1, LC-2, and Town and Country Wagon)

Lubricate pinion bearing cones. Install locating washer SP-2919 on tool mainshaft. Position rear pinion bearing cone on main screw of Tool C-758-D-3 followed by pinion bearing spacer.

NOTE: Spacer has a larger bore at one end, install large bore end of spacer next to rear bearing.

Install sleeve Tool SP-1730 on tool main screw with sleeve bottoming against the tool main screw shoulder. Install original shims removed from drive pinion over the tool main screw and sleeve and against spacer. Position the carrier in stand so companion flange is facing upwards. Insert tool in carrier. Install pinion front bearing and compression sleeve Tool SP-535. Install tool centralizing washer SP-534 followed by the main screw nut, Tool SP-533. Hold compression sleeve Tool SP-535 with holding Tool C-784 or C-3281, tighten nut to 240 foot-pounds torque. (Fig. 26).

With an inch-pound torque wrench on the nut of tool, rotate wrench several revolutions to seat bearings, (Fig. 24). The correct reading should be 25 to 35 inch-pounds. If bearing pre-load is more than 35 inch-pounds, a thicker shim should be used under front bearings. Shims are available in thickness of .010, .012, .014, .016, .018, .020, .022, .024 and .026 inch. If bearing pre-load is less than 25 inch pounds, a thinner shim should be used.

NOTE: Correct pre-load readings can only be obtained with pinion shaft tool in a vertical position.

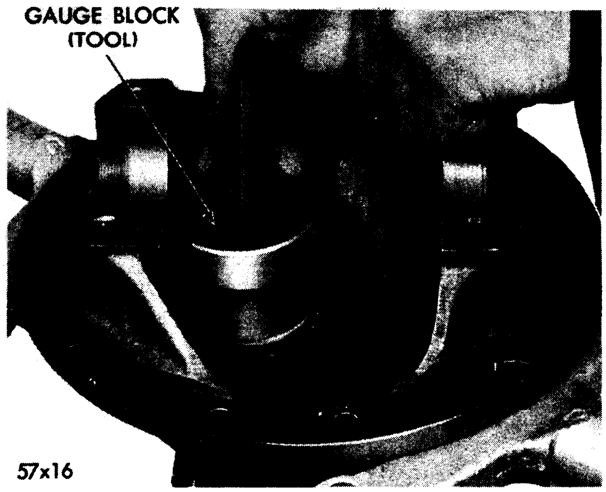


Fig. 27—Installing Gauge Block on Main Body

Assemble gauge block SP-528 (Fig. 27) to main screw. Place SP-561 bearing arbor in carrier bearing supports, as shown in Figure 28.

NOTE: Remove any burrs or upsets in bearing supports before installing bearing arbor, as arbor must be securely seated in bottom of bearing bores.

Center arbor in differential bearing pedestals of carrier. Insert a piece of .002 inch shim stock between arbor and each cap and tighten caps to 10 foot-pounds torque. Select a pinion washer of sufficient thickness so that it will just pass between gauge block end of setting tool and machined surface of arbor, as shown in Figure 29.

For example, if a .090 inch washer can be inserted, but a .092 washer cannot be forced between the two surfaces by hand, the .090 inch washer should be used even though it might feel loose. Check end of drive pinion as it should indicate amount that should be added or subtracted from washer that was selected in above check.

Example: If mark on pinion shaft indicated + 2, a .002 inch thinner washer should be used for final assembly. If spacer selected by the use of tool is .090 inch, it is necessary to deduct .002 inch. The correct washer, therefore, for final assembly would be .088 inch.

When correct washer has been selected for drive pinion, disassemble tool from carrier. Add washer selected to tool, between spacer SP-2921 and pinion rear bearing. Add spacer SP-2920 and the **pinion bearing adjusting spacer** (that was removed from the axle at disassembly). Insert tool assembly in carrier. Slide front bearing on shaft and into position in its cup. Install tool spacer, nut and washer. Tighten tool 240 minimum foot-pounds torque, as shown in Figure 24. Turn the tool with a speed wrench to permit bearings to seat. When bearings are seated, check bearing pre-load by revolving tool, using an inch-pound torque wrench, as shown in Figure 27. The correct bearing pre-load should be 25 to 35 inch-pounds torque.

If the bearing adjustment does not conform to above specifications, it will be necessary to change the adjustment by using a thicker or thinner bearing spacer. A **thicker** spacer should be used if pre-load is too great or a **thinner** spacer if pre-load is not sufficient. When correct spacer has been selected for drive pinion

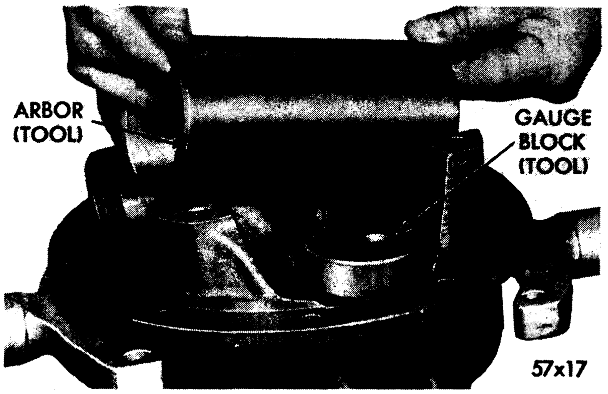


Fig. 28—Installing Arbor

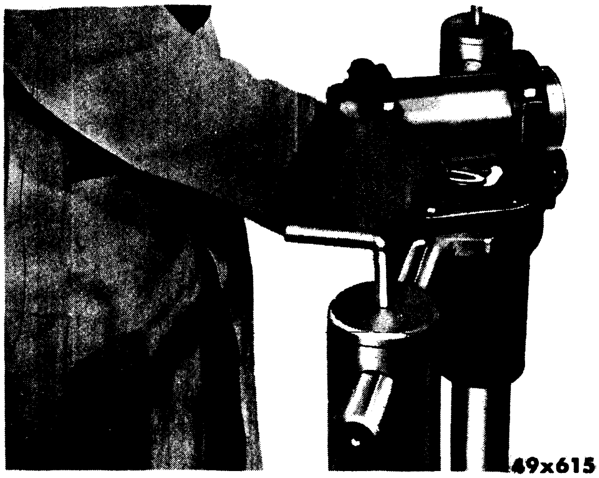


Fig. 29—Determining Spacer Washer Thickness

bearings, remove the carrier cap, shim stock and arbor from carrier housing. Disassemble tool from carrier. Install pinion setting washer over pinion stem with chamfered side against the pinion. Make certain the contacting surfaces of rear bearing cone are perfectly clean. Install cone on stem and press bearing on stem with Tool DD-955. (Fig. 30).

Install the selected shim pack. Lubricate pinion front and rear bearing cones with heavy oil. Apply a light coat of sealer in carrier bore at seal area and install new seal, driving seal with Tool C-3656 until driver bottoms on pinion front bearing. (Fig. 31) (Seal installed). Install companion flange on pinion stem with Tool C-496. Holding companion flange with Tool C-784, tighten nut to 240 foot-pounds torque.

11. PINION BEARING PRE-LOAD AND PINION SETTING (LC-3, LY-1)

Check the bearing cups and carrier for grit and dirt. Assemble washer SP-2921 followed by correct pinion locating washer and spacer SP-2920 along with rear bearing on main shaft of Tool C-758-D-3. Insert tool, bearing and washer assembly in carrier along with original shims previously removed from drive pinion. Install front bearing, compression sleeve SP-535, centralizing washer SP-534 and main nut SP-533. Hold compression sleeve nut with holding Tool C-784 or C-3281 and torque nut to 240 foot-pounds.

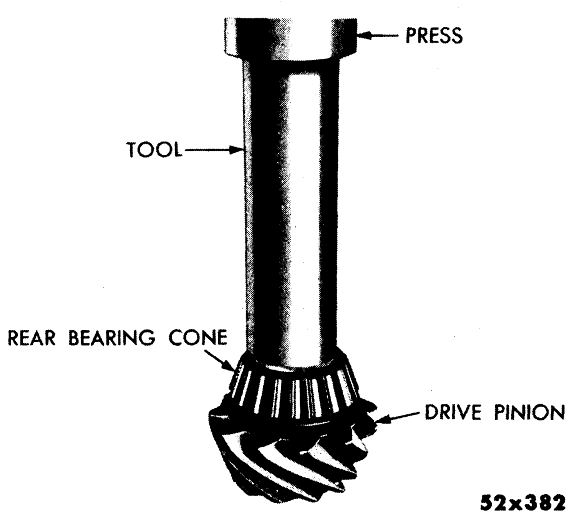


Fig. 30—Installing Pinion Bearing Cone on Pinion Shaft

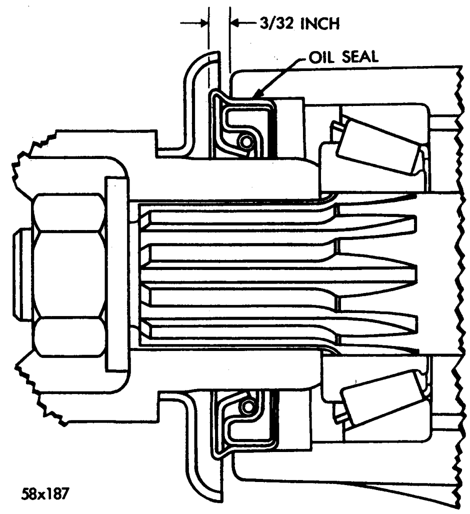


Fig. 31—Pinion Seal Installed

With an inch-pound torque wrench, rotate wrench in a clockwise direction several revolutions to seat bearings. The correct torque reading should be from 25 to 35 inch-pounds. If bearing preload is more than 35 inch-pounds, a thicker shim should be used under front bearing cone. Shims are available in thicknesses of .012, .016, .018, .020, .022, .024 and .026 inch. If bearing preload is less than 25 inch-pounds, a thinner shim should be used.

NOTE: Correct pre-load can only be obtained with tool in a vertical position.

Remove tool with shim pack, bearing cone, pinion locating washer, and spacer from carrier.

Assembly of Pinion in Carrier

With stem end of pinion facing up, install selected washer on pinion stem. Chamfered side of washer facing the drive pinion head. Position rear bearing cone on pinion stem. Make sure contacting surfaces of washer, pinion head and rear bearing cone are perfectly clean and free of dirt or foreign particles. Install rear bearing cone onto pinion stem with Tool DD-955. Install selected shim pack. Lubricate pinion front and rear bearings. Insert pinion stem and bearing assembly in carrier. Apply a light coat of sealer in carrier bore at seal area and install new seal with Tool C-3656 until driver bottoms on pinion front bearing. (Fig. 31) (Seal installed). Support pinion gear in carrier and start companion flange with installing Tool C-496 or DD-999. Install plain washer (concave side of washer down) and nut. Torque flange nut 240 foot-pounds and remove tool.

12. DIFFERENTIAL BEARING PRE-LOAD AND BACKLASH

NOTE: The differential bearing pre-load and backlash between drive gear and pinion are obtained after the pinion bearing pre-load and pinion are established.

Place differential and drive gear assembly on the bearing support and snug down the caps. Check drive gear for runout on the back face (Fig. 32). Drive gear runout should be true within .005 inch maximum. Make adjustments as follows:

Using two spanner wrenches Tool C-406 (Fig. 33), screw out bearing adjuster at back face of drive gear and screw in the opposite adjuster until considerable backlash is obtained. This helps align bearing cups.

Tighten bearing cap lower bolts 110 foot-pounds torque, leaving top bolts fairly loose. This holds bearing cups in line while moving drive gear. Screw out adjuster on tooth side of gear until it clears bearing cup. Screw in opposite adjuster until only a little backlash remains. This will insure bearing cup alignment for final adjustment.

Turn drive gear a few times by hand to seat bearings. With a dial indicator, find point of least backlash on drive gear at 90 degree intervals. At least point of backlash, screw in adjuster at back face of drive gear until .001 inch appears on indicator.

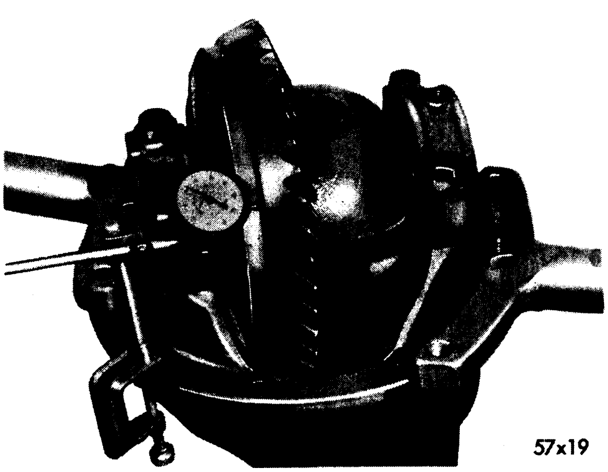


Fig. 32—Checking Ring Gear Runout

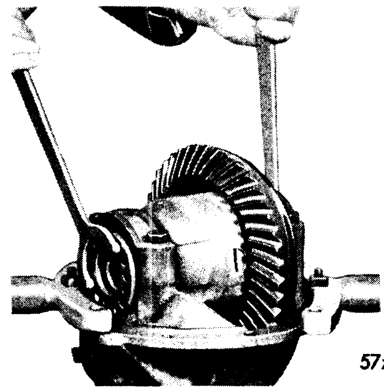


Fig. 33—Adjusting Differential Bearings

Screw in adjuster on tooth side until indicator shows .006 to .008 inch backlash. Lock adjusting nuts in place and tighten both top bolts 110 foot-pounds torque.

Secure the dial indicator to the carrier flange so pointer of indicator is squarely contacting one of the drive gear teeth (thrust side), (Fig. 34). After the first reading is taken, move the dial indicator away from the gear tooth and rotate and check drive gear at 90 degree intervals for specified backlash between drive gear and pinion. If adjustment is followed, the bearing supports will be spread, differential bearings pre-loaded, and backlash between drive gear and pinion established.

CAUTION

Whenever adjustment of differential assembly is changed to obtain correct tooth contact, re-

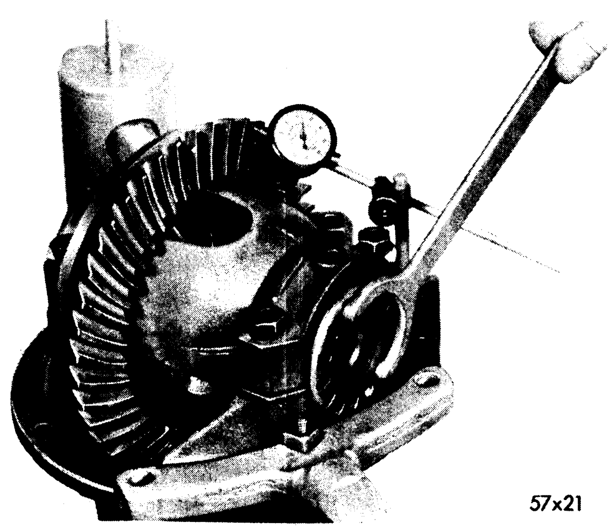


Fig. 34—Checking Back Lash between Drive Gear and Pinion

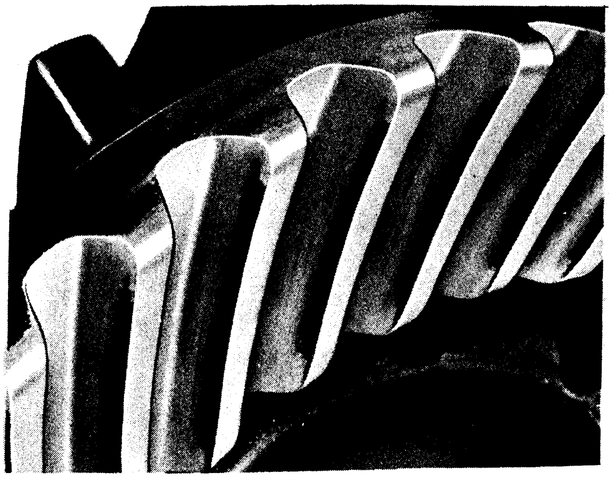


Fig. 35—Heavy Face Contact

adjust differential bearing pre-load and backlash between drive gear and pinion.

If all adjustment have been correctly made, the gears will be properly meshed and quiet operation will result.

13. GEAR ADJUSTING FOR CORRECT TOOTH CONTACT

Check tooth contact by means of gear marking compound applied to drive gear teeth, as shown in Figure 34. Apply load against back face of drive gear with a round bar as drive pinion is rotated. This leaves a bare area the size, shape and location of contact. If improper tooth contact is evident, as indicated by Fig. 35 and 36, the pinion should be adjusted either forward or backward, maintaining the backlash within

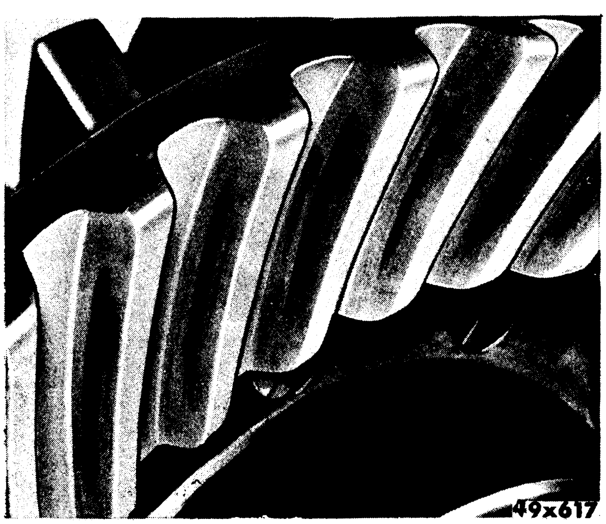


Fig. 36—Heavy Flank Contact

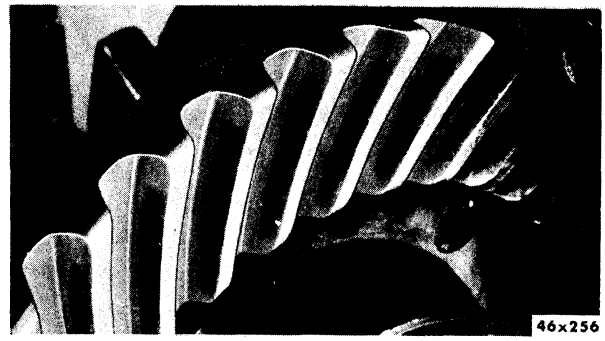


Fig. 37—Correct Gear Tooth Contact

specified limits until correct tooth contact, as shown in Figure 37, is obtained. With adjustments properly made, correct tooth contact, as shown in Figure 37, will result. Notice that contact pattern is well centered on the drive and coast sides about $\frac{1}{16}$ inch from edges of teeth. When tooth marks are obtained by hand, they are apt to be rather small. Under an actual operating load, however, the contact area increases. Figures 35 and 36 show improper or incorrect tooth contact. To correct such conditions, readjust drive gear and pinion as follows:

a. Heavy Face Contact

If tooth marking is across the length of tooth, narrow and high on the tooth face, as shown in Figure 36, the teeth will roll over or gall. This type of contact causes excessive wear and noise.

To correct heavy face contact—move the pinion in **toward center** of drive gear by installing a **thicker** washer behind pinion. Readjust backlash.

b. Heavy Flank Contact

If tooth marking is across the length of tooth, but narrow and low on the flank, as shown in Figure 36, the teeth will gall or score. This type of contact causes excessive wear and noise.

To correct heavy flank contact—move the pinion **away from the center** of the drive gear by using a **thinner** washer behind pinion. Readjust backlash.

14. INSTALLATION OF DIFFERENTIAL CARRIER

Check carrier flange and flange face for nicks and burrs. Mount differential and carrier to axle housing using a new gasket Tighten assembly mounting nuts 35 foot-pounds torque.

15. AXLE DRIVE SHAFT REPLACEMENT AND END PLAY ADJUSTMENT

Loosen the brake shoe cams and remove the rear hub and drum assemblies with puller Tool C-845, (Fig. 3).

NOTE: Do not attempt to remove the brake drums by hammering on end of an axle drive shaft as damage to the bearings and thrust block will result.

Disconnect the brake line at each cylinder and remove the brake support plates and dust shields as assemblies.

NOTE: Remove axle shaft keys and install Tool C-745 for LC1 and LC-2 and C-757 for LC-3 and LY-1 to protect the axle outer seal (Fig. 4).

Remove shims. Remove axle drive shafts and bearing cups (Fig. 5). Remove inner oil seals (Fig. 7).

NOTE: It is advisable to replace inner and outer oil seals when replacing an axle drive shaft.

Clean all parts thoroughly. Inspect bearings and cups for brinnelling and axle shaft for signs of fatigue, or worn bearing and seal surfaces.

Install shims totaling .040 inch at one end of the axle housing. Shims are available in .05, .010, .0125, .015 and .030 inch thickness. Lubricate the bearing and install the axle shaft, bearing and bearing cup (Fig. 38), the bearing cup is driven into the axle housing with Tool C-413 until the face of installing tool bottoms tightly against the shims. Remove tool and install the dust shield, lockwashers and nuts. Tighten 30-35 foot-pounds torque.

Working from the opposite end of the axle housing, install the other axle shaft with bearing until inner end of axle shaft contacts the axle shaft thrust block. Lightly tap end of axle shaft with a fibre mallet to insure shaft is contacting the thrust block: this will force the

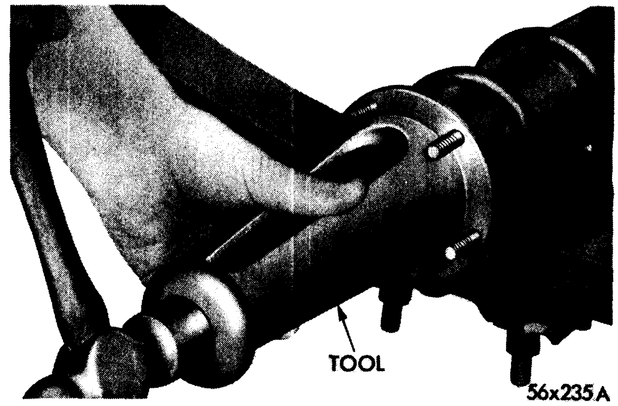


Fig. 38—Installing Axle Drive Shaft Bearing Cup with Tool C-413

opposite shaft away from the thrust block to its full travel.

Install the bearing cups carefully (Fig. 38), until no axle shaft end play exists without preloading the bearing. Rotate axle shaft during installation of the cup to properly seat bearing.

NOTE: The bearing cup will protrude beyond the face of the axle flange.

Hold the tool firmly against the bearing cup and install a feeler gauge between the axle housing flange and the face of the tool. This measurement will be approximately .040 inch. To obtain .013 to .018 inch axle shaft end play, add a minimum of .013 to whatever the feeler gauge reading indicates.

NOTE: It is recommended that the end play be held to the high limit rather than the low. The end play will decrease during operation due to heat expansion.

CAUTION

When adjusting axle shaft end play, equal thickness of shims should be removed or installed on both sides of axle housing to maintain the centralized position of axle shaft thrust block.

Remove the tool and install the correct shim pack thickness which has been determined.

After axle shaft end play has been checked and corrected, install brake drum and wheel assembly. Tighten axle shaft nuts to a minimum of 145 foot-pounds torque. Install cotter keys and hub caps.

16. INNER OIL SEAL—AXLE SHAFT (REMOVED)

a. Removal

Remove inner oil seal with puller Tool C-637 (Fig. 7).

b. Installation

Drive seal into axle counterbore until it is squarely bottomed (Fig. 39). The lip of seal is away from drive flange of tool.

17. BRAKE DUST SHIELD OIL SEAL

a. Removal

With brake dust shield removed, remove outer seal (Fig. 40).

b. Installation

Install seal with outside marking on seal retainer toward brake shoe side of brake dust shield.

18. BEARING—AXLE DRIVE SHAFT

a. Removal

With axle shaft removed, remove bearing with puller Tool C-293 (Fig. 6).

b. Installation

Press bearing on shaft (Fig. 41) and lubricate bearing rollers with Multi-Purpose Gear Lubricant. Install the outer bearing cups with Tool C-413 (Fig. 38).

19. WELDING REAR AXLE HOUSING

The axle housing should be completely disassembled, if it is to be welded with arc welding equipment. It is also possible to weld the as-

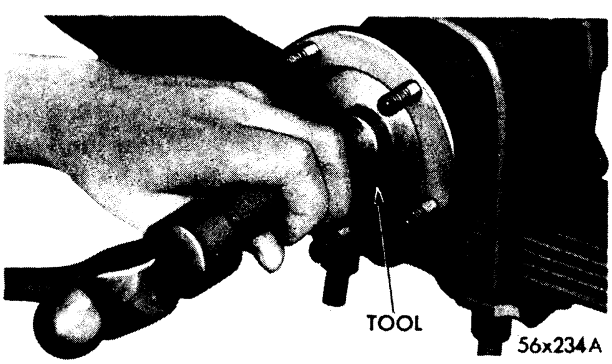


Fig. 39—Installing Axle Shaft Inner Oil Seal with Tool C-839

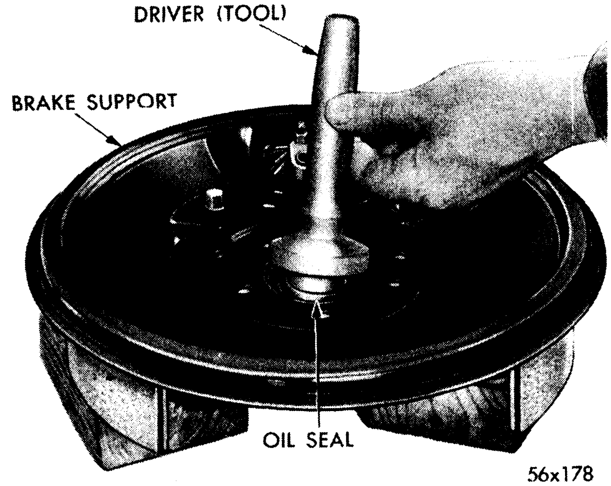


Fig. 40—Removing Rear Axle Shaft Oil Seal from Brake Support with Tool C-839

sembled housing with gas welding equipment, if precaution is taken to protect gaskets and heat-treated parts.

20. REAR AXLE HOUSING ALIGNMENT

Rear Axle housings may become bent, bowed or warped. If not corrected, such conditions will cause premature axle failure. Disassemble axle assembly and check housing for horizontal and vertical alignment, as follows:

a. Checking Axle Housing for Horizontal Alignment

Place axle housing in "V" blocks—on surface plate. Turn housing until machined surface for carrier mounting is facing UP and perfectly level, as shown in Figure 42. Place square

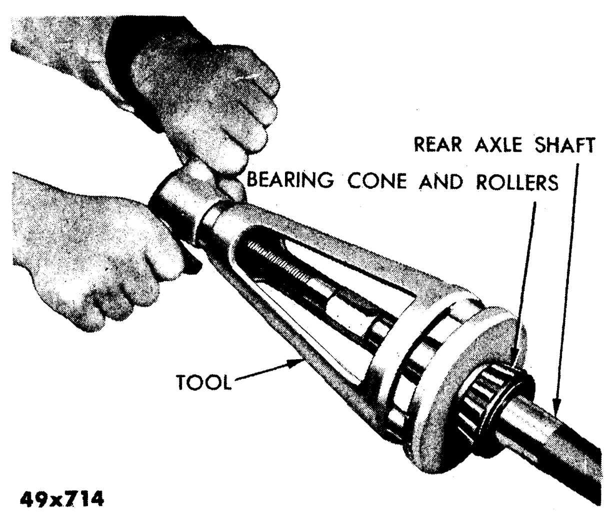


Fig. 41—Installing Axle Shaft Bearing

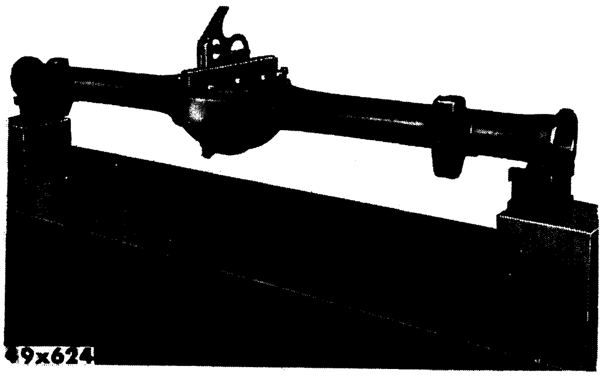


Fig. 42—Leveling Housing for Checking Alignment

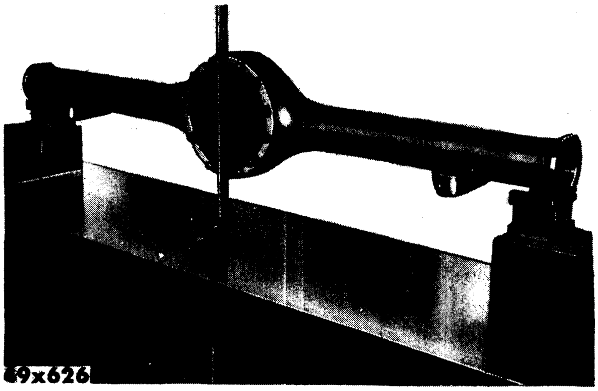


Fig. 44—Squaring Axle for Vertical Alignment

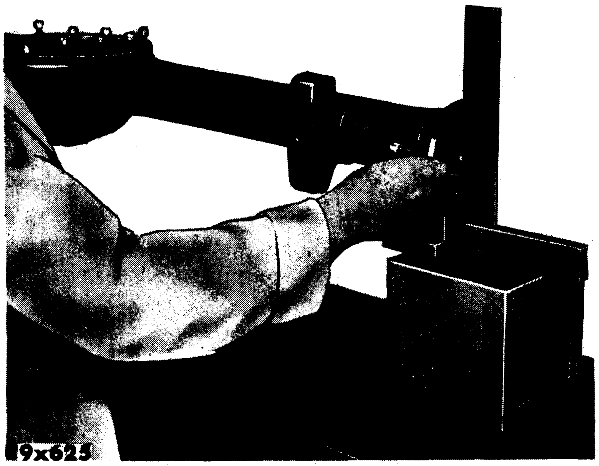


Fig. 43—Checking Horizontal Alignment

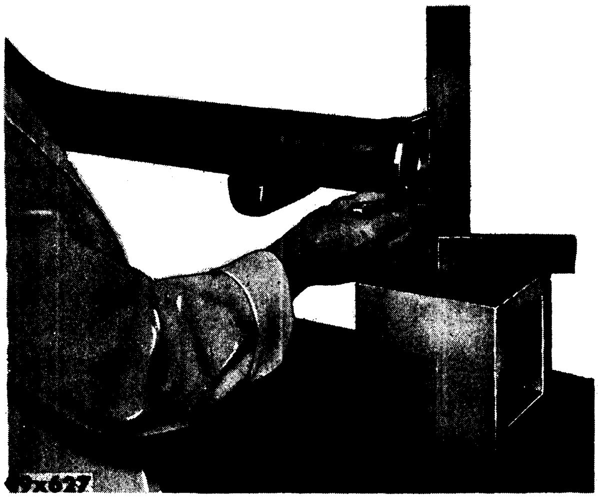


Fig. 45—Checking Vertical Alignment

against machined surface of housing end flange and surface plate, as shown in Figure 43. Amount of housing misalignment will be indicated by thickness of feeler gauge between square and end flange at top or bottom. A housing that checks more than .007 inch should be replaced.

b. Checking Axle Housing for Vertical Alignment

With housing in "V" blocks, turn housing until machined surface for carrier mounting is in a squared, vertical position, as shown in Figure 44. Place a square against machined surface of housing end flange and surface plate, as shown in Figure 45. Amount of housing misalignment will be indicated by thickness of feeler gauge between square and end flange at top or bottom. A housing that checks more than .007 inch should be replaced. To determine amount that axle is misaligned, multiply thickness of feeler stock used by the ratio of 4.7 to 1.

SURE-GRIP DIFFERENTIAL

The conventional rear axle delivers the same amount of torque to both axle shafts. The driving force is therefore, limited by the wheel which has the least amount of traction. If one of the rear wheels gets on an icy patch or into soft mud, its friction against the road lowers suddenly so that the Torque delivered to that wheel is often great enough to overcome friction causing the wheel to spin.

To overcome these characteristics of the conventional differential, the Sure-Grip differential permits the axle shaft whose wheel has the greater traction to develop a considerable amount of torque thus enabling the car to pull out of its difficulty.

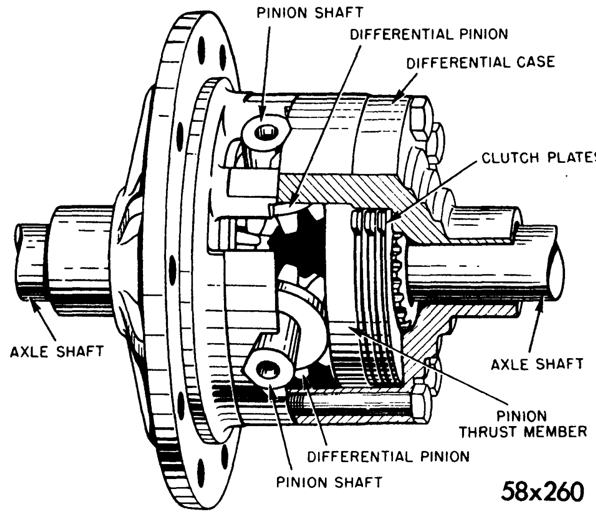


Fig. 46—Sure-Grip Differential (Cut-away)

21. DESCRIPTION (Fig. 46)

The Sure-Grip differential is similar to the conventional differential except for the addition of friction plates for clutching the differential case to the differential gears and a means for engaging these plates. It has four pinion gears, positioned in the case by two pinion shafts which are at right angles to each other and loose fitting at their intersection. Both ends of each shaft have two flat surfaces, or ramps, which mate with identical ramps in the differential case. There is additional clearance in the case to permit a slight peripheral movement of the ends of the pinion shafts within the case.

22. OPERATION (Fig. 47)

Torque delivered by the engine is transmitted to the rear wheels via the axle drive pinion and drive gear to the differential case and to the pinion shafts which are rotated by the case. The pinion shafts carry the pinion gears around, rotating the differential side gears and the axle shafts which are splined to the side gears.

The friction of the wheels against the road, the inertia of the wheels themselves, and the

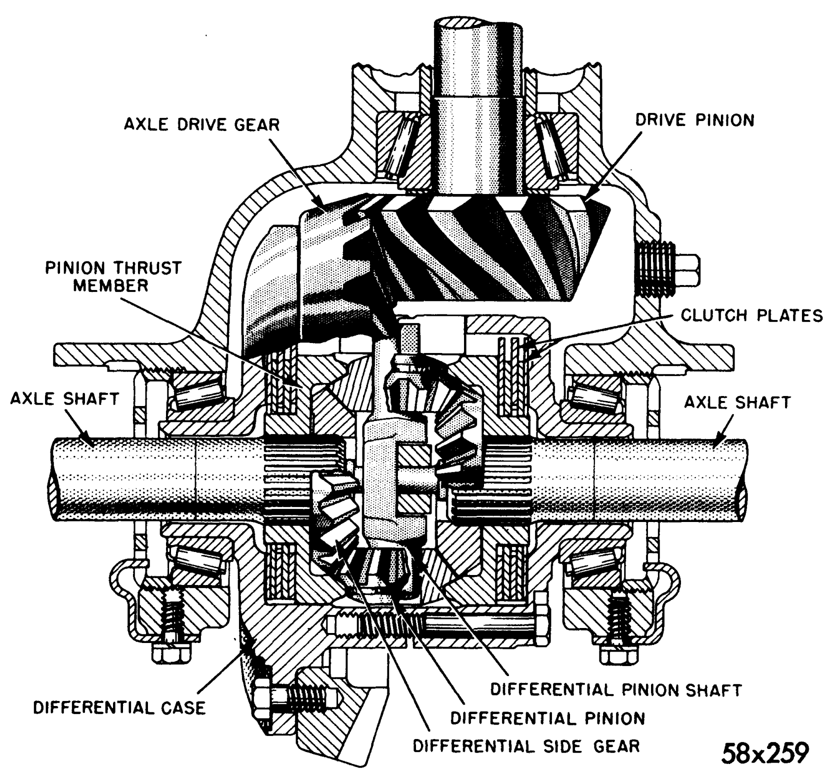


Fig. 47—Sure-Grip Differential Cross-Section

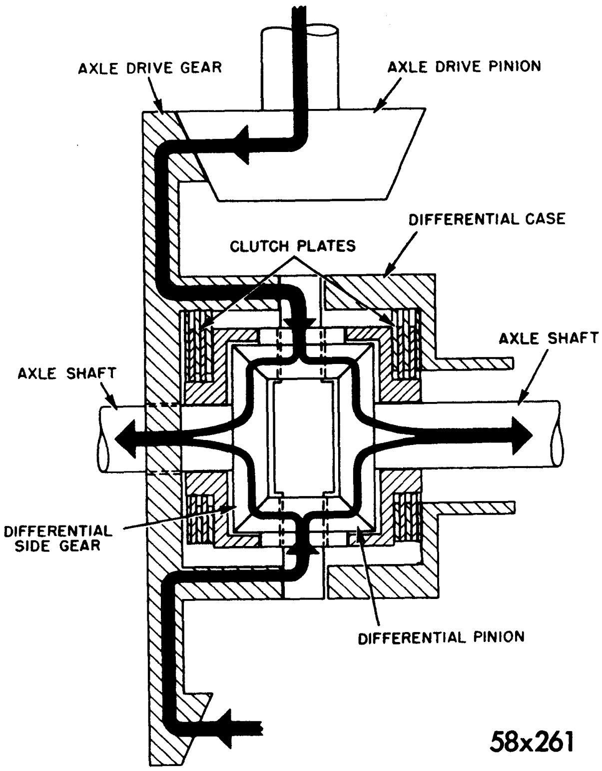


Fig. 48—Power-Flow Axle Shafts Turning at Same Speed

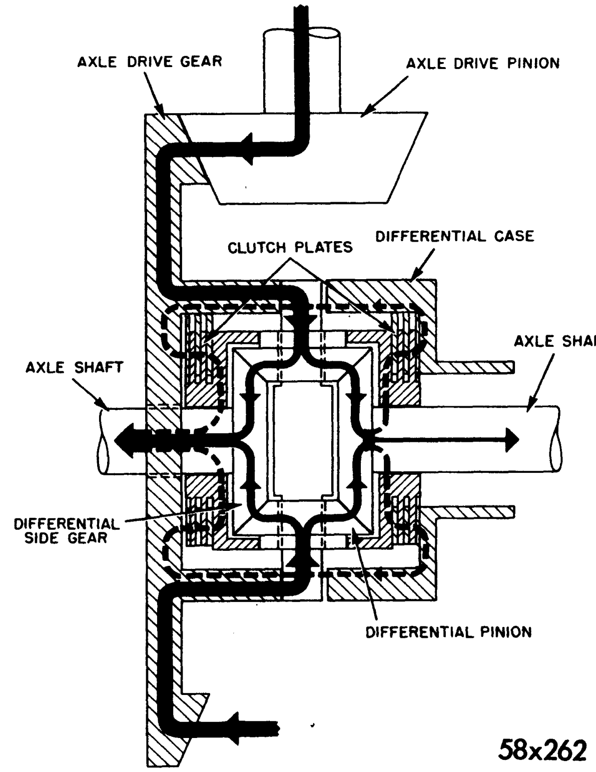


Fig. 49—Power-Flow Axle Shafts Turning at Differential Speeds

friction of the differential gears make the pinion shafts resist turning so that the driving force causes the pinion shaft ramps to slide against the differential case ramps pushing the pinion shafts apart slightly. As the pinion shafts move outward, two of the pinions on one of the pinion shafts bears against one of the pinion thrust members and the two pinions on the other pinion shaft bear against the other thrust member. Each thrust member is splined to one of the axle shafts and drives two friction plates of the clutch. The other two friction plates of each clutch are attached to the differential case so that when they are engaged, both axles shafts become clutched to the case, to a degree that varies with the amount of torque transmitted.

This in effect, locks the axle shafts in normal, straight-ahead driving, thus prevents momentary spinning of the wheels when encountering poor traction. Refer to Figures 48 and 49 for "Power Flow."

SERVICE PROCEDURES

WARNING

Before raising a rear wheel off the ground, shut off engine, set parking brake tightly, carefully block front wheel diagonally opposite the one to be removed against both forward and rearward movement.

23. REMOVAL AND INSTALLATION OF DIFFERENTIAL

Follow the same procedure outlined under removal and installation of the conventional rear axle differential.

24. DISASSEMBLY

Remove axle drive gear. Check runout of drive gear mounting flange. Replace both case halves if runout exceeds .003 inch.

NOTE: Before disassembling case halves, place scribe marks on each half to aid in aligning

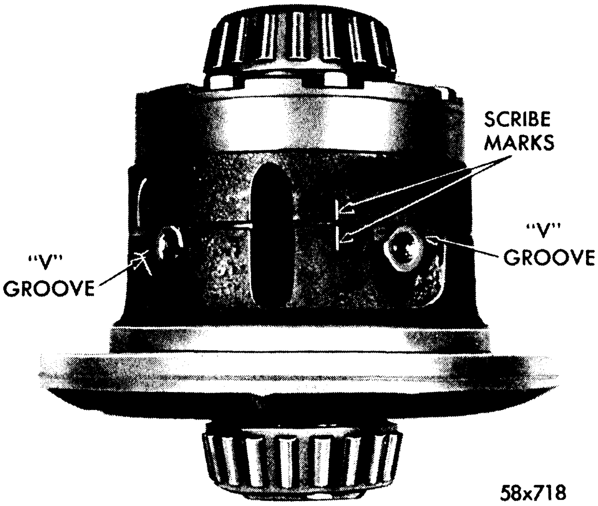


Fig. 50—Case Halves Scribed for Proper Reassembly

case when reassembling (Fig. 50).

Remove case cap attaching bolts and remove case cap (Fig. 51). Remove clutch plates (Fig. 52), (noting relation of clutch plates). Remove side gear retainer (Fig. 53). Remove side gear (Fig. 54). Remove pinion shafts with pinion gears (Fig. 55). Remove remaining side gear (Fig. 56), side gear retainer (Fig. 57) and clutch plates (Fig. 58). Remove axle shaft spacer by pressing out lock pin.

25. ASSEMBLY

Clean all parts thoroughly. Inspect all parts for wear, nicks and burrs. Replace worn, cracked or distorted clutch plates. If case is worn, it will be necessary to replace both halves.

Install clutch plates alternately so that an external tanged plate (approximately 1/16 inch thick(is installed first, followed by an internal

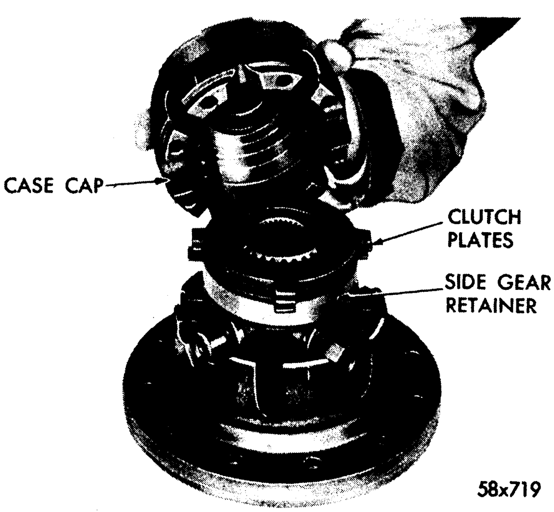


Fig. 51—Removing or Installing Differential Case Cap

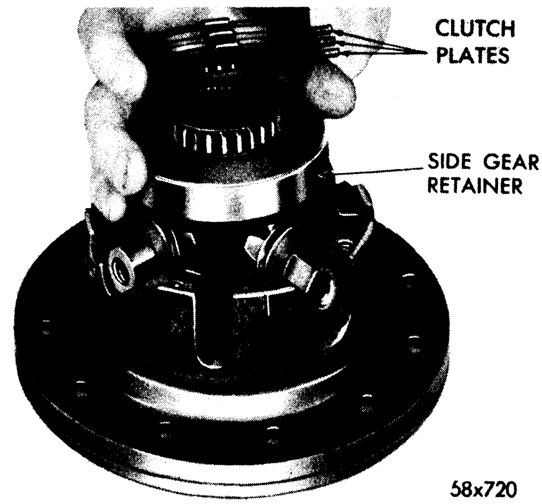


Fig. 52—Removing or Installing Clutch Plates (Cap Side)

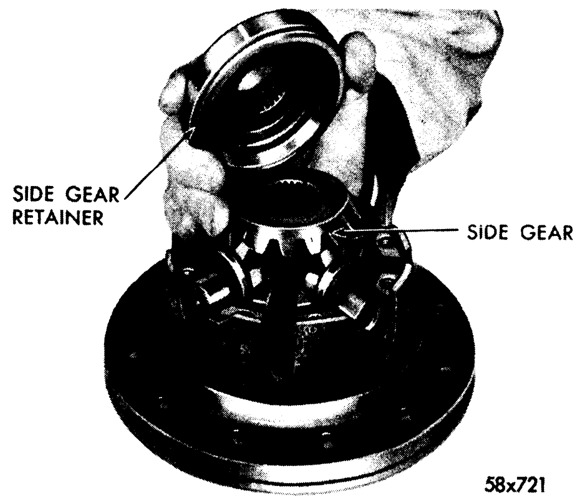


Fig. 53—Removing or Installing Side Gear Retainer (Cap Side)

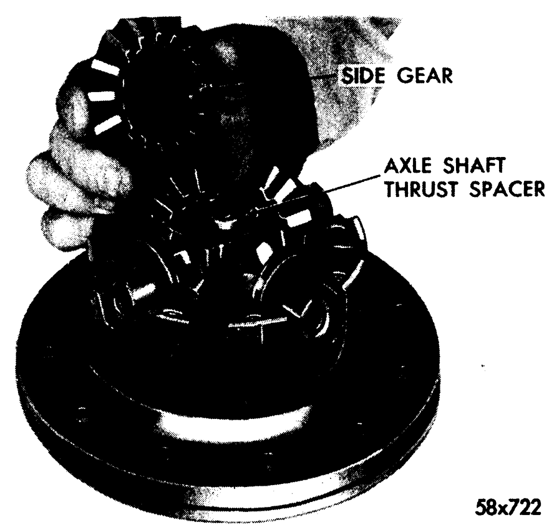


Fig. 54—Removing or Installing Side Gear (Cap Side)

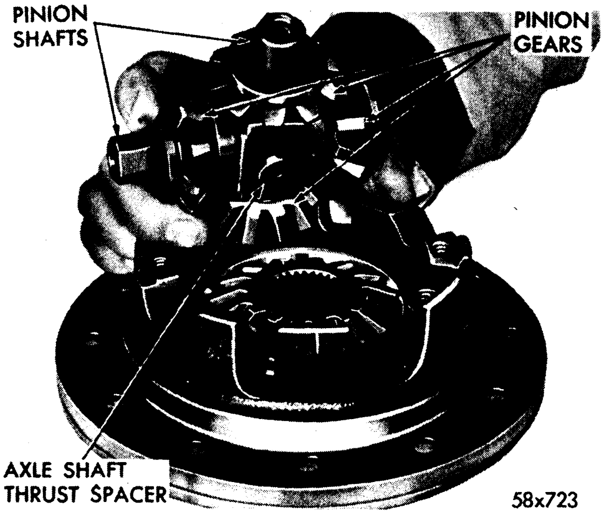


Fig. 55—Removing or Installing Pinion Shafts and Pinion Gears

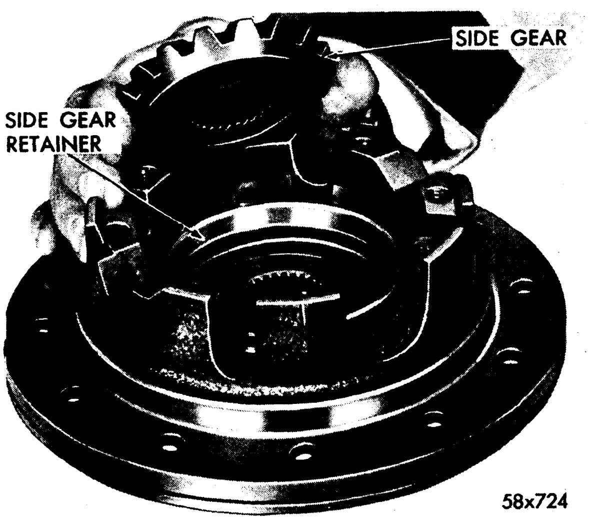
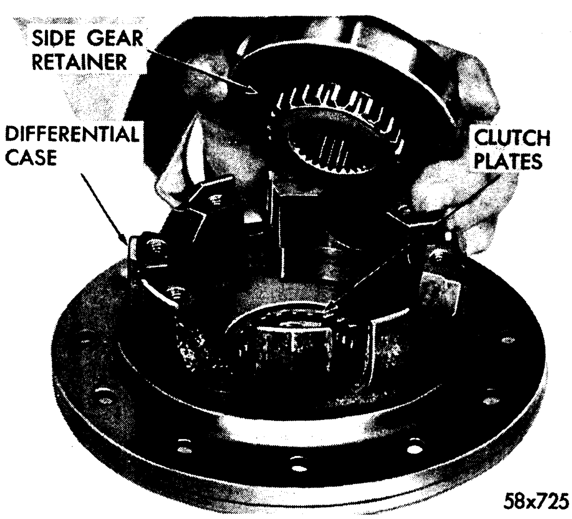


Fig. 56—Removing or Installing Side Gear from Differential Case



Removing or Installing Side Gear Retainer from Differential Case

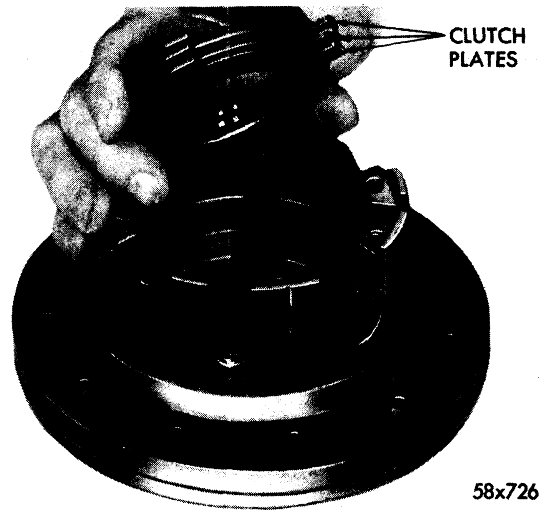


Fig. 58—Removing or Installing Clutch Plates from Differential Case

splined plate until 5 plates are installed. The thin plate (approximately $\frac{1}{16}$ inch) should be installed so that it will be toward the case. Install one side gear retainer, (Fig. 57) engaging splines of retainer with internal splined clutch plates. Install one side gear (Fig. 56).

Install a lock pin in one of the axle thrust spacers, drive pin until pin appears at thrust end of spacer but does not extend beyond thrust face. Align the pinion shafts and install spacer and pin through holes in pinion shafts. Install the other axle shaft thrust spacer, engaging the lock pin, as shown in Figure 59. Press spacer onto the lock pin until the two spacers are in contact. Thrust spacers are a loose fit in pinion shafts.

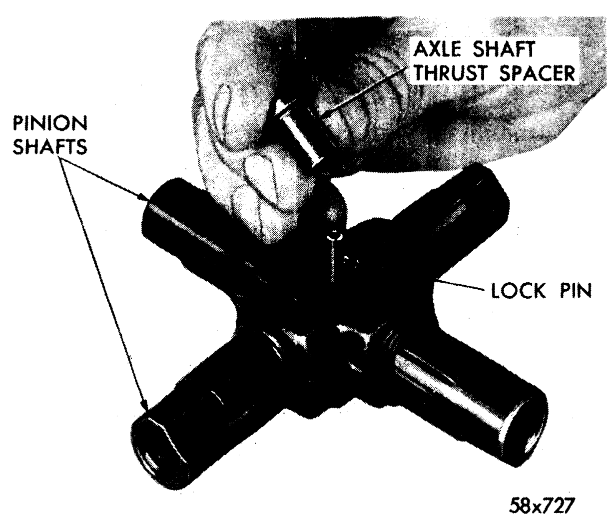


Fig. 59—Installing Axle Shaft Thrust Spacers

Install the four pinion gears on the pinion shafts and install the shafts and pinions assembly in position (Fig. 55). Install side gear (Fig. 54), side gear retainer (Fig. 53), and clutch plates (Fig. 52). Install clutch plates alternately with one thick plate (with tang) facing side gear retainer followed by an internal splined plate until 5 plates are installed.

NOTE: The thin plate (approximately 1/16 inch) should be installed so that it will be towards the case cap.

Install case cap, as shown in Figure 51. Make sure that scribe marks are in alignment, as shown in Figure 50.

Install cap attaching bolts. Tighten evenly to 40 foot-pounds torque. Check the clearance between the pinion mate shaft and the "V" of the case, as shown in Figure 60. Place feeler gauges on both ends of the same shaft and on opposite sides of the "V" so that the total shaft to case clearance can be checked. Do this for both shafts. Clearance should not exceed .020 inch. If clearance exceeds .020 inch with existing clutch plates, install new plates and recheck.

If clearance is still excessive, check shafts and case for wear.

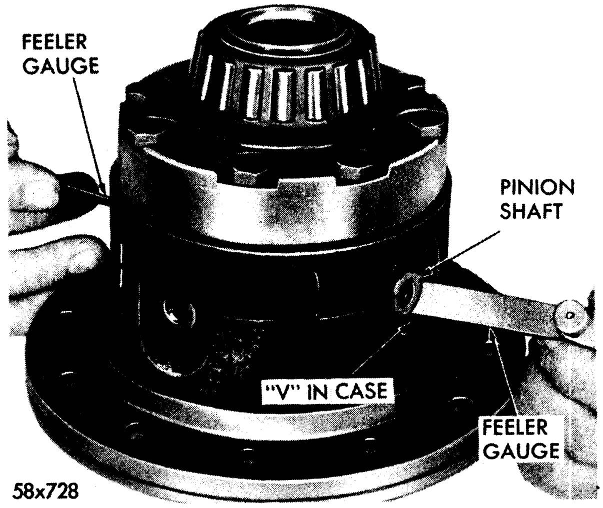


Fig. 60—Checking Clearance between Pinion Mate Shafts and "V" in Case

26. INSTALLATION

Install drive gear and differential assembly in the same manner as outlined under the conventional differential assembly.

LUBRICATION

Fill Sure-Grip Differential with 3½ pints of special differential lubricant MOPAR #1879414. Check level of unit after filling.

SERVICE DIAGNOSIS

27. REAR WHEEL NOISE

a. Wheel loose on axle shaft.

b. Worn drum or axle shaft keyways.

c. Wheel hub bolts loose.

d. Brinnelled or scored wheel bearings.

e. Insufficient lubrication.

f. Improper shimming at axle bearing.

g. Bent or spring axle shaft.

28. REAR AXLE NOISE

a. Lubricant level too low.

b. End play in drive pinion bearings. Also see paragraph 3—Gear noise on coast.

c. Excessive gear lash between ring gear and pinion. Also see paragraph 3. Gear noise on pull.

d. Loose drive pinion companion flange nut.

e. Scuffed gear tooth contact surfaces.

29. REAR AXLE GEAR NOISE

a. Gear noise on pull—a heavy pitch noise and increases as car speed increases, indicates scored gear teeth due to loss of lubricant, excessive gear lash or wrong type of lubricant.

b. Gear noise on coast—noise is heavy and (irregular), indicating excessive end play in pinion bearings.

c. Bearing noise on pull or coast—a rough grating sound that may change slightly in volume as speed changes; indicates that the rear axle pinion bearings are chipped, cracked, scored, badly worn and loose, or no gear lash.

30. CLICKING NOISE IN DRIVE LINE

Noise in drive line when vehicle is backed up or moved forward.—Clean axle shaft taper, keys and drums. Apply a heavy coating of chalk around entire circumference and length of the tapered section of rear axle shaft. Install drums and tighten axle shaft, nuts 145 foot-pounds torque, minimum. Check universal joints, and flange splines. Tighten companion flange nut 250-280 foot-pounds torque.

31. REAR AXLE DRIVE SHAFT BREAKAGE

a. Improperly adjusted wheel bearings.

b. Abnormal clutch operation.

c. Misaligned axle housing.

d. Vehicle overloaded.

32. DIFFERENTIAL CASE BREAKAGE

a. Improper differential bearing adjustment.

b. Abnormal clutch operation.

c. Excessive drive gear clearance.

d. Vehicle overloaded.

33. DIFFERENTIAL SIDE GEAR BROKEN

a. Worn thrust washers.

b. Misaligned or bent axle shaft.

c. Overloading vehicle.

34. TOOTH BREAKAGE (Drive Gear and Pinion)

a. Overloading and abnormal clutch operation.

b. Improper gear adjustment.

35. OVERHEATING OF AXLE UNIT

a. Lubricant level too low.

b. Bearings adjusted too light.

c. Bearings adjusted too tight.

d. Excessive wear in gears.

e. Insufficient drive gear to pinion clearance.

36. LOSS OF LUBRICANT

a. Lubricant level too high.

b. Clogged breather.

c. Scored or worn parts.

Section III

BRAKES

CONTENTS

DATA AND SPECIFICATIONS TOTAL CONTACT SERVICE BRAKES

MODELS	LC1	LC2, LC3, LY1
TYPE	Total Contact (Floating Shoe) Hydraulic	
DRUM DIAMETER	11 in.	12 in.
LINING		
Type	Moulded Asbestos	
Attachment	Cyclebond	
Width	2½ in.	
Thickness	$\frac{13}{64}$ in.	
BRAKE SHOE RETURN SPRING TENSION USING FISH SCALE HOOKED AT TOE OF SHOE	35 to 45 lbs. required to break contact between shoe and push rod	
BRAKE PEDAL FREE PLAY	$\frac{1}{32}$ in. to ⅛ in.	
WHEEL CYLINDER BORE		
Front—Upper and Lower	1⅛ in.	
Rear	1⅛ in.	
MASTER CYLINDER BORE	1⅛ in.	
PISTON CLEARANCE	.003 in. to .0065 in.	

DATA AND SPECIFICATIONS

HAND BRAKE

MODELS	LC1, LC2, LC3, LY1
TYPE	Internal Expanding (TorqueFlite Trans.)
LOCATION	Propeller Shaft at Rear of Transmission
DRUM DIAMETER	7 inch (TorqueFlite Trans.)
LINING TYPE	Moulded and Compressed Asbestos
Length	13.06 inch (TorqueFlite Trans.)
Width	2 in.
Thickness	5/32 in.
Clearance	.015 in. to .020 in.

SPECIAL TOOLS

Tool Number	Tool Name
C-3014	Installing Tool—Hand Brake Adjusting Nut Spanner
C-3015	Installing Tool—Hand Brake Adjusting Nut Cable
C-3080	Hone—Brake Cylinder Surfacing
C-3281	Wrench—Brake Drum Holding
C-3462	Wrench—Brake Shoe Return Spring Remover and Installer
C-3496	Tank—Master Cylinder Refiller Air Pressure
C-452	Puller—Parking Brake Drum
C-650	Hose—Brake Bleeder
C-757	Installing Sleeve—Rear Axle Shaft Oil Seal
C-845	Puller—Wheel

TIGHTENING REFERENCE

	Foot-pounds
Rear Brake Support Plate Screws	35
Front Brake Support Plate Bolt Nuts	35
Wheel Cylinder Screws	20

Section III
BRAKES

Total Contact brakes (Figs. 1 and 2) are continued on the 1958 models. The primary virtues of the Total Contact brakes are: (a) greater resistance to fade (b) instantaneous power response (c) less fatigue in heavy traffic when repeated acceleration and braking are necessary.

These brakes are of the drum type, with floating brake shoes mounted between plates located on center plane of lining (Figs. 3 and 4). With wheel cylinders mounted in same plane, braking forces are transmitted equally across width of lining. The web of shoe is contoured in depth, so when brakes are applied equal pressures are applied to brake drums along entire length of lining. The shoes are held in position by brake shoe return springs. One end of each spring is hooked in loop of return spring links. The other end engages the brake shoe.

An anchor pin in support plate assembly holds the spring link in a fixed position at one end. The other end of link is positioned by the brake shoe adjusting cam, providing a constant-

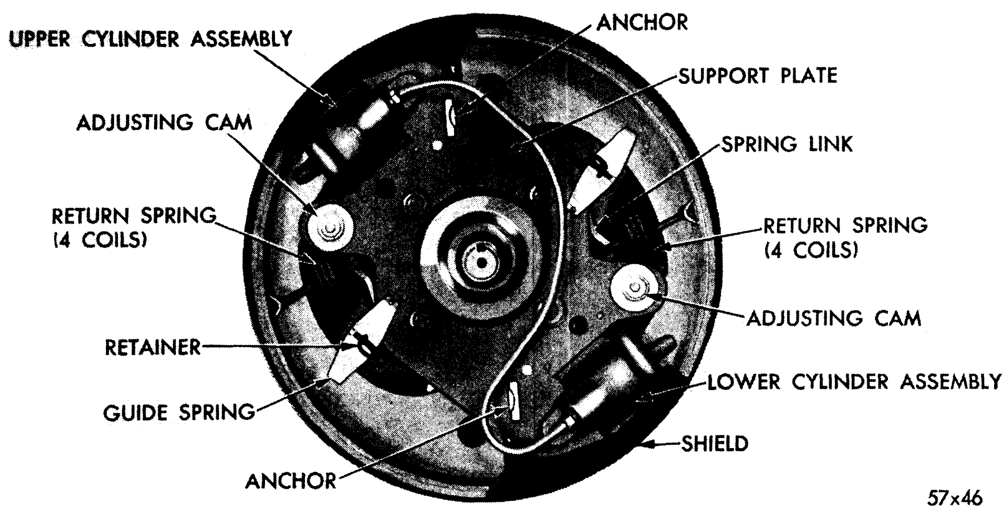


Fig. 1—Total Contact Brake Assembly (Front)

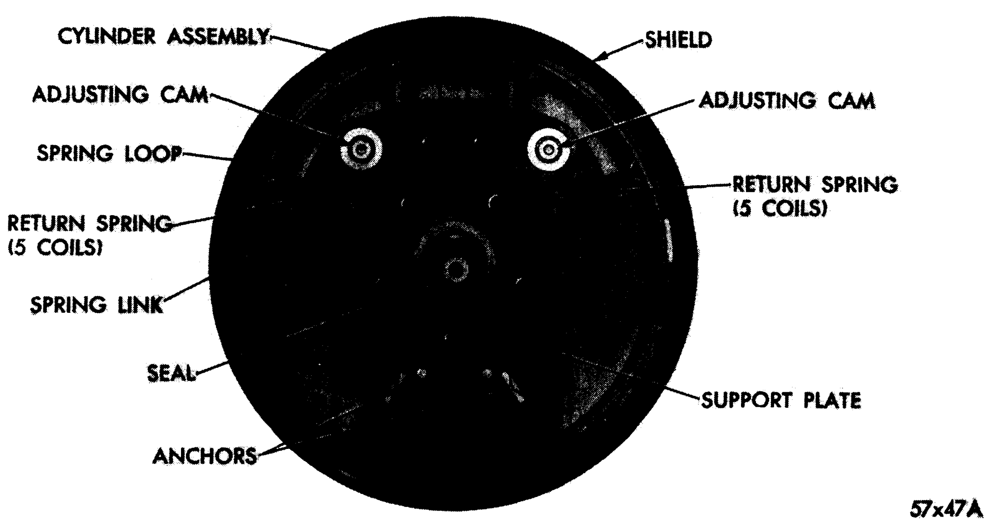


Fig. 2—Total Contact Brake Assembly (Rear) (Windsor Only)

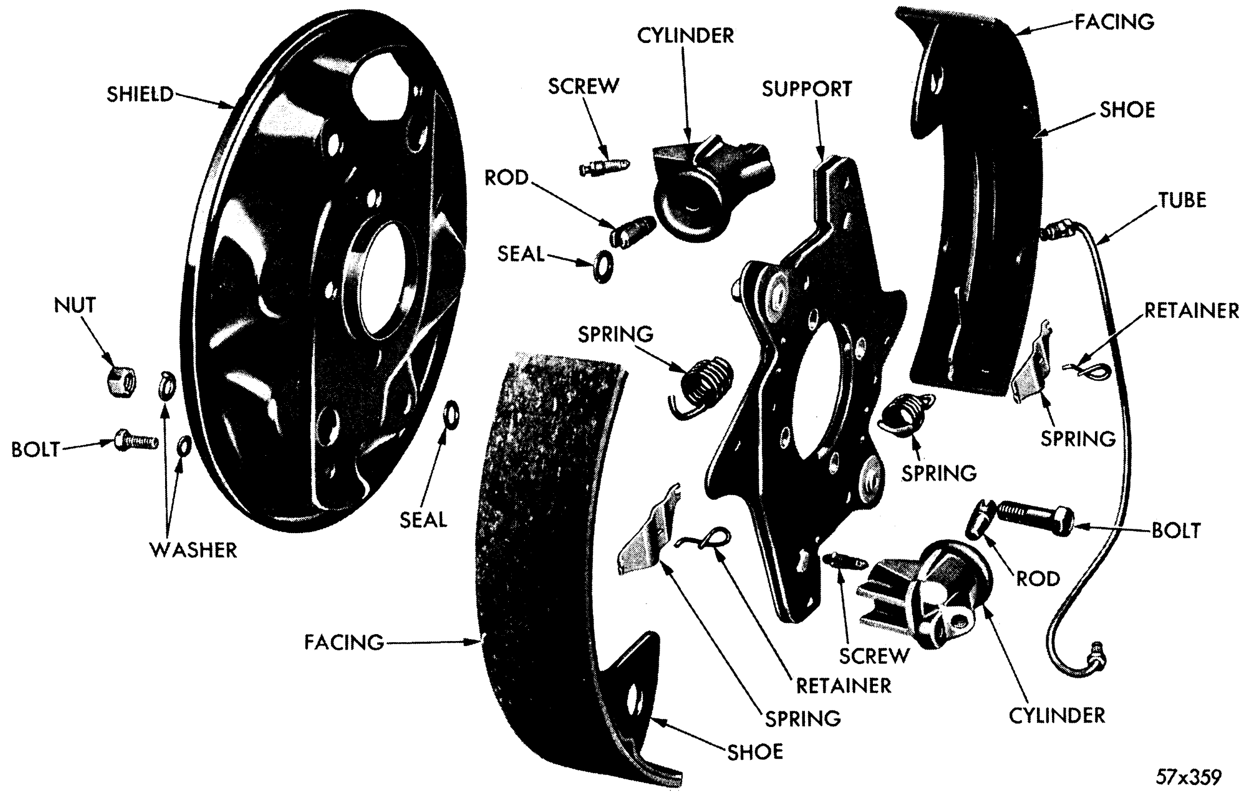


Fig. 3—Front Brake (Disassembled View)

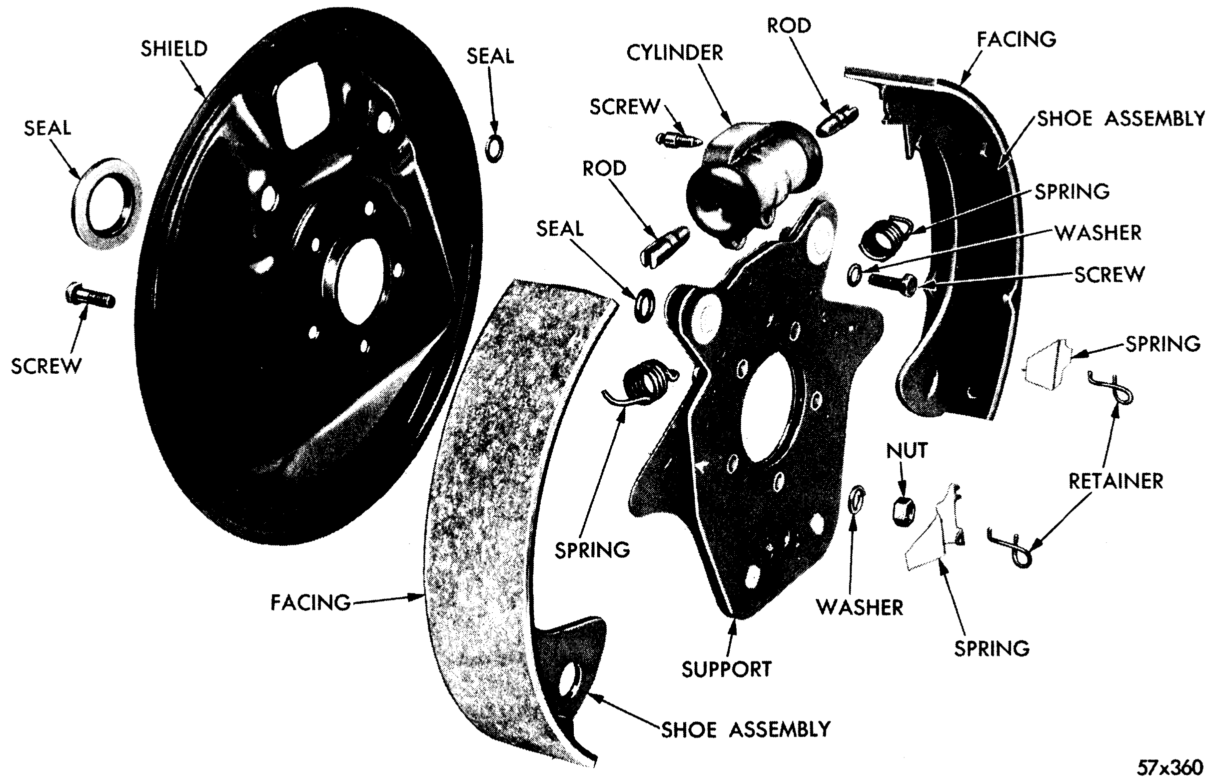


Fig. 4—Rear Brake (Disassembled View)

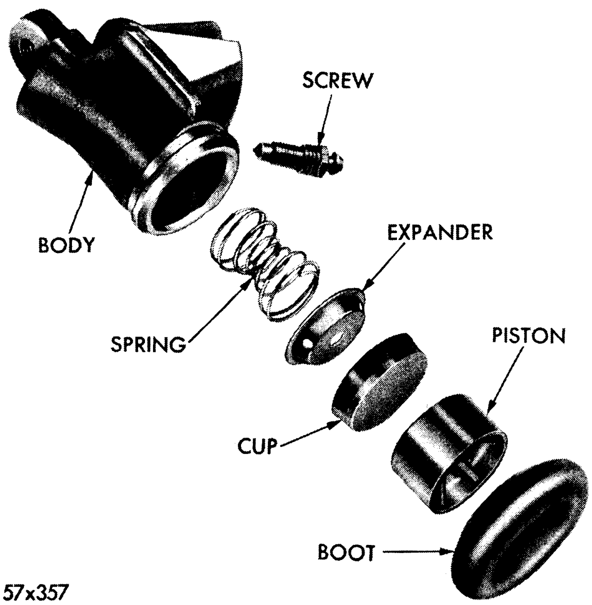


Fig. 5—Front Wheel Cylinder (Exploded View)

loaded spring length. Side rattle and twisting of shoe is controlled by guide springs, which maintains a constant spring pressure against side of web of shoe holding shoe against support plate. The guide spring also helps to eliminate brake noise.

In front brakes two cylinders of single piston type (Fig. 5) are attached to the support plate assembly. The location of cylinders is such that when brakes are applied, self-energizing action affects both front and rear shoes of front brake when vehicle is traveling forward.

The front shoe pivots at the bottom of support plate and rear shoe pivots at top. Each shoe is actuated by its own wheel cylinder.

Each rear brake assembly uses one wheel cylinder of double-acting type (Fig. 6). Both shoes pivot at the bottom of support plate and are actuated by wheel cylinder causing shoes to operate in opposition to each other. Self-energizing action is effective on rear brake front shoe when vehicle is traveling forward and effective on rear shoe when traveling in reverse.

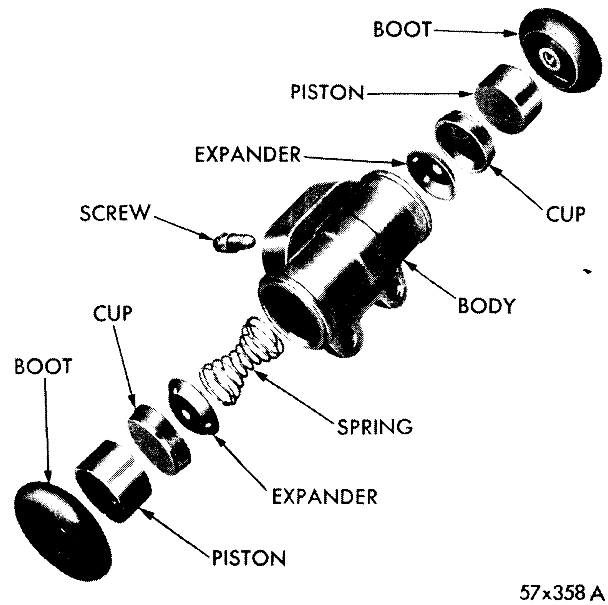


Fig. 6—Rear Wheel Cylinder (Exploded View)

SERVICE PROCEDURES

1. DISASSEMBLY OF FRONT BRAKE

Block brake pedal to prevent downward movement of pedal. Back off adjusting cams. Remove wheel, and hub and drum assembly. Using Tool C-3462, remove shoe return springs (Fig. 7). The end of tool should be inserted between spring link and support plate assembly. With tool cam slot engaging spring hook, turn handle of tool to disengage spring.

NOTE: Do not use brake spring pliers or damage to lining will result.

Turn brake shoe guide retainer ¼ turn, then remove retainer and guide (Fig. 8). **The lip on end of guide is used for positioning guide on outer support plate.** Slide shoes from between

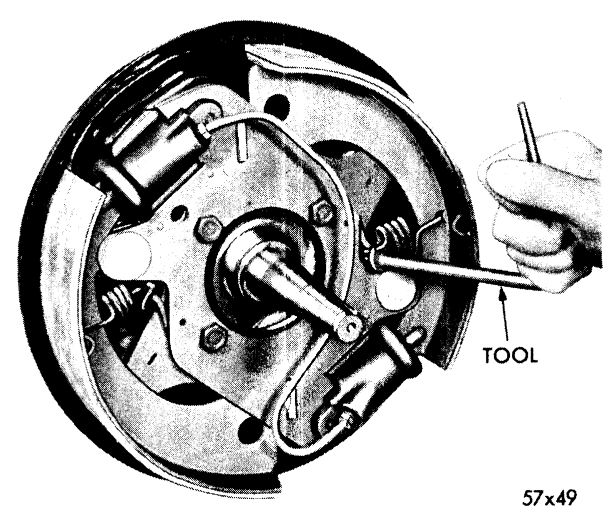


Fig. 7—Removing Front Brake Shoe Return Spring

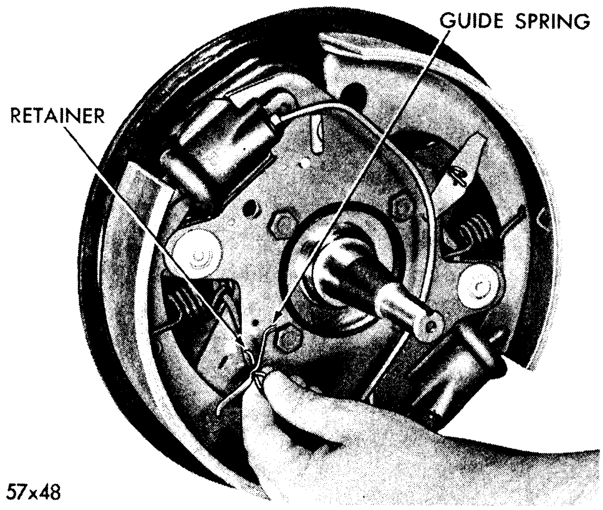


Fig. 8—Front Brake Mounting Bolts

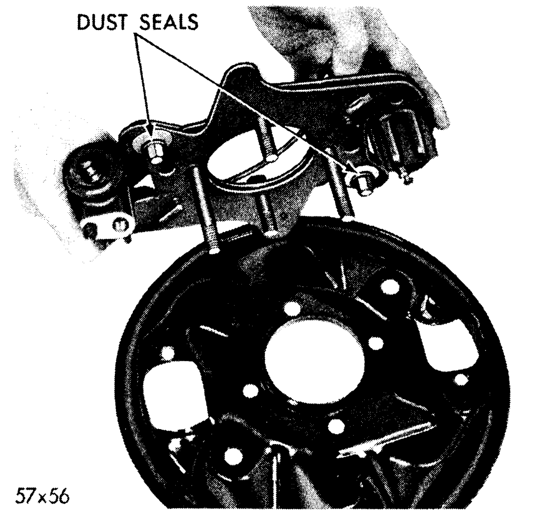


Fig. 10—Removing or Installing Support Plate

support plates (Fig. 9). Disconnect flexible brake hose at upper wheel cylinder, and remove wheel cylinder mounting screws and lockwashers at rear of brake shield.

Remove four support plate mounting bolts, nuts and lockwashers, and remove support plate with wheel cylinders and cylinder connector tube attached (Fig. 10). With assembly on bench, remove cylinder connector tube and wheel cylinders.

NOTE: Perform operations outlined in "Servicing the Wheel Cylinders."

2. ASSEMBLY OF FRONT BRAKE

Place wheel cylinders into position in support

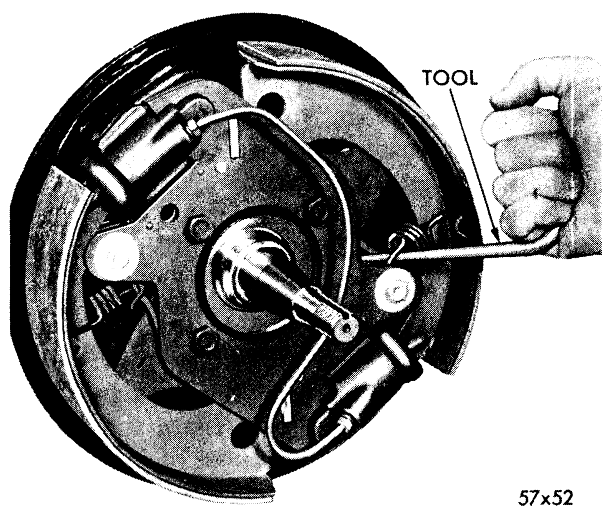


Fig. 11—Installing Front Brake Shoe Return Spring

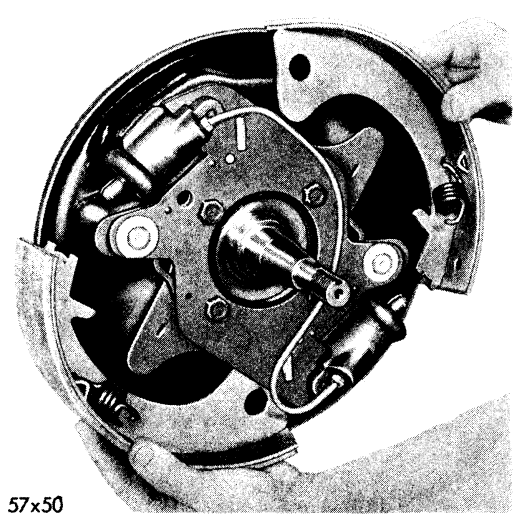


Fig. 9—Removing Front Brake Shoe From Support Plate

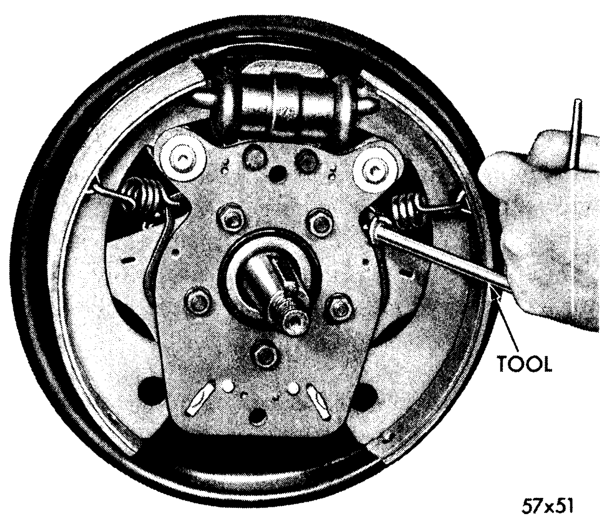


Fig. 12—Removing Rear Brake Shoe Return Spring with Tool C-3462

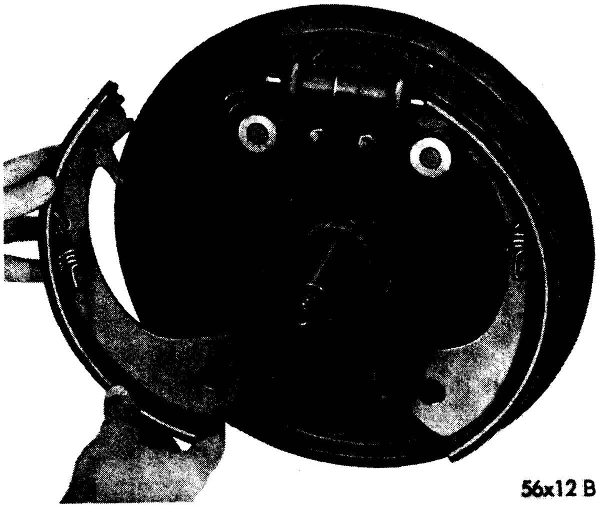


Fig. 13—Removing or Installing Rear Brake Shoe

plate assembly and install connector tube. Position support plate on brake shield and install cylinder mounting screw and lockwasher, but do not tighten.

NOTE: Be sure brake adjusting cam rubber dust washers are in place and in good condition before installing support plate assembly.

Install four support plate bolts, lockwashers, and nuts. Tighten 35 foot-pounds and wheel cylinder mounting screw 20 foot-pounds torque.

Install wheel cylinder flexible brake hose, and tighten all connections securely. Install brake shoes, and brake shoe return springs. (Fig. 11)

3. DISASSEMBLY OF REAR BRAKE

Block brake pedal in "UP" (released) position.

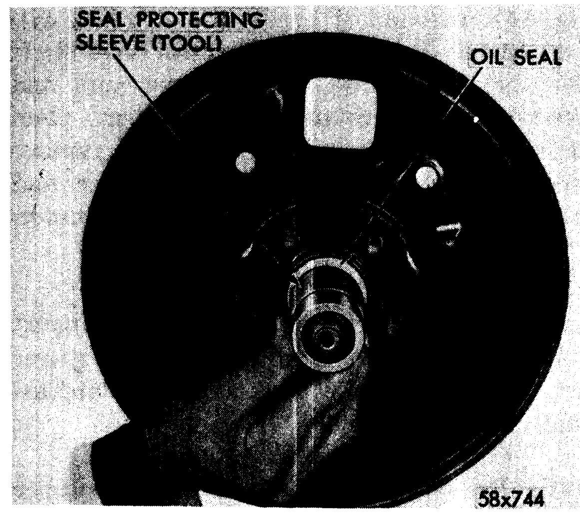


Fig. 15—Removing or Installing Rear Brake Support Shield with (Tool C-745)

Raise car and remove wheels. **Back off all adjusting cams.** Remove hub and drum assembly, using puller Tool C-845. Insert wrench, Tool C-3462, in inner support plate hole, with tool cam slot engaging spring hook (Fig. 12). Turn tool handle to disengage spring from return spring link, and turn handle in opposite direction to release spring. Remove both springs in this manner. **Do not use brake spring pliers or damage to lining will result.**

After removing brake shoe return spring, dislocate shoe from adjusting cam and wheel cylinder and remove brake shoes (Fig. 13). To avoid warping of shoe force should not be used to remove shoe from support plate.

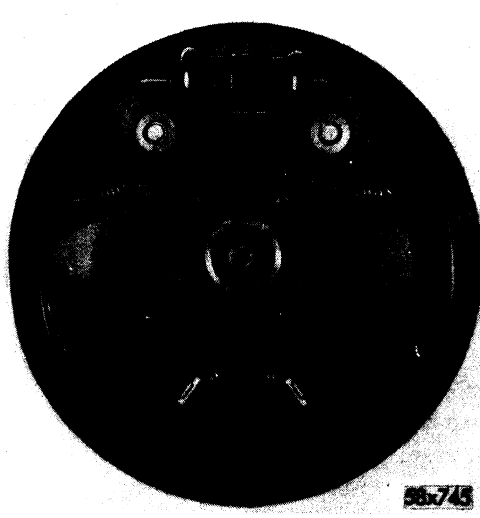


Fig. 14—Removing Rear Brake Shoe Support Plate

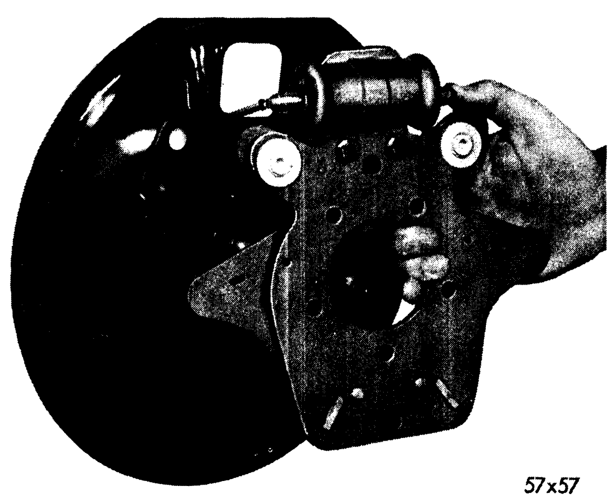


Fig. 16—Installing Rear Brake Support Plate

(Fig. 14). Disconnect brake line at wheel cylinder. Install Tool C-745 to protect axle shaft outer seal. (Fig. 15). Remove five nuts and lockwashers that retain brake support plate and brake shield to axle housing and remove support plate (Fig. 16) wheel cylinder and dust shield as a unit. Remove wheel cylinder.

4. ASSEMBLY OF REAR BRAKE

Assemble wheel cylinder on brake shoe support plate. Install screws and lockwashers finger tight. Assemble brake shoe support plate assembly to brake shield.

NOTE: Be sure brake adjusting cam rubber dust washers are in place and in good condition before installing brake support plate assembly. These washers are located between support plate and brake shield.

Position Tool C-745 (Fig. 15) and install brake shield, support plate and wheel cylinder. Tighten support plate screws 35 foot-pounds and wheel cylinder screws 20 foot-pounds torque. Connect brake fluid line to wheel cylinder.

Position brake shoes in support plate. **Make sure wheel cylinder push rods properly engage toe end of shoes and shoes are in alignment. Refer to "Brake Shoe Alignment." Paragraph 5.** If shoes must be relined, refer to "Brake Lining Replacement," Paragraph 6. Install brakes shoe return springs, using Tool C-3462 (Fig. 17). Check tension of springs, by hooking fish scale at toe of shoe and pulling shoe away from wheel cylinder. Scale should read 35 to

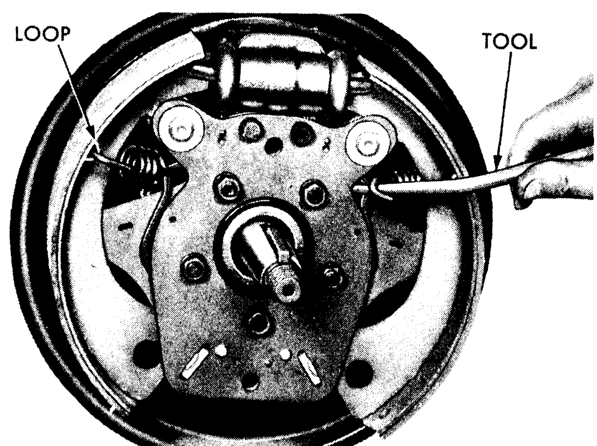


Fig. 17—Removing Rear Brake Shoe Return Spring With Tool C-3462

45 pounds before contact is broken between web of shoe and wheel cylinder push rod.

NOTE: Long end of brake return springs must be hooked in shoes. Otherwise, brake noise will be encountered due to coil springs contacting shoes.

Install brake shoe guide springs, making sure positioning lip of spring engages hole in support plate (Fig. 13). Loosen adjusting cams and install hub, drum and wheel assembly. Bleed brake system, refill master cylinder to proper level, and adjust brakes, as outlined in "Brake Adjustment," Paragraph 8.

5. BRAKE SHOE ALIGNMENT

To insure maximum stopping ability, the entire length and width of lining must contact drum upon brake application. Examination of used lining will disclose if shoe is out of alignment. Misaligned shoes cannot be corrected by grinding and should be discarded. The brake shoe support plate assembly should also be checked. If it is sprung or damaged ,replace with new support assembly.

NOTE: Brake shoe clearance should be checked with a feeler gauge. The minimum clearance should be .003 inch.

6. BRAKE LINING REPLACEMENT

Pre-cemented Cyclebond brake lining can be successfully bonded to either new or used brake shoes.

NOTE: It is very important that equipment manufacturer's instructions be carefully observed for curing time, temperature, and clamping pressure (100 psi.), depending on type of equipment used.

7. GRINDING THE BRAKE LINING

NOTE: Brake shoes grinding must be done with brake shoes removed from vehicle.

Check drum out-of-round with an accurate indicator. Drum must not exceed .004 inch. Measure the drum diameter with an accurate micrometer, and transfer drum diameter to grinding machine and grind linings to specified clearance of .010 to .024 inch below drum diameter.

8. BRAKE ADJUSTMENT

NOTE: Whenever brakes have been relined or new shoe assemblies installed, always apply brake pedal prior to adjusting brakes. This action causes brake shoes to center themselves in brake drum and to assist in adjustment.

a. Front Brake Adjustment

Turn each adjusting cam (Fig. 18) on both front brakes in direction of forward wheel rotation (Fig. 19) until shoe lining is solid against drum and wheel is locked. Turn adjusting cams slowly in opposite direction(each cam a little at a time) until no drag is felt.

b. Rear Brake Adjustment

The forward rear wheel brake shoe adjusting cams are rotated in direction of forward wheel rotation. The rear wheel shoe adjusting cams are rotated in direction of reverse wheel rotation (Fig. 19).

9. SERVICING THE WHEEL CYLINDER

Wheel cylinder pistons that are badly scored or corroded should be replaced. Use new piston cups when reconditioning cylinders. Cylinder walls that have light scratches, or show signs of corrosion, can usually be cleaned up with crocus cloth. Cylinders that have deep scratches or scoring, may be honed, however, using Tool C-3080, providing diameter of cylinder bore is not increased more than .002 inch. A cylinder that does not clean up at .002 inch should be discarded and new cylinder used. (Black stains on cylinder walls are caused by piston cups and will do no harm).

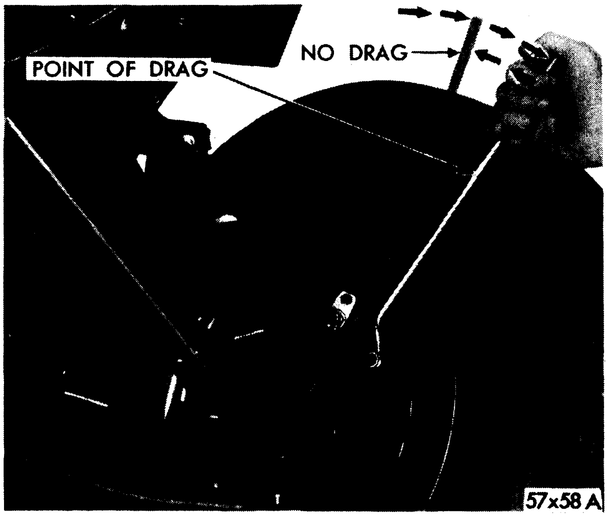


Fig. 18—Adjusting Brake Shoe at Cam

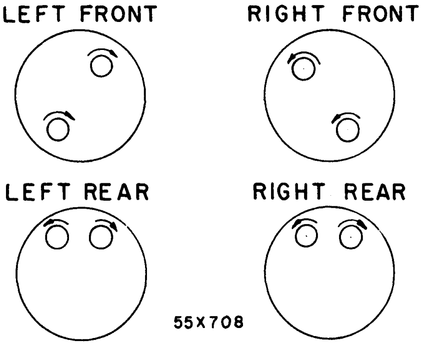


Fig. 19—Adjusting Front and Rear Brake Shoe (Orientation Diagram) (As Viewed Beneath Vehicle)

10. SERVICING THE MASTER CYLINDER

When servicing the hydraulic brake system, these important rules must be observed: All vital parts of system must be kept **CLEAN,** free from dirt, grease and oil. The system must be free from air and all connections must be tightly sealed upon completion of job. Only high boiling point brake fluid, such as MOPAR Super Brake Fluid should be used. To remove

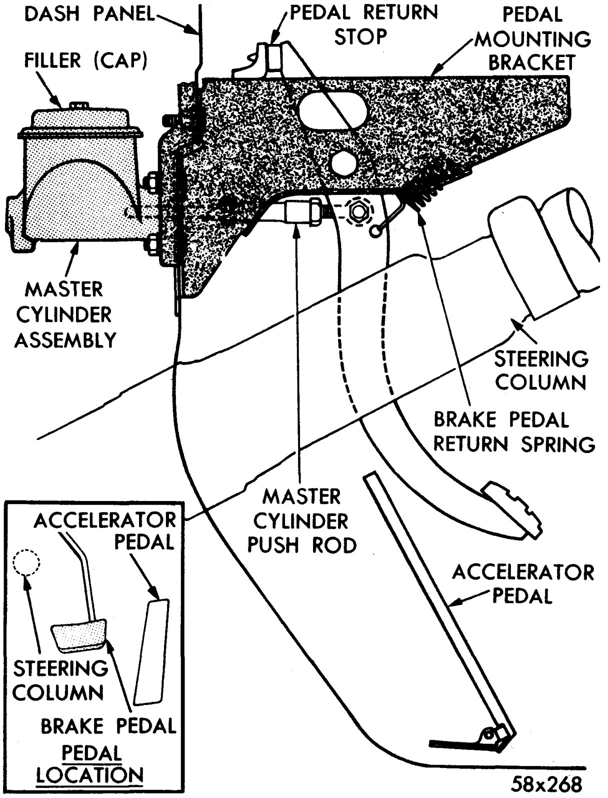


Fig. 20—Master Cylinder Location and Linkage

master cylinder, refer to Fig. 20, and proceed as follows:

Remove pedal return spring, disconnect push rod, and brake line tube at master cylinder. Disconnect stop light switch leads and remove master cylinder. Clean outside of master cylinder thoroughly, remove reservoir filler cap, and drain all brake fluid. Refer to Figure 21 and disassemble master cylinder for inspection. If master cylinder piston is badly scored or corroded, replace with new one. Piston cups and valve assembly should be replaced when reconditioning master cylinder.

Master cylinder walls that have light scratches or show signs of corrosion, can usually be cleaned with crocus cloth. Cylinders that have deep scratches or scoring may be honed, providing diameter of cylinder bore is not increased more than .002 inch. A master cylinder bore that does not clean up at .002 inch should be discarded and new cylinder used. (Black stains on the cylinder bore are caused by piston cups and will do no harm).

CAUTION

Use extreme care cleaning master cylinder after reconditioning. Remove all dust or grit by flushing cylinder with alcohol. Wipe dry with clean lintless cloth and clean second time with alcohol. Dry master cylinder with air pressure, and flush with clean brake fluid. (Be sure relief port in master cylinder is open.)

Before assembling, piston, cups and valve assembly should be dipped in new MOPAR Super Brake Fluid.

11. BLEEDING THE BRAKE SYSTEM

Remove any dirt around master cylinder reservoir filler cap so that dirt and grit will not drop into reservoir. Compressed air refiller, Tool C-3496, filled with MOPAR Super Brake Fluid or high boiling point fluid, provides a convenient way for keeping master cylinder filled while bleeding brake system. Back brake adjusting cams all the way off. This allows pistons in wheel cylinders to move back and permits greater movement of piston to expel air faster.

Starting with right rear wheel cylinder, wipe dirt off bleeder valve, and attach bleeder hose, Tool C-650, to valve. Place other end of hose in jar half full of brake fluid. Bleed intermit-

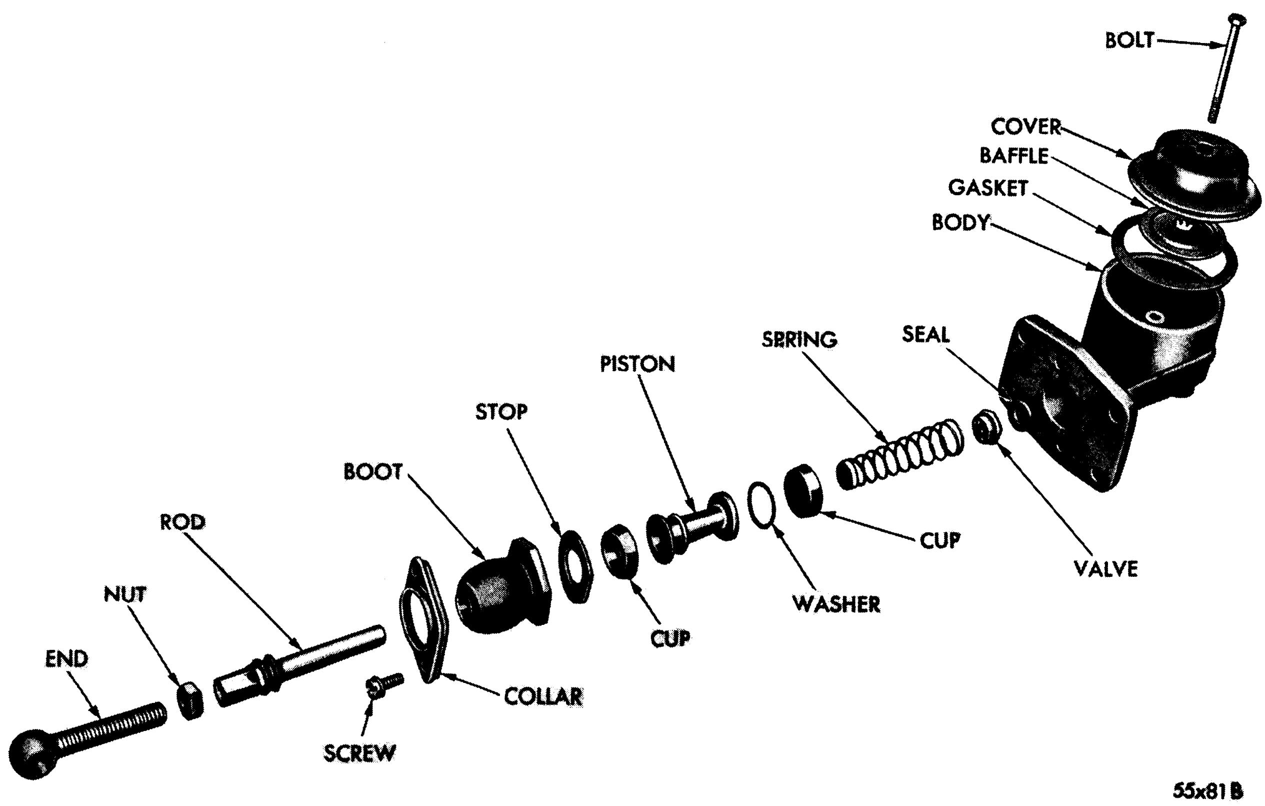


Fig. 21—Master Cylinder (Disassembled View)

tently, opening and closing valve (at wheel cylinder) about every four seconds. This causes a whirling action in cylinder to help expel air. Continue this process until fluid runs out of bleeder hose in a solid stream without air bubbles. Continue bleeding by repeating this operation on left rear wheel, right front wheel, and left front wheel. At front wheels, bleed lower cylinder first to force all air out of connecting line.

If necessary, repeat bleeding operation when there is an indication of air remaining in system. **Be sure to adjust cams after completion of bleeding operation.**

12. TEST FOR FLUID CONTAMINATION

To determine if contamination exists in brake fluid (indicated by swollen or deteriorated rubber cups), make following test: Place small amount of drained brake fluid in small glass bottle. Separation of fluid into two distinct layers will indicate mineral oil content. Add 1/3 water to contents and shake. If fluid becomes milky, oil is present. If fluid remains clear, it is not contaminated with mineral oil. **Be safe and discard old brake fluid that has been bled from system. Fluid drained from bleeding operation may contain dirt particles or other contamination and should not be used.**

13. SERVICING THE HAND BRAKE (INTERNAL EXPANDING TYPE)

The hand brake (Fig. 22) is internal expanding type and is used only on cars equipped with TorqueFlite Transmission. The brake is fully enclosed to keep out dirt and oil and requires very little servicing. Longer lining life is assured by protection against dirt and by use of Cyclebond linings. Adjustment, when needed, are very simple for both steel control cable and shoes.

a. Disassembly

To service the internal expanding hand brake, refer to Fig. 23, and proceed as follows: Disconnect propeller shaft at transmission. Engage holding Tool, C-3281, with companion flange. Loosen and remove companion flange nut, lockwasher and flatwasher. Install puller, Tool C-452, on companion flange and remove flange and brake drum. Remove brake adjusting screw cover and disengage ball end of cable from operating lever. Separate shoes at bottom, allowing brake shoe adjusting nut, screw and sleeve to drop out, and release shoes. Remove brake shoe return spring.

Pry out brake shoe anchor washer and remove outer shoe guide. Slide each shoe out from under brake support grease shield spring. (As shoes are removed, operating strut lever will drop out of plate.) Separate operating lever from right-hand brake shoe by removing nut, lockwasher and bolt. The brake is now disassembled as necessary for replacement of worn or damaged parts.

b. Assembly

Assemble operating lever to right-hand brake shoe. Slide right and left-hand brake shoes under brake support grease shield spring and up against inner anchor shoe guide. Spread shoes and insert operating lever strut, with wide slot toward operating lever and word "top" facing up.

Replace outer brake anchor shoe guide and washer. Replace brake shoe return spring. Spread both shoes apart at bottom and install brake shoe adjusting nut, screw and sleeve. **Be sure to install adjusting nut, screw and sleeve in proper position.** Turn brake shoe adjusting nut until shoes are in released position, and install brake drum. Be sure brake shoes are centered on backing plate and are free to move. Connect brake control cable and adjust brakes and control cable. See "Adjustment" "C". Replace the adjusting screw cover plate.

c. Adjustment

Push in Neutral (N) push button. Be sure hand brake is released. Disconnect front end of propeller shaft to permit turning of brake drum by hand (if not previously disconnected). Remove adjusting screw cover plate. Turn brake shoe adjusting nut to decrease shoe-to-drum clearance until slight drag is felt on drum. Back off adjusting nut at least one full notch (using spanner wrench, Tool C-3014) to give approximately .010 inch clearance. **Be sure two raised shoulders on adjusting nut are seated in grooves on adjusting sleeve.**

Test hand brake lever for travel. When it is properly adjusted, there should be from 3 to 5 notches on lever rod visible beyond face plate. **Never substitute for a brake shoe adjustment**

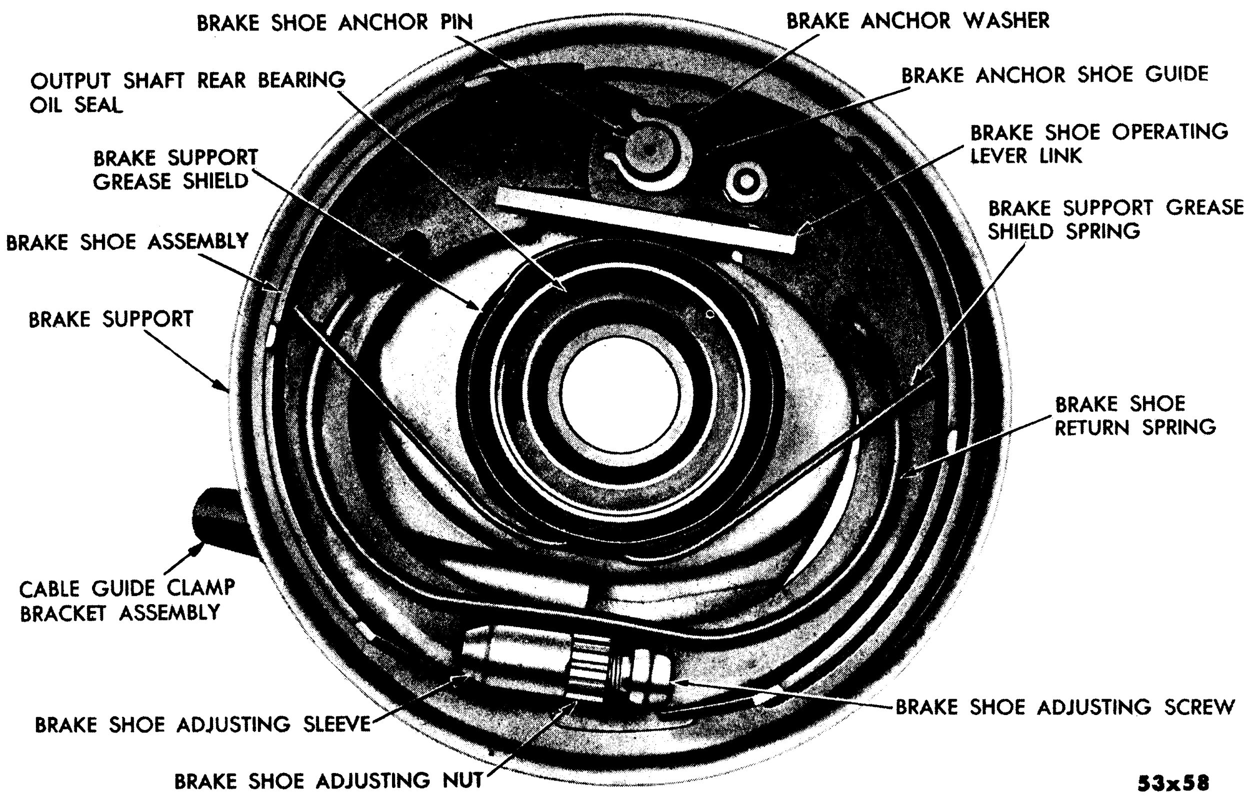


Fig. 22—Internal Expanding Type Hand Brake

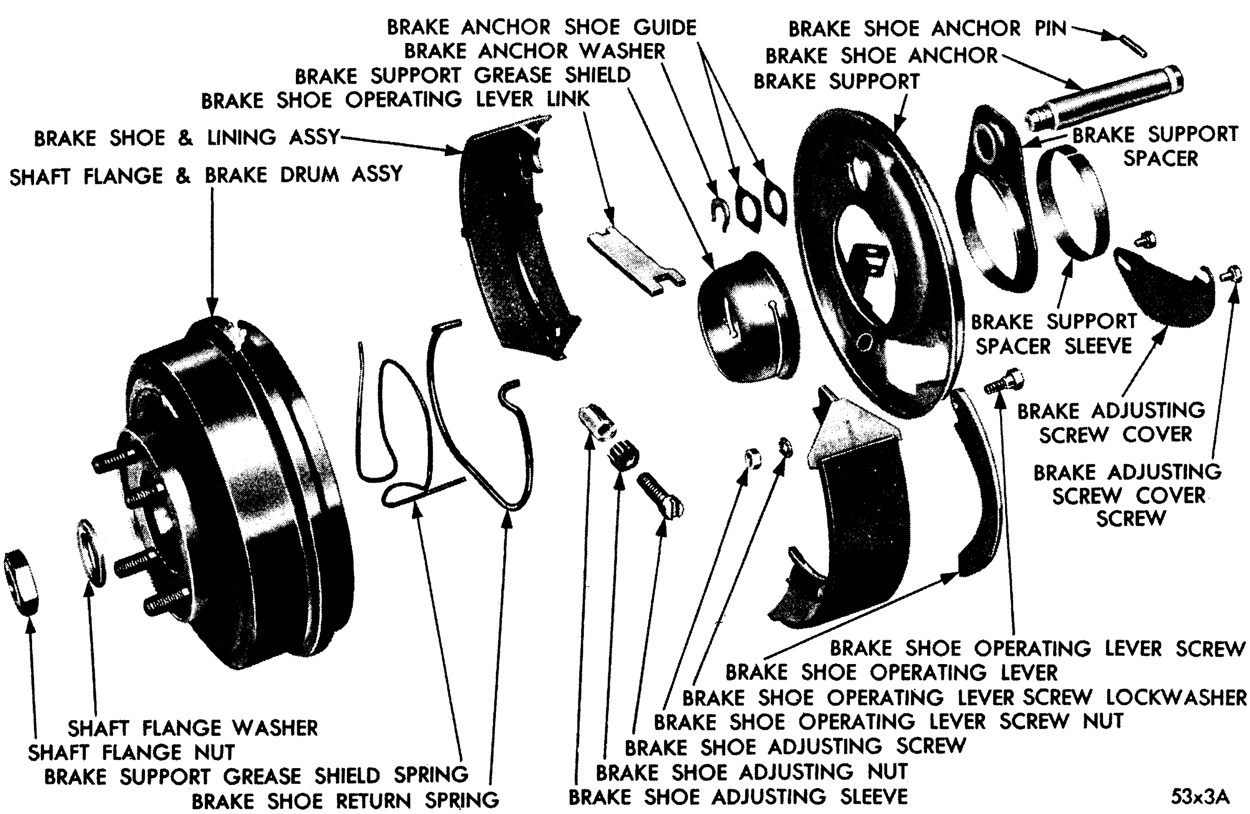


Fig. 23—Hand Brake (Disassembled View)
Internal Expanding Type

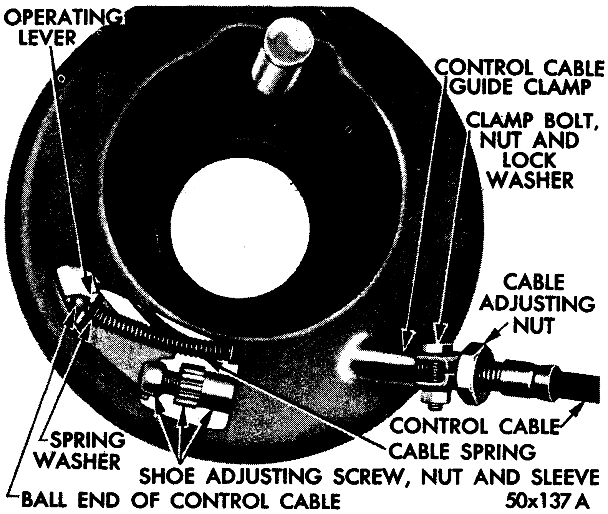


Fig. 24—Rear View of Brake (Typical)

by adjusting cable. Install adjusting screw cover plate and connect propeller shaft.

14. SERVICING HAND BRAKE CABLE (INTERNAL EXPANDING TYPE)

a. Removal (At Transmission End)

If removal of control cable is required for replacement or repair, refer to Fig. 24, and proceed as follows. Loosen guide clamping bolt and remove adjusting screw cover plate. Pry ball end of cable up and out of operating level slot with a screwdriver. Remove control cable from guide.

b. Installation

Slide cable into guide. Insert installer, Tool C-3015, between spring retainer washer and ball on end of cable. Hook cable into slot in operating lever, with lever between ball and washer.

c. Adjustment

After installation has been completed, adjust cable as follows: The cable length adjusting nut should be positioned against cable housing so there is at least .005 inch, but not more than .010 inch, clearance between operating lever brake shoe cable.

To lock adjustment, tighten cable housing clamp securely and tighten cable adjusting nut against housing. Never substitute cable adjustment for brake shoe adjustment.

15. CYCLEBOND BRAKE LINING

Pre-cemented Cyclebond brake lining can be applied to either new or used shoes. See instructions in MOPAR Shop Replacement Packages.

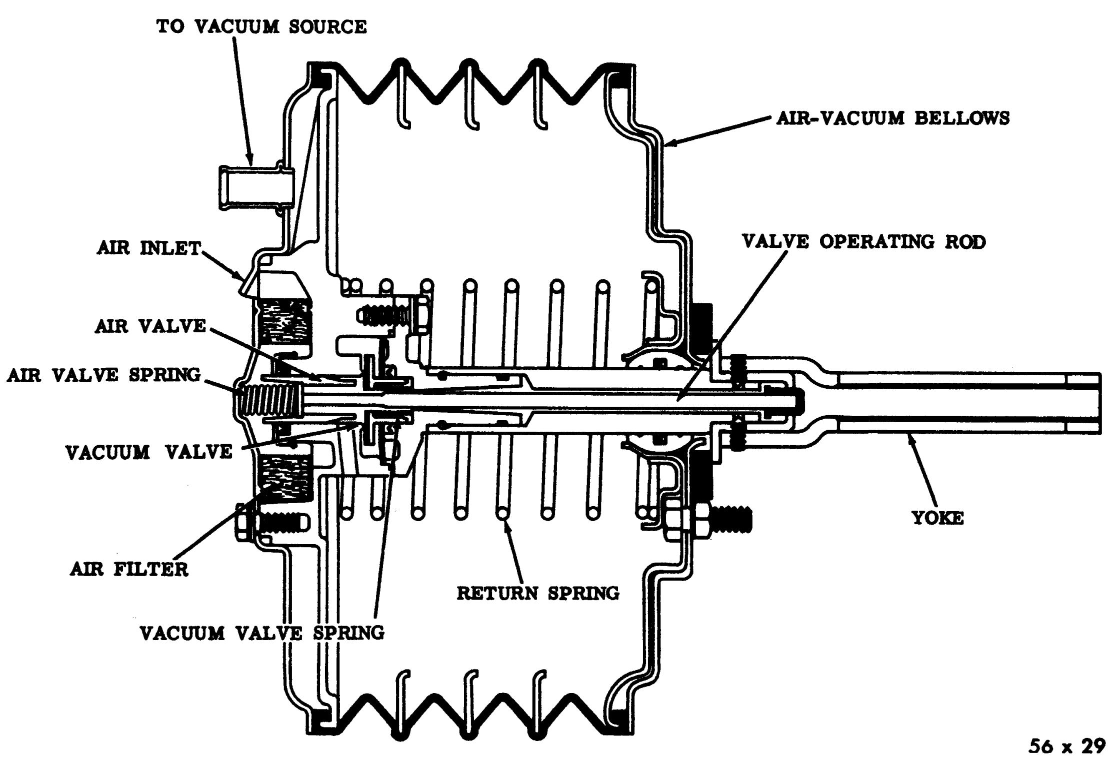


Fig. 25—Bellows Type Power Brake (Sectional View)

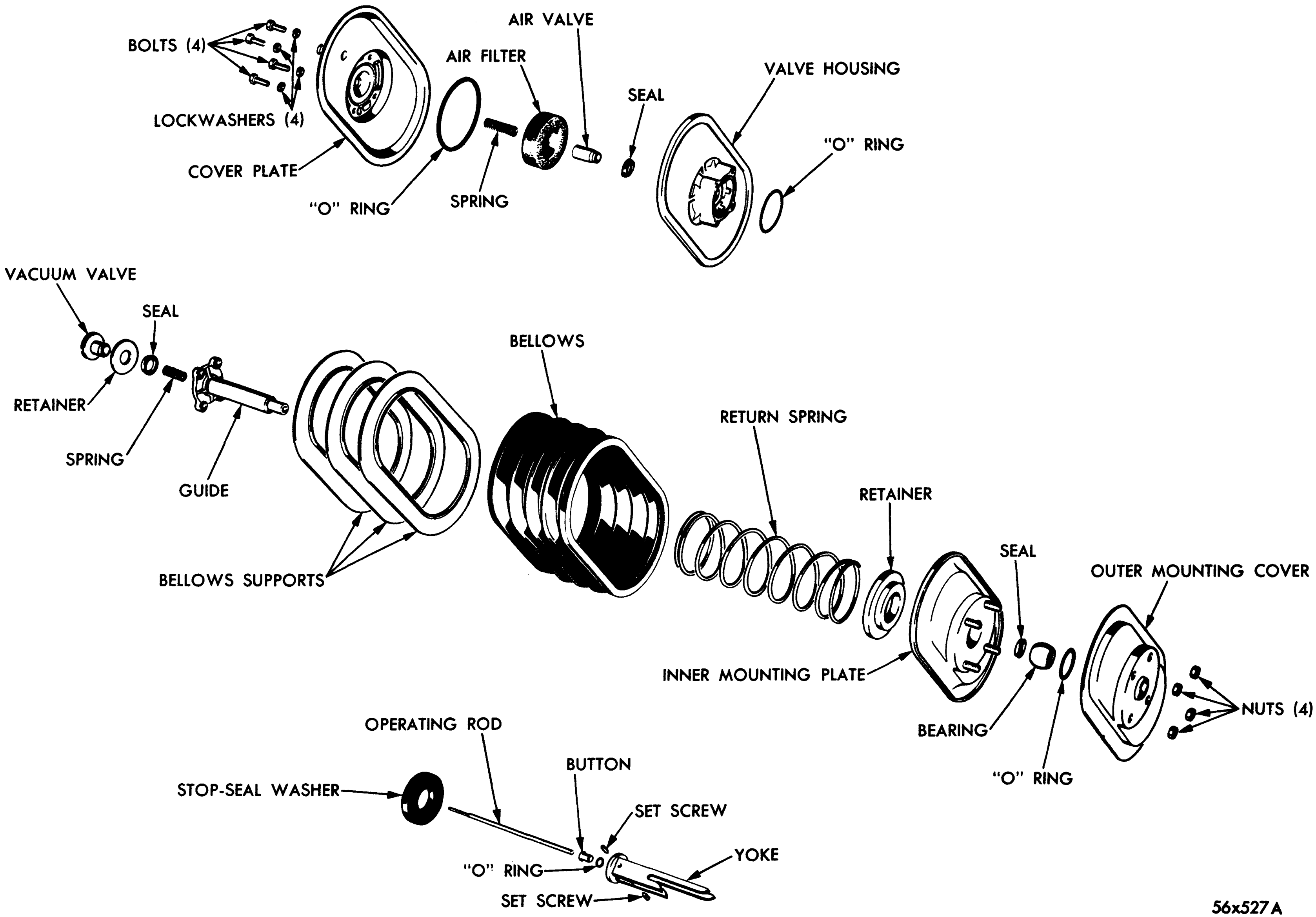


Fig. 26—Bellows Type Power Brake (Disassembled View)

POWER BRAKE UNIT (BELLOWS TYPE)

The Bellows Type Booster unit is an oval-shaped, air-vacuum bellows mounted on engine side of dash panel, and is connected mechanically to brake pedal linkage through power unit push rod (Figs. 25 and 26). The unit is an air suspended unit and therefore, requires a vacuum reserve tank, which is mounted on the engine side of the front fender splash shield. Brake linkage exists only when the unit is assisting in a brake application. With a loss of engine vacuum, the brake pedal is free to move completely, independent of the Power Unit to apply the brakes in the conventional manner. (Fig. 25).

SERVICE PROCEDURES

16. REMOVAL OF POWER BRAKE UNIT

Use pedal depressor, depress pedal to prevent trigger arm from extending beyond extremities of bracket.

NOTE: If pedal linkage is allowed to extend through hole in dash panel, trigger arm may be damaged.

Disconnect vacuum hose at power vent. Remove master cylinder power unit and bracket assembly hex nuts and lockwashers. Carefully withdraw unit from dash panel (Fig. 27).

NOTE: Use care to prevent loss of nylon bushing on pedal linkage cross pin.

17. DISASSEMBLING POWER BRAKE

Should it be necessary to disassemble bellows type power brake unit for overhaul or repair, refer to Figs. 28 and 29, and proceed as follows: Remove nuts that attach mounting plate to unit. Slide plate off and away from unit.

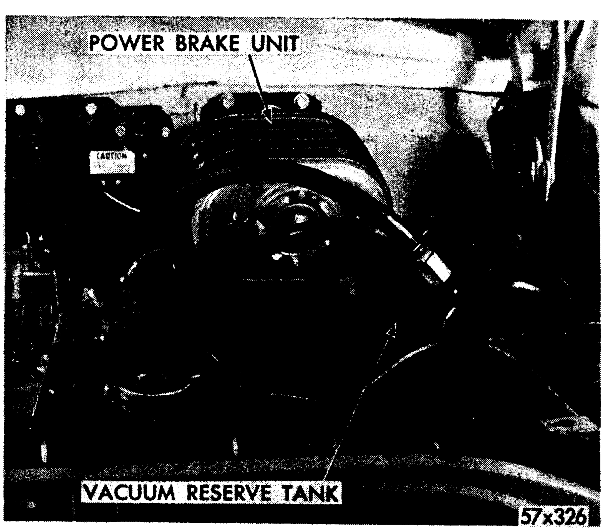


Fig. 27—Power Brake (Installed)

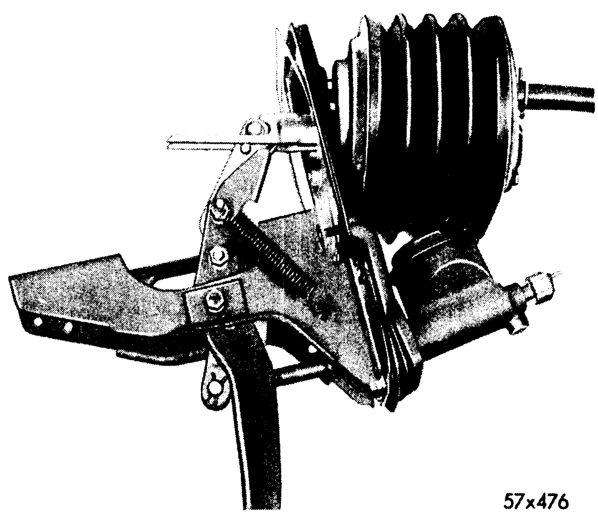


Fig. 28—Bellows Type Power Brake Unit and Linkage Installation

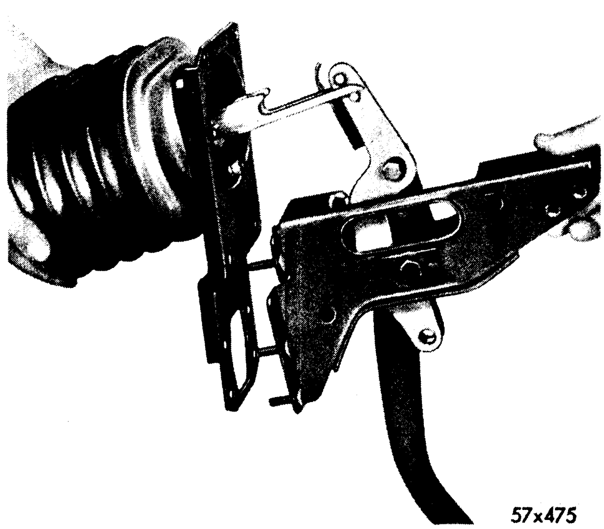


Fig. 29—Removing or Installing Power Brake Unit (Bellows Type Shown)

Remove and discard mounting plate "O" ring.

Using an Allen wrench, back out two set screws sufficiently to allow removal of yoke (Fig. 30). Slide yoke off end of guide and away from unit. (Slightly compress bellows by hand for clearance when loosening set screw). Remove rubber stop seal washer. Lift valve operating rod out of unit, remove, and discard valve operating rod button seal (Fig. 31).

Remove nuts that attach outer mounting plate. Using screwdriver, pry up gently on plate to loosen. Lift plate straight up and away from unit. Discard "O" ring. Compress bellows by hand sufficiently to expose guide bearing. Slide bearing off end of guide (Fig. 32). Remove and discard bearing seal from inside bearing. Peel back outer lip of bellows completely around inner mounting plate. (Keep one hand on inner mounting plate to prevent it from snapping up). Remove plate and lift out return spring and return spring retainer. Place unit on its side and remove bolts and lockwashers that attach valve cover to valve. Lift off cover (Fig. 33). (If it is necessary, use a flat blade to separate cover plate from bellows flange.) Extreme care should be taken to avoid marking or scratching inner face of plate where it clamps to bellows flange. A scratch on this surface could cause a leak.

Remove "O" ring from valve cover and discard. Remove air valve spring from center of valve. Remove air filter and slide air valve out of housing (Fig. 34). To remove valve, it may be necessary to use a hook formed from paper

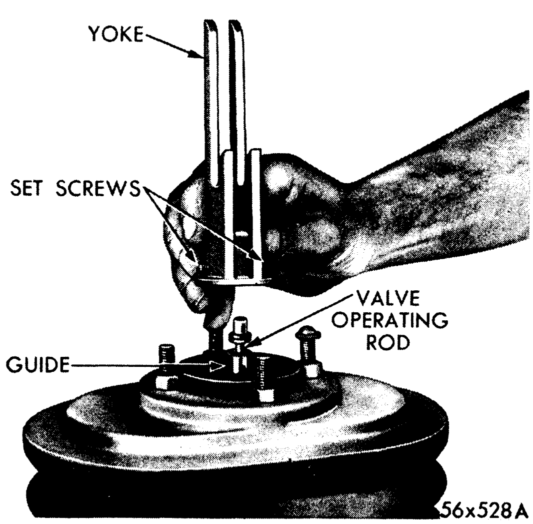


Fig. 30—Removing or Installing Yoke

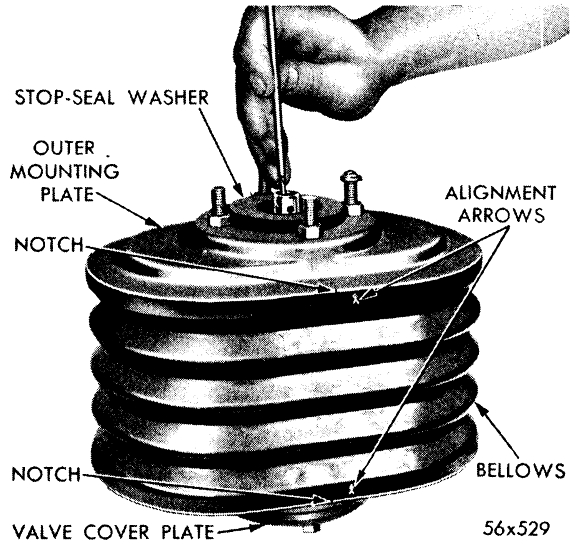


Fig. 31—Removing or Installing Operating Rod

clip. Place valve housing end down on bench. Remove bellows from valve by peeling back outer lip of bellows (Fig. 35). Lift bellows up

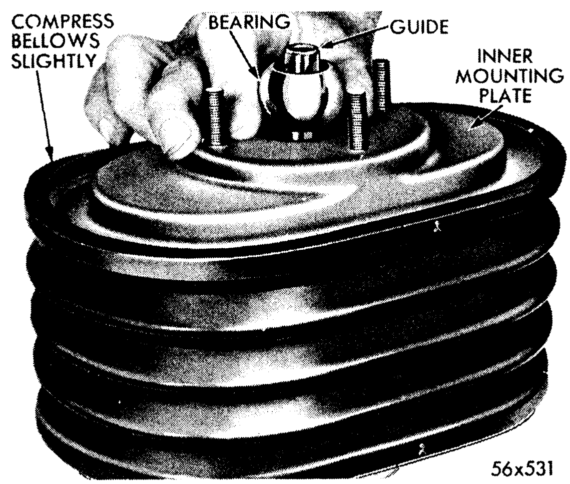


Fig. 32—Removing Guide Bearing

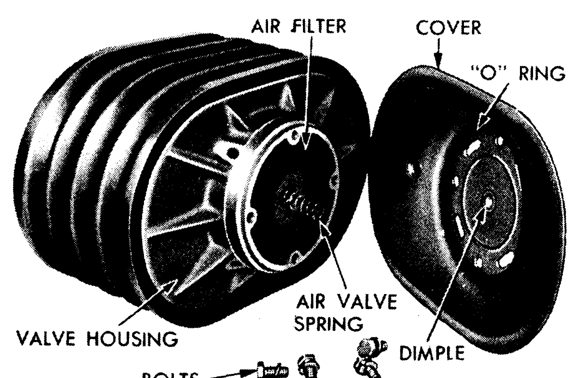


Fig. 33—Removing Valve Housing Cover

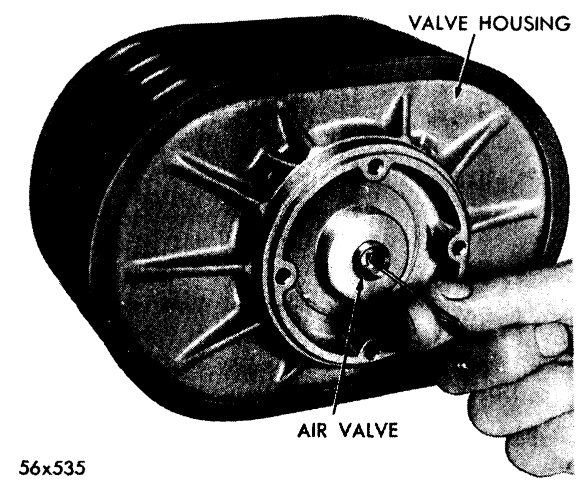


Fig. 34—Removing Air Valve

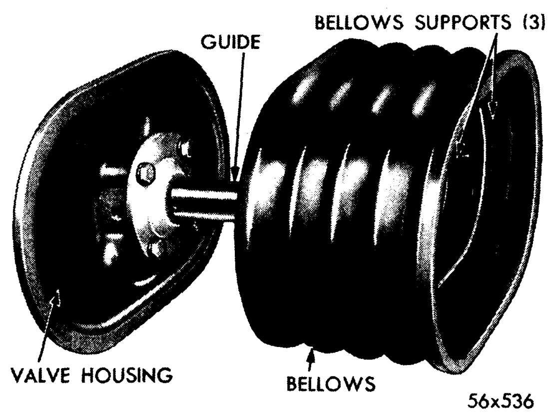


Fig. 35—Removing Bellows

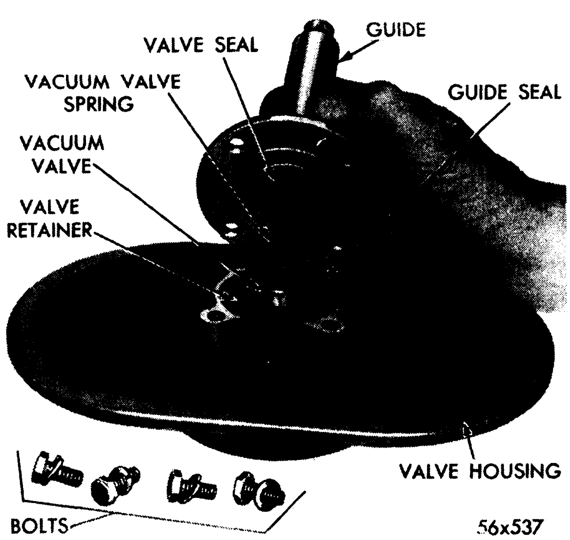


Fig. 36—Removing or Installing Guide

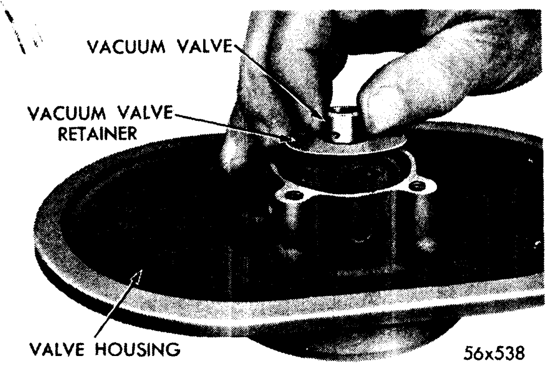


Fig. 37—Removing the Vacuum and Retainer

and away from valve. If new bellows is to be installed, remove 3 bellows support.

Remove bolts and lockwashers that attach guide to valve body. Lift off guide to expose vacuum valve, valve spring and seals (Fig. 36). Remove seals and discard them. Lift out vacuum valve and retainer (Fig. 37). Remove and discard valve housing to guide seal. Invert valve housing and remove air valve seal from its groove in valve body (Fig. 38).

CAUTION

Work carefully to avoid marking or scratching inside diameter bore of valve housing.

The bellows type power brake now has been disassembled as much as necessary for cleaning and inspection. Clean all parts (except bellows, bearing and air filter) in solvent and blow dry with compressed air. Place cleaned parts on clean paper for reassembly. If necessary, bellows may be washed with water and mild soap. Inspect all parts for wear or damage and check air valve for signs of scoring or wear. If valve body or valve is scored or worn, install new

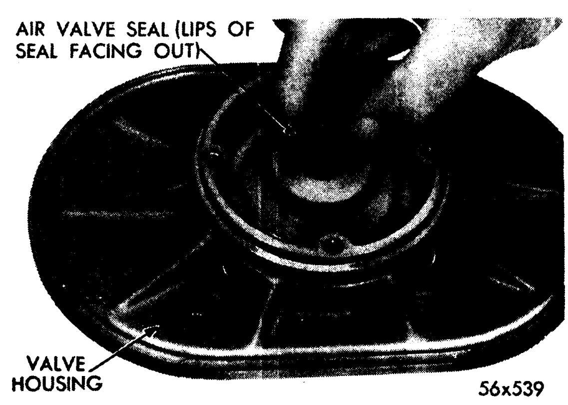


Fig. 38—Removing or Installing the Air Valve Seal

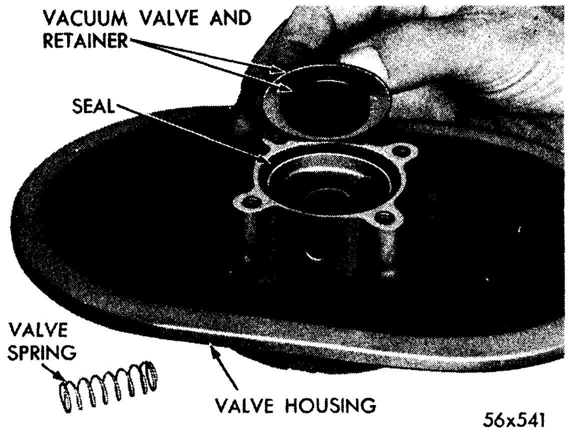


Fig. 39—Installing the Vacuum Valve and Retainers

parts as required. **Always use new "O" and seal rings.**

18. ASSEMBLING THE POWER BRAKE

Be sure all seals and "O" rings are suitably coated with silicone grease (rings and seals precoated in Parts Kits). Assemble as follows: Insert new air valve seal into bore of valve housing (lips of seal facing out when installed). (Refer to Fig. 38). Carefully position new vacuum valve in retainer. Invert valve housing and install vacuum valve and retainer in housing. Press down firmly on retainer to snap it in place. (Fig. 39)

Position new valve housing to guide seal in groove provided. Install new vacuum valve seal in bore guide, with lip of seal toward bottom of bore (Fig. 40). Install vacuum valve spring in center of valve. Position guide over vacuum

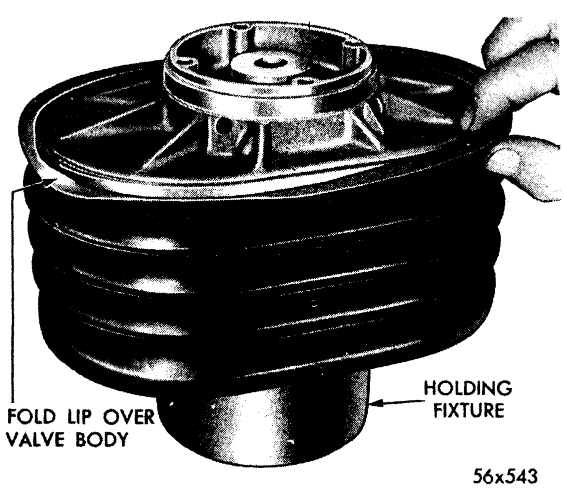


Fig. 40—Installing the Bellows

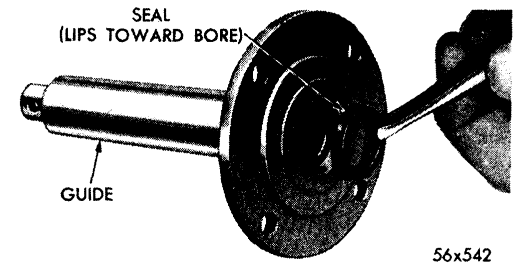


Fig. 41—Installing the Vacuum Seal

valve, lining up bolt in guide with bolt holes in valve body. Carefully lower guide down against valve body, making certain tapered portion of vacuum valve enters seal evenly. Press down on guide to seat and install bolts and lockwashers. Tighten bolts evenly and securely.

CAUTION

Be sure countersunk holes at end of guide, line up with long centerline of valve housing.

If new bellows are being installed, position supports in bellows. (The supports must be centered in three center accordion folds, and aligned with bellows and each other.) Using holding fixtures (made from piece of 4-inch pipe) to support guide and valve assembly, install bellows (Fig. 41). **Be sure arrows on edge of bellows and housing are aligned.** With assembly in holding fixture, lightly coat outer surface of air valve with silicone grease (do not use any other kind of grease), and insert (small end first) into bore of housing (Fig.

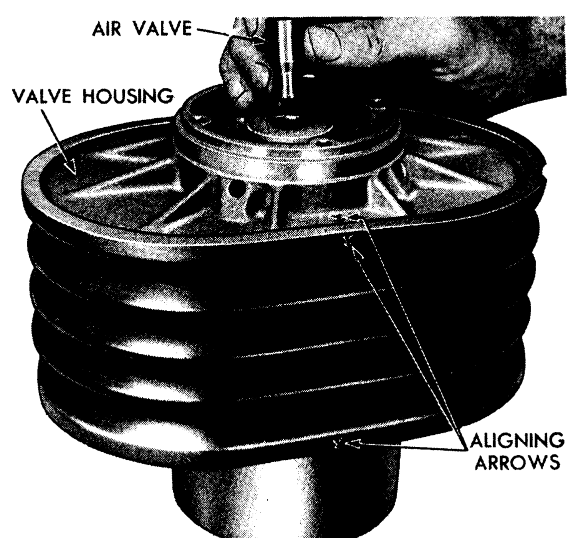


Fig. 42—Installing the Air Valve

42). Use finger pressure to test for free movement of valve against vacuum valve spring.

Install air valve spring in recess in air valve and air filter. Install new valve housing cover "O" ring on shoulder provided on valve body hub. Position valve body cover over valve housing, with notch in edge of cover matching arrow on bellows (Fig. 43). Be sure air valve spring nestles on dimple in center of cover. Press cover down evenly over valve housing to seat cover "O" ring, install bolts, and tighten securely.

Remove assembly from holding fixture and invert unit. Coat guide lightly with silicone grease and install return spring. Position spring evenly around hub of valve housing and guide (Fig. 44). Place spring retainer and inner mounting plate over spring, being sure arrow stamped on plate is in line with arrow on edge of bellows. Compress return spring and fold bellows lip over edge of plate. Be sure bellows fit evenly all around plate. Install new guide bearing seal in groove inside bearing bore. The seal must nest snugly in bearing. Using silicone grease, lubricate inside of bearing and slide it over guide, while compressing bellows (Fig. 45). **Bearing must be installed with lip of seal facing out.** Push bearing down over guide and into pocket of plate. Release bellows and bearing will ride up guide with plate into position.

Install bearing to mounting plate "O" ring and lower outer mounting plate down on assembly. **The notch on edge of plate must be in line with arrow on bellows.** Install nuts and draw down finger tight. Slide new valve operating rod seal ring over nylon bumper on end of rod and into groove. Install rod in center of guide. Press on end of rod to test for free operation or movement of air and vacuum valves. A "two step" movement should be felt when rod is depressed and released fully. Place new stop-seal washer in position and install yoke on end of guide. Compress bellows slightly and alternately tighten set screws. **The hub of yoke must be down snug against shoulder of guide, with set screws aligned with tapered holes in guide.** Tighten mounting plate nuts securely.

Place mounting bracket in position, with long

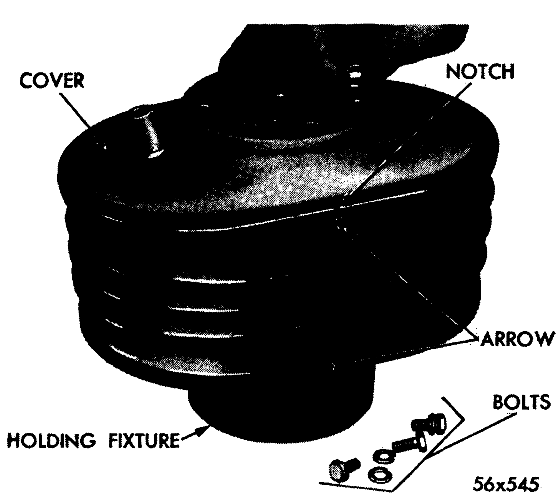


Fig. 43—Installing Valve Housing Cover

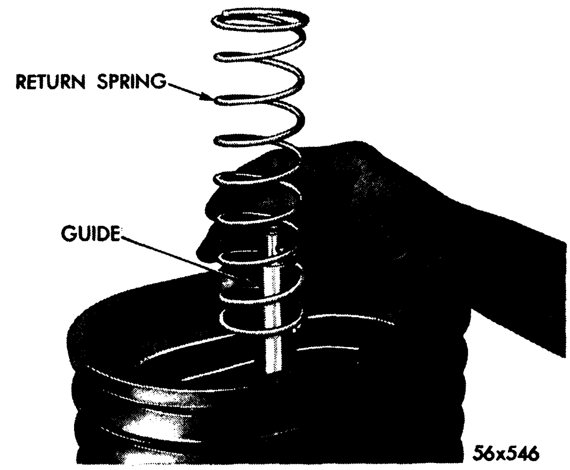


Fig. 44—Installing Return Spring

Fig. 45—Installing Guide Bearing

centerline of bracket at right angle to long centerline of unit section. Install nuts and lockwashers and tighten securely.

19. INSTALLATION OF POWER BRAKE UNIT

Position power brake unit on dash panel of vehicle so that its axis inclines down toward front of car.

NOTE: As yoke passes through dash panel, be sure that it engages pedal linkage correctly by sliding over nylon bushings on power brake lever cross pin. Install and connect master cylinder.

Replace four hex nuts and lockwashers, tighten nuts securely, and release pedal.

PEDAL LINKAGE ADJUSTMENTS

20. PEDAL LINKAGE ADJUSTMENTS (ON CAR) (FIG. 46)

It should seldom be necessary to adjust brake pedal trigger arm. Adjustment, however, may be necessary, occasionally, to eliminate the following conditions: If pedal pressure releases slowly, adjust by rotating adjustment screw in **counter-clockwise direction.** A time delay (noted during a fast brake application), can be corrected by making a **clockwise** adjustment on adjusting screw. Should pedal vibrate (booster chatter), turn adjusting screw in counter-clockwise direction (Fig. 46). More likely cause of chatter is empty master cylinder, or improperly bled brake system. Refill or bleed.

NOTE: Rotation of adjustment screw should be limited to plus or minus 90 degrees about original setting.

21. ASSEMBLY OF PEDAL LINKAGE IN PEDAL BRACKET

CAUTION

Use extreme care during assembly or handling of linkage as power brake pedal trigger arm is easily damaged.

22. LUBRICATION

Except for an occasional few drops of SAE 10-W Engine Oil on power brake lever pin bushings, brake pedal linkage requires no further lubrication. The power unit will require no lubrication under normal usage.

23. PEDAL FREE PLAY ADJUSTMENT

After master cylinder, booster, and pedal linkages are completely installed, a free play adjustment check should be made at **no vacuum** as follows:

NOTE: Removing vacuum hose and pressing brake pedal several times will aid in obtaining a no vacuum condition.

Insert blade of screw driver between rubber collar of power brake trigger pivot and rear side of elongated hole in power brake lever, forcing them apart.

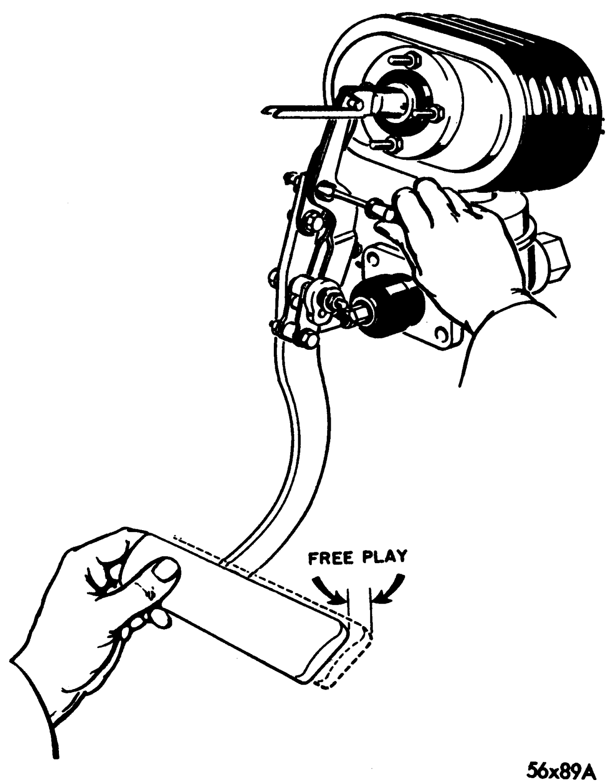


Fig. 46—Checking Pedal Free Play (Bellows Type)

NOTE: If brake pedal and power brake lever are not wedged apart, a false free play setting (which includes booster valve travel) will be measured at pad end of pedal.

Check free play with linkage in this position by pushing lightly at pad end of brake pedal (Fig. 46). Pedal free play travel should be between 1/32 and 1/8 inch. If pedal free play movement does not come within required limits, adjustment is made by lengthening or shortening push rod as required.

24. ALTERNATE METHOD OF MEASURING PEDAL FREE PLAY

Remove master cylinder push rod end pin. Using **light** finger pressure, move push rod forward until contact is made with master cylinder piston. Attempt to insert push rod end pin through power lever and push rod end hole. If push rod must be pulled back to allow passage of push rod end pin, free play is present. If push rod must be pushed further into master cylinder to allow passage of push rod end pin, no free play is present and an adjustment must be made at push rod.

25. SERVICING THE MASTER CYLINDER

The master cylinder can be bled and push rod end assembled at proper length, as described in this section. The length from push rod end hole to master cylinder mounting face has changed however, because of difference in brake pedal linkage. The distance from push rod end hole to master cylinder face is 4.7 inches. The service procedures covering master cylinder are the same as on standard master cylinder.

26. TESTING BRAKE SYSTEM

With unit completely assembled and installed on vehicle, make following vacuum and hydraulic leakage test. Operational test should also be made to determine that brake power unit and hydraulic brake system is operating up to standard.

Road test car and make brake applications at about 20 m.p.h. If brake pedal has a spongy feel when brakes are applied, air is present in hydraulic systems and lines must be bled. Bleed brake system at each wheel cylinder.

With engine not running, apply brakes several times to exhaust all vacuum in system. Depress brake pedal, hold foot pressure on pedal and start engine. As soon as engine begins to operate, brake pedal will tend to fall away under foot pressure, and less pressure will be required to hold pedal in applied position.

If there is **NO** noticeable difference in pedal effect with or without engine running, vacuum system is not functioning. Check for restriction in vacuum supply line, restriction on air cleaner, faulty pedal adjustments, or faulty power unit operation. Stop engine and again exhaust all vacuum in system. Depress brake pedal and hold foot pressure on pedal. If pedal gradually falls away under foot pressure, hydraulic system is leaking. If brake pedal travels to within one inch of toe board, brake shoes require readjustment or relining.

SERVICE DIAGNOSIS

27. PEDAL GOES TO FLOOR

a. Check fluid in master cylinder, refill with MOPAR Super brake fluid.

b. Check wear on brake lining, adjust or replace as necessary.

c. Check master cylinder for corrosion, repair or replace as necessary.

d. Check wheel cylinders, replace swollen or otherwise damaged cups.

e. Check loose connections or broken lines, repair or replace as necessary.

f. Air in brake system, bleed brakes using air-less bleeder tank unit, Tool C-837.

28. SPONGY PEDAL

a. Check brake fluid contamination, replace with MOPAR Super brake fluid.

b. Check brake drums, replace excessively refaced or broken drums.

29. BRAKES PULLING TO ONE SIDE

a. Check tires, inflate to proper pressure.

b. Check brakes, adjust for proper clearance.

c. Check drums for out-of-round, machine drums and replace with brake shoes to fit drum.

d. Check brake shoes for twist, straighten, reline, or grind to fit drum. (See paragraph on shoe bind.)

e. Oil, grease or brake fluid on shoes, clean with alcohol. Badly saturated linings may require replacement.

f. Check brake lining, replace with matched lining.

30. SQUEALING BRAKES

a. Check lining, replace with proper lining.

b. Check brake drum, clean or reface as necessary.

c. Check brake shoes, straighten or replace as necessary.

d. Check brake support plate, straighten or replace.

e. Check brake shoe return spring, replace as necessary.

31. DRAGGING BRAKE

a. Excessive brake adjustment, adjust to proper clearance.

b. Check hand brake, that it is fully released.

c. Check wheel cylinders, repair or replace as necessary.

d. Check brake shoe return spring, replace worn or broken springs.

e. Brake pedal binding, loosen pedal across shaft.

f. Check master cylinder, repair or replace. Check for swollen cup.

g. Check for lack of pedal free play—adjust.

h. Check brake shoe squareness (See Paragraph on shoe bind).

i. Check compensating port in master cylinder, repair or replace as necessary.

32. HARD PEDAL

a. Check brake shoe lining, replace with proper lining.

b. Check brake shoe push rods, make proper adjustments.

33. WHEEL LOCKS

a. Check brake lining, replace torn or loose lining.

b. Check wheel bearings, adjust to proper clearance.

c. Check wheel cylinders, repair or replace as necessary.

d. Check grease seal leaks, replace if necessary.

34. BRAKE PEDAL FAILS TO RETURN

a. Check pedal return spring, adjust or replace as necessary.

b. Check master cylinder, tighten loose mounting bolts.

c. Check brake pedal mounting bracket, adjust bracket and tighten bolts.

Section IV
ACCESSORY BELT DRIVES
CONTENTS

DATA AND SPECIFICATIONS
TORQUE METHOD

Torque (ft.-lbs.) to be applied to Components.

ACCESSORY	USED BELT		NEW BELT	
	LC-1	LC-2, 3, LY-1	LC-1	LC-2, 3, LY-1
Power Steering Bracket**	80*	75	120*	125
Idler Bracket	25	–	40	–
Generator—Without Air Conditioning	35	35	50	50
With Air Conditioning	40	40	70	70

BELT DEFLECTION METHOD

Deflection (inches) to be applied at midpoint of belt segment under a five-pound load. (See Fig. 3)

ACCESSORY	USED BELT		NEW BELT	
	LC-1	LC-2, 3, LY-1	LC-1	LC-2, 3, LY-1
Power Steering**	5/32*	3/16	3/32*	3/32
Fan Belt—Idler	1/8	–	1/16	–
Generator—Without Air Conditioning	15/32	3/8	5/16	5/16
With Air Conditioning	3/8	3/16	5/16	3/32

*LC-1 with Air Conditioning only.
**On early production power steering pumps with bolt-on pulleys use the following torques and deflections.

TORQUE		DEFLECTION	
Used Belt	New Belt	Used Belt	New Belt
45	70	3/16	3/32

Section IV
ACCESSORY BELT DRIVES
SERVICE PROCEDURES

The satisfactory performance of the belt driven accessories depends on the maintenance of the proper belt tension. If the specified tensions are not maintained, belt slippage may cause engine over-heating, lack of power steering assist, loss in air conditioning capacity, reduced generator charging rates, and greatly reduced belt life. To avoid any such adverse effects, the following service procedure should be followed:

Retighten all belts to the specified used belt* tension at new car preparation. Retighten all belts at the 2,000 mile check up. Check all belts by the deflection method at servicing and retighten if needed.

The new belt tension specifications should be used on all belt replacements, and the above procedure followed thereafter.

The two methods by which belt tensions can be properly established is as follows:

1. TORQUE METHOD

All generator and power steering pump belts can be tightened to the specified tension (see specifications in this section) by use of a torque wrench. The generator belts are tensioned by using Tool C-3379 and torque wrench as shown in Figure 1. The power steering belts are tightened by inserting the torque wrench in the square hole provided in the bracket as shown in Figure 2. Other belts can also be tightened by this method if the adjusting bracket has a square hole. To tighten belts by the torque method, loosen all mounting bolts and apply the specified torque to the accessory or idler. Tighten all mounting bolts while the torque is apllied to the accessory. If it is not possible to use the torque wrench because of clearance, use an extension.

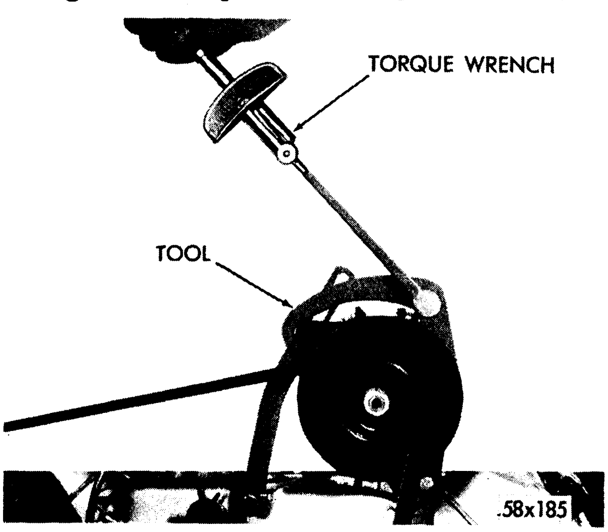


Fig. 1—Tightening Generator Belts using Tool C-3379

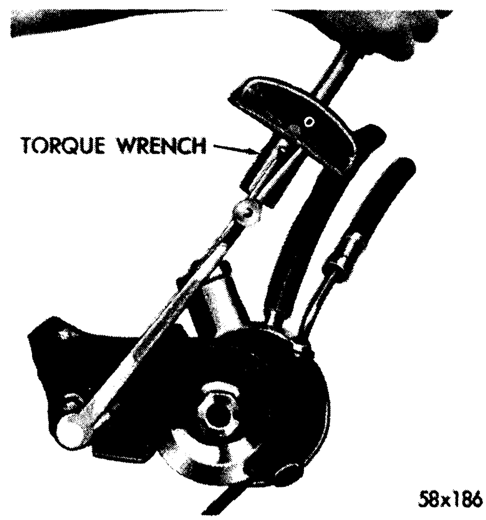


Fig. 2—Tightening Power Steering Belts using Square Hole

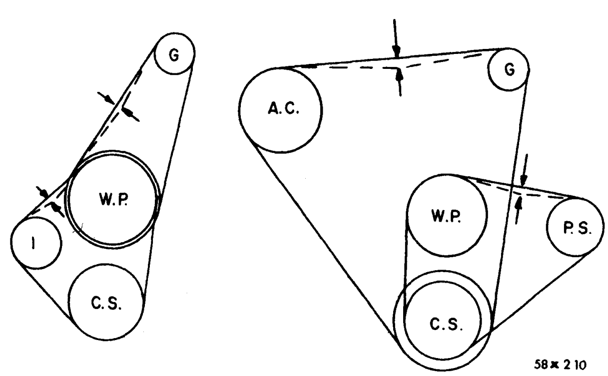


Fig. 3—Belt Deflection Locations

I. Idler
C. S. Crankshaft
W. P. Water Pump
G. Generator
A. C. Air Conditioning
P. S. Power Steering

2. BELT DEFLECTION METHOD

All belts can also be tightened by measuring the deflection of the belt at the mid-point between two pulleys under a five-pound push or pull. A small spring scale Tool C-690 can be used to establish the five-pound load. See Figure 3 for correct location at which to measure deflection.

*Any belt that has operated for a minimum of a half-hour is considered to be used.

This method should be used only when it is not possible to use the torque method, as it is a less accurate substitute. To tension the belts by the deflection method, loosen all mounting bolts and use a bar to apply tension to the belts being careful not to damage the accessory. A pry bar can be used if the accessory has a square hole. Tighten the mounting bolts and check the deflection. (See tension specifications). It may be necessary to repeat this procedure several times to establish the correct tension.

SERVICE DIAGNOSIS

3. INSUFFICIENT ACCESSORY OUTPUT DUE TO BELT SLIPPAGE

a. Check belt tension and belt condition.

b. If belt is excessively glazed or worn, replace and tighten as specified.

4. BELT SQUEAL WHEN ACCELERATING ENGINE

a. Belts too loose—retighten

b. Belts glazed—replace belts

5. BELT SQUEAK AT IDLE

a. Misaligned pulleys—align accessories (file brackets or use spacers as required)

b. Non-uniform groove or eccentric pulley—replace pulley.

c. Non-uniform belt—replace belt

d. Dirt and paint imbedded in belt—replace belt

e. Belt too loose—retighten

6. BELT ROLLED OVER IN GROVE

a. Broken cord in belt—replace belt

7. BELT JUMPS OFF

a. Belt too loose—retighten

b. Misaligned pulleys—align accessories

Section V

COOLING SYSTEM

CONTENTS

DATA AND SPECIFICATIONS

MODELS	LC-1, 2	LC-3, LY-1
COOLING		
Type	Pressure Vent	
Capacity:		
With Heater	22 qts.	25 qts.
Without Heater	21 qts.	24 qts.
Radiator Cap Relief:		
Valve Pressure—psi	14	
With Air Conditioning	14	
WATER PUMP		
Type	Centrifugal	
Bearing Type	Ball Bearing	
THERMOSTAT		
Type		Choke
Starts to Open (up to)	158° to 162° F.	(Air Cond. 177° to 182° F.)
Fully Open	185° F.	(Air Cond. 202° F.)
FAN BELT		
Number Used (Standard Steering)	one	
(Power Steering)	two	
Type	V	
Tension	See Accessory Belt Drive Section IV	

DATA AND SPECIFICATIONS (Cont'd)

MODELS	LC-1, LC-2 LC-3, LY-1
FAN	
Number of Blades	*Six
Diameter	18 in.
RADIATOR-TO-BLADE	
Clearance	Top—3/4 inch Bottom—3/4 inch
RADIATOR	
Type	Cellular Tubular or Fin and Tube
Thickness (Standard)	2 inch Cellular Tubular or 2 inch Fin and Tube
With Air Conditioning	2 1/4 inch Cellular Tubular 2 1/2 inch Fin and Tube

*LC-1 with Air Conditioning have ring shroud, six blade Silent Flite fan with 2 1/2 inch Fin and Tube.
*LC-2, LC-3, LY-1 with Air Conditioning have a box type fan shroud, five blade Silent Flite fan.
*On LC-1 5 blade Silent Flite fan is not available.

SPECIAL TOOLS

Tool Number	
C-311	Flushing Gun
C-3208	Remover—Water Pump Shaft Bushing
C-3476	Puller—Plastic Water Pump Impeller Insert
C-3468	Sleeve—Water Pump Bearing and Shaft Installing
C-551	Refacer—Water Pump Housing Seat

TIGHTENING REFERENCES

	(Foot-Pounds)
Water Pump Body to Housing	30
Water Pump Body Bolt	30
Water Pump Inlet Elbow Bolt	30

Section V
COOLING SYSTEM

The cooling system incorporates a cellular tubular or fin and tube type, full flow radiator and a centrifugal water pump. On cars equipped with Air Conditioning—Heater Unit, the engine cooling system has an 180° F. thermostat, 14 pound radiator pressure cap and sufficient permanent type anti-freeze to insure the engine coolant 20° F. in the summer time, and greater strength of anti-freeze in the winter according to the atmospheric temperatures. **The 180° F. thermostat and the 14 pound radiator pressure cap is for year around operation and sufficient permanent type anti-freeze to insure the engine coolant to 20° F. is required for the summer time.**

1. SILENT FLITE FLUID FAN DRIVE (FIGS. 1 AND 2) (All Models with Air Conditioning)

The fluid fan drive consists of a rotor driven by the shaft which is secured to the water pump flange. The rotor is enclosed by the housing to which the fan is bolted. This housing is mounted on the shaft through two single row, sealed-for-life, ball bearings.

A nominal clearance space is maintained between the housing and rotor. The rotor is free to float along the axis of the shaft and anti-friction material has been applied to its faces in case of contact of these faces and the housing. The housing is partially filled with a special, heavy fluid and the drag of the fluid between the housing and rotor provides the driving force rotating the fan.

The power required to rotate the fan increases very rapidly with speed. The fluid fan drive has been designed to provide the necessary driving force to maintain cooling at low speeds and to limit the top speed of the fan at higher engine speeds, thus making more power available to the wheels and eliminating the fan noise encountered at higher engine speeds.

a. Engine Overheating

If the fan drive operates below its minimum design speed, excessive engine heating may occur. Check as follows: (1) The water pump to engine speed ratio is 1.1 to 1. The drive characteristics are such that a 1 to 1 ratio between the crank pulley and the fan should be obtained at an engine speed of 1400 R.P.M. or above. This can be checked with a timing light. The speed of the fan and crank shaft pulley is the same when both components are stopped by the timing light. If both components are stopped by the timing light at 1400 Engine R.P.M. or

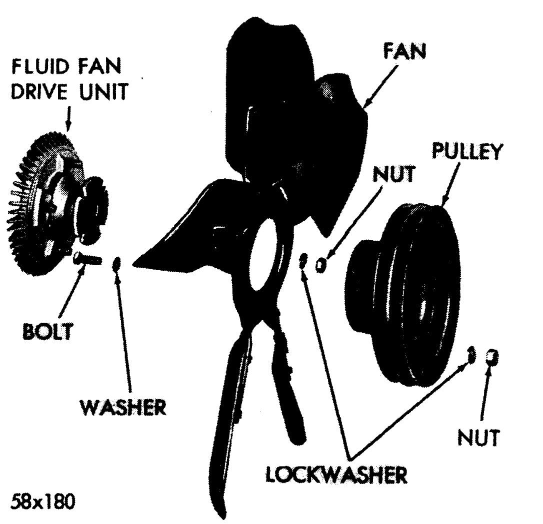


Fig. 1—Silent Flite Fluid 5 Blade Fan Drive (Used On Air Conditioning Only) Exploded View

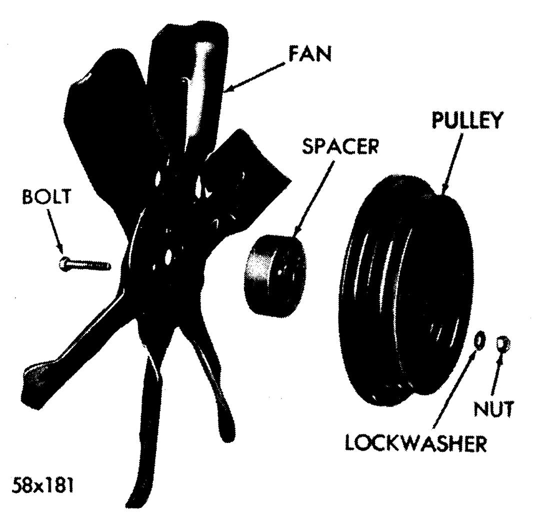


Fig. 2—Standard Fan Drive (Exploded View) (Used without Air Conditioning)

at a higher engine speed, the drive is satisfactory. If, however, the engine speed at which this occurs is less than 1400 R.P.M. the drive is operating below minimum speed and must be replaced with a new unit. **Do Not Remove Filler Plug or Add Fluid to Drive Unit.**

b. Excessive Fan Noise

Should the drive lock-up, excessive fan noise will result. This may occur if a bearing fails or if drive is binding internally. On a properly functioning unit the fan can be rotated relative to the water pump pulley with only light finger pressure. When rotating the fan by hand there will be a marked decrease in the effort to rotate it after the fan has been turned through several complete revolutions. If there is excessive fan noise, and if the drive cannot be rotated relative to the pump pulley, it is defective and must be replaced.

2. WATER PUMP

a. Removal from Car (See Fig. 3)

Drain cooling system and remove upper half of fan shroud (Air Conditioning Models only). Loosen the power steering pump or idler pulley, generator, and remove all belts. Remove fan, spacer and pulley. On Air Conditioning Models, remove the pulley from water pump fan hub, loosen all nuts from fan to remove the fluid fan drive, as shown in Figure 1. Remove bolts holding water pump body to housing and remove water pump.

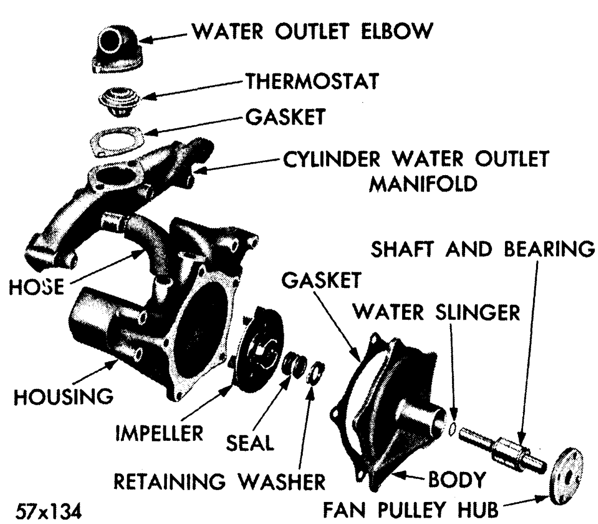


Fig. 3—Water Pump Assembly (Exploded View)

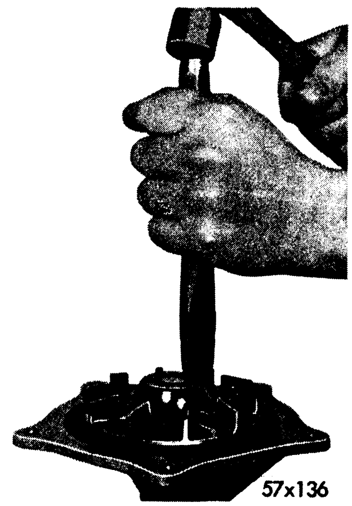


Fig. 4—Removing Plastic Impeller

b. Disassembly (Fig. 3)

Support pump body on hub end and remove impeller by breaking the plastic away from metal insert, as shown in Figure 4. Remove impeller metal insert using Tool C-3476.

NOTE: Shaft and bearing assembly do not have to be removed to service a leaking pump.

Support body on fan hub end and press out shaft and bearing assembly.

CAUTION

Shaft and bearing assembly can be removed only in the direction described. If an attempt is made to remove shaft in opposite direction, damage to water pump body will result.

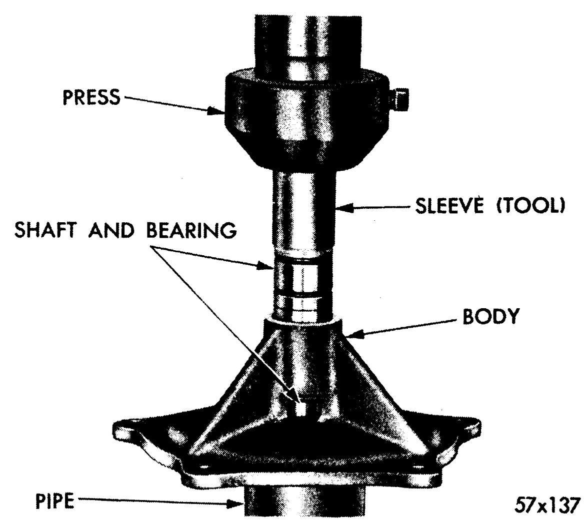


Fig. 5—Installing Shaft and Bearing Assembly (Tool C-3468)

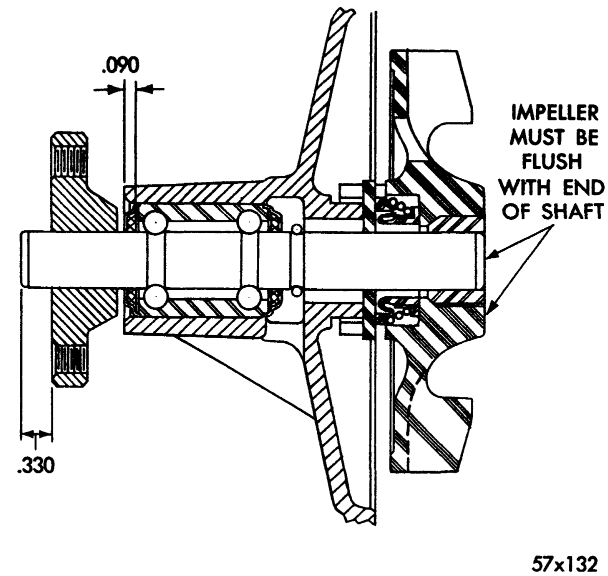


Fig. 6—Schematic Drawing (Water Pump)

NOTE: Bearing and hub assemblies removed from water pumps for any reason should not be used again because damage to bearings and hub usually results during removal.

Clean parts thoroughly. Inspect condition of seal seat and recondition using refacing Tool C-551.

c. Assembly (Fig. 1)

Support pump body as close to center bore as possible in an arbor press. **DO NOT SUPPORT BODY ON ATTACHING FACE, OR ON SEAL SEAT.** Press shaft and bearing assembly into body, using Tool C-3468, as shown in Figure 5.

NOTE: The .090 inch dimension must be maintained when installing new shaft and bearing assembly, as shown in Figure 6.

CAUTION

When pressing on impeller, support the pump body so that pressure is applied to the shaft and not to the pump body. If pressure is applied to pump body, damage to bearings will result. Press impeller on evenly to prevent breakage.

Install fan hub while supporting pump body on impeller and on shaft, as this will apply pressure to the end of shaft, and not to the body. Maintain .330 inch dimension, as shown in Figure 6.

d. Installation on Car (Fig. 7)

Install water pump body on housing, using new gasket. Tighten bolts to 30 foot-pounds torque. Install pulley, spacer and fan. (On Air Conditioning Models, assemble the fan to the fluid fan drive and pulley, and attach the assembly to the water pump. Tighten nuts to 15 foot-pounds torque. Install the upper half of fan shroud, run the engine, and check for leaks.

3. RADIATOR

The Torque Converter oil cooler is now located in the bottom of the pan in the radiator tank, which is an integral part of the radiator. The bottom of the radiator tank therefore, acts in the capacity of a heat exchanger in that the oil flowing from the torque converter is directed thru a tube into the bottom of the radiator pan, coming out on the opposite side of the radiator to be returned to the torque converter. See Transmission Section XI, for operation.

a. Removal

Remove the two oil cooler connections at the bottom of the radiator and drain the oil from the tank. Drain the cooling system, remove hoses, fan shroud (On Air Conditioning Models only), and radiator support bolts. Remove the radiator.

b. Installation

Attach radiator to radiator support bolts and reconnect the two oil cooler connections. Install fan shroud (if so equipped) connect hoses and refill cooling system. Check for leaks. Add

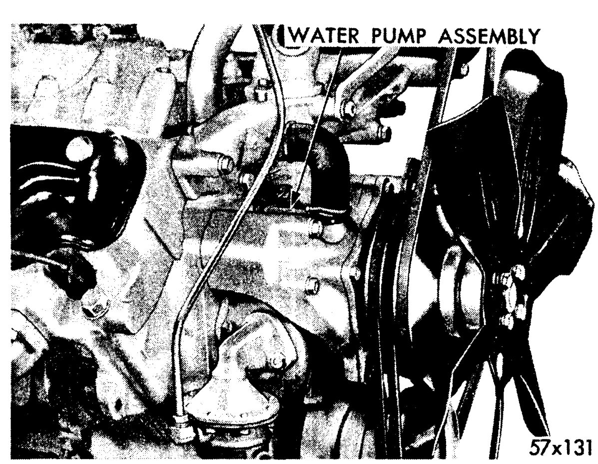


Fig. 7—Water Pump Installed (Spitfire Engine)

sufficient oil to the transmission to refill the system.

c. Cleaning Radiator

Drain cooling system and refill with clean SOFT water and add the contents of one can (No. 1 top-compartment) of MOPAR Cooling System Cleaner. Run engine at a fast idle for ½ to ¾ hour.

Drain cooling system and refill with clean water. Pour conditioner (No. 2 bottom-compartment) into radiator and run engine for ten minutes. Flush entire cooling system until water runs clean. Refill radiator with clean SOFT water. Use MOPAR Radiator Rust Inhibitor during the summer months.

4. REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the cooling system, using air pressure, in a direction opposite to that of the normal flow of water.

a. Cylinder Block

Drain radiator and remove hoses at radiator. Remove thermostat and reinstall thermostat housing. Install flushing gun Tool C-311, or other suitable flushing gun to the inlet hose. Connect water hose of gun to a pressure water source and the air hose of gun to a pressure air source. Turn on water, and when cylinder block is filled, turn on the air in short blasts. Allow cylinder block to fill between the blasts of air. Continue this procedure until water runs clean. Check thermostat and if satisfactory, reinstall; otherwise, replace. Use a new thermostat housing gasket. Refill cooling system.

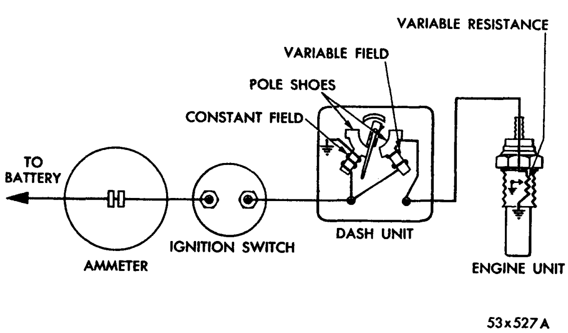


Fig. 8—Water Temperature Gauge

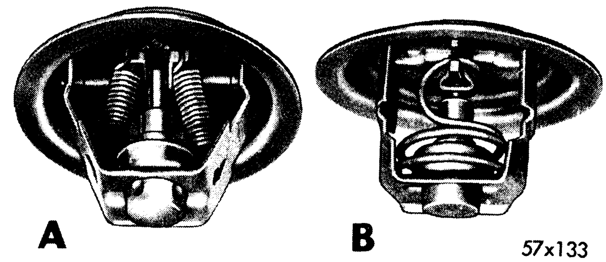


Fig. 9—Thermostat Assembly

b. Radiator

Drain cooling system and remove hoses from engine. Install flushing gun Tool C-311, or other suitable flushing gun in radiator outlet neck. Fill radiator and turn on air in short blasts.

NOTE: Do not apply more than 15 P.S.I. pressure when pressure flushing radiator, as damage to radiator may result.

Continue this procedure until water runs clean. Refill cooling system. Run engine and check for leaks.

5. WATER TEMPERATURE GAUGE (Fig. 8)

a. Dash Unit

Consists of two electro-magnets, one connected to the ignition switch and ground, and the other electro-magnet between the ignition switch and a variable resistance to ground sending unit in the engine water. The temperature of the water varies the current in the one electro-magnet which pulls against the pointer

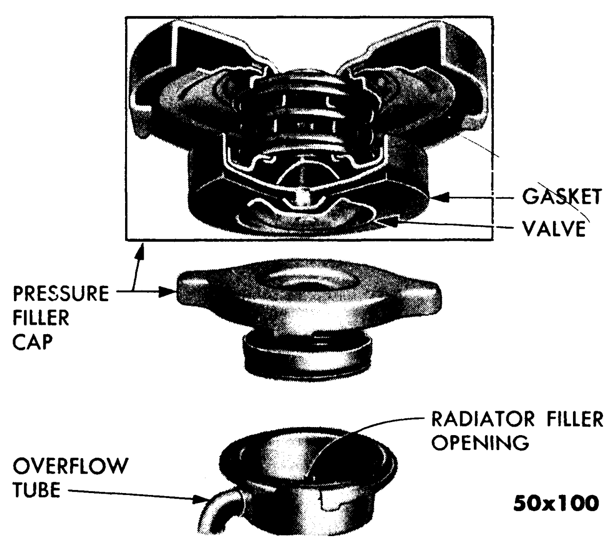


Fig. 10—Radiator Pressure Cap

(and other magnet) away from (C) cold position.

b. Sending Unit

The sending unit is located in the water outlet manifold and transmits the water temperature to dash unit.

c. Electrical Circuit (Testing)

Remove wire at sending unit and turn ignition switch on. Gauge hand should not move. If hand moves, the wire is grounded or gauge is defective. Remove wire at dash gauge terminal "GA," and if hand still moves, replace dash gauge; otherwise, replace wire. If gauge operates correctly and wire is not grounded, replace the engine unit.

6. THERMOSTAT (Testing) (Fig. 9)

The thermostat starts to open at 158-162 degrees F. (177-182 degrees F. for Air Conditioned) and is fully opened at 185° Std. (202° for Air Conditioned). Place thermostat in a pail of water with a thermometer and heat water until thermostat starts to open. Check thermometer and continue heating until thermostat is wide open, and again check thermometer. Replace thermostats that do not open completely, open at too low temperature or open at too high temperature.

7. RADIATOR PRESSURE CAP

Radiators are equipped with a 14 psi cap, as shown in Figure 10. Always check identification number on cap, when replacing.

WARNING

When removing pressure cap, turn it counterclockwise to the stop, permitting built up pressure to escape through overflow tube. This will prevent hot water from spraying out of radiator filler opening.

SERVICE DIAGNOSIS

8. POOR CIRCULATION

a. Check for low coolant level and refill to 1¼ inches below filler neck.

b. Inspect and replace hoses if collapsed.

c. Check for plugged radiator or cylinder block and reverse flush as necessary.

d. Check for loose water pump impeller and repair as necessary.

e. Check for loose or defective fan belt, tighten or replace as necessary.

9. OVERHEATING

a. Refer to Poor Circulation listed in Paragraph 8.

b. Check for plugged air passages of radiator core and clean passages by applying air pressure on reverse side of radiator core.

c. Check for sticking thermostat and replace as necessary.

d. Check for excessive sludge in the crankcase. Drain and flush crankcase as necessary. In severe cases, remove oil pan and clean inside of block by hand.

10. OVERCOOLING

a. Check temperature gauges and replace as necessary.

b. Check operation of thermostat (could be sticking) in the open position.

Section VI

ELECTRICAL SYSTEM

CONTENTS

SECTION VI
ELECTRICAL SYSTEM
DATA AND SPECIFICATIONS

BATTERY

	LC-1, LC-2	LC-3, LY-1
Voltage	12	12
Capacity	66 Plate 60 Amp hour	78 Plate 70 Amp hour
Terminal Ground	Negative	Negative

STARTER

	LC-1, LC-2, LC-3, LY-1
Model	MDT 6003
Voltage	12 Volts
Field Coils	4
Poles	4
Drive	Solenoid Shift Over-running Clutch
Brush Spring Tension (New Brushes)	32 to 48 ozs.
End Play	.005″ to .030″
Free Running Test	3800 Min. RPM—80 Amps at 11.0 Volts
Stall Torque Test	8.5 Min. Ft. Lbs.—350 Amps at 4 Volts
Solenoid Switch:	
Pull-in Coil Draw	28.6 to 32.9 Amps at 6 Volts
Hold-in Coil Draw	10.2 to 11.8 Amps at 6 Volts
Pinion Adjustment (Clearance Between Pinion and Stop) with armature end play removed	$\frac{3}{32}'' + \frac{1}{32}'' - \frac{1}{64}''$

ELECTRICAL LIGHT BULBS

	Number Required	Mazda Number	C.P. or Watts	Chrysler Part No.
Headlights Inner (High Beam Only)	2	4001	37½ W	1753435
Headlights Outer (High and Low Beam)	2	4002	50-37½ W	1753436
Headlight Beam Indicator Light	1	57	2	127934
Parking and Front Turn Signal	2	1034	32-4	151567
Rear Tail, Stop and Turn Signal Light	2	1034	32-4	151567
License Plate Light	2	67	3	142450
Glove Box Light	1	57	2	127934
Instrument Lights	4	57	2	127934
Map Light	1	1004	15	151578
Turn Signal Indicator Light	2	57	2	127934
Dome Light	1 or 2	1004	15	151578
Hand Brake Warning Light	1	90	6	142453
Back Up Light	2	1073	32	142456

ELECTRICAL LIGHT BULBS (Cont'd)

	Number Required	Mazda Number	C.P. or Watts	Chrysler Part No.
Transmission Push Button Light	1	57	2	127934
Radio Dial Light	2	1891		
Clock Light	1	57	2	127934
Trunk Light	1	1003	15	151577

CIRCUIT PROTECTORS

Circuit	Type	Rated Capacity	Location
Lighting System	Circuit Breaker	22½ AMP	Integral with Headlight Switch
Clock	Internally Protected		
Windshield Wiper	Circuit Breaker	6 AMP	Back of Wiper Switch
Radio	Fuse	7½ SPE	In Radio Lead Wire
Window Lifts	Circuit Breaker	20 AMP—30 AMP Spl. 4 Dr. Sedan	Behind Left Front Kick Panel
Six Way Seat	Circuit Breaker	40 AMP	Behind Left Front Kick Panel

GENERATOR

Car Model	LC-1, LC-2, LC-3	LY-1
Gen. Model		
Standard	(GJC-7012A; 1770754)	(GHM-6001E; 1753625)
With Air Conditioning	(GHM-6004C; 1704264)	(GHM-6004C; 1704264)
With Instant Heater	(GHM-6001E; 1753265)	(GHM-6001E; 1753265)
Rotation	Clockwise at Drive End	Clockwise at Drive End
Voltage	12	12
Output	Controlled by Vibrating Regulator	Controlled by Vibrating Regulator
Rated Current Output	30 Amperes	30 Amperes
Bearings		
Standard	Ball at drive end—Bushing at opposite end	Ball at drive end—Bushing at opposite end
With Air Conditioning	Ball—Both ends	Ball—Both ends
Ground Polarity	Negative	Negative
Poles	2	2
Brushes	2	2
Spring Tension	18 to 36 oz.	20 to 36 oz.
Field Coil Draw (Arm. to Field Term.)	1.2 to 1.3 amps at 10 volts	1.1 to 1.3 amps at 10 volts
Motorizing Draw	3.4 to 3.9 amps at 10 volts	2.3 to 2.6 amps at 10 volts
Test Bench Output Test (at 70° F)	20 amps, 14.3 volts at 1750 Max. RPM 30 amps, 15 volts at 2250 RPM	6 amps, 13.6 volts at 950 Max. RPM 30 amps, 15 volts at 1800 Max. RPM

REGULATOR

Car Model	LC-1, LC-2, LC-3, LY-1
Regulator Model	VRX-6201A—1642333
Rround Polarity	Negative
Gesistors	
Marked 100	
Marked 60	55.0 to 70.0 ohms
Marked 38	34.5 to 42 ohms
Marked 30	28.0 to 34.5 ohms

REGULATOR (Cont'd)

Car Model	LC-1, LC-2, LC-3, LY-1									
Voltage Regulator										
Voltage Winding Resistance	43.7 to 49.3 ohms									
*Armature Air Gap	.048 to .052 inch									
*Contacts are closed with high limit gauge installed and open with the low limit gauge installed. (Gauge on contact side and next to brass pin.)										
Voltage Setting (Operating Voltage after 15 minute run at 7 amperes)										
Temperature in degrees F	50°	60°	70°	80°	90°	100°	110°	120°		
	14.42 to 15.05	14.36 to 14.94	14.30 to 14.90	14.23 to 14.83	14.16 to 14.76	14.09 to 14.69	14.2 to 14.9	13.94 to 14.54		
	Where difficulty is encountered in keeping battery charged, it is suggested that the upper voltage limit for a given temperature be used to set regulator.									
Current Limiting Regulator										
*Armature Air Gap	.045 to .052 inch									
	*Contacts are closed with high limit gauge installed and open with the low limit gauge in place. (Gauge installed on contact side and next to brass pin).									
Current Setting	Current Regulator Setting after 15 minute run at 7 amperes. Then followed with a 15 minute run at rated regulator setting (.2 to .4 volt below the voltage regulator setting).									
Temperature in degrees F	40°	60°	70°	80°	100°	40°	60°	70°	80°	100°
Current at Specific Temperature	31–35	29–33	28–32	27–31	25–29	41–45	39–43	38–42	37–41	35–39
Cut-Out Relay:										
Voltage Winding Resistance	107 to 121 ohms									
Air Gap (Contacts Open)										
Measure Gap as near hinge as possible	.031 to .034 inch									
Contact Gap (Minimum)	.015 inch									
Contacts Close (Volts)	13.0 to 13.75 volts									
Contacts Open (After a charge of 10 amperes.)										
Discharge Amperes	0 to 6 amperes discharge									
Volts	8.2 to 9.3 volts									

DISTRIBUTOR

Car Model	LC-1, LC-2	LC-3, LY-1
Timing Mark Location	Vibration Damper	Vibration Damper
Distributor Model		
Standard	IBP 4002F; 1841514	IBS 4007A; 1841515
Contact Gap	.015 to .018 inch	.015 to .018 inch
Dwell	29° to 32°	(one set of points—29° to 32°) (both sets of points—36° to 39°)
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Breaker Arm Spring Tension	17 to 20 ounces	17 to 20 ounces
Drive	Camshaft	Camshaft
Side Play (shaft)	.005 inch max.	.005 inch max.
End Play (measured after assembly)	.003 to .010 inch	.003 to .010 inch
Firing Order	18436572	18436572
Timing	6° BTC	6° BTC
Timing Mark Location	Vibration Damper	Vibration Damper
Advance Curves	IBP 4002A; 1770750	IBK 4304; 1689325
Automatic (Distributor degrees and RPM)	0° at 250 to 450 0° to 2° at 450 2.75° to 4.75° at 750 6° to 8° at 1100 9° to 11° at 2200	0° at 220 to 490 0° to 2° at 490 2° to 4° at 750 3.5° to 4.5° at 850 8° to 11° at 2400

DISTRIBUTOR (Cont'd)

Car Model	LC-1, LC-2	LC-3, LY-1
Vacuum (Distributor degrees and inches of vacuum)	0°–8″–9″ 4.5°–6.5°–12″ 10°–12°–16″	0°–7.5″–8.5″ 4.5°–6.5°–11″ 10°–12°–16″

SPARK PLUGS AND COIL

Spark Plugs		
Type	AR-42	AGR-42
Size	14 mm.	14 mm.
Gap	.035 in.	.035 in.

Coil

Model....CAH–4001 Chrysler Part No. (1688212)

Output test should include resistor.

Secondary resistance (ohms at 70° to 80° F.)....8000 to 9200

Primary resistance (ohms at 70° to 80° F.)....1.65 to 1.79

Ballast resistance (ohms at 70° to 80° F.)....665 to .735

HORNS

All Models

Make....Auto-Lite, Spartan, Jubilee

Current draw at 12.4 volts....9 to 10 amps

ELECTRIC WINDSHIELD WIPER

All Models

Variable Speed Motor	
Rated Volts	12
Resistor (ohms) (Variable speed wiper)	17-40
Field Current Draw at 13.5 volts	1½ to 2 amps
Motor Current Draw (with dry glass)	
High Speed	1½ amps at 66 to 75 rpm
Low Speed	3 amps at 35 to 40 rpm

POWER SEAT LIFTS

All Models

Type Motor		Series wound	
Rated Voltage		12	
Current Draw with Passenger Load	Pounds	Amps	Volts
Vertical Lift	500	50-60	10.5
	200	40-45	10.6
Horizontal Lift	600	60	10.4
	150	35	11.0

WINDOW LIFTS

All Models

Type Motor	Series wound
Rated Voltage	12
Maximum Stall Current	25 amps at 8.9 volts

Section VI

ELECTRICAL SYSTEM

BATTERIES

1. TESTING THE 12-VOLT BATTERY (FIG. 1)

NOTE: The battery cable terminals should be tight on battery posts to insure good contact. Battery posts and terminals that are corroded should be disconnected, terminals and clamp cleaned with a soda solution and a stiff brush. After cleaning, apply a thin coating of petrolatum.

a. Specific Gravity Test

Test specific gravity of battery with an accurate hydrometer. Where electrolyte level is too low to make a test, add battery water but do not attempt to test gravity until battery has been returned to service operation for at least four hours of normal driving.

The specific gravity of electrolyte will vary 4 points (.004) with every 10 degree F. change in temperature. Subtract 4 points (.004) for each 10 degrees below, and add .004 for each 10 degrees above 80 degrees F. Readings must be corrected to 80 degrees F. before interpreting as follows:

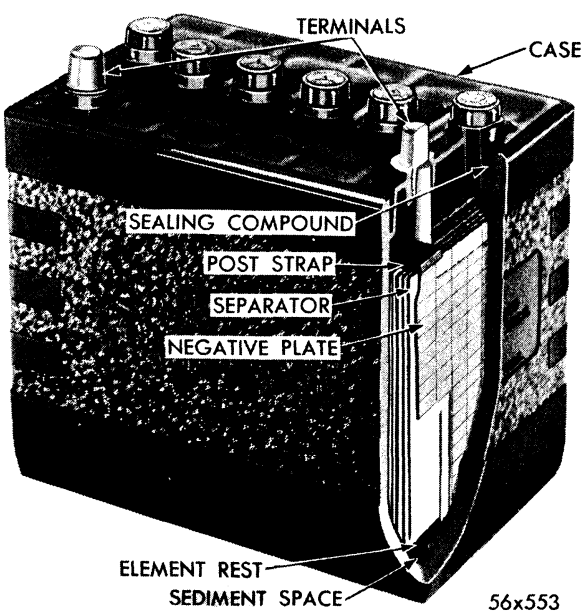


Fig. 1—Typical 12 Volt Battery (Cutaway View)

A fully-charged battery has a specific gravity reading of 1.255 to 1.275 (all batteries for use in temperate climates).

A battery that has a specific gravity reading of 1.225 or less, in cold temperature or 1.210 in warm temperature and all cells reading evenly within 15 specific gravity points (.015) of each other, requires recharging.

A battery that has a specific gravity reading which varies more than 15 points between any two cells should be recharged and high rate discharge tester or other suitable method used to check battery before discarding battery as unsuitable for use.

b. Voltage Tests

(1) Battery Cell Tester (Open-Circuit Voltmeter)

To make battery test, contact the meter prods (Tool MT-379) to proper cell terminals (red to positive, black to negative), using caution not to connect across more than one cell. The point of prod will have to be pushed through sealing compound to make contact with buried link for each cell reading.

NOTE: Freshly charged batteries have a "surface charge" which causes high and inaccurate readings unless properly dissipated. If battery is in vehicle, turn headlights on for one to three minutes to remove surface charge. Then turn lights off and wait several minutes before taking another reading.

The individual cell readings should not vary more than 0.05 volt between any two cells. A battery varying more than .05 volt between any two cells should be recharged and high rate discharge tester or other suitable method used to check battery before discarding battery as unsuitable for use.

(2) High Rate Discharge Test of Capacity (Fig. 2)

Satisfactory capacity tests can be made only

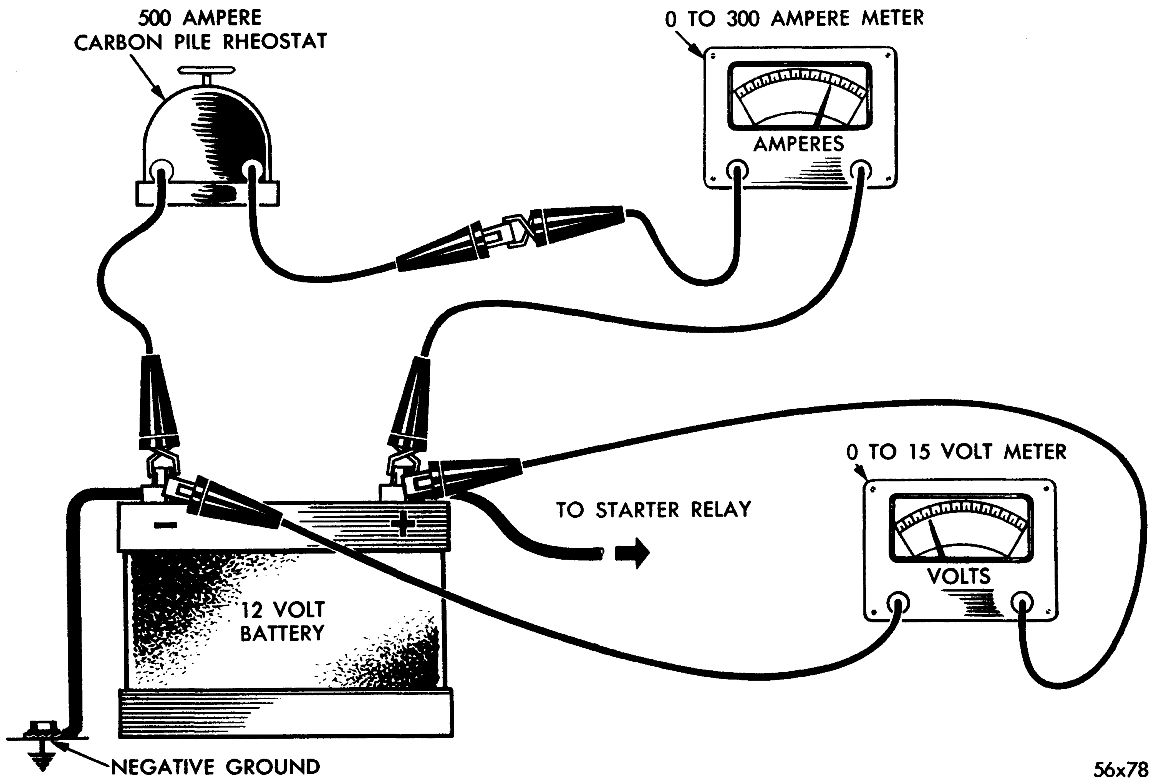


Fig. 2—Test Connections for Battery Capacity Test

when battery equals or exceeds 1.210 specific gravity at 80 degrees F.

Connect a carbon pile rheostat in series with an ammeter and battery, (Fig. 2). **Be sure the carbon pile control knob is rotated to full resistance position before connecting.** The voltmeter clips must contact battery posts **only** and not the high rate discharge tester clips. Unless this is done, the actual battery terminal voltage will not be indicated. Rotate carbon pile control knob until 200 amperes register on the meter. With battery under discharge for approximately 15 seconds, read terminal voltage. If terminal voltage shows 9.5 volts or more, battery has good output capacity.

2. CHARGING THE BATTERY

a. Slow Charging

NOTE: Slow charging is recommended wherever possible.

The slow chargers commonly used in service stations are suitable for charging both 6 and 12-volt batteries on the same circuit. Each 12-volt unit must be considered as equal to two 6-volt batteries, and charging rate must be adjusted to suit the smallest 12-volt battery on the line. Safe slow charging rates are determined by allowing one ampere per positive plate per cell. The proper slow charging rate for an 11 plate battery is five amperes.

Connect (positive +) charger lead to positive terminal and negative (—) charger lead to negative terminal of battery. If several batteries are to be charged in same circuit, due to charging voltage supply, batteries are connected in series for required number per circuit.

As batteries approach full charge, each cell will begin to gas or bubble freely. The battery temperature should not exceed 125 degrees F. during charge. If this temperature is reached, the battery should be cooled by reducing charge rate or removed from circuit. The battery is fully-charged when three successive hourly hydrometer readings show no rise in specific gravity.

b. Slow Charging Batteries to Remove Sulphation

To condition a battery that is sulphated, charge battery for minimum of 24 hours at a maximum charging rate of four (4) amperes. As battery approaches full charge check specific gravity at hourly intervals. With no rise in specific gravity for three successive readings battery is charged to its peak capacity.

c. Fast Charging

Use **only** a 12-volt fast charger and adjust charging rates to maximum of 25 to 30 amperes for 60 or 70 ampere hour batteries.

CAUTION

Battery temperature should not exceed 125 degrees F. during charge. If charger is not equipped with thermostatic cut-off and battery has not received sufficient charging, turn charger off until battery has cooled to 100 degrees F. before starting high rate charge for continued charging.

d. Boosting Charge for Stock Batteries

Stock batteries should be boosted monthly or when specific gravity reaches 1.210 specific gravity corrected to 80 degrees F., or when open-circuit voltage drops to 2.05 volts per cell. **Battery should be fully-charged when installed.**

WARNING

When batteries are being charged an explosive gas mixture forms beneath cover of each cell. Do not smoke near batteries on charge or which have recently been charged. Do not break live circuits at terminals of batteries on charge. A spark will occur where the live circuit is broken. Keep all open flames away from battery.

STARTERS

The starter drive is engaged with flywheel by a solenoid mounted on starter. The relay is separated from solenoid and is mounted on left front fender splash shield. There is no cover band on starter, and brush arm supports are attached to starter frame.

3. TESTING STARTER RESISTANCE AND CURRENT DRAW

Test battery. If it tests 1.210 specific gravity or less, charge battery. Test circuit resistance and starter current draw at same time (Fig. 3).

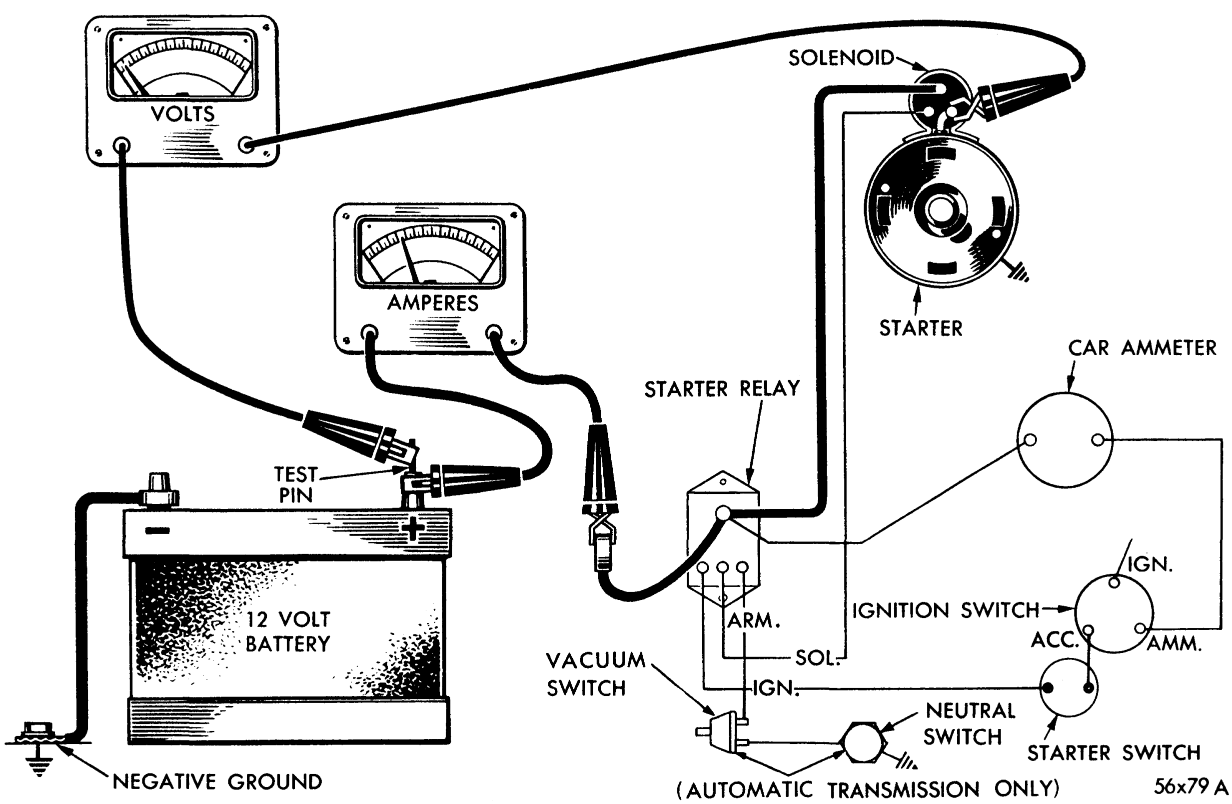


Fig. 3—Testing Starter Motor Circuit Resistance and Current Draw

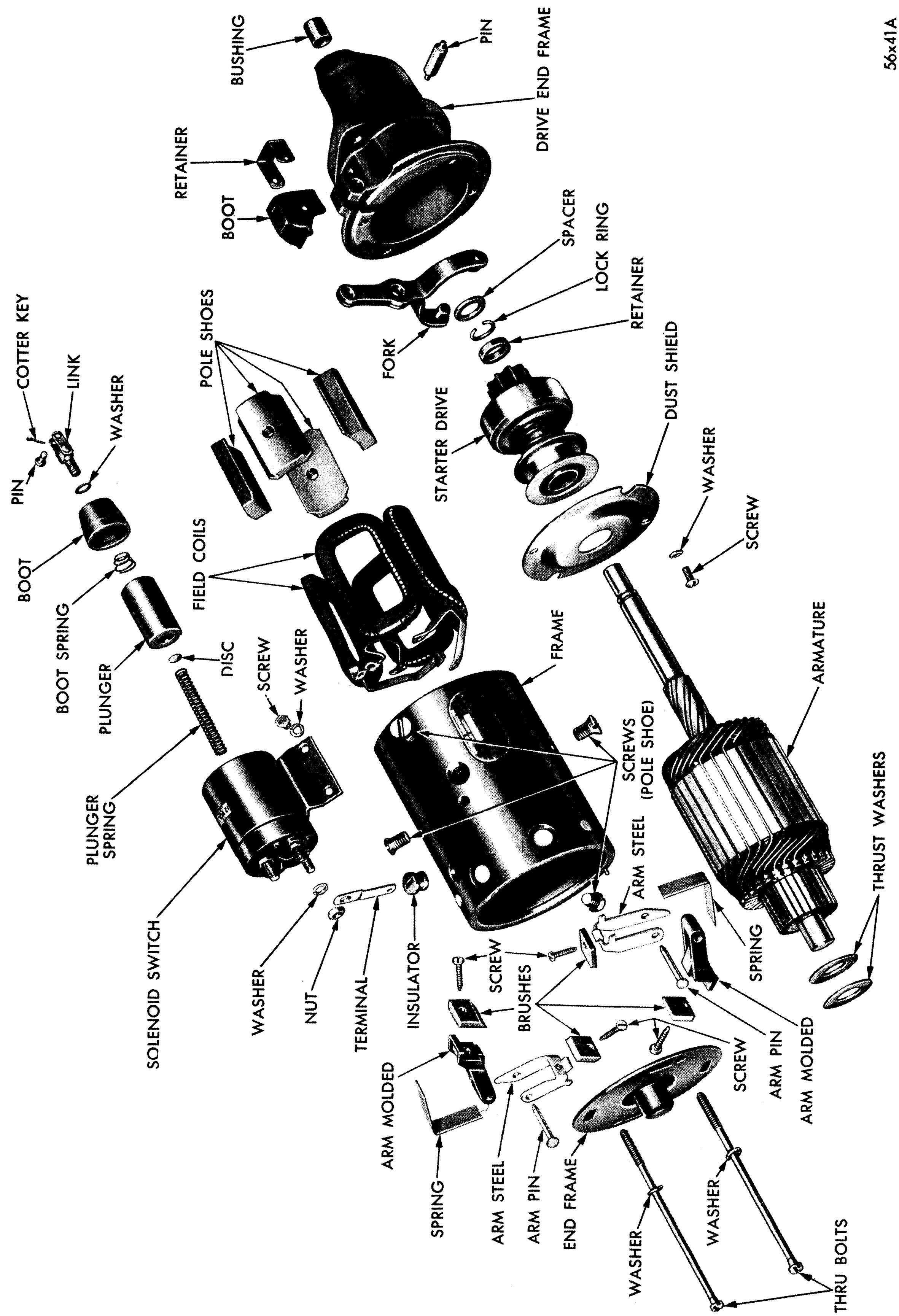


Fig. 4—12 Volt Starter Motor

Disconnect battery lead from positive battery terminal post. Connect 0 to 300 scale ammeter between disconnected lead and battery terminal post. Connect a test voltmeter with .10 volt scale divisions between the removed battery cable lug and solenoid switch motor terminal.

Crank engine and observe readings on voltmeter and ammeter. The voltage should not exceed .20 volt per 100 amperes of current. The current should not exceed 150 amperes (warm engine and battery). A reading of voltage that exceeds .20 volt per 100 amperes indicates there is high resistance caused from loose circuit connections, defective cable or burned switch contacts. A current that is high (150 amperes or more), and is combined with slow cranking speed, indicates that starter should be removed and repaired. A current that is low, with slow cranking speed, indicates resistance in solenoid switch or loose brush pigtail or soldered lead starter such as burned commutator and worn brushes.

4. REMOVAL OF STARTER

Disconnect battery cable from battery. Raise car and disconnect cable and solenoid lead wire from solenoid switch. Remove starter attaching bolts and remove starter assembly.

5. TESTING THE STARTER MOTOR (ASSEMBLED)

a. Free-Running Test

Place starter in vise and connect a fully charged, 12 volt battery to starter as follows:

Connect a test ammeter (100 ampere scale) and carbon pile rheostat in series with battery positive post and starter terminal. Connect voltmeter (15 volt scale) across starter. Rotate carbon pile to full-resistance position. Connect battery cable from battery negative post to starter frame. Adjust rheostat until starter voltage shown on voltmeter reads 11 volts. The current draw should be 80 amperes, with a minimum armature speed of 3800 r.p.m.

b. Stall Test

Install starter motor in test bench. Follow instructions of equipment manufacturer and check stall torque of starter against following specifications. With applied battery voltage adjusted to 4 volts, stall torque should be 8.5 foot-pounds, minimum, with a current draw of 350 amperes.

6. DISASSEMBLING THE STARTER (FIG. 4)

Remove clevis pin from solenoid plunger linkage. Remove thru bolts and tap commutator end plate from field frame. Lift brush holder arms so brushes are raised from commutator. Hold brushes up by use of "U" shaped clips to outside of frame. Tap drive end housing free from dowel pin and remove drive end housing and armature assembly from field frame. Remove shield plate attaching screws and remove drive end housing from armature and drive assembly.

7. CLEANING THE STARTER PARTS

Do not immerse parts in cleaning solvent. Immersing field frame and coil assembly and/or armature will damage insulation. Wipe these parts with cloth **only.**

Do not immerse drive unit in cleaning solvent. The drive clutch is pre-lubricated at factory and solvent will wash lubrication from clutch. The drive unit may be cleaned with brush moistened with cleaning solvent and wiped dry with cloth.

8. REPLACING BRUSHES AND SPRINGS

Brushes that are worn more than ½ the length of a new brush, or are oil-soaked, should be replaced. The starter must be disassembled to install brushes and springs.

9. TESTING THE ARMATURE

a. Testing the Armature for Short Circuit

Place armature in growler and hold a thin steel blade parallel to core and just above it, while slowly rotating armature in growler. A shorted armature will cause blade to vibrate and be attracted to core. Replace a shorted armature.

b. Testing Armature for Ground

Touch armature shaft and end of a commutator bar with pair of test lamp test prods. If lamp lights, it indicates a grounded armature. Replace grounded armature.

c. Testing Commutator RunOut, Refacing and Undercutting

Place armature in pair of "Vee" blocks and check runout with dial indicator. Check both shaft and commutator. A bent shaft requires replacement of armature. When commutator runout exceeds .003 inch, commutator should be refaced. Remove only sufficient metal to provide a smooth, even surface. After commutator is refaced, undercut insulation between bars to depth of $\frac{1}{32}$ inch with a thin, hacksaw blade, or Tool C-770. Undercut insulation square and full width of groove, and polish commutator with 000 sandpaper to remove burrs.

10. TESTING THE FIELD COILS FOR GROUND

Disconnect ground lead from the shunt field coil at terminal screw. Touch each of brush holders with a test lamp prod, while holding the other test prod against starter frame. Two of brush holders that are 180 degrees apart should cause test lamp to light, as they are intentionally grounded. The other two brush holders should not cause lamp to light when tested, as they are insulated. If these insulated brush holders cause lamp to light when tested, it indicates that the field coil is grounded. **Be sure brush pigtails or leads are not touching field frame.**

If field coils are grounded, inspect terminal insulation. If insulation is in good condition, test each coil separately after unsoldering connection wire. Replace grounded field coils. Test shunt field coil for continuity and for any ground, then reconnect ground lead.

11. REPLACING THE FIELD COILS

A pole shoe screwdriver should be used to remove and install field coils to prevent damage to pole shoe screws and for proper tightening. Pole shoes that are loose may cause armature core to rub pole shoes. This will decrease starter efficiency and damage the armature core and windings.

12. SERVICING THE BUSHINGS

Inspect armature shaft bearing surfaces and bearings for wear by placing core in vise equipped with soft jaws. Do not squeeze tightly. Try commutator end plate and the drive end nose casting by placing them on shafts and checking for side play. Replace commutator end plate assembly if bearing is worn. Also, replace drive end bearing if it is worn. The bearing should be well soaked in SAE 10-W Engine Oil before it is installed.

13. SERVICING THE DRIVE UNIT

To Remove drive from armature shaft, tap stop collar toward pinion and remove lock ring first. Place drive unit on shaft and, while holding armature, rotate pinion. The drive pinion should rotate smoothly in one direction (not necessarily easily), but should not rotate in opposite direction. If drive unit does not function properly or pinion is worn or burred, replace drive unit.

14. ASSEMBLING THE STARTER

(Refer to Fig. 4.) Lubricate armature shaft and splines with 10-W oil. Assemble drive end parts on armature using a new lock ring for stop collar. Install dust gravel shield, and slide assembly into field frame concentrically on nose casting, and slide assembly into field frame until end of commutator touches brushes. While holding armature against brushes with slight pressure, push brushes up and allow them to come to rest on commutator, slide armature assembly into place. Install commutator end plate and through bolts. Make sure end nose and plate are positioned on dowel pins, and tighten through bolts. Install solenoid plunger clevis pin and cotter key, but do not bend cotter key over until solenoid plunger travel and pinion clearance have been established. Be sure dust boot lip is over ring projection on solenoid unit.

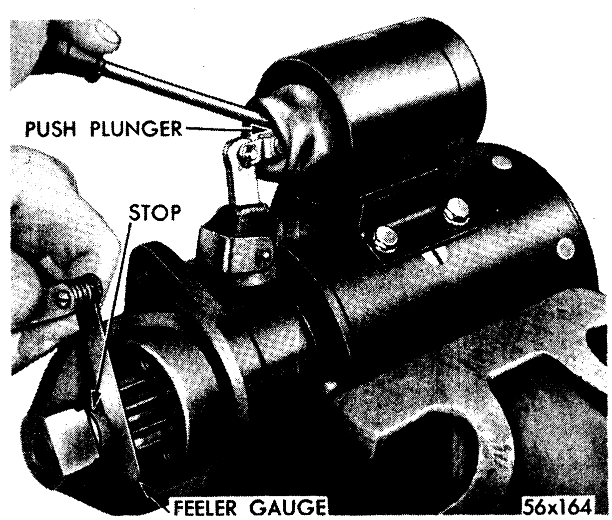


Fig. 5—Adjusting Starter Drive Pinion Clearance

15. ADJUSTING STARTER DRIVE GEAR (PINION) CLEARANCE (FIG. 5)

Place starter assembly in vise equipped with soft jaws and tighten vise sufficiently to hold starter. Push in on solenoid plunger link adjusting bolt (**NOT THE FORK LEVER**) until plunger bottoms. Measure clearance between end of pinion and pin stop with plunger seated and pinion pushed toward commutator end (Fig. 5). The clearance should be $\frac{3}{32}$ inch, plus $\frac{1}{32}$ inch or minus $\frac{1}{64}$ inch. Adjust for proper clearance by screwing link **in** or **out** of plunger as required. Bend cotter key and test starter operation under a free running test.

16. INSTALLING THE STARTER

Before installing starter in car, lubricate armature shaft ahead of pinion with 10-W oil and be sure starter and flywheel mounting surfaces are free of dirt and oil. These surfaces must be clean to make good electrical contact. Install starter from beneath car. Draw attaching bolts up tight and attach wires to solenoid switch. Lower car to floor; install battery cable and test operation of starter for proper engine cranking.

GENERATORS

17. REMOVAL

The generator is mounted on a bracket attached to engine and held in place by two bolts through end frames and bracket. It is secured at top by a bolt through drive end frame and the belt tightening strap. Disconnect battery ground terminal and wires at generator armature and field terminals. Loosen generator adjusting strap bolt, push generator to left to relieve belt tension and remove generator attaching bolts and generator.

18. CHARGING CIRCUIT RESISTANCE TEST (FIG. 6)

Before an output test of generator is made, charging unit should be tested for high resist-

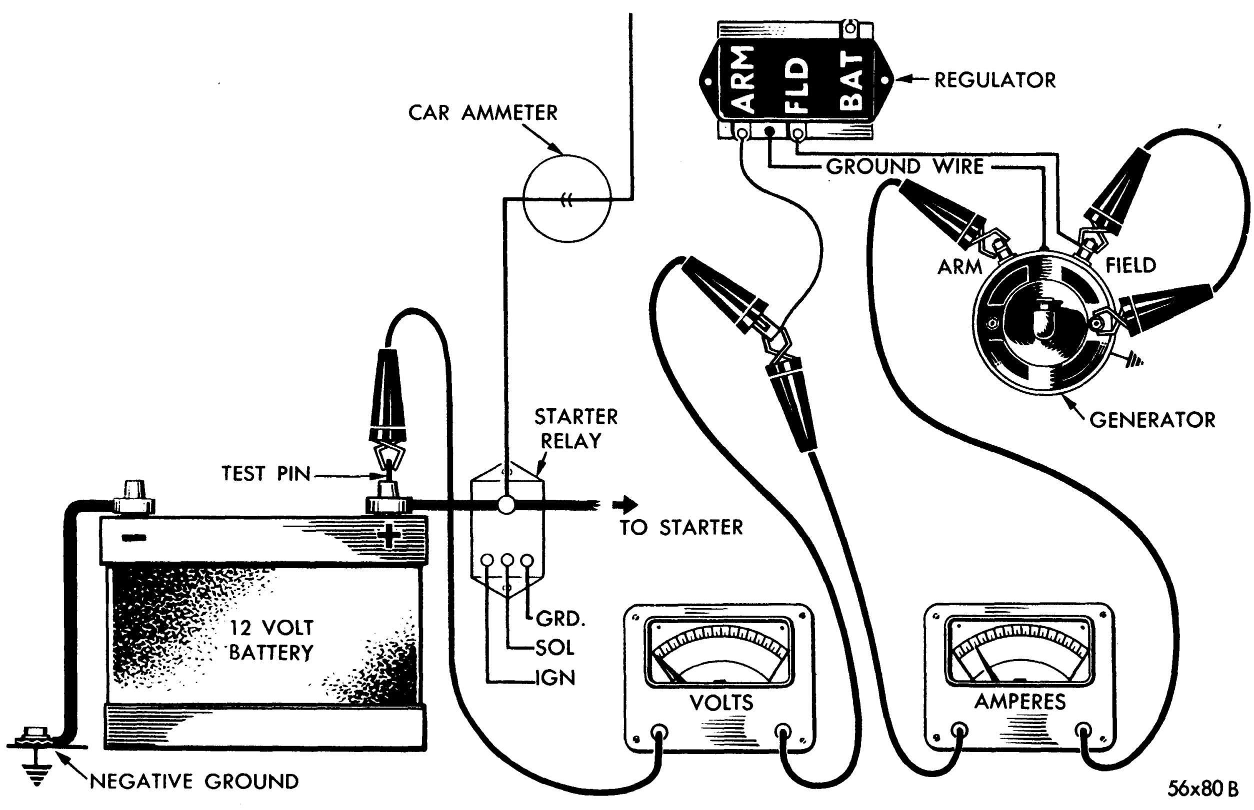


Fig. 6—Charging Circuit Resistance Test

ance due to loose connections, damaged wiring and burned relay contacts. The generator drive belt tension should also be checked and adjusted if tension is incorrect.

Connect test equipment, as shown in Figure 6. The ammeter is connected at generator and volt meter is attached to armature lead so that any voltage loss in test ammeter will not register on voltmeter. Start engine, increase engine speed until 10 amperes register on test ammeter, and read voltmeter. The voltage shown will be voltage drop of charging circuit and should not exceed .50 volt. A voltage drop that exceeds .50 volt indicates high resistance from a loose connection, burned relay contacts or a partially broken wire. Where voltage drop exceeds .50 volt, a-point-to-point check is required. Move one of voltmeter leads back along circuit toward other test lead connection, checking voltage at each terminal connection. A sudden drop in voltage indicates that high resistance is present between that point and last point tested. Clean relay contacts, tighten loose connections and replace damaged wiring.

Adjust belt tension by measuring with a scale applied at center of longest span between pulleys. The deflection should be ¼ inch with a 9 to 12 pound pressure. See Cooling System, Section V, (Fig. 4.)

19. GENERATOR OUTPUT TEST

Connect equipment, as shown in Figure 6, with exception of voltmeter leads. In output test, connect voltmeter from generator armature terminal post to ground. Increase engine speed while observing the meters. A generator that is in good condition should be capable of an output in amperes that will exceed rated output slightly: approximately 15 volts at 2,300 generator r.p.m.

CAUTION

The engine MUST NOT be running for more than few seconds while making above test to avoid damage to generator. Check generator. Check generator brushes for excessive arcing and/or bounce while high output is being delivered. A rough, burned or dirty commutator will cause arcing and bouncing at brushes.

20. DISASSEMBLY

To disassemble a standard type generator (Fig. 7), remove through bolts and pull end plate from field frame. Slide armature and drive end frame assembly from generator field frame. Place armature core in vise equipped with soft jaws, and remove pulley with Tool C-3505. Remove drive key and press end frame assembly from armature. Do not remove field coils from frame at this time.

Generators used on Air Conditioned cars (Fig. 8) have a ball bearing at commutator end. To remove drive end frame, remove through bolts. Pull end frame free of dowel pin and rotate end frame far enough so lugs are away from terminal posts.

Support generator in arbor press on plates against end frame lugs. Press end plate from shaft while supporting generator assembly to prevent it from falling when free. Complete disassembly operation in same manner as for a standard generator.

21. CLEANING AND INSPECTION

CAUTION

Do not immerse armature, field frame and field assembly, or bearing felts in cleaning solution. Never steam clean a generator.

Wipe above parts with a clean cloth. When cleaning ball bearings do not spin them with compressed air. Inspect field coils for burned or damaged insulation. Inspect commutator for wear and condition of soldered coil leads. An armature that has been overheated will show signs of throwing solder and will require resoldering or replacement. Inspect commutator for trueness.

Inspect bearings for wear or roughness. Replace worn or rough bearings. The bushing type bearing requires replacement of end frame assembly.

22. TESTING GENERATOR COMPONENTS

a. Testing Armature for Ground

Place one probe from 110-volt test lamp on armature shaft and other probe at end of any commutator bar. If test lamp lights, it indicates a ground. Do not touch shaft bearing surface or commutator bar brush surface with test probe as this will pit surfaces. Replace grounded armatures.

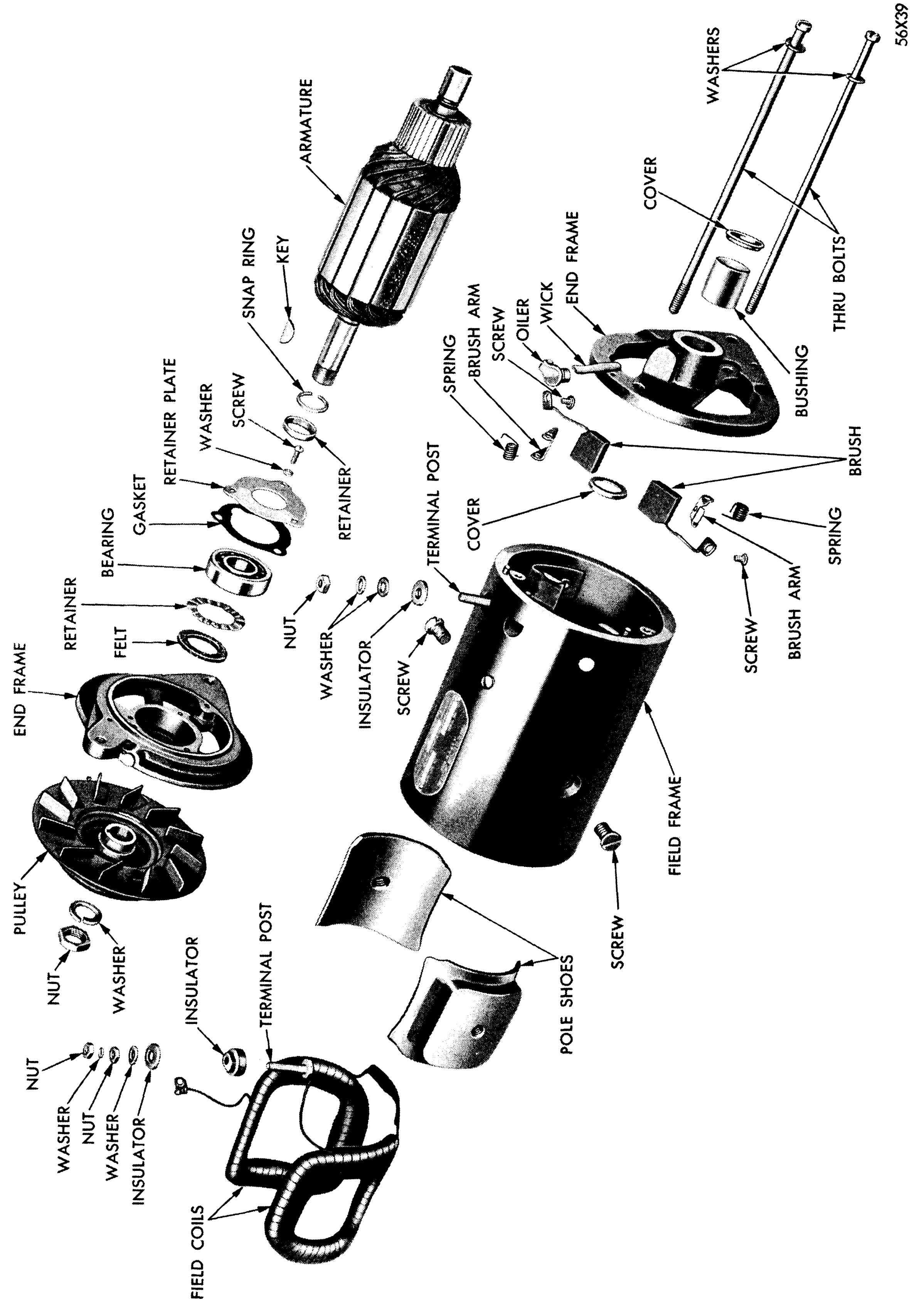


Fig. 7—12 Volt Generator (Standard Equipment)

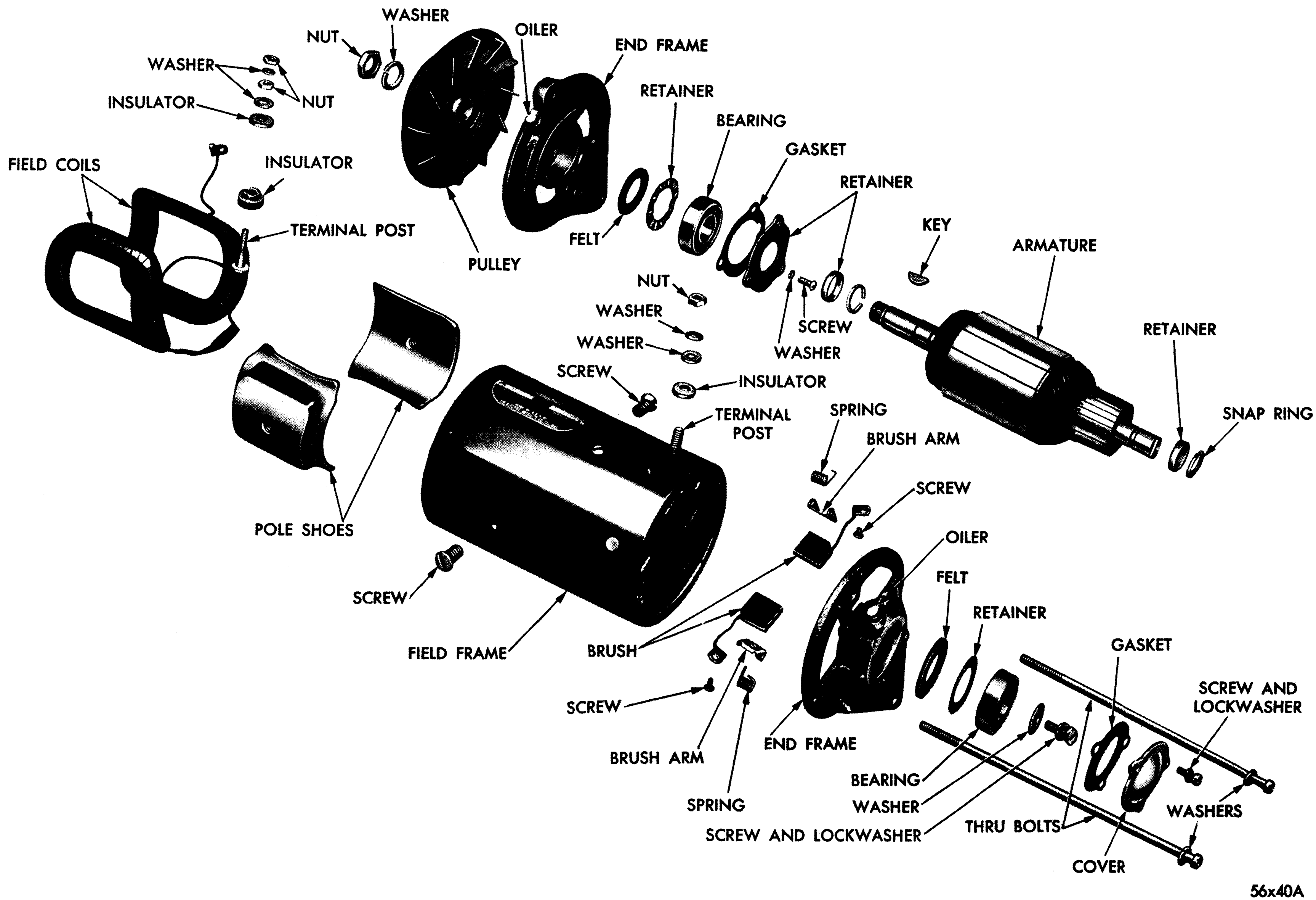


Fig. 8—12 Volt Generator (Air Conditioning Models)

b. Testing Armature for Short Circuit

Place armature in growler and, while rotating armature hold thin steel blade parallel to core and just above it. A shorted armature will cause steel blade to vibrate and be attracted to core. Replace shorted armature.

c. Testing Field Frame Assembly for Ground

Disconnect "ARM" terminal field lead from insulated brush holder. Touch a 110-volt lamp probe to generator "FIELD" terminal post, while holding other probe against good ground on field frame (be sure brush lead terminals are not touching a ground). The lamp should not light. If lamp lights, a ground exists, and it will be necessary to determine whether ground is in field coils or field terminal post.

Remove terminal post from field frame and retest from field lead to ground. If lamp lights, field coils or connecting lead is grounded. Move connecting lead between two coils away from frame. If light still burns, ground is in field coils.

Touch one of 110-volt test lamp probes to "ARM" terminal post and field frame. If lamp lights, it indicates that either terminal post or brush holder is grounded. Remove terminal post and retest brush holder. If lamp lights, brush holder is grounded. Replace defective parts. It is necessary to replace field frame if, insulated brush holder is grounded.

d. Testing Field Current Draw (Fig. 9)

Test field coils for short circuits between windings, high resistance connections, or for improper coils, by connecting test equipment, as shown in Figure 9. Adjust battery voltage to specified voltage of 10-volts with rheostat. The reading on ammeter indicates field current draw. A current reading that exceeds 1.2 to 1.3 amperes indicates that coil windings are shorted, or that wrong coils have been installed. A current reading that is less than specified indicates poor electrical connections or wrong field coils. Replace short circuited or improper coils, or re-solder defective connections.

23. SERVICING THE ARMATURE

Reface commutator if runout exceeds .0005 inch, or if it is rough, burned, or worn so that insulation between bars is too high. Undercut insulation between commutators bars to depth

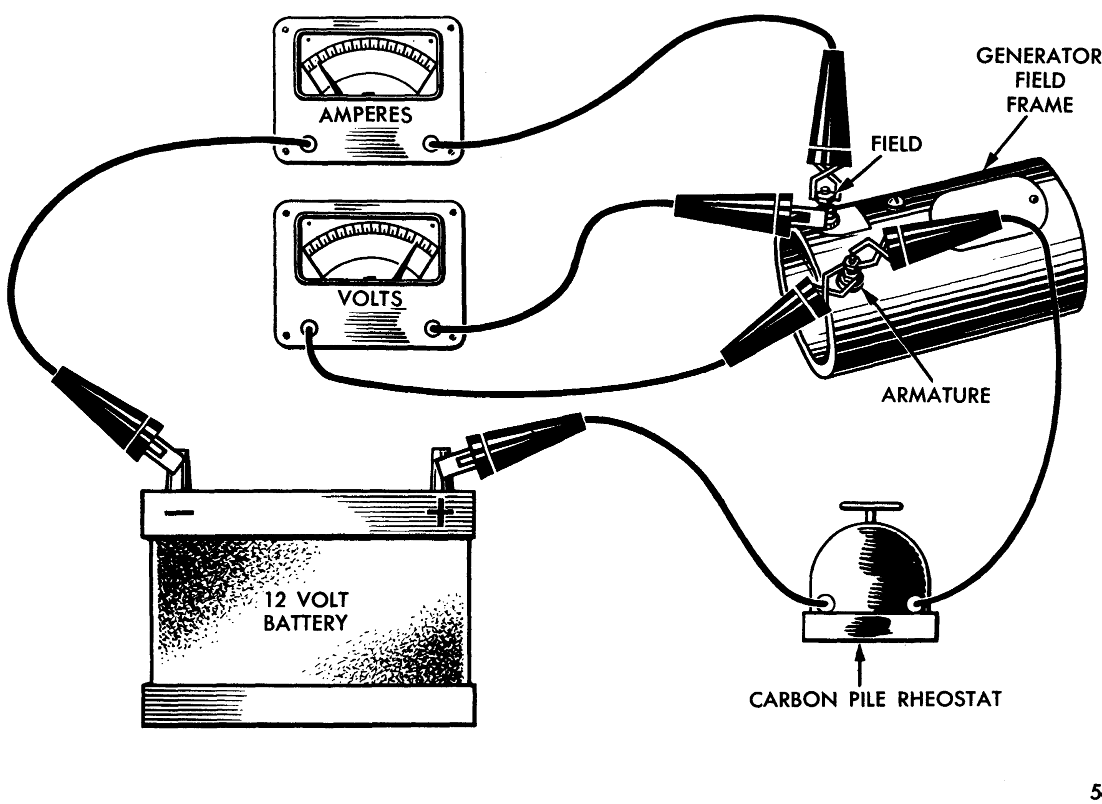


Fig. 9—Testing Field Current Draw

of $\frac{1}{32}$ inch, the full width of insulation. Metal particles are sometimes embedded in grooves following undercutting and should be removed.

24. REPLACING FIELD COILS

To replace field coils, a pole shoe screwdriver, such as Tool C-3078, should be used to prevent damage to screws and to assure proper tightening when installing coils. Pole shoes that are loose will rub armature core, causing loss of efficiency and damage to armature.

25. REPLACING BRUSHES AND SPRINGS

Brushes that are oil soaked or worn to ½ length of a new brush should be replaced. Sand new generator brushes to fit contour of commutator. With new type brush holder, it is difficult to measure spring tension (which must be done after generator is assembled). It is suggested that new springs be installed when brushes are replaced.

26. ASSEMBLING THE GENERATOR

a. Standard Generators

Soak felt washers and Oilite bushing in clean engine oil. Pack ball bearing about half full with high temperature non-fiber bearing lubricant. Compress felt slightly to remove oil before installing.

(Refer to Figs. 7 and 8.) Assemble drive end parts on armature before installing it in generator. **Do not grip core too tightly in vise.** Install retainer over snap ring before pressing bearing and end frame assembly on shaft. Install suitable sleeve over armature shaft so that pressure is applied to inner race when pressing bearing on shaft.

b. Accessory Equipment Generators

On generators used with air conditioning equipment, install armature and drive end assembly in generator field frame. Install commutator end plate and through bolts. Place felt and shield in commutator end plate and press bearing on shaft, applying pressure to inner race. Install shield.

c. Testing After Assembly

The generator should be tested before it is installed on car. If proper bench test equipment is not available, it is possible to motor test generator. A generator that will motor freely with specified voltage applied will, in most cases, operate properly when driven as a generator.

27. MOTORING TEST

Connect a carbon pile rheostat and test ammeter in series with positive post of 12-volt battery and generator armature terminal post. Connect a jumper lead from field terminal post to ground. Connect a jumper lead to battery negative post and generator frame. This will cause armature to rotate as a motor. Adjust battery voltage to 10 volts. The reading on test ammeter should be 3.4 to 3.9 amperes with armature turning smoothly.

28. INSTALLATION

Place generator in position and install attaching bolts. Adjust drive belt tension at generating strap so there is a deflection of ¼ inch with 9 to 12 pounds pressure. Refer to Fig. 4, Cooling System, Section V.

CAUTION

Be sure condenser used for radio interference is properly attached to armature ("ARM") terminal post.

REGULATORS

The current and voltage regulator is designed to operate **only** in 12-volt, negative ground electrical system.

NOTE: Do not attempt to adjust unit unless proper procedures are thoroughly understood. Otherwise, damage to entire electrical system may result.

29. PREPARATIONS FOR TESTING

Disconnect battery before attempting to remove regulator assembly or to connect test equipment. Do not connect test equipment. Do not connect battery again until after regulator removal and/or installation has been completed. Do not connect battery when installing test equipment until equipment is installed and all connections are protected against accidental ground. Failure to adopt these pre-cautions may result in damage to electrical circuit parts or wiring.

Before testing regulator assembly, make sure generator drive belt tension is correct. The battery specific gravity should be 1.210 or higher. Check charging circuit resistance. The voltage drop of insulated side of circuit should not exceed .50 volt, with 10 amperes of current flowing. The ground side of charging circuit should also be tested.

30. NORMALIZING THE REGULATOR TEMPERATURE

Connect a test ammeter in series between battery lead and regulator "Batt" terminal. Connect a test voltmeter from regulator "Batt" terminal to ground. Connect a variable resistance across battery. Start engine, adjust engine speed to 1,500 r.p.m., and observe test ammeter. Adjust variable resistance to obtain a load of 7 amperes. Maintain this 7 ampere load for 15 minutes to normalize regulator temperature.

31. TESTING REGULATOR TEMPERATURE

When testing regulator, keep cover in place and make sure temperature at regulator is known. The regulator armature hinges are temperature compensated and control will vary with temperature changes.

To measure temperature at regulator, hold an accurate Fahrenheit thermometer two inches from cover. The correct voltage setting of regulator for various temperatures with 7 amperes flowing is shown in Specifications.

32. TESTING THE VOLTAGE REGULATOR SETTING (FIG. 10)

Connect test equipment, start engine and operate at 1,500 r.p.m. Hold Fahrenheit thermometer 2 inches from regulator cover and note temperature reading. Observe voltage on test voltmeter. Compare voltage reading and temperature with those shown in Specifications. If adjustment is required, decrease engine speed to slow idle. Remove regulator cover and bend lower hanger of voltage regulator **down** to increase voltage or **up** to decrease voltage (Fig. 11). Replace regulator cover, increase engine speed to 1,500 r.p.m., and check temperature and voltage readings.

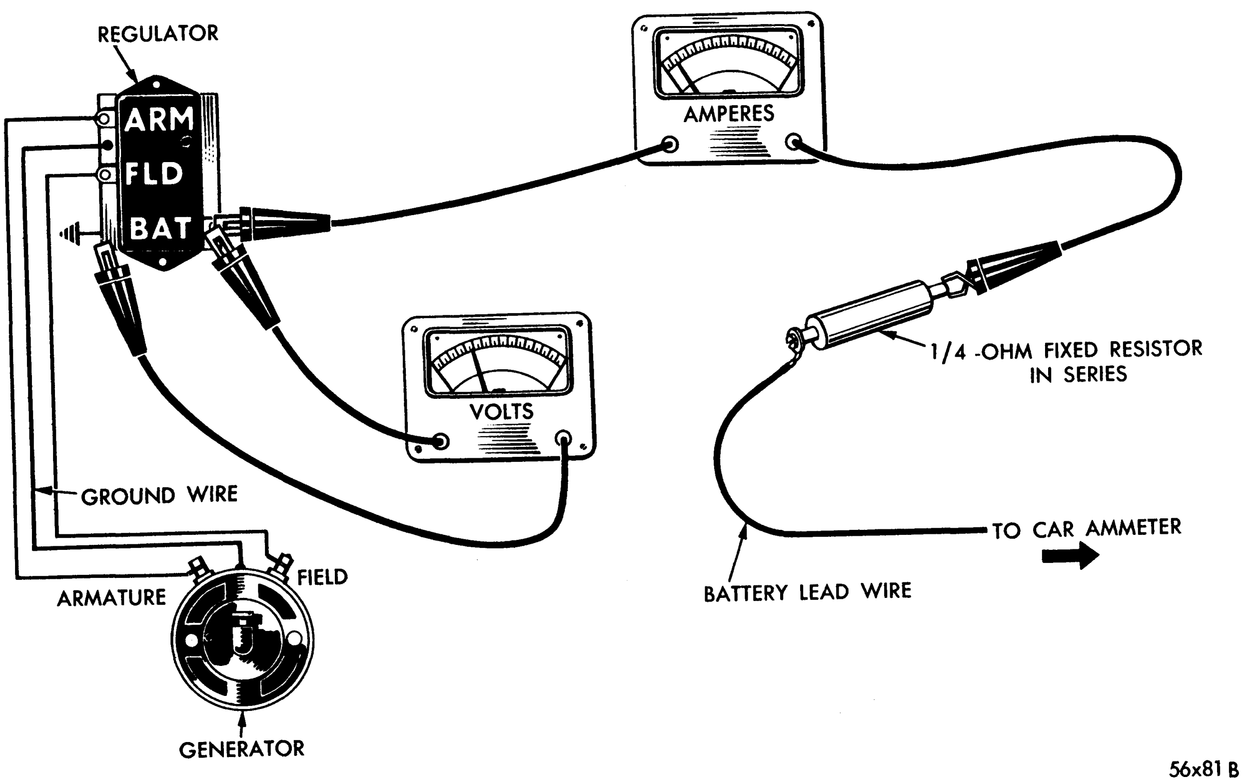


Fig. 10—Voltage Regulator Test

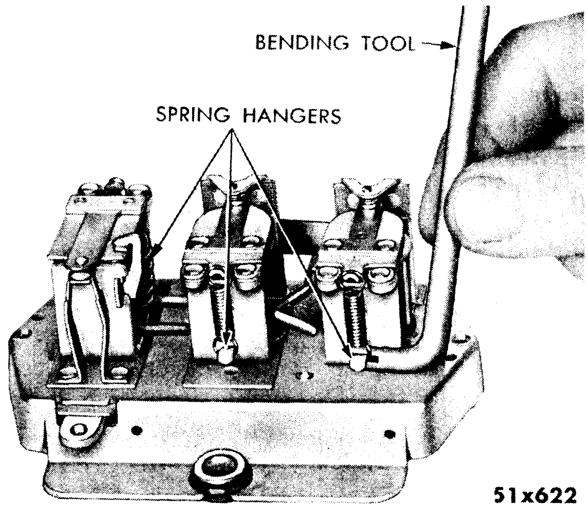


Fig. 11—Adjusting Armature Spring Tension

WARNING

The regulator must be cycled by reducing engine speed low enough for cut-out relay contacts to open, before increasing engine speed to 1,500 r.p.m. when retesting after each adjustment. The regulator cover must be in place when test is made.

33. TESTING THE CURRENT REGULATOR

The current regulator is temperature compensated and temperature must be considered in same manner as when testing voltage regulator. The test of current regulator would normally be made following test procedure for voltage regulator. When test of current regulator immediately follows voltage regulator test, generator should be run at its rated output of 30 amperes for 15 minutes (in addition to voltage regulator 15 minute run) before checking or adjusting current regulator. Test as follows:

Install test equipment (Fig. 12), start engine and increase speed to 2,000 r.p.m. Adjust variable resistance across battery until current settles to steady ampere output. The current regulator should limit current output as listed in Data and Specifications.

If adjustment is required, reduce engine speed to slow idle and remove cover from regulator. Bend lower current regulator spring hanger **down** to increase current output setting or **up** to decrease setting, (Fig. 13).

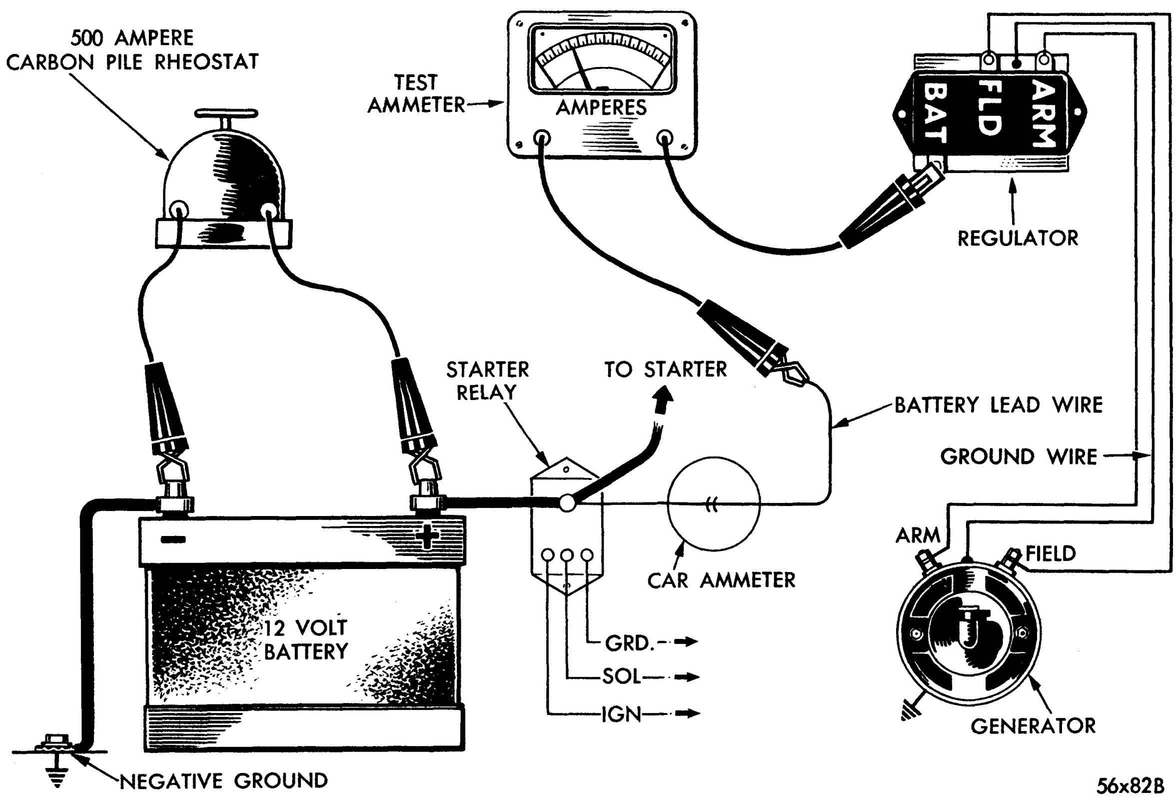


Fig. 12—Current Regulator Test

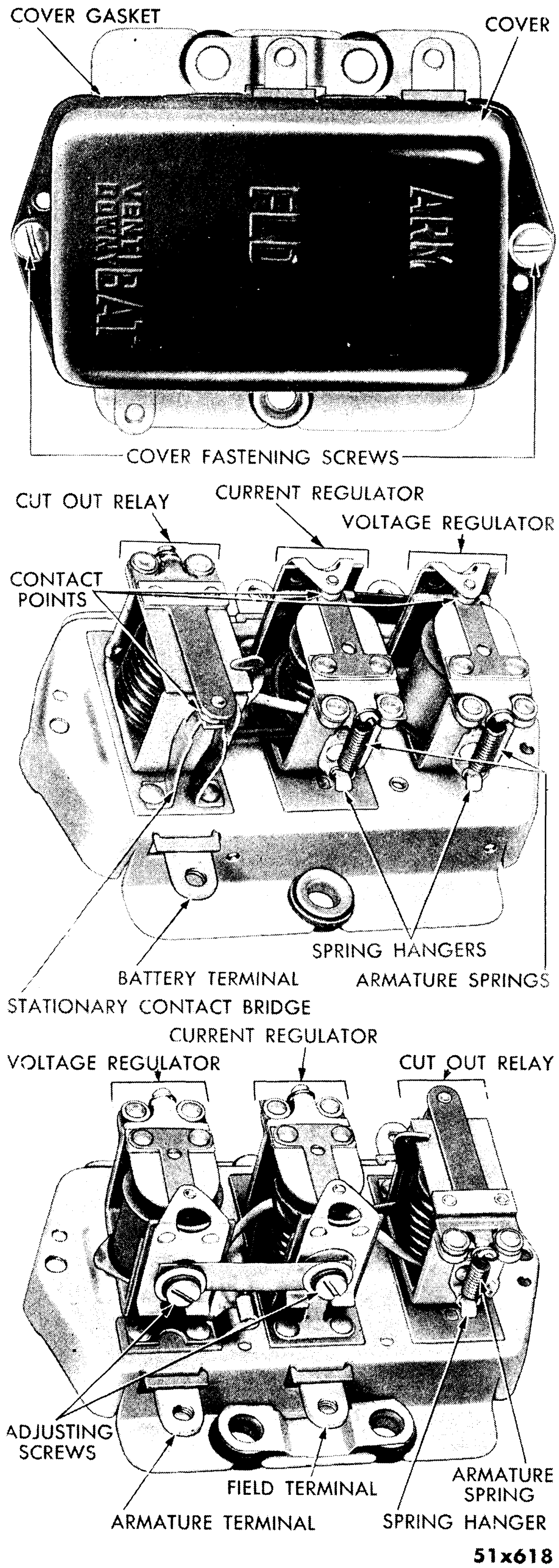


Fig. 13—Current and Voltage Regulator

WARNING

The current regulator must be cycled by reducing engine speed, low enough to open cut-out relay contacts after each adjustment. Retest the new setting after each adjustment with cover in place.

34. TESTING CUT-OUT RELAY (FIG. 14)

Connect test ammeter in series between regulator "Batt" terminal and battery lead wire. Connect variable resistance in series between regulator field terminal and generator field lead wire. Connect test voltmeter (0 to 15 — volts) from regulator "ARM" terminal to ground.

If the present test immediately follows tests of voltage and current regulators, it is not necessary to normalize regulator temperature. If regulator assembly is cold, normalize the temperature.

Start engine and adjust speed to slow idle. Rotate variable resistance control knob to full resistance position. Slowly rotate variable resistance control knob toward "no resistance" position, while carefully observing voltmeter. Increase engine speed slowly. The relay contacts close when voltmeter hand jumps back slightly. The closing voltage is highest reading in volts reached before hand jumps back and should be 13 to 13.75 volts. Rotate variable resistance control knob toward full "no resistance" position. Observe test ammeter. If charging rate of 10 amperes is not indicated, increase idle speed slightly until reading is indicated.

Slowly rotate rheostat control knob toward "full resistance" position, while observing test ammeter. The ammeter hand will drop toward zero and beyond, and suddenly return to zero. The discharge amperes noted, will be reverse current required to open relay contacts. The relay contacts should open at 0 to 6 amperes discharge current, or 8.2 to 9.3 volts after charge of 10 amperes. If adjustment is necessary, use bending tool from Tool-kit C-828. Bend lower spring hanger **down** to increase closing voltage, or bend it **up** to decrease.

NOTE: After each adjustment, it is essential that a complete retest be made to determine new values of closing voltage and discharge current required to open relay contacts. Regulator cover must be in place when test is made.

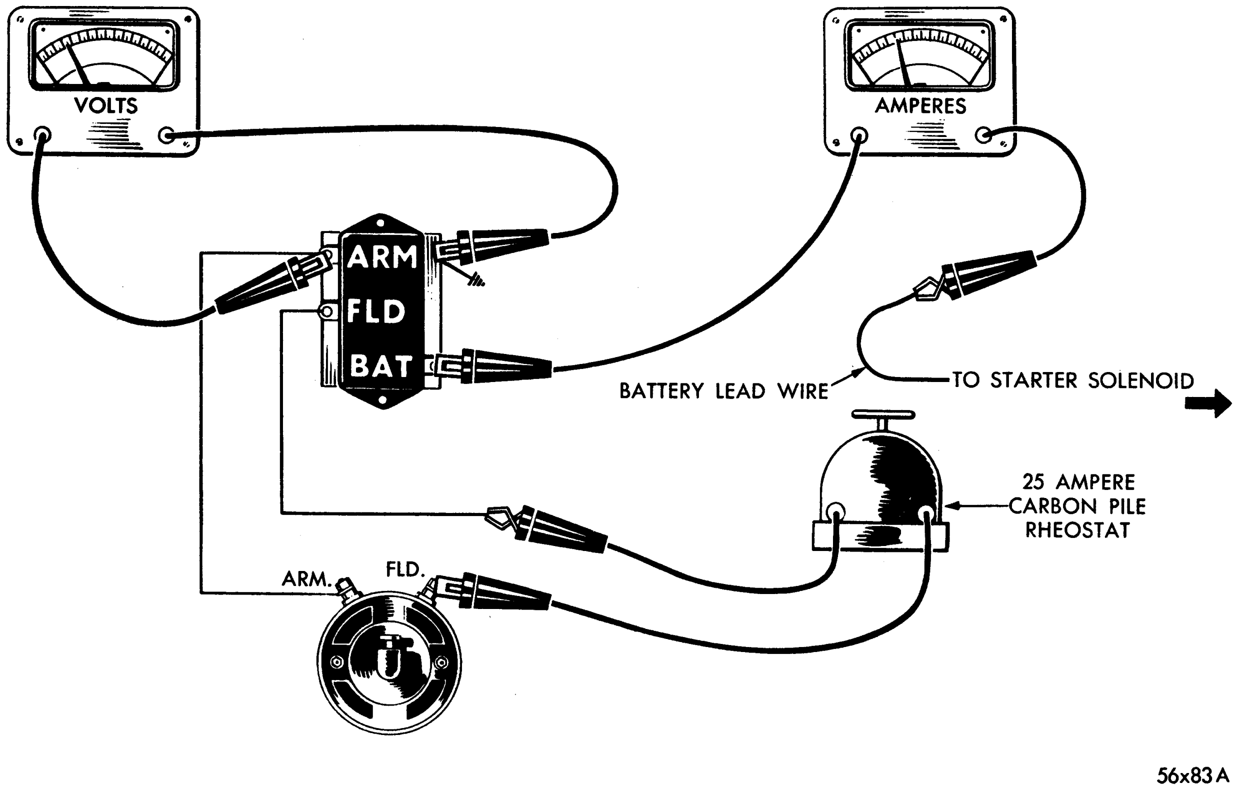


Fig. 14—Cut-Out Relay Test

35. SERVICING THE REGULATOR CONTACT POINTS

a. Inspecting and Cleaning Contacts

Inspect contact points of all three units. The contact points become silver gray during normal use. File burned and oxidized points with a clean contact point file. Do not remove too much material. Never use sandpaper, emery cloth or dirty file to clean contact points, as foreign material may become embedded in contacts and result in arcing or burning.

The filing should be done parallel to length of armatures. Cross filing will form grooves and result in contacts sticking and faulty operation. After contacts are clean and smooth, wipe them with piece of clean, lintless bond tape.

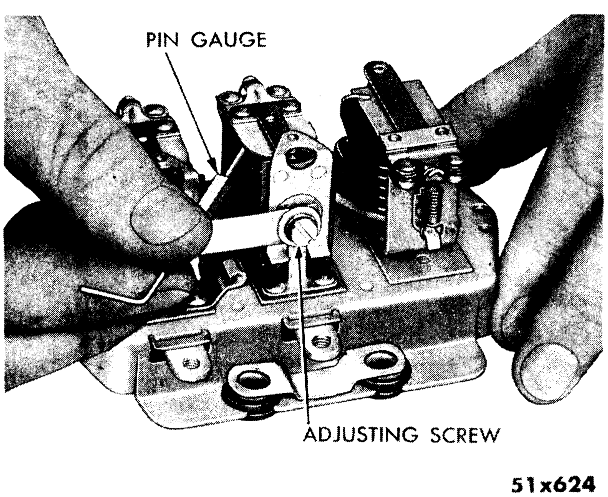


Fig. 15—Checking Regulator Air Gaps

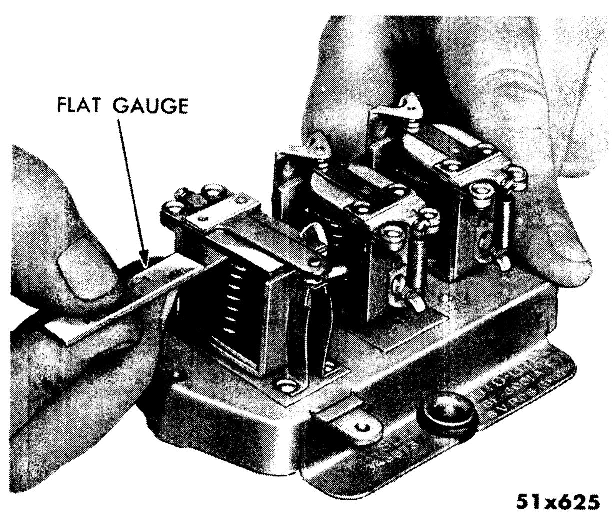


Fig. 16—Checking Cut-Out Relay Air Gaps

b. Adjusting Air Gaps (Regulator)

Place .052 inch wire gauge between armature and core at contact side of stop pin (Fig. 15). The contacts should open when armature is pressed down. Place .048 inch gauge in same position and press down on armature. The contacts should just open if air gap is properly adjusted. Adjust air gap by loosening screw and lowering or raising stationary contact.

c. Cut-Out Relay Air Gap

Place flat .031 inch gauge between lower side of armature and top of relay core as close to hinge as possible (Fig. 16). With relay armature against upper stop, .031 inch gauge should slide in freely, but .034 inch gauge should be too tight. Adjust air gap by bending upper stop **up** to increase air gap, or **down** to decrease it.

d. Cut-Out Relay Contact Clearance

Adjust contact clearance by expanding or contracting bridge (Fig. 17). The proper clearance is .015 inch.

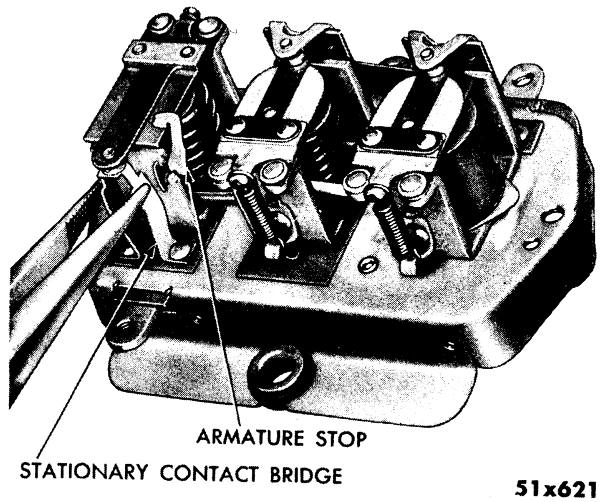


Fig. 17—Adjusting Cut-Out Relay Contact Clearance

IGNITION SYSTEM

36. TESTING PRIMARY CIRCUIT RESISTANCE (FIG. 18)

It is essential to good ignition that all primary connections be clean and tight. Connect jumper wire from distributor primary terminal to ground. This eliminates necessity of closing

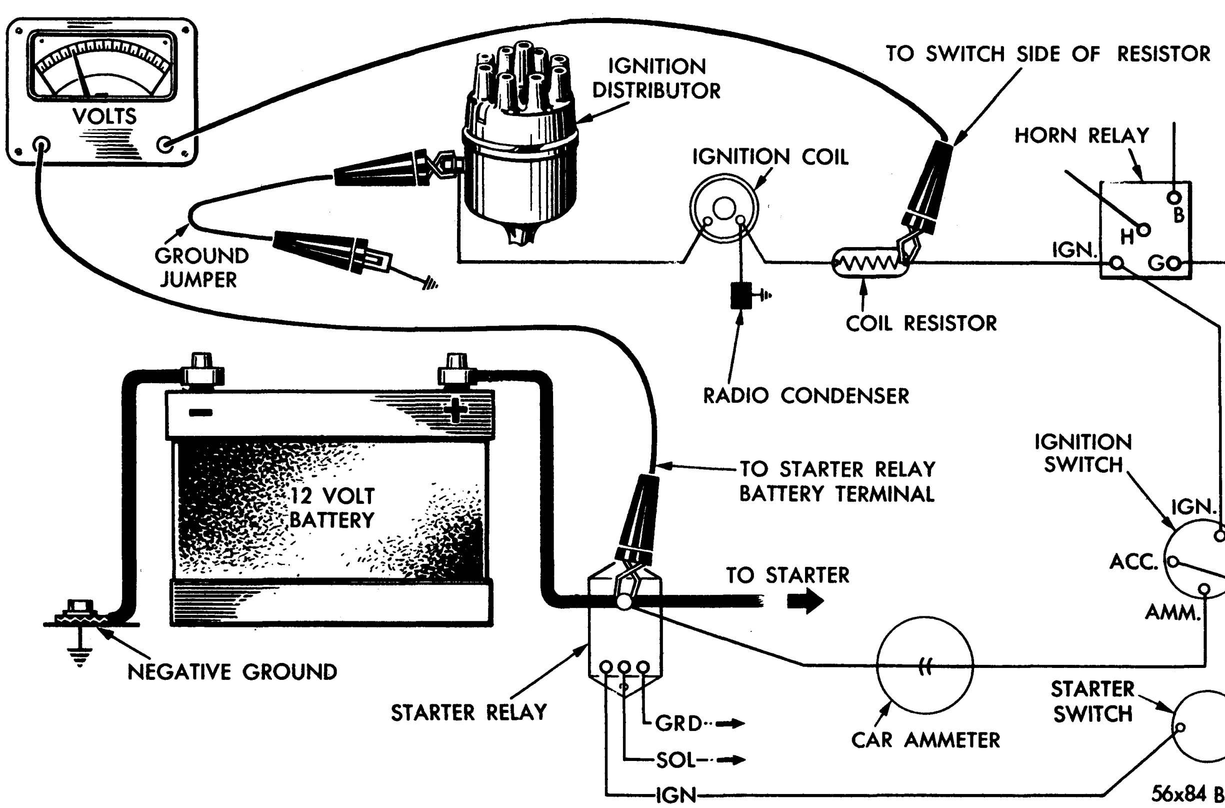


Fig. 18—Testing Primary Circuit Resistance

contacts. Connect low reading voltmeter (with scale divisions of $\frac{1}{10}$ volt) from switch side of resistor to battery connection at relay or junction block (Fig. 18).

Turn ignition switch on and observe voltmeter. A reading in volts that exceeds .2 volt indicates a loose connection in circuit between voltmeter leads or poor contact in ignition switch. Move key off and on while noting voltmeter. A reading that varies, also indicates poor contact in switch. Clean and tighten loose connections and/or replace defective switch.

SERVICING DISTRIBUTOR

37. REMOVAL AND INSTALLATION OF DISTRIBUTOR

a. Removal

Disconnect vacuum tube and primary lead wire. Lift off distributor cap and remove distributor hold down lock plate and distributor. (On cars equipped with power brakes remove vacuum line fitting in manifold.)

b. Installation

Make sure number one piston is at top dead center and install distributor so that rotor is pointing to number one firing position. Install lock plate and screw, but do not tighten. Rotate crankshaft to align specified degree mark on vibration damper with ignition timing indicator pointer. Rotate distributor until contacts are just opening and tighten hold down plate. Install vacuum tube, primary lead and distributor cap.

38. IGNITION TIMING (FIG. 19)

Make certain distributor is properly installed in engine. Install timing light and start engine. Allow engine to warm up sufficiently to enable carburetor fast idle mechanism to position for slow idle speed. Loosen distributor lock plate and rotate distributor clockwise or counterclockwise to align proper degree mark on vibration damper with ignition timing indicator points. Tighten lock plate.

39. CHECKING DISTRIBUTOR GOVERNOR ADVANCE

Install distributor assembly in test bench and check governor advance as recommended by equipment manufacturer.

Adjust governor advance by bending outer spring lug of light spring for low speed and outer lug of heavy spring for high speed operation.

40. CHECKING DISTRIBUTOR VACUUM ADVANCE

After checking governor advance check vacuum advance. If vacuum advance is out of specifications adjust by adding or removing washers as follows: Remove retaining plug and gasket

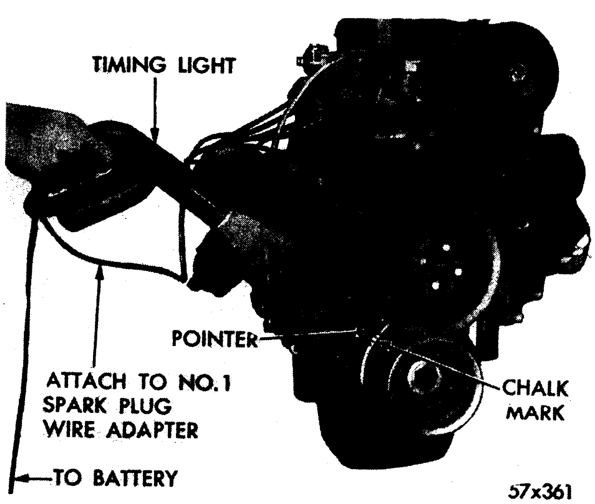


Fig. 19—Ignition Timing (Typical View)

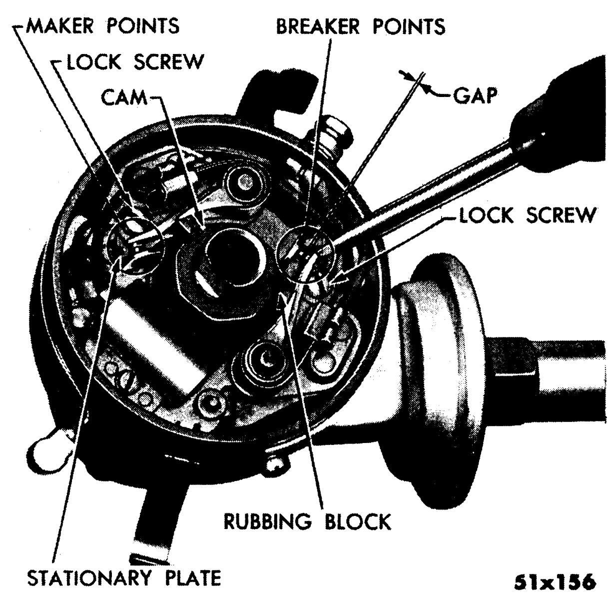


Fig. 20—Installing and Aligning Contacts (Typical View)

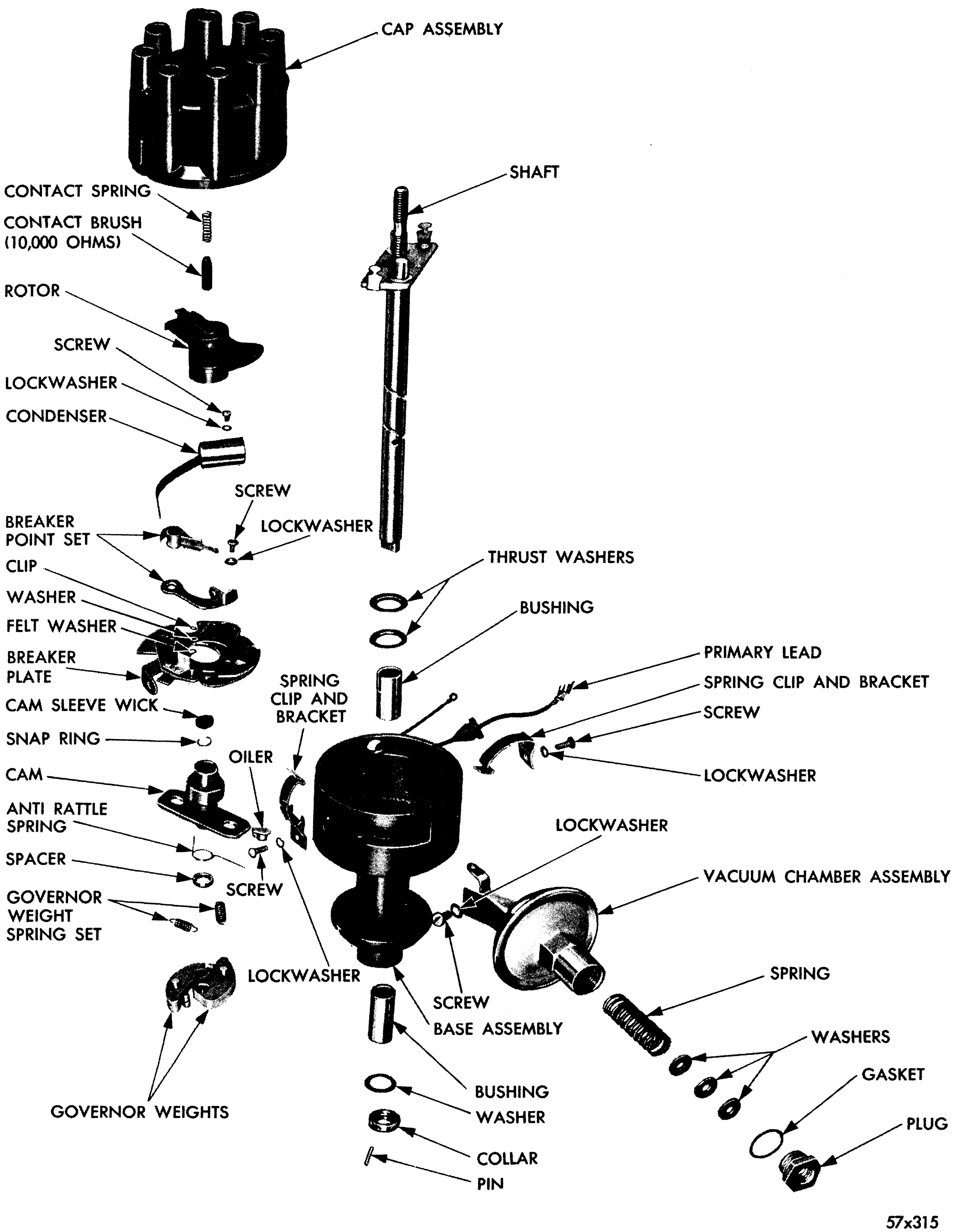


Fig. 21—Single Point LC-1, LC-2 Distributor (Disassembled)

and remove washers. Check thickness of removed washers and substitute thinner washer if specified advance requires more than required vacuum. Replace with thicker washer if vacuum required to move plate is less than specified.

In some cases it may be necessary to replace spring and then, adjust to Specifications by means of various combinations of washers. The right combination of washers are installed when distributor plate is rotated to its full position with specified vacuum applied.

41. INSTALLING AND ALIGNING CONTACTS (FIG. 20)

Remove old contacts and install new set. Adjust spring tension 17 to 20 ounces.

Align contacts to provide center contact by bending stationary contact only. Grip bracket next to contact and bend it away from breaker arm and then, bend it back to vertical. A new stationary contact is always lower than arm. It may be necessary to repeat bending process several times to provide perfect alignment that is absolutely necessary for efficient ignition and good contact life. It may be necessary to twist stationary contact to obtain alignment. **Never bend movable arm.** Following alignment of contacts; readjust clearance .015 to .018 inch.

42. ADJUSTING CONTACT POINT CLEARANCE

Measure clearance with feeler gauge, dial indicator or with a dwell meter .015 to .018 inch. New contacts should always be adjusted to .018 inch. This will allow rubbing block to wear into cam contour and still provides specified clearance when shaped.

Where dwell meter is used to check clearance it is essential to adjust clearance with feeler gauge or dial indicator. A dwell reading that varies from specified clearance indicates that one or more of following conditions are present and must be eliminated. (1) Worn rubbing block. (2) Rubbing block not square with cam. (3) Badly worn cam (old distributor). (4) Worn distributor bushings. (5) Movable contact arm that has been bent. On dual breaker arm distributors clearance should be same for both sets of contacts.

43. DISASSEMBLY OF DISTRIBUTOR (FIGS. 21 AND 22)

Remove vacuum chamber retaining screws,

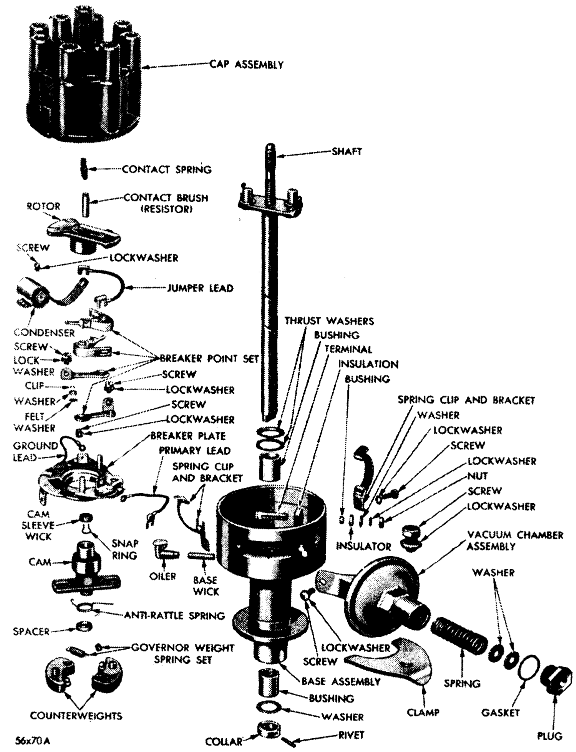


Fig. 22—Dual Point LC-3, LY-1 Distributor (Disassembled)

vacuum lever arm spring clip retainer, washer and felt. Remove vacuum unit and distributor cap clamp springs. On LC-3 and LY-1 loosen primary terminal post nut and remove primary lead. LC1-2—Push in rubber grommet and remove primary lead. Lift breaker plate assembly from distributor.

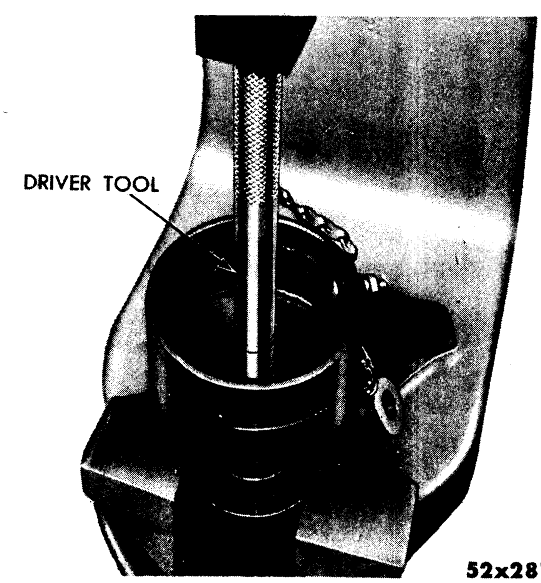


Fig. 23—Removing Drive Shaft Bushing

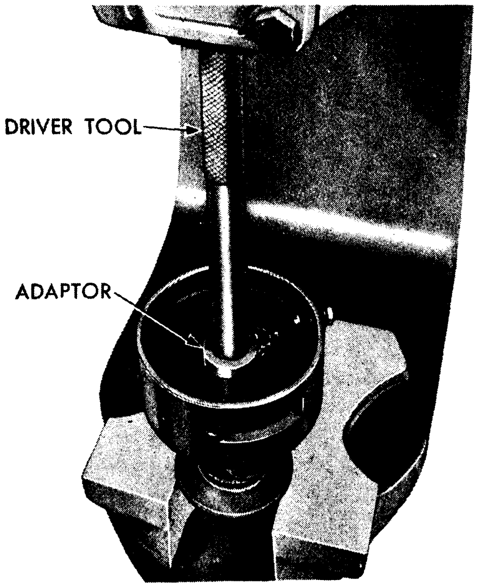


Fig. 24—Installing Upper Bushings (Typical View)

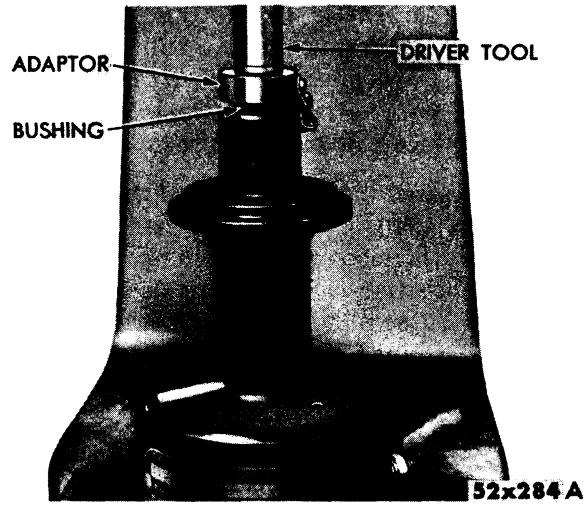


Fig. 25—Installing Intermediate Bushing (Typical View)

Remove cam felt and spring clip retainer from center of cam. Disengage anti-rattle spring and remove cam and yoke. Place distributor in vise and attach dial indicator to body. Move shaft **to** and **from** dial indicator with just enough force to indicate clearance. Replace bushings and/or shaft if side play exceeds .005 inch. Drive rivet from collar and shaft, and slide shaft from distributor body. Wash all parts in solvent, except breaker plate assembly and vacuum unit. Clean these parts with a brush moistened with solvent. Blow parts dry with compressed air.

44. REPLACING DISTRIBUTOR BODY BUSHINGS

With distributor disassembled, place housing in arbor press and remove the bushings with driver, Tool C-3041 (Fig. 23). Soak new bushings in light engine oil for approximately 15 minutes.

Place adapter over driver with shoulder down and slide new upper bushing over driver and down on adapter shoulder. Insert bushing and driver into bore (Fig. 24), and press bushing into position. The bushing, when properly installed, will measure .094 inch below top of bore.

Place adapter over driver with shoulder down and slide new upper bushing over driver and down on adapter shoulder. Insert bushing and driver into bore (Fig. 24), and press bushing into position. The bushing, when properly installed, will measure .094 inch below top of bore.

Invert distributor housing, reverse adaptor driver and slide bushing on driver. Insert driver and bushing into housing and press bushing in until it is flush with bottom face of distributor base (Fig. 25). Drill 1/8 inch hole through upper bushing by drilling through oil wick hole. Remove burrs from hole after drilling. Install burnishing tool into upper bushing and force it through both bushings. The burnishing tool is designed to burnish hole to proper diameter of .4995 to .5000 inch.

SPARK PLUGS

45. SERVICING SPARK PLUGS

a. Removal

Remove single rocker shaft engine spark plugs with Tool C-3054. For double rocker shaft engine remove ignition cable cover, air cleaner on right side and heater blower. Loosen plug with Tool C-3054 and lift out tube and plug. No gaskets are used on double rocker shaft engines.

b. Cleaning and Adjusting

Spark plugs that are badly oxidized or have electrodes that show considerable wear should be replaced. Clean plugs in blast type cleaner.

Be sure all compound is removed from plug. Adjust gap with round gauge to .035 inch by bending side electrode only.

c. Installation

NOTE: Spitfire engines are equipped with 3/8 inch base plug, as shown in Figure 26, A. Fire Power engines have a 3/4 inch base, as shown in Figure 26, B. Both plugs use an extended electrode for better efficiency and performance.

Where necessary to replace spark plugs, always use same type plug as one removed. Do not use short electrode plug in place of extended electrode or interchange 3/8 inch base plugs with 3/4 inch base plugs.

To assure good heat transfer clean seats in head and also tube (double rocker shaft engines). Use new gaskets on plugs for single rocker shaft engines. **No gaskets are used on double rocker shaft engines.** When installing plugs in double rocker shaft engines, place plug in socket wrench and lower tube over plug, (Fig. 27), before installing. Tighten plugs 32 foot-pounds torque.

46. HIGH TENSION CABLES, DISTRIBUTOR CAP AND ROTOR

a. Cables

Clean high tension cables and inspect for cracks and chafed spots. Replace damaged cables. Fit terminals to spark plug caps so they will fit snugly when installed. Terminal clips should fit tight in cap towers.

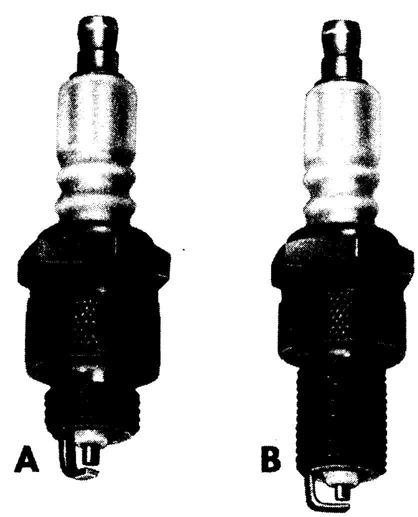


Fig. 26—Spark Plugs 56x321A
a. Spitfire
b. Firepower

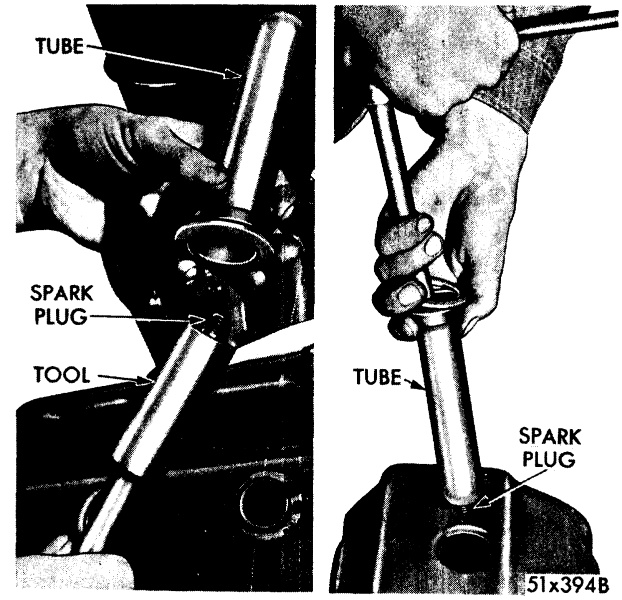


Fig. 27—Removing and Installing Spark Plugs

b. Distributor Cap and Rotor

Inspect cap for cracks and clean corrosion from towers. Inspect electrodes for excessive burning. Inspect rotor for cracks and burned tip. Inspect brush spring for distortion and be sure carbon brush moves freely in cap. Push cables all the way into towers.

47. IGNITION COIL

Clean oil and dust from coil. Clean corrosion from secondary tower and push cable all the way in. Be sure primary leads are connected to proper primary terminals according to polarity markings. The coil is designed to operate with a ballast resistor. The resistor is mounted on the coil bracket and must be included with coil when making a test of primary output. Coils that are tested without resistor will appear to be defective.

Check coil for external leaks and arcing. Always make two tests when checking coil. One when coil is cold, the other after coil has warmed up. The ballast resistor and coil must be tested together for output. To check the high tension circuit, pull secondary cable out of distributor cap. Hold end of cable about 1/4 of an inch away from cylinder head and crank engine with engine ignition switch on. If spark jumps 1/4 inch gap, coil can be considered satisfactory.

LIGHTING SYSTEM

48. HEADLIGHT AIMING AND ADJUSTMENT

The dual headlight system has **two** 5¾ inch Sealed Beams on each side of the front of the vehicle. (Fig. 29).

Identification on the 5¾ inch lamps is accomplished by the numeral "1" molded in the top of the lens of the inner or single filament lamps and by the numeral "2" molded in the top of the lens of the outer or double filament lamps.

The inner lamps only operate on the upper beam. The outer lamps operate on both upper and lower beams. When the upper beam switch is used for highway driving, all four lamps will be in operation.

a. Headlight Aiming Using Wall or Screen

Place car on level surface with screen 25 feet ahead of headlight lenses. The screen (or wall) should be painted a light color. The horizontal line on screen should be 2 inches below center line of headlights (Fig. 28). The center vertical line should be equi-distant from two outer lines which represent vertical center of headlights.

b. Headlamp—Horizontal Alignment

Car should be on a level floor, directly facing the screen, 25 feet from the headlight lenses. Locate the center line of the car with the center vertical line of the screen. By measuring from the floor to the center of the head lamps determine the horizontal center line of the lamps. Transfer this measurement to the screen; then, locate the horizontal aiming line two (2) inches below the head lamp horizontal center line (See Fig. 28).

c. Vertical Alignment

It will be necessary to determine vertical center lines of both inner and outer head lamps from the center of the car. Alignment should be made on the inner lamp on high beam as in Figure 28 (block off outer lamps). On low beam, adjust the outer lamp units in accordance with the low beam pattern as shown in Figure 30. Adjustment is obtained by screws at top and sides of headlights (Fig. 29).

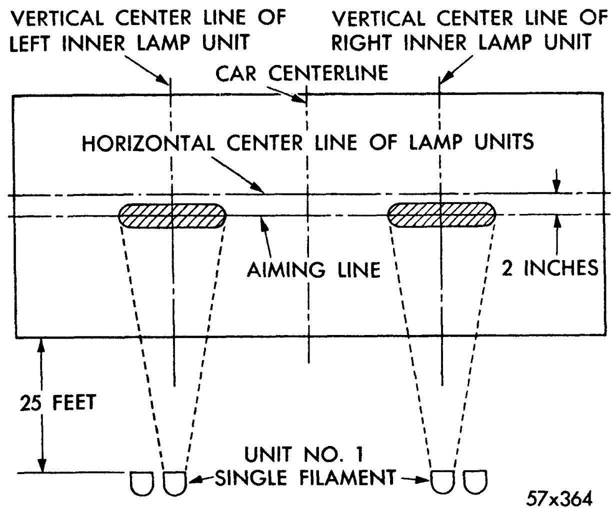


Fig. 28—Adjusting Single Filament Headlight

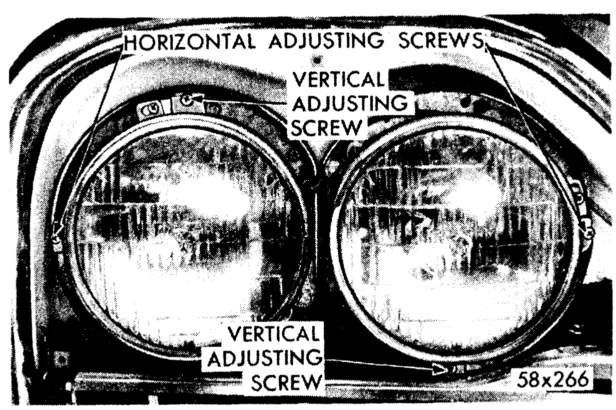


Fig. 29—Adjusting Dual Headlight

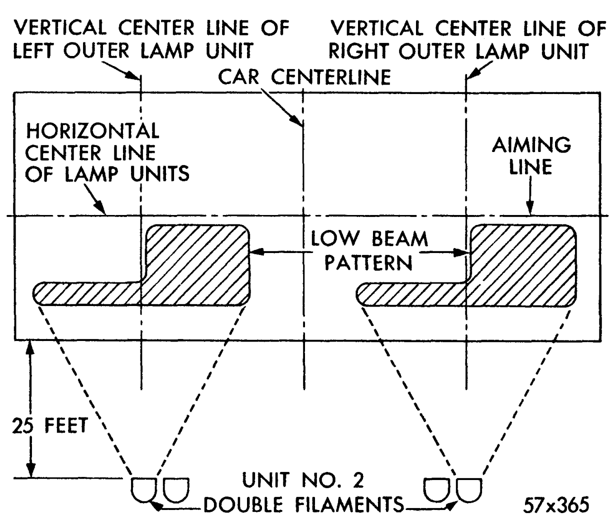


Fig. 30—Adjusting Double Filament Headlight

d. Tolerances (No. 1 units)

(a) A vertical tolerance of ± 2" will be tolerated.

(b) A horizontal tolerance of ± 6" will be tolerated.

The lower beam of the No. 2 unit will be aimed so that the top edge of the high intensity portion of the pattern is aimed at the level of the lamp center and the left edge of the high intensity portion of the pattern is aimed straight ahead.

e. Tolerances (No. 2 unit)

(a) A vertical tolerance of ± 2" will be tolerated.

(b) A horizontal tolerance of 6" to the right will be tolerated.

Upon aiming the lower beam of the No. 2 unit, the upper beam of the No. 2 unit will be automatically aimed.

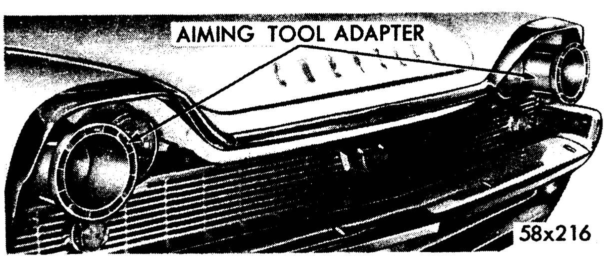


Fig. 31—Headlight Aiming Tool Adapters

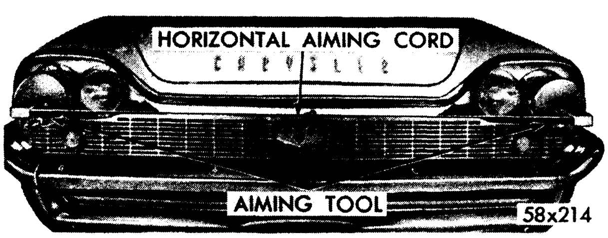


Fig. 32—Aiming Outer Headlights

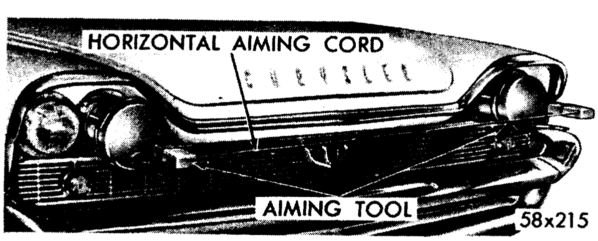


Fig. 33—Aiming Inner Headlights

f. Adjusting Headlights Using Tool C-3552

Headlight may be adjusted by using Tool C-3552. Refer to Figs. 31, 32 and 33. Use aiming tool according to manufacturers recommendations.

49. TESTING VOLTAGE AT HEADLIGHTS

One of factors affecting lighting efficiency is loss of voltage to light bulbs due to high resistance in circuit. Headlight voltage must be measured with lights burning and battery in fully-charged condition.

Remove headlight rim and, with Sealed-Beam unit partially removed from its mounting seat, attach leads of reliable voltmeter to prongs of Sealed-Beam unit while it is still inserted in connector socket. With Sealed-Beam unit in its correct position, top prong supplies current for low (traffic) beam. One of the side prongs supplies current for high beam and the other is ground connection.

With only lights burning, engine warmed up and running at speed equivalent to car speed of about 20 m.p.h., voltage at headlights should be not less than 13.25 volts, or more than 14.5 volts (with battery and generator at room temperature, approximately 70 degrees F.). If voltage is low at either headlight socket (with only standard equipment in the circuit), proceed as follows:

Test voltage output of battery which should be 12 to 12.5 volts. Clean and tighten battery terminals and ground cable. Check wires and connections to all lights, and check main headlight switch and dimmer switch for high resistance. When voltmeter is placed between ground and input side of switch and then between ground and output side of switch (with lights burning), difference in readings will represent the voltage drop in switch. The same method may be used in checking voltage drop in wires by taking reading at each end of wire. A switch showing voltage drop of more than one-tenth of a volt, or wire showing a voltage drop of one-tenth of a volt should be replaced. If any wire in lighting circuit has been replaced with other than standard equipment wire, it may lack capacity and cause voltage drop. The most important wire in entire primary circuit is wire that is connected from starter switch to ammeter, because it must carry full load of all branching circuits.

50. CIRCUIT BREAKERS

The Headlight circuit breaker (22½ amperes) is integral with light switch, and the Windshield Wiper circuit breaker (6 amperes) is on back of wiper switch on Imperial Models and on bracket behind clock of the LC-1-2-3 Models. The Convertible Coupe Top Lift circuit breaker (25 amperes) is on top light switch.

The Rear Compartment Cigar Lighter circuit breaker is 8 amperes on Four Door Sedans and Convertible Coupes, and the window lift circuit breaker, is 20 and 30 amperes. They are located behind left front kick panel on side cowl. The Seat Lift circuit breaker (40 amperes) is behind left kick panel on side of cowl.

51. DESCRIPTION AND OPERATION OF FUEL GAUGES

The fuel gauge system incorporates an electromagnetic unit on all models. The system is connected to battery through ignition switch. The gauges operate only when ignition switch is in "Accessory" or "ON" position (Fig. 34).

A single wire connects electro-magnet and tank unit, and the tank unit case is grounded. As fuel in tank moves from "full" to "empty", a change in magnetic field surrounding variable field magnet (Fig. 34) takes place. This change in the magnetic field causes the gauge hand indicating the amount of fuel in the tank to move from "full" to "empty".

52. TESTING THE ELECTRO-MAGNETIC FUEL GAUGE

For following tests, ignition switch must be turned counter-clockwise to "Accessory", or extreme left hand position.

a. Testing Wire from Ignition Switch to Panel Unit

Connect one wire of test lamp to "SW" terminal on panel unit and connect other wire to a ground. If lamp lights when ignition switch is turned on, this circuit is in good condition.

b. Testing Panel and Tank Units for Ground

The panel unit and tank unit must have good grounds to operate properly. Use jumper wire to temporarily ground each unit at case. If gauge reading changes when temporary ground

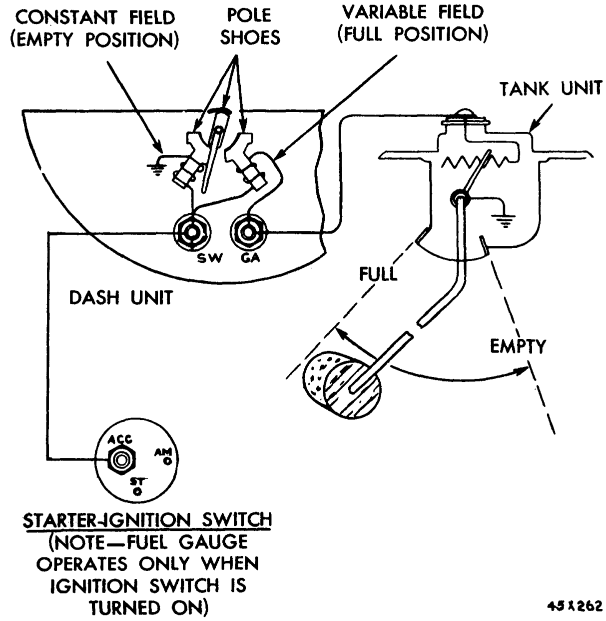


Fig. 34—Electro Magnetic Fuel Gauge Circuit

is made, make sure that case of unit under test is properly grounded. Clean and tighten mounting screws of panel unit. Clean contacting surface of tank unit, and make sure retainer is tight.

c. Testing Wire Between Panel Unit and Tank Unit

Disconnect wire at both ends. Connect test lamp between "AM" terminal of ignition switch and one end of wire. If lamp lights, wire is grounded and should be repaired. If lamp does not light, ground opposite end of wire. The lamp should light; if it does not, the wire is broken and should be replaced.

IMPORTANT

To get good electrical contact at terminals, place a shake-proof type washer on terminal stud before installing wire. The prongs of washer will dig into mounting and form a good contact.

d. Testing Panel Unit and Tank Unit

If previous tests indicate that panel unit is receiving current when ignition switch is turned on, panel and tank units are properly grounded, and wire between units is in good condition, test panel unit and tank unit as follows:

Use spare tank unit that is in good condition and same type. Some types of tank units may appear to be similar, but may have "reverse action" which would cause a false indication. To use spare tank unit, disconnect wire at "GA" terminal of panel unit. Connect spare tank unit to "GA" terminal and ground case of spare tank unit with jumper wire. Move float arm of spare tank unit up and down. If panel unit registers correctly, tank unit in car is faulty and should be replaced. Remove tank unit, as shown in Figure 35. If panel unit does not register when float arm of spare tank unit is moved up and down, panel unit is faulty and should be replaced.

53. TESTING THE ELECTRO-MAGNETIC FUEL GAUGE TANK UNIT (REMOVED)

To test tank unit, connect jumper wire from 12-volt battery to 12-volt test lamp, and connect ground side of lamp to another jumper wire leading to tank unit terminal. Connect another jumper wire from tank unit case to other side of battery. With float in "full" position, lamp should light at almost full brilliance. When float is lowered, light in lamp should steadily decrease in brightness until it will just barely glow in a reasonably dark room.

This test will show whether or not tank unit is operating properly; but, it will not indicate exact calibration. If contact wiper does not contact wire cone resistor, the gauge will not function. In most cases of tank unit failure, unit should be replaced (Fig. 35). When installing unit in tank, do not bend float arm. Make sure that gasket is properly positioned and tighten lock ring.

54. ELECTRIC TEMPERATURE GAUGE

The electric (or magnetic) temperature gauge consists of two units, dash unit and engine

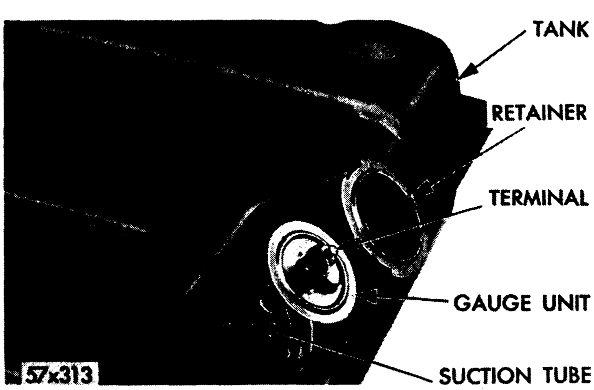


Fig. 35—Removing and Installing Fuel Gauge (Tank Unit)

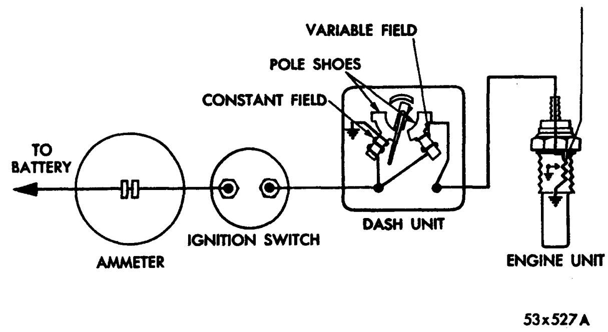


Fig. 36—Electric Temperature Gauge

unit. The gauge is connected to source of voltage through ignition switch.

a. Dash Unit

The dash unit (Fig. 36) has two magnetic poles. One of windings is connected to ignition switch and to ground. The other winding in dash unit connects to ground through engine unit.

b. Engine Unit

The engine unit changes resistance as its temperature varies causing a corresponding change in the strength of the variable field in the dash unit.

55. TESTING THE ELECTRIC TEMPERATURE GAUGE CIRCUIT

a. Test 1

Disconnect wire at engine unit and turn on ignition. The gauge hand should stay against left side stop pin.

b. Test 2

Ground wire disconnected from engine unit and turn on ignition. The gauge hand should swing across dial to right side stop pin.

c. Test Results and Corrective Measures

Item 1—If gauge hand does not stay on left hand stop pin in Test 1, wire is grounded between dash unit and engine unit or dash unit is defective. Test further by disconnecting wire at dash unit "GA" terminal and turn on ignition switch. If gauge hand now stays on left hand stop pin, replace wire. But, if gauge hand still moves, replace dash unit.

Item 2—If gauge hand does not swing across dial in Test 2, there is an open circuit in wire between dash unit and engine unit, dash unit is defective, or no power is reaching dash unit. Test further by grounding "GA" terminal on dash unit and turning on ignition switch. If gauge hand now moves, replace wire. If gauge hand still does not move, connect 12-volt test lamp from dash unit ignition terminal to ground. Turn on ignition switch. The test lamp should light. If test lamp lights, replace dash unit. But, if test lamp does not light, test wire between ignition switch and dash unit by connecting test lamp to "Accessory" terminal at ignition switch and to ground. When this is done, test lamp should light.

Item 3—If gauge hand operates correctly in Test 1 and Test 2, but gauge does not indicate temperature changes correctly, engine unit is defective, or dash unit is not calibrated properly. Use an engine unit that is in good condition. Then, if gauge is still not accurate, replace dash unit.

Item 4—If gauge hand is at right hand stop pin (maximum) at all times, and Test 1 and Test 2 indicate that wiring and dash unit are in good condition, the engine unit is defective. Install new engine unit. If gauge hand will not move, dash unit is damaged or incorrectly installed. Install unit correctly, or replace as necessary.

56. TESTING THE OIL PRESSURE GAUGE

Test oil pressure gauge by hooking up an accurate gauge and comparing readings. The hook up can be made by using "Tee" fitting at flexible hose connection. Warm up engine and compare readings for idle and normal driving pressures.

Be sure that oil level is checked before making this check. An oil gauge pointer that flutters is usually an indication that oil has entered oil tube connecting gauge to engine block. The tube should have air in it to cushion pulsations of oil pump and oil relief valve. The fluttering pointer may be result of leak in oil gauge tube or due to improper installation. To correct this condition, disconnect tubing at gauge and engine block and drain out oil. Connect tubing at gauge first and then at block.

Test for possible plugging by breaking connection at gauge. Hold gauge end of line over an empty, clean container and start engine. The oil should flow at a steady rate. If it does not flow steadily, tube may be kinked or plugged. Check $\frac{1}{32}$ inch hole in gauge tube nipple in block. If it is plugged, this hole can be cleaned with a fine pin.

If oil lines are open and gauge does not operate, small hole leading into tube may be plugged. The hole can also be cleaned out with a pin.

57. SPEEDOMETER

When speedometer fails to indicate speed or mileage, cable or housing is probably broken.

a. Speedometer Cable

Most cables are broken due to lack of lubrication, a sharp bend or kink in housing. A cable may break if speedometer head mechanism binds. If such is the case, speedometer head should be repaired or replaced before new cable or housing is installed.

A "jumpy" pointer condition (together with a sort of scraping noise) is due, in most instances, to dry or kinked speedometer cable. The kinked cable rubs on housing and winds up, slowing down pointer. The cable then unwinds and the pointer "jumps". To check for kinks, remove cable, lay it on flat surface, and twist one end with fingers. If it turns over smoothly, the cable is not kinked. But, if part of cable flops over as it is twisted, cable is kinked and should be replaced.

b. Lubricating Speedometer Cable

The speedometer cable should be lubricated with MOPAR All-Weather Speedometer Cable Lubricant every 10,000 miles. At the same time, put in a few drops of MOPAR Speedometer Oil on wick in speedometer head. Refer to Section XV, "Lubrication."

Fill ferrule on upper end of housing with MOPAR Speedometer Cable Lubricant. Insert cable in housing, starting at upper end. Turn cable around carefully while feeding it into housing. Repeat filling ferrule except for last six inches of cable. Too much lubricant at this point may cause lubricant to work into indicating head.

c. Installation of Speedometer Cable

If cable sticks when it is inserted into housing and will not pass through it, interior of housing is damaged or kinked. Be sure to check housing from one end to other. Straighten sharp bends by relocating clamps or elbows. Replace housing if it is badly kinked or broken. Position cable and housing so that they lead into head as straight as possible.

58. AMMETER

The ammeter shows only current flowing to or from battery, as case may be, and does not indicate entire generator output. The current supplied for ignition, lights and accessories is automatically deducted from generator output reading. Because of this, the ammeter should never be used as an accurate check for generator current output. Ammeter should not indicate more than 10 ampere charge above 30 miles per hour, after first 30 minutes of continuous driving. If more than a 10 ampere charge is indicated with a battery specific gravity of 1,260 or higher, check voltage control regulator.

SWITCHES

59. IGNITION STARTER SWITCH (STANDARD TRANSMISSION)

The following precautions must be followed when installing accessories such as heaters, radio, spot-light, etc. Use accessory terminal **only** on ignition switch and **not** the ammeter terminal post.

a. Starter Switch (Torque-Flite Transmission —Only)

The starter switch is mounted on the push button box and is actuated by the neutral push button.

b. Vacuum Switch is located on Engine Intake Manifold.

c. Neutral Switch is located on outside of Torque-Flite transmission.

60. REMOVAL AND INSTALLATION OF IGNITION LOCK CYLINDER

NOTE: Remove battery ground cable before removing ignition lock cylinder.

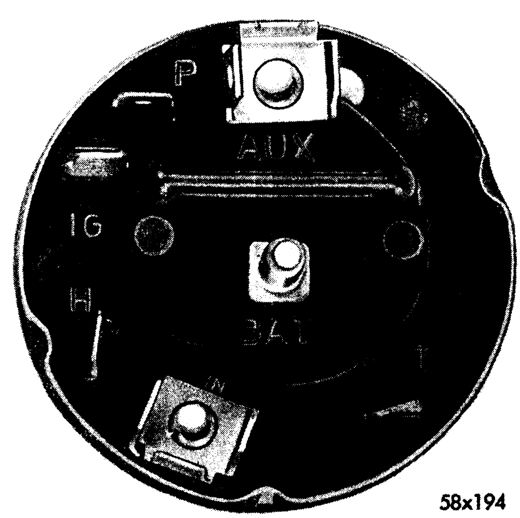
To remove ignition lockcylinder, turn ignition key clockwise to "on" position, and loosen set screw holding switch in instrument panel. Pull switch assembly out from instrument panel toward firewall far enough to allow lock cylinder locking pin to clear instrument panel. With ignition key in "on" position, use pointed punch to push in on cylinder locking pin, while pulling on cylinder. Remove ignition lock cylinder. To install lock cylinder in switch, line up locking pin with slot in switch housing. Press in on cylinder lock assembly. Install switch in instrument panel and tighten locking screw.

61. WINDSHIELD WIPER SWITCH

The windshield wiper switch has a 6 ampere circuit breaker for circuit protection. The armature resistor, windshield wiper, parking and battery terminals are located on outside of switch.

62. HEADLIGHT SWITCH (FIG. 37)

The headlight and panel light switches are combined into one unit, but are operated by separate controls. On all models, switch (or switches) is held in instrument panel by a threaded sleeve and hex nut. The panel light switch control encircles inner headlight switch and is indexed on its shaft by lugs in tabe plate and slots in shaft. The headlight switch knob is held on its shaft by a recessed hex screw. If a switch is unoperative or defective, replace complete unit.



58x194

Fig. 37—Headlight Switch (Rear View)

63. TURN SIGNAL SWITCH AND CIRCUIT LY-1

The turn signal circuit used on the Imperial models consists of a manual canceling switch, an automatic canceling switch, a flasher unit, a relay and the necessary connecting wires and lamps.

The manual canceling switch is of the "rocker button" or "teeter" type, with the letter "R" at the top for a right turn, and the letter "L" at the bottom for a left turn. It is located at the bottom of the row of push buttons for the Torque-Flite transmission. To operate the switch, merely push the "R" or "L" end of the rocker button. If an error has been made and you wish to turn the signal off, merely press the center of the rocker button and the signal becomes inoperative.

The automatic canceling switch is mounted on the steering column, and automatically cancels the signal when the steering wheel returns to the straight-ahead position.

The flasher unit is mounted on the back of the speedometer, behind the instrument panel.

The relay is mounted at the top of the left cowl side panel. It contains the latching relays which hold the circuits closed until they are broken either by the automatic or manual canceling switches.

HORNS

Three makes of horns are used. Sparton, Auto-Lite, and Jubilee. The horn circuits are tested in the same manner for all three makes. The tone adjustment however, is different for each type. The horn relay is electrically connected to ignition switch and does not operate when switch is in "OFF" position.

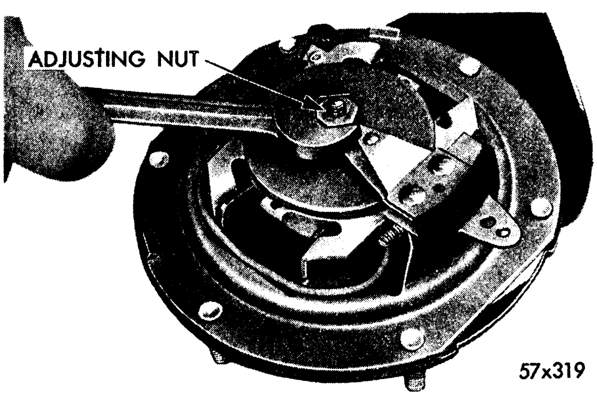


Fig. 38—Adjusting (Sparton) Horn

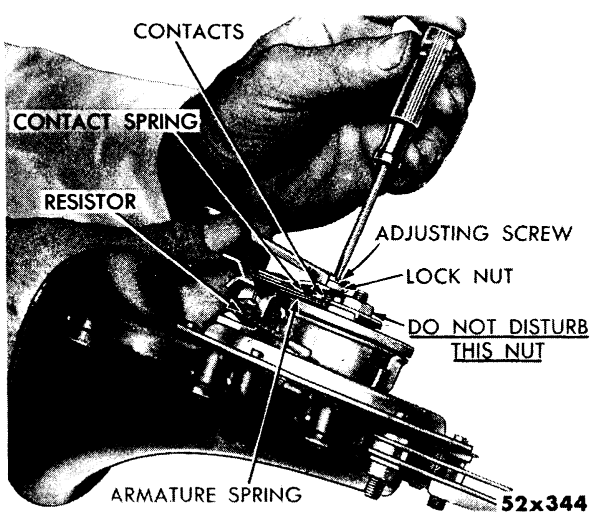


Fig. 39—Adjusting (Auto-Lite) Horn

64. TESTING HORN CIRCUITS

When horns fail to blow, test circuit as follows. Touch jumper wire from Relay "SW" terminal to ground. If horn blows, it is an indication that trouble is in wire from "SW" terminal to horn button, or in horn button contact ring. If horns do not blow, connect jumper from "B" terminal to "H" terminal. If horns operate, relay is defective. If horns do not blow, trouble is in wire to horns, in horns, or in the wire from starter relay to horn relay "B" terminal.

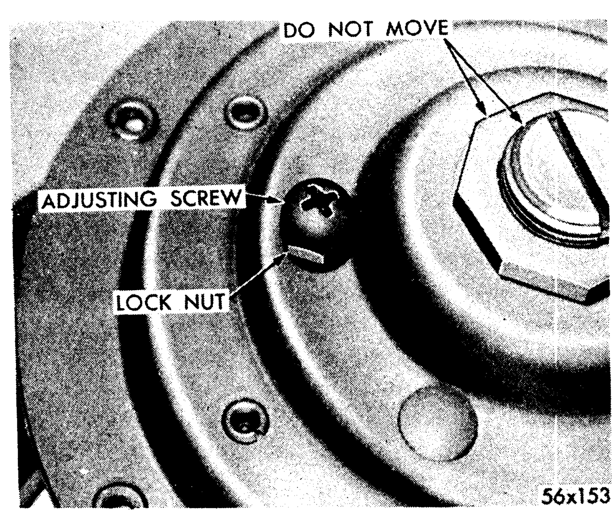


Fig. 40—Adjusting (Jubilee) Horn

65. SERVICING THE HORNS

a. Adjusting the Sparton Horns

Pry cover from horn. Remove contact adapter, turn adjusting nut counter-clockwise (Fig. 38) until there is no vibration. Turn adjusting nut clockwise approximately ¼ turn, or until tone has clear, mellow sound.

b. Adjusting the Auto-Lite Horns

Pry cover retaining clips up, and remove cover. Loosen lock nut and turn adjusting screw (Fig. 39) clockwise until vibration stops. Then, turn adjusting screw back counter-clockwise, approximately ¼ turn until tone is clear and mellow, and tighten lock nut.

c. Adjusting the Jubilee Horn (High and Low)

To adjust Jubilee horn tone, connect test ammeter between positive post of 12-volt battery and horn terminal post. Connect jumper lead from negative battery post to horn base. Observe test ammeter and rotate adjusting screw (Fig. 40) to right or left to obtain reading of 8 or 9 amperes at 12.4 volts. Tighten adjusting screw lock nut.

WINDSHIELD WIPERS

66. VARIABLE SPEED, OFF-GLASS PARKING WINDSHIELD WIPERS

(Refer to Figure 44). The variable speed motor is a compound wound, reversible type unit which makes possible off-glass parking feature. The wiper also contains a Geneva Wheel in gear box for actuating off-glass parking switch, and an eccentric in connecting link at wiper crank pivot which automatically lengthens links making off-glass parking position possible.

67. REMOVAL DISASSEMBLY AND ASSEMBLY OF VARIABLE SPEED WINDSHIELD WIPERS (Fig. 41)

a. Removal

To facilitate assembly or disassembly of eccen-

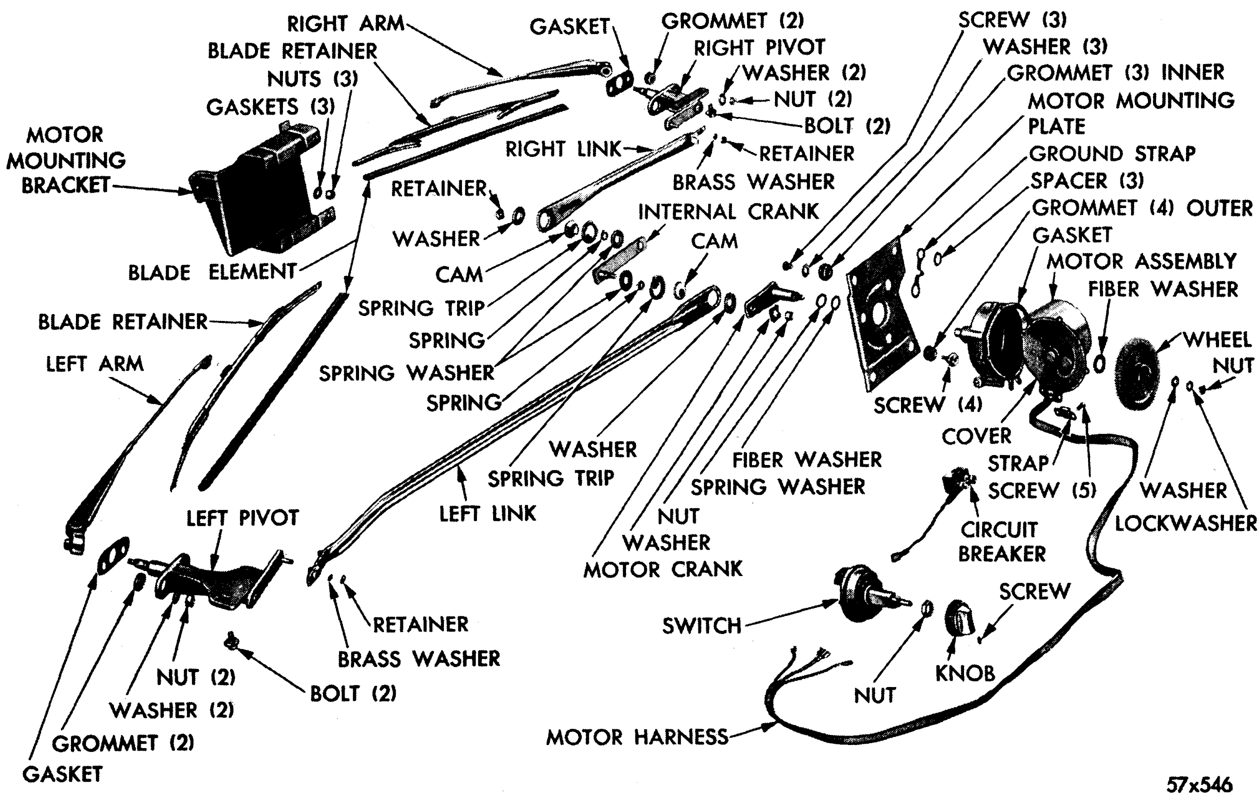


Fig. 41—Windshield Wipers (Disassembled)

trics at the motor crank and link ends, remove windshield wiper assembly as a unit whenever wiper or links are to be serviced.

I. **Cars that are not equipped with heater and defroster ducts:** Disconnect the wiper leads at switch. Disconnect wiper links at pivot cranks by removing clips and brass washer. Remove three (3) nuts which hold the large wiper motor bracket to firewall. The complete unit may now be removed by moving the bracket back far enough to clear the studs and lowering unit down from under instrument panel.

NOTE: Care should be taken not to bend the links and battery should be disconnected to eliminate the possibility of shorts.

II. **Cars equipped with Heater and Defroster ducts.** Remove glove box and door. If car is equipped with a radio that removes from front of instrument panel, time will be saved by removing it. Disconnect wiper leads from the switch. Disconnect links from pivot cranks by removing clip and washer. While holding unit in place, remove four (4) self-tapping stud bolt assemblies from motor plate to motor bracket which is attached to firewall. The unit may now be moved horizontally towards passenger side and then down from under instrument panel. The motor bracket can be removed by taking off three attaching nuts and bringing it straight down after clearing the studs.

b. Disassembly of Windshield Wiper Link (Fig. 41)

With motor and link assembly laying on clean bench, remove clip that holds right-hand link to crank arm. Remove bevel washers, and carefully remove link. The pivot end of link is provided with a stop to prevent wipers from going over center and locking. Remove parking cam and spring release. Remove coil spring from around pin by spreading the springs ends apart, and remove spring washer. The left-hand link is disassembled in same manner, after removing crank arm to crank lever retaining nut. To replace wiper switch or Geneva Wheel remove switch plate.

c. Assembly of Motor Switch

Make sure gear box contains lubricant. Install switch plate. Be sure Geneva Wheel follower pin engages smoothly with top of gear.

d. Assembly of Windshield Wiper Link

Install spring washer, with concave surface toward crank arm. Expand ends of crank pin coil spring and install on crank pin. Install spring release.

NOTE: The spring releases are identical but must be installed in accordance with the following letter code; looking directly at the crank, the spring release, and the link, have the same code letter visible.

Install parking cam so that it will index with spring release, and engage ends of spring between release and parking cam in openings at point of index. Install washer with convex surface toward cam and link assembly. Install retaining bolt and nut. Assemble right link and cam assembly to crank lever pivot in same manner, locking in place with a clip instead of retaining bolt.

e. Pivot Removal

Remove the wiper arms and blades. Remove two (2) front stud and washer bolts (on the Imperial models the front of pivot is held in place by an exterior spanner nut, bezel, and sealing gasket). Remove the back two (2) bolts. The pivot can now be removed from inside of car.

f. Installing New Pivot

Install new gasket and pivot. The use and proper installation of Belleville Type washers and bolts is important. Hand tighten bolts. Draw up front two nuts and washers 65 inch pounds torque, tighten back bolts, 75 inch-pounds torque, to insure a good seal.

g. Installation of Windshield Wiper Motor Bracket and Link Assembly

Install three rubber gaskets on bracket studs. Reinstall in reverse order given for removal in preceding section. All nuts and bolts should be tightened 75 inch-pounds torque, except wiper arm is tightened 85 inch-pounds torque. To readjust wiper arms: Loosen wiper arm nut until a definite click is head. Move arm to desired position and tighten 85 inch-pounds torque.

NOTE: All wiper arms are capable of infinite adjustment with respect to the pivot shaft.

h. Switch Color Code

Red Lead—field lead—switch terminal F-1.

Yellow Lead—field lead—switch terminal F-2.

Black Lead—armature lead—switch terminal "A".

Blue Lead—Park Lead—switch terminal "P".

Heavy Lead—hot lead from battery—connect to circuit breaker.

68. PUSH PEDAL CONTROL

When the pedal is depressed, a stream of washer fluid will spray the windshield, also the windshield wipers will start to operate as long as the pedal is depressed. The electrical pedal control is standard on Models LC-3 and all Imperial Models. It is optional equipment on the LC-1-LC-2 Models. Figure 42 show the wiring diagram.

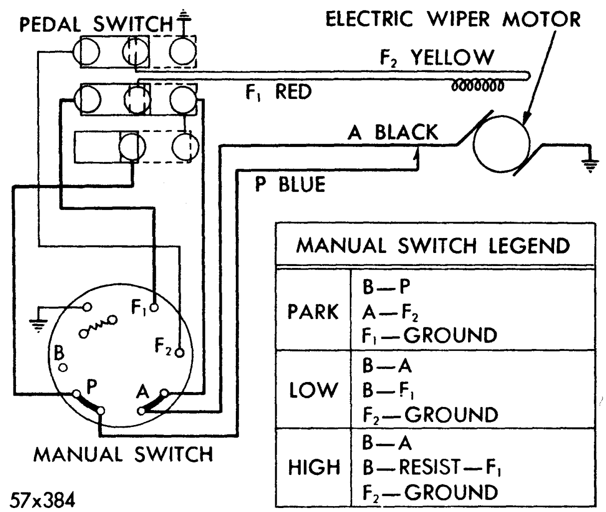


Fig. 42—Pedal Control—Electric Windshield Washer—Wiring Diagram

ELECTRIC WINDOW LIFTS

The three component parts in basic circuit are circuit breaker, motor, and switch. There is no relay, and switch carries full amperage load of motor.

The power window lift motors have an individual, built-in circuit breaker. All models, except four door special, use one 20 amp. circuit breaker on left cowl side to protect wiring to both front and rear motors. The four door special uses one 30 amp. circuit breaker for same purpose. Four switches are used to control window lifts—a master switch located on left front door, and an individual door switch for each of other doors. The individual switch feeds are brought out to circuit breaker on cowl side. The harness for right door is carried across upper firewall. The motors require no lubrication.

When operating a window, normal amperage draw is 12 to 16 amperes for all cars, except rear doors of four door Nassau, Newport and St. Regis models which draw approximately 18 to 22 ampere. This will vary with voltage.

69. REMOVAL OF WINDOW LIFT

Disconnect battery and remove garnish molding. Remove door handle control, escutcheon plate. Remove door trim panel, arm rest bracket, and window lift control switch. Disconnect wires from motor. Remove clips from regulator pins which hold lower glass channel. On Imperial models remove studs and rollers from regulator arms.

Raise glass manually and prop glass in up position. Raise glass before loosening cap screws so that it is out of working area. Remove four regulator to door attaching cap screws and pivot guide retaining pin. Lower motor and regulator assembly through opening in door.

If gear box is to be replaced, remove regulator counter-balance spring before removing unit. The counter-balance spring has approximately 360 degrees of wrap.

CAUTION

Use large pair of pliers when removing. Be sure to remove spring before disassembling gear box.

The gear box, which is replaced as an assembly, consists of worm and worm gear. The worm gear drives a pinion which is meshed with regulator sector gear. The gear box is lubricated at assembly and should not require further lubrication. Use MOPAR Lubriplate, 105 light-weight on all other moving parts.

70. INSTALLATION OF WINDOW LIFT

Place motor and regulator assembly through opening in door and insert intermediate pivot arm pin into guide inside of door shell. There is no clip. Install four regulator attaching screws, finger tight.

After installing regulator retaining screws, check to make certain that intermediate pivot arm did not slip out of guide during installation. Remove window prop and lower glass. Insert control arms into glass channel, using leather washer on each side of channel, and secure with clip. On Imperial Models, install rollers and pins in regulator arms. The control arms can be inserted into glass channel only when glass is in lowered position.

Connect wires to motor and connect battery. On Hard-Top Models—adjust regulator in slotted holes. Allowing both pins to contact glass channel when glass frame is flush with vent wing. On Sedan—adjust regulator so that glass runs free in channel. Check glass for alignment. Connect an ammeter into electrical circuit and operate window. The ammeter reading should be constant without fluctuation as follows: Approximately 14 amperes, all models except rear doors of four-door Nassau, Newport and St. Regis models. If ammeter reading fluctuates, there is a bind in glass or in linkage. The down stop should be adjusted so window is flush with garnish molding, and other parts.

ELECTRIC LOCKING DOOR LOCKS

The electric door lock is operated by a push-pull double acting solenoid, attached by a connecting rod to the door lock actuating lever. By pressing the single pole double throw switch mounted on the right and left front door trim panel, a solenoid in each of the four doors is actuated, moving the lock slide member into the lock or unlock position. (Fig. 48)

All doors may be locked or unlocked either mechanically or electrically. To lock mechanically push the front door handle to the forward position and depress the rear door locking button. To lock electrically depress the switch to lock or lift upward to unlock the doors.

71. REMOVAL AND INSTALLATION OF SOLENOID

a. Removal

Remove the door trim panel. Disconnect the lock to solenoid connecting rod at the solenoid. Disconnect wires and remove solenoid.

b. Installation

Fasten solenoid to door and connect up wires. Connect lock connecting rod to solenoid. The front doors connecting rod is adjustable. Adjust the rod by turning the turn buckle in or out until the solenoid will just pull the locking lever into the lock. Check to make sure the solenoid will pull the lever far enough out to unlock the door. Install the trim panel.

POWER SEATS

The power seat can be moved six ways—forward, backward, upward and downward and tilt. (Refer to Fig. 43). The power seat is driven by one motor located under front seat.

The motor operates a gear drive train which supplies power through flexible cables to the slave units located in the seat track. The control switch assembly is on left side of front seat and is wired through a relay to a 40 ampere circuit breaker. This circuit breaker is located adjacent to window lift circuit breakers behind left front kick panel.

The wire from starter relay supplies power to circuit breaker. If car is also equipped with electric window lifts, power is supplied by a brass jumper parallel with electric window lift circuit breakers.

Power is supplied to relay from circuit breaker. Six wires go to switch. One used for power, two used for motor field current which also actuates relay for motor armature current. Three wires attach to solenoids which control movement of front riser, rear riser and hor-

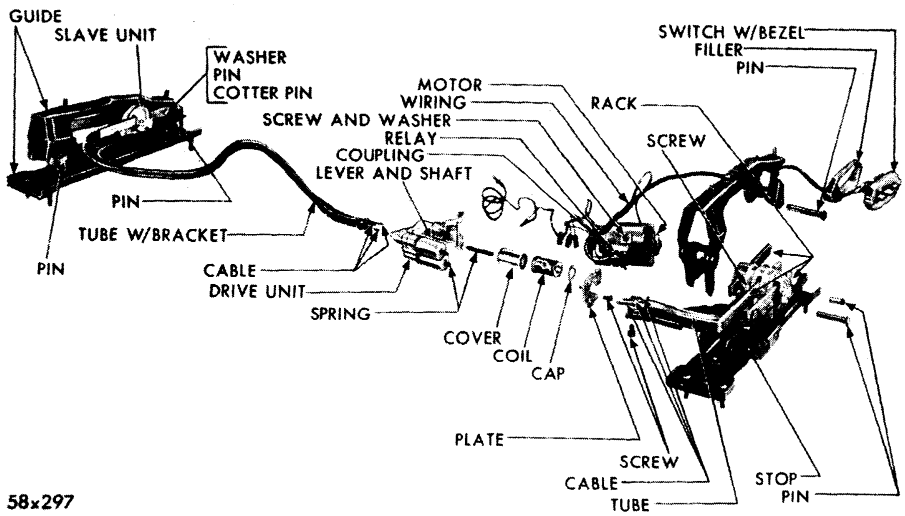


Fig. 43—Power Seat Assembly (Exploded View)

izontal movement. The wiring harness to motor is looped to permit up and down movement.

The wire harness should be clipped securely so wires will not be pinched when track is in extreme forward position. The tracks are replaced **only** as an assembly, and are not interchangeable from left to right. Tracks cannot be adjusted. The horizontal travel is five inches and horizontal plane of seat track is inclined 11 degrees. Vertical travel is 2 inches at front and 2 inches at rear. Available tilt is 7½ degrees forward and 8 degrees rearward from neutral.

72. REMOVAL AND INSTALLATION OF FRONT SEAT ASSEMBLY AND ADJUSTER

a. Removal

Remove front seat cushion—four-door only, and disconnect battery. Remove control wires from switch. Remove front seat assembly. On Hard-Top-Models—remove front seat and cushion as an assembly. Remove nuts from seat guide attaching studs and remove adjuster from car.

NOTE: Do not damage flexible tubing during removal.

b. Installation

Install adjuster and attaching nuts. Connect seat adjuster battery wire to circuit breaker in cowl. Allow loop from relay to clip on floor for horizontal travel. Install front seat assembly. Connect control wires to switch and install front seat cushion on four-door models.

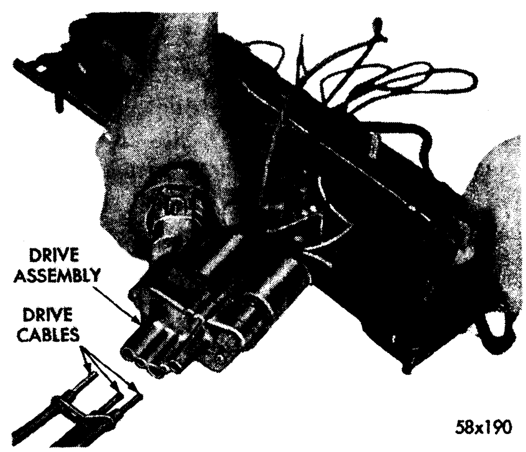


Fig. 44—Removing Left Guide and Drive Assembly

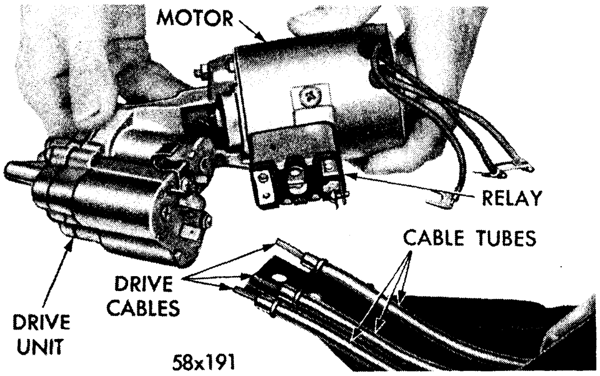


Fig. 45—Removing Drive Assembly from Left Slave Unit

73. REMOVAL AND INSTALLATION OF FLEXIBLE CABLES

a. Removal

Remove the front seat assembly. Disconnect battery wires at motor relay. Remove retainer plate that holds right side tubes to drive assembly. Remove the left seat guide attaching studs nuts and remove the guide and drive assembly (Fig. 44). Be careful not to bend or damage right side tubes when sliding tubes out of drive assembly. Pull flexible cables from right side tubes.

Remove the bolts that hold the motor and drive assembly to the left guide bracket. Remove drive assembly with tubes from left slave unit (Fig. 45). Remove flexible cables from tubes.

b. Installation

Place the three left cable tubes into the left slave unit (Fig. 46).

(With the shortest tube on the inside and longest on the outside). Install the flexible cables in the tubes. Make sure the cables seat in the slave unit. Position drive unit on left side tubes. Make sure flexible cables seat in slot in drive unit. Bolt drive unit to guide bracket.

Place the right side flexible cables in the right side tubes. Position left guide and drive assembly on the right side tubes. Make sure the cables seat in the drive assembly. Install the right side tubes retainer plate. Bolt left guide assembly to floor. Connect wire to relay and check operation of seat. (Fig. 47)

See Figures 49 through 57 for electrical wiring diagrams.

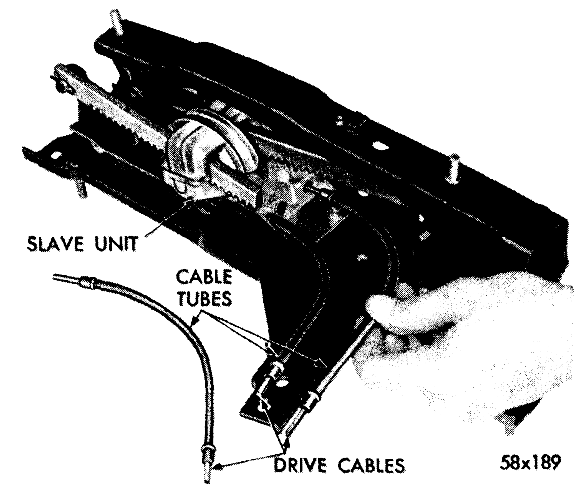


Fig. 46—Installing Cable Tubes in Slave Unit

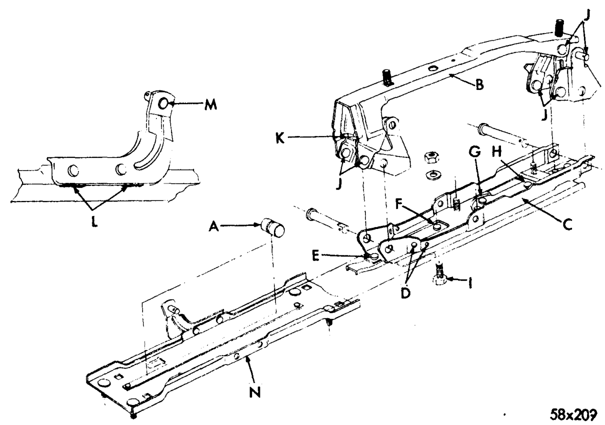


Fig. 47—Seat Guide Assembly

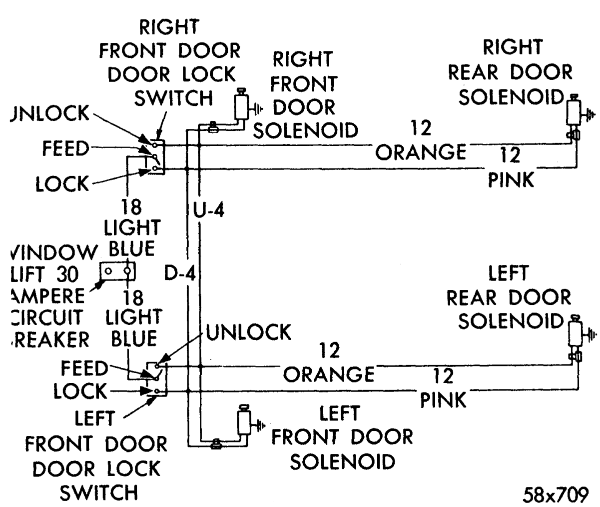


Fig. 48—Electric Door Locks (Imperial)

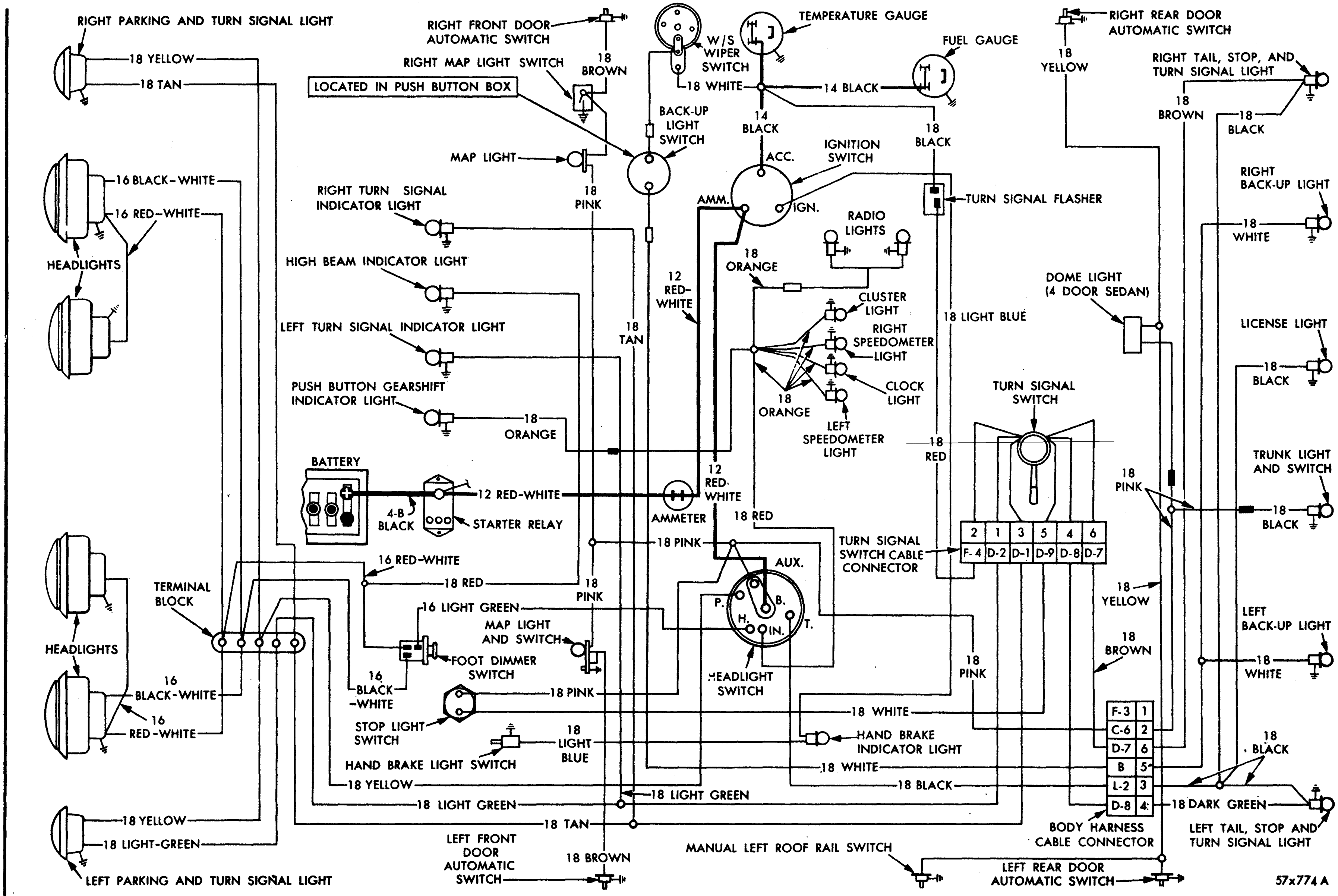


Fig. 49—Lighting and Turn Signals (Chrysler) Wiring Diagram

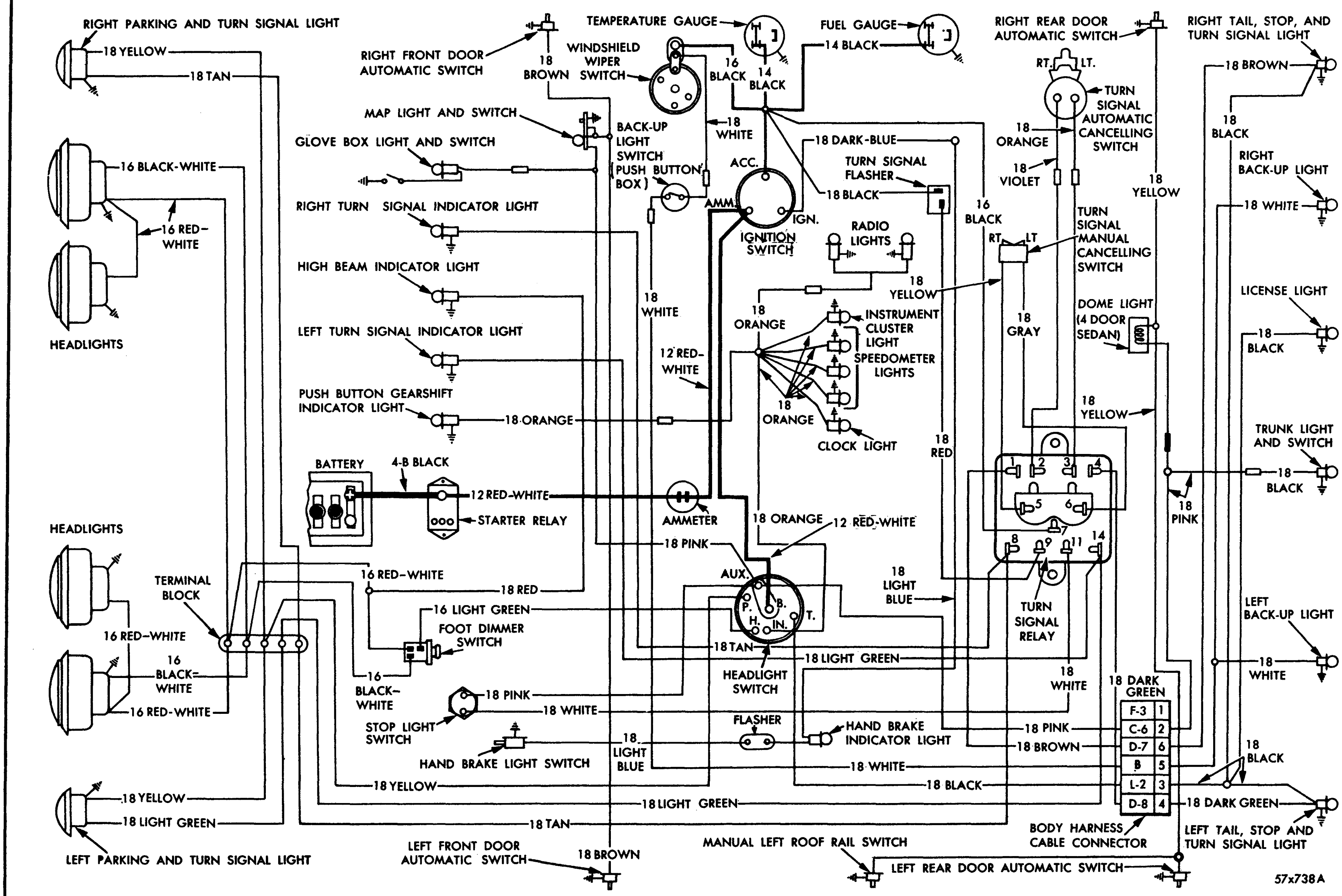


Fig. 50—Lighting and Turn Signals (Imperial) Wiring Diagram

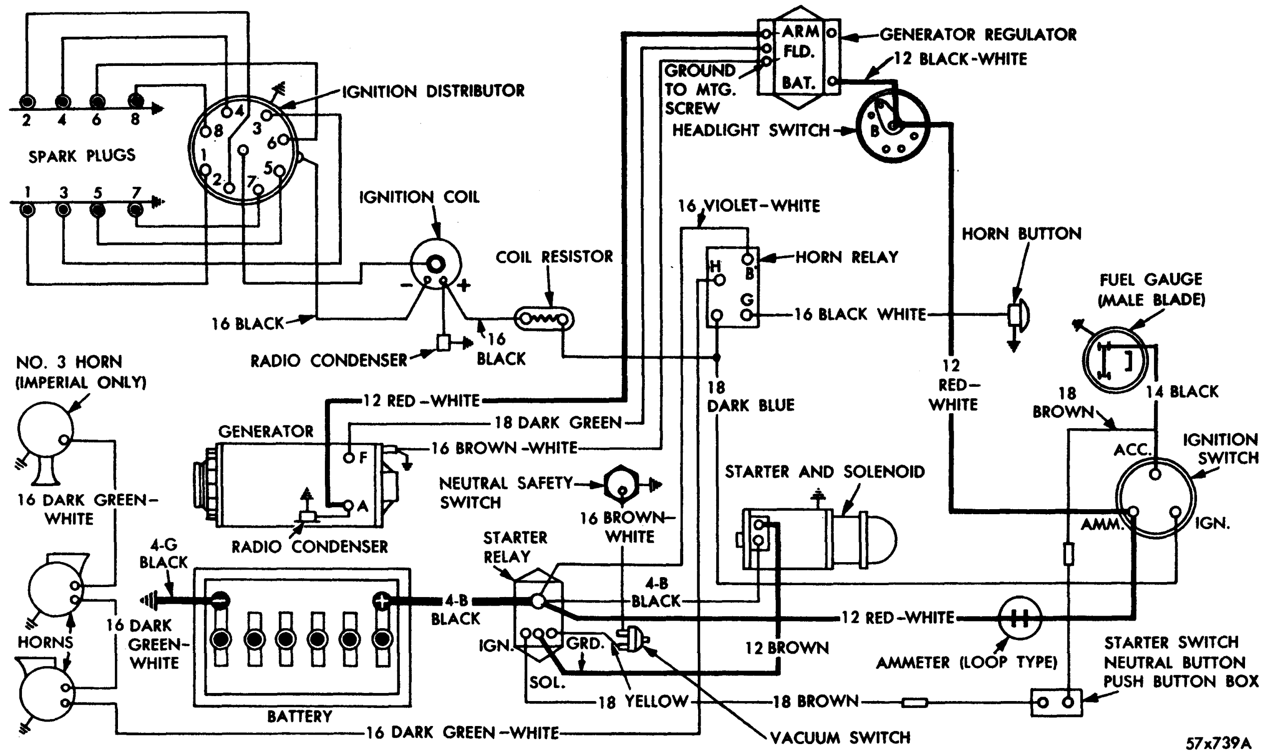


Fig. 51—Starter, Generator, Ignition and Horns Wiring Diagram

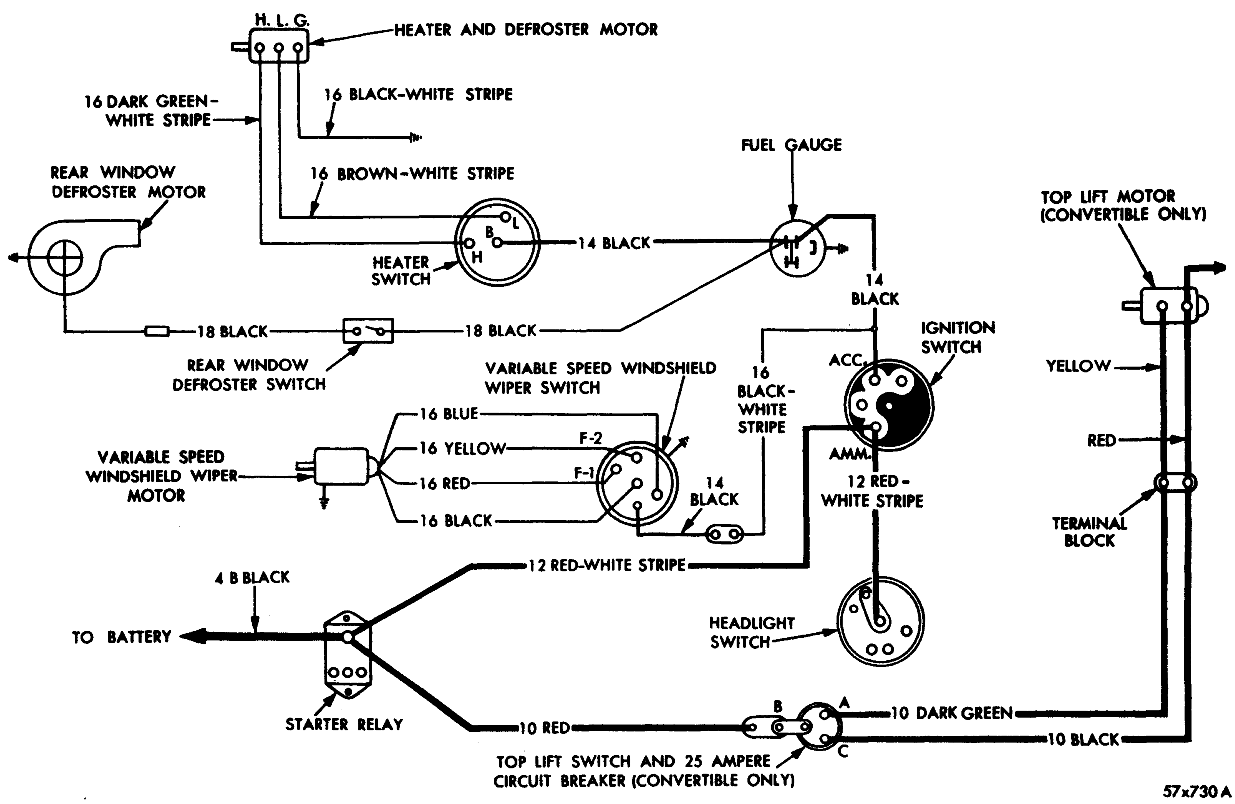


Fig. 52—Windshield Wipers, Heater and Convertible Top (Chrysler) Wiring Diagram

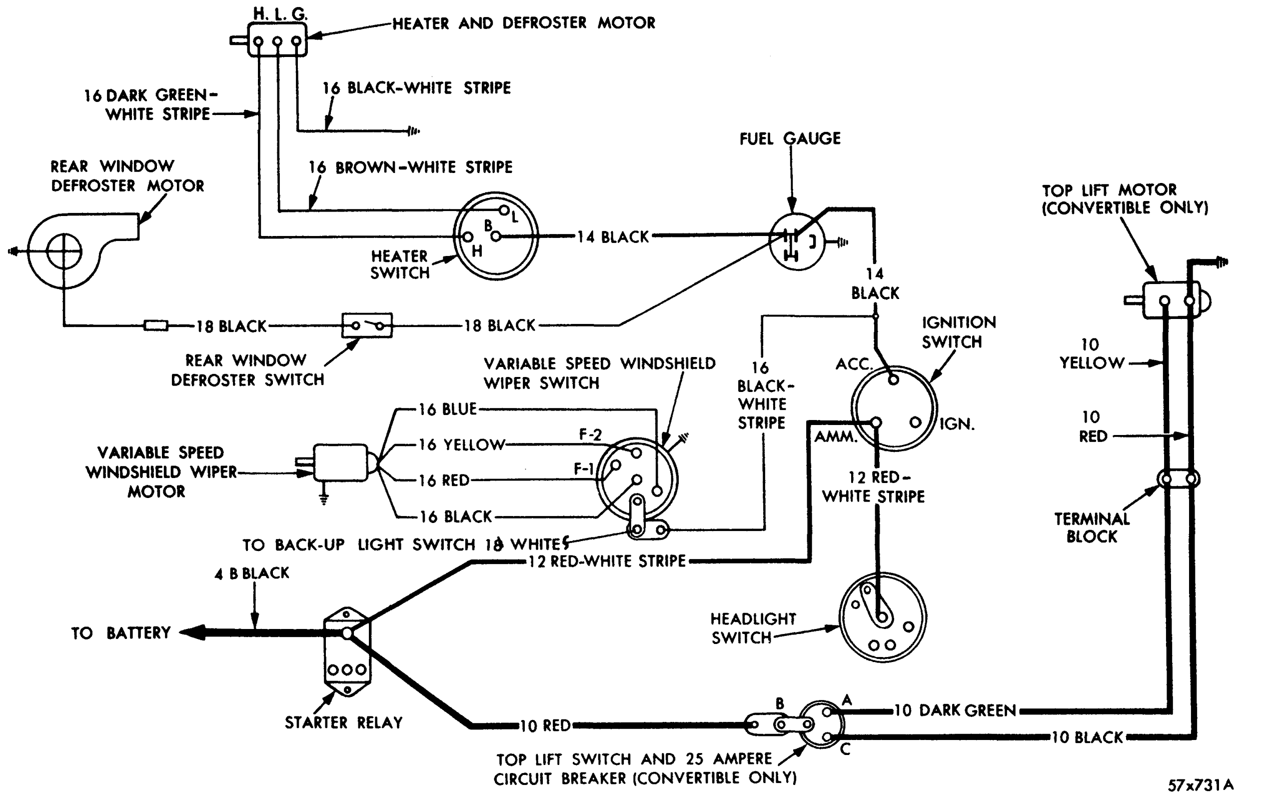


Fig. 53—Windshield Wipers, Heater and Convertible Top (Imperial) Wiring Diagram

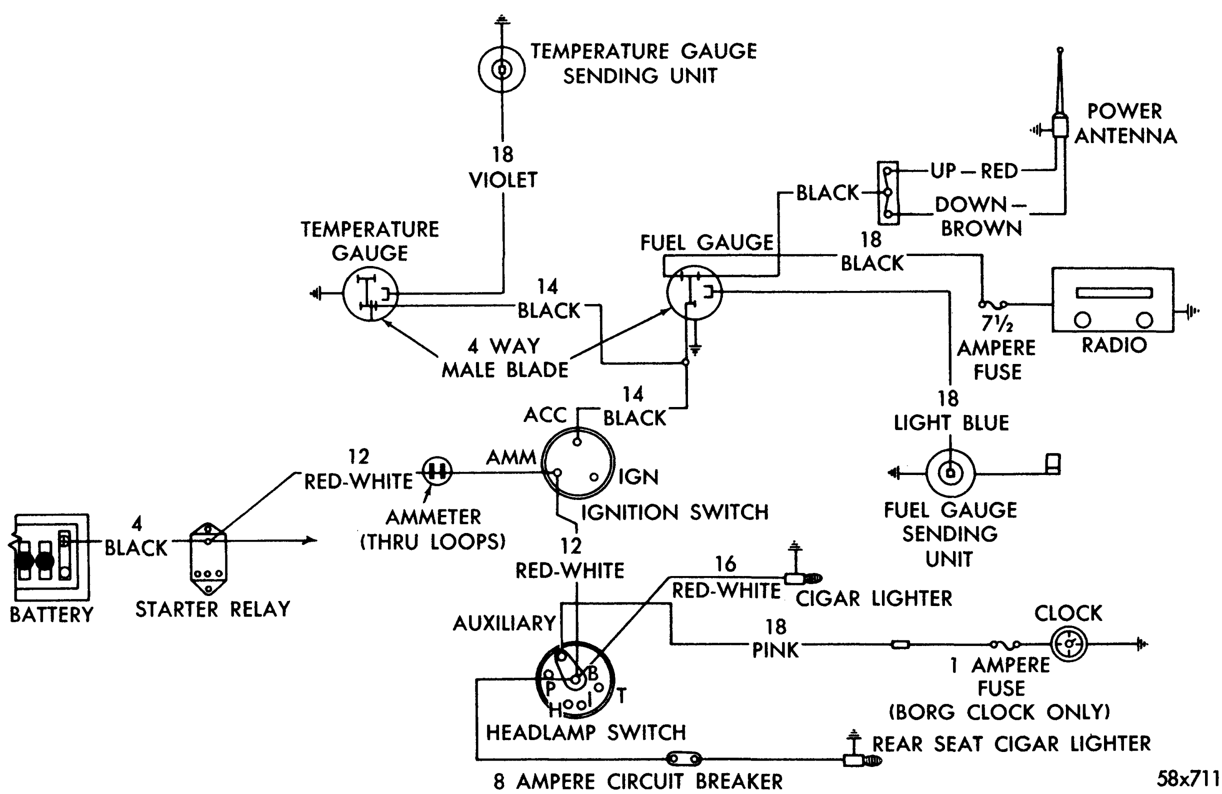
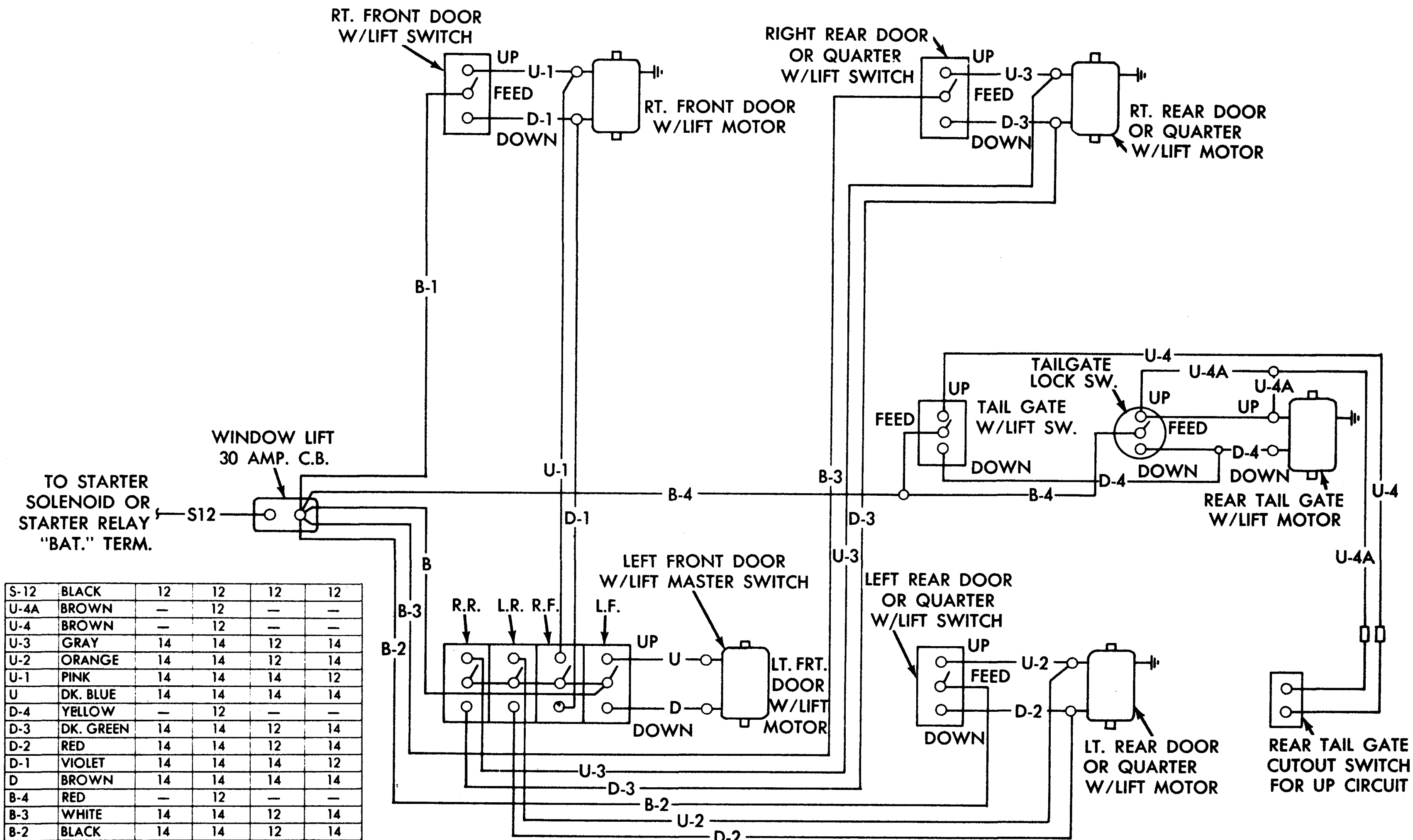


Fig. 54—Instruments and Accessories Wiring Diagram



SYM.	COLOR	SIZE 4 D. SED.	SIZE 4 D. SUB.	SIZE 4 D. H.T.	SIZE 2 D. H.T. CV. CPE.
S-12	BLACK	12	12	12	12
U-4A	BROWN	—	12	—	—
U-4	BROWN	—	12	—	—
U-3	GRAY	14	14	12	14
U-2	ORANGE	14	14	12	14
U-1	PINK	14	14	14	12
U	DK. BLUE	14	14	14	14
D-4	YELLOW	—	12	—	—
D-3	DK. GREEN	14	14	12	14
D-2	RED	14	14	12	14
D-1	VIOLET	14	14	14	12
D	BROWN	14	14	14	14
B-4	RED	—	12	—	—
B-3	WHITE	14	14	12	14
B-2	BLACK	14	14	12	14
B-1	YELLOW	14	14	14	12
B	TAN	12	12	12	12

58x212

Fig. 55—Electric Window Lifts Wiring Diagram

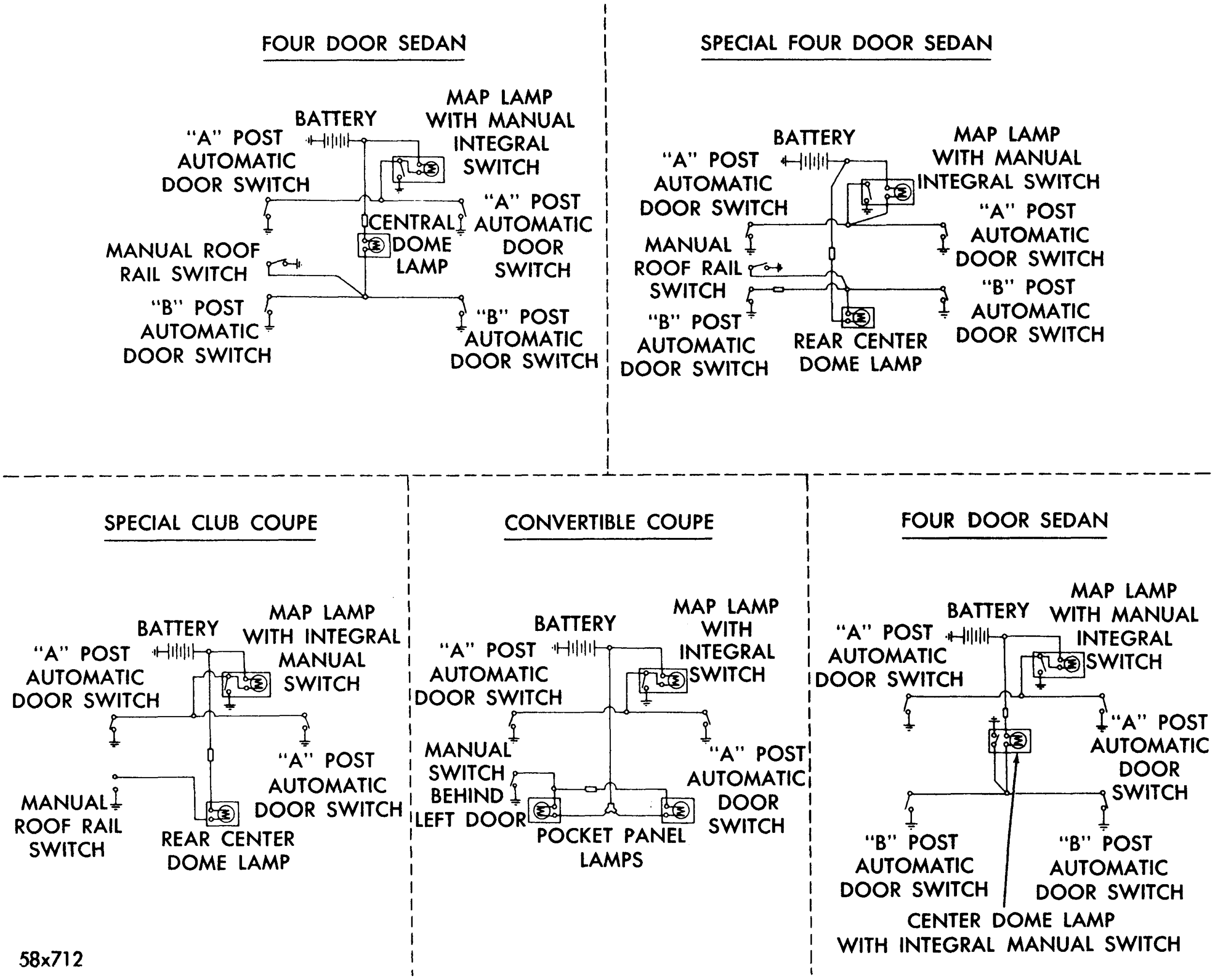


Fig. 56—Interior Lamps and Switches Wiring Diagram (Chrysler)

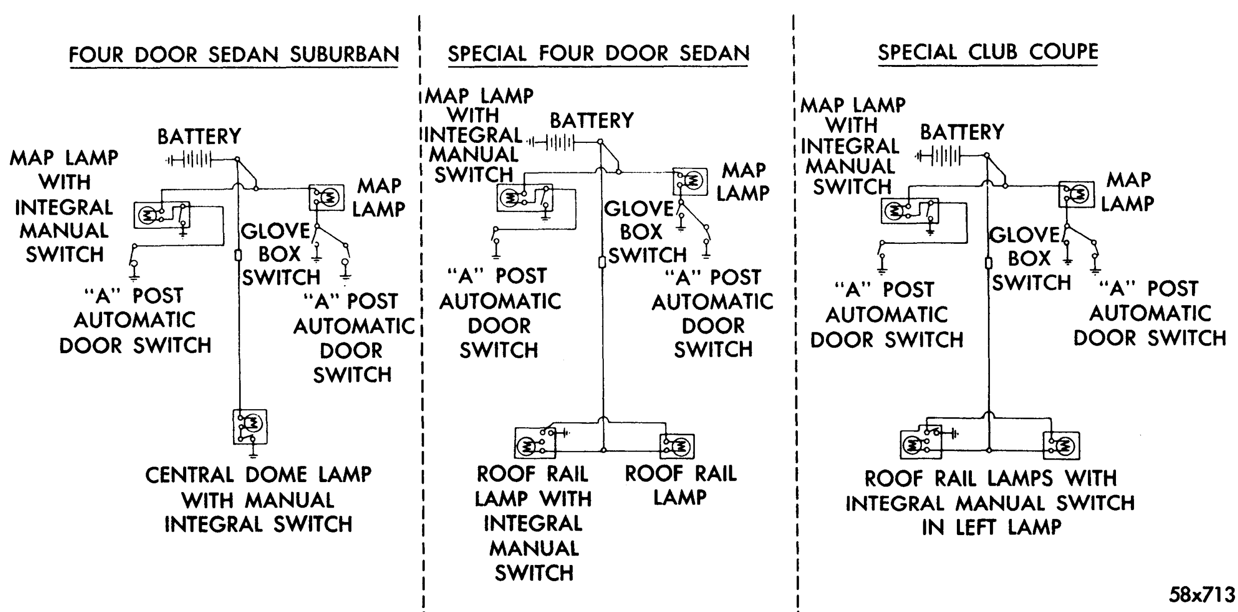


Fig. 57—Interior Lamps and Switches Wiring Diagram (Imperial)

SERVICE DIAGNOSIS

BATTERIES

74. BATTERY DISCHARGED

a. Charge battery by slow charging. Test circuit resistance and regulator.

b. Investigate use of accessories and type of driving car is subjected to.

c. Check for short circuits.

75. BATTERY DOES NOT RETAIN WATER

a. Check voltage regulator.

b. Check for broken case.

c. Reseal joints between cell covers and case.

76. BATTERY DOES NOT TAKE CHARGE

a. Add water to adjust electrolite to proper level.

b. Test battery capacity after 24 hours charge at four amperes.

c. Dissolve sulphated condition by charging at one ampere per positive plate per cell (or for 24 hours at four amperes) until charging rate does not rise for two successive readings taken at hourly intervals.

STARTERS

77. STARTER RELAY DOES NOT CLOSE

Check all relay, ignition-starter switch connections and neutral.

a. Replace open circuit wire between starter relay arm (or ground) terminal post and neutral switch (T.F. trans. only).

b. Replace open circuit wire between ignition-starter switch and ignition terminal on starter relay.

c. Replace neutral switch (TF trans. only).

d. Replace starter relay.

e. Replace ignition-starter switch.

f. Recharge battery.

78. RELAY OPERATES BUT SOLENOID DOES NOT

a. Replace open circuit wire between starter-relay solenoid terminal and solenoid actuating terminal post.

b. Check and clean up solenoid switch contacts.

c. Clean and tighten terminal connections on terminal bus bar between solenoid and starter fields.

d. Turn and under cut armature. Replace brushes.

e. Check for broken lead or loose soldered connection inside solenoid switch cover.

f. Replace solenoid.

g. Replace starter relay.

79. SOLENOID PLUNGER VIBRATES BACK AND FORTH WHEN SWITCH IS ENGAGED

a. Recharge battery. Replace defective battery. Clean and tighten cable connections.

b. Check for loose connections at relay, ignition starter switch and solenoid.

c. Check and repair any broken leads or soldered connections inside solenoid switch cover.

d. Replace solenoid.

80. STARTER OPERATES BUT PLUNGER DOES NOT RETURN WHEN IGNITION-STARTER SWITCH IS RELEASED

a. Replace broken solenoid plunger return.

b. Check ignition starter switch opening.

c. Replace solenoid.

d. Adjust pinion clearance.

81. SOLENOID OPERATES BUT STARTER DOES NOT

a. Recharge or replace battery.

b. Clean and tighten cable connections.

c. Check solenoid switch for closing (contacts jumper).

d. Adjust pinion clearance with plunger adjusting screw, with starter on bench.

e. Repair starter.

82. STARTER FAILS AND LIGHTS DIM

a. Recharge or replace battery.

b. Clean and tighten cable connections.

c. Check brush pigtails and coil leads for grounds.

d. Replace grounded starter fields.

e. Check for armature rubbing on field poles.

83. STARTER ARMATURE ROTATES BUT PINION DOES NOT ENGAGE

a. Check arm shaft for rusting.

b. Replace starter drive and adjust pinion clearance.

c. Check solenoid plunger linkage.

d. Replace engine flywheel ring gear if bad.

84. STARTER PINION JAMS IN RING GEAR

a. Replace drive. Replace flywheel ring gear. Tighten starter mounting bolts securely when replacing starter.

b. Armature shaft bent. Replace armature and check pinion and flywheel teeth.

GENERATORS

85. GENERATOR FAILS TO CHARGE

a. Ground generator field terminal with engine running at 1500 R.P.M. If it still fails to charge, remove generator and repair. If generator charges with field grounded, remove regulator, clean and adjust contacts or replace regulator.

b. Test for open circuit in field lead from generator to regulator.

c. Test for grounded armature lead from generator to regulator.

86. LOW UNSTEADY CHARGING RATE

a. Adjust or replace drive belt.

b. Test charging circuit resistance, cleaning and tightening all loose connections.

c. Inspect generator brushes and commutator for wear, grease or commutator out of round.

d. Test car ammeter.

87. EXCESSIVE CHARGING RATE

a. Check regulator contacts for sticking and for high setting of voltage regulator.

b. Check for grounded field lead between generator and regulator or for grounded field terminal post by disconnecting field lead at regulator with engine running at 1200 R.P.M. This should cause generator to quit charging if it does, regulator field circuit is grounded or contacts stuck. If charge stops with field open, disconnect field lead at generator. If charge stops, field lead is grounded, if not, remove generator and repair ground in generator field terminal post or field lead to post.

88. NOISY GENERATOR

a. Check pulley alignment.

b. Check for electrical noise by grounding armature terminal; if noise stops remove generator and inspect commutator and brushes.

c. Inspect bearing for wear or roughness.

d. Tighten pole shoe screws.

89. PREMATURE FAILURE OF ARMATURE

a. Test regulator.

b. Test for shorted cell in battery by using capacity test.

REGULATORS

90. REGULATOR CONTACTS OXIDIZED

a. Check resistance of ground circuit.

b. Check field coils for short circuit.

c. Check for misalignment or improper air gap adjustment of regulator contacts.

91. REGULATOR CONTACTS PITTED

a. File contacts. Reset air gaps and adjust regulator setting to specifications.

b. Check battery for proper ground polarity (negative post grounded). Clean and adjust contacts and reset output to specifications.

c. Wrong regulator polarity. Replace regulator.

92. BURNED COIL WINDINGS

a. Replace regulator after checking for high voltage regulator setting.

b. Check for grounded field circuit. Repair ground and replace regulator.

93. BURNED CONTACT ARM

a. Replace regulator and connect wires to proper terminal.

b. Never short between the battery lead and the regulator field terminal. If this is done accidentally clean contacts and adjust regulator.

94. REGULATOR CONTACTS STUCK

a. Reset air gaps and adjust settings. Replace regulator if contacts are badly burned or pitted.

b. Check battery polarity (negative ground). Remove field lead from regulator and touch battery lead to polarize generator after battery is properly installed.

c. Install regulator of proper polarity. A negative ground regulator has NEG stamped on base.

IGNITION

95. BURNED CONTACTS

a. File contacts that are not excessively burned. Align contacts and adjust gap to specifications. Adjust breaker arm spring tension.

b. Replace contacts that are badly burned. Check for presence of oil or grease on and around contacts; eliminate cause if present. Check voltage regulator. Check condenser.

96. PITTED CONTACTS

a. Replace condenser with one of proper capacity.

97. FOULED SPARK PLUGS

a. Check plugs for proper heat range.

b. Eliminate excessive oil consumption.

c. Check carburetor for rich mixture.

d. Adjust gaps to .035 inch.

98. BURNED SPARK PLUGS

a. Check for proper heat range.

b. Tighten plugs to specified torque, using new gaskets (engines so equipped).

c. Check voltage regulator setting.

d. Check carburetor for lean mixture.

e. Adjust ignition timing.

f. Check for leaking head gasket or cracked cylinder head.

99. DISTRIBUTOR CAP BLOWS OFF

a. Check for ruptured diaphragm in vacuum advance unit.

LIGHTING

100. LIGHTS BURN OUT

a. Replace damaged bulbs after adjusting voltage regulator.

101. LIGHTS DO NOT LIGHT

a. Test voltage at headlights and replace bulbs or repair wiring.

b. Replace or repair dimmer or light switch.

c. Recharge or replace battery and test generator and voltage regulator.

d. Test voltage drop of circuit. Clean and tighten all loose connections.

102. LIGHTS FLICKER

a. Test voltage drop of circuit. Clean and tighten all loose connections.

b. Test battery. Recharge or replace battery. Test voltage regulator.

c. Check bulb contacts for corrosion or being loose. Clean and tighten ground connections.

103. EXCESSIVE FLARE AT ACCELERATION

a. Recharge or replace battery.

b. Adjust voltage regulator.

c. Clean and tighten engine to body ground connection.

104. INTERMITTENT OPERATION OF HEADLIGHTS

a. Check circuit breaker.

b. Test voltage drop of circuit. Clean and tighten all loose connections. Replace defective dimmer or headlight switch.

FUEL GAUGE

105. GAUGE POINTER STICKS AT EMPTY MARK

a. Clean paint from indicator pointer where it contacts empty stop.

106. GAUGE POINTER DOES NOT MOVE TO FULL MARK (FULL TANK)

a. Clean and tighten loose connections, in fuel system electrical circuit.

b. Check tank unit for good ground connection.

c. Check tank to frame ground connection.

d. Check tank unit for open coil. Replace tank unit.

e. Replace dash unit.

107. GAUGE POINTER FLICKERS

a. Clean and tighten all loose connections (including ground).

b. Check tank unit arm contact to rheostat.

108. GAUGE POINTER STAYS AT FULL

a. Check both dash and tank units for short circuit.

HORNS

109. HORNS DO NOT BLOW

a. Short from relay "SW" terminal to ground (IGN SW ON). If horns now blow repair wiring from "SW" terminal to horn contact ring.

b. Connect jumper relay IGN. terminal to B terminal and depress button. If horn blows repair wiring IGN. terminal to IGN. switch.

c. If horns do not blow after above tests, connect jumper from "B" to "H" terminal. If horns blow replace relay. If horns do not blow check wiring from battery to B terminal and H terminal to horn.

d. If horns still do not blow after tests above, repair or replace horns.

110. HORNS BLOW CONTINUOUSLY

a. Disconnect wire from relay "SW" terminal. If horns stop blowing check for ground in wiring from "SW" terminal to horn button, contact plate. If horns still blow when wire is removed from "SW" terminal, replace relay.

b. Check for grounded horn button.

WIPERS

111. WIPERS OPERATE SLOWLY

a. Replace brushes. Turn and undercut armature commutator.

b. Check for loose connections in ground and wiring circuit. Clean and tighten.

c. Free up and lubricate pivot shaft.

d. Replace control switch.

e. Replace motor.

112. WIPERS FAIL TO OPERATE

a. Free up and lubricate linkage.

b. Test control switch and wire from motor to switch by connecting jumper wire from ammeter to motor, and across switch terminals. (Refer to Figure 49).

c. Remove motor and test on bench.

113. WIPER BLADES NOT PARKING OFF GLASS

a. Repair or replace link spring.

b. Adjust parking switch plate on motor gear box.

114. BLADES CHATTER

a. Replace arm.

b. Install blades that have proper pressure.

115. MOTOR WILL NOT PARK

a. Check wiring and panel switch.

b. Install new parking switch.

c. Replace motor.

POWER WINDOWS

116. WINDOW DOES NOT OPERATE FROM MASTER SWITCH, BUT WILL FROM DOOR SWITCH

a. Replace wire between circuit breaker and master control switch.

b. Replace master control switch.

c. Replace broken wire at door containing master switch group.

117. WINDOW DOES NOT OPERATE FROM EITHER MASTER OR INDIVIDUAL SWITCH

a. Replace burned out motor and check for grounded sticking or defective switch.

b. Check voltage of circuit for broken wiring between circuit breaker and motor terminals.

c. Replace circuit breaker if voltage is present at terminal opposite battery feed, if all windows do not operate.

d. Check motor ground wire for good ground.

e. Motor is thermal protected and will not operate when warm, allow to cool and recheck.

118. WINDOW OPERATES IN ONE DIRECTION ONLY FROM EITHER MASTER OR DOOR SWITCH

a. Check switch.

b. Check connections at motor junction block and leads from junction block to motor. Replace motor if connections at junction are clean and tight.

119. CIRCUIT BREAKER "CLICK" ON AND OFF CONTINUOUSLY AND WINDOW DOES NOT OPERATE

a. Check for ground between circuit breaker and switches by disconnecting one wire at a time from circuit breaker to locate circuit containing ground. Replace wire or grounded switch.

120. WINDOW OPERATES IN WRONG DIRECTION

a. Reverse switch lead to switch involved.

TURN SIGNAL SWITCHES

121. LIGHTS WON'T FLASH

a. Test the manual switch. Turn the ignition switch on. To check the right turn signal push the manual switch for a right turn and connect the test lamp between the relay No. 5 terminal and ground. If the test light flashes but the right turn lamps don't flash, it indicates the bulbs or wiring between the lamps and relay is faulty and should be repaired or replaced. If the test light doesn't flash, test the flasher.

The left turn signal is checked in the same manner except that the test light is connected between the relay No. 6 terminal and ground.

b. Test the flasher. Connect the test light between the relay No. 9 terminal and ground. If the test light fails to light, it indicates the wiring between the flasher and relay, or the flasher or relay is faulty and should be replaced.

c. Test the relay. Connect the test light between the relay No. 7 terminal and ground. If the test light fails to light, it indicates the wiring from the fuel gauge to the relay, or the relay is faulty and should be replaced.

POWER SEATS

122. ENTIRE UNIT INOPERATIVE

Remove all wires from seat switch and connect together as shown for the six various control operations, if operation is normal, by connecting wires as shown. Replace switch.

For Forward Horizontal

Connect
- Red
- White
- Green

For Forward Tilt

Connect
- Red
- White
- Yellow

For Straight Up

Connect
- Red
- White
- Yellow
- Brown

For Rearward Horizontal

Connect
- Red
- Blue
- Green

For Rearward Tilt

Connect
- Red
- White
- Brown

For Straight Down

Connect
- Red
- Blue
- Yellow
- Brown

123. MOTOR INOPERATIVE

Check red wire at relay with test light. If test-light does not light, check for continuity in number 10 red feed wire, faulty circuit breaker or poor connection between circuit breaker and starter relay. If test light lights, connect number 10 red feed wire with red and black or red and green wires from motor. If motor runs, relay was faulty.

124. SEAT INOPERATIVE (MOTOR RUNS)

Jump wire from number 10 feed wire to each solenoid terminal on clutch assembly. Solenoids should each "click" as jumper is connected. If solenoid does not click:

a. Check wire in harness for open circuit. Repair.

b. Possible seized solenoid armature in coil. Replace coil.

c. Possible burned-out solenoid. Replace solenoid.

125. SEAT INOPERATIVE (MOTOR RUNS AND SOLENOIDS CLICK)

Check drive unit for stripped or broken gear. Replace drive unit if necessary.

126. SLAVE UNIT INOPERATIVE (MOTOR, SOLENOIDS AND DRIVE UNIT O. K.)

Check for broken drive cable. Replace as necessary.

127. EXCESSIVE FREEPLAY IN UNIT (SEAT HAS ROCKING MOTION EXCESSIVE MOVEMENT BETWEEN SLIDE AND BASE OF TRACK ASSEMBLY)

This condition is possibly due to roller (A), Fig. 1) being out of position.

a. Remove power seat assembly from vehicle.

b. Remove seat drive tubes from slave unit.

CAUTION

Do not run motor with drive cables and tubes disassembled or unit will be placed out of synchronization.

c. Remove seat support (B).

d. Remove seat slave unit from seat track slide (C).

e. Remove horizontal stops located on slide at (D).

f. Separate seat slice (C) from base (N) by pressing slide rearward which will allow rollers (A) to jump retaining rivets (E F G H), thereby separating slide from base.

g. Remove rivet (F) and replace with $\frac{5}{16}$—18 x $\frac{1}{2}$" cap screw (1) as shown to retain in proper position. To reassemble, reverse the above sequence.

NOTE: In reassembly, a frayed drive cable may occur. Such a cable may be repaired by applying a light coating of solder and then grinding to cable size.

128. SEAT TRACK EXCESSIVELY LOOSE (CAUSED BY LOOSE RIVET JOINTS)

To correct:

a. Disassemble upper track seat support (B) by removing cotter keys and pins.

b. Remove seat support and tighten all riveted joints (J) by peening with a ball peen hammer.

129. LOOSE FRONT LEVERS

To correct:

a. Arc weld front levers (K) to prevent movement between the two sections comprising the front lever assembly as shown.

130. SEAT CHUCK FORE AND AFT (CAUSED BY LOOSE HORIZONTAL TRACK SUPPORT TO LOWER TRACK BASE

To correct:

a. Remove seat track assembly from vehicle and arc weld as shown (L).

b. Tighten rack attaching pins (M) by arc welding.

c. Check for loose horizontal rack in slave unit gear train. If loose, replace slave unit.

Section VII

ENGINE

CONTENTS

Section VII

ENGINE

DATA AND SPECIFICATIONS

	LC-1 and 2	LC-3 and LY-1
ENGINE		
Type	V 90°	V 90°
Number of Cylinders	8	8
Bore	3.94″	4.00″
Stroke	3.63″	3.90″
Piston Displacement	354 cu. in.	392 cu. in.
Compression Ratio	10.0 to 1	10.0 to 1
Compression Pressure at 150 rpm (plugs removed) Wide Open Throttle	150 to 200 lbs.	150 to 200 lbs.
Maximum Variation Between Cylinders (any one engine)	20 lbs.	20 lbs.
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
CYLINDER NUMBERING—From Front of Engine		
Left Bank	1-3-5-7	1-3-5-7
Right Bank	2-4-6-8	2-4-6-8
CRANKSHAFT		
Type	Fully Counter-Balanced	Fully Counter-Balanced
Bearings	Steel Backed Babbitt	Steel Backed Babbitt
Journal Diameter	2.4995 to 2.5005″	2.687 to 2.688″
Crank Pin Diameter	2.249 to 2.250″	2.374 to 2.375″
Maximum Out-of-Round Permissible	.001″	.001″
Number Main Bearings	5	5
Diameter Clearance (Desired)	.005 to .0015″	.005 to .0015″
End Play	.002″ to .007″	.002″ to .007″
*C75-1 (2 Barrel Carburetor)		
C75-2 (4 Barrel Carburetor)		
Thrust Taken by	No. 3 Main Bearing	No. 3 Main Bearing
Finish at Rear Seal Surface	Diagonal Knurling	Diagonal Knurling
Interchangeability of Bearings	Upper and Lower Nos. 1, 2, 4 Upper and Lower No. 3 Upper and Lower No. 5 Not Interchangeable	Upper and Lower Nos. 1, 2, 4 Upper and Lower No. 3 Upper and Lower No. 5 Not Interchangeable
MAIN BEARINGS (service) All Available in Standard and the Following Undersizes	.001, .002, .003, .010, .012″	.001, .002, .003, .010, .012″
CONNECTING RODS AND BEARINGS		
Type	Drop Forged "I" Beam	Drop Forged "I" Beam
Length (Center to Center)	6.625″	6.951″
Weight (less bearings) (shells)	25.2 oz.	27.6 oz.

ENGINE (Cont'd)

	LC-1 and 2	LC-3 and LY-1
Bearings	Steel-Backed Babbitt	Steel-Backed Babbitt
Diameter and Length	2.2507 to 2.2512″ x 29/32″	2.375 x 29/32″
Diametral Clearance Desired	.0005 to .0015″	.0005 to .0015″
Maximum Allowable Before Reconditioning	.0025″	.0025″
Side Clearance	.006 to .014″	.006 to .014″
Bearings for Service	Standard .001, .002, .003, .010, .012″ US	Standard .001, .002, .003, .010, .012″ US
CONNECTING ROD BUSHING		
Type	Steel-Backed Bronze	Steel-Backed Bronze
Number of Bearings	8	8
Diameter and Length	.9843 to .9846 x 1¼″	.9843 to .9846 x 1¼″
Interchangeability	All	All
Clearance	.0001 to .0004″ Selective	.0001 to .0004″ Selective
CAMSHAFT		
Drive	Chain	Chain
Bearings	Steel-Backed Babbitt	Steel-Backed Babbitt
Number	5	5
Thrust Taken By	Thrust Plate	Thrust Plate
End Play	.002 to .006″	.002 to .006″
Maximum Allowable Before Reconditioning	.010″	.010″
Diametral Clearance	.001 to .003″	.001 to .003″
Maximum Allowable Before Reconditioning	.005″	.005″
CAMSHAFT BEARING JOURNALS		
Diameter and Length		
No. 1	1.998 to 1.999 x 15/16″	1.998 to 1.999 x 15/16″
Nos. 2, 3 and 4	1.998 to 1.999 x ¾″	1.998 to 1.999 x ¾″
No. 5	1.4355 to 1.4365 x 29/32″	1.4355 to 1.4365 x 29/32″
CAMSHAFT BEARINGS		
Diameter and Length (after reaming)		
No. 1	2.000 to 2.001 x 15/16″	2.000 to 2.001 x 15/16″
Nos. 2, 3 and 4	2.000 to 2.001 x 13/16″	2.000 to 2.001 x 13/16″
No. 5	1.4375 to 1.4385 x 29/32″	1.4375 to 1.4385 x ⅞″
TIMING CHAIN		
Adjustment	None	None
Number of Links	68	68
Pitch	.375″	.375″
Width	1⅛″	1⅛″

ENGINE (Cont'd)

	LC-1 and 2	LC-3 and LY-1
TAPPETS		
Type	Hydraulic	Hydraulic
Clearance in Block	.0005 to .0015″	.0005 to .0015″
Body Diameter	.9040 to .9045″	.9040 to .9045″
Clearance Between Valve Stem Rocker Arm or Tappet	Dry Lash .060 to .210″	Dry Lash .060 to .210″
PISTONS		
Type	Horizontal Slot w/steel strut	Horizontal Slot w/steel strut
Material	Aluminum Alloy Tin Coated	Aluminum Alloy Tin Coated
Land Clearance (diametral)	.028 to .033″	.029 to .034″
Clearance at Skirt	1½″ from Bottom of Skirt .0005 to .0015″	1½″ from Bottom of Skirt .0005 to .0015″
Weight (Std. through .060″ oversize)	646 gm.	700 gm.
Piston Length (overall)	3.99 in.	4 in.
Ring Groove Depth		
No. 1	.200″	.209″
No. 2	.200″	.209″
No. 3	.194″	.201″
Pistons for Service	Std. .005, .020, .040, .060″ OS	Std. .005, .020, .040″ OS
PISTON PINS		
Type	Full Floating	Full Floating
Diameter and Length	.9841 to .9843 x 3.140 to 3.150″	.9841 to .9843 x 3.140 to 3.150″
Clearance in Piston (thumb press at 70° F.)	.0000 to .0005″	.0000 to .0005″
End Play	.004 to .026″	.004 to .026″
Clearance in Rod (selective)	.0001 to .0004″	.0001 to .0004″
Piston Pins for Service	Std., .003, .008″ OS	Std., .003, .008″ OS
Direction Offset in Piston	Toward Right Side of Engine	Toward Right Side of Engine
PISTON RINGS		
Number of Rings per Piston	3	3
Compression	2	2
Oil	1	1
Width of Rings—		
(Compression)	.0775 to .0780″	.0775 to .0780″
(Oil)	.1860 to .1865″	.1860 to .1865″
Piston Ring Gaps (all)	.010 to .020″	.013 to .025″
RING SIDE CLEARANCE		
(Compression)		
Upper	.002 to .0035″	.002 to .0035″

ENGINE (Cont'd)

	LC-1 and 2	LC-3 and LY-1
Intermediate	.002 to .0035"	.002 to .0035"
(Oil)	.001 to .0025"	.0010 to .0025"
VALVES—Intake		
Material	Silicon-Chromium Steel	Silicon-Chromium Steel
Head Diameter	$1\frac{15}{16}$"	2"
Length (to top of valve face)	$4\frac{23}{32}$"	$5\frac{1}{32}$"
Stem Diameter	.372 to .373"	.372 to .373"
Stem to Guide Clearance	.001 to .003"	.001 to .003"
Maximum Allowable Before Reconditioning	.004"	.004"
Angle of Seat	45°	45°
Adjustment	None	None
Lift	.388"	.388"
VALVES—Exhaust		
Material	Nitrogen Treated Manganese Chromium—Nickel Steel	
Head Diameter	$1\frac{1}{2}$"	$1\frac{3}{4}$"
Length (to top of valve face)	$4\frac{3}{4}$"	$5\frac{1}{32}$"
Stem Diameter	.371 to .372"	.371 to .372"
Stem to Guide Clearance	.002 to .004"	.002 to .004"
Maximum Allowable Before Reconditioning	.006"	.006"
Angle of Seat	45°	45°
Adjustment	None	None
Lift	.388"	.388"
VALVE SPRINGS		
Number	16	16
Free Length	2"	2"
Load When Compressed to (valve closed)	$1\frac{11}{16}$" 78 to 88 lbs.	$1\frac{11}{16}$" 78 to 88 lbs.
Load When Compressed to (valve open)	$1\frac{5}{16}$" 170 to 184 lbs.	$1\frac{5}{16}$" 170 to 184 lbs.
Valve Springs I.D.	1.010 to 1.030"	1.010 to 1.030"
CYLINDER HEAD		
Number Used	2	2
Combustion Chamber	Polyspherical	Hemispherical
Valve Seat Runout (maximum)	.002"	.003"
Intake Valve Seat Angle	45°	45°
Seat Width (finished)	.060 to .085"	.060 to .085"
Exhaust Valve Seat Angle	45°	45°
Seat Width (finished)	.040 to .060"	.040 to .060"

ENGINE (Cont'd)

	LC-1 and 2	LC-3 and LY-1
Cylinder Head Gasket Compressed (thickness)	.027″	.028″
ENGINE LUBRICATION		
Pump Type	Rotary, Full Pressure	Rotary, Full Pressure
Capacity (qts.)	4*	5*
Pump Drive	Camshaft	Camshaft
Operating Pressure at 40 to 50 mph	40 to 65 lbs.	40 to 65 lbs.
Pressure Drop Results from Clogged Filter	15 to 20 lbs.	15 to 20 lbs.
*When Filter Element is Replaced Add 1 Qt.		

SPECIAL TOOLS

Tool Number	Tool Name
C-119	Indicator—Cylinder Bore
C-385	Compressor—Piston Ring
C-425	Vacuum Gauge
C-455	Wrench—Starting Motor Flange Nut
C-647	Tester—Clutch and Valve Spring
C-690	Scale and Gauge—Piston Fitting
C-741	Reamer—Solid Valve Guide
C-756	Cleaner—Valve Guide
C-863	Timing Light—6 and 12 Volt
C-897	Driver—Welch Plug Installer
C-3005	Wrench—Torque 100 Foot-Pounds (Sensory Type)
C-3012	Reamer—Cylinder Bore Ridge
C-3020	Tool Main Bearing Seal
C-3024	Tool—Rocker Arm and Spring Compressor
C-3025	Sleeve—Guide Wear Measuring—Intake
C-3026	Sleeve—Guide Wear Measuring—Exhaust
C-3028	Reamer Set—Valve Tappet
C-3033	Puller Set—Damper, Sprocket, Crank Gear
C-3038	Fixtures—Cylinder Head Holding (FirePower)
C-3046	Tool—Piston Ring Installer (SpitFire)
C-3049	Reamer—Piston Pin Line (.980 to 1.030)
C-3052	Remover—Distributor Shaft Bushing
C-3053	Driver and Burnisher—Distributor Drive Shaft Bushing
C-3054	Wrench—Spark Plug
C-3059	Tool—Main Bearing Upper Shell
C-3061	Gauge—Valve Stem Length (FirePower)

SPECIAL TOOLS (Cont'd)

Tool Number	Tool Name
C-3065	Gauge—Cylinder Compression
C-3066	Connector—Timing Light
C-3068	Rack—Hydraulic Tappet
C-3075	Gauge—Top Dead Center (FirePower)
C-3132	Puller and Installer—Camshaft Bearing
C-3151	Driver—Welch Plug Installing
C-3160	Pliers—Hydraulic Tappet Leakdown Checking
C-3167	Stand—Engine Repair
C-3168	Adapter—Engine Repair Stand
C-3216	Puller—Hydraulic Tappet
C-3221	Tool—Piston and Connecting Rod Assembly
C-3339	Dial Indicator Set
C-3419	Wrench—Distributor Lock Plate
C-3422	Compressor—Valve Spring (FirePower)
C-3427	Reamer—Valve Guide (.404 to .405 inch)
C-3430	Reamer—Valve Guide (.389 to .390 inch) (SpitFire)
C-3433	Reamer—Valve Guide (.379 to .380 inch) (SpitFire)
C-3436	Gauge—Valve Stem Length (SpitFire)
C-3466	Plate—Engine Lifting
C-3495	Tool—Piston Ring Installer (FirePower)
C-3501	Cylinder Bore Deglazing Hone
C-3506	Removing and Installing Tool—Chain Case Cover Oil Seal
C-3509	Tool—Camshaft Holding
C-3511	Tool—Rear Main Bearing Seal Installing
C-3574	Tool Main Bearing Seal
DD-883	Driver—Valve Guide

TIGHTENING REFERENCE

	(Foot-Pounds)
Camshaft Sprocket Bolt	35
Camshaft Sprocket Hub Thrust Plate Bolt	15
Carburetor to Manifold Stud Nut	15
Chain Case Cover Bolt	35
Connecting Rod Bearing Cap Bolt Nut	45
Cylinder Head Bolt	85
Distributor Clamp Bolt	15
Engine Front Mounting to Frame Nut	85
Engine Front Mounting to Block Nut	45
Exhaust Manifold Stud Nut	25
Exhaust Pipe Flange Bolt Nut	40
Crankshaft Bearing Cap Bolt	85

TIGHTENING REFERENCE (Cont'd)

	(Foot-Pounds)
Fan Blade Bolt	15
Flywheel Housing to Cylinder Block Bolt	50
Fuel Pump Bolt	30
Generator Adjusting Strap Bolt	15
Generator Adjusting Strap Mounting Bolt	30
Generator Bracket Bolt	50
Generator Mounting Bolt	20
Ignition Cable Cover Screw	7
Intake Manifold Bolt	30
Main Bearing Cap Bolt	85
Oil Filter Bolt	25
Oil Level Indicator Tube Bracket Bolt Nut	10
Oil Pan Bolt	15
Oil Pan Drain Plug	35
Oil Pump Cover Bolt	10
Oil Pump Mounting Bolt	35
Spark Plugs	30
Vibration Damper Hub Bolt	135
Vibration Damper Inertia Member Flange Bolt	15
Water Outlet Elbow Bolt	35
Water Pump Housing Bolt	30

	(Inch-Pounds)
Crankcase Ventilator Outlet Pipe Bolt	15
Manifold Heat Control Counterweight Bolt	50
Rocker Arm Cover Bolt Nut	30
Tappet Chamber Cover	50

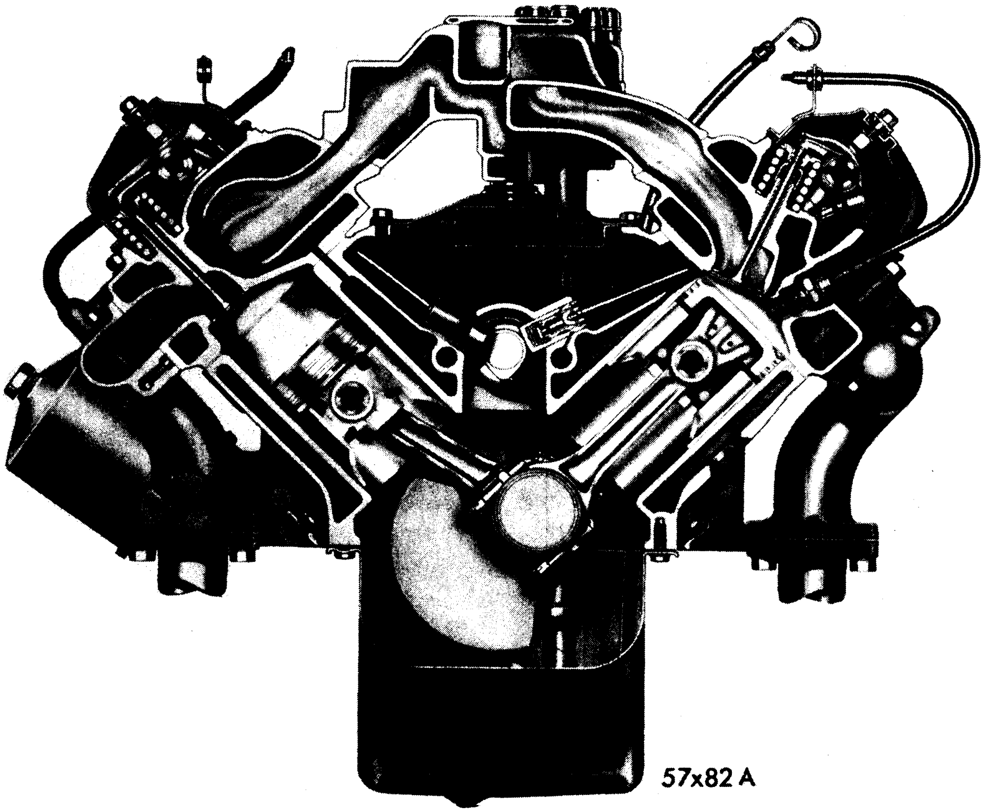


Fig. 1—SpitFire V-8 Engine (End Sectional View)

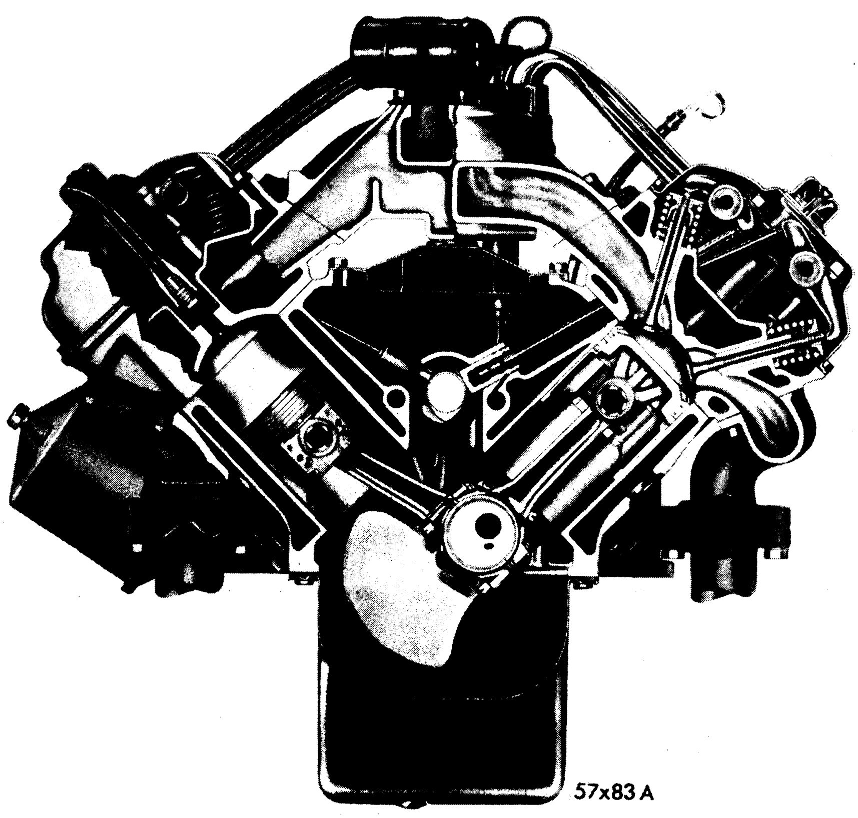


Fig. 2—FirePower V-8 Engine (End Sectional View)

Section VII
ENGINE (FIGS. 1 and 2)

1. MINOR TUNE-UP

The following procedures are provided as a guide which should be followed when performing minor engine repairs or a complete engine over-haul.

Clean and adjust spark plugs (.035 inch gap). Adjust or replace distributor contact points (.015 to .018 inch gap). Check distributor cap for cracks and corrosion. Inspect rotor, rotor spring and plunger. Inspect distributor to spark plug wires for shorts. Inspect small lead wires for tightness, breakage, or damaged insulation. Check for excessive play in distributor vacuum advance plate bearing. Reset ignition timing. Check battery specific gravity and clean and tighten battery connections. Check starter amperage draw. Inspect fan belt, and check adjustment. Tighten carburetor flange nuts to 15 foot-pounds torque. Set carburetor idle mixture adjustment. Adjust throttle stop screw so engine idles at 450 to 500 r.p.m. Check manifold heat control valve.

2. MAJOR TUNE-UP

On cars equipped with air conditioning, power steering, power brakes, heater, etc., refer to Section covering this equipment for removal, installation and adjustment procedures.

A periodic engine tune-up will assure maximum engine performance and fuel economy. In addition, perform all steps of a "Minor Tune-Up." Tighten manifold nuts. Make a compression test. The compression should not vary more than 20 pounds between cylinders. Refer to "Engine Data and Specifications" for compression pressures. Check coil and condenser and inspect primary and secondary wires. Service the Air Cleaner — **DO NOT WASH OR OIL.** Normal operation—Replace filter element every 15,000 miles. Service more frequently under severe dusty conditions. (See Fig. 3.) Test fuel pump for pressure and vacuum, and adjust carburetor. Refer to Fuel and Exhaust System, Section VII, "Carburetor Adjustments." Check manifold heat control valve. Road test car as a final check.

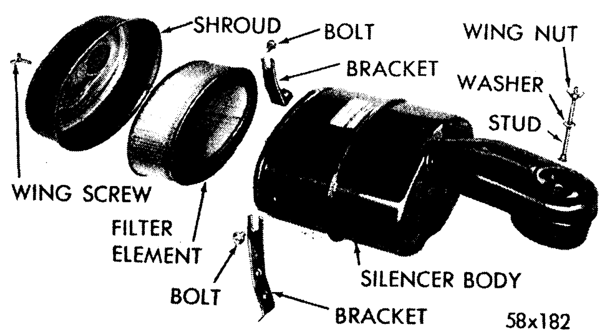


Fig. 3—Carburetor Air Cleaner (Disassembled View)

SERVICE PROCEDURES

3. REMOVAL OF ENGINE ASSEMBLY (FROM CAR)

Drain cooling system and remove battery. Remove fan shroud, (Air Conditioning Models only) radiator and hood. **Before removing hood, scribe outline of hinge brackets on hood to assure proper adjustment when installing.** Disconnect fuel lines and wire attached to engine units. Remove air cleaner and carburetor. Attach engine lifting fixture, Tool C-3466, to carburetor flange studs on intake manifold and attach a chain hoist to fixture eyebolt.

Disconnect propeller shaft, wires and linkage at transmission. Remove exhaust pipe. (Be sure exhaust system is sufficiently supported while engine is removed.) Remove rear crossmember to transmission support attaching bolts.

NOTE: Place a rollaway jack under transmission to relieve weight from crossmember. Place a wood block between head of jack and transmission to avoid damaging transmission oil pan. This jack must support weight of rear of power plant and must be able to roll with the engine as engine is being removed from chassis.

Remove crossmember rear engine support. Lower car to convenient working height and remove engine front support. With chain hoist, raise engine and, at same time work engine out of chassis. If engine is to be disassembled, place engine in engine repair stand, Tool C-3167, using transmission mounting bolts.

4. INSTALLING ENGINE (IN CAR)

Install engine lifting fixture, Tool C-3466 and attach chain hoist to fixture eyebolt. Lower engine carefully, until front and rear of engine are approximately positioned. Place a rollaway jack under transmission to support weight of rear of engine. Install engine rear support crossmember. Position engine and install nuts at front mounts. Position and install rear engine support bolts and remove jack and hoist. Remove engine lifting fixture. Install manifold, carburetor, fuel lines, wiring and linkage. Install radiator, radiator hoses, wires and radiator shroud. Install exhaust pipes, using new gaskets. Reinstall hood by checking scribe marks placed on inside of hood at removal. Connect propeller shaft at transmission. Be sure all drain cocks are closed; refill cooling system, refill engine crankcase and transmission. Refer to Lubrication, Section XIV for quantities and lubricants to use. Check entire system for leaks and correct as necessary.

NOTE: Whenever an engine has been rebuilt and a new camshaft and/or new tappets have been installed, one quart of MOPAR Oil Additive should be added to engine oil to aid break-in. The oil mixture should be left in engine for a minimum of 500 miles. It is not necessary however, to drain the mixture before normal oil change is required, nor is it necessary to use the oil additive at subsequent oil changes.

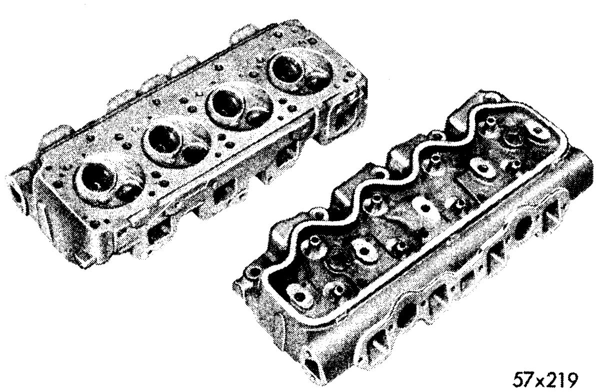

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Fig. 4—Cylinder Head (SpitFire Engine)

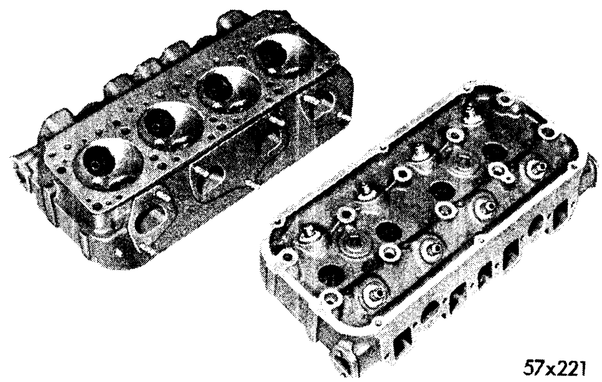
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Fig. 5—Cylinder Head (FirePower Engine)

Start engine, warm up to 160 degrees F., check timing and adjust carburetor as necessary.

5. REMOVAL OF CYLINDER HEADS (Fig. 4 and 5)

Drain cooling system. Remove generator. Remove carburetor air cleaner and fuel line. Disconnect accelerator linkage. Remove vacuum control tube at carburetor and distributor. Disconnect coil wires and heater hose. Remove heat indicator sending unit wire. Remove oil level indicator (dip stick). Remove air tube between automatic choke and exhaust manifold. Remove water outlet manifold. Remove heater blower. Remove ignition cable cover and disengage insulators from spark plugs. Use a thin wall socket, or Tool C-3054 to remove spark plugs and tubes. Remove intake manifold, ignition coil and carburetor as an assembly. Remove cylinder head covers and gaskets. Disconnect exhaust pipes at manifold flanges. Remove bolts that attach rocker arm support brackets to cylinder head and block, and pull rocker assemblies and bolts directly away from heads.

CAUTION

The rocker arm assembly attaching bolts (FirePower) also hold cylinder heads to block. When these bolts are removed, cylinder heads are loose and are held by two dowel pins only.

Remove push rods and place them in their respective slots in holder Tool-C-3068. Lift off cylinder head and place into holding fixture Tool C-3038. Remove exhaust manifold and gasket, if cylinder head is to be replaced.

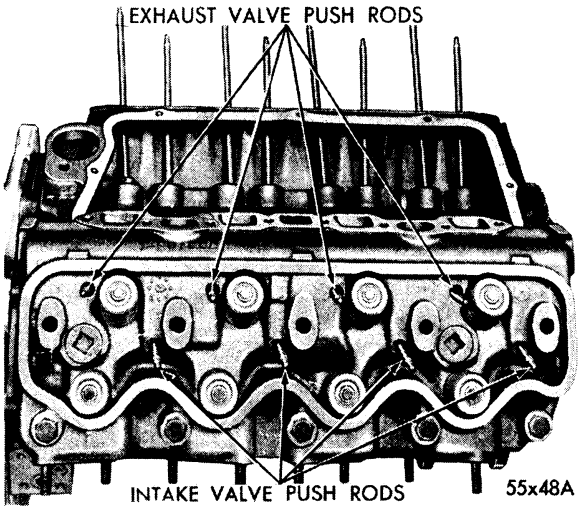

Fig. 6—Push Rods Installed (SpitFire)

NOTE: On FirePower Engine only, the right cylinder head rocker shaft brackets and the cylinder head bolts can be removed as a complete assembly. On the left cylinder head remove the stop light switch from the master brake cylinder, oil level indicator, (on Power Steering remove pump oil line) before removing the cylinder head assembly.

6. INSTALLATION OF CYLINDER HEADS

Clean gasket surfaces of cylinder block and cylinder head. Check all surfaces with a straightedge if there is any reason to suspect leakage. Install cylinder heads and new cylinder head gaskets. Coat gaskets with MOPAR Perfect Seal, Part No. 1122893 or equivalent sealer. Install push rods as shown in Figures 6 and

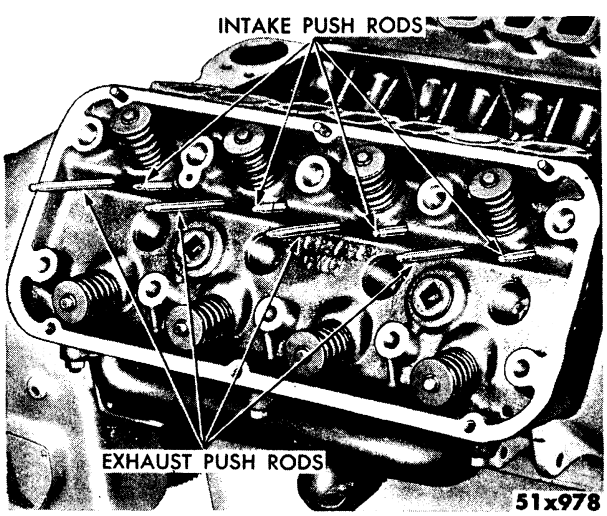

Fig. 7—Push Rods Installed (FirePower)

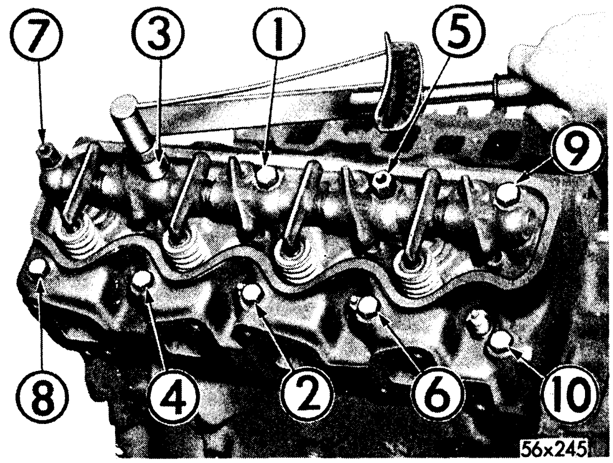

Fig. 8—Tightening Cylinder Head Bolts (SpitFire)

7. Insert cylinder head bolts into rocker arm support brackets and place rocker arm assemblies in position on head, lining up all push rods to their respective rocker arms. Starting at top center, tighten all cylinder head bolts to 60-80 foot-pounds torque, in sequence shown in Figure 8 and 9. Then repeat the procedure, tightening all head bolts to 85 foot-pounds torque. Place new valve tappet cover gaskets in position, and install tappet cover. Tighten bolts to 50 inch-pounds torque. Install crankcase breather tube on tappet cover and insert oil level indicator (dip stick) tube into position. Install new cylinder head cover gasket and install cover. Tighten nuts and bolts to 30 inch-pounds torque. On FirePower engines slide spark plug tube seals over tubes, and install in position in heads. Check spark plugs for .035 inch gap and install plugs, being careful not

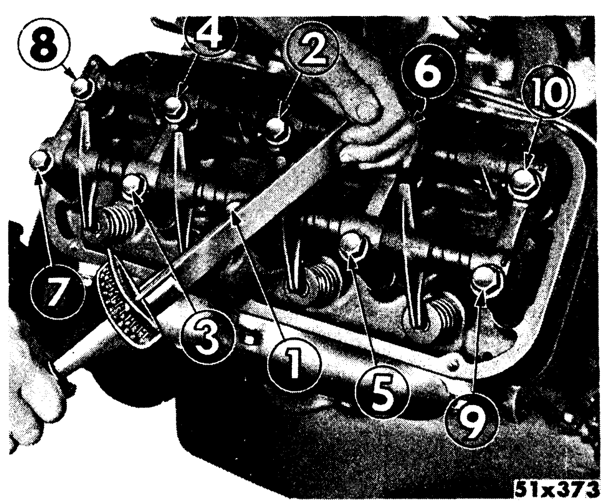

Fig. 9—Tightening Cylinder Head Bolts (FirePower)

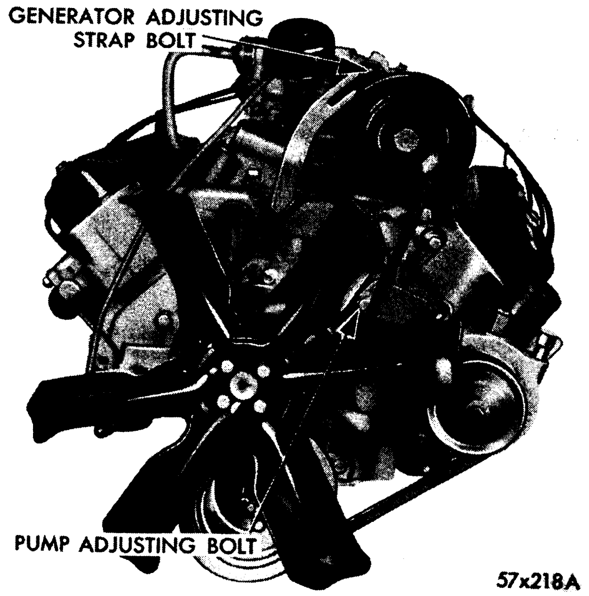

Fig. 10—Adjusting of Fan Belts

to drop them on electrodes as this would cause gap setting to be altered. Tighten spark plugs to 30 foot-pounds torque with Tool C-3054. Install new intake manifold gaskets and manifold. Tighten bolts to 30 foot-pounds torque.

NOTE: When installing intake manifold, insert short bolts in holes on extreme ends of manifold.

Install distributor cap coil wire, spark plug cables and insulators. On FirePower Engines place spark plug tube seal retainers in position and install spark plug covers, after carefully

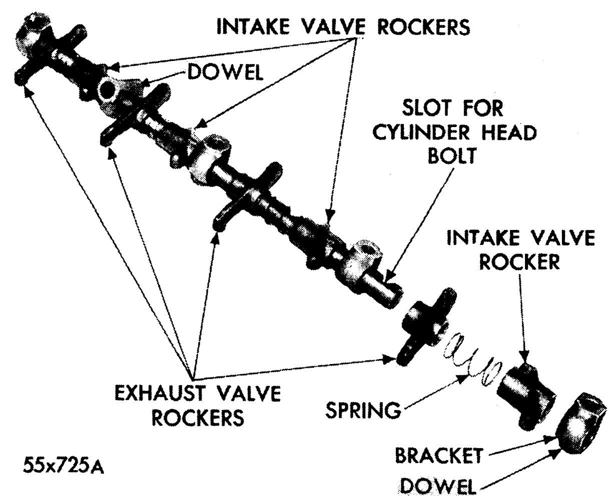

Fig. 11—Rocker Shaft Assembly (Disassembled View) (SpitFire)

arranging spark plug cables. Tighten screws securely. Install generator. Tighten generator bracket bolts to 50 foot-pounds torque and generator mounting nut to 20 foot-pounds torque.

NOTE: When adjusting fan and accessory belt drives as shown in Figure 10, refer to Section IV, Accessory Belt Drives in this Manual.

7. REMOVAL OF ROCKER ARMS AND SHAFT ASSEMBLY

Remove rocker arm cover and gasket. Remove bolts that attach rocker arm support brackets and cylinder head to cylinder block and remove rocker arms and brackets as an assembly.

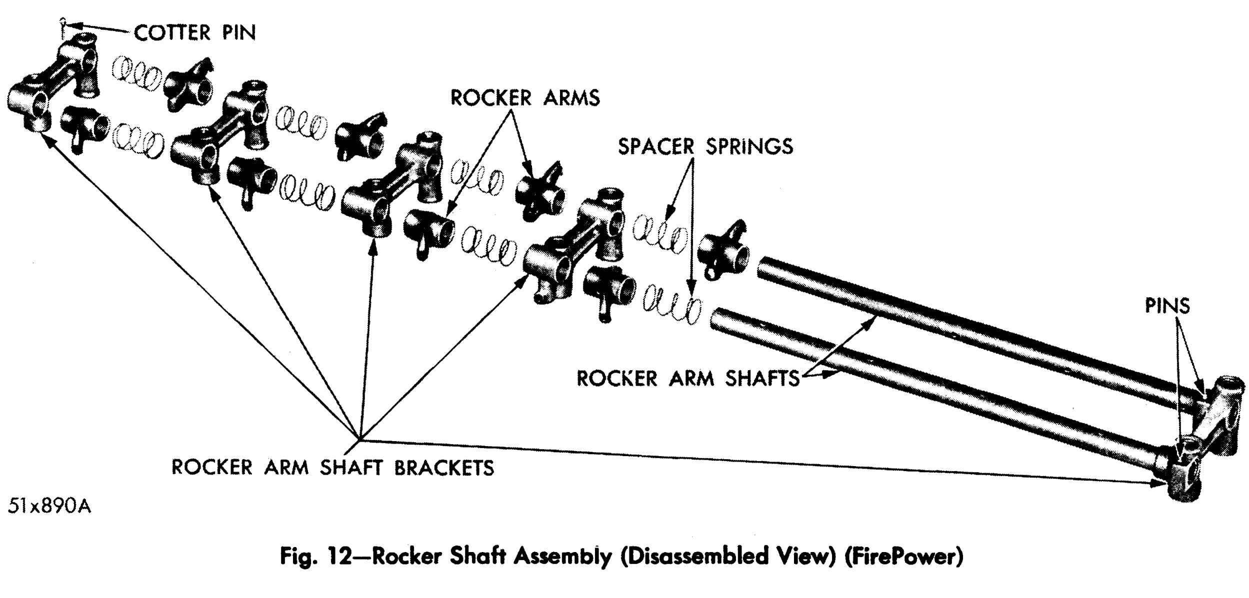

Fig. 12—Rocker Shaft Assembly (Disassembled View) (FirePower)

CAUTION

With bolts removed, the cylinder heads are held in position by two locating dowel pins only. (FirePower Engines)

If rocker arm assemblies have been disassembled for cleaning, inspection or replacement, refer to Figures 11 and 12 for proper reassembly.

NOTE: On FirePower engines rocker shafts are stamped "IN" for intake and "EX" for exhaust. The intake rocker arms are shorter than exhaust rocker arms.

8. INSTALLATION OF ROCKER ARM AND SHAFT ASSEMBLY

Install push rods as shown in Figures 6 and 7. The push rods should be properly positioned in rocker arm and tappets.

CAUTION

Be sure locating dowels on brackets are in proper alignment in head, as shown in Figure 11.

Position rocker arm assemblies. Install cylinder head bolts. Tighten bolts 60-80 foot-pounds torque in sequence shown in Figures 8 and 9. Then repeat the procedure, tightening all head bolts to 85 foot-pounds torque.

9. REMOVAL OF VALVES AND VALVE SPRINGS

With cylinder head removed, compress valve springs with Tool C-3422 (SpitFire Engines and Tool C-3024 (FirePower Engines). Remove valve retaining locks, valve spring retainers, valve stem cup seals (intake valves only) and valve springs. **Remove burrs from valve stem lock grooves to prevent damage to valve guide when valves are removed.**

10. VALVE INSPECTION

Clean valves thoroughly, and discard burned, warped or cracked valves. Check valve stems for wear. Intake valve stems should measure .372 to .373 inch, and exhaust valve stems should measure .371 and .372 inch. If wear exceeds .002 inch, replace the valve. Remove carbon and varnish deposits from inside of valve guides with cleaner, Tool C-756.

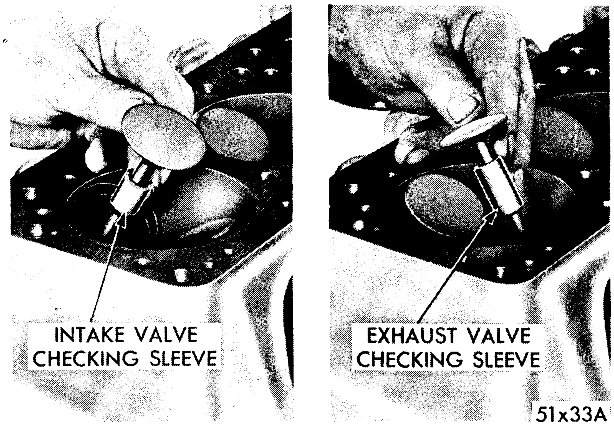

Fig. 13—Installing Sleeves to Check Guide Clearance (FirePower) (Typical of SpitFire)

NOTE: On SpitFire Engines, the valve guides are cast integrally with the cylinder head. Service valves with oversize stems are available for these engines.

Check valve stem to guide clearance as follows: Install sleeve, Tool C-3025, over intake valve stem, and sleeve Tool C-3026 on exhaust valve stem and install valves (Fig. 13). These special sleeves place valve at working height for easy checking with a dial indicator. Attach dial indicator Tool C-3339 to cylinder head and set it at right angle to edge of valve being checked (Fig. 14). Move valve to and from indicator. The total dial indicator reading should not exceed .008 inch on intake valves, or .014 inch on exhaust valves. If readings exceed the above tolerances, install new valve guides

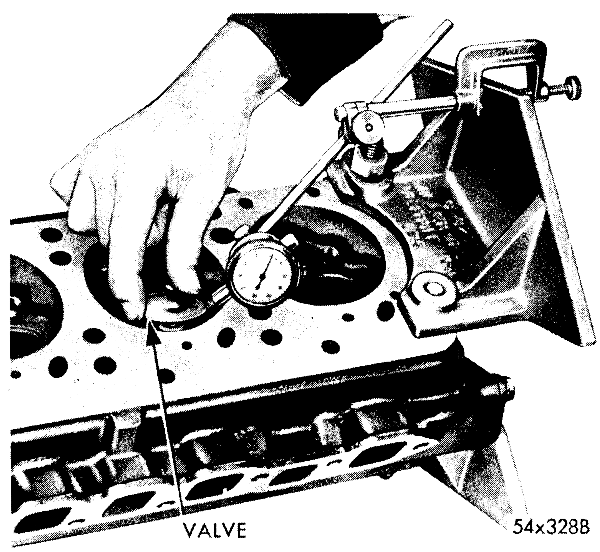

Fig. 14—Checking Valve Guide Clearance (SpitFire) (Typical of FirePower)

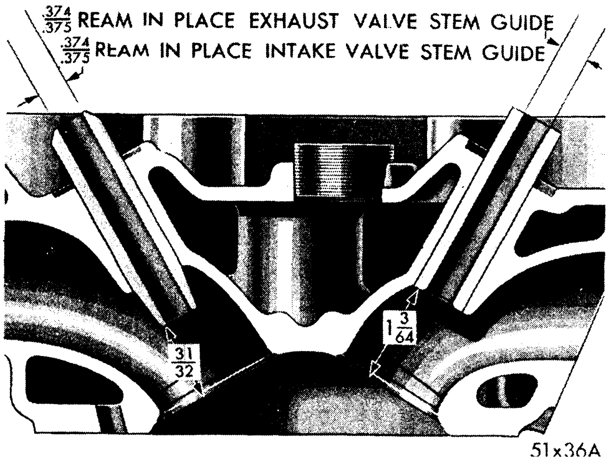

Fig. 15—Exhaust and Intake Valve Guide Installed in Head (FirePower)

(FirePower Engines), or ream guides for oversize valves (SpitFire Engines), to next oversize (if other than standard).

11. REMOVAL AND INSTALLATION OF VALVE GUIDES

On FirePower Engines drive out guides through top of cylinder heads with Tool DD-883. Install as follows: Turn cylinder head with combustion chamber facing up. Drive valve guides into position with a suitable driver to dimensions shown in Figure 15. After new valve guides have been installed, ream each guide .374 to .375 inch with Tool C-741. On SpitFire Engines valves with oversize stems are available in .005, .015, and .030 inch. Reamers to accommodate the oversize valve stems are as follows: Reamer Tool C-3433 (.379 to

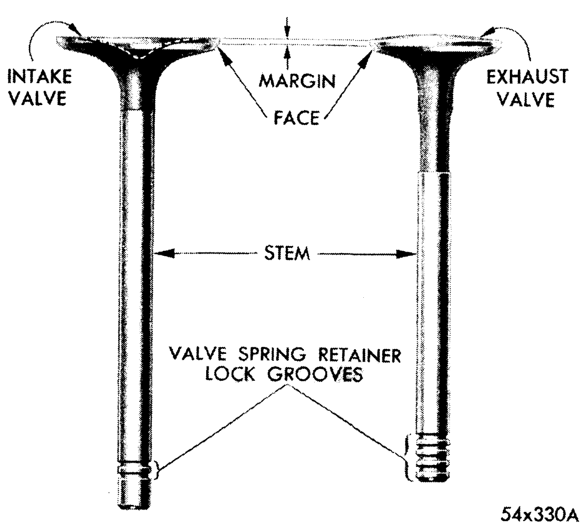

Fig. 16—Intake and Exhaust Valve Nomenclature

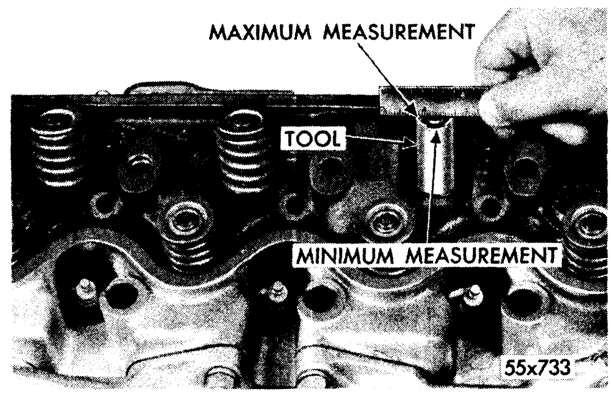

Fig. 17—Checking Valve Stem Position (SpitFire)

.380 inch), Reamer Tool C-3427 (.404 to .405 inch). Slowly turn reamer by hand and clean guide thoroughly before installing new valve.

CAUTION

Do not attempt to ream valve guides from standard directly to .030 inch. Use step procedure of .005, .015, and .030 inch so the valve guides may be reamed true in relation to valve seat.

12. REFACING VALVES AND VALVE SEATS

The intake and exhaust valves are faced to a 45 degree angle. When refacing valve, always check remaining margin (Fig. 16). Valves with less than $3/64$ inch margin should be discarded. The angle of both valve and seat should be identical. When refacing valve seats with Tool MTH-80, it is important that correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained. Check concentricity of valve seat using a dial indicator; total runout should not exceed .002 inch (total indicator reading). When the seat is

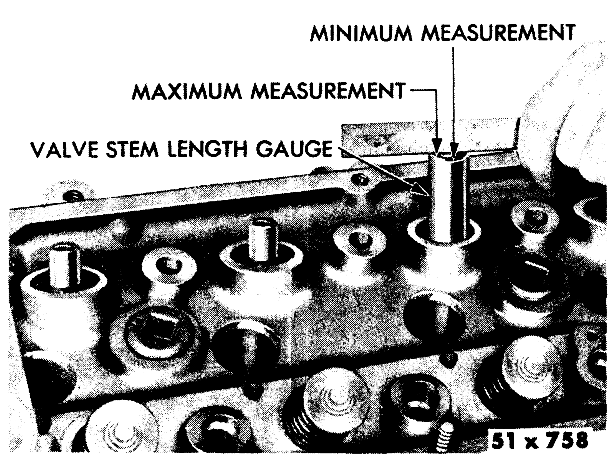

Fig. 18—Checking Valve Stem Position (FirePower)

properly positioned, width of intake seats should be $\frac{1}{16}$ to $\frac{3}{32}$ inch. The width of exhaust seats should be $\frac{3}{64}$ to $\frac{1}{16}$. When valves and seats are reground, the position of valve in head is changed, shortening operating length of hydraulic tappet. This means that plunger is operating closer to its bottomed position, and less clearance is available for thermal expansion of valve mechanism during high speed driving. Design of plunger travel includes a safety factor for normal wear and refacing of valves and seats. The dimension from valve spring seat in head to valve tip should be checked with gauge Tool C-3436 for SpitFire Engines and gauge Tool C-3061 for FirePower Engines, (Figs. 17 and 18).

The end of cylindrical gauge and bottom of slotted area represent maximum and minimum allowable extension of valve stem tip beyond spring seat. If tip exceeds maximum, grind to approach, but do not go below minimum allowable on gauge.

13. TESTING VALVE SPRINGS

Whenever valve springs are removed they should be tested with spring tester, Tool C-647. Attach torque wrench, check tension and multiply reading by 2. The valve springs should test 170 to 184 pounds when compressed to $1\frac{5}{16}$ inch. Discard springs that do not meet these specifications.

Check each spring for squareness with a steel square and surface plate. (Fig. 19). If spring is more than $\frac{1}{16}$ inch out of square, install new spring.

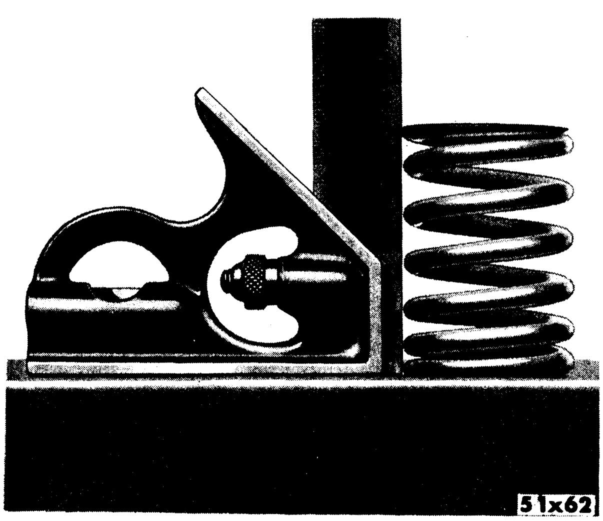

Fig. 19—Checking Valve Spring for Squareness

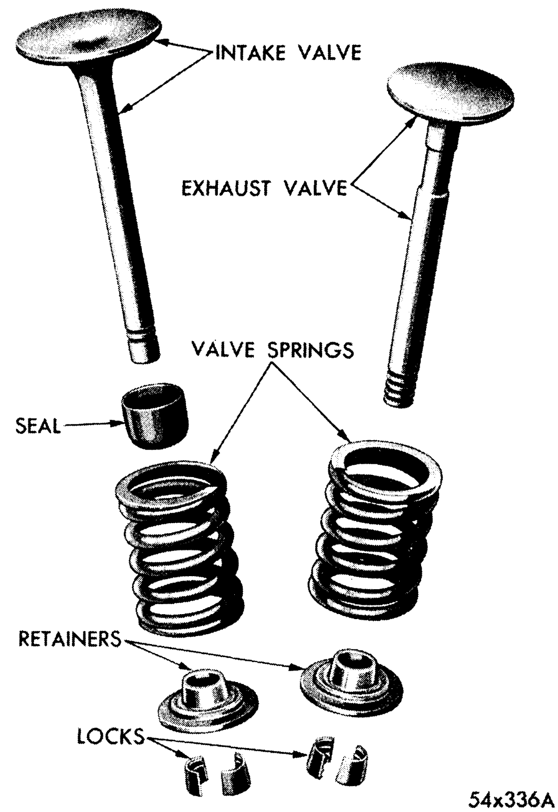

Fig. 20—Valves, Springs, Seals, Retainers and Locks (Disassembled View)

14. INSTALLING VALVES AND VALVE SPRINGS

Coat valve stems with lubricating oil and insert in position in cylinder head. Install cup seals on intake valve stems and over valve guides (Figs. 20 and 21), and install valve springs and retainers. Compress valve springs with Tool C-3422. Install locks and release tool.

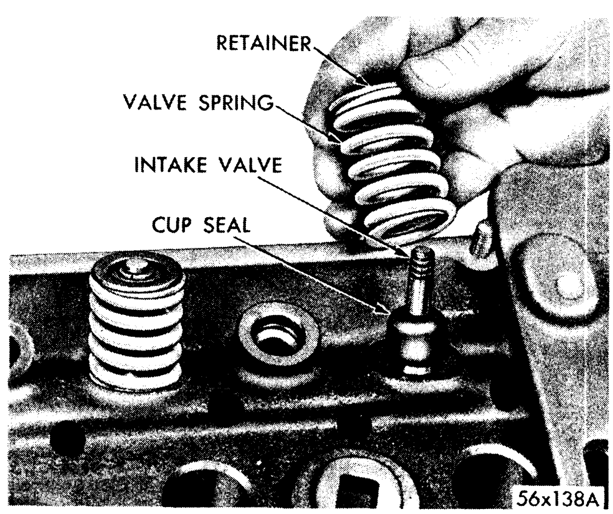

Fig. 21—Installing Intake Valves and Cup Seals

NOTE: If valves and/or seats are reground, check the installed height of springs. Make sure measurement is taken from full depth of counterbore in cylinder head to bottom surface of spring retainer. (If spacers are installed measure from top of spacer). If height is greater than 1 11/16 inches, install a 1/16 inch spacer (Part No. 1400482) in head counterbore to bring spring height back to normal 1 5/8 to 1 11/16 inch.

15. HYDRAULIC TAPPETS

a. Preliminary to Checking Hydraulic Tappets

Before disassembling any part of engine to check for tappet noise, check oil pressure at gauge and oil level in oil pan. The pressure should be between 40 to 65 pounds at 2,000 r.p.m. The oil level in pan should never be above "full" mark on dip stick, nor below "add oil" mark. Either of two conditions could be responsible for noisy tappets.

Oil Level Too High—If oil level is above "full" mark on dip stick, it is possible the connecting rods can dip into oil when engine is running and create foaming. This foam is fed to the hydraulic tappets by the oil pump, causing them to go flat and allowing valves to seat noisily.

Oil Level Too Low—Low oil level may allow pump to take in air which, when fed to tappets, causes them to lose length and allows valves to seat noisily. Any leaks on intake side of pump through which air can be drawn will create the same tappet action. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level leaks have been corrected, the engine should run at fast idle for sufficient time to allow all of air inside of tappets to be worked out.

b. Tappet Noises

To determine source of tappet noise, run engine at idle with cylinder head covers removed. Feel each valve spring to detect the noisy tappet.

NOTE: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on valve spring. Inspect rocker arm push rod sockets and push rod ends for wear. If noise is not appreciably reduced, it can be assumed the noise is in the tappet.

Valve tappet noise can be separated into two types, light noise and heavy noise. A light noise is usually caused by excessive leakdown around the unit plunger, or by plunger partially sticking in cylinder. A heavy noise is caused either by a tappet check valve not seating, or by foreign particles becoming wedged between plunger and tappet body, causing plunger to stick in down position. This heavy noise will be further evidenced by clearance between valve stem and rocker arm as valve closes. In either instance, the unit assembly should be removed for inspection and cleaning.

c. Removal of Tappets (with Rocker Arms in Position)

NOTE: If all of tappets are to be removed, it will be advisable to remove rocker arms and shaft. If only one or two tappets are to be removed, proceed as follows:

Install valve spring compression Tool C-3024, over rocker arm (Fig. 22) so heel of tool rests on valve stem side. Make certain valve is seated and tappet body is resting on low point of camshaft lobe. Refer to Paragraph 17, "Locating the Low Point of Camshaft Lobe in Conjunction with Valve Tappet Face." Using handle

Fig. 22—Compressing Valve Spring (FirePower) (Typical of SpitFire)

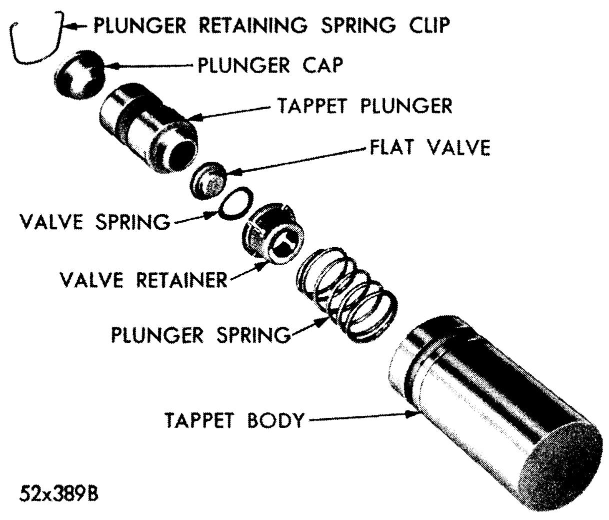

Fig. 23—Hydraulic Tappet (Disassembled View)

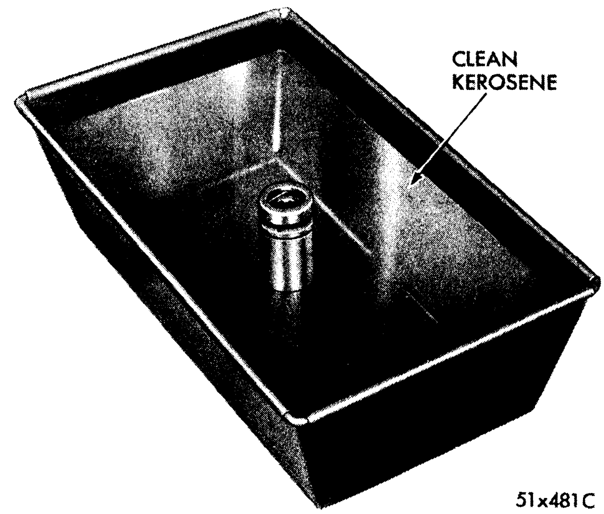

Fig. 24—Tappet Immersed in Clean Kerosene

of tool for leverage, compress valve springs sufficiently to raise rocker arm above push rod. While holding rocker arm in this position, slide rocker arm to one side along the tube.

NOTE: To avoid damage to valves, be sure that piston head is well below top of travel before compressing valve springs.

Remove intake manifold, carburetor and coil as an assembly. Remove tappet chamber cover and gasket. Lift tappet out of bore. If all tappets are to be removed, remove hydraulic tappets and place them in their respective holes in tappet and push rod holder, Tool C-3068. This will insure installation of tappets in their original locations.

NOTE: Do not disassemble a tappet on a dirty work bench. The plunger and tappet bodies are not interchangeable. The plunger and valve must always be fitted to the original body. It is advisable to work on one tappet at a time to avoid mixing parts. Mixed parts are not usable.

d. Disassembly (Fig. 23)

Pry out plunger retainer spring clip. Clean varnish deposits from inside of tappet body above plunger cap. Invert tappet body and remove plunger cap, plunger, flat check valve, check valve spring, check valve retainer, and plunger spring. Separate plunger, check valve retainer, and check valve spring. Place all parts in their respective place in tappet holder, Tool C-3068.

e. Cleaning and Assembly

Clean all tappet parts in a solvent that will remove all varnish and carbon. Replace tappets that are unfit for further service. Assemble tappets, as shown in Figure 24.

f. Inspection

If tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream bore to next oversize, using Tool C-3028. If plunger shows signs of scoring or wear and valve is pitted, or if valve seat on end of plunger indicates any condition that would prevent valve from seating, install a new tappet assembly.

g. Testing

Use a clean container. Fill the container with clean kerosene. Remove cap from plunger and completely submerge tappet in an upright position. Allow tappet to fill with kerosene. Remove tappet and replace cap. Hold tappet in an upright position and insert the lower jaw of pliers, Tool C-3160, in groove of tappet body (Fig. 25). Engage jaw of pliers with top of tappet plunger. Check leakdown by compressing pliers. If plunger collapses almost instantly as pressure is applied, disassemble tappet, clean and test again. If tappet still does not operate satisfactorily after cleaning, install a new tappet.

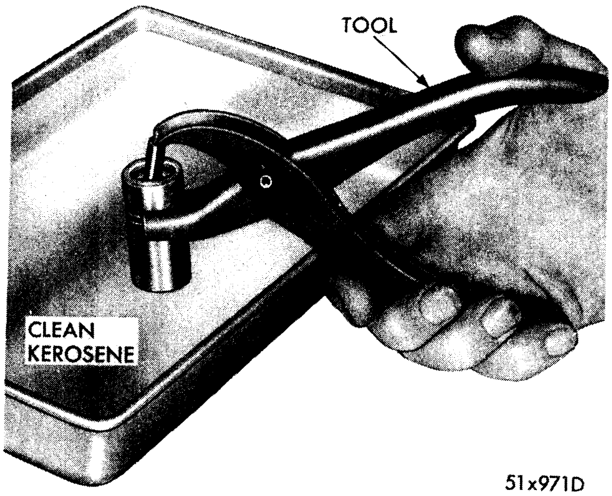

Fig. 25—Testing Hydraulic Tappet (Typical)

h. Installation

Lubricate tappets. Install tappets (Fig. 26) and push rods in their original bores. Position rocker arm so it is partially seated on valve stem. Install valve spring compressor tool and compress valve spring until rocker arm can be positioned over push rod. Remove tool and install tappet chamber cover. Install intake manifold, carburetor and coil, refill cooling system, start engine, warm up to normal operating temperature.

NOTE: To prevent damage to valve mechanism, the engine must not be run above fast idle until all of hydraulic tappets have filled with oil and become quiet.

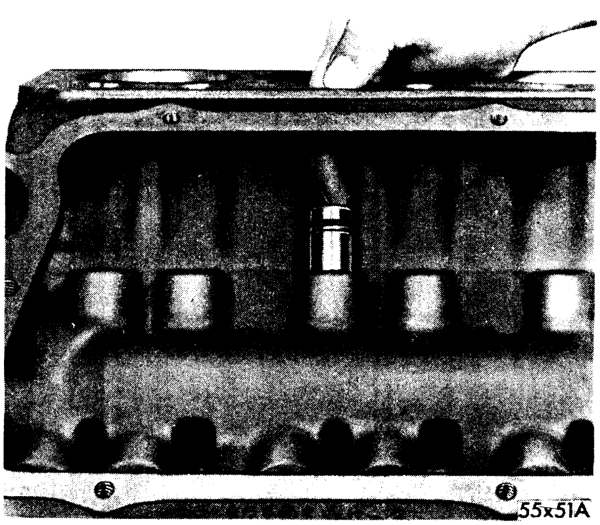

Fig. 26—Installing Tappet Assembly

16. CHECKING VALVE TIMING

Turn crankshaft until Number one intake valve is closed. Insert a .210 inch spacer between rocker arm and stem of Number one intake valve. (This can be done by prying between rocker and valve spring seat with a large screwdriver).

Install a dial indicator so that pointer contacts valve spring seat as nearly at a right angle as possible. Wait until seat stops moving. This indicates that oil has bled out of hydraulic tappet and plunger has bottomed, giving, in affect, a solid tappet. Set dial indicator on zero and turn crankshaft clockwise (normal running direction) until dial indicator shows that valve has lifted .020 inch (SpitFire) and .024 inch (FirePower). The timing on the vibration damper should now read from 5 degrees (BTDC) before top dead center to 7 degrees (ATDC) after top dead center. Before making this check, it is well to check the accuracy of the (TDC) top dead center mark on the damper by bringing Number One piston to (TDC) by means of an indicator placed in spark plug opening. After valve timing has been checked, turn crankshaft counter-clockwise until tappet is back down to valve-closed position. Remove the .210 inch spacer from between the rocker arm and valve stem.

CAUTION

Under no condition should crankshaft be turned further in clockwise direction, as spacer might cause valve spring to bottom and damage valve operating mechanism.

17. LOCATING LOW POINT OF CAMSHAFT IN CONJUNCTION WITH VALVE TAPPET FACE (CYLINDER HEAD INSTALLED)

Remove distributor cap, noting position of rotor for Number One and Number Six cylinders. Set timing mark ("DC") on vibration damper to pointer. With rotor at Number One firing position, the following tappets will be on low side of cam lobe.

2—Intake	7—Intake
2—Exhaust	8—Intake
4—Exhaust	8—Exhaust

NOTE: To remove Number One intake and exhaust tappet, rotate the crankshaft ¼ turn clockwise from above position.

With rotor at Number Six firing position, the following tappets will be on low side of cam lobe:

3—Intake	5—Intake
3—Exhaust	5—Exhaust
4—Intake	7—Exhaust

NOTE: To remove Number Six intake and exhaust tappet, rotate crankshaft ¼ turn clockwise from above position.

18. REMOVAL OF TIMING GEARS AND CHAIN

Remove radiator and water pump assembly. Remove bolt and flatwasher holding vibration damper on crankshaft. Remove two of the damper bolts, install Tool C-3033, and pull damper assembly off end of crankshaft.

Remove chain cover and gasket. Slide crankshaft oil slinger off end of crankshaft. Remove fuel pump eccentric attaching bolt, cup washer and eccentric. Remove timing chain, with crankshaft and camshaft sprockets. Remove the camshaft and crankshaft gear keys from their respective slots.

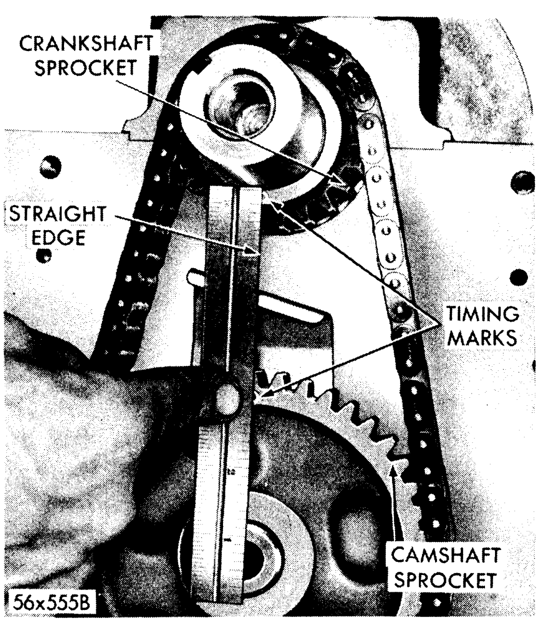

Fig. 27—Checking Alignment of Timing Marks

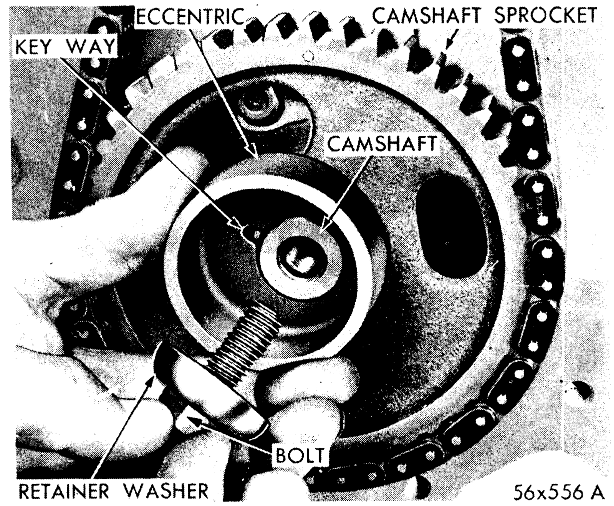

Fig. 28—Installing Fuel Pump Eccentric

19. INSTALLATION OF TIMING GEARS AND CHAIN

a. Installation

Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary centerline through both camshaft and crankshaft bores.

Place timing chain around both sprockets. Insert crankshaft and camshaft woodruff keys in their respective slots. Turn crankshaft and camshaft to line up with keyway locations in the sprockets.

Lift sprockets and chain (keep sprockets tight in position as described) slide both sprockets evenly over their respective shafts

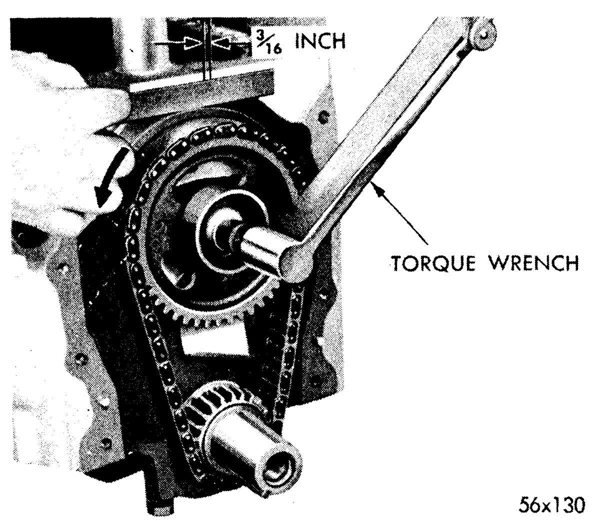

Fig. 29—Measuring Timing Chain Stretch (Typical)

(see Fig. 29), "Camshaft Installation". Use straight edge to check alignment of timing marks (Fig. 27.)

Slide fuel pump eccentric over camshaft against sprocket (Fig. 28). Be sure slot in eccentric lines up with protruding camshaft sprocket key. Install cup washer and bolt and tighten 35 foot-pounds torque.

b. Checking Timing Chain for Stretch

Place a scale next to timing chain so that any movement of chain may be measured. Place a torque wrench and socket over camshaft gear attaching bolt and apply torque in direction of crankshaft rotation to take up slack; 30 foot-pounds torque (with cylinder heads installed) and 15 foot-pounds torque (heads removed). Holding scale with dimensional reading even with edge of a chain link, apply torque in reverse direction 25 foot-pounds (with cylinder heads installed) and 15 foot-pounds (heads removed), and note the amount of chain rotation (Fig. 29). Install new timing chain, if its movement is greater than $\frac{3}{16}$ inch.

NOTE: With a torque applied to camshaft gear bolt, the crankshaft should not move. If there is any movement, however, the crankshaft should be blocked to prevent rotation.

If chain is satisfactory, slide crankshaft oil slinger over shaft and up against gear (flange away from gear.)

20. TIMING CHAIN CASE COVER OIL SEAL REPLACEMENT

a. Removing Oil Seal

Position puller screw of Tool C-3506 through

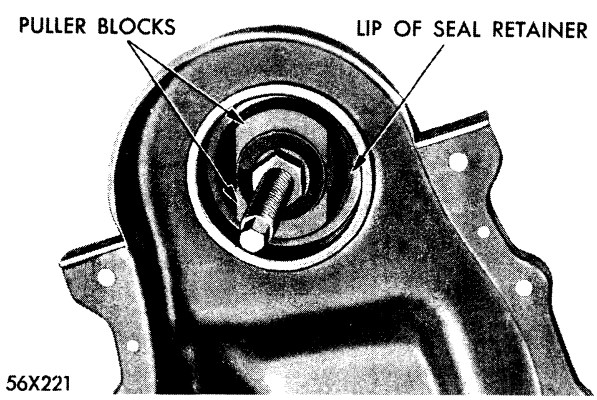

Fig. 30—Puller Blocks Expanded to Correct Pulling Position

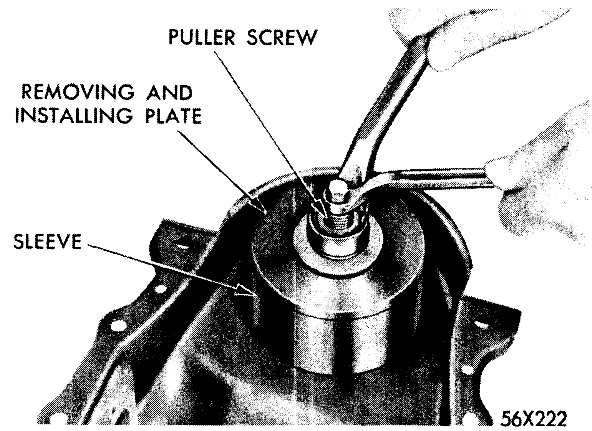

Fig. 31—Removing Oil Seal

case cover, with inside of case cover up. Position puller blocks directly opposite each other, and force angular lip between neoprene and flange of seal retainer. Place washer and nut on puller screw. Tighten nut as tight as possible by hand, forcing blocks into gap to point of distorting seal retainer lip (Fig. 30). **THIS IS IMPORTANT!** (puller is only positioned at this point.) Place sleeve over retainer and place removing and installing plate into sleeve. Place flatwasher and nut on puller screw. Hold center screw and tighten lock nut to remove seal (Fig. 31).

b. Installing Oil Seal

Insert puller screw through removing and installing plate so that the thin shoulder will be facing up.

NOTE: Always have thin shoulder up with stamped case cover, and thick shoulder up with a cast iron case cover.

Insert puller screw with plate through seal

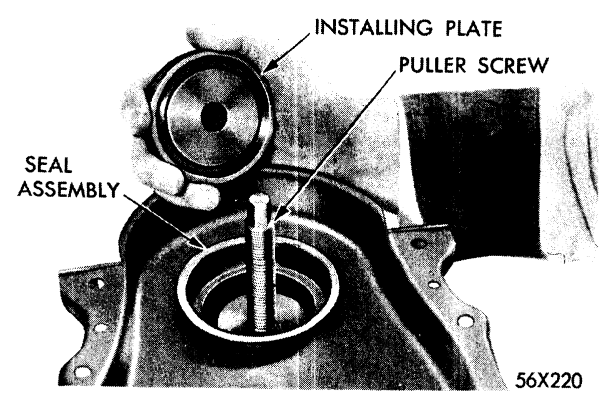

Fig. 32—Positioning Installer Plate on New Seal

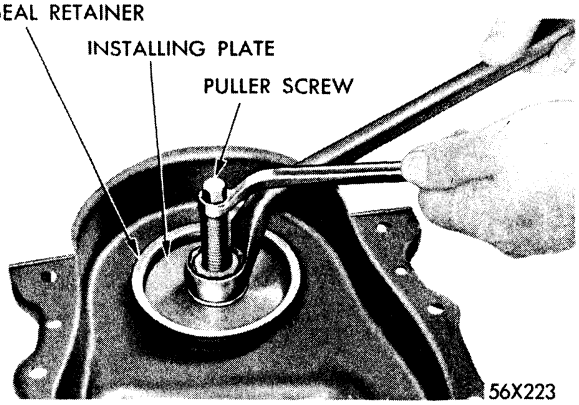

Fig. 33—Installing New Seal

opening (inside of chain case cover facing up). Place seal in cover opening, with neoprene down. Place seal installing plate into the new seal, with protective recess toward lip of seal retainer (Fig. 32). Install flatwasher and nut on puller screw, hold screw, and tighten nut (Fig. 33). Seal is properly installed when neoprene is tight against face of cover. Try to insert a .0015 feeler gauge between neoprene and cover (Fig. 34). If seal is installed properly, the feeler gauge cannot be inserted.

NOTE: It is normal to find particles of neoprene collected between the seal retainer and crankshaft oil slinger.

c. Installing Chain Case Cover

Be sure mating surfaces of chain case cover and cylinder block are clean and free from burrs. Using a new gasket, slide chain case cover over locating dowels and tighten bolts 15 foot-pounds torque.

21. INSTALLING VIBRATION DAMPER (Fig. 35)

Place damper hub key in slot in crankshaft, and slide hub on crankshaft. Place installing tool (part of Puller set Tool C-3033) in position and press damper hub on crankshaft. Slide pul-

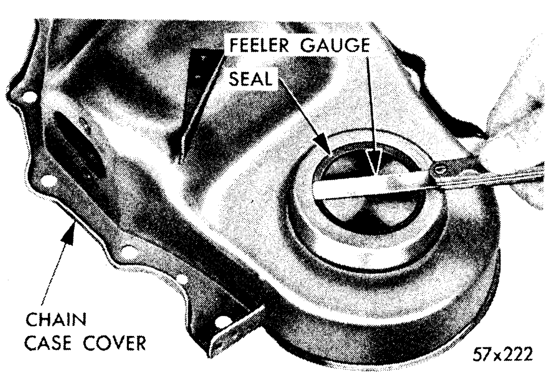

Fig. 34—Checking to Determine if Seal is Properly Seated

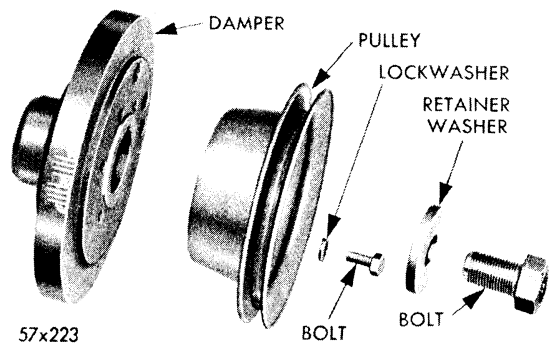

Fig. 35—Vibration Damper Assembly (Disassembled View)

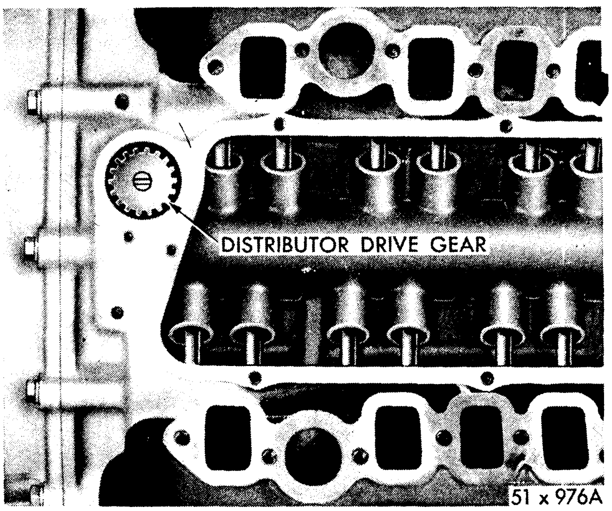

Fig. 36—Distributor Drive Gear Installation

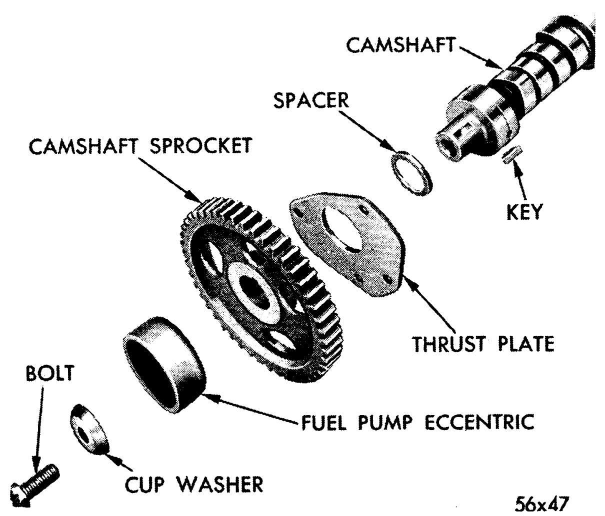

Fig. 37—Camshaft Drive Parts (Disassembled View)

ley over shaft and secure with bolts and lockwashers. Tighten bolts 15 foot-pounds torque. Install damper hub retainer washer and bolt. Tighten to 135 foot-pounds torque.

22. CAMSHAFT REMOVAL

With intake manifold, tappet cover, push rods, tappets and timing gears removed, remove distributor. Lift out distributor drive gear and stub shaft, (Fig. 36). Remove camshaft thrust plate attaching bolts and oil trough, (Fig. 37). Withdraw camshaft and spacer, **being careful not to damage the cam bearings with the cam lobes.**

23. REMOVAL AND INSTALLATION OF DISTRIBUTOR DRIVE SHAFT BUSHING (Camshaft Removed)

a. Removal

Insert Tool C-3052 into old bushing and thread down until a tight fit is obtained, (Fig. 38). Hold puller screw and tighten puller nut until bushing is removed.

b. Installation

Slide new bushing over burnishing end of Tool C-3053 and insert tool and bushing into bore. Drive bushing and tool into position, using a soft hammer. As the burnisher is pulled through bushing by tightening puller nut, the bushing is wedged tight in block and burnished to correct size. **DO NOT REAM THIS BUSHING.**

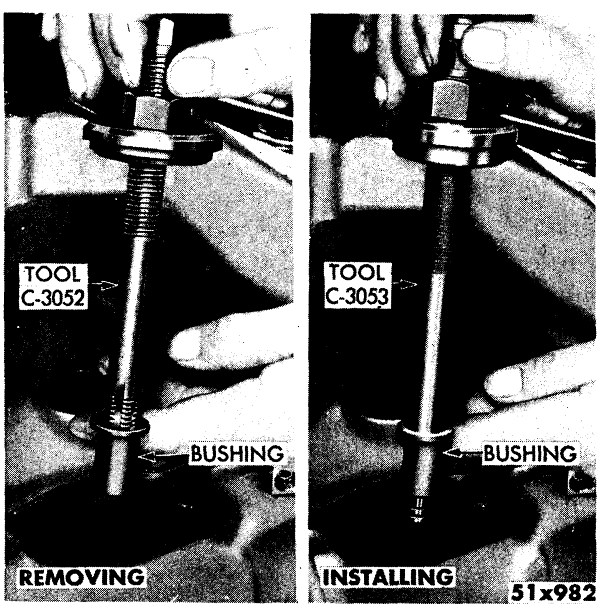

Fig. 38—Removing and Installing the Distributor Drive Shaft Bushing

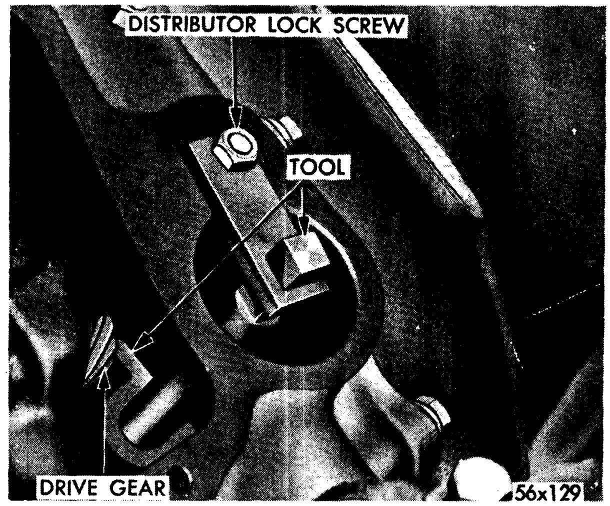

Fig. 39—Camshaft Holding Tool C-3509

24. CAMSHAFT INSTALLATION

Install Tool C-3509 in place of distributor drive gear and stub shaft (Fig. 39). Hold tool in position with distributor lock plate screw. This tool will restrict the camshaft from being pushed in too far and prevent knocking out the Welch plug, and **should remain installed until camshaft and crankshaft sprockets and timing chain have been installed.** Lubricate camshaft lobes and camshaft bearing journals and install camshaft **being careful not to damage cam bearings with the cam lobes.** Install thrust plate spacer (chamfered side toward camshaft fillet). Install thrust plate and oil trough; tighten screws 15 foot-pounds torque.

Check difference in thickness between spacer and thrust plate. The spacer should be thicker than thrust plate to extent that camshaft must have an end play of .002 to .006 inch.

NOTE: Whenever an engine has been rebuilt and a new camshaft and or new tappets have been installed, one quart of MOPAR Oil Additive should be added to the engine oil to aid break in. The oil mixture should be left in the engine for a minimum of 500 miles. However, it is not necessary to drain the mixture before normal oil change is required, nor is it necessary to use the oil additive at subsequent oil changes.

25. DISTRIBUTOR (BASIC) TIMING

Before installing the distributor drive shaft and gear, time engine as follows: Rotate crankshaft until Number One cylinder is at top dead center on Firing Stroke (check with Tool C-3075). When in this position, the pointer on chain case cover should be over ("DC") on vibration damper. Position oil pump shaft so that it lines up with slot in drive gear. Coat shaft of drive gear with engine oil. Install so that, after gear spirals into place, it will index with oil pump shaft, and slot in top of drive gear will be parallel with centerline of crankshaft (Fig. 36).

26. INSTALLATION OF DISTRIBUTOR

Hold distributor over mounting pad on cylinder block with vacuum chamber pointing toward right hand cylinder bank. Turn rotor until it points forward and to approximate location of Number One tower in distributor cap. Turn rotor counter-clockwise until breaker contacts are just separating. Place distributor oil seal ring in position. Lower distributor and engage shaft in slot of distributor drive shaft gear while holding rotor in position.

27. REMOVAL AND INSTALLATION OF CAMSHAFT BEARINGS (Engine Removed from Car)

a. Removal

With engine completely disassembled, drive out rear cam bearing Welch plug. Install proper size adapters and horse shoe washers (part of Tool C-3132) at back of each bearing shell to be removed and drive out bearing shells.

b. Installation

Install new camshaft bearings with Tool C-3132 by sliding new camshaft bearing shell over proper size adapter. Position bearing in tool (Fig. 40). Install horse shoe lock and by reversing removal procedure, carefully drive bearing shell into place. Install remaining shells in like manner. The oil holes in camshaft bearings and cylinder block must be in exact alignment to insure proper lubrication. (Fig. 40). Camshaft bearing index can be checked after installation by inserting a pencil flashlight in bearing shell. The complete circumference of camshaft bearing hole should be visible by looking through main bearing drilled oil passage. Another oil hole in cam bearings should be visible by looking down the left bank oil hole above and between No. 1 and 3 cylinders to

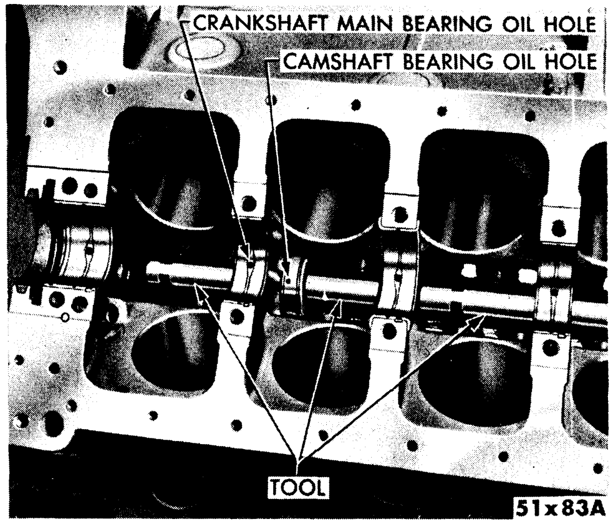

Fig. 40—Installing Camshaft Bearing Shells Using Tool C-3034

No. 2 cam bearing, and on the right bank above and between No. 6 and 8 cylinders to No. 4 cam bearing. If camshaft bearing shell oil holes are not in exact alignment, remove and reinstall. Use Tool C-897 to install a new Welch plug at rear of camshaft. Be sure this plug does not leak.

28. CYLINDER BLOCK

Clean cylinder block thoroughly, check all core hole plugs for evidence of leaking. If new core hole plugs are installed; coat edges of plug and core hole with a suitable sealer and drive plugs in place with driver, Tool C-897. Examine block for minute cracks or fractures. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.**

NOTE: Pistons and connecting rods must be removed from the top of cylinder block. When removing piston and connecting rod assemblies from engine, rotate crankshaft so each connecting rod is centered in cylinder bore.

Remove connecting rod cap and bearing shells. Install Tool C-3221 on one connecting rod bolt and protector over the other bolts and push each piston and rod assembly out of cylinder bore. After removal, install bearing cap to mating rod.

a. Checking Cylinder Bores

The cylinder bores should be checked for out-of-round and taper with Tool CM-119. If cylinder bores show more than .005 inch out-of-round or a taper of more than .010 inch, the cylinder block should be rebored and new pistons and rings fitted.

b. Honing Cylinder Bores

To remove light scoring, scuffing, or scratches from cylinder walls, use honing Tool C-823. **The crankshaft, bearings and internal parts should be protected during honing and boring operations.** Usually one or two "passes" with a hone will clean up a bore and still maintain required limits. If cylinder bores are found to be satisfactory in respect to taper and out-of-round and new rings are to be installed, use cylinder surfacing hone Tool C-3501 with 280 grit stones for deglazing bores. This will facilitate in the break-in of new rings.

CAUTION

Be sure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and water be used with a brush and then thoroughly dried. If this is impossible use SAE No. 10 oil and CLEAN rags. When the bore can be wiped with a clean white rag and be withdrawn clean, the bore is clean.

c. Cylinder Walls

Cylinder walls which are badly scored, scuffed, scratched, or worn beyond specified limits should be rebored. Whatever type of boring equipment is used, boring operation should be closely co-ordinated with the fitting of pistons and rings, in order that specifications may be maintained.

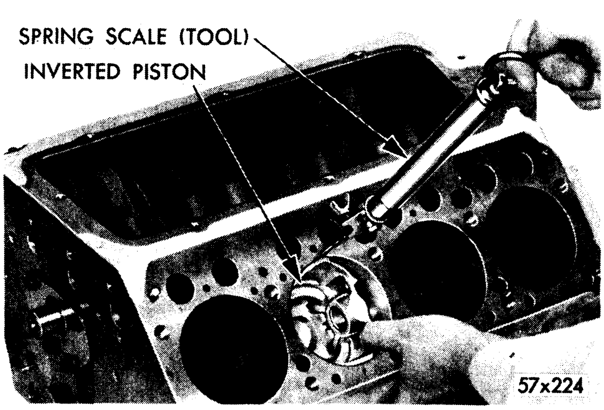

Fig. 41—Fitting Piston to Cylinder Bore (FirePower) (Typical of SpitFire)

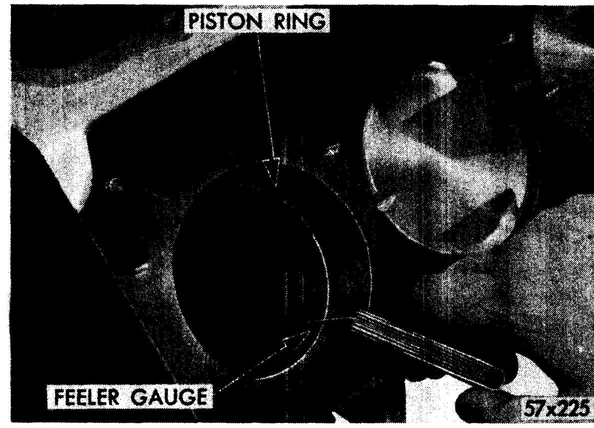

Fig. 42—Checking Ring Gap in Cylinder Bore (FirePower) (Typical of SpitFire)

d. Fitting Pistons

The piston and cylinder wall must be clean and dry. Coat the bore very lightly with SAE 10 W Engine Oil. The recommended clearance between the thrust face of piston and cylinder wall is .005 to .0015 inch. Check clearance with a .002 inch feeler stock ½ inch wide on spring scale Tool C-690, by inserting piston in bore, upside down, with feeler stock between thrust face of piston and cylinder wall. Hold piston and draw the feeler stock straight out with spring scale (Fig. 41). The amount of pull required to withdraw the feeler stock should be 8 to 12 pounds.

NOTE: Piston fitting should be done at normal room temperature, 70° F.

All service pistons include piston pins and retaining rings and are available in standard

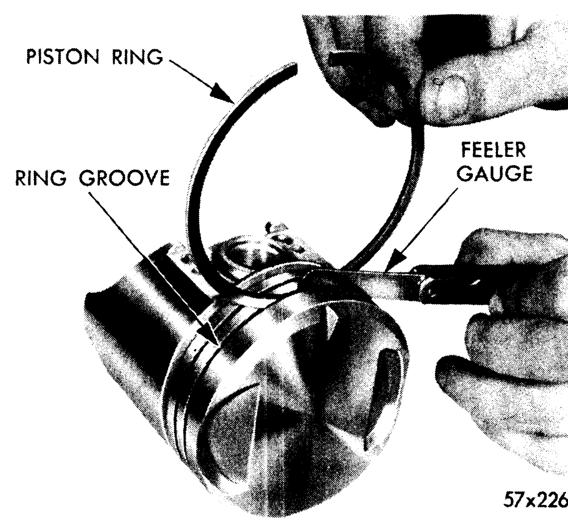

Fig. 43—Checking Piston Ring Side Clearance

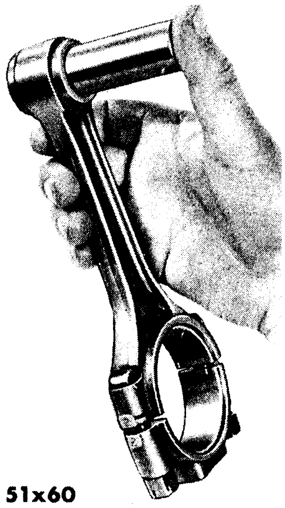

Fig. 44—Fitting Piston Pins in Connecting Rod

and the following oversizes, .005, .020, .040 and .060 inch, (C-75 only).

e. Fitting Rings

Measure piston ring gap about two (2) inches from bottom of cylinder bore in which it is to be fitted. (An inverted piston can be used to push the rings down to position.) This will insure positioning rings exactly square with cylinder wall before measuring. Insert feeler stock in gap (Fig. 42). The ring gap should be between .010 to .020 inch. This measurement is the same for all rings. Measure clearance between piston ring and ring groove (Fig. 43). The clearance should be .0015 to .0030 inch for top compression ring, .001 to .0025 inch for intermediate ring, and .001 to .003 for oil control ring. Starting with oil ring expander, place expander ring in lower ring groove and install oil control ring. Install compression rings, in top and middle grooves. Use ring installer, Tool C-3418.

NOTE: Be sure the mark "Top" on each compression ring is to the top of piston when ring is installed.

f. Fitting Pins

The piston pin should be a tight thumb press fit in connecting rod (Fig. 44) and in piston (Fig. 45) at normal room temperature, 70°F. If proper fit cannot be obtained with standard pins, ream piston and connecting rod, and install oversize piston pin. Piston pins are supplied in standard and the following oversizes: .003 and .008 inch. Assemble pistons to rods on right cylinder bank (2, 4, 6, and 8), with the indent on piston head opposite to the larger chamfer on the large end of connecting rod. Assemble pistons to rods on left cylinder bank (1, 3, 5, and 7) with the indent on the piston head on the same side as the larger chamfer on large end of connecting rod.

29. CONNECTING RODS

IMPORTANT

A Maltese Cross stamped on the engine numbering pad (Fig. 46) indicates that engine is equipped with a crankshaft which has one or more connecting rods and main bearing journals finished .001 inch undersize. The position

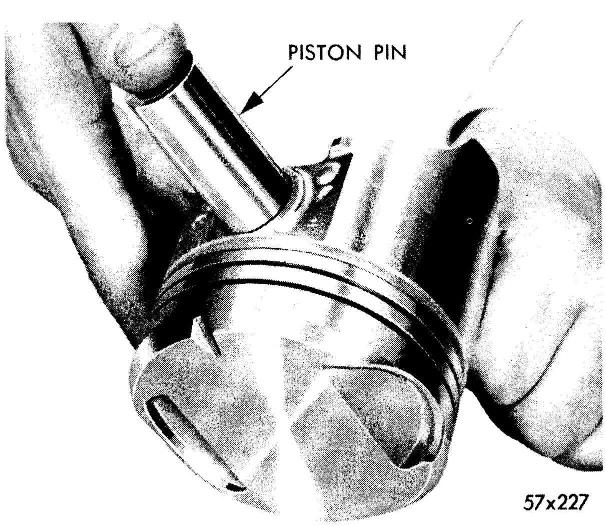

Fig. 45—Fitting Piston Pin in Piston (Typical)

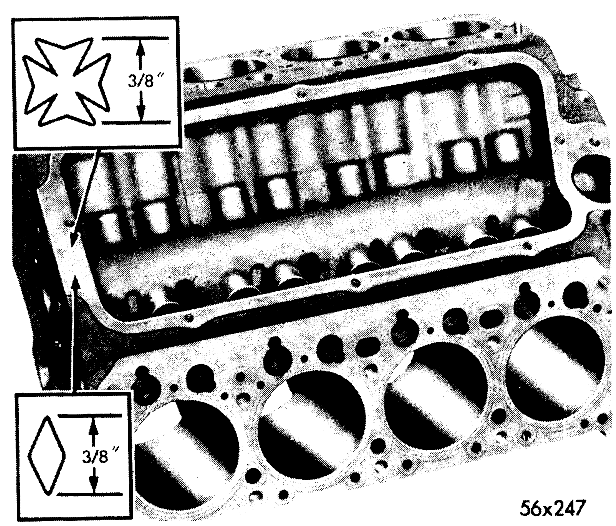

Fig. 46—External Identification (Parts other than standard size)

of the undersize journal or journals will be stamped on machined surface of Number 3 counter-weight (Fig. 47). Connecting rod journals will be identified by letter "R" and main bearing journals by the letter "M". Thus, "M-1" indicates that Number 1 main bearing journal is .001 undersize. Also, a diamond-shaped marking stamped on engine numbering pad indicates that All tappet bodies are .008 inch oversize. (See Fig. 46).

30. INSTALLING CONNECTING ROD BEARINGS

NOTE: Fit all rods of one bank until completed. Do not alternate from one bank to another, because when rods are assembled to pistons correctly, they are not interchangeable from one bank to another.

Each bearing cap has a small "V" groove across the parting face. When installing the lower bearing shell, make certain that "V" groove in shell is in line with "V" groove in cap. This allows lubrication of the cylinder wall. The bearing shells should always be installed so that small formed tang fits into machined grooves of rods. The side play should be from .006 to .014 inch (two rods).

Limits of taper or out-of-round on any crankshaft journals should be held to .001 inch. Bearings are available in .001, .002, .003, .010 and .012 undersize.

NOTE: Install bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file rods or bearings caps.

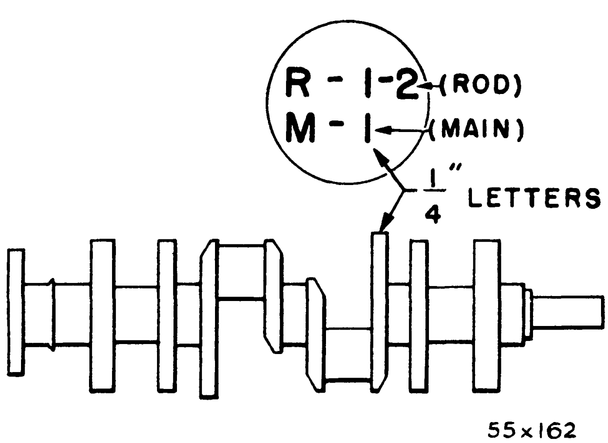

Fig. 47—Internal Identification (Parts other than standard size)

31. CHECKING CONNECTING ROD BEARING CLEARANCE (PLASTIGAGE METHOD)

The measurement of connecting rod bearing clearance can be done with the use of Plastigage with the engine in the chassis. After removing the connecting rod cap, wipe off oil from the journal and inserts. Place the Plastigage on bearing, parallel with crankshaft. Reinstall cap and tighten attaching nuts alternately to specified torque.

Remove cap and measure the width of the compressed material with the graduated scale to determine bearing clearance. Allowable clearance is from .0005 to .0015 inches. If taper of compressed material is evident, measure with the graduated scale. If difference exceeds .001 inch, journal should be checked with micrometers.

32. INSTALLING PISTON AND CONNECTING ROD ASSEMBLY IN CYLINDER BLOCK

Before installing pistons, rods, and rod assemblies in bore, be sure that compression ring gaps are diametrically opposite one another and not in line with oil ring gap. The oil ring expander gap should be toward the outside "V" of engine. The oil ring gap should be turned toward the inside of the "V" of engine. Immerse piston head and rings in clean engine oil, slide ring compressor, Tool C-385, over piston, and tighten with special wrench (part of Tool C-385). Be sure position of rings does not change during this operation. Screw connecting rod bolt protector (part of Tool C-3221) on one rod bolt, and insert rod and piston into cylinder bore. Attach puller part of Tool C-3221 on the other bolt, and guide the rod over crankshaft journal. Tap piston down in cylinder bore, using handle of a hammer. At the same time, guide connecting rod into position on crankshaft journal. The **notch or groove** on top of piston **must** be pointing toward front of engine and the larger chamfer of connecting rod bore must be installed toward crankshaft journal fillet. Install rod caps, tighten nuts to 45 foot-pounds torque.

33. CRANKSHAFT

The crankshaft journals should be checked for excessive wear, taper and scoring. Journal grinding should not exceed .012 inch under the standard journal diameter. **DO NOT** grind thrust faces of No. 3 main bearing. **DO NOT** nick crankpin or main bearing fillets. After regrinding remove rough edges from crankshaft oil holes and clean out all oil passages.

34. CRANKSHAFT BEARINGS

The halves of Number 1, 2 and 4 bearings are interchangeable (the bearing caps are not interchangeable) and should be marked at removal to insure correct reassembly. Number 3 bearing, which controls the crankshaft end thrust, is not interchangeable with the others. The upper and lower halves, however, of Number 3 bearing are interchangeable. Number 5 bearing halves are not interchangeable. Bearing shells are available in standard and the following undersizes: .001, .002, .003, .010 and .012 inch. Never install an undersize bearing shell that will reduce the clearance below specifications.

35. REMOVAL AND INSTALLATION OF MAIN BEARINGS

a. Removal

Remove oil pan and mark bearing caps before removal. Remove bearing caps one at a time. Remove upper half of bearing by inserting Tool C-3059 (Fig. 48) in oil hole of crankshaft. Slowly rotate crankshaft clockwise, forcing out upper half of bearing shell.

b. Checking Main Bearing Clearance

PLASTIGAGE METHOD. Use same technique as described in Paragraph 31.

CAUTION

If bearings are measured with the engine in the chassis, the crankshaft must be supported in order to take up clearance between the upper bearing insert and crankshaft journal. This can be done by snugging bearing caps of adjacent bearings with .005 to .015 inch cardboard between lower bearing shell and journal. Be sure to remove cardboard. Use extreme caution when this is done to avoid unnecessary strain on the crankshaft or bearings or false reading may be obtained. Do not rotate crankshaft while plastigage is installed.

It is permissible to use a .001 inch undersize bearing with a standard bearing or a .002 inch bearing. Always use the smaller diameter bearing half as the upper housing half. Never use a new bearing with used bearing and never use an upper bearing half more than .001 inch smaller than the lower bearing half.

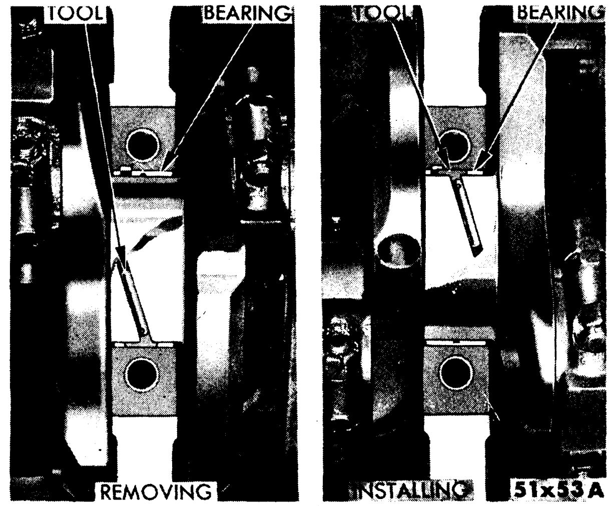

Fig. 48—Removing and Installing Main Bearing Upper Shell

c. Installation

NOTE: When installing a new upper bearing shell, slightly chamfer the sharp edge from plain side.

Start bearing in place, and insert Tool C-3059 in oil hole of crankshaft (Fig. 48). Slowly rotate the crankshaft counter-clockwise, sliding bearing into position.

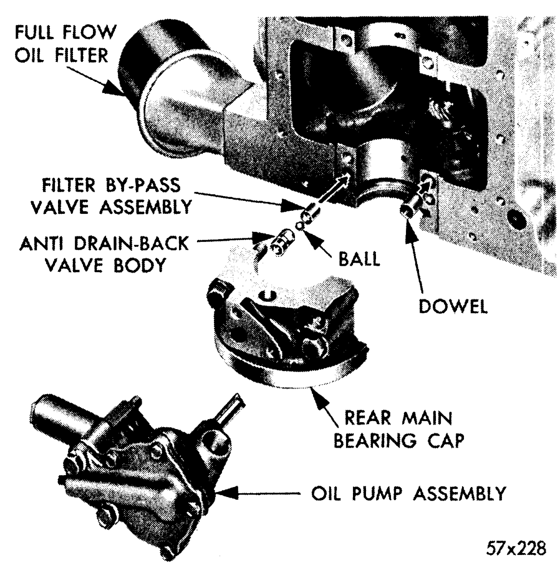

Fig. 49—Installing By-Pass Valve — Rear Main Bearing Cap

After all bearings have been fitted, tighten Number 3 (center) main bearing first, and work alternately to both ends. Tighten all caps to 85 foot-pounds torque.

NOTE: Before installing rear main bearing cap, position hollow dowel in cylinder block bore. See Fig. 49.

Crankshaft end play should be .002 to .007 inch.

36. REMOVAL AND INSTALLATION OF OIL PAN

a. Removal

Drain oil and remove dip stick. Disconnect crossover and "Y" pipe at exhaust manifolds and at clamp to exhaust extension so that crossover and "Y" pipe may be moved out of way. Remove the converter dust shield. **Be sure the rest of exhaust system is sufficiently supported.**

Loosen distributor cap to prevent interference with the heater housing with engine raised. Remove starter. Remove nuts from front engine mounts and hoist engine ¾ inch. Rotate the crankshaft until the front counterweight is up (this is done when the timing mark is 180° from the timing pointer). Disconnect steering linkage at idler arm support bracket, and allow linkage to settle away from bottom of pan. Remove bolts that hold pan to cylinder block and remove pan.

b. Installation

Clean pan thoroughly and install new seals and gaskets. **End seals should be bottomed in their grooves and retained by crimping.** Ends of seals should extend approximately 1/32 inch higher than the attaching face of oil pan to insure proper sealing. Tighten bolts evenly to 15 foot-pounds torque. Install exhaust pipes and connect steering linkage. Refill crankcase. See "Lubrication", Section XV.

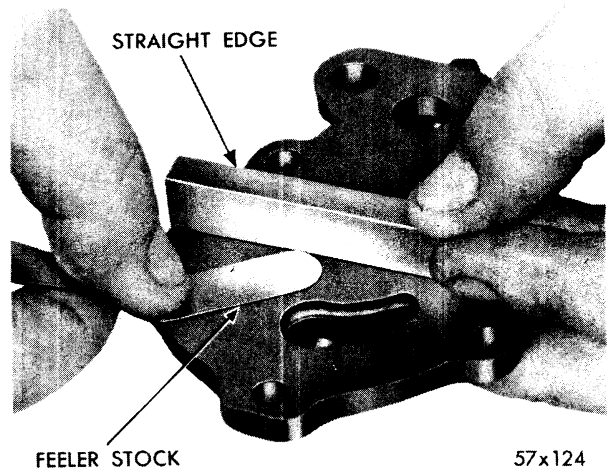

Fig. 51—Checking Oil Pump Cover

37. OIL PUMP

a. Removal

Remove oil pan, oil pump attaching bolts and remove pump by pulling straight down.

b. Disassembly (Fig. 50)

Remove oil pump cover and oil seal ring. Remove pump rotor and shaft, and lift out pump rotor body. Remove oil pressure relief valve plug, and lift out spring and plunger.

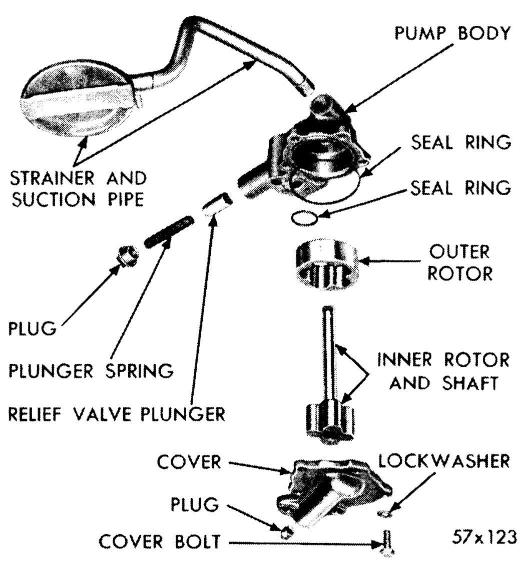

Fig. 50—Oil Pump (Disassembled View)

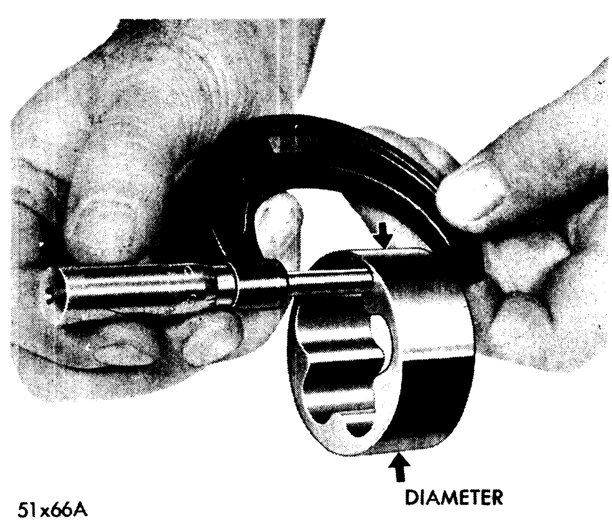

Fig. 52—Measuring Thickness of Outer Rotor

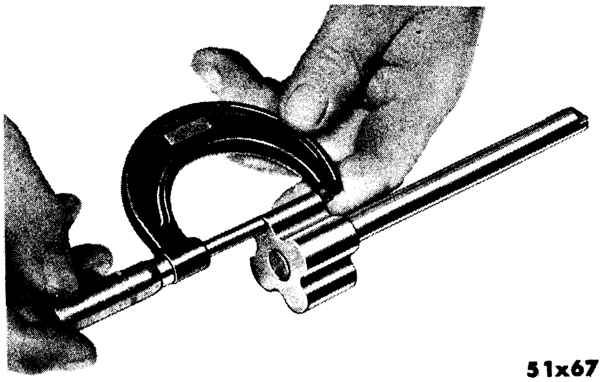

Fig. 53—Measuring Thickness of Pump Rotor

c. Inspection and Repair

Wash all parts thoroughly. The mating face of oil pump cover should be smooth. Replace cover if it is scratched or grooved.

Lay a straightedge across cover surface (Fig. 51). If a .0015 inch feeler gauge can be inserted between cover and straightedge, the cover should be replaced. If outer rotor measures less than .998 inch (Fig. 52) and diameter less than 2.244 inches, replace outer rotor. If pump rotor measures less than .998 inch (Fig. 53) a new pump rotor should be installed. Slide outer rotor and rotor into pump body and place a straightedge across face (between bolt holes), as shown in Figure 54. If a feeler gauge of more than .004 inch can be inserted between rotors and straightedge, replace pump body. Remove pump rotor and shaft, leaving outer rotor in pump cavity. Press rotor body to one side with fingers and measure clearance between outer rotor and pump body, (Fig. 55). If measurement is more than .012 inch, replace oil pump body. If clearance between pump rotor and outer rotor (Fig. 56) is more than .010 inch, replace pump rotor and outer rotor. Check

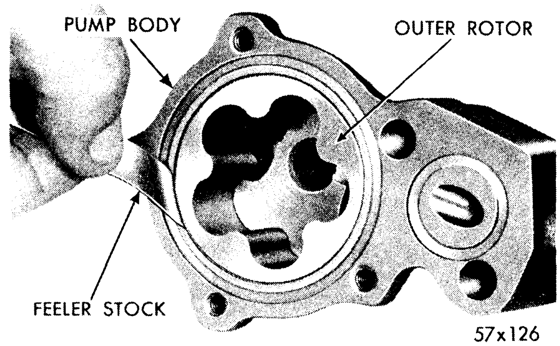

Fig. 55—Measuring Clearance between Outer Rotor and Oil Pump Body

oil pump relief valve plunger for scoring and for free operation in its bore. If plunger is scored, replace plunger. The spring should conform to Specifications on chart. If, for any reason, the spring has to be replaced, the same color spring should be used. An exception is where oil pressure is either above or below specifications. When assembling oil pump, be sure to use a new oil seal ring between cover and body. Tighten cover bolts to 10 foot-pounds torque. Prime the oil pump.

RELIEF VALVE SPRING CHART

Color	Free Height	Under Load Height	Tension Pounds
Gray (Lt.) . . .	3 1/32 inch	2 1/16 inch	16.1 to 17.1
Red (Std.) . . .	2 27/32 inch	2 1/16 inch	19.5 to 20.5
Brown (Hvy.)	2 31/32 inch	2 1/16 inch	22.0 to 23.9

d. Installation

Make sure rear main bearing cap hollow dowel is in position in cylinder block, as shown in

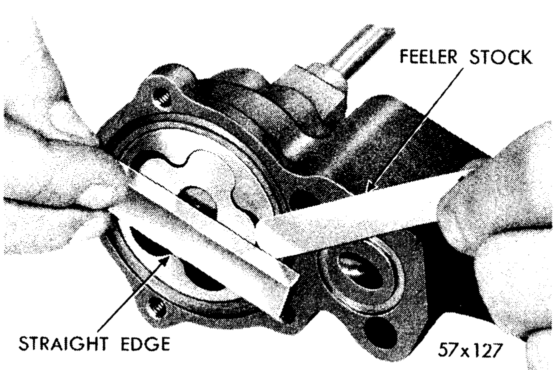

Fig. 54—Measuring Clearance over Oil Pump Rotor

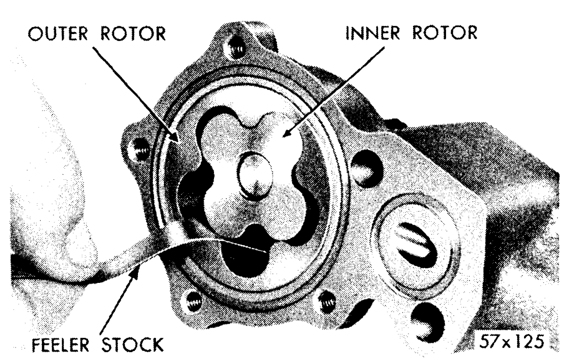

Fig. 56—Measuring Clearance Between Pump Rotors

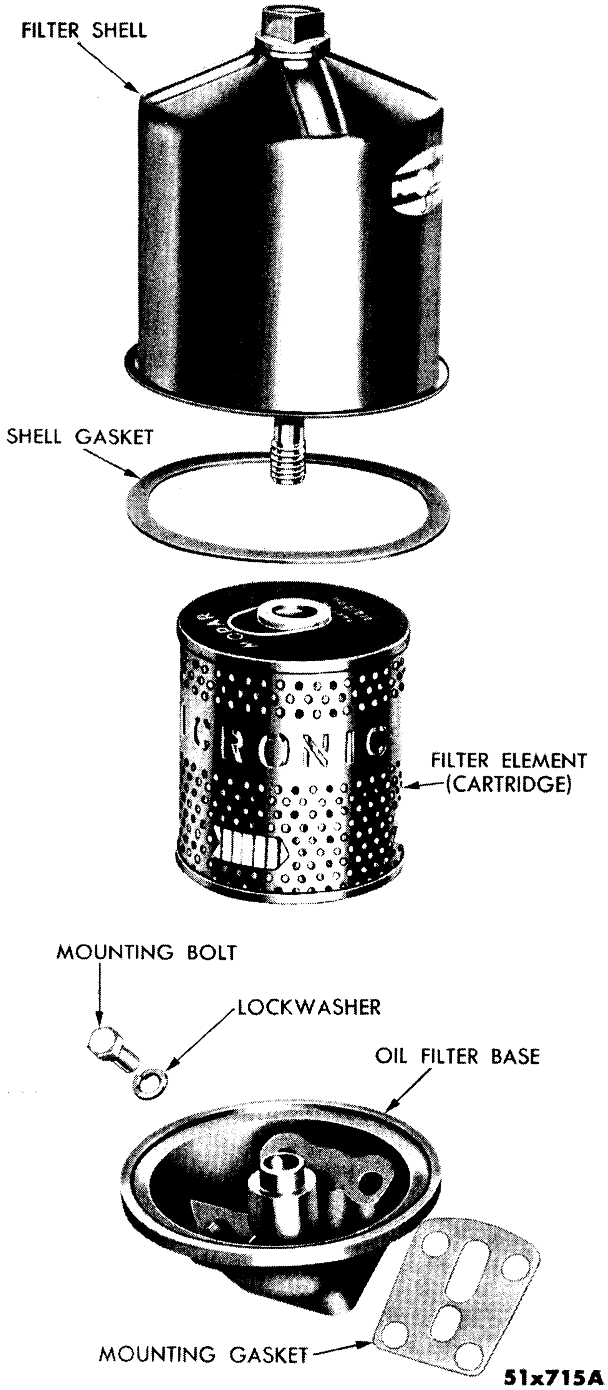

Fig. 57—Full Flow Type Oil Filter (Disassembled View)

Figure 49. Align tank on oil pump shaft with slot on distributor lower drive shaft. Install oil pump to rear main bearing cap. Tighten mounting bolts to 33 foot-pounds torque.

After oil pump has been installed, check alignment of strainer. The bottom of strainer must be on a horizontal plane with machined surface of cylinder block. The foot on the strainer should touch bottom of oil pan.

38. REMOVAL AND INSTALLATION OF OIL FILTER

Remove the shell retaining center bolt and lift off outer shell and gasket. (Fig. 57). Remove filter element. Remove filter base attaching bolts and filter base if necessary.

Use new gaskets, reinstall filter base and new

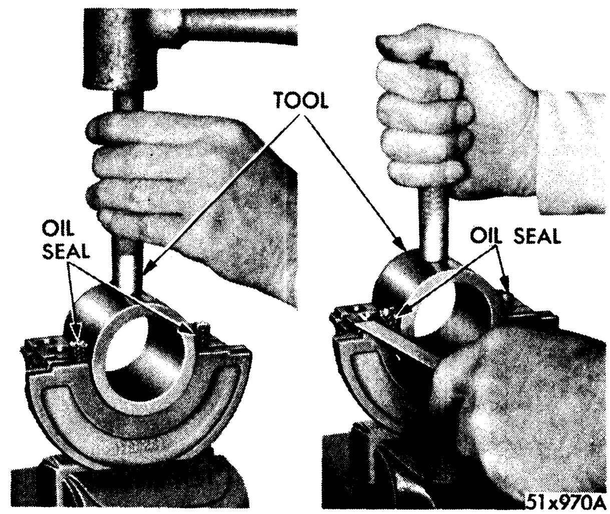

Fig. 58—Installing Rear Main Bearing Oil Seal

filter element. Install outer shell and tighten center bolt securely.

NOTE: FirePower Engine—Remove air cleaner. Loosen oil filter. Raise car. Remove filter from below car.

39. REPLACEMENT OF REAR MAIN BEARING OIL SEAL (Crankshaft removed)

Remove old oil seals from cylinder block and bearing cap. Install a new rear main bearing oil seal in block so that both ends protrude. Tap seal down into position using Tool C-3574 on the FirePower Engines and Tool C-3020 on the SpitFire Engines until tool is seated in bearing bore. Hold tool in this position, and cut off portion of seal that extends above block on both sides.

Install a new seal in bearing cap (bearing shell removed) so that the ends protrude. (Fig. 58.) Tap seal down into position with Tool C-3511 (left-hand view), until tool is seated. Trim off portion of seal that protrudes above cap (right-hand view). Install two cap side seals in grooves in cap. Care should be used when installing these seals as they are **NOT** inter-

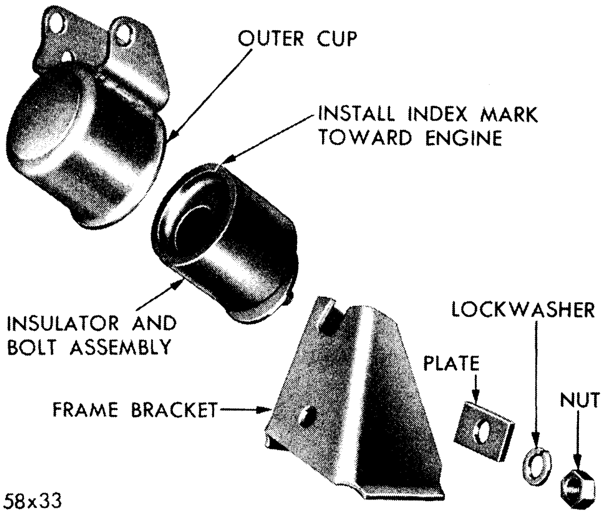

Fig. 59—Front Engine Mounting (Disassembled View)

changeable from left to right or from (Spitfire) to (Firepower) engines. The seal with the longer body should be installed on the oil filter side of the block. Seals incorrectly installed will cause an oil leak.

40. REMOVAL OF FRONT ENGINE MOUNTINGS (Fig. 59)

Remove nut, washer and lockwasher from underside of frame bracket. Place jack under engine toward front of bottom portion of **oil pan.** Remove nuts, bolts from each mount.

SERVICE DIAGNOSIS

41. ENGINE WILL NOT START

Possible Causes:

a. Weak battery.

b. Overheated engine.

c. Low compression.

d. Corroded or loose battery terminal connections.

e. Weak coil.

f. Broken or loose ignition wires.

g. Dirty or corroded distributor contact points.

h. Defective ignition switch.

i. Moisture on ignition wires, caps, or plugs.

j. Cracked distributor cap.

k. Fouled spark plugs

l. Stuck valves.

m. Improper spark plug gap.

n. Improper timing (ignition).

o. Damaged distributor rotor.

p. Dirt or water in gas line or carburetor.

q. Ice in carburetor or fuel line.

r. Carburetor flooded.

s. Fuel level in carburetor bowl not correct.

t. Insufficient supply of fuel.

u. Defective fuel pump.

v. Vapor lock.

w. Sticking choke.

x. Defective starting motor or solenoid.

y. Defective neutral switch.

42. ENGINE STALLS

Possible Causes:

a. Idling speed too low.

b. Needle valve and seat in carburetor stuck.

c. Idle mixture too lean or too rich.

d. Carburetor flooding.

e. Dirt or water in gas line or carburetor.

f. Frozen gas line.

g. Incorrect carburetor float level.

h. Leak in intake manifold, distributor vacuum line or carburetor mounting gaskets.

i. Worn accelerator pump. (Stall occurs on acceleration.)

j. Improper choke adjustment.

k. Choke sticking.

l. Carburetor icing (cold, wet weather).

m. Excessive pressures (air conditioning).

n. Loose ignition wires.

p. Weak battery.

q. Loose ignition switch connection.

r. Spark plugs dirty, damp, or gaps incorrectly set.

s. Distributor advance not operating.

t. Defective coil or condenser.

u. Distributor points dirty, burned, or incorrectly spaced.

v. Exhaust system restricted.

w. Trailing edge of rotor worn.

x. Leaks in ignition wiring.

y. Incorrect valve tappet clearance. (C-300)

z. Burned valves.

aa. Low compression.

bb. Engine overheating.

cc. Use of winter fuels in hot weather.

43. ENGINE HAS NO POWER

Possible Causes:

a. Torque converter stator assembled in reverse.

b. Incorrect ignition timing.

c. Weak coil or condenser.

d. Stiff accelerator linkage.

e. Trailing edge of rotor worn.

f. Defective mechanical or vacuum advance (distributor).

g. Hydraulic tappet pump up (high speed).

h. Excessive play in distributor shaft.

i. Weak spring in contact points.

j. Distributor cam worn.

k. Spark plugs dirty or gap incorrectly set.

l. Insufficient point dwell.

m. Fouled spark plugs.

n. Low grade fuel.

o. Weak valve springs.

p. Carburetor in poor condition.

q. Valves sticking when hot.

r. Dirt or water in gas line or carburetor.

s. Ice in gas line or carburetor.

t. Improper carburetor float level.

u. Worn camshaft lobes.

v. Defective fuel pump.

w. Pistons or pins fit tight.

x. Valve timing incorrect.

y. Too rich or lean fuel mixture.

z. Incorrect valve tappet clearance (C-300).

aa. Blown cylinder head gasket.

bb. Low compression.

cc. Flow control valve not operating (Power Steering).

dd. Burned, warped, or pitted valves.

ee. Spark plug breakdown under load.

ff. Plugged, restricted, or damaged muffler or tail pipe.

gg. Brakes dragging.

hh. Tight wheel bearings.

ii. Clutch slipping. (If so equipped.)

jj. Engine overheating.

kk. Detonation.

ll. Stuck transmission regulator valve.

mm. Improper ignition or battery ground.

44. ENGINE "LOPES" OR MISSES (AT IDLE)

Possible Causes:

a. Air leak between intake manifold and heads due to retaining bolts bottoming or damaged gasket.

b. Incorrect carburetor idle adjustment.

c. Dirt or water in gas line or carburetor.

d. Dirty jets or plugged passages in carburetor.

e. Incorrect valve tappet clearance. (C-300).

f. Burned, warped, or pitted valves.

g. Incorrect ignition timing.

h. Leaks in ignition wiring.

i. Blown head gasket.

j. Air leak at carburetor mounting gasket.

k. Worn lobes on the camshaft.

l. Moisture on ignition wires, cap, or plugs.

m. Worn timing chain.

n. Defective spark advance mechanism.

o. Sticking valves.

p. Excessive play in distributor shaft.

q. Distributor cam worn.

r. Inoperative choke.

s. Spark plugs damp, dirty, or the gaps set too close.

t. Overheated engine.

u. Weak battery.

v. Uneven compression.

w. Low grade of fuel. (Winter fuel used in summer.)

x. Flooding carburetor.

y. Carburetor icing (cold, damp weather).

45. ENGINE MISSES WHILE IDLING

Possible Causes:

a. Spark plugs dirty, damp, or gap incorrectly set.

b. Broken or loose ignition wires.

c. Burned or pitted contact points, or points set with insufficient gap.

d. Coil or condenser defective.

e. Weak battery.

f. Distributor cap cracked.

g. Trailing edge of rotor worn.

h. Moisture on ignition wires, cap, or plugs.

i. Excessive play in distributor shaft.

j. Distributor shaft cam worn.

k. Burned, warped, or pitted valves.

l. Incorrect valve tappet clearance. (C-300.)

m. Incorrect carburetor idle adjustment.

n. Improper carburetor float level.

o. Low compression.

46. ENGINE MISSES AT HIGH SPEED

Possible Causes:

a. Dirt or water in gas line or carburetor.

b. Dirty jets in carburetor, especially the economizer jet.

c. Weak coil or condenser.

d. Incorrect ignition timing.

e. Distributor points dirty or incorrectly spaced.

f. Trailing edge of rotor worn.

g. Loose ignition wiring.

h. Excessive play in distributor shaft.

i. Spark plugs fouled, damp, or dirty, or the gaps set too wide.

j. Insufficient point dwell.

k. Insufficient spring tension on points.

l. Normal hydraulic tappet pump up.

m. Worn camshaft lobes.

n. Weak valve springs.

o. Abnormal resistance in spark plugs.

p. Distributor cam lobe worn.

q. Engine overheating.

r. Low grade fuel.

s. Badly worn diaphragm in fuel pump.

t. Detonation or pre-ignition.

u. Frozen heat control valve.

47. EXTERNAL OIL LEAKAGE

Possible Causes:

a. Outside oil lines.

b. Timing chain case cover oil seal.

c. Rear main bearing oil seal.

d. Oil pan gaskets.

e. Oil pan drain plug.

f. Oil filter gasket.

g. Clogged rear camshaft bearing drain hole.

h. Tappet cover gaskets.

i. Fuel pump gasket.

j. Timing chain cover gasket.

48. OIL PUMPING PAST PISTON RINGS

Possible Causes:

a. Oil level too high. (a) Dip stick not entering oil pan far enough. (b) Dip stick incorrectly marked.

b Loose main or connecting rod bearings.

NOTE: Excessive bearing clearance will cause the cylinder walls to be flooded with oil.

c. Too light oil for the type of service and conditions.

d. Excessively hot operating temperatures.

e. Piston ring gaps not staggered or incorrect size rings used.

f. Incorrect set of piston rings or rings out-of-round.

g. Cylinder head improperly torqued, causing a distortion of the cylinder bores for which the piston rings cannot compensate.

h. Rings fitted too tight in piston.

i. Oil rings carboned up or return grooves in piston clogged.

j. Insufficient piston ring tension.

NOTE: Common condition after engine has overheated.

k. Compression rings installed upside-down.

l. Excessive oil pressure or broken piston rings.

m. Burned piston.

NOTE: This condition can be brought about by excessive detonation and pre-ignition.

n. Scored cylinder walls or piston rings.

o. Excessively worn rings or cylinder walls.

NOTE: This condition can be traced to one or more of the following:

(1) Normal wear.

(2) Failure to keep air cleaners, carburetor, and crankcase filler cap installed and serviced.

(3) Failure to service the oil filter.

(4) Careless filling of the oil pan by allowing dirt or foreign material to fall in.

(5) Failure to clean cylinder walls properly after reboring or honing.

(6) Failure to prevent grindings and stone dust from getting on cylinder walls or improper cleaning of valve ports after grinding seats.

(7) Use of rings with heavier wall tension than necessary.

(8) Excessive speeding of a cold engine. In addition to the foregoing, many engines are overhauled for excessive use of oil or smoking without any degree of success because the actual cause may be due to any one or more of the following.

(9) Excessive clearance between valve guide and valve stem.

(10) Diaphragm of fuel pump porous.

(11) External oil leaks.

(12) Internal oil leak into cooling system.

49. OIL PUMPING AT VALVE GUIDES

Possible Causes:

a. Worn valve stems or guides.

b. Intake valve stem guide in inverted position. (FirePower engine.)

c. Intake valve seals damaged or missing.

50. HIGH OIL CONSUMPTION DUE TO LUBRICATING OIL

Possible Causes:

a. Oil level too high.

b. Contaminated oil.

c. Poor grade of oil.

d. Thin, diluted oil.

e. Oil pressure too high.

f. Sludge in engine.

51. HIGH OIL CONSUMPTION—MISCELLANEOUS

Possible Causes:

a. Overheated engine.

b. Sustained high speeds.

c. Misadjusted breather cap, causing excessive crankcase ventilation.

Certain mechanical conditions can affect engine oil pressure readings. In order to aid in determining the cause, the following conditions and possible causes are listed.

52. NO OIL PRESSURE WHEN ENGINE IS FIRST STARTED

Possible Causes:

a. Oil from the oil galleries and oil filter has drained back into the oil pan when the engine was shut off.

b. Frozen or partially clogged oil gauge line.

53. NO OIL PRESSURE AT IDLE

Possible Causes:

a. Oil gauge not registering properly, due to higher than normal pressure required to start gauge registering.

b. Excessive oil pump rotor end clearance.

c. Stuck oil pump relief valve.

d. Loose main and connecting rod bearings.

e. Loose camshaft bearings.

f. Plugs in ends of rocker shafts. Loose or missing.

g. Internal oil passage leakage.

h. Oil pump body cover seal ring blown out or missing.

i. Oil pump body cover seal ring replaced with common gasket.

54. NO OIL PRESSURE ON FAST STARTS OR RAPID ACCELERATION

Possible Causes:

a. Low oil level in oil pan.

b. Oil pump suction tube not aligned, or bent, causing the oil strainer to extend above the oil surface in the pan.

c. The foot on the oil strainer should touch the bottom of the oil pan.

d. Oil pump rotor pin sheared.

e. Expansion plug missing in oil pump cover.

f. Oil filter and oil filter by-pass plugged.

g. Air leak in oil pump suction tube.

h. Oil pump strainer plugged.

i. Oil pump relief valve stuck open.

j. Internal oil passage leak.

55. BROKEN VALVES

Possible Causes:

a. Weak valve springs.

b. Worn valve guides.

c. Excessive tappet clearance. (C-300)

d. Cocked springs or retainers.

e. Out-of-round valve seats.

f. Defective valve forgings.

g. Excessive engine speeds.

h. Detonation or pre-ignition.

56. BURNED OR STICKING VALVES

Possible Causes:

a. Close tappet clearance. (C-300).

b. Weak valve springs.

c. Gum formations on stem or guide.

d. Eccentric valve face.

e. Deposits on valve seats.

f. Incorrect valve seat width.

g. Improper valve guide clearance.

h. Warped valves.

i. Improper block cooling.

j. Exhaust back pressure.

k. Improper spark timing.

l. Out-of-round valve seat.

57. NOISY VALVES

Possible Causes:

a. Incorrect tappet clearance. (C-300).

b. Worn tappets or adjusting screws (C-300).

c. Wear in cam lobes.

d. Worn valve guides.

e. Excessive run-out of valve seat or valve face.

NOTE: When replacing valve guides, be sure the counterbore in guide is up for exhaust and down for intake.

58. BROKEN VALVE SPRINGS

Possible Causes:

a. Valve flutter at high speed.

b. Improper crankcase ventilation.

c. Worn timing chain.

d. Cold engine operation due to defective thermostat.

e. Rust, due to improper storage.

f. Coolant leaking into crankcase.

59. VALVE DEPOSITS

Possible Causes:

a. Quality of fuel.

b. Quality of lubricating oil.

c. Valve stem wear.

d. Improper cooling of block.

e. Sludged engine.

f. Worn valve guides.

g. Improper lubrication of valve stem.

h. Excessive engine idling.

i. Rich carburetor setting.

When diagnosing the cause of valve failure, it must be remembered that a valve can only transfer its heat through the valve seats and guides, to the cooling system. There is only one basic cause for valve failure and that is the inability of a valve to dissipate its heat into the cooling system as rapidly as necessary.

The following information is presented as an aid in diagnosing valve failure and also to help in preventing a recurrence.

60. CONDITIONS WHICH CAN CAUSE BOTH INTAKE AND EXHAUST VALVE FAILURE

a. Deposits on the upper part of the valve stems which prevents full seating of the valves.

b. Sludge deposits on the end of the valves and springs cause the valves to stick. These deposits are caused by poor maintenance of the engine oil or filter, low engine operating temperatures due to an inoperative thermostat, or short intermittent engine operation. The latter condition does not allow the engine to reach operating temperature to evaporate the condensation in the crankcase. Extremely slow driving of the vehicle does not induce sufficient crankcase ventilation to remove condensation.

c. Insufficient tappet clearance or operating clearance between tappet plunger and bottom of tappet body (hydraulic tappets).

On hydraulic tappets, this condition is usually caused by excessive valve face and seat regrinding which allows the valve stems to extend too far out of the guides.

Sufficient clearance is very important and will insure complete closing of the valves when the engine is hot.

d. Valves or seats that are not ground concentric with the valve guide. This can be due to worn refacing equipment. Valve-to-seat contact should be checked with a film of Prussian blue.

e. Improper valve seat width. Recondition valve faces and seats as directed in Paragraph 12.

f. Valve and valve seat not refaced to a 45 degree angle, due to worn or inaccurate equipment.

g. Excessively refaced valves. The distance between the top edge of the valve face and the top of the valve must not be less than $\frac{3}{64}$ inch. **Discard any valve that does not meet specifications.**

h. Incorrect valve timing.

i. Excessive valve guide wear. Worn guides will not provide proper cooling and permit oil to be sucked into the intake ports causing a carbon formation which could lead to valve sticking.

j. Restrictions in the cooling passages around the valve seats caused by excessive scale and rust deposits. This is the result of not using a rust inhibitor in the cooling system.

k. Engine overheating to such a degree that there is insufficient coolant remaining in the engine to dissipate the valve heat.

61. CONDITIONS WHICH CAN CAUSE INTAKE VALVE FAILURE

a. Sticking valves. This condition can be brought about by heavy carbon and/or a varnish deposit on the valve stems and heads. Gum forms as a result of the exposure of gasoline to air for an extended period. In some cases where gum and varnish have deposited on the valve stem, valve sticking has occurred while the engine was hot and operating under power. A good idle might be obtained while such an engine was relatively cool.

Cars which have been improperly prepared for extended storage or have been using fuel from bulk storage that is used very little—such as on a farm or ranch during the winter months—are susceptible to this type of valve sticking.

Heavy carbon deposits can result from short trip operation.

Rust. This condition results from prolonged storage without proper preparation.

b. Valve dishing and valve face grooving are usually the result of overheating. Overheating can be aggravated by, or attributed to, pre-ignition or detonation.

62. CONDITIONS WHICH CAN CAUSE EXHAUST VALVE FAILURE

a. Back-pressure due to restrictions in the exhaust system which prevent rapid expulsion of the hot gases.

b. Excessively lean fuel-air mixtures.

c. Carburetion (improper size jets.)

d. Air leaking into the intake manifold.

e. Air leak at carburetor mounting or throttle body gaskets.

f. Air leaks in vacuum line for booster brakes or other vacuum-operated accessories.

g. Improper ignition timing.

h. Detonation or pre-ignition.

i. Overloading engine by pulling heavy house trailers, luggage trailers, or boat trailers.

k. Low grade fuel.

l. Heat control valve stuck in the closed position.

As a matter of interest, broken or cracked exhaust valve seats, as well as cylinder heads with cracks radiating out from an exhaust valve port, can be traced to prolonged operation with burned or leaking exhaust valves.

63. PISTON RING NOISE

Possible Causes:

a. Broken ring.

b. Top ring striking cylinder ridge.

c. Broken ring lands.

d. Excessive side clearance in groove.

64. PISTON NOISE

Possible Causes:

a. Piston pin fits too tight or too loose.

b. Excessive piston-to-bore clearance.

c. Carbon accumulation in head.

d. Collapsed piston skirt.

e. Insufficient clearance at top ring land.

f. Broken piston skirt, or ring land.

g. Misaligned connecting rods.

65. CONNECTING ROD NOISE

Possible Causes:

a. Low oil pressure.

b. Insufficient oil supply.

c. Thin or diluted oil.

d. Misaligned rods.

e. Excessive bearing clearance.

f. Eccentric or out-of-round crank pin journal.

66. MAIN BEARING NOISE

Possible Causes:

a. Low oil pressure.

b. Insufficient oil supply.

c. Thin or diluted oil.

d. Loose vibration damper or torque converter.

e. Excessive bearing clearance.

f. Excessive end play.

g. Eccentric or out-of-round journals.

h. Sprung crankshaft.

i. Excessive belt tension.

67. BROKEN PISTON RINGS

Possible Causes:

a. Wrong type or size.

b. Detonation.

c. Undersize pistons.

d. Pre-ignition.

e. Ring striking top ridge.

f. Worn ring grooves.

g. Rings assembled improperly.

h. Broken ring lands.

i. Insufficient gap clearance.

j. Excessive side clearance in groove.

k. Uneven cylinder walls (particularly due to a previous ring breakage in same cylinder).

68. BROKEN PISTONS

Possible Causes:

a. Undersize pistons.

b. Eccentric or tapered cylinders.

c. Misaligned connecting rod.

d. Engine overheating.

e. Water or fuel leakage into combustion chamber.

f. Detonation or pre-ignition.

69. DETONATION

Detonation, pre-ignition, and after-running are abnormal types of combustion. Normal combustion starts at the spark plug and the flame expands to the extremes of the combustion chamber. During the short period of combustion, a high pressure is produced which pushes down on the piston to develop engine power.

Detonation occurs after the spark plug fires, when some of the fuel-air mixture in the combustion chamber is ignited by spontaneous combustion before the flame reaches it. The mixture is burned much more rapidly than during normal combustion. Thus, detonation produces excessive temperatures and pressures. Detonation is most easily recognized by a pinging sound during acceleration or continuous wide open throttle operation, such as climbing a steep hill.

A detonation complaint is usually concerned with the noise that is produced. Although a mild case of detonation will not damage an engine, excessive detonation may result in engine failure caused by the excessive temperatures and pressures. Detonation can cause broken piston rings, broken and burned piston ring lands, blown cylinder head gaskets, and short bearing life.

Detonation is caused primarily by the following:

a. Advanced spark timing.

b. Combustion chamber deposits.

c. Low octane fuels.

d. Excessively high coolant or air temperatures.

When correcting a detonation complaint the first thing to check is the spark timing as directed in Paragraph 73. If detonation persists at the proper timing, the distributor should be removed and checked to see if it conforms to spark advance specifications. The spark advance mechanism should be repaired if necessary. Further investigation depends on the type of operation. If the vehicle is used primarily for light duty, the detonation probably results from excessive combustion chamber deposits. These should be removed.

70. PRE-IGNITION

Pre-ignition is the burning of the air-fuel mixture before the spark plug fires. The mixture is ignited by a hot spot in the combustion chamber. Since this is equivalent to advancing the spark, it results in higher temperatures and pressures in the combustion chamber than those produced during normal combustion.

Sometimes, pre-ignition produces a pinging sound which is louder than detonation. If pre-ignition occurs early on the compression stroke, it is not audible. If it occurs before the intake valve closes, the engine will backfire through the air cleaner.

In many cases, it is difficult to distinguish between audible pre-ignition and detonation; in fact, they may occur simultaneously. Audible pre-ignition may be isolated from detonation by accelerating the vehicle at wide open throttle (not above 2000 rpm) until the loud pinging is heard and then turning off the ignition. If the engine continues to fire, it is pre-ignition; if it ceases to fire, the engine is detonating. Remove the foot from accelerator pedal before turning on the ignition again.

Often, inaudible pre-ignition is difficult to distinguish during operation, but it can be recognized by the failures it can produce, as noted below. If the engine back-fires through the air cleaner during wide open throttle operation, a colder set of plugs should be installed. If the back-firing ceases, it was probably caused by pre-ignition. If the engine continues to back-fire, it is caused by other factors, such as faulty ignition, incorrect carburetor mixture, incorrect valve timing, or a worn camshaft.

Inaudible pre-ignition cannot be recognized until a piston or valve failure occurs. It is generally caused by a hot spark plug, or advanced ignition timing. Check spark plug type and set ignition timing as described below. **ALWAYS USE SPECIFIED SPARK PLUGS.**

71. HOT STARTING NOISE

A form of audible pre-ignition sometimes occurs when a hot engine is started. Usually, the noise is limited to two or three sharp raps which are heard just as the engine begins to fire. This condition does not cause damage to the engine and is common with high compression engines. It cannot be eliminated by retarding ignition timing or changing spark plugs. Slow cranking speed may accompany the hot starting noise.

72. AFTER-RUNNING

After-running is a compression ignition of the engine at very slow speeds after the ignition has been turned off.

This condition is a source of irritation to the owner but it does not cause engine failure. After-running is primarily caused by one or more of the following factors:

a. Fast idle speed.

b. High coolant temperatures.

c. Combustion chamber deposits.

After-running is generally caused by fast idle speed or cutting the ignition before the engine throttles down to idle. The idle speed should be properly adjusted and the owner questioned as to whether he has the habit of pumping the accelerator pedal before turning off the ignition. If this does not correct the complaint, the vehicle should be checked for overheating.

If the vehicle has been used primarily for light duty operation, some highway operation will remove combustion chamber deposits which may eliminate the complaint.

This complaint cannot be corrected with cold spark plugs.

73. IGNITION TIMING

Due to normal variations between engines in their fuel requirements, high altitude operation (which results in a richer fuel mixture that reduces the octane requirements of the engine), and the variations in octane ratings of the fuels being marketed, the established ignition timing setting of 6 degrees BTDC for the V-8 engines should be considered a basic or starting point when tuning an engine. As a result of the conditions mentioned, a variation of plus or minus 6 degrees from the starting setting is permissible.

CAUTION

The advancing of timing in excess of 6 degrees of the basic setting is not recommended, as in-

audible pre-ignition could be encountered under some operating conditions at high speeds.

When tuning an engine to obtain maximum performance, economy, and smooth operation, and to take advantage of variations in octane requirements, it is desirable to make the final ignition timing during actual road test. Should the final timing be made during the road test, it is suggested the following procedures be followed:

a. Set the ignition timing at 6 degrees BTDC.

b. Drive the vehicle until normal operating temperature has been reached.

c. While in high gear, decelerate the car to 20 mph or just before the transmission downshifts; then, with a wide open throttle, accelerate to about 40 mph. Without downshifting to second gear.

d. During this wide open throttle operation, if a slight unobjectionable pinging or detonation is heard that disappears as the car approaches 40 mph, the timing can be considered to be the best setting; however, if the pinging or detonation is objectionable, the timing should be retarded 1 degree at a time until the proper setting has been reached.

74. TAPPET STARTING NOISE

This is a condition where the tappets are noisy upon starting and remain so for approximately 5 or 10 minutes, or until the engine has reached normal operating temperature.

Possible Causes:

a. Engine oil drain-back.

If the anti-drain back valve leaks, the oil drains out of the oil galleries and drilled passages into the oil pan. This occurs when the engine is not operating. Upon starting, it is necessary that the oil pump refill the system and, at the same time, force the air that entered the system out of the engine through the tappets. Until the oil system has been refilled and all the air bled out, noisy tappets may be experienced.

b. Filter change.

This may cause the same condition as above, and for the same reasons. Air trapped in the lubricating system may require a minimum of 20 to 30 minutes to bleed out. When changing an oil filter element, there is always a possibility that air may be trapped in the cover of the filter and not work out through the tappets until some time later, after the tappets have originally quieted.

c. Tappet varnish.

The problem of tappet varnish will not necessarily hinder the tappets since they are designed to allow the varnish to build up in areas that do not affect their operation. There is, however, a condition in which a varnish-coated tappet can possibly cause trouble; this is when a valve has been replaced. A new valve can effectively change the length of the valve mechanism and thereby allow the tappet plunger to operate in a new position in the body which may have a varnish build-up and result in the plunger sticking.

d. Anti-freeze.

Starting noise can also be caused by a gummy deposit, which results from leakage of anti-freeze or glycol into the engine oil. When cold, this deposit will be hard, but when hot, it becomes soft and gummy. This is another reason excessive tappet noise can be experienced when starting and gradually disappear as the gummy substance softens and allows the plungers to assume their normal operating positions. If this deposit is permitted to remain, it can eventually cause scuffing of the hydraulic tappet plunger.

e. Normal tappet leakdown.

This condition occurs on all engines and is due to the normal leakdown of the tappets that remain under valve spring pressure when the engine is shut off. The expulsion of air and the duration for quieting these particular tappets is dependent on the clearance to which the tappet plunger body has been fitted. The closer the fit, the longer the noise will persist.

75. ALL TAPPETS NOISY

In cases where all 16 tappets are noisy, it is generally safe to assume that the noise is not the fault of the tappets, but of the oil supply, which is inadequate, **or into which air has been induced. No advantage can be gained by installing 16 new tappets unless they are found to be stuck due to an anti-freeze leak. In this case it is imperative that the leak be corrected to prevent reoccurrence.**

Possible Causes:

a. Drain plug out of oil pan.

The loss of the drain plug from the oil pan will result in the loss of oil and oil pump pressure.

b. Plug out of the oil pump cover.

A plug out of the oil pump cover will permit the majority of oil from the pump to escape back into the oil pan. This usually shows up as fluctuation or low oil pressure on the gauge.

c. Oil strainer improperly located in pan.

When this occurs, tappet noise may occur shortly after a turn, stop, or fast acceleration. This condition may also be detected by close observation of the oil pressure gauge.

d. Low oil level.

Low oil level permits the oil strainer to become uncovered while accelerating, stopping, or turning. Air will be pumped into the lubrication system when this happens.

e. Plugged oil screen.

A plugged oil screen is generally due to inadequate oil and/or filter change periods for the type of operation.

f. Oil pump relief valve stuck.

When this condition occurs, it usually permits pressure to be normal at higher speeds while falling below normal at low engine speeds or at idle. **Normal oil pressure for a warm engine at idle is considered to be 12 psi or more at 500 rpm.**

g. A major oil pressure drop is generally caused by excessive bearing clearance, etc., which permits excessive leakage of hot engine oil and reduces the pressure of oil delivered to the tappets below the minimum required for quiet and proper operation of the tappet.

h. Oil foaming.

This is a condition where a large quantity of air bubbles are trapped in the oil, producing a condition of foaming or sudsing (aeration). Since air unlike oil, is compressible, tappet noise or loss of valve lift will result when the aerated oil enters the tappet.

i. Excessive oil supply.

When the oil level is too high in the oil pan, the crankshaft and connecting rods dip into the oil and churn it, causing an aerated condition.

j. Low oil supply.

This condition permits the reuse of a small quantity of oil which does not have sufficient time to cool and rid itself of the normal air induced into the oil.

k. Air entering the oil pump.

This condition can be caused by an improperly located oil screen, a leak in the suction tube, loose oil pump cover, etc. In all cases, air will be drawn into the oil pump and induced into the oil.

l. Plug out of oil pump cover.

A plug that is loose or missing out of the oil pump cover will cause excessive by-passing and aeration of the oil.

m. Prolonged use of engine oil.

Where operating conditions are such that the majority of driving is slow or short and intermittent, not permitting the engine to warm up to operating temperature, it is possible for normal condensation to build up in the crankcase to a point where it will cause the oil to foam.

n. Water from the cooling system leaking into the engine oil.

Water from the cooling system leaking into engine oil will cause excessive oil foaming.

o. Glycol in the engine oil.

When glycol leaks into the engine lubrication system it has a tendency to form a gummy substance which deposits on the engine parts. This substance will normally affect the operation of the hydraulic tappets, first by causing sticking, and then gradually causing the tappets to scuff and become increasingly noisy until they reach a point where the plungers will stick completely. **This is the only condition which may require the replacement of all 16 tappets. However, unless the leak is corrected, it will repeat itself.**

76. ONE OR MORE TAPPETS NOISY

Possible Causes:

a. Excessive dry lash.

The term of dry lash refers to the clearance between the valve stem and rocker arm when the tappet is on the heel of the cam lobe and the plunger is bottomed in the tappet body. The normal clearance is .060 to .210 inch, and any lash exceeding .210 inch could cause a tappet to be noisy. **A condition of excessive dry lash usually indicates wear.**

To determine if proper dry lash is the problem, insert a 1/8 inch (.125) feeler between the rocker arm and the valve stem; then, start the engine. If the noise has disappeared it is quite possible it was caused by a worn rocker arm or push rod.

b. Broken valve spring.

c. Sticking rocker arm.

This could be the result of any condition that prevents free movement of the rocker arm on the rocker shaft.

d. Worn rocker arm.

This condition is usually due to lack of hardness of the rocker arm or push rod end, and can be detected by the dry lash test as described above.

e. Face of rocker arm not true.

When this condition is present, it will be noted that the rocker arm is making contact on the edge of the valve stem. This can cause a valve cocking condition and result in the valve stem to ride heavy or bind in the guide.

f. Push rods worn, bent, or interfering (in head).

A worn push rod can be identified by a worn spot on one end. This can be caused by insufficient lubrication. Check holes in arm and rocker shaft.

When installing a new rocker arm, be sure the lubricating oil holes are open.

Worn, bent, or interfering push rods can be detected by the dry lash test, as described above.

A bent push rod is generally caused by mishandling and can result in the cylinder head or increased dry lash.

The push rod interference in the cylinder head can be caused by inadequate clearance in the push rod passages through the cylinder heads. If this condition is found, it is only necessary to relieve the ends of the hole at the top and bottom.

g. Tight tappet.

While rare, this condition occurs where the tappet or the tappet bore is of incorrect size, bell-mouthed, or out-of-round, causing the tappet to stick in its bore. A condition of this nature is indicated by heavy wear or scuff marks on portions of the side of the tappet body. Unless the tappet bores in the cylinder block are cleaned up, the same condition will occur with a replacement tappet. **To check bore, slide a new tappet in and out. If the tappet sticks, ream bore to next oversize and install new oversize tappet.**

h. Stuck hydraulic tappet plungers.

This condition is where a tappet plunger is stuck in the tappet body and is unable to compensate for changes in the valve train clearance. **Extended engine operation at high speed with this condition existing, could cause valve breakage.** Three basic causes for this condition are: **Dirt or metal chips; glycol in the lubricating oil; and, the mismatching of parts in assembly after cleaning.**

Varnish build-up around the top of the tappet above the operating range of the plunger is a normal condition, therefore, it should not be confused with a stuck tappet in which the plunger will normally be found stuck below the operating range.

i. Valve stem varnish.

Occasionally, this condition may occur where a heavy deposit of varnish has adhered to the valve stem and restricts the movement of the valve in the guide.

j. Faulty tappets.

This is caused by conditions that may be inherent in the individual tappets, such as bent valve washers, omitted valve washers, tight plunger caps, improperly fitted retainer, bad flat valve or valve seat, a plugged or missing oil hole in the tappet body or plunger, or a loose plunger to body fit that causes a fast leakdown under spring pressure. (The latter usually shows up at idle when the oil is hot.)

Since the hydraulic tappet is not reparable, only those determined to be faulty should be

replaced. The replacement of any tappets other than the individual ones causing the condition, would serve no purpose.

k. Worn valve guide.

Tappet noise can also be caused by a guide that is worn .015 inch or more, or by a valve that is bent to a point where it will actually hang up in the guide. Valves can be bent in the field when attempting to compress a valve spring on an engine with the piston up or near TDC, or by failing to use the proper head holding fixtures, Tool C-3209, when the heads have been removed for repairs.

l. Tappet oil feed hole plugged or restricted.

In many cases where a tappet has been removed for being noisy, it has been found that the oil feed hole in the tappet or the cylinder block was restricted or plugged. This condition is due to varnish, sludge, dirt, or other foreign materials. **Again this condition can be attributed to infrequent filter element or oil change.** Before installing any tappet, it is a good policy to run a drill rod or drill into the feed hole to make sure it is open. **Be sure no burr is left in the tappet bore after opening with rod.**

m. Worn tappet or camshaft lobe.

There have been instances where scoring starts between the cam lobe and the face of the tappet, in the same manner as any other bearing surface. When this condition occurs, it can result in damage not only to the face of the tappet, but to the camshaft lobe as well. It will produce tappet noise and a lack of engine performance.

This condition can be determined by measuring the lift of the valve. The lift can be measured by bottoming the tappet in the same way as checking for valve timing, by inserting a shim of sufficient size to take up the dry lash. The lift of the valve can then be measured with a dial indicator and compared with other valves shimmed in the same manner. The normal valve lift should be approximately .360 inch. Since wear of up to .030 inch is permissible, the mileage of the engine, as well as the comparison check with other cylinders, should be taken into consideration before a decision is reached to replace the camshaft. When tappets and/or camshaft replacement is necessary due to excessive wear, a very thorough cleaning of the lubricating system should be performed, or else the particles of worn metal that have deposited out of the oil will cause a reocurrence of the same trouble.

77. INTERMITTENT TAPPET NOISE

Possible Causes:

a. Aerated or foaming oil.

This is a condition where a large quantity of air bubbles are trapped in the oil, producing a condition of foaming or sudsing (aeration). Since air, unlike oil, is compressible, tappet noise or loss of valve lift will result when the aerated oil enters the tappet.

b. Defective tappets.

Although these defects cannot be corrected in the field, and therefore require replacement of the individual tappet, the following is presented to point out possible defects:

c. Extremely wide seat on the lapped seat of the tappet plunger.

d. Insufficient check valve travel to compensate for various speeds.

e. Out-of-round tappet plunger.

78. TAPPET CLEANING

When cleaning tappets (if needed) at the time of engine overhaul or valve grind, it should be done in accordance with the procedure described in this section. Extreme precautions must be taken to be sure that all work be done in clean surroundings and using clean materials. If the cleanliness precautions are not observed, it is more than likely the effort will be wasted and noisy or stuck tappets can be expected.

Section VIII

FUEL AND EXHAUST SYSTEM

CONTENTS

DATA AND SPECIFICATIONS

MODEL	LC-1	LC-2	LC-3	LY-1
FUEL PUMP				
Make	Carter	Carter	Carter	Carter
Model	M-2663S	M-2663S	M-2663S	M-2663S
Type	Mechanical	Mechanical	Mechanical	Mechanical
Driven By	Camshaft	Camshaft	Camshaft	Camshaft
Pump Pressure (pounds)	5 to 7	5 to 7	5 to 7	5 to 7
CARBURETOR				
Make	Ball and Ball	Carter	Carter	Carter
Type	Dual Downdraft	4 Barrel Downdraft	4 Barrel Downdraft	4 Barrel Downdraft
Model	BBD-2685S	AFB-2650S	AFB-2651S	AFB-2651S
THROTTLE BORE (Primary and Secondary)	......	1 7/16 inch	1 7/16 inch	1 7/16 inch

DATA AND SPECIFICATIONS (Cont,d)

MODEL	LC-1	LC-2	LC-3	LY-1
MAIN VENTURE				
Primary and Secondary	......	1 3/16 inch	1 3/16 inch	1 3/16 inch
LOW SPEED JET PRIMARY	......	.031 inch	.031 inch	.031 inch
ADJUSTMENTS				
Idle Mixture (both screws)	One Full Turn Open	One Full Turn Open	One Full Turn Open	One Full Turn Open
Idle Speed	500 rpm.	500 rpm.	500 rpm.	500 rpm.
Accelerator Pump	1 1/32 in. + or −1/64	Middle Hole of Arm	Middle Hole of Arm	Middle Hole of Arm
Pump Setting (top of Plunger to Air Horn)	......	.429 or 7/16 inch	.429 or 7/16 inch	.429 or 7/16 inch
Float Setting (casting to top of Floats)	9/32 + or −1/64	5/16 inch	5/16 inch	5/16 inch
Float Drop	......	3/4 inch	3/4 inch	3/4 inch
Choke Unloader (wide open kick)	1/4 inch	1/4 inch	1/4 inch	1/4 inch
Choke Setting	One Notch Rich	One Notch Rich	One Notch Rich	One Notch Rich
Fast Idle	.015 inch	.012 inch	.012 inch	.012 inch

Fast Idle Speed Setting	
New Yorker and Imperial	1350 to 1400 rpm.
Saratoga	1375 to 1425 rpm.

SPECIAL TOOLS
CARBURETOR

C-3225	Stand, Carburetor Repair
C-3400	Repair Stand
T-109-22	Bending Tool
T-109-28	Gauge, Unloader—3/16 inch
T-109-29	Closing Shoes Clearance Gauge (wire) (.017 to .022 inch)
T-109-31	Choke Unloader Gauge—(1/4 inch)
T-109-41	Bending Tool
T-109-44	Wire Gauge, Fast Idle (.015 to .018 inch)
T-109-58	Screw Driver Bit (1/4 inch)
T-109-59	Screw Driver Bit (3/16 inch)
T-109-107	Float Gauge (5/16 inch)
T-109-193	Choke Piston Lever Adj. Gauge (wire)
T-109-197	Gauge, Bowl Vent Cap
T-109-200	Fast Idle Gauge (wire) (.012 inch)
T-109-200	Secondary Throttle Adj. Gauge (wire) (.010 inch)
T-109-213	Bending Tool
T-109-214	Bending Tool
T-109-236	Gauge Float Lever (5/32 inch)
T-109-237	Thickness (.005 inch)
T-109-282	Gauge, Float Setting
T-109-284	Gauge, Float Level (9/32 inch)
T-109-287S	Elevating Legs (set of 5)

Section VIII

FUEL AND EXHAUST SYSTEM

FUEL PUMP

The fuel pump (Fig. 1) is driven by an eccentric on the camshaft, which actuates the rocker arm. This action lifts the pull rod and diaphragm assembly upwards against the main spring, thus creating a vacuum in the valve housing, which opens the inlet valves and fuel is drawn into valve housing chamber from fuel tank.

On the return stroke of rocker arm, the main spring pressure forces the diaphragm to down position, which expels fuel in valve chamber through outlet valve, to carburetor.

When the carburetor float chamber is filled with fuel, the float in carburetor shuts off the needle valve, creating pressure in fuel pump chamber. This pressure holds fuel pump diaphragm upward against spring pressure until carburetor requires more fuel.

As the engine consumes fuel the float level in the carburetor bowl drops and needle valve opens to admit fuel into float chamber, which releases the pump pressure and starts the pumping cycle again. Actually, change in float level is negligible.

1. TESTING FUEL PUMP (On Car)

If fuel pump fails to pump fuel to carburetor, following checks should be made to determine cause of failure before removing fuel pump from car:

a. Fuel Lines

Make certain that fuel lines are not blocked and that fittings are tight. Check flexible hoses for cracks or deterioration which would cause leakage or retard flow of fuel to fuel pump.

b. Fuel Pump Breather Hole

Check for gasoline or oil leakage at fuel pump breather hole. A gasoline leak at this point indicates a defective diaphragm. An oil leak at this point indicates presence of a deterio-

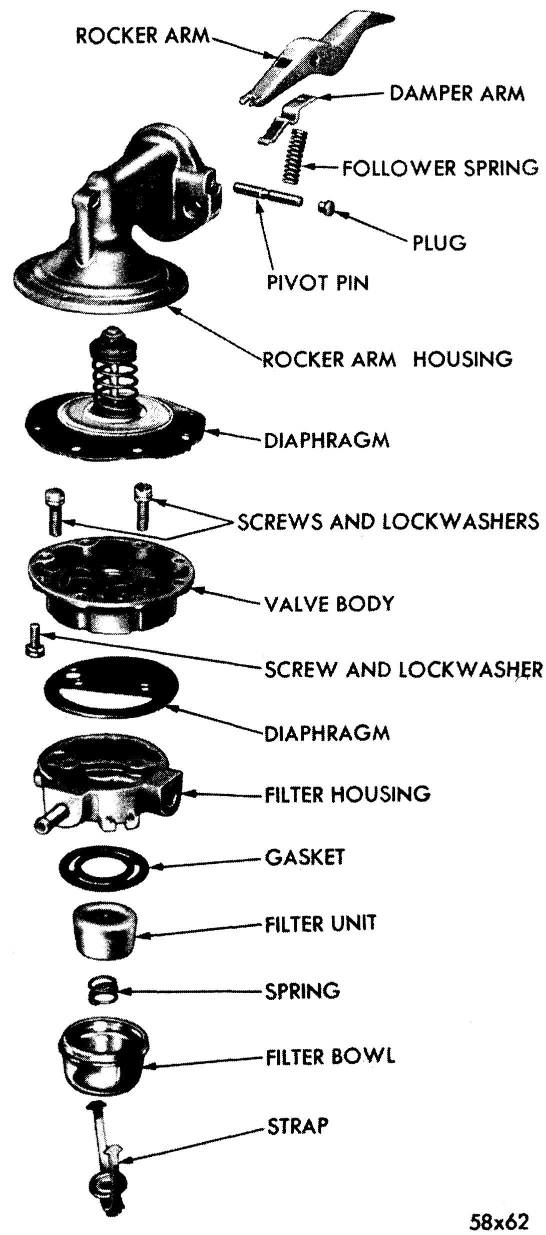

Fig. 1—Fuel Pump (Exploded View)

rated or damaged oil seal on the diaphragm pull rod. In either case, the diaphragm assembly should be replaced.

2. PRESSURE TEST

Insert a "T" fitting in the fuel line at the carburetor, as shown in Figure 2.

The hose between the "T" fitting and gauge Tool C-483 should not exceed 6 inches. (A longer hose may collect fuel and the additional weight of the fuel would be added to the pressure of the pump and would result in an inaccurate reading).

Vent the fuel pump for a few seconds (to relieve air trapped in the fuel chamber) by allowing it to pump at full flow into a container. (If air is trapped in the fuel chamber, the pump will not operate at full capacity and a low pressure reading will result).

Connect a tachometer, then start the engine and run at 500 r.p.m. The reading should be from 5 to 7 p.s.i.

If the Pressure Is Too Low—A weak diaphragm main spring, or improper assembly of diaphragm, may be the cause.

3. ADDITIONAL CHECKS

Check for leakage at fuel pump diaphragm which might be caused by loose mounting bolts. Check fuel pump mounting bolts to insure that no oil leakage exists around mounting flange. If fuel pump fails to operate satisfactorily, disconnect fuel pump inlet and outlet lines and remove fuel pump assembly from engine. (On cars equipped with air conditioning remove fuel pump from bottom side of engine compartment).

4. VACUUM TEST

The vacuum test should be made with the fuel line disconnected from the carburetor. (This will allow the pump to operate at full capacity, which it must do to prime a dry carburetor).

The vacuum reading should be at least (10°) hg. Vacuum at 500 r.p.m. with the fuel line disconnected at the carburetor.

5. VOLUME TEST

The fuel pump should supply 1 quart of fuel in 1 minute or less at 500 r.p.m.

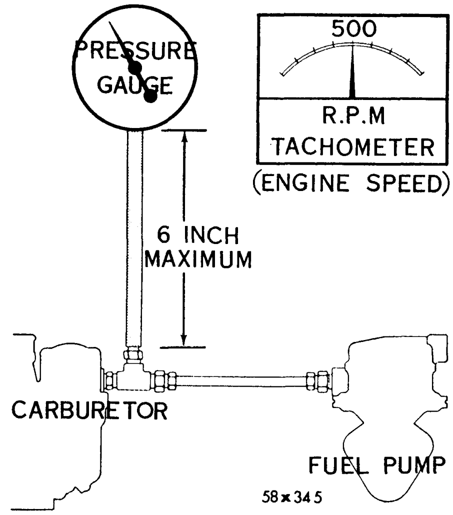

Fig. 2—Pressure Testing Fuel Pump

If the pump does not perform to the above test requirements, the fuel pump should be removed from the vehicle and overhauled.

6. SERVICING THE FUEL PUMP (FIG. 1)

Mark the various pump housings in such a manner that they may be reassembled with the inlet and outlet ports in correct location.

Remove the rocker arm follower spring by prying up and over the dimple in the housing. Disengage the rocker arm damping lever from rocker arm and remove from pump. Remove the rocker arm pivot pin plug, using plug removing Tool T-109-43. Turn pump on its side (pivot pin down) and rap gently to remove the pivot pin. Disengage rocker arm diaphragm pull rod and remove from housing.

Remove the screws that attach the rocker arm housing to the valve body. Separate housing and body, then lift out diaphragm. Remove the screws that attach the valve body to the filter housing. Remove the outlet dome diaphragm. Loosen the filter bowl retaining screw, then disengage retaining strap from housing, by pressing up from bottom. Remove filter bowl, spring, ceramic unit and gasket.

7. CLEANING AND INSPECTION

Clean all fuel pump parts (except diaphragm) in a suitable solvent, then blow dry with compressed air. Examine the diaphragm for cracks, torn screw holes or ruptures. Check the condition of the rubber oil seal on diaphragm pull rod. If deteriorated, install a new diaphragm and pull rod assembly. Check the rocker arm for wear or scoring on the face that contacts the camshaft eccentric. If arm is scored or worn, install new rocker arm.

The component parts of the valve body are not available for service. If inspection reveals the need for new valves, install new valve body assembly.

8. REASSEMBLING THE FUEL PUMP

When reassembling the fuel pump, **do not use shellac or other adhesive sealer on the diaphragm.**

Place the outlet dome diaphragm in position on filter housing with the inlet passage hole over passage. Place valve body over diaphragm and align scribe marks. Install attaching screws and tighten securely. Slide the diaphragm and pull rod assembly into position in the rocker arm housing. Now press up on bottom of diaphragm until sufficient clearance has been obtained to allow engagement for rocker arm. Slide rocker arm into housing and engage slot in end of arm with pull rod, **below** the plastic washers. Align arm, then install pivot pin and plug.

Place the rocker arm and diaphragm assembly in position on valve body, with scribe marks and screw holes aligned. Install attaching screws (threading carefully through diaphragm holes) and tighten alternately.

Engage the tongue end of damper arm in slot of the rocker arm with the recess in damper arm pressing against pivot pin. Hold in

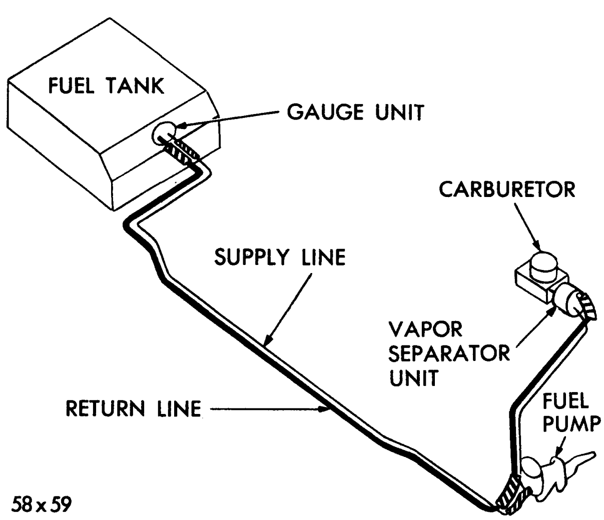

Fig. 3—Vapor Separator Package (Schematic)

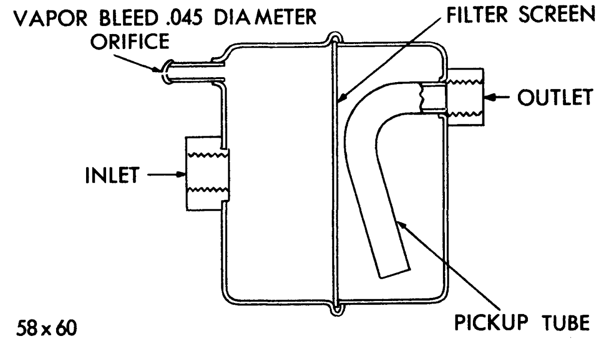

Fig. 4—Vapor Separator Unit (Sectional View)

this position, then install follower spring. (Be sure follower spring ends are over dimple in housing and tang on damper arm.) Invert pump and install filter gasket. Engage ends of bowl retaining strap in slots of filter housing. Tilt retaining strap to the side far enough to install the ceramic filter, tension spring, and bowl. Center bowl, then tighten retaining screw securely.

Check the pump pressure as described in paragraph 2. Install pump on car, using a new mounting gasket. Tighten bolts securely.

9. THE VAPOR SEPARATOR (MODEL LC1—WITH AIR CONDITIONING ONLY)

The vapor separator package, as shown in Figure 3, is used on the Windsor models equipped with air conditioning only and is used to prevent vapor lock. The vapor separator consists of a 5⁄16 inch fuel supply line between the fuel tank and fuel pump, and between the fuel pump and the vapor separator unit which is attached directly to the carburetor fuel inlet connection. A 1⁄4 inch return line from the top side of the unit parallels the supply line back to the fuel tank.

The vapor separator (serviced only as a unit consists of a stamped steel can, a filter screen, an inlet and outlet fitting and a metered return line orifice fitting, as shown in Figure 4.

a. Operation

Fuel is drawn from the fuel tank by the fuel pump through the supply line, into the pump and thence into the vapor separator unit, until the unit is filled with fuel. The unit outlet fitting is connected to a short section of tubing through which solid fuel from the bottom of the separator unit flows into the carburetor for distribution to the engine. Any fuel vapor (caused by excessive heat) that has gathered in the indrawn fuel, rises to the top of the separator unit and is forced out of the metered fitting into the return line, back to the fuel tank for condensation to solid fuel.

b. Servicing the Vapor Separator

As previously mentioned, the vapor separator unit is serviced only as an assembly. Checking to see if the unit is installed correctly (with the return line fitting uppermost) and that the metered orific in the return fitting is open, is the extent of service.

To check the vapor separator unit for a restricted or plugged screen, disconnect the fuel inlet and return lines at the unit. Remove unit from carburetor. Reconnect fuel inlet line and plug return.

With a suitable container under the outlet connection, turn engine over with starting motor. Check the quantity of fuel pumped through the unit. See volume in Paragraph 1. If the flow appears to be restricted, install a new vapor separator unit.

If vapor lock is evident, remove the coupling hose at the unit and check to see if orifice is open. If clogged, bend a paper clip and insert through opening to clear. If necessary, use air pressure to clear return line, **after removing tank filler cap.**

SERVICE DIAGNOSIS

10. FUEL PUMP LEAKS—FUEL

a. Tighten loose housing screws.

b. Install new diaphragm.

c. Tighten loose inlet or outlet or outlet fuel fittings.

11. FUEL PUMP LEAKS—OIL

a. Install new diaphragm.

b. Tighten fuel pump mounting bolts.

c. Install new pump to block gasket.

d. Install new pull rod oil seal.

12. INSUFFICIENT FUEL DELIVERY

a. Tighten fuel line fittings.

b. Install new diaphragm.

c. Thaw out frozen fuel lines.

d. Install new valve body.

e. Install correct fuel pump.

13. FUEL PUMP NOISE

a. Tighten fuel pump mounting bolts.

b. Install new rocker arm.

c. Install new rocker arm follower spring.

d. Lubricate at rocker arm pivot and pull rod with Lubriplate.

CARBURETOR
MODEL BBD-2685S (MODEL LC-1)

The Ball and Ball (BBD) (Fig. 5) series carburetor is of the dual downdraft type. Each throat has its own throttle valve, idle and main metering systems and are supplemented by the float, accelerating and power systems.

14. CARBURETOR MODEL IDENTIFICATION

On each BBD series carburetor, model number is stamped on metal tag attached to air horn. Do not remove or destroy this tag, as it is the only means provided for carburetor model identification. Before attempting to repair or overheal carburetor, refer to model number and secure a repair kit for number indicated on tag.

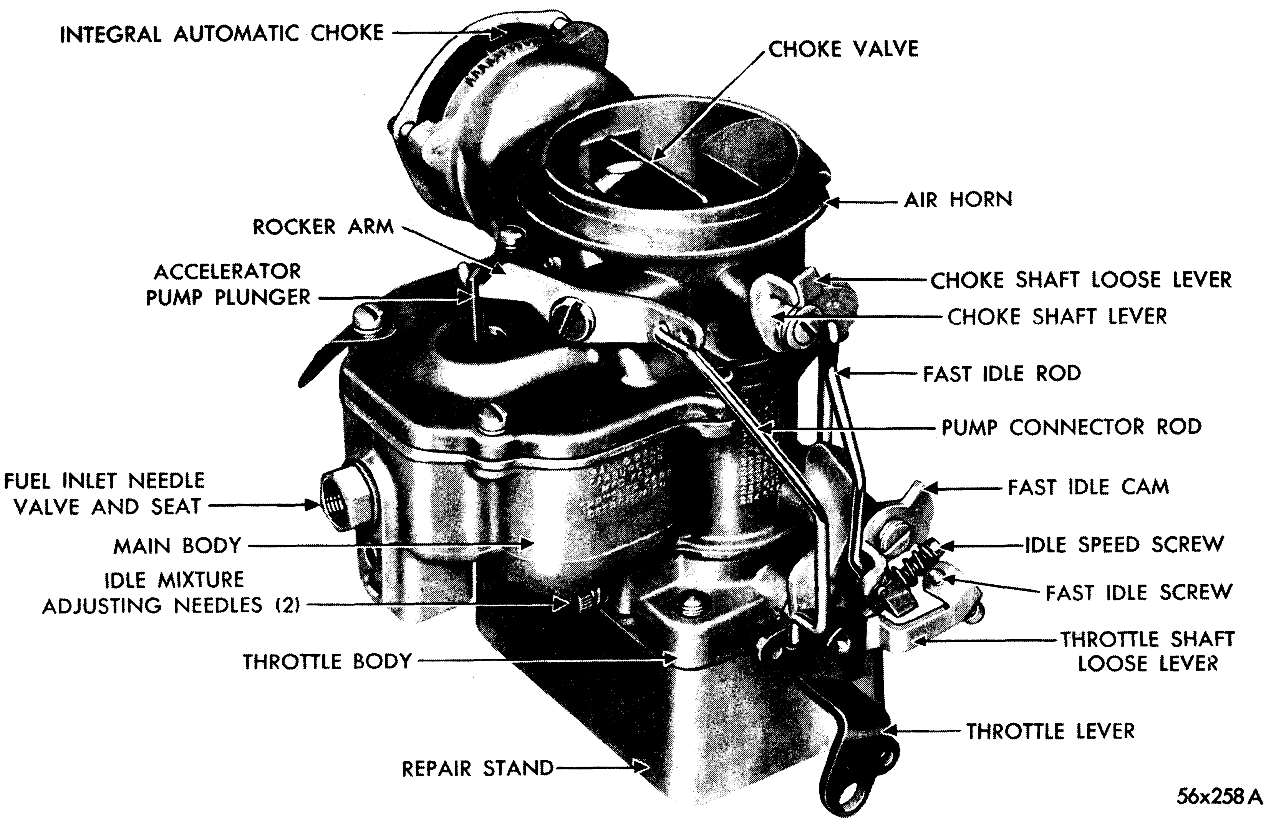

Fig. 5—Carburetor Assembly (BBD-2685S)

SERVICE PROCEDURES

15. REMOVAL OF CARBURETOR FROM ENGINE

Remove air cleaner, gasket, fuel line, choke heat tube and vacuum spark advance tube. Disconnect throttle linkage, remove the carburetor from intake manifold. Discard mounting flange gasket.

The carburetor must be disassembled, all parts carefully cleaned in suitable solvent, such as "Metalclene" or equivalent. Inspect all parts for damage or wear and replace as necessary.

16. CARBURETOR DISASSEMBLY (FIG. 6)

Place carburetor assembly on repair stand Tool C-3225, (if available). This Tool is used to protect throttle valves from damage and provide a suitable base for working. Remove hair pin clips that retain fast idle and pump connector rods, disengage from choke and throttle levers, as shown in Figure 7. Remove air horn and integral automatic choke, as shown in Figure 8, discard gasket. Remove fuel inlet needle valve, seat, gasket and float fulcrum pin retainer. Lift out floats, as shown in Figure 9. Remove step-up piston screw, lift step-up piston and rods up out of carburetor bowl, as shown in Figure 10. Remove step-up piston spring and gasket from piston cylinder.

Remove main metering jets and gaskets, as shown in Figure 11. Remove vented screws that attach venturi cluster to main body. Lift cluster up and away from carburetor, as shown in Figure 12, discard cluster gaskets. Invert carburetor and drop out the discharge check ball. The metering of fuel from accelerator pump is controlled by two drilled holes in the venturi cluster. Be sure these holes are clean.

Do not remove the idle orifice or main vent tubes from the venturi cluster. They can easily

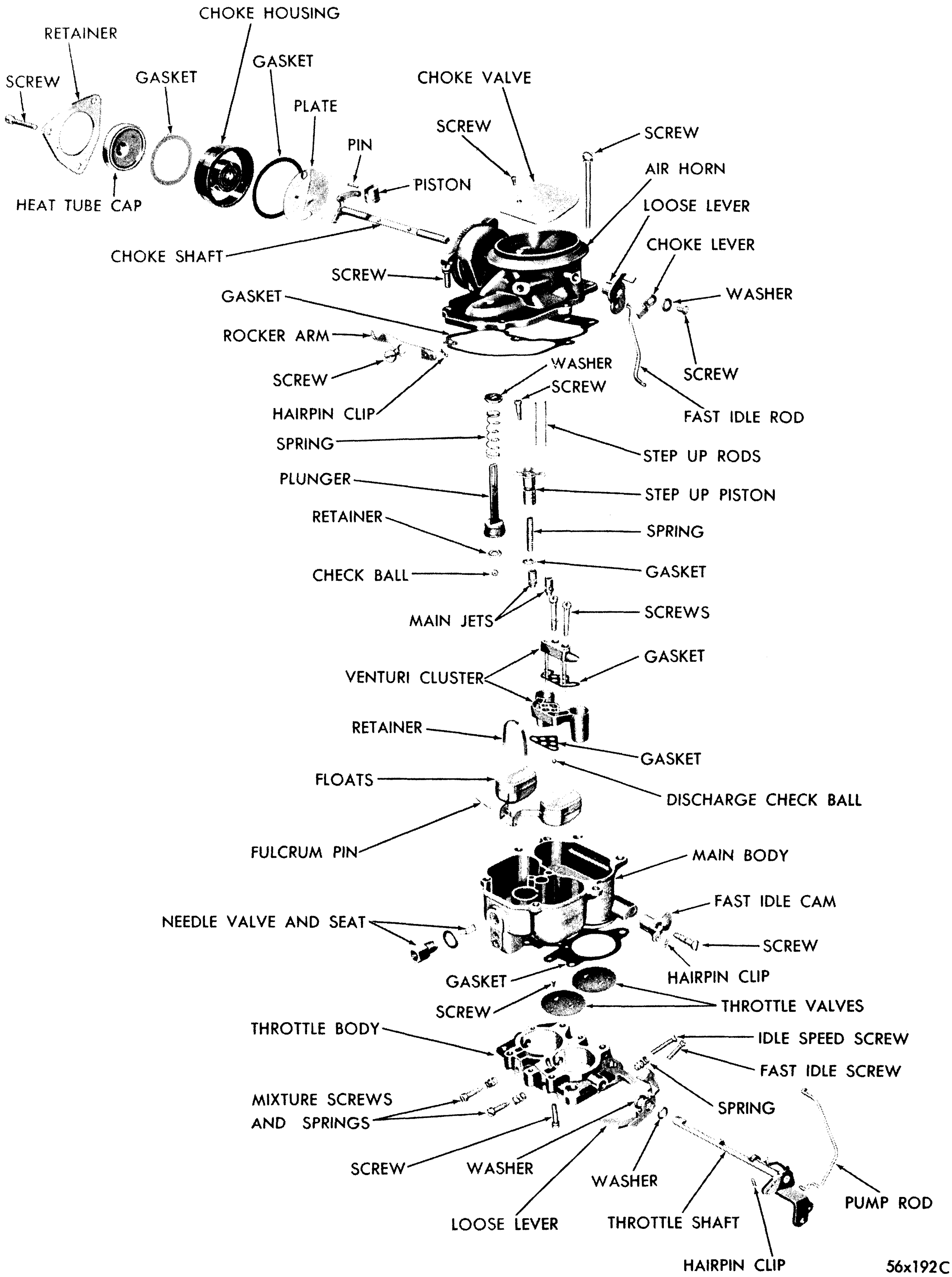

Fig. 6—Carburetor Assembly (BBD-2685S) (Disassembled View)

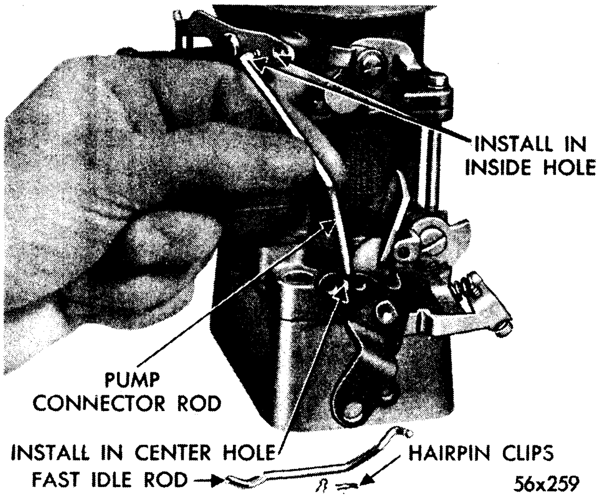

Fig. 7—Removing or Installing Fast Idle and Pump Connector

be cleaned in solvent and dried with compressed air. The discharge cluster is serviced **only** as an assembly.

Remove idle mixture adjusting needles and springs from throttle body. Invert carburetor and remove screws that attach throttle to main body. Separate bodies and discard gasket.

Disengage accelerator pump plunger from rocker arm, by pushing up on bottom of plunger and sliding slotted end off rocker arm hook, as shown in Figure 13. If pump plunger leather is worn, hard or cracked, a new pump plunger should be installed at reassembly. Place plung-

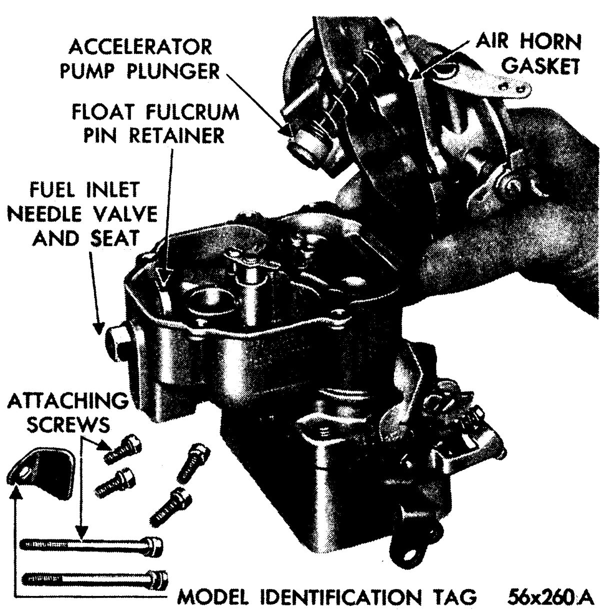

Fig. 8—Removing or Installing Air Horn

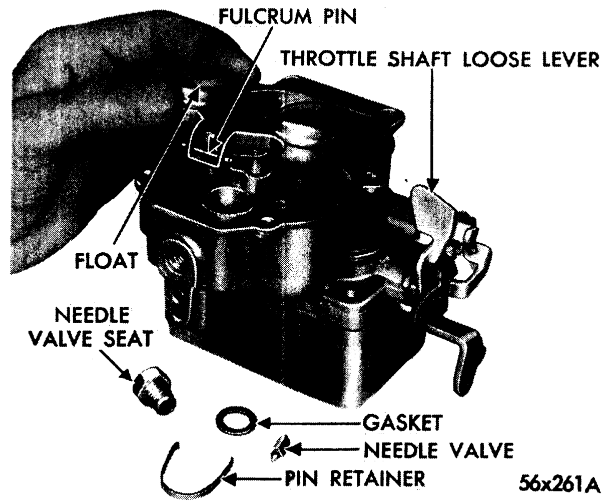

Fig. 9—Removing or Installing Float

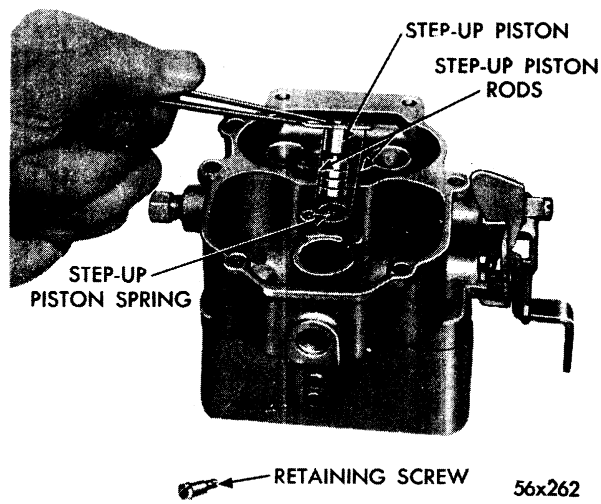

Fig. 10—Removing or Installing Step Up Piston and Rods

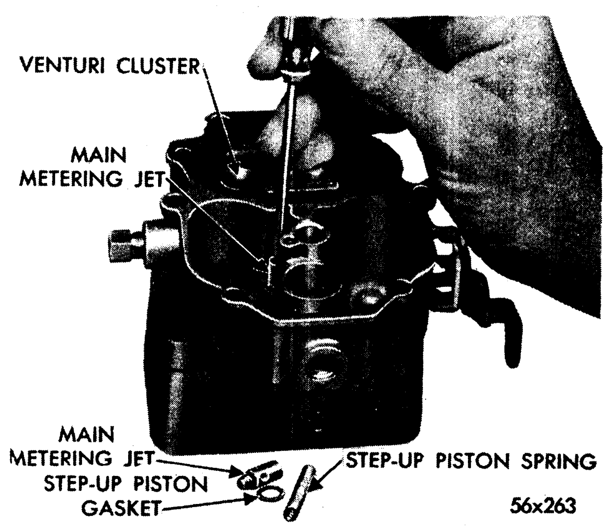

Fig. 11—Removing or Installing Main Metering Jets

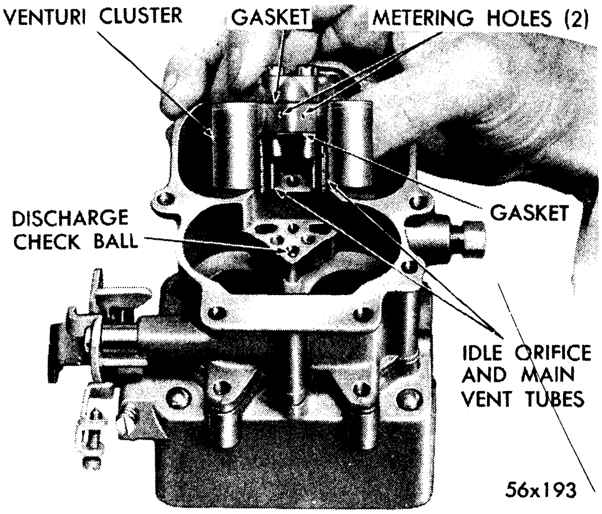

Fig. 12—Removing or Installing Venturi Cluster

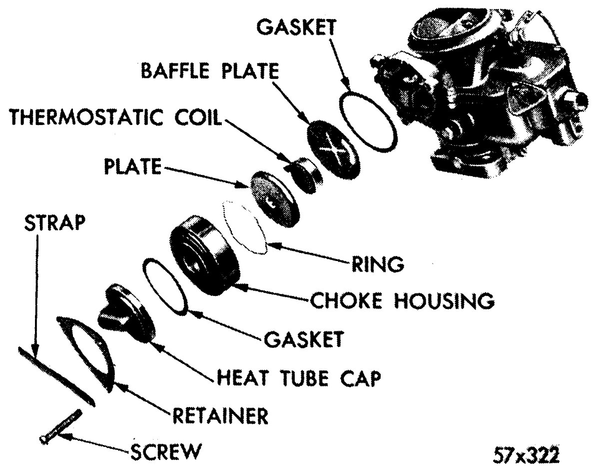

Fig. 14—Removing or Installing Choke Baffle Plate and Gasket

er in a jar of clean gasoline or kerosene to prevent leather from drying out.

Remove screws that attach the thermostatic coil housing and cap to air horn. Remove coil housing, thermostatic coil, cap, gaskets and baffle plate, as shown in Figure 14. Using a file or other suitable tool, remove staking portion of screws that attach choke valve to choke shaft. Remove screws and slide choke valve out of air horn. The choke valve screws are staked to prevent loosening and care must be used at removal so as not to break off in shaft.

Remove screw that attaches choke shaft lever to choke shaft. Hold choke shaft lever firmly with fingers, as shown in Figure 15, so as not to jam choke piston in its well. Slide choke lever, loose lever and washer off end of choke shaft as shown in Figure 16. Turn choke shaft clockwise until choke piston clears the top of its cylinder, then withdraw the choke piston, link and shaft from air horn, as shown in Figure 17.

The carburetor now has been disassembled into three units, namely, the air horn, main body and throttle body, and component parts of each disassembled as far as necessary for cleaning and inspection. It is usually not advisable to remove throttle shaft or valves, un-

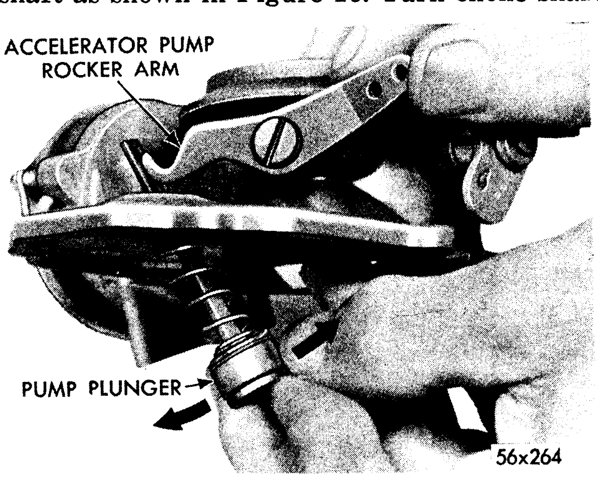

Fig. 13—Removing or Installing Accelerator Pump Plunger

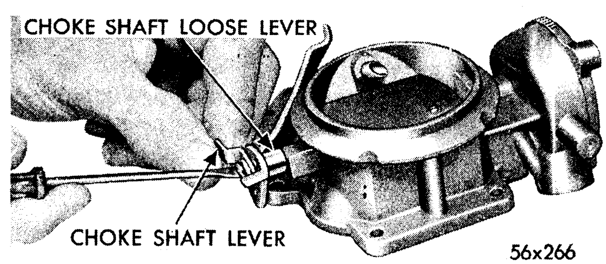

Fig. 15—Removing or Installing the Choke Shaft Lever

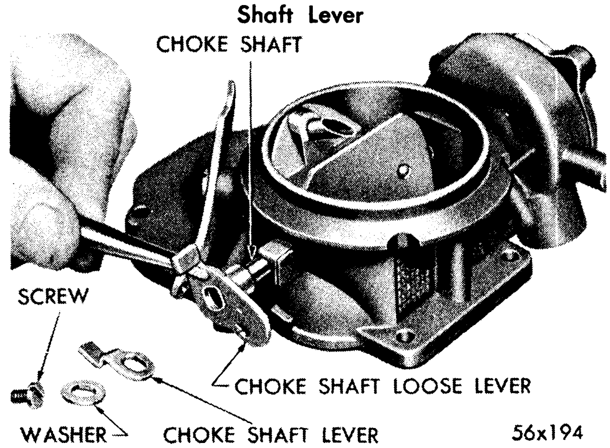

Fig. 16—Removing or Installing Choke Shaft Loose Lever

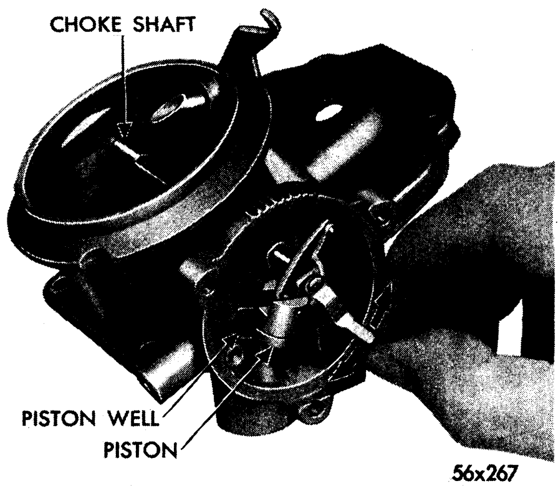

Fig. 17—Removing or Installing Choke Shaft Piston

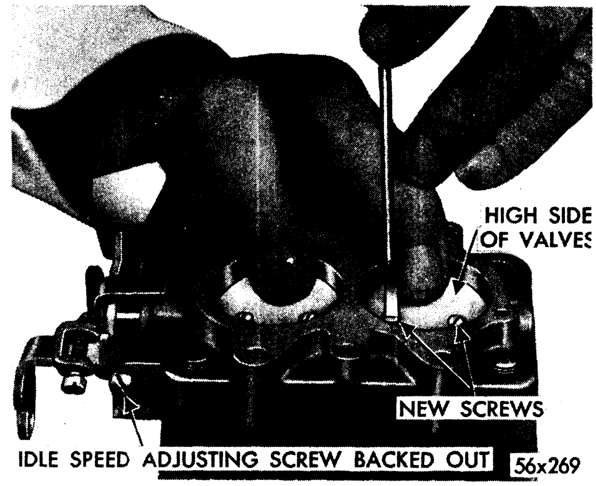

Fig. 19—Removing or Installing Throttle Valves

less wear or damage necessitates installation of new parts. To install new valves or throttle shaft, refer to Inspection and Reassembly Paragraph 18.

17. CLEANING CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol. There are other commercial solvents or cleaners, however, such as Metalclene (or equivalent) which may be used with satisfactory results.

IMPORTANT

If the commercial solvent or cleaner recommends the use of water as a rinse, it should be HOT. After rinsing, all trace of moisture must be blown from passages with air pressure. Never clean jets with wire, drill or other mechanical means as the orifices may become enlarged, making fuel mixture too rich for proper performance.

18. INSPECTION AND REASSEMBLY

Check throttle shaft for excessive wear in

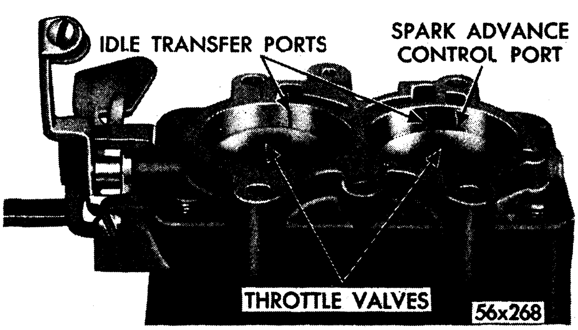

Fig. 18—Ports in Relation to Throttle Valves

throttle body. If wear is extreme, it is recommended that throttle body be replaced rather than installing a new throttle shaft in old body.

During manufacture, location of idle transfer port and spark advance control ports to valves is carefully established for one particular assembly (See Fig. 18). If a new shaft should be installed in an old worn throttle body it would be very unlikely that original relationship of ports to valves would be obtained. Changing port relationship would adversely affect normal car operation between speeds of 15 and 30 miles per hour. If it has been determined however, that new valves and shaft are to be installed, adhere closely to following instructions: Mark valves to be sure each is replaced in same bore from whence removed. Using file or other suitable tool, remove staking portion of screws that attach throttle valves to throttle shaft. Remove screws and slide throttle valves out of bores. The throttle valve screws are staked on opposite side to prevent loosening and care must be used at removal so as not to break off in shaft.

Slide throttle shaft out of throttle body. Position new shaft in body, then back off idle speed screw (adjusting). This will allow valves to be fully seated for instalation operation. The letter "C" in a circle stamped on valves must be toward idle ports and visible from bottom of throttle body when valves are installed. Slide valves into their respective bores, insert NEW attaching screws, but do not tighten. Hold valves in place with fingers, as shown in Figure 19 (fingers pressing on high side of valves).

Tap valves lightly with screwdriver to seat fully in bores. Holding valves in this position, tighten screws securely, then stake by squeezing with pliers. Install two idle mixture adjusting needles and springs in throttle body. (The tapered portion must be straight and smooth. If tapered portion is grooved or ridged, a new idle mixture adjusting needle should be installed to insure having correct idle mixture control).

Idle Mixture Needle Adjustment

The adjusting should be made with fingers. **DO NOT USE A SCREWDRIVER.** Turn needles lightly against their seats, then back off one full turn for approximate setting.

Assembling the Automatic Choke

To function properly, it is important that all choke parts be clean and move freely when installed. It is possible, under extremely dust conditions, that fine particles of dirt may be found deposited on various choke parts. A heavy, black, hard carbon deposit on choke parts will indicate the possibility of a leak in the heat tube, in exhaust manifold. Check tube and install a new one if necessary. Examine for wear or damage. Worn or damaged parts must be replaced in order to insure proper choke operation.

The thermostatic coil, heat retainer plate and coil housing are serviced as an assembly **only.** If housing is cracked or broken, install a complete new assembly. The index mark cut in rim of housing is only correct for one coil originally installed. Do not attempt to separate thermostatic coil from heat retainer plate.

To remove coil and heat retainer plate from housing, hit housing sharply against palm of

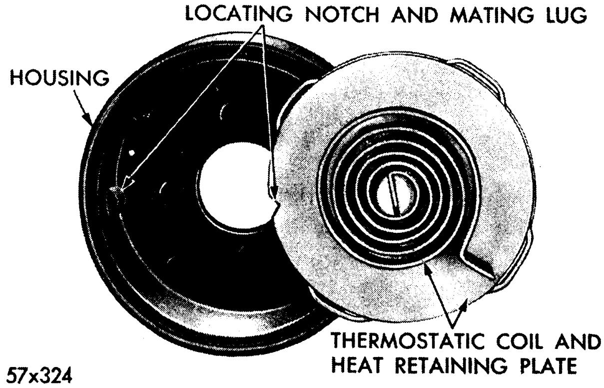

Fig. 20—Installing Heat Retainer Plate

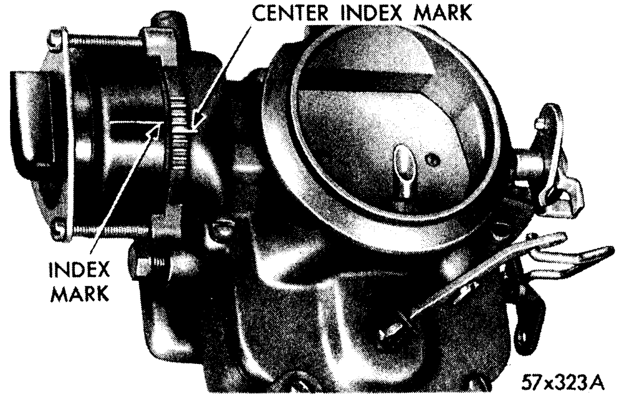

Fig. 21—Alignment of Index Marks of Choke

hand (coil side down). Clean dirt, dust or other foreign material that may be present from retainer plate and out of choke housing. When reassembling, match lug in the housing, with notch on plate, as shown in Figure 20. Install plate and press down until it is seated in housing. Be sure retaining spring in plate is clear of notch.

Slide choke shaft and piston into air horn. Be sure that groove in piston is clean. Turn choke shaft clockwise until piston clears choke cylinder. (Refer to Fig. 17). Turn choke shaft counter-clockwise, allowing choke piston to enter its cylinder. Slide choke valve down into position, then start new screws. Holding valve in closed position, tap gently with screw driver to center and locate valve, then tighten screws securely. Stake by squeezing with pliers. Hold air horn up-right and close choke valve. The valve should open freely of its own weight. Do not lubricate any of choke operating parts.

Install choke baffle plate and gasket. Place coil housing retaining ring over housing and heat tube cap, and, with index mark in down position, install coil housing. Turn the housing clockwise until index mark lines up with one notch rich mark on carburetor, as shown in Figure 21. Install screws and tighten securely. Slide choke shaft loose lever and sleeve over choke shaft, followed by choke shaft lever, washer and screw (Refer to Figure 16. Tighten screw securely. Place new gasket on throttle body. Invert assembly and install attaching screws. Just **snug** screws down, do not tighten at this time.

Place discharge check ball on its seat, test accelerator pump action as follows: Remove accelerator pump plunger from jar of gasoline.

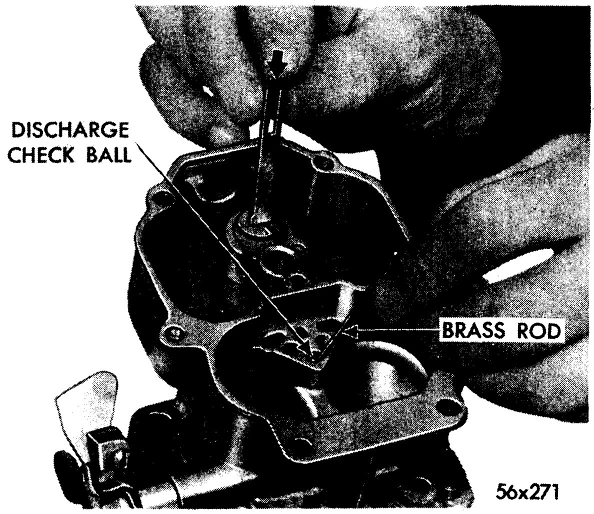

Fig. 22—Accelerator Pump Test

Flare back leather several times, slide into pump cylinder. Pour clean gasoline into float chamber (approximately ½ inch deep).

Raise plunger and press lightly on end of plunger shaft, forcing plunger down into cylinder. Do this several times, until all air has been removed from discharge passage. Using a small clean brass rod, hold discharge check ball firmly on its seat, as shown in Figure 22.

Raise pump plunger and press downward, no fuel should be emitted from either accelerator pump intake or discharge passage. If fuel does emit from either passage, it is an indication of dirt or a damaged check ball. Remove ball, reclean passage, and, if necessary, install new check ball. Retest as described above.

If fuel still emits from passage, place a small drill rod on check ball. Lightly tap with hammer to form a new ball seat. Install new check ball and test as previously described. If condition still exists, install a new main body. Remove plunger and pour out gasoline after test.

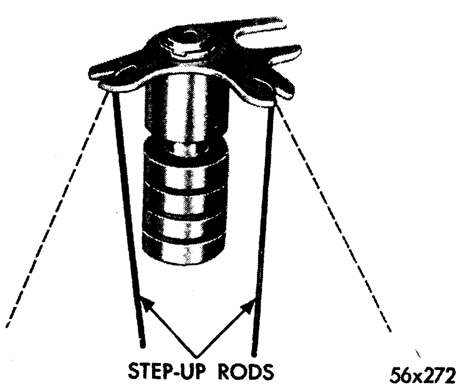

Fig. 23—Positioning Step-up Rods

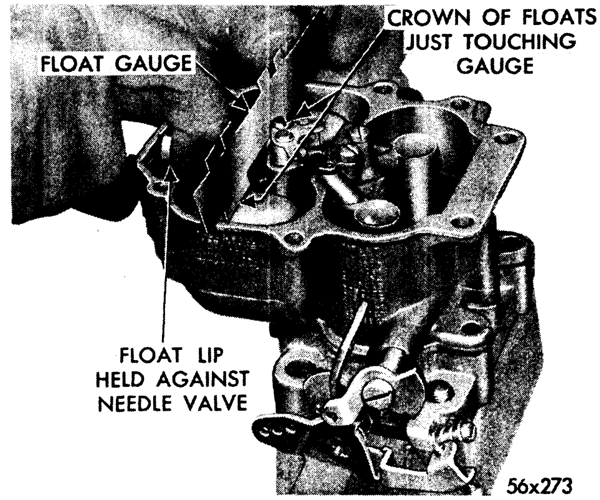

Fig. 24—Checking Float Height

Reinstall the venturi cluster, gaskets and idle bleed screws. Tighten screws securely. (Refer to Fig. 12). Install main metering jets and gaskets, step-up piston gasket, spring, piston and rods. (Refer to Fig. 11). Before installing the step-up piston, be sure the step-up rods are able to move freely each side of vertical position, as shown in Figure 23. Be sure step-up piston slides freely in its cylinder. A step-up piston stuck in the **UP** position will cause a rich mixture at part throttle, whereas a piston stuck in **down** position will cause a lean mixture at wide open throttle and poor acceleration. Install retaining screw and tighten securely.

Install float, fulcrum pin and retainer. (Refer to Fig. 9). Install fuel inlet needle valve, seat and gasket. If needle valve is ridged, grooved, or shows signs of wear, a new needle valve and seat should be installed.

Checking Float Height

When checking float height, be sure and remove air horn gasket. Place float gauge Tool T-109-282 in position over floats, as shown in Figure 24. Both floats should just touch gauge when float lip is held firmly against inlet needle. To adjust, bend float lip to raise or lower floats until correct setting has been obtained. If one float is lower than the other, equalize by bending float arm.

If Tool T-109-282 is not available, use a steel scale and measure distance from crown of float (in the center) to top of fuel bowl. This measurement should be $\frac{9}{32} \pm \frac{1}{64}$ inch. Remove accelerator pump plunger from jar of gasoline, slide spring and cup washer over shaft. Slide assembly up through air horn and engage with rocker arm. Using a new gasket, place air horn on main body and install screws. Be sure plunger leather enters pump cylinder evenly.

Install accelerator pump and fast idle rods and secure with hairpin clips. Tighten all air horn and throttle body attaching screws securely.

19. CARBURETOR ADJUSTMENTS

The following adjustments should be made with the carburetor on a bench (for ease of working), and, should be made in the following order: Fast idle adjustment, choke shaft lever adjustment, unloader adjustment (wide open kick) and accelerator pump adjustment.

a. Fast Idle Adjustment

To make the fast idle adjustment, hold the choke valve tightly closed. Tighten the fast idle adjusting screw (on the high step of the fast idle cam), until wire gauge Tool T-109-44 (.015 inch) can be inserted between the throttle valve and the bore (side opposite port), as shown in Figure 25. The index mark on the fast idle cam should be in direct line with the fast idle screw shank.

b. Choke Shaft Lever Adjustment

Invert the carburetor and open the throttle valves to wide open position. Close the choke valve tightly and then close the throttle valves. This will position the fast idle cam to fast idle. The index mark on the cam should split the center of the fast idle adjusting screw, as shown in Figure 26. If an adjustment is necessary, bend the choke lever, using Tool T-109-22, as shown in Figure 27, until the index mark on the cam indexes the fast idle adjusting screw.

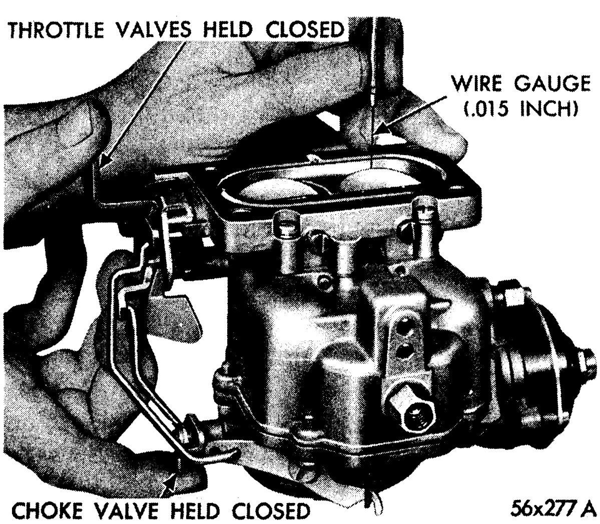

Fig. 25—Correct Throttle Opening for Fast Idle

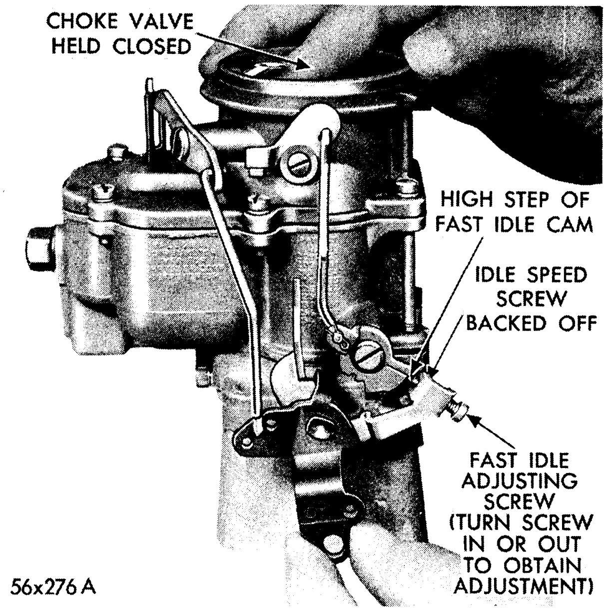

Fig. 26—Checking Fast Idle Setting

c. Choke Unloader Adjustment (Wide Open Kick)

To make unloader adjustment, lightly hold choke valve closed, then open throttle valves

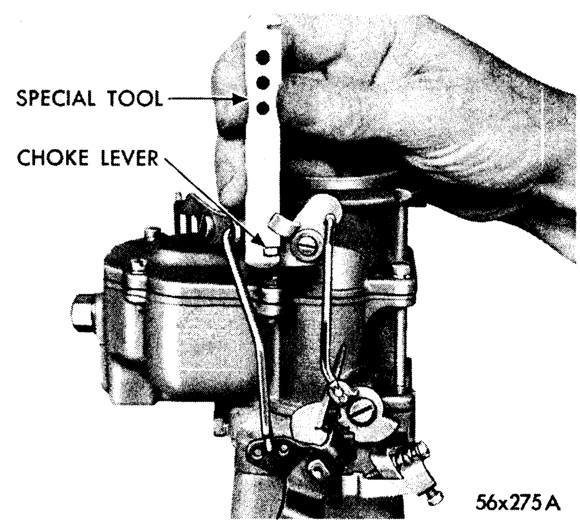

Fig. 27—Bending Choke Lever for Correct Fast Idle Cam Setting

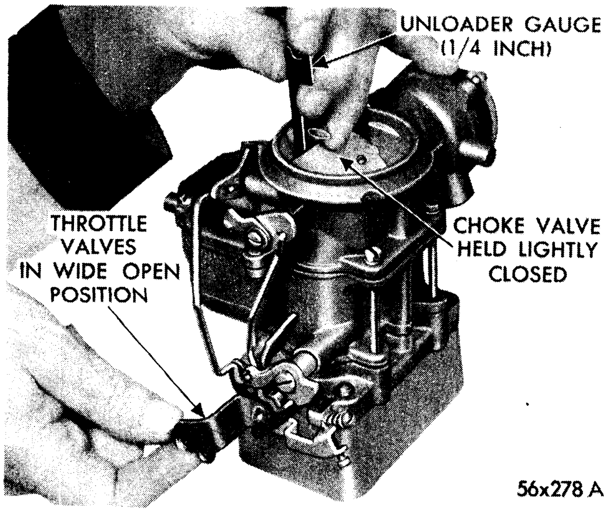

Fig. 28—Checking Choke Unloader Adjustment

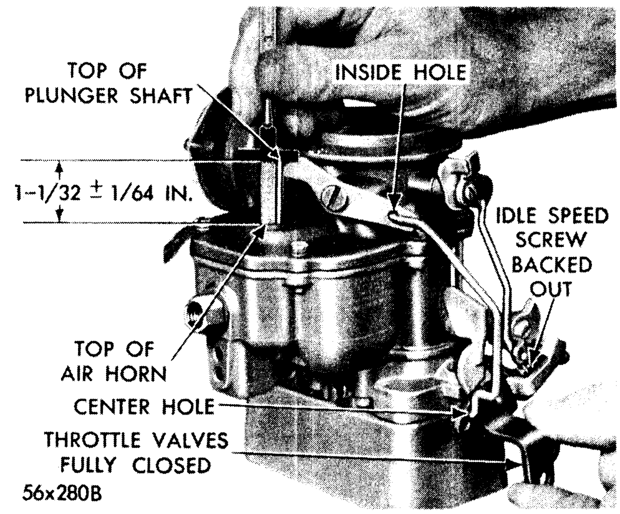

Fig. 30—Checking Accelerator Pump Travel

to wide open position. The choke valve should open sufficiently to allow unloader gauge Tool T-109-31 (¼ inch) to be inserted between choke valve and wall of air horn, as shown in Figure 28. Adjust if necessary, by bending the arm on throttle lever, using Tool T-109-213, as shown in Figure 29, until correct clearance has been obtained.

d. Accelerator Pump Adjustment

To make accelerator pump adjustment, be sure pump connector rod is located in center hole of throttle lever and in inside hole of rocker arm. Back off idle speed adjusting screw until throttle valves are fully seated in their bores. (Make sure fast idle adjusting screw is off fast idle cam.) With throttle valves seated, distance from top of plunger shaft to top of air horn bowl cover, should be 1 $\frac{1}{32}$ inch ± or minus $\frac{1}{64}$ inch when measured with a steel scale, as shown in Figure 30. To adjust pump setting, bend pump connector rod, using Tool T-109-213, as shown in Figure 31, until correct pump travel distance has been obtained.

20. INSTALLATION OF CARBURETOR ON ENGINE

Install a new carburetor mounting gasket on intake manifold, then install carburetor. Before tightening attaching nuts, start fuel and vacuum lines, to prevent stripping threads on these connections. Complete tightening of attaching nuts, fuel and vacuum line connections, install heat control tube. Install throttle con-

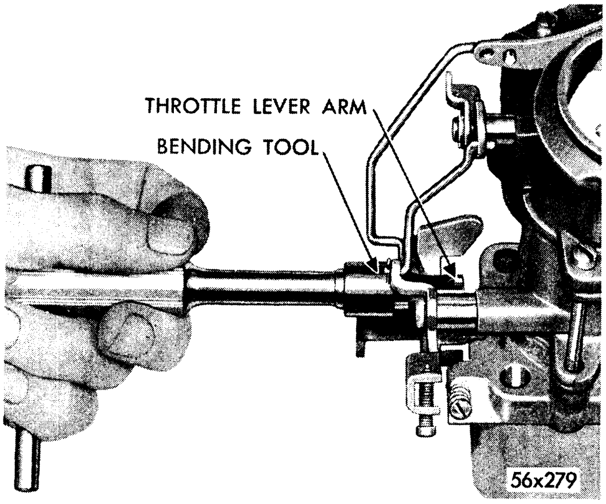

Fig. 29—Bending Throttle Lever Arm for Unloader Adjustment

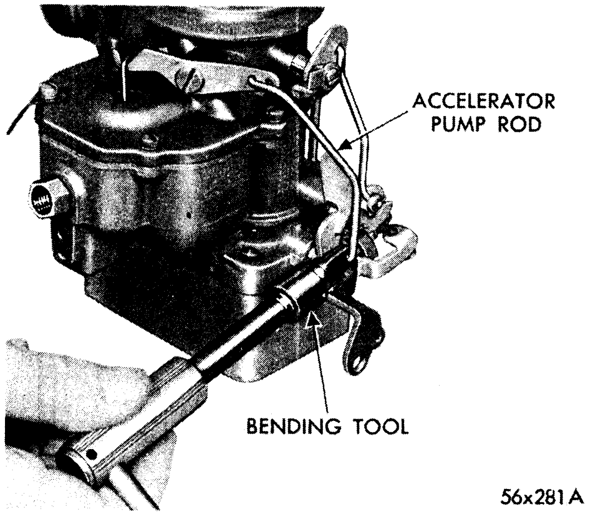

Fig. 31—Bending Pump Rod for Correct Pump Travel

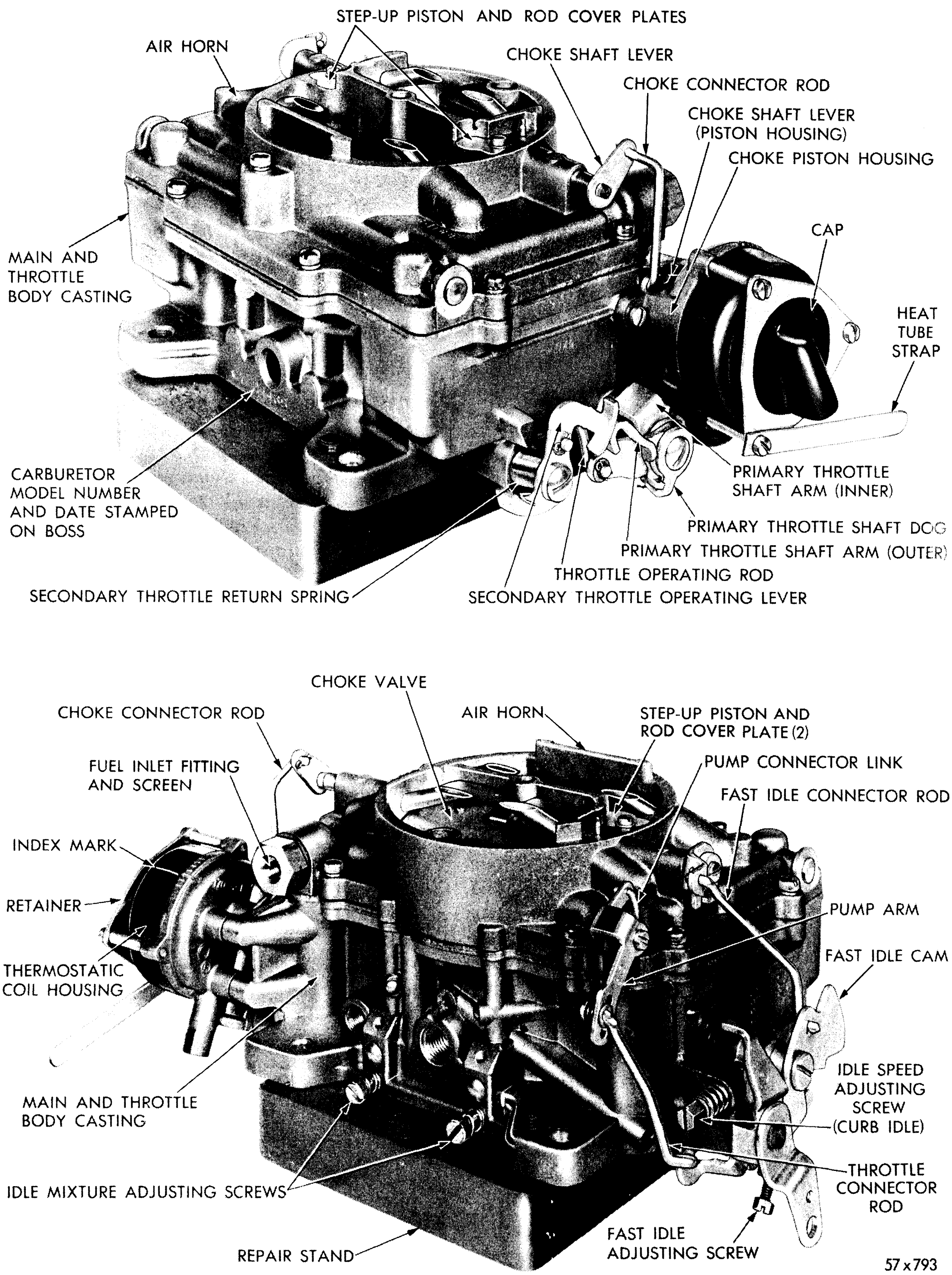

Fig. 32—Carburetor Assembly (Right and Left View)

trol linkage return spring and anchor, the air cleaner and gasket. Set engine idle speed as follows.

Idle Mixture Adjustment—No amount of carburetor adjustment will give a smooth engine idle, unless following items are known to be in good condition and/or adjusted correctly. Spark plugs, distributor points, good high tension terminal connections (no leaks in leads), engine ignition timing and manifold heat control valve operating properly.

If it was not made during assembly of carburetor, make preliminary setting of idle mixture adjusting needles, by turning them clockwise until seated. Back out one full turn. To prevent damage to the needles and seats, use finger pressure **ONLY** to make this adjustment.

Try and turn each adjusting needle the same amount. There is very little inter-connection between two branches of intake manifold. The cylinders on each branch will react to changes in idle mixture as much as if there were two four cylinder engines. It is assumed that approximately the same idle mixture is required by each set of four cylinders. It is further assumed that idle mixture delivered by each barrel of carburetor will be approximately the same if each idle adjusting needle is opened the same amount. The final fine setting may vary slightly from this, but it is best to start with needles in same physical location.

With engine warmed-up, idle speed set at 500 r.p.m. and both idle adjusting needles set at one full turn open, observe the roughness of engine and absence or presence of fluffs at tail pipe and/or pipes. Turn both idle mixture adjusting needles clockwise (leaner) 1/8 turn. If r.p.m. increases slightly, the engine runs smoother, and there are fewer fluffs in exhaust, the leaner adjustment is in right direction. Try turning needles clockwise another 1/8 turn, or a total of 1/4 turn from initial setting. This may further improve idle or make it worse. If, with this setting, the idle was improved, reset idle speed to 500 r.p.m. and then try individual adjustments of each needle 1/8 turn clockwise (leaner) and counter-clockwise (richer) to find best adjustment for each needle.

If the 1/8 turn (leaner) clockwise adjustment of both needles produced a drop in engine r.p.m., rougher operation, and more fluffs at tail pipes, try adjusting both needles 1/8 turn counter-clockwise (richer) from initial setting. Repeat procedure described above.

The best idle operation will normally be found with idle mixture needles set somewhere between 3/4 and 1 1/4 turns open. The final setting should result in both needles being open same number of turns, plus or minus 1/8 turn.

After final adjustment of idle mixture adjusting needles, recheck (and set if necessary) the idle speed.

CARBURETORS Models AFB-2650S-2651S
Models (LC-2, LC-3, LY-1)

The new AFB 2650S and 2651S (aluminum four barrel) carburetors (Fig. 32) contain many new features, some of which are, a new location for the step-up rods and pistons. The stepup rods, pistons and springs are accessible for service without removing the air horn, or the carburetor from the engine. The venturi assemblies (primary and secondary) are replaceable and contain many of the calibration points for both the high and low speed systems.

All the major castings of the carburetor are aluminum, with the throttle body cast integral with the main body. This allows an over-all height reduction in the carburetor. The section containing the accelerator pump and the integral choke is termed the primary side of the carburetor. The other side is the secondary. The five conventional systems used in previous four barrel carburetors are also used in this unit. The five conventional systems are, two float systems, two low speed systems, (primary side only) two high speed systems, one accelerator pump system and one automatic choke control system.

21. SERVICING THE CARBURETOR

Dirt, dust, water and gummy deposits are some of the main causes for poor carburetor operation. However, proper cleaning and the installation of new parts, where required, will return the carburetor to its originally designed performance.

When overhauling the AFB Carburetor, several items of importance should be observed to assure a good job.

The carburetor should be carefully disassembled.

All parts cleaned in a suitable solvent, then inspected for wear or damage.

Air pressure only should be used to clean the various orifices and channels.

Questionable parts should be replaced with new ones. When inspecting parts removed from the carburetor it is at times rather difficult to determine if they are satisfactory for further service. It is recommended therefore that in such cases that new parts be installed.

22. DISASSEMBLING THE AFB CARBURETOR

To disassemble the carburetor for cleaning or overhaul, refer to Figure 32, and proceed as follows:

Place the carburetor assembly on repair stand Tool C-3400 or T-109-287S elevating legs. These tools are used to protect the throttle valves from damage and to provide a suitable base for working.

Remove the hairpin clip that attaches the fast idle connector rod to the choke lever. Disengage rod from lever, then swing rod at an arc until it can be disengaged from the fast idle cam.

Remove the retainer and spring that holds the throttle connector rod in the center hole of the accelerator pump arm. Remove the hairpin clip that attaches the lower end of rod in the primary throttle shaft lever. Disengage rod from arm and lever, then remove from carburetor.

Remove the hairpin clips that attach the choke connector rod to the choke shaft lever and the lever at the choke piston housing. Disengage rod and remove from carburetor.

Remove the screws attaching the step-up piston and rod cover plates. **Hold cover down with a finger to prevent the piston and rods from flying out.** Lift off the plates and slide the step-up pistons and rods out of the air horn. Remove the step-up piston springs.

Remove the ten screws that attach the air horn to the main body. (1 screw in hole in air horn). Lift the air horn straight up and away from the main body. **When removing air horn, use care so as not to bend or damage the floats.** Remove the accelerator pump plunger lower spring from the pump cylinder.

a. Disassembling the Air Horn

Place the air horn in an inverted position on the bench (to protect the floats) then proceed to disassemble as follows:

Using a suitable Tool, remove the float fulcrum pins, (left and right) then lift the floats up and out of bosses on air horn. **It is suggested that the float on the pump side be marked so that the floats can be re-installed in their respective positions.**

Remove the two needle valves from their respective seats, after marking the one on the pump side for identification. Using a wide blade screw driver, remove the needle valve seats. Be sure each needle valve is returned to its original seat at reassembly.

Remove the hairpin clip that holds the accelerator pump connector link in the pump arm and plunger shaft. Disengage link from pump arm and shaft. Slide the accelerator pump plunger and spring out of the air horn. Remove the air horn to main body gasket and discard.

Place the accelerator pump plunger in a jar of clean gasoline or kerosene, to prevent the leather from drying out.

Remove the fuel inlet fitting and filter screen from the air horn.

b. Main Body Disassembly

Using a Phillips screw driver, remove the screws that attach the accelerator pump jet housing to the main body. Lift out the jet hous-

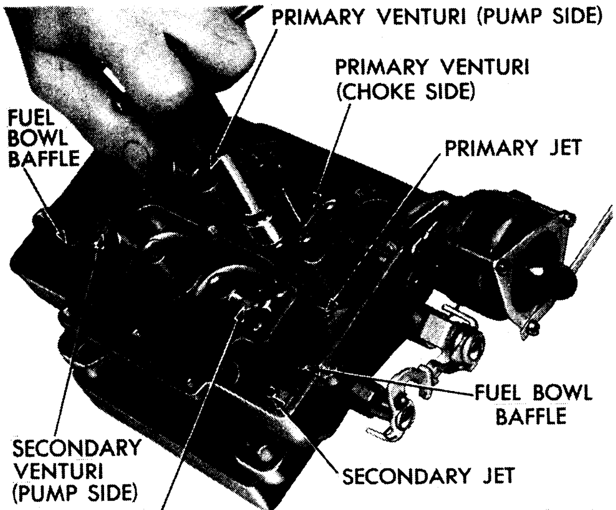

Fig. 33—Removing or Installing Main Metering Jets (Primary)

ing and gasket. Discard the gasket. Now, invert the main body and drop out the discharge check needle, from the discharge passage.

Using Tool T109-58, remove the main metering jets (primary side), as shown in Figure 33. **The primary and secondary main metering jets are not interchangeable. It is very important that these jets be installed in their respective locations in the main body at reassembly.** Again using Tool T109-58, remove the main metering jets (secondary side), as shown in Figure 34.

Remove the screws that attach the primary venturi (choke and pump side) to the main body. Lift the venturi straight up and away from the main body, as shown in Figure 35. Discard the gaskets.

The venturi assemblies are not interchange-

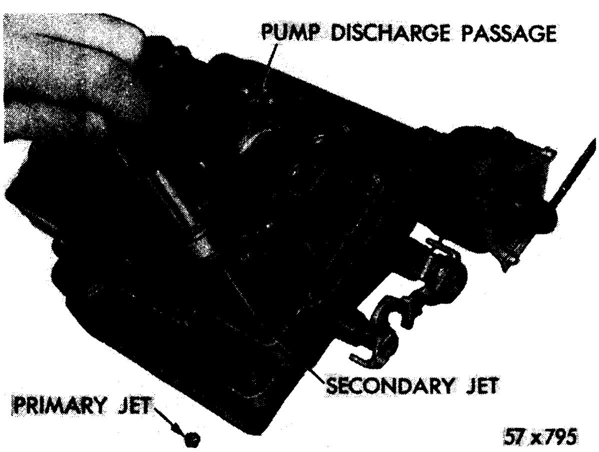

Fig. 34—Removing or Installing Metering Jets (Secondary)

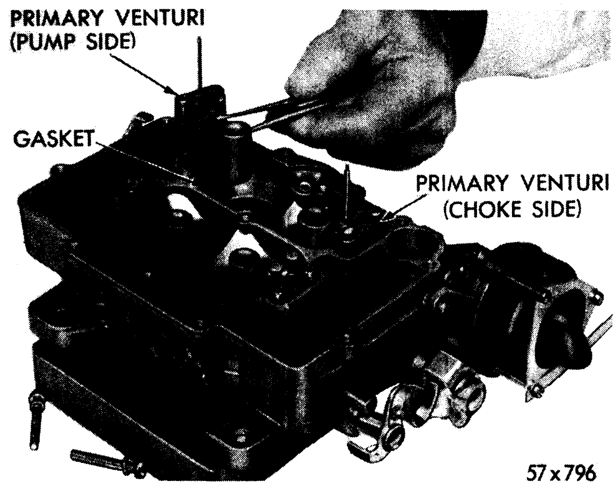

Fig. 35—Removing or Installing Primary Venturi (Choke Side and Pump Side)

able, side for side and must be re-installed in their original location at reassembly.

Remove the screws that attach the secondary venturi (choke and pump side) to the main body. Lift the secondary venturi assemblies straight up and away from the body as shown in Figure 36.

Invert the main and throttle body casting, then remove the accelerator pump intake check ball plug. Using Tool T109-59, screw driver bit, remove the check ball seat, as shown in Figure 37. Again invert the body casting and drop out the intake check ball.

Remove the two idle mixture adjusting screws and springs from the throttle body portion of the main casting.

Remove the screws that attach the thermostatic coil spring housing retainer to the choke piston housing. Remove the retainer, cap, gasket, housing, gasket and baffle plate from the choke housing.

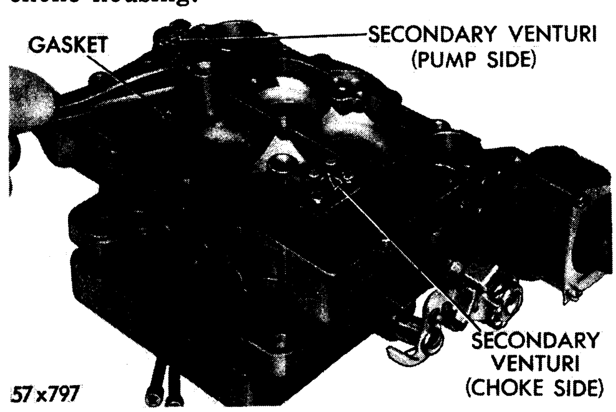

Fig. 36—Removing or Installing Secondary Venturi (Choke Side and Pump Side)

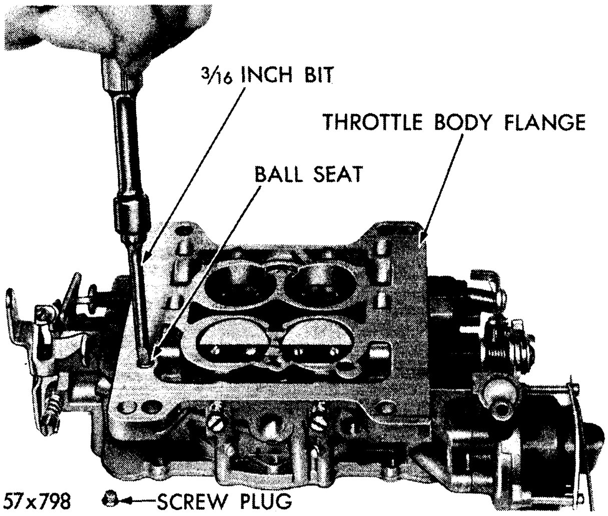

Fig. 37—Removing Intake Check Ball Seat

Remove the screws that attach the choke piston housing to the main body casting. Remove choke piston housing and discard the vacuum passage gasket.

Remove the choke piston arm attaching screw and washer, then slide the choke piston out of its cylinder.

The carburetor now has been disassembled into two units, namely the air horn and the main and throttle body casting. The component parts of each, have been disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shafts or valves, unless wear or damage necessitates the installation of new parts. During the manufacture of the carburetor, the location of the idle transfer ports and the idle discharge ports to the valve is carefully established for one particular assembly, as shown in Figure 38. The valves are milled to give the proper port relation.

If new throttle shafts should be installed in an old, worn body, it would be very unlikely that the original relationship of these ports to the valves would be obtained. A very slight change in the port relationship to the valves would adversely affect normal carburetor operation, between the speeds of 15 and 30 miles per hour.

It is recommended that if the throttle shafts are excessively worn, that a new carburetor be installed. However, if the throttle valves have become nicked, burred or damaged, new valves may be installed, providing the following instructions are carefully followed.

The screws that attach the throttle valves are staked on the opposite side and care should be used in removal so as not to break the screws in the throttle shaft. Remove the staked portion of the screws with a file.

Remove the screws that attach the primary throttle valves to the throttle shaft and slide valve (or valves) out of the bores.

Remove the screws that attach the secondary throttle valves to the throttle shaft and slide valve (or valves) out of bores.

The primary valves and secondary valves are not interchangeable and should be kept separate in order that each may be returned to its respective bore. (See Fig. 39).

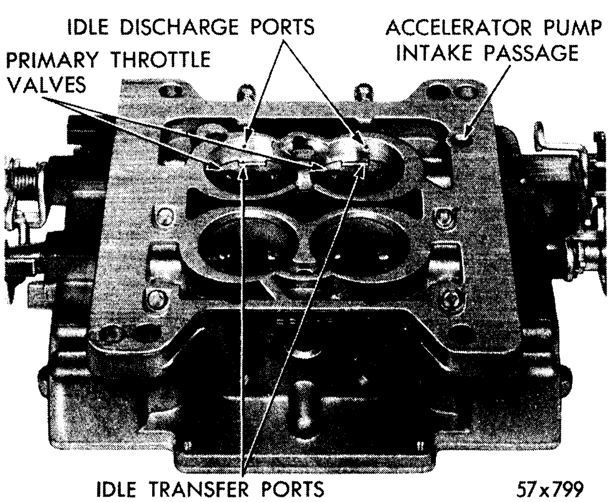

Fig. 38—Ports in Relation to Throttle Valves

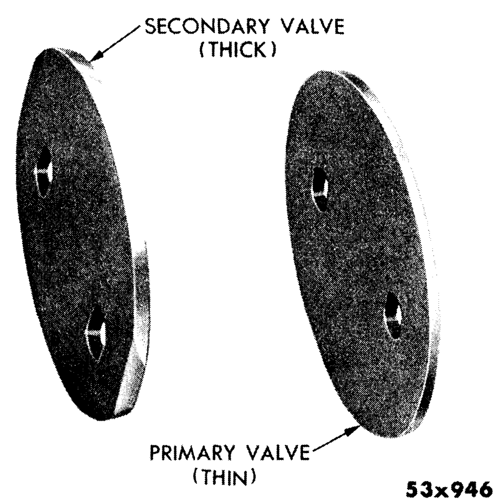

Fig. 39—Throttle Valve Identification

23. CLEANING CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol, which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

IMPORTANT

If the commercial solvent or cleaner recommends the use of a water rinse, it should be "HOT". After rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill, or other mechanical means, because the orifices may become enlarged, making the mixture too rich for proper performance.

It is important that all parts of the automatic choke be clean and move freely, in order to function properly. It is possible, under an extremely dusty condition, fine particles of dirt may be deposited on the various choke parts.

Examine all choke parts for wear or damage. Worn or damaged parts must be replaced with new, to insure proper operation of the choke. Other than an occasional cleaning, the automatic choke control requires no servicing. However, it is very important that the choke control unit works freely at the thermostatic coil spring housing and at the choke shaft.

To remove the thermostatic coil spring and heat retainer plate from the housing for cleaning, hit the housing sharply against the palm of the hand (coil side down). Clean dust, dirt or other foreign material that may be present, from the retainer plate and out of the choke housing. When reassembling, match the lug in the housing with the notch on the heat retainer plate. Install the plate and press down until seated. **Be sure the retaining spring in the plate is clear of notch.**

The thermostatic coil spring, heat retainer plate and coil housing are serviced as an assembly only. If the housing is cracked or broken, install a complete new assembly. The index mark out in the rim of the housing is correct for the one coil originally installed. **Do not attempt to separate the thermostatic coil from the heat retainer plate.**

24. CARBURETOR ASSEMBLY

a. Main and Throttle Body Casting

Slide the primary throttle valve (or valves) into their respective bores, install new screws, but do not tighten. **Be sure the idle speed adjusting screw is backed out.** Hold the valves in place with the fingers. (Fingers pressing on the high side of valves).

Tap the valves lightly with a screw driver to seat in the bores. Holding the valves in this position, tighten the screws securely. Stake screws by squeezing with pliers.

Install the two idle mixture adjusting screws and springs in the throttle body portion of the casting. The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture adjusting screw should be installed to insure having correct idle mixture control. **DO NOT USE A SCREW DRIVER.** The adjustment should be made with the fingers. Turn the idle mixture adjusting screws lightly against their seats, then back off one full turn for an approximate adjustment.

Position the choke shaft lever (piston housing) so that it is pointing toward the piston cylinder, as shown in Figure 40. (One o'clock when viewed from the rear).

Slide the choke piston into the cylinder, and at the same time position the piston arm over the flats on the shaft. Install retaining washer and screw. Snug down and carefully tighten.

Slide a new vacuum passage gasket into position, then install the piston housing on the body casting. Install screws and tighten securely.

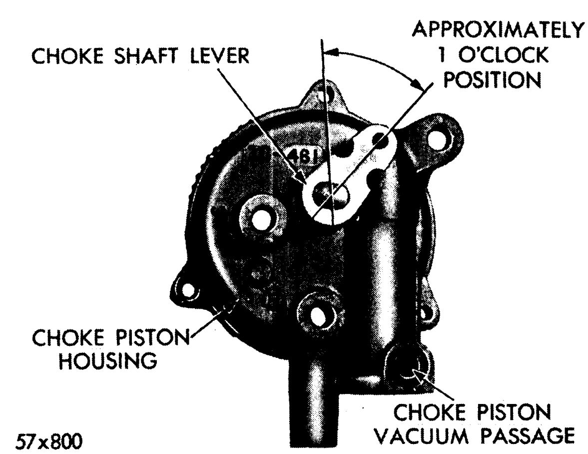

Fig. 40—Positioning Choke Shaft Lever

Place new secondary venturi gaskets in position, then install the secondary venturi (pump and choke side) by lowering straight down on gaskets. Install attaching screws and tighten securely. **Be sure all the metering holes and vent tubes are clean, in both the primary and secondary venturi.**

Place new primary venturi gaskets in position, then install the primary venturi (pump and choke side) by lowering straight down on the gaskets. (Refer to Figure 35). Install attaching screws and tighten securely.

Install the primary and secondary main metering jets, using Tool T109-58. (Refer to Figures 33 and 34). Tighten jets securely.

Invert the carburetor and install the accelerator pump intake check ball. Install seat and tighten securely, using Tool T109-59. (Refer to Figure 37). Install screw plug and tighten securely.

b. Accelerator Pump Test

Pour clean gasoline into the carburetor bowl (approximately ½ inch deep). Remove the accelerator pump plunger from the jar of gasoline. Flex the leather several times, then slide into the pump cylinder.

Install the accelerator pump discharge check needle in the discharge passage. Raise the pump plunger and press lightly on the plunger shaft to expel air from the pump passages. Using a small clean brass rod, hold the discharge check needle firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage.

If fuel does emit from the intake passage, disassemble the intake check ball and reclean the passage. Fuel leakage at the discharge check needle indicates the presence of dirt or a damaged check needle. Clean again and then install a new check needle. Retest for leakage.

If either the intake check ball or discharge check needle leaks after above test and service fix, attempt to reseat as follows:

c. Intake Check Ball

Remove the screw plug, gasket, ball seat and ball from the bottom of the throttle body flange. Install a new ball and ball seat. Install screw plug and new gasket, then retest as described previously.

d. Discharge Check Needle

With the discharge check needle installed, insert a piece of drill rod down on the needle. Lightly tap the drill rod with a hammer to form a new seat. Remove and discard old needle and install a new one. Retest as described previously. If the service fix does not correct the condition, a new carburetor will have to be installed.

Install the accelerator pump jet housing gasket. Install housing and attaching screws. Tighten screws securely.

Press down on the accelerator pump plunger shaft, and as the plunger is being depressed, a clear straight stream should emit from each jet. If the streams are identical, (if either one is diverted or restricted) a new accelerator pump jet housing should be installed. After test, pour the gasoline from the carburetor bowl and remove pump plunger.

e. Assembling the Air Horn

Slide the fuel inlet screen into the fuel line fitting, then install fitting in air horn. Tighten securely.

Check to see if the leather on the accelerator pump plunger is hard, cracked or worn. If any sign of wear or deterioration is evident, install a new plunger assembly.

Slide the accelerator plunger into air horn, then install the accelerator pump link. Install the retaining hairpin clip to secure.

Place a new air horn to main body gasket in position on the air horn, then install the float needle valve seats. (Be sure each needle seat and needle is reinstalled in its original position).

Slide the right and left floats into position in the air horn, then install the float fulcrum pins. (**Be sure the marked float is installed on the pump side of the air horn**).

After the floats have been installed, check the float alignment, level and drop settings as follows:

f. Float Alignment Setting

Sight down the side of each float shell to de-

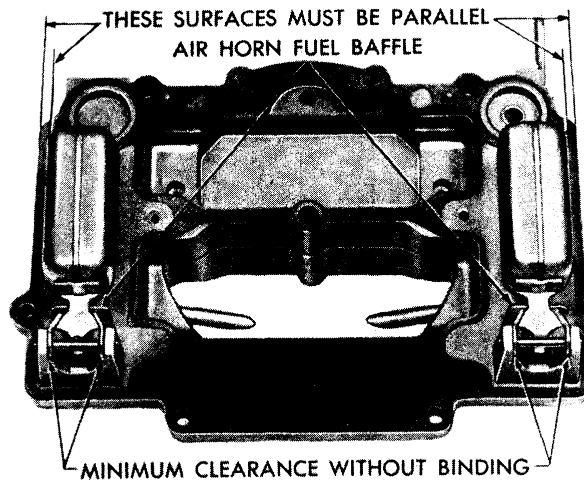

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Fig. 41—Checking Float Alignment

termine if the side of the float is parallel to the outer edge of the air horn casting, as shown in Figure 41.

If the sides of the float are not in alignment with the edge of casting, bend the float lever by applying pressure to the end of the float shell with the fingers while supporting the float lever with the thumb. **To avoid damage to the float, apply only enough pressure to bend the float lever.**

After aligning the floats, remove as much clearance as possible between the arms of the float lever and the lugs on the air horn. To do this, bend the float lever. The arms of the float lever should be as parallel as possible to the inner surfaces of the lugs on the casting.

g. Float Level Setting

With the air horn inverted, the air horn gasket in place and the float needle seated, slide float gauge T109-107 ($\frac{5}{16}$″) between the top of the float (at outer end) and the air horn gasket, as shown in Figure 42. Float should just touch gauge.

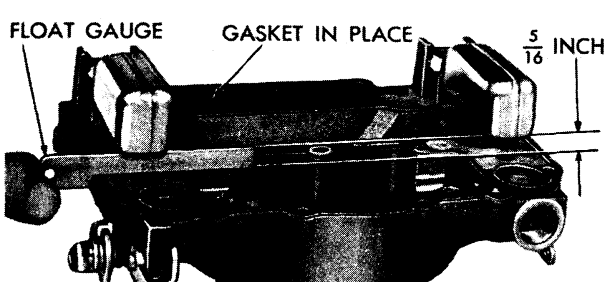

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Fig. 42—Checking Float Height with Gauge

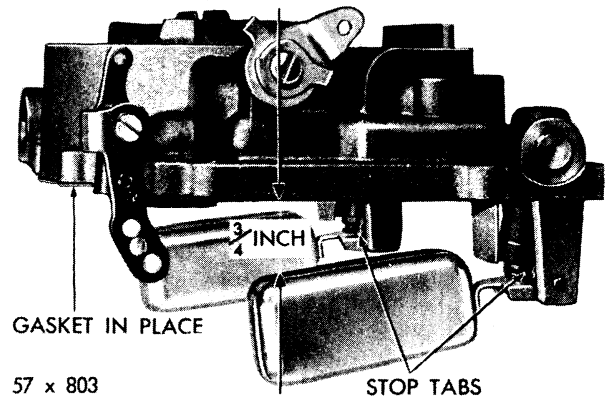

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Fig. 43—Checking Float Drop

Check the outer float in the same manner. If an adjustment is necessary, bend the float arm using Tool T109-22, until correct clearance has been obtained. After bending arm, recheck the float alignment.

h. Float Drop Setting

Holding the air horn in an upright position, measure the distance from the top of the floats (outer end) to the air horn gasket as shown in Figure 43. This measurement should be $\frac{3}{4}$ inch. If an adjustment is necessary, bend the stop tabs on the float levers until the correct drop setting has been obtained. Bend the tab towards the needle seat to lessen the drop, or away from the seat to increase the drop.

After the floats have been checked and adjusted, continue to assemble the carburetor as follows:

Place the accelerator pump plunger lower spring in the pump cylinder, then lower the air horn carefully down on the main body.

CAUTION

Be sure the fuel baffles on the air horn, slide down in front. (bowl side) of the float chamber baffles, or the air horn will not index correctly with the main body and can cause the floats to hang up.

Be sure the leather on the plunger does not curl or wrinkle. Accelerator pump operation will be affected if this precaution is not observed.

Install the 10 air horn attaching screws and tighten securely. (the two long screws should be installed in the holes that are located at the air cleaner mounting surface. The 1 inch screw at the front and the 1½ inch at the rear).

Slide the step-up piston springs into the piston cylinders, followed by the step-up pistons and step-up rods. Install the cover plates and attaching screws while holding the step-up pistons down in position. Tighten screws securely.

Engage the choke connector rod with the choke shaft lever and the lever at the choke piston housing. Install hairpin clips to secure.

Engage the throttle connector rod with the primary throttle shaft lever, then install hairpin clip. Slide the flatwasher over other end of rod and engage with the accelerator pump arm. Install retainer spring and retainer secure.

Engage the lower end of the fast idle connector rod with the fast idle cam, then swing in an arc to lock in cam. Slide other end of rod into the choke shaft lever and secure with hairpin clip.

The carburetor now has been completely assembled with the exception of the automatic choke housing and heat tube cap. This was done in order to make the choke piston lever adjustment.

25. CARBURETOR ADJUSTMENTS

The following adjustments should be made with the carburetor on the bench for ease of working, and, should be made in the following order:

a. Fast Idle Adjustment

With the choke valve held tightly closed, tighten the fast idle adjusting screw (on the high

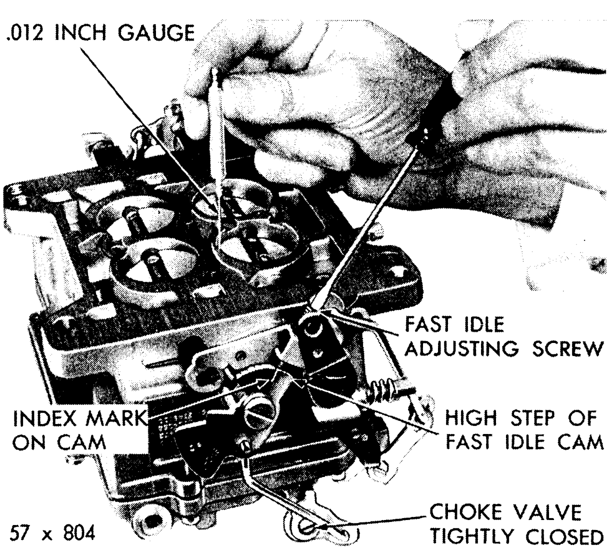

Fig. 44—Checking Fast Idle Adjustment

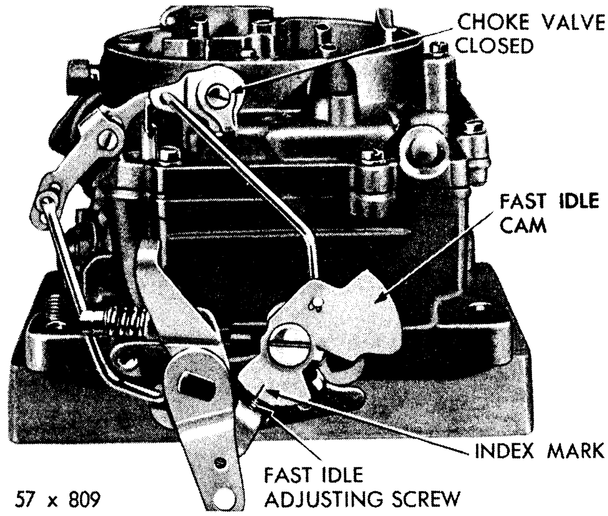

Fig. 45—Checking Fast Idle Indexing

step of the fast idle cam), until wire gauge Tool T109-200 (.012 inch) can be inserted between the primary throttle valve and the bore (side opposite idle port), as shown in Figure 44. The index mark on the fast idle cam should be in direct line with the fast idle screw shank.

b. Choke Shaft Lever Adjustment

Invert the carburetor and open the throttle valves to wide open position. Close the choke valve tightly and then close the throttle valves. Release the choke valve. This will position the fast idle cam to fast idle. The index mark on the cam should split the center of the fast idle adjusting screw, as shown in Figure 45. If an adjustment is necessary, bend the fast idle connector rod at the angle, using Tool T109-213, until the index mark on the cam indexes the fast idle adjusting screw.

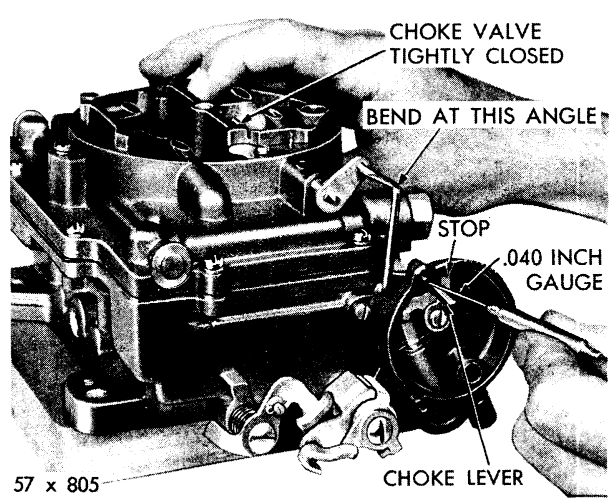

Fig. 46—Checking Piston Lever Adjustment

c. Choke Piston Lever Adjustment

Move the choke valve to the fully closed position. It should then be possible to insert a .040 inch shank or wire gauge, Tool T109-193, between the choke lever and the stop lug in the piston housing, as shown in Figure 46.

If an adjustment is necessary, bend the choke connector rod at the upper angle, using Tool T109-213, until correct clearance has been obtaned. Reinstall baffle plate and gasket. Place the choke thermostatic coil housing against baffle plate and gasket with the index mark pointing straight down. Turn housing clockwise until the index mark on the housing is in line with the first notch rich beyond the center mark on the piston housing. Hold in this position and install heat tube cap and gasket. Be sure the heat tube opening in cap is pointing horizontally toward the rear. Install retaining ring, strap and attaching screws. Tighten securely.

d. Choke Unloader Adjustment

With the throttle valves in the wide open position, it should be possible to insert Tool T109-31 ($\frac{1}{4}$ inch) gauge between the upper edge of the choke valve and the inner wall of the air horn, as shown in Figure 47.

If an adjustment is necessary, bend the unloader lip on the throttle shaft lever, using Tool T109-41 until correct opening has been obtained.

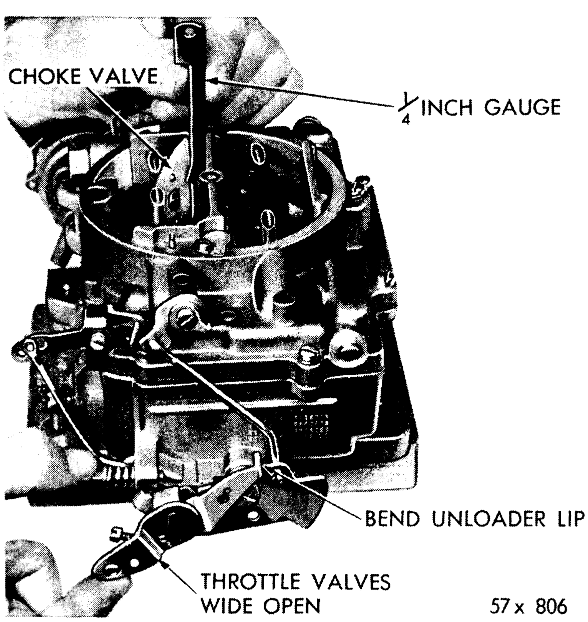

Fig. 47—Checking Choke Unloader Adjustment

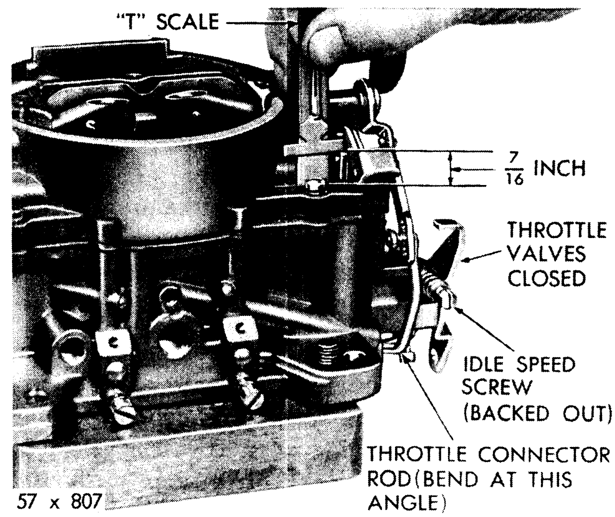

Fig. 48—Checking Accelerator Pump Travel

e. Accelerator Pump Adjustment

Move the choke valve to wide open position, to release the fast idle cam. Back off the idle speed adjusting screw (curb idle) until the throttle valves are seated in the bores.

Measure the distance from the top of the air horn to the top of the plunger shaft, using a "T" scale, as shown in Figure 48. This distance should be $\frac{7}{16}$ inch.

If an adjustment is necessary, bend the throttle connector rod at the lower angle, using Tool T109-213, until correct travel has been obtained.

f. Secondary Throttle Lever Adjustment

To check the secondary throttle lever adjust-

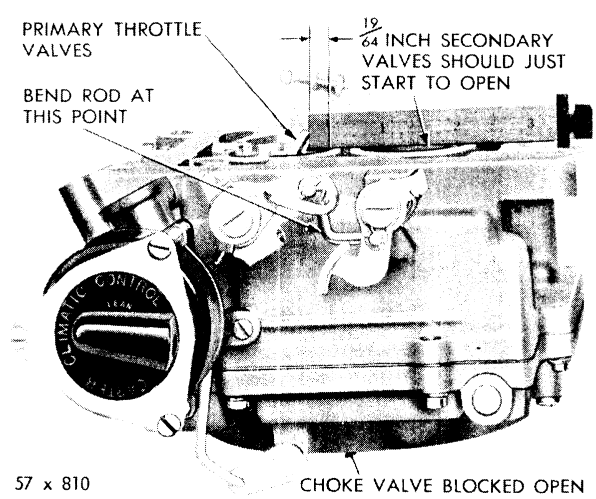

Fig. 49—Checking Secondary Throttle Opening

ment, block the choke valve in the wide open position and invert the carburetor. Slowly open the primary throttle valves until it is possible to measure $^{19}/_{64}$ inch between the lower edge of the primary valve and the bore (opposite idle port), as shown in Figure 49. At this measurement, the secondary valves should just start to open. The stop lugs on both the primary and secondary throttle levers should contact the bosses on the flange at the same time.

If an adjustment is necessry, bend the secondary throttle operating rod at the angle, using Tool T109-213, until correct adjustment has been obtained. At wide open throttle, the primary and secondary throttle valves should reach the full vertical position.

With the primary and secondary throttle valves in the tightly closed position, it should be possible to insert Tool T109-29 (.017 to .022 inch) wire gauge, between the positive closing shoes on the secondary throttle levers, as shown in Figure 50.

If an adjustment is necessary, bend the shoe on the secondary throttle lever, using Tool T109-22, until correct clearance has been obtained.

g. Secondary Throttle Lock-Out Adjustment

Crack the throttle valves, then manually open and close the choke valve. The tang on the secondary throttle lever should freely engage in the notch of the lock-out dog.

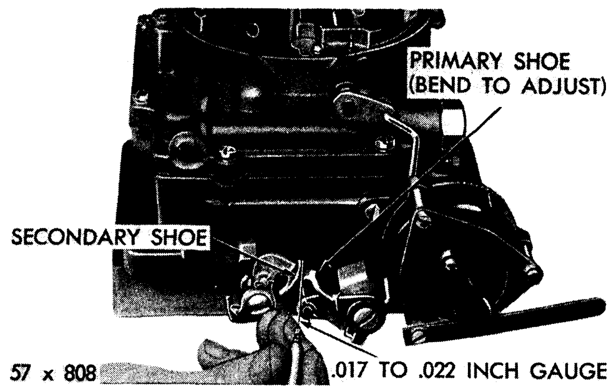

Fig. 50—Checking Clearance between Closing Shoes

If an adjustment is necessary, bend the tang on the secondary throttle lever, until engagement has been made. Use Tool T109-22 for this operation.

After adjustments have been made, reinstall carburetor on engine, using a new gasket.

It is suggested that the carburetor bowl be filled with clean gasoline. This will help prevent dirt that is trapped in the fuel system, from being dislodged by the free flow of fuel, as the carburetor is primed.

SERVICE DIAGNOSIS

26. POOR IDLING

a. Tighten main to throttle body screws.

b. Check and adjust float level.

c. Install new idle mixture needles.

d. Install new throttle shaft or body.

e. Clean idle discharge holes.

f. **Clean carburetor and idle bleed.**

27. POOR ACCELERATION

a. Clean accelerator pump by-pass jet.

b. Install new accelerator pump.

c. Clean accelerator pump discharge cluster.

d. Clean vacuum piston and cylinder.

e. Install new accelerator pump inlet check valve.

f. Check and reset float level.

g. Install needle valve and seat.

h. Install new throttle linkage.

i. Check and readjust choke.

28. CARBURETOR FLOODS OR LEAKS

a. Install new main body if required.

b. Install new air horn to main body gasket.

c. Check and adjust float level.

d. Install new fuel inlet needle valve and seat.

e. Check fuel pump pressure and install new pump if necessary.

29. POOR PERFORMANCE—(mixture too rich)

a. Replace air cleaner element (paper).

b. Install new floats.

c. Check float level and adjust if necessary.

d. Check fuel pump pressure and install new pump if necessary.

e. Install new main metering jets.

f. Check manifold heat control valve.

EXHAUST SYSTEM

The LC-1 Model (Single rocker shaft engine) exhaust system consists of exhaust and intake manifolds, heat control valve, "Y" exhaust extension pipe muffler, and tail pipe, as shown in Figure 51.

The LC-2 Model (single rocker shaft engine) and the LC-3 (double rocker shaft engine) exhaust system is dual exhaust system which consists of exhaust and intake manifolds, heat control valve, two exhaust pipes, two exhaust mufflers and two tail pipes, as shown in Figure 52.

The exhaust system of the Imperial Models is a dual system with four mufflers, as shown in Figure 53.

The Manifold Heat-Control Valve Housing is now cast integral with the Right Exhaust Manifold on all models.

SERVICE PROCEDURES

30. INTAKE AND EXHAUST MANIFOLDS (All Models)

Figures 54 and 55 show intake manifold and cross-over passages.

a. Removal of the Intake Manifold

Remove air cleaner, drain radiator. Remove

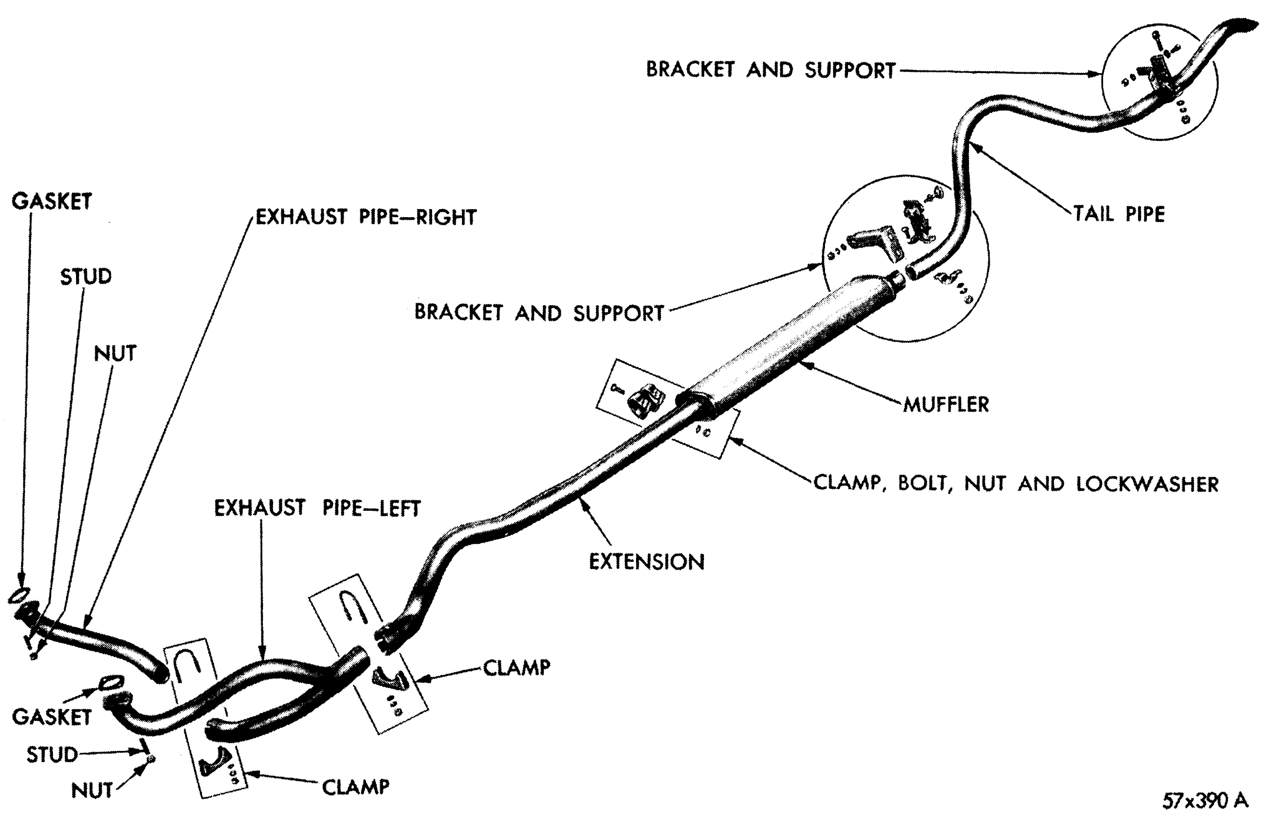

Fig. 51—Exhaust System (Single Rocker Shaft Engine Model LC-1)

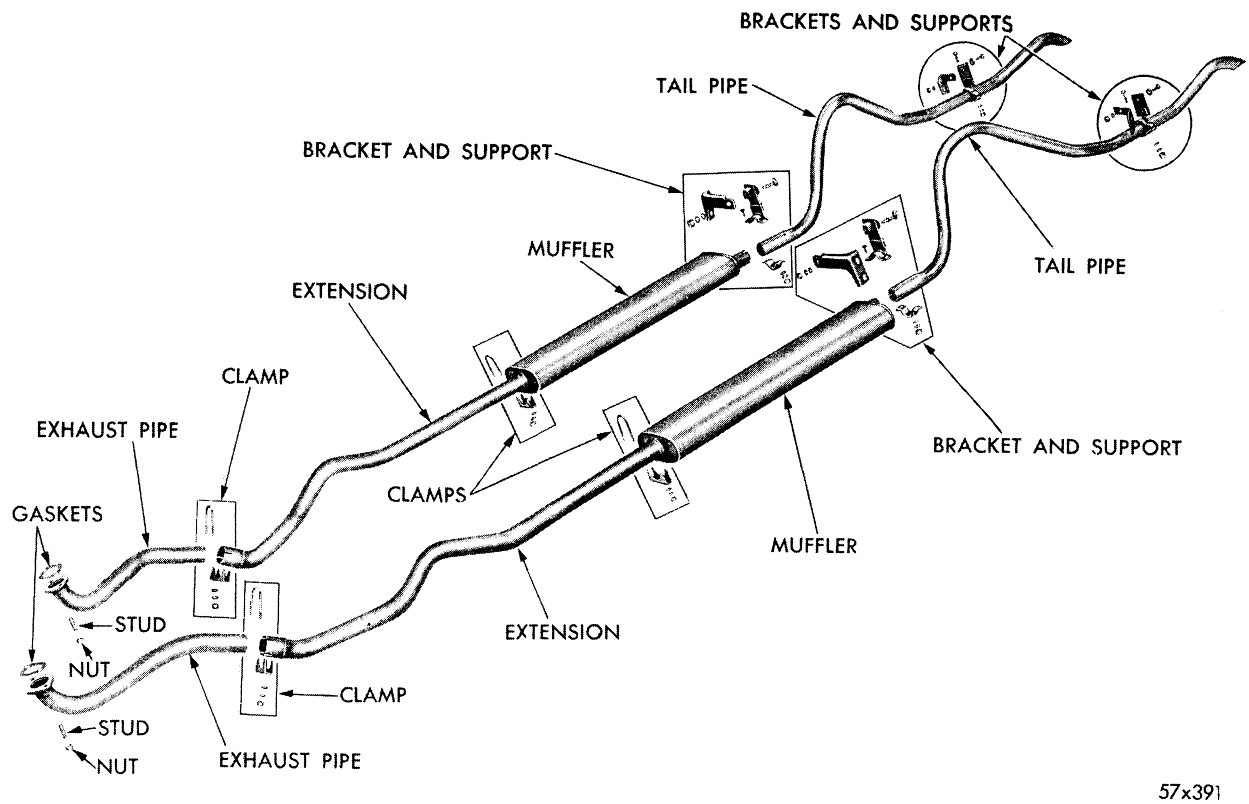

Fig. 52—Dual Exhaust System (Models LC2, LC3)

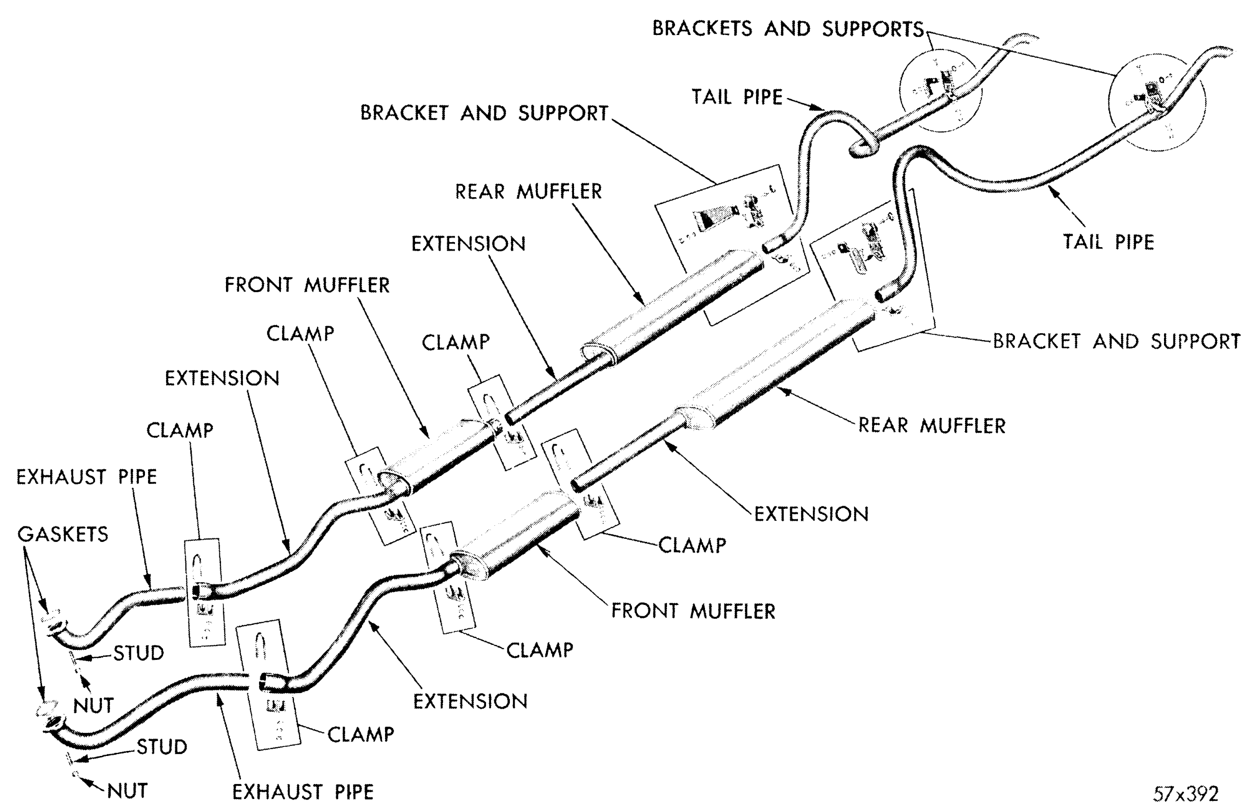

Fig. 53—Dual Exhaust System (Model LY1)

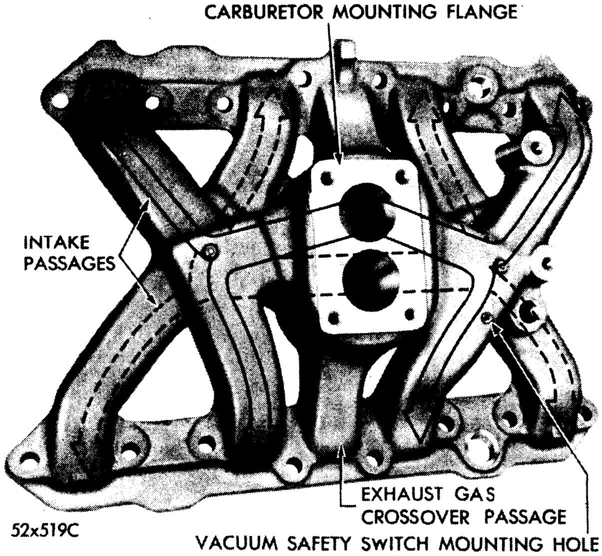

Fig. 54—Intake Manifold (LC1 Engine Only)

generator and disconnect carburetor linkage. Disconnect power brake vacuum line at manifold (if so equipped). Disconnect distributor vacuum advance line and fuel line at carburetor. Disconnect automatic choke heat tube at carburetor. Disconnect wires at coil. Remove bolts holding intake manifold to cylinder head. Remove intake manifold.

NOTE: If car is equipped with air conditioning, remove bracket from intake manifold to compressor.

b. Removal of Left Side Exhaust Manifold

Remove nuts and bolts that hold exhaust pipe to manifold flange. Remove and discard gasket.

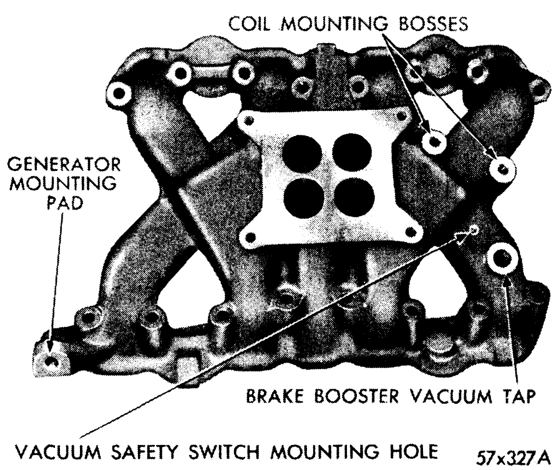

Fig. 55—Intake Manifold (LC2, LC3, LY1)

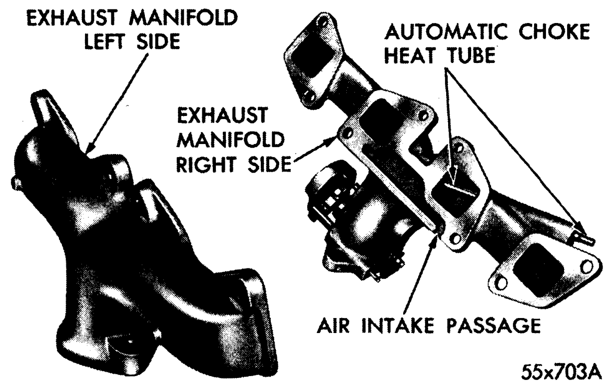

Fig. 56—Exhaust Manifold (All Models)

Remove exhaust manifold retaining nuts, slide manifold off studs out and away from cylinder head.

Use care when removing manifold attaching nuts and bolts, because constant heating and cooling of manifolds may have caused them to freeze. Lubricate with a good grade of penetrating oil and allow to stand for several minutes before attempting removal.

c. Removal of Right Side Exhaust Manifold

Remove automatic integral choke heat tube from exhaust manifold. (Be careful not to bend tube when removing.) Remove bolts and nuts that hold exhaust pipe to exhaust manifold flange. Discard gasket. Remove oil filter cover and element. Remove bolt and clamp that hold ground cable and heat tube to cylinder head. Remove nuts that hold exhaust manifold to cylinder head, loosen front engine mount nuts and jack up engine to slide manifold off studs and away from cylinder head.

NOTE: On all cars, exhaust pipe to transmission clamp and brackets have been eliminated so be sure exhaust pipe is sufficiently supported before removing exhaust pipe from exhaust manifold.

31. INSPECTION OF INTAKE AND EXHAUST MANIFOLDS (All Models)

Clean intake and exhaust manifolds in solvent; blow dry with compressed air. Inspect manifolds for cracks, distortion, or any other condition which would make them unfit for further service.

Particular attention should be given to "Hot spot" chamber in intake manifold. If chamber is coated with hard black carbon, it must be scraped or sand blasted to remove deposit. The layers of carbon act as an insulator and retard heating action of exhaust gases on "hot spot" chamber which, in turn, affects vaporization rate of fuel passing through intake manifold.

When inspecting exhaust manifolds, be sure to check choke heat tube cavity inlet passage. The passage and cavity must be clean and free from any obstructions. (See Fig. 56). New gaskets should be used when installing exhaust and intake manifolds and all mating surfaces must be clean and smooth.

32. EXHAUST PIPES, MUFFLERS AND TAIL PIPES

The exhaust system normally requires little service. The system should be checked periodically for leaking gaskets, broken supports or insulators and burned or blown out muffler or pipes. The exhaust pipe, muffler, and tail pipe are mounted by hangers which are insulated to isolate vibration. A support, with a special clamp and hanger supports tail pipe at rear of muffler, while another clamp and support mounted on rear of frame supports rear of tail pipe. The front support is adjustable.

33. EXHAUST SYSTEM (All Models)

When servicing exhaust system, it is rather difficult to remove clamps and disconnect pipes because of rust, dirt, or other foreign matter which has adhered to these parts. Lubricate nuts and bolts, which are to be removed, with a good grade of penetrating oil and wait several minutes before attempting removal. Hit connecting clamp several sharp bows with a soft hammer if clamps are rusted to pipes.

34. REMOVAL

a. Cross-Over Exhaust Pipe

Refer to Fig. 51 and proceed as follows:

Remove clamp bolt from clamp at "Y" pipe and cross-over pipe connection. Remove bolts from left-hand exhaust manifold flange. Discard gasket. Remove cross-over pipe.

b. "Y" Exhaust Pipe

Remove clamp bolt from clamp connecting "Y" pipe and exhaust pipe. Remove bolts from right-hand exhaust manifold flanges, discard gasket. **On all cars be sure the exhaust system is sufficiently supported.** Remove "Y" pipe.

c. Muffler

Loosen or remove clamp bolts at exhaust pipe to exhaust extension pipe and muffler assembly. Remove muffler and extension pipe assembly.

d. Tail Pipe

Remove clamp bolt from front tail pipe bracket. Remove clamp bolt from rear tail pipe bracket. Jack up frame to relieve body weight from rear springs, remove tail pipe.

NOTE: **In most instances where clamps are used, they will have to be spread before pipes can be removed.**

35. INSTALLATION

When installing components of exhaust system start at exhaust manifolds and work toward rear until muffler is to be installed. Position tail pipe, install muffler. If entire exhaust system, or any component of it is being replaced, clamps and brackets should be tightened only to extent necessary to hold exhaust system in position. The final tightening is done after system has been properly aligned.

36. DUAL EXHAUST SYSTEM

The dual exhaust system is standard equipment on the LC2-LC3 models.

The service procedure for dual exhaust system (removal, installation and alignment) will be comparable to exhaust system for the LC-1 with following exceptions.

In dual exhaust system, cross-over and "Y" exhaust pipes are not used; there is an individual exhaust pipe, muffler and exhaust extension pipe and tail pipe for each cylinder bank. (Refer to Fig. 52).

37. ALIGNMENT OF EXHAUST SYSTEMS

Figs. 51, 52, and 53 illustrate various types of supports, insulators and clamps with procedures as follows:

Tighten exhaust manifold flange studs and nuts evenly, 40 foot-pounds torque. Install muffler and tail pipes and leave clamp bolts loose in order to align entire system. Check muffler and tail pipes so that clearance of ½ inch is maintained between frame, floor pan, bumper, shock absorber and fuel tank. Tighten all clamp bolts and brackets to 20 foot-pounds torque.

MANIFOLD HEAT CONTROL VALVE

The manifold heat control valve, as shown in Fig. 57, is controlled by a thermostatic coil counterweight, and velocity of exhaust gas through exhaust manifold. The thermostatic coil is installed in a manner which will maintain sufficient tension on valve shaft to keep valve in closed position when engine is cold.

In closed position, hot gases circulate up and around "hot spot" chamber in intake manifold. This, in turn, preheats vaporized fuel passing down through manifold, resulting in smooth engine performance.

NOTE: Should heat control valve become stuck in either open or closed position car performance would be affected.

38. TESTING MANIFOLD HEAT CONTROL VALVE

Inspect operation of heat control valve periodically. With engine idling (car standing) accelerate to wide open throttle and release quickly. The counterweight should respond by moving clockwise approximately ½ inch and returning to its normal position. If no movement is observed, the valve shaft may be frozen or the coil is weak or broken. In either case, heat control valve should be disassembled and replaced with new parts.

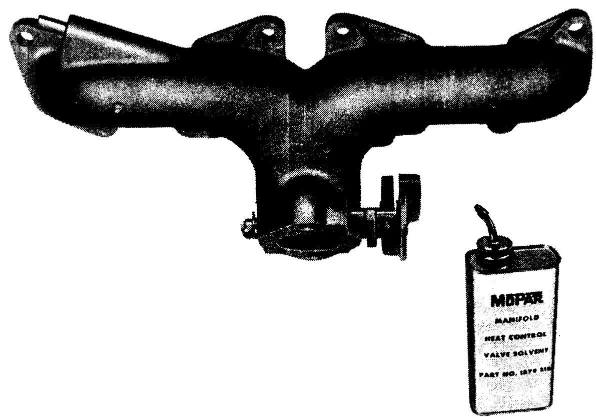

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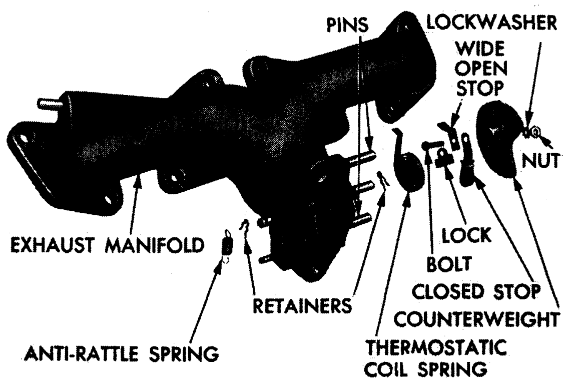
Fig. 58—Servicing the Valve Shaft

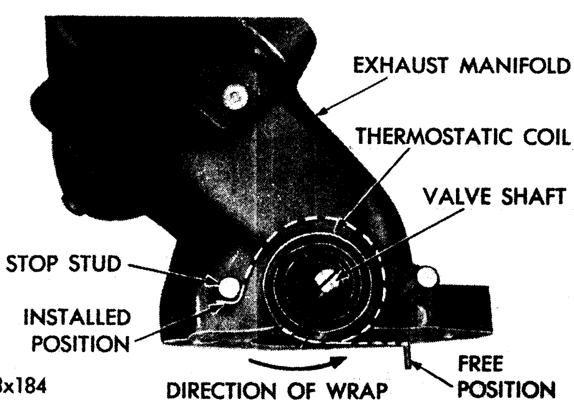
a. Disassembly (Fig. 57)

Loosen retaining nut and remove counterweight, lock and stop from end of shaft, exposing the thermostatic coil. Unhook coil from pin and remove by prying out of valve shaft slot. If valve shaft is frozen in manifold, apply Mopar Manifold Heat Control Valve Solvent Part No. 1879318 to both ends of shaft as shown in Figure 58, and allow to stand several minutes. Loosen by turning shaft clockwise or counter-clockwise (depending on frozen position) until shaft is free. Work shaft from closed to open position several times until shaft can be turned very easily with fingers.



57x328

Fig. 57—Manifold Heat Control Valve



58x184

Fig. 59—Positioning the Thermostatic Coil

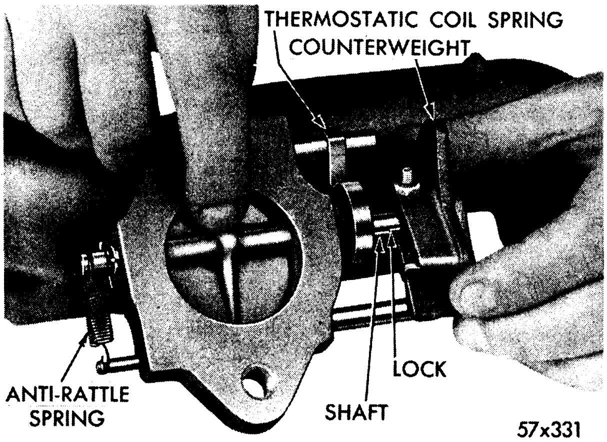


Fig. 60—Installing the Heat Control Valve Counterweight

b. Assembly

Position valve shaft in extreme counter-clockwise position. Place the new coil in position over shaft slot, with outer end tongue of coil in lower right-hand position, as shown in Figure 60. Press inner end of coil into slot of shaft and seat firmly.

Move outer end tonque around and hook under pin, as shown in Fig. 59. Place counterweight over shaft (with weight in upward position) and insert lock in shaft slot, as shown in Fig. 60. Center counterweight on shaft and turn assembly clockwise until stop passes the pin. Press counterweight on shaft until seated, install stop, and tighten nut securely with Tool T-109-173. Test valve for proper operation.

c. Servicing

The manifold heat control valve should be checked for proper operation at all lubrications and engine tune-up. See Lubrication, Section XV.

SERVICE DIAGNOSIS

39. EXCESSIVE EXHAUST NOISE

a. Check for leaks.

b. Check system for bind. Loosen all hangers and test car by driving.

c. Check complete exhaust system for sign of failure, repair as required.

d. Install new gaskets as required after checking exhaust manifold for distortion. Be sure manifold registers evenly with cylinder head. Tighten nuts to 25 foot-pounds torque.

e. Install new gasket after checking flange for cracks or foreign material that will not allow gasket to seat properly. Tighten bolts evenly.

f. Remove exhaust manifold and check mating surfaces. Place manifold on smooth surface and check mating flanges for alignment. If manifold shows sign of distortion (more than .010 inch), install new manifold and gaskets.

g. Tighten clamps or replace as necessary.

40. LEAKING EXHAUST GASES

a. Locate leak and correct.

b. Install new manifold and gaskets, if necessary.

c. Check complete system for alignment and adjust as required. A leaking connection will be indicated by black streaks along pipes.

d. Install new muffler and tail pipes if needed. Check alignment of exhaust pipes, muffler and tail pipe. Align as necessary.

e. Remove manifold and install new gaskets if necessary, after carefully inspecting both cylinder head and manifold mating surfaces. Tighten manifold nuts and bolts evenly, working from center to outer ends of manifold.

f. Check for bent or pinched exhaust or tail pipes. Such conditions will retard the flow of exhaust gases. Install new parts as required. If excessive amount of carbon is present or if car is sluggish, install new muffler.

g. Tighten clamp at rear muffler connection.

41. ENGINE HARD TO WARM UP

Check operation of heat control valve and make necessary repairs.

42. MANIFOLD HEAT CONTROL VALVE RATTLE

a. Check for broken thermostatic spring and make necessary correction.

b. Check for weak or broken anti-rattle spring and make necessary repairs or replacement.

c. Check shaft for looseness in body and correct condition as necessary.

Section IX

FRAMES, SPRINGS AND SHOCK ABSORBERS

CONTENTS

DATA AND SPECIFICATIONS

FRAME				
Models	**LC-1**	**LC-2**	**LC-3**	**LY-1**
TYPE	Welded, Double Channel Box Section, Side-Rails			
DIMENSIONS	See Figures 1, 2, 3, 4 and 5			

REAR SPRINGS				
TYPE	Semi-Elliptic			
NO. OF LEAVES				
SEDANS	5	6	7	7
TOWN & COUNTRY WAGON	6	–	7	–
WIDTH	2.5	2.5	2.5	2.5
LENGTH	57 in.	60 in.	60 in.	60 in.
SHACKLE	Silent Block Rubber Bushings			
HANGER	Side Strapped with Rubber Bushed Bolts			

SHOCK ABSORBERS

Models	**LC-1, LC-2, LC-3, LY-1**
TYPE	Oriflow, Double Acting, Hydraulic

TORQUE SPECIFICATIONS		**(Foot-Pounds)**
REAR SPRING SILENT BLOCK NUT		100
SHOCK ABSORBER STUD NUT	½″ UPPER.......	60
	9/16″ LOWER......	70
REAR SPRING U-CLIP BOLT NUTS		70
REAR SPRING SHACKLE NUTS 7/16″		50
SHOCK ABSORBER MOUNT NUT (REAR)		60

ESSENTIAL TOOLS

C-3413.............................Remover and Installer—Shock Absorber Lower Mounting Assembly

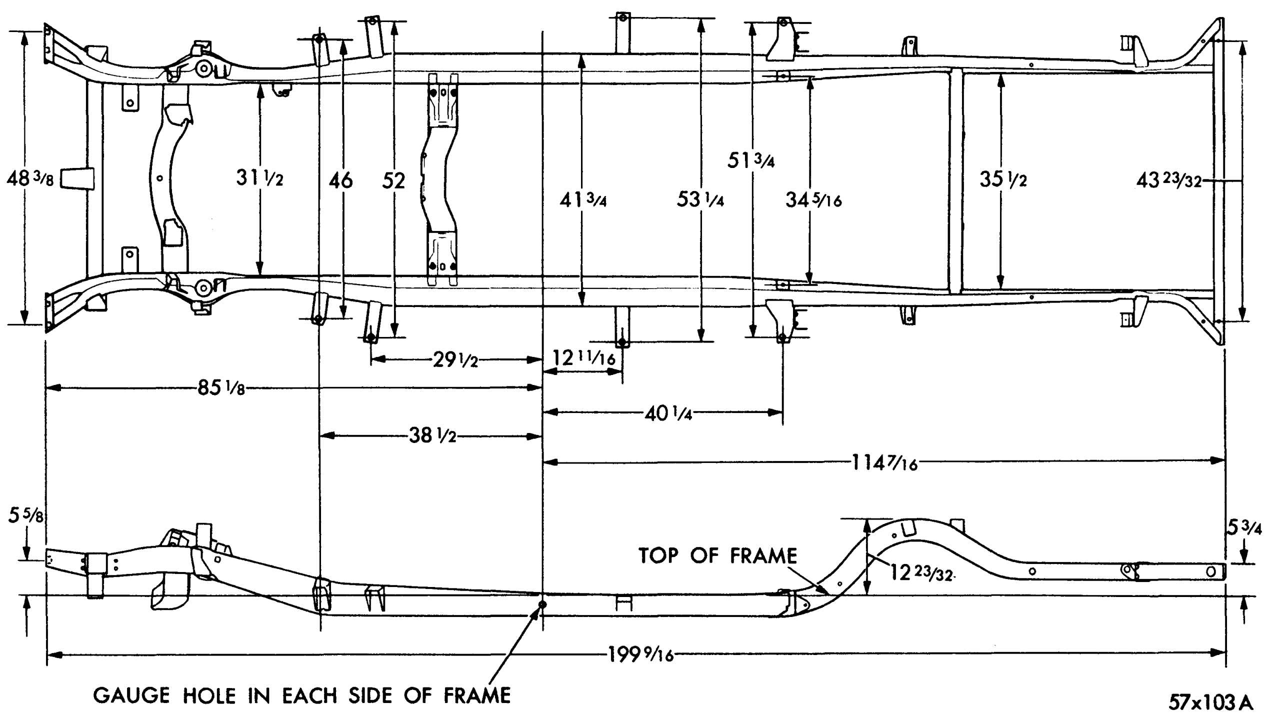


Fig. 1—Frame Dimensions—Windsor

SECTION IX

FRAMES, SPRINGS AND SHOCK ABSORBERS

FRAME

A new full length box section frame with redesigned crossmembers and longer side rails are used on 1958 Chrysler Models.

Two front crossmembers are now used, the forward member for bumper, radiator support and strut attachment and the other for engine and suspension support.

The convertible coupe frames have X-members as formerly, to reduce the increased body shake that is inherent in this model and improve frame to body attachment. A frame to rear axle control strut is continued for the Imperial Models. (See Paragraph 8, "Universal Joint", Section XII, for adjustment procedures).

1. CHECKING FRAME DIMENSIONS

In case of collision, frame members can often be satisfactorily straightened to the required dimensional limits. In case of serious damage or fracture to front crossmembers, upper and lower control arms and steering knuckle, the component parts, ball joints and steering arms should be replaced.

CAUTION

Under no circumstances should the control arms, knuckles, steering arms or torsion bars be heated for straightening. Heating these parts will anneal the metal and lower their strength to a point which will make them dangerously weak for further use.

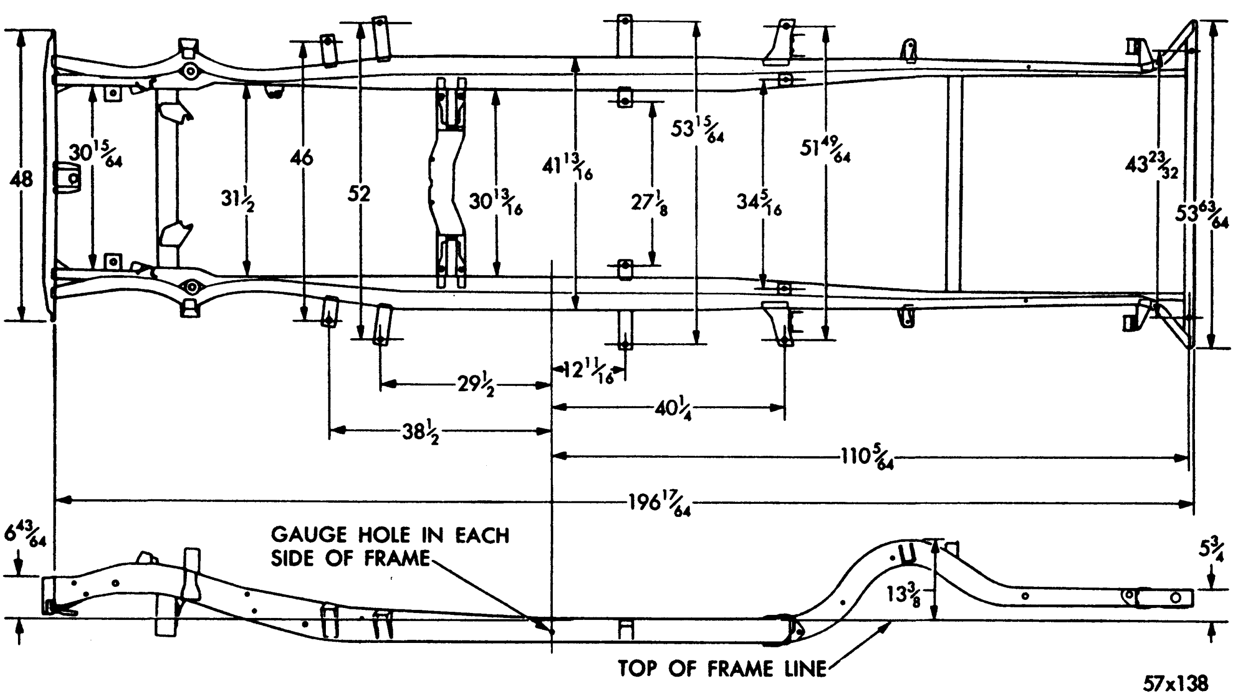


Fig. 2—Frame Dimensions—Saratoga and New Yorker

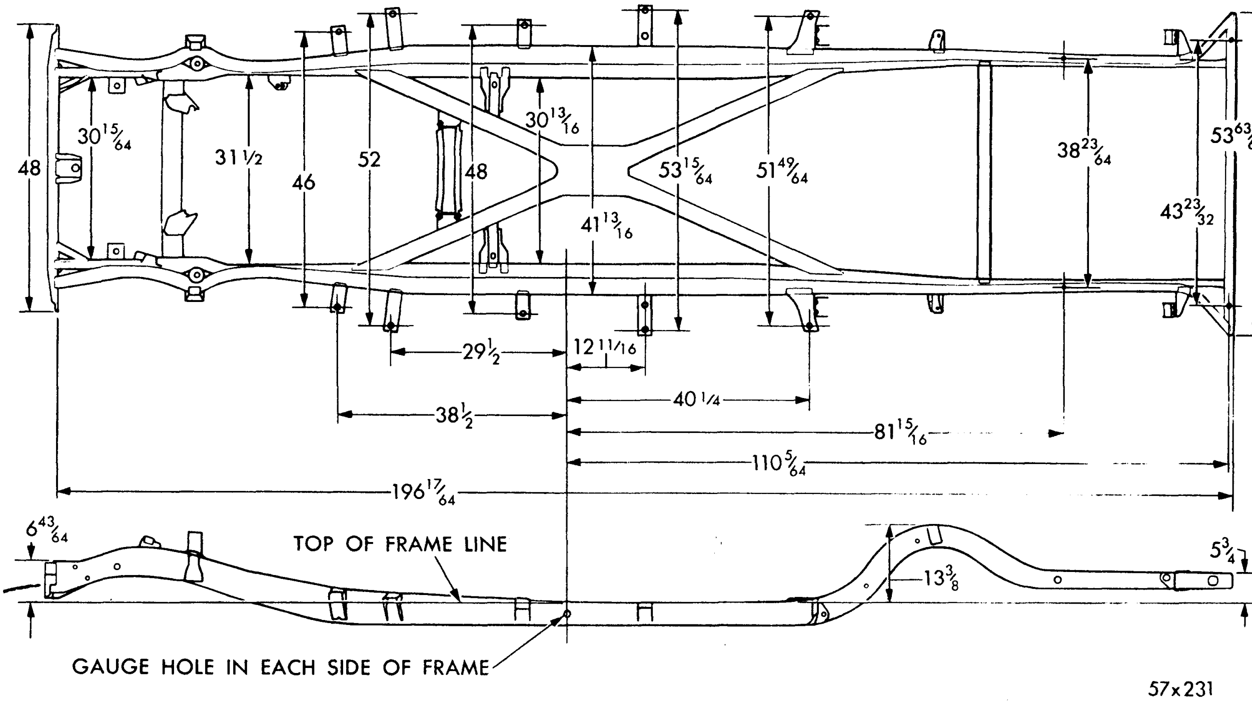


Fig. 3—Frame Dimensions—Convertible (New Yorker)

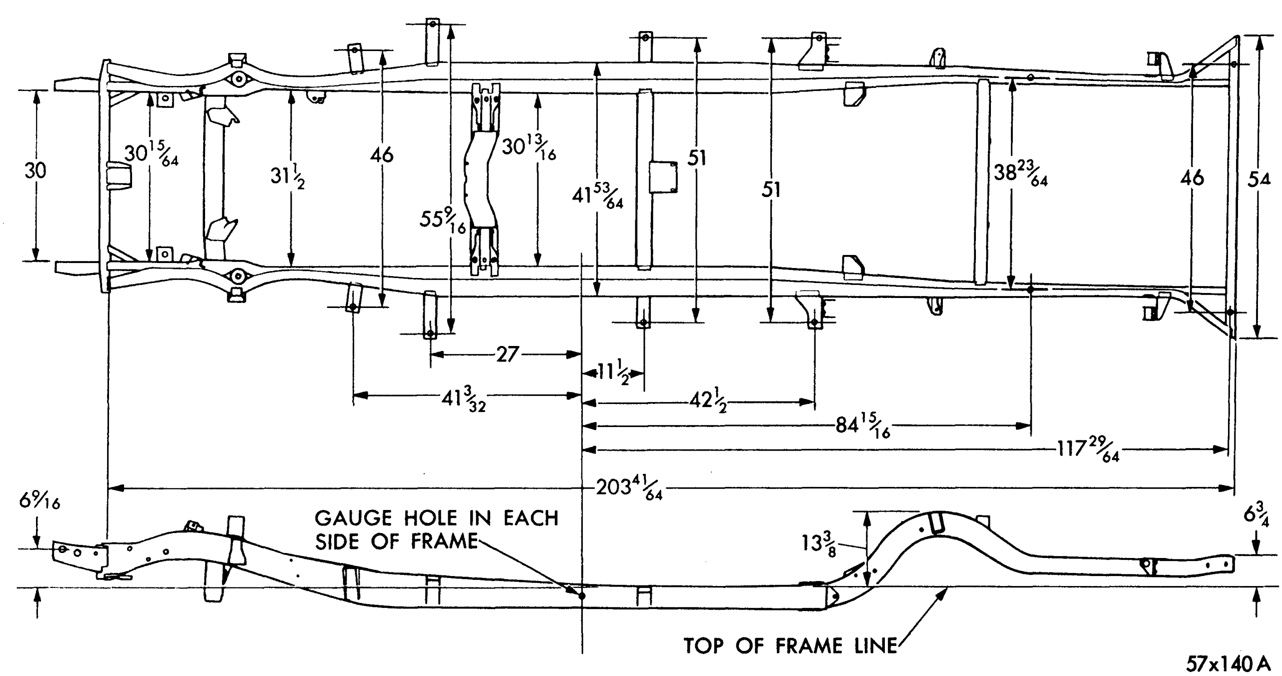


Fig. 4—Frame Dimensions—Imperial

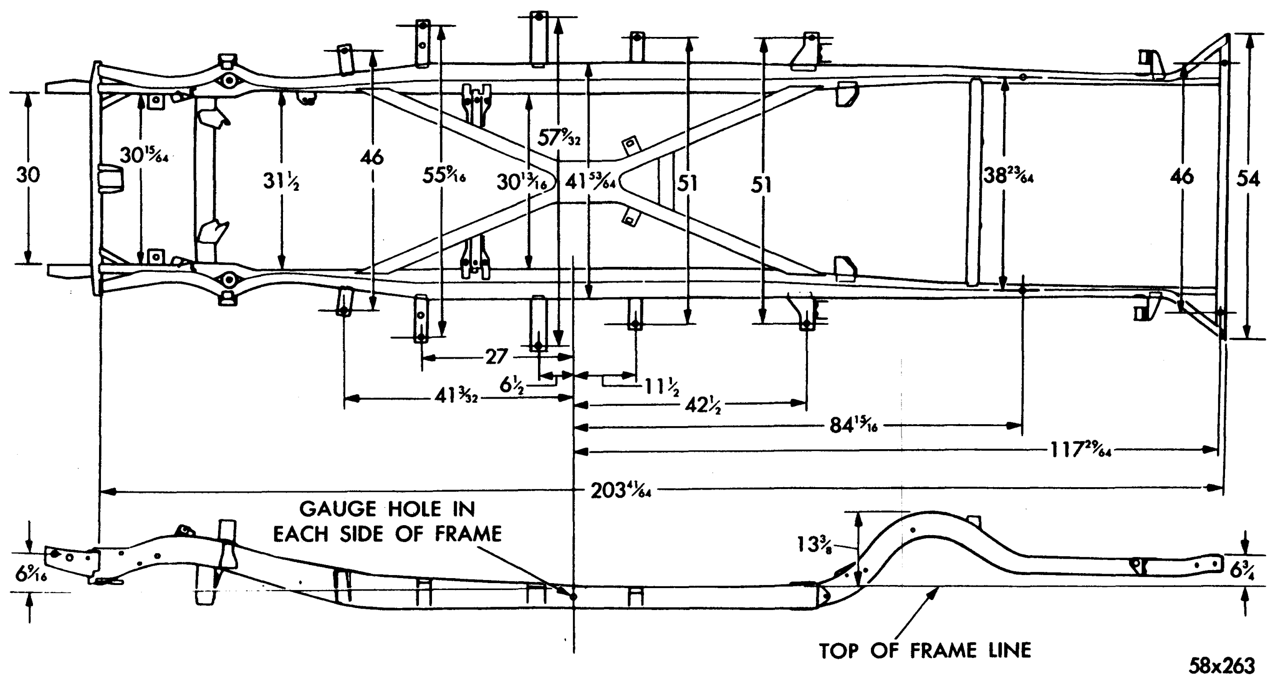


Fig. 5—Frame Dimensions—Imperial, 4-Door H.T. and Convertible

Before a member is replaced, it is essential that frame alignment be checked and corrected if necessary. Whenever possible, parts should be securely fastened with hot rivets. In cases where no riveting equipment is available, finished bolts snugly fitted in reamed holes may be used. The nuts should be securely tightened and non-spreading lockwashers used. (Cold rivets are not recommended unless adequate power press equipment is available to do a secure riveting job.) When welding frame members, care must be taken to localize the heat so that the steel hardness of frame will be retained. Reinforcement welds should run lengthwise, along side of reinforcement.

Figures 1, 2, 3, 4 and 5 show various dimensions to be used as a guide for checking frame alignment. These dimensions are the true distance between two points as measured with a steel tape.

Figure 5 shows a few of various measurements that may be taken to check "squareness" of frame. Diagonal measure will quickly determine which section of frame is bent and where force should be applied to restore correct alignment.

2. FRAME ALIGNMENT

To properly check a frame for alignment, diagonal measurement should be performed with great care. When body is removed, the frame may be easily checked for alignment by measur-

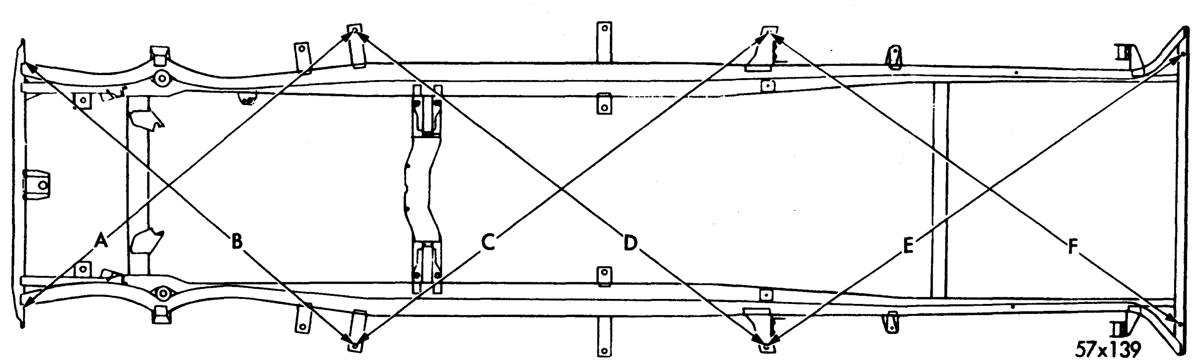


Fig. 6—Typical Frame Diagonal Measurements

ing diagonals as shown in Figure 6, with trammels or steel tape and check dimensions given in Figs. 1, 2, 3 and 4. Measurements may be taken without removing body from chassis by using plumb-bob and chalk line on level floor.

Attach line of plumb-bob to one of rear body bolts. The plumb-bob should be suspended slightly above floor. When plumb-bob comes to rest, mark floor directly underneath it. The marks made on floor will represent various points of frame to be checked diagonally. Move car away so the distance can be measured to compare with the diagonal measurements, shown in Figures 1, 2, 3, 4 and 5.

3. REPLACING BODY SUPPORT BRACKETS

The body support brackets are welded to frame in manufacturing. Due to "Box" construction of frame, rivets cannot be used to attach a new body bracket to frame.

Cut damaged bracket off frame, file surface smooth. Clamp new bracket in correct position and weld securely to frame member. The shielded arc-weld method is recommended for frame welding, or replacement of body frame support brackets. The heat generated from welding operation is localized and burning of material is held to a minimum when a mild steel welding rod is used. Install body bolt and washers, insulator and nut. Tighten to 18 foot-pounds torque. On Convertibles, install a solid spacer, bolt and nut, and tighten securely.

SPRINGS

The rear springs (Fig. 7) are of the semi-elliptical design. The front ends of rear springs are mounted outboard of the frame side rails and attached to hangers. (See Fig. 8).

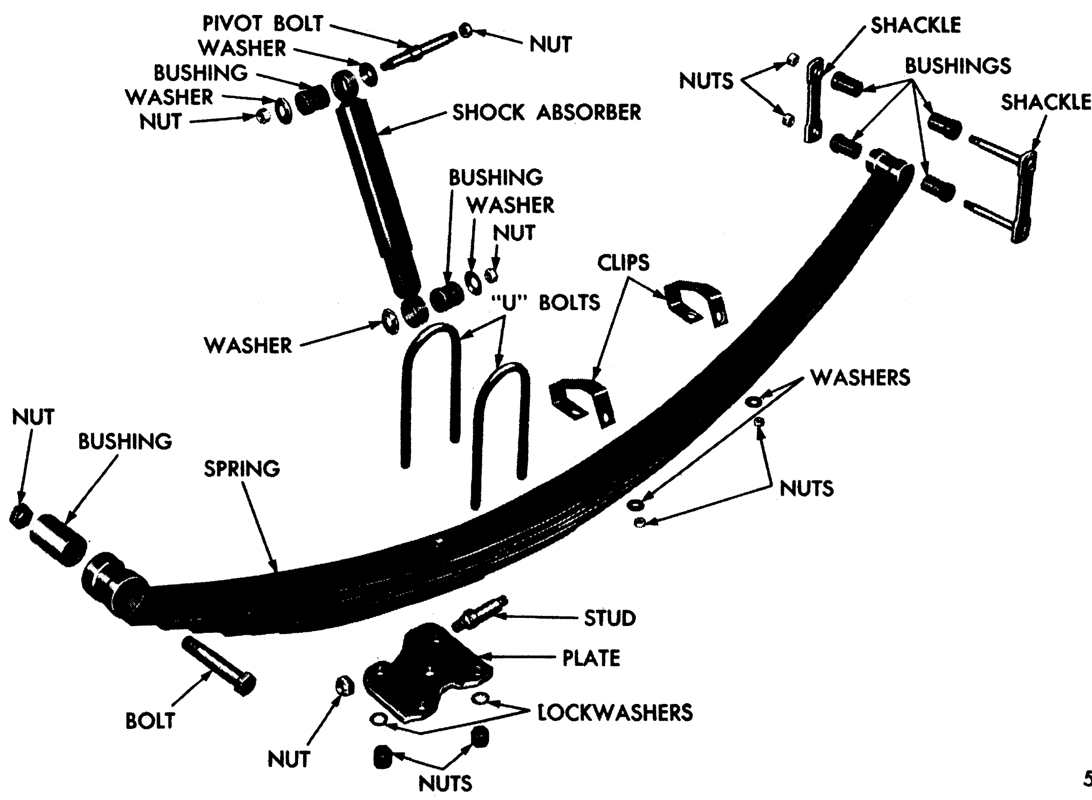


Fig. 7—Typical Rear Springs Suspension (Disassembled View)

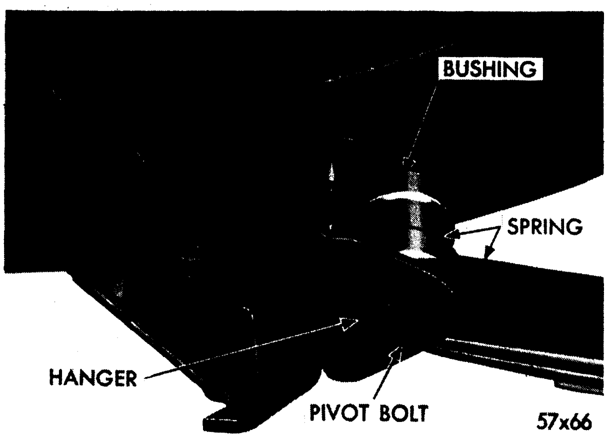


Fig. 8—Rear Springs Front Mounting

The front and rear spring shackle bolts are cushioned in rubber which tends to reduce road noise to a minimum. (No lubrication is required at the rear shackles.) (See Fig. 9).

To eliminate "spring wind-up" on acceleration, an additional spring leaf has been added to front section of rear spring.

The width of spring leaves are 2½ inches (refer to "Data and Specifications"). Thus, with outboard-mounted rear springs, rear-end roll is greatly reduced and car stability on curves or sharp turns is maintained.

Should it become necessary to install new springs or silent blocks, it will be necessary to remove the rear spring silent block nut bolt and lockwasher to remove rear spring.

4. SPRING MAINTENANCE

It is important that spring "U" bolts be inspected at regular intervals and kept tight to prevent spring breakage. Tighten spring "U" bolt nuts to 70 foot-pounds torque. The spring shackles should be inspected occasionally to make sure they are tight, but not binding. Tighten to 50 foot-pounds torque. No lubrication of any kind should be used on rubber bushings.

The height of the car may be affected if rear spring height varies more than ¾ inch on one side as compared with other side. To check this, measure vertical distance from top of rear spring main leaf to underside of frame side rail on both sides of car. If these distances differ by more than ¾ inch, this is an indication that one of rear springs may need to be replaced. This condition could also be due to a bent frame kick-up or an incorrectly welded spring saddle.

CAUTION

Care should be taken when replacing rear spring on Imperial Models to see that the rear axle housing to frame struts are shimmed properly, so as to maintain correct propeller shaft to axle pinion shaft angle. (See Section XII).

5. REPLACEMENT OF REAR SPRING INTERLINERS

The 1958 Chrysler rear springs are similar to those previously used with exception of rear spring interliners. To replace interliners, proceed as follows: Examine spring interliners (Fig. 10). If any are missing, or if any have lost their metal fasteners, they must be replaced.

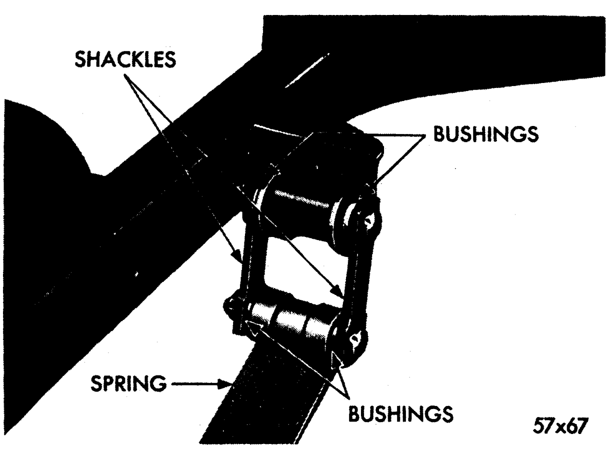


Fig. 9—Rear Spring Shackles

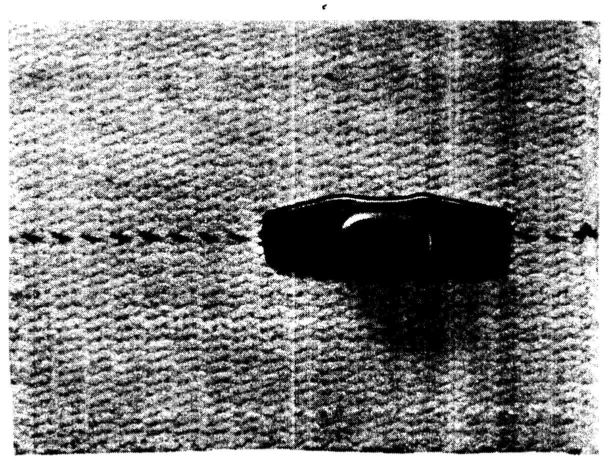


Fig. 10—Front Interliner

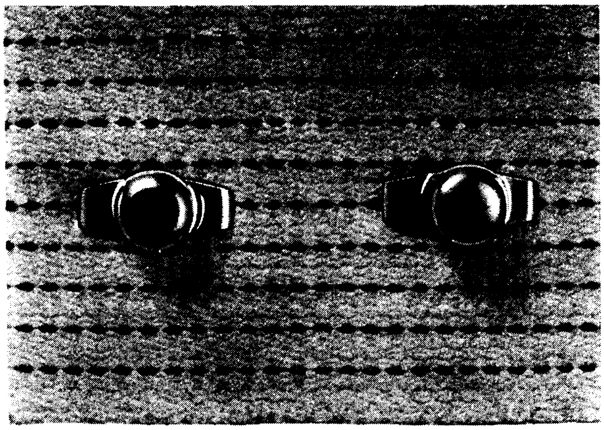


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Fig. 11—Rear Interliner

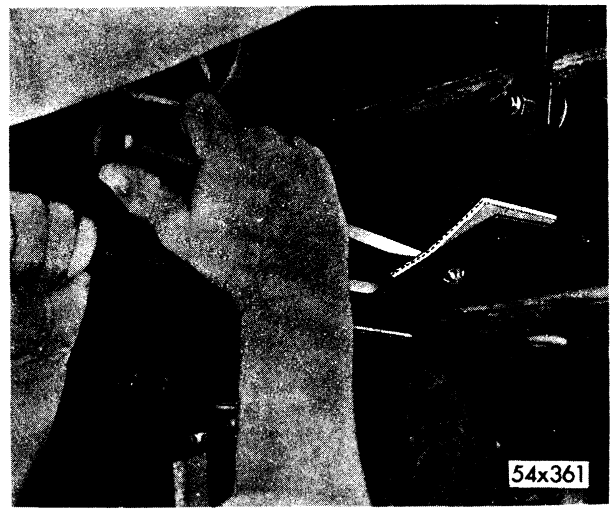

Fig. 13—Prying Interliner Fastner Through Leaf

a. Removal

Unload rear springs by jacking up the rear end of frame until rear shock absorbers are fully extended. Remove alignment clips from springs.

If any of removed parts (nut, bolt, spacer, clip) are damaged, use corresponding replacement parts. Pry out metal fastener directly beneath spring leaf surface and slip out old interliner, after separating the spring leaf to which interliner was fastened from the next longer spring leaf. To effect this separation, pry open the slight gap between leaves with a screwdriver until a tapered bar can be hammered in place between screwdriver and interliner, as shown in Figure 11. Keep tapered bar in place.

Clean the lower (grooved) surface of the longer spring leaf as far as interliner makes contact. Use sandpaper wrapped around a flat file and scrub vigorously to remove any dirt or rust spots to obtain smooth metallic surfaces to left and right of groove. Wipe off excess particles, including dirt in groove itself, with a clean cloth. In order to reach between leaves, open gap by bearing down on end of tapered bar.

b. Installation of Interliner (Fig. 12)

Slip new interliner in place by opening gap between the spring leaves again with tapered bar and moving interliner until prongs of metal fasteners are aligned with holes in the shorter leaf, as shown in Figure 12. With tapered bar still in place, pry prong end of each metal fastener through hole in spring leaf.

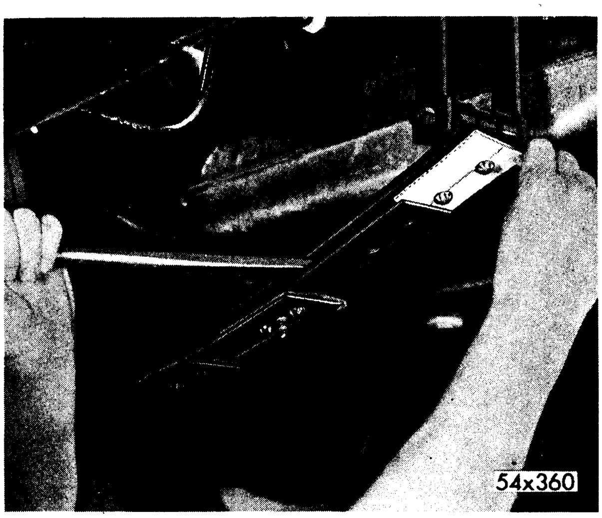

Fig. 12—Positioning New Interliners

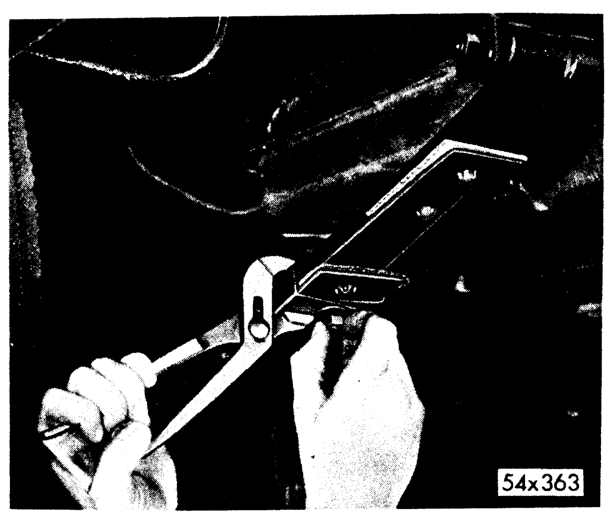

Fig. 14—Tightening Aligning Clip

Remove tapered bar which has remained between leaves during these operations. The bar may be withdrawn while a screwdriver is placed alongside. Then the screwdriver may be pulled out, reversing operation which was used to insert bar in position. A faster method for withdrawing bar is to insert end of a bar with a short tapered hook alongside the tapered bar. After tapered bar has been withdrawn, the bar with hook can be slipped out easily using leverage motion inward on the far end of hooked bar. Position wrap-around alignment clip and tighten retainer nut, as shown in Figures 13 and 14. Peen end of bolt over nut so it will not loosen.

SHOCK ABSORBER

Chrysler cars are equipped with double acting Oriflow shock absorbers. In the Oriflow shock absorber, resistance is built up slowly at beginning of stroke so as not to jolt passengers. This resistance is increased to a maximum at mid stroke and is tapered off to zero at end of movement. The major part of dampening is accomplished at high velocity mid-operation of stroke where no jolt can originate. There can be little jolt at beginning and at end of stroke because both velocities of movement and the resistance offered by the shock absorber are low at those points.

This simply means that the piston encounters minimum resistance at beginning of stroke and is gradually slowed down by increased resistance due to fluid velocity through the orifices. In turn, slow movement of piston causes fluid velocity to decrease and offer minimum resistance at termination of stroke.

To improve the riding qualities of the 1958 cars the valving of the front shock absorber has been revised to afford more control to spring action under varying road conditions.

6. TESTING ORIFLOW SHOCK ABSORBERS

Oriflow shock absorbers are designed to operate with low resistance when operated slowly and with high resistance when operated rapidly. Since they operate with little resistance when compressed by hand or by bench test methods, their true operating efficiency can only be determined by a road test. It is impossible to determine operating efficiency of Oriflow shock absorbers by rocking the car by the bumper.

When road testing, drive car over a fairly rough road to test resistance under fast shock absorber piston speed. Then drive over a fairly smooth road to test resistance during slower shock absorber piston speeds.

Hand testing Oriflow shock absorbers will only reveal complete failure. The amount of ride control evident from a hand test on bench is small, compared with control exerted under actual riding conditions. For this reason, it is impossible to feel any sudden resistance in an Oriflow shock absorber, no matter how fast it is operated by hand.

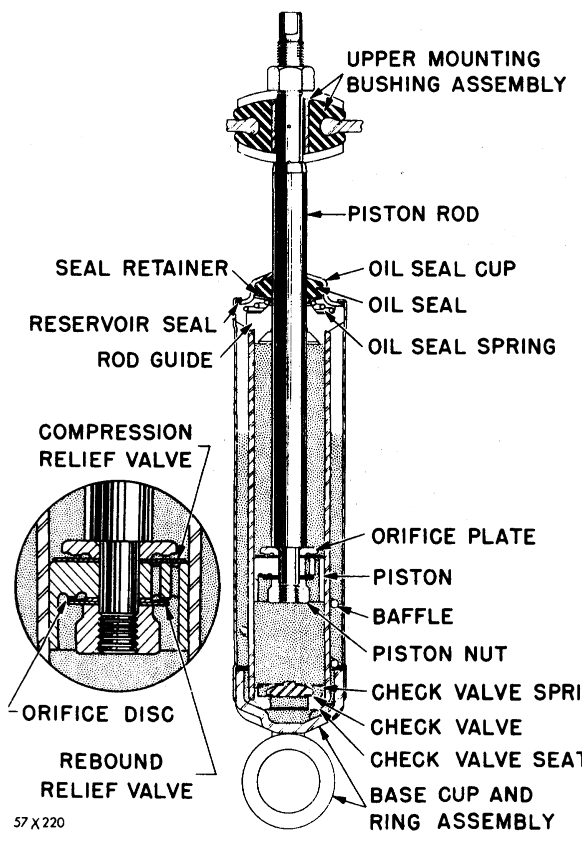

Fig. 15—Front Shock Absorber

7. SERVICING THE ORIFLOW SHOCK ABSORBERS

The Oriflow shock absorber cannot be refilled or disassembled. Where servicing is required, the shock must be removed and a new unit installed. **SHOCK ABSORBERS SHOULD ONLY BE REPLACED IF THEY HAVE LOST THEIR RESISTANCE IN ONE OR BOTH DIRECTIONS OR IF THEY DRIP OIL. EVIDENCE OF OIL MOISTURE IS NOT CAUSE TO REPLACE THEM AS SEAL MUST SEEP TO PREVENT SCORING.**

8. REMOVAL AND INSTALLATION OF FRONT SHOCK ABSORBERS

a. Removal (Fig. 15)

From the engine compartment remove dirt and grit from around shock absorber piston rod and upper retainer housing. Remove piston rod nut and retainer washer. Place jack in center of engine front crossmember and raise vehicle off floor. Remove shock absorber to lower control arm bracket attaching nut, bolt and washer. Disengage shock absorber eye from control arm bracket. Push lower portion of absorber up into frame housing sufficiently to clear lower bracket. Remove shock absorber.

NOTE: Care must be taken to see that the lower shock absorber mounting upper washer on the piston shaft is recovered from shock absorber housing when removing the shock absorber.

b. Installation

Place upper mounting retainer washer cupped side up, on shock absorber piston rod. Compress shock absorber piston rod into shock absorber. Insert assembly up through opening in frame to allow piston rod to enter upper housing bushing. While holding in position, install upper mounting retainer washer (cupped side down) and nut. Hold piston rod with suitable wrench and tighten nut to approximately 24 foot-pounds torque or until upper and lower mounting washer contacts steel spacer in bushing. Position lower end of shock absorber in lower control arm mounting bracket, install attaching bolt, nut and lockwasher, tighten to 40 foot-pounds torque.

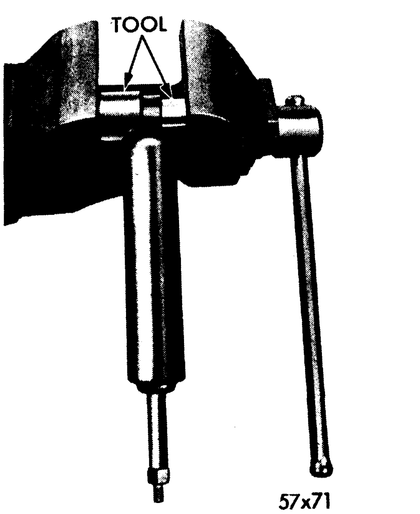

Fig. 16—Installing Shock Absorber Eye Bushing

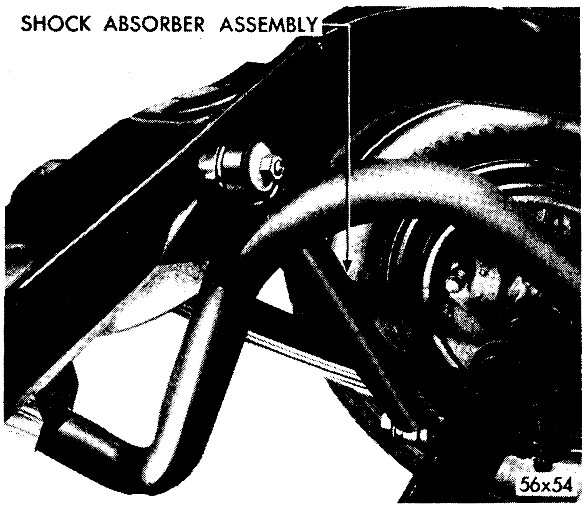

Fig. 17—Rear Shock Absorber Installed

9. REPLACING SHOCK ABSORBER PISTON SHAFT UPPER BUSHING

NOTE: The upper bushing should be checked whenever the shock absorber is removed from car.

a. Removal

If bushing is worn or damaged proceed as follows: Remove bushing inner steel spacer from bushing and with a suitable drift remove piston shaft bushing from frame housing.

b. Installation

Remove inner bushing spacer from replacement bushing. Immerse bushing in water (do not use brake fluid, soap or other alkaline fluids). Insert bushing in housing and with a twisting motion press bushing in place. Install bushing spacer.

10. REPLACING LOWER SHOCK ABSORBER EYE BUSHING

Remove the lower shock absorber bushing sleeve in vise or arbor press as shown in Figure 16.

NOTE: To avoid damaging bushings when installing bushings, press against the steel sleeve.

11. REMOVAL AND INSTALLATION OF REAR SHOCK ABSORBERS (Fig. 17)

To remove rear shock absorber, remove nuts from shock absorber mounting stud pins which pass through eyes at top and bottom of shock absorber, and remove shock absorber.

When installing a shock absorber, install bushings in the shock absorber's eye. Install inner bushing retainers, shock absorber and bushing assembly and outer retainers and nut. The concave face of each retainer must fit against convex face of adjacent bushing. Tighten to specified torque.

Section X

STEERING

CONTENTS

MANUAL

CONSTANT CONTROL FULL TIME POWER STEERING

DATA AND SPECIFICATIONS

MODELS	LC-1	LC-2	LC-3	LY-1
Steering Type				
Manual	Worm and Three Tooth Roller	None	None	None
Power	Rack and Gear Sector, Recirculating Ball Nut			
Ratio				
Manual	20.4	....	....	None
Power	16.1	16.1	16.1	16.1
Turning Radius (Curb to Curb)	42.3	45.4	....	49.5
Number Wheel Turns				
Manual	5.6	....	....	....
Power	3.5	3.5	3.5	3.5
Tread—Front	61.0	61.0	61.2	61.9
Rear	59.7	59.7	60.0	62.4
Wheel Base	122.0	126.0	126.0	129.0

DATA AND SPECIFICATIONS (Cont'd)

MODELS	LC-1	LC-2	LC-3	LY-1
Camber				
Left	+ ¼ degree ± ¼ degree			
Right	0 degree ± ¼ degree			
	Preferred Left + ⅜ degree, Right 0 degree			
	Left ¼ degree to ½ degree algebraically greater than right			
*Caster				
Manual	− ¾ degree ± ¾ degree with Manual Steering			
Power	+ ¾ degree ± ¾ degree with Power Steering			
Toe-In (Outside Thread Inches)	⅛ ± 1/32 in. (⅛ in. Preferred)			
Toe-Out on Turns	21 degrees 45 minutes ± 1 degree (inner wheel when outer wheel is 20 degrees)			
Steering Axis Inclination at Camber (Degree)	5 to 7 degrees at 0 degree			
Steering Knuckle Type	Ball and Socket			
Front Wheel Bearing Type	Tapered Roller Bearing			
Inner Bearing Size	1.25	1.25	1.25	1.375
Outer Bearing Size	.75	.75	.75	.844
Spindle Thread Size	¾−16 (NF)			
Steering Linkage Type	Symmetric Idler Arm (Equal Length Tie Rods)			

*Caster should be equalized as near as possible on Left and Right wheel.

POWER STEERING PUMP SPECIFICATIONS

MODELS	Slipper Type	Sleeve Type
Fluid Capacity of Hydraulic System	64 Fluid ounces	64 Fluid ounces
Type of Fluid	Automatic Transmission Fluid (Type A)	
Maximum Pump Pressure	850 to 950 psi.	750 to 900 psi.
Maximum Fluid Flow at 3,000 R.P.M.	2.25 gal.	2.25 gal.
Maximum Pump Rotor Clearances	.001−.0015	.012
Flow Control Valve Spring		
Free Length	3.15	4.0 inches
Working Length	2.35	1.5 inches
Force at Working Length	16 ± .65 lb.	12.5 ± 1.25 lbs.

POWER STEERING PUMP SPECIFICATIONS (Cont'd)

MODELS	Slipper Type	Sleeve Type
Pressure Relief Valve Spring		
Free Length	....	.825 inch
Working Length	....	$\frac{35}{64}$ inch
Force at Working Length	....	12.5 to 14 lbs.

SPECIAL TOOLS

MANUAL STEERING

Tool Number	Tool Name
C-3402	Pitman Arm Puller
C-3428	Steering Wheel Puller

CONSTANT CONTROL FULL TIME POWER STEERING

Tool Number	Tool Name
C-3106	Pliers—Snap Ring Bearing Retainer
C-3128	Pliers—Snap Ring
C-3211	Hose—High Pressure
C-3233	Driver—Shaft Bushing
C-3229	Pliers—Gear Shaft Adjusting Screw Snap Ring
C-3309B	Gauge—Pressure Check
C-3318	Hose—Low Pressure
C-3332	Remover—Gear Shaft Bearing
C-3333	Driver—Gear Shaft Bearing
C-3350	Remover and Installer—Gear Shaft Seal
C-3388	Hose—Coupling
C-3532	Adapters
C-3602	Fixture—Pump Assembly
C-3615	Puller—Steering Pump Pulley
C-3633	Nut Wrench—Gear Cross Shaft Retainer
C-3634	Adjusting Wrench—Gear Support Nut
C-3638	Seal Remover—Gear Worm Shaft
C-3640	Seal Driver—Pump Shaft
C-3642	Seal Puller—Pump
C-3643	Supporting Stand—Pump Shaft
C-3646	Puller—Steering Arm
C-3649	Aligning Tool—Gear Spacer to Housing
C-3650	Seal Driver—Gear Worm Shaft
C-3655	Remover—Hydraulic Steering Pump Flow Control Valve Bore Plug
C-760	Pliers—Snap Ring
MTU-36	One Ounce Pull Scale

TIGHTENING REFERENCE

MANUAL STEERING

	Foot-Pounds Torque
Steering Gear to Frame Bolt	50
Steering Gear Pitman Arm Nut	120
Steering Wheel Nut	40
Steering Knuckle Arm Bolt	50
Steering Linkage Ball Stud Nut	40
Idler Arm Bolt Bushing Nut	60
Tie Rod Clamp Bolt and Nut	150 In.-Pounds

CONSTANT CONTROL FULL TIME POWER STEERING

	Foot-Pounds Torque
Steering Wheel Nut	40
Steering Arm Nut	120
Steering Gear Housing to Frame Bolt	50
Steering Valve End Plug	50
Steering Valve Body Attaching Bolts	15
Steering Column Support Nut	150
Steering Gear Shaft Cover Nut	100
Steering Gear Shaft Adjusting Screw Lock Nut	50
Pressure Control Valve Body Screws	10

RESERVOIR

MODELS	Slipper Type		Sleeve Type	
	Thread Size	Foot-Pounds	Thread Size	Foot-Pounds
Reservoir Cover Bolt.............	5/16-18	15	1/4 x 20	10
Flow Spring Retainer Fitting......	—	—	—	20
Bearing Cap to Body.............	—	—	—	25

PUMP

MODELS	Slipper Type		Sleeve Type	
			Thread Size	Foot-Pounds
Pump Assembly Bolt.............	—	—	5/16 x 18	15
Hose Connector Outlet............	—	—	5/8 x 18	30
Flow Divider Valve Plug..........	—	—	7/8 x 14	20

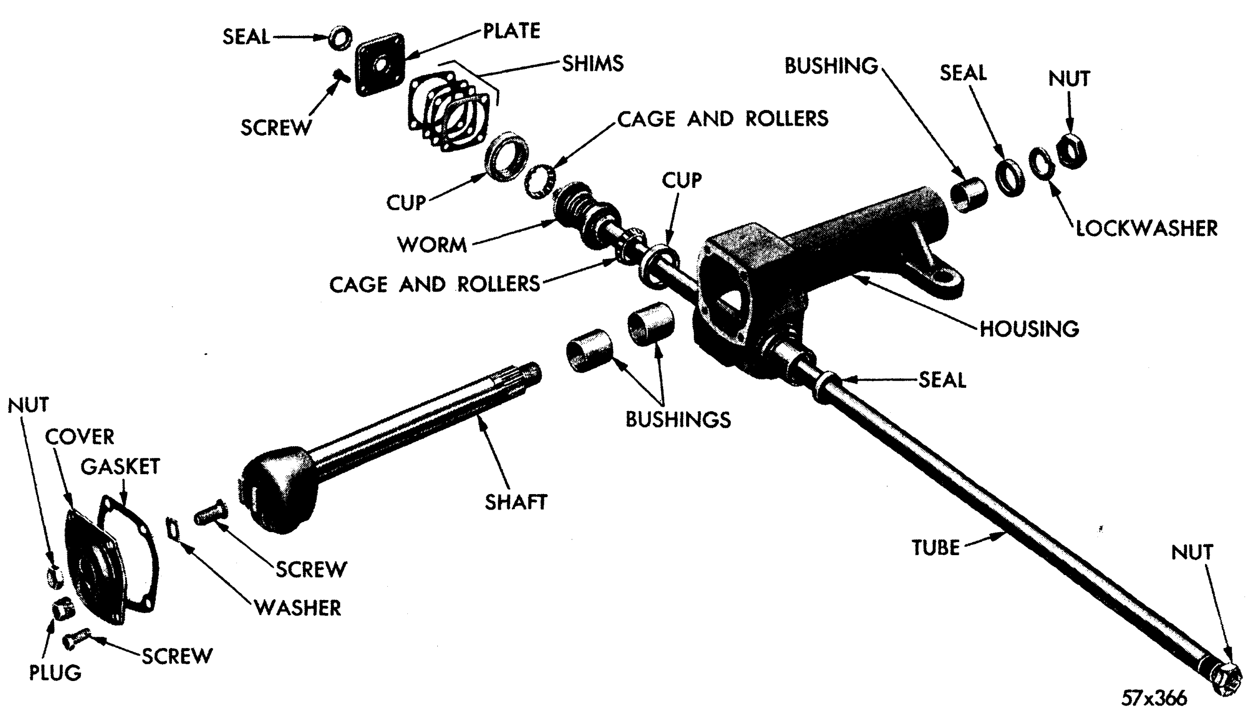

Fig. 1—Steering Gear Assembly (Disassembled View)

Section X
STEERING
MANUAL

A modified three-tooth roller and worm steering gear assembly (Fig. 1) is used in the Chrysler 1958 cars, equipped with manual steering. The steering gear is mounted inboard of the frame and can be serviced without removal from car.

The worm is integral with the steering tube and is supported at each end by tapered roller bearings. The worm bearing preload is adjusted by means of shims placed between housing and housing end cover. The steering gear shaft rotates in two bronze bushings pressed into the steering gear housing. The three-tooth roller on shaft is meshed with worm. When the steering wheel is turned, the worm rotates the steering gear shaft and roller, moving the steering gear arm, which is splined to end of shaft and held in place with a nut.

Backlash between steering gear shaft roller tooth and worm is controlled by an adjusting screw that is threaded through shaft and roller cover. The base end of adjusting screw is engaged in the hole in end of the steering gear shaft. Correct backlash can be obtained by turning adjusting screw in or out, as required.

The steering wheel and arm are splined to the steering tube and steering gear shaft, respectively. Both steering wheel and steering gear arm have master serrations to insure correct installation.

The high point is the point of least clearance between the worm and roller and is at midpoint of worm and roller travel.

NOTE: Proper steering gear adjustments influence the performance of the steering gear assembly. Care should be taken to accomplish proper shaft and worm high point setting since this adjustment limits the turning circle on each side of center.

1. REMOVAL OF STEERING WHEEL ASSEMBLY

Disconnect battery. Turn ornament counterclockwise and remove (Fig. 2). Disconnect wire from terminal, remove three screws, three bushings and remove horn ring (Fig. 3). Remove horn blowing contact ring switch from steering wheel hub. Loosen steering wheel nut three full turns and attach steering wheel puller Tool C-3428 and remove nut and steering wheel.

2. ASSEMBLY OF STEERING WHEEL ASSEMBLY

Attach steering wheel to hub and tighten nut.

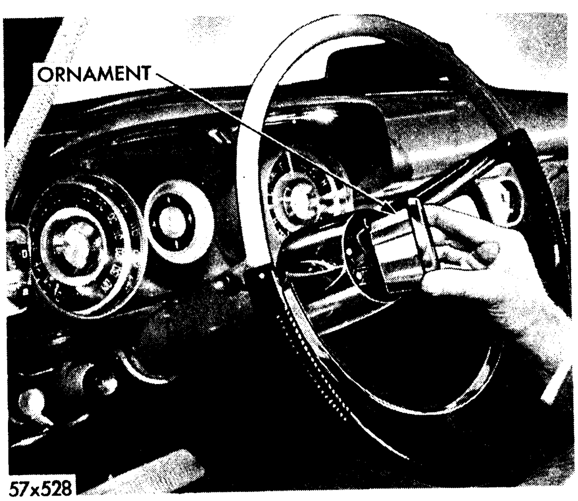

Fig. 2—Removing or Installing Steering Wheel Ornament

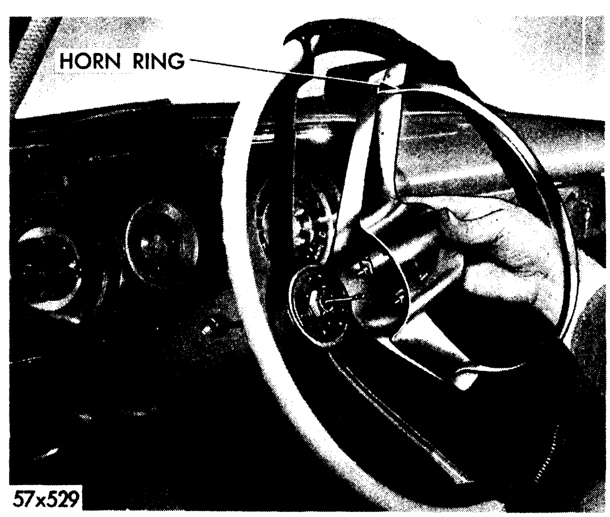

Fig. 3—Removing or Installing Steering Wheel Horn Ring

Install contact ring switch, connect wire to terminal. Install horn ring and tighten three screws. Turn ornament clockwise in hub. Reinstall battery cable.

3. REMOVAL OF MANUAL STEERING GEAR ASSEMBLY (Figs. 1, 2 and 3)

a. Removal (From Vehicle)

NOTE: It is not necessary to remove the steering column and mast assembly from car to service gear lower worm bearings and cross shaft assembly.

Disconnect the battery ground cable. Remove the steering wheel and disconnect the horn and turn signal wires at the instrument panel. Remove jacket tube clamp at the steering gear housing. Remove the steering jacket support clamp at the instrument panel. Remove the dust shield at the firewall. Remove the floor opening panel. Remove the steering gear arm with Tool C-3402. Remove the steering gear housing to frame bolts. Slide the steering gear jacket tube and remove control units rearward, through the drivers compartment as an assembly. Remove the brake pedal pad and remove gear from engine compartment side of firewall.

b. Disassembly Steering Gear Assembly (Fig. 1)

Remove gear shaft adjusting screw lock nut, shaft cover, and gasket, and steering gear shaft and roller tooth assembly. Remove gear shaft oil seal from housing. Remove cover and shims from bottom of housing. Remove steering tube and worm assembly, bearing cups and cages.

c. Reassemble Steering Gear Assembly (Fig. 1)

Clean all parts in a suitable solvent. Check all parts for wear.

NOTE: Assemble parts without lubrication. Lubrication should be done after adjustments are completed.

If either of the worm thrust roller bearings are damaged, replace both bearings. Use new oil seals. The steering gear housing and bushing assembly is serviced only as an assembly.

Insert worm and tube into housing with bearings and cups. Install shims and lower housing cover, making sure bearings are seated. When tightening cover, turn worm tube to be sure no bind exists. Final tightening of cover screws cause end play to disappear with torque of 3/8 to 3/4 pound required to rotate the tube, when measured with the pull applied at rim of steering wheel. Add or remove shims in event a bind or excessive end play occurs. Shims are available in .003, .006, .011 and .025 inch.

Install gear shaft. Before installing cover, turn adjusting screw all the way out. Place steering wheel on tube and rotate steering wheel in one direction to the end of its travel. Rotate wheel in other direction to the end of its travel, counting the turns. Rotate wheel back 1/2 full number of turns. This is center of travel (high point). Turn adjusting screw (clockwise) until all end play in roller shaft is gone. Rotate wheel to one end of its travel and apply a spring scale of torque wrench. With pull applied at rim of steering wheel, tension should measure from 1 to 2 pounds. The greatest tension should be felt as the wheel is rotated past the center position (high point).

Adjust bearing load by turning adjusting screw in or out. Install lock plate nut and steering gear arm. Fill gear housing with SAE 90 Gear Lubricant and check for leaks.

d. Installation (In Vehicle)

Install the steering column dust shield on column. Install the steering gear assembly from the engine side of fire wall. Install mounting bolts and attach nuts, tighten to 15 foot-pounds torque. Install the jacket tube clamp at the gear housing. Slide the steering gear jacket tube, and remove control assembly through the floor panel opening. Install the jacket support to dash bracket, align and tighten screws 50 inch-pounds torque. Tighten the steering gear housing to frame bolts 50 foot-pounds torque. Install the steering gear arm nut and washer and tighten 120 foot-pounds torque. Connect horn and turn signal wires at instrument panel. Install floor opening panel and dust shield. Install steering wheel, horn ring and ornament. Connect battery.

4. STEERING GEAR ALIGNMENT

A slight bind of the steering gear may be caused by shifting of body due to loosened bolts. Tighten body bolts. Loosen the steering gear at frame, and dash bracket to allow the

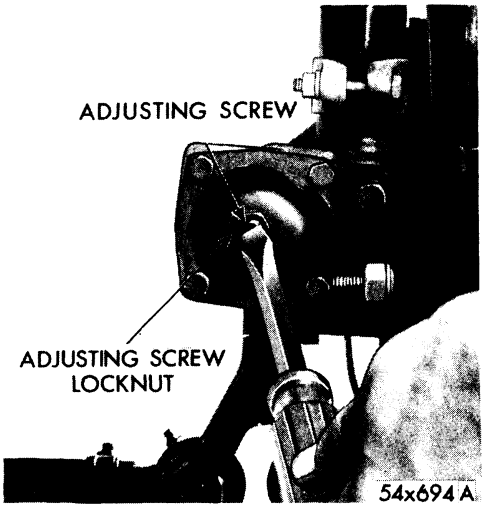

Fig. 4—Steering Gear Adjustments

steering gear to move in relation to the frame. Tighten mounting bolts 50 foot-pounds torque.

Position the center of steering column in center of the instrument panel. If this cannot be done by moving the frame bracket, add metal washer shims between frame and frame bracket to eliminate all bind.

5. ADJUSTMENT (In Car) (Fig. 4)

a. Adjusting Steering Tube Worm Bearings

Remove steering gear arm, drain the housing and disconnect horn wire at connector. Remove grease retainer cover at bottom of steering gear housing and remove necessary shims to eliminate excessive end play. Add shims of necessary thickness, to eliminate a binding condition. If any tightness exists, too many shims have been removed or the steering assembly is out of alignment. See "Steering Gear Alignment," Paragraph 4.

b. Adjustments of Roller Tooth and Worm (In Car)

Disconnect steering gear ar mat link. Rotate steering wheel to mid-position and check for backlash by attempting to move steering gear arm back and forth. If backlash exists, remove roller shaft adjustment screw locknut and tighten adjusting screw enough to eliminate free play. Be sure the roller shaft and worm do not bind. Check backlash again. Install adjusting screw locknut and steering gear arm.

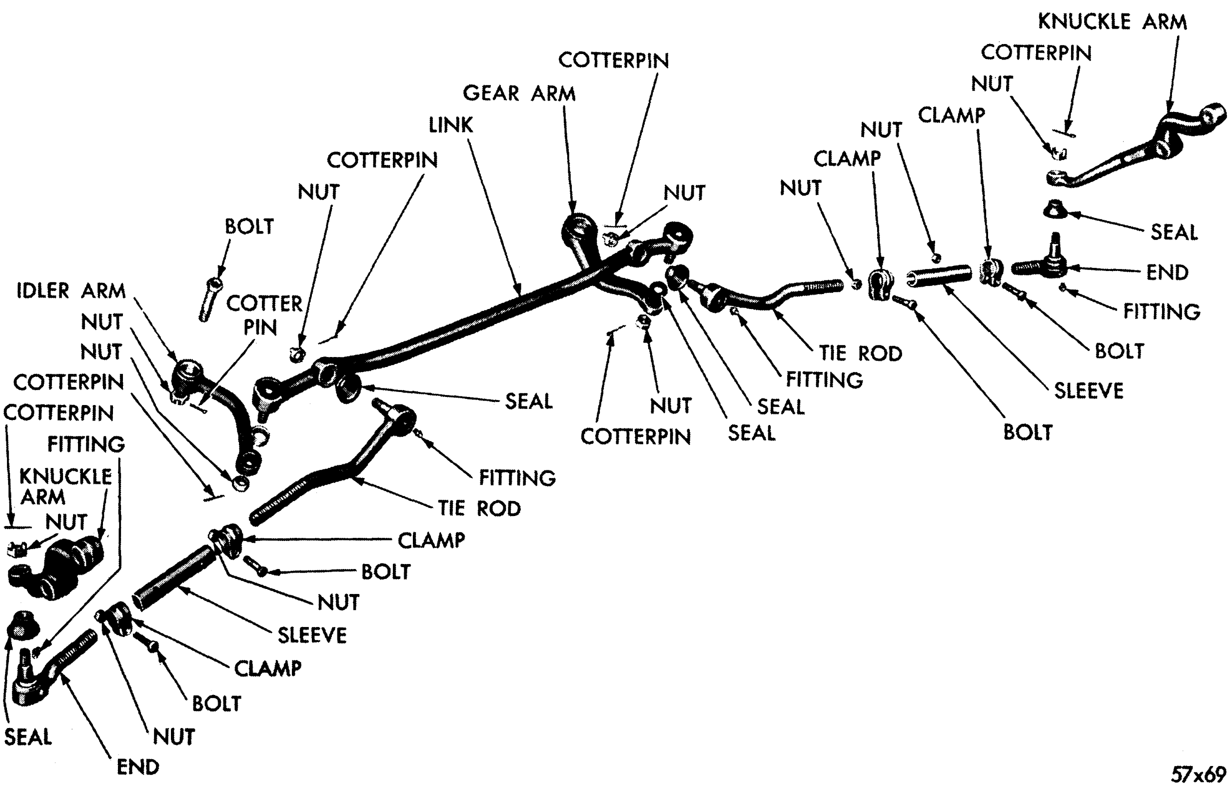

Fig. 5—Steering Gear Linkage

6. SERVICING THE IDLER ARM (Fig. 5)

The idler arm and bushing is serviced as an assembly. With wheels in straight-ahead position check opening of idler arm bracket (should be 2¼ inches). Install idler arm assembly. Apply lubriplate to support bolt. Tighten nut to 60 foot-pounds torque and install cotter pin.

7. STEERING KNUCKLE TIE RODS (Fig. 5)

a. Removal

NOTE: Tie rod end and bolt is serviced only as an assembly.

Loosen nut on rod ball and remove tie rod end with Tool C-3394. Insert leg of tool between the steering linkage knuckle arm and tie rod end. Turn puller screw against tie rod end nut, forcing tie rod end from the knuckle arm. Remove tie rod from center link by placing leg of puller between center link and tie rod end. Remove tie rod end assembly from tie rod by loosening clamps and unscrewing the rod end assembly.

b. Installation

NOTE: The clamping bolts must be beneath tie rods to prevent interference on turns. Check and adjust toe-in when new tie rods are installed.

When installing tie rod ends to the rod tube, be sure to thread the ends evenly on tube body to nominal length to obtain proper positioning of steering wheel.

8. ADJUSTMENT OF FRONT WHEEL BEARINGS

(Refer to Front Wheel Suspension, Section I)

Tighten the wheel bearing adjusting nut with an inch-pound torque wrench 90 inch-pounds while rotating the wheel. Position the nut lock, over the adjusting nut so the spindle cotter pin hole is in line with one set of the slots in the nut lock. Without removing the nut lock, back off the nut until the next set of slots are lined up with the spindle cotter pin hole. Insert and bend the cotter pin to secure the nut lock.

NOTE: This procedure should result in from .000 inch (no preload) to .003 inch bearing free play measured axially. It is important to remove any burrs or nicks on the spindle thread to insure accurate readings.

NOTE: Check to make certain that cancelling dogs on steering wheel actuate the direction switch.

CONSTANT CONTROL FULL TIME POWER STEERING

The Constant Control Full Time Power Steering is a completely new power steering gear system consisting of a hydraulic pressure pump a power steering gear and connecting hoses. The power steering gear (Figs. 6 and 7) consists of a gear housing, containing a gear shaft and sector gear, a power piston with gear teeth milled into the side of the piston is in constant mesh with the gear shaft sector teeth, a worm shaft connects the steering wheel to the power unit piston through a coupling. Figure 7 shows how the wormshaft is geared to the piston through recirculating ball contact. At the upper end of the piston, a flange carries the rubber "D" ring which separates the power chambers of the piston.

A steering gear valve lever upper end is fitted into a spool valve in the steering gear valve body and the bottom end into a radially drilled hole in the thrust bearing center race. The valve lever pivots in the bearing center race spacer. The spacer is compressed at its outer diameter between the steering gear cylinder head and the column jacket support, holding the spacer in a fixed position. The center thrust bearing race which tips the valve lever (which in turn actuates the steering valve) is held firmly against a shoulder on the wormshaft by two thrust bearings, bearing races and an adjusting nut. The center thrust bearing race is, in effect, clamped axially to the wormshaft and must therefore move with the wormshaft whenever the steering wheel is turned.

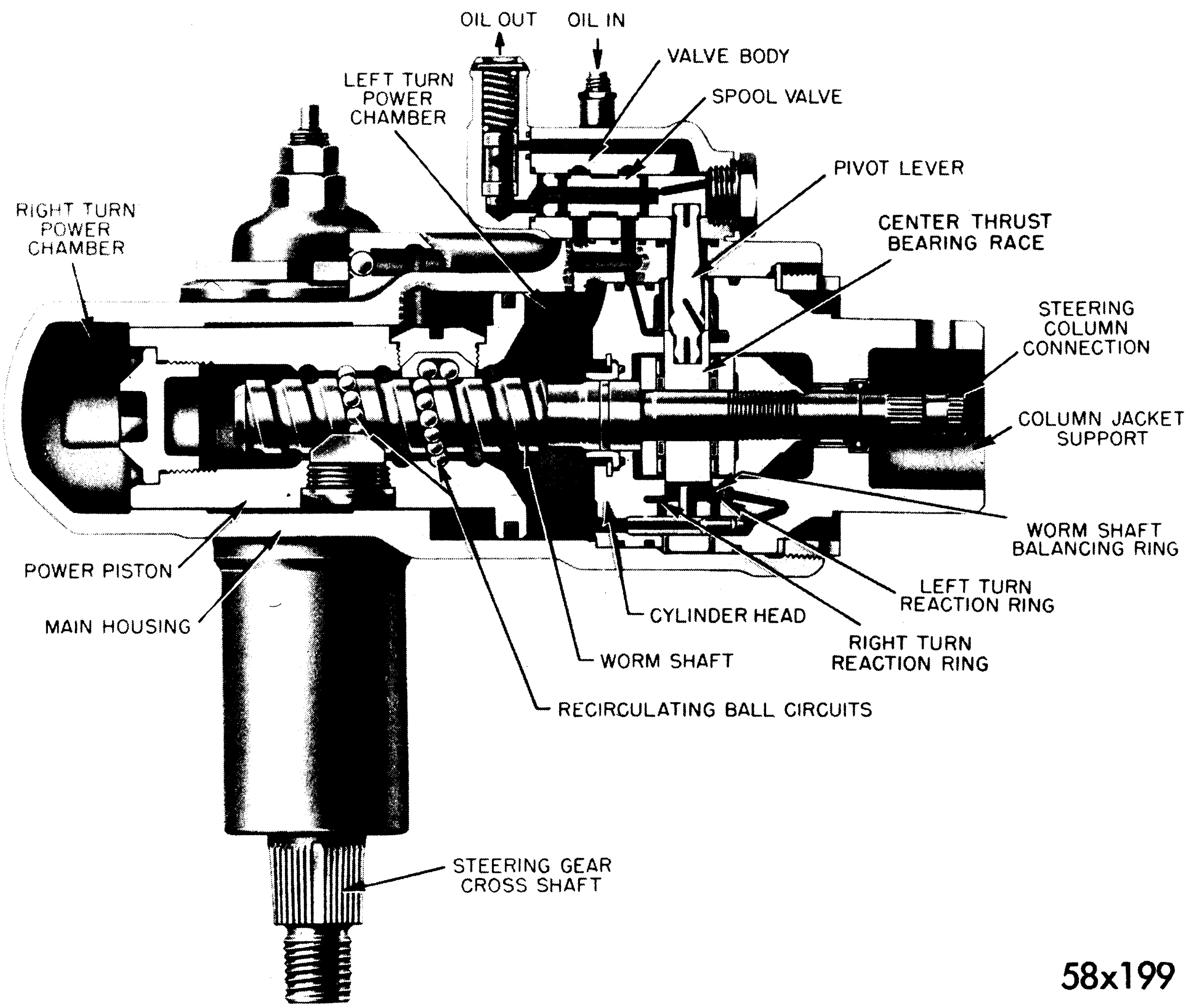

Fig. 6—Steering Gear (Sectional View)

In this description, the left end of the steering gear means the lower end, and the right end means the upper end of the steering gear. For simplicity, direction of flow will be described as flowing to left or flowing to right as shown in the following illustrations.

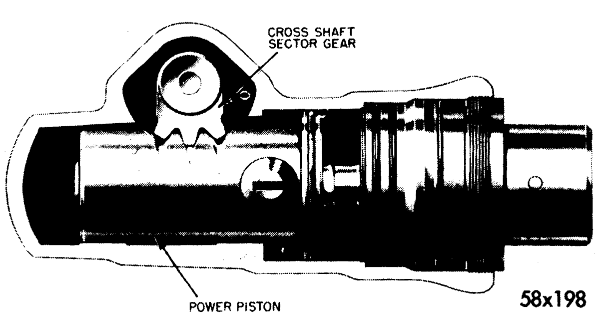

Fig. 7—Steering Gear Housing (Sectional View)

When the car is in the straight-ahead direction, the steering valve is in the neutral (center) position and oil flow through both of the grooves in the steering valve body is equal, since, in the neutral position, (Fig. 8), the two lands of the steering valve are centered in the grooves of the valve body. The left oil passage directs its oil where it contacts the right end of the power piston and across into the right reaction chamber. Part of this oil is forced around the grooves of the wormshaft, inside the piston and around the recirculating balls, to the hollow area between the left end of the wormshaft and the left end of the power piston. Pressure on end of wormshaft is bal-

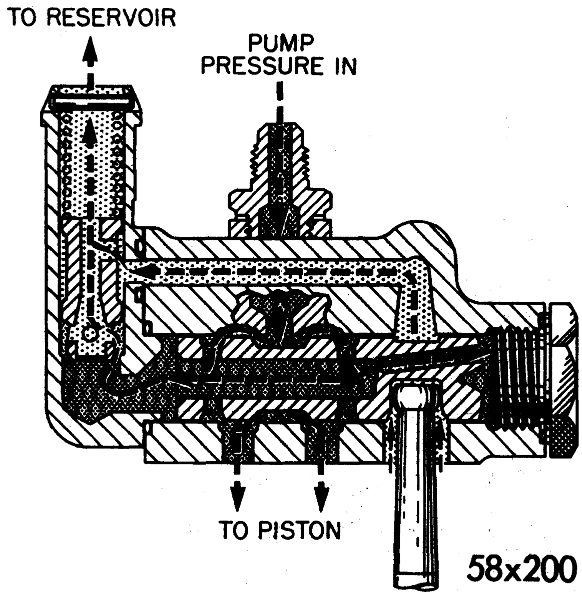

Fig. 8—Steering Gear Valve (Neutral Position)

anced by the pressure against the area of the wormshaft balancing ring.

At the same time, oil from the right groove in the steering valve is directed to the left, through a galley, parallel to the wormshaft. This oil flows to the area to the left of the power piston flange. Part of this oil is then directed through the cylinder head into the left reaction chamber.

Forces exerted on the piston through oil pressure on its faces are completely balanced by two worm reaction rings. These are shown in cross section in Figure 9 on either side of the pivot lever through the center bearing race.

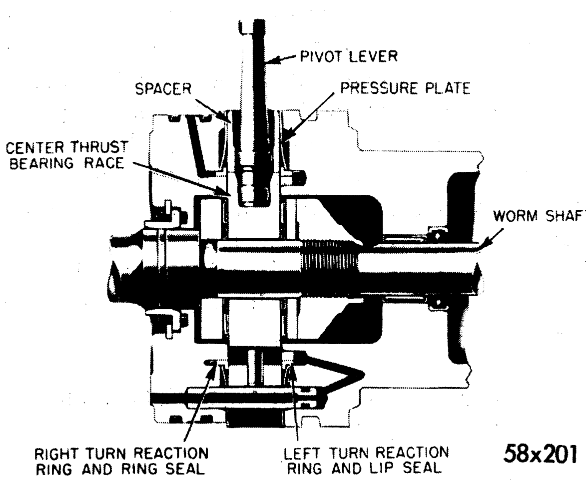

Fig. 9—Reaction Area

The reaction ring shown to the left of the center bearing race is fed oil from the right—turn power chamber oil galley through a drilled hole as shown in Figure 9.

When the driver makes a left turn, power is immediately provided by the unit to effect the turn. As the wormshaft rotates inside the power piston, the piston is prevented from instantly "climbing down" the wormshaft by the resisting forces which the steering linkage and wheels transmit to the steering gear crossshaft. Instead, the wormshaft is "drawn out" of the piston a very small amount (a few thousands of an inch). The center thrust bearing race, which is in effect clamped axially to the wormshaft, moves the same distance. The race thus tips the pivot lever and moves the spool valve to the left (down).

The oil flow diagram for a left turn is shown in Figure 10. Here it can be seen that as the left edges of the two lands on the valve approach the groove edges of the valve body, two things happen: First, flow to the right groove in the valve body is reduced. Secondly, the flow of oil to the left groove is increased because the opening is larger. Oil then flows from the power steering pump through the enlarged orifice and through the oil galley to the left turn power chamber of the piston. Since the supply of oil to the left side (right turn chamber) of the piston has been cut off by movement of the spool valve, a force unbalance on the

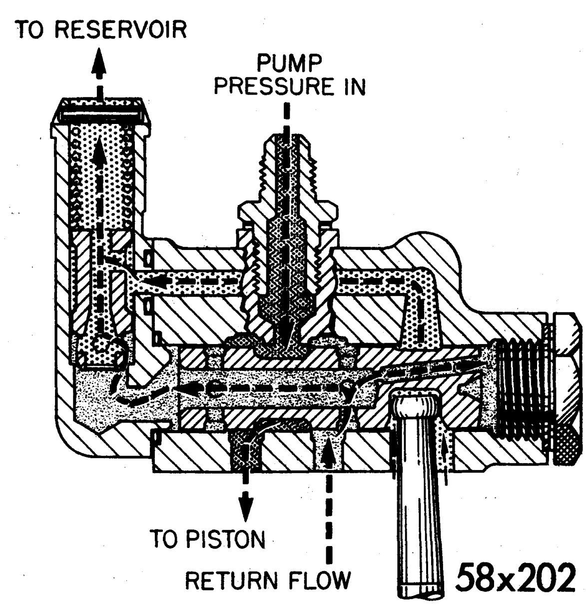

Fig. 10—Steering Gear Valve in Left Turn Position

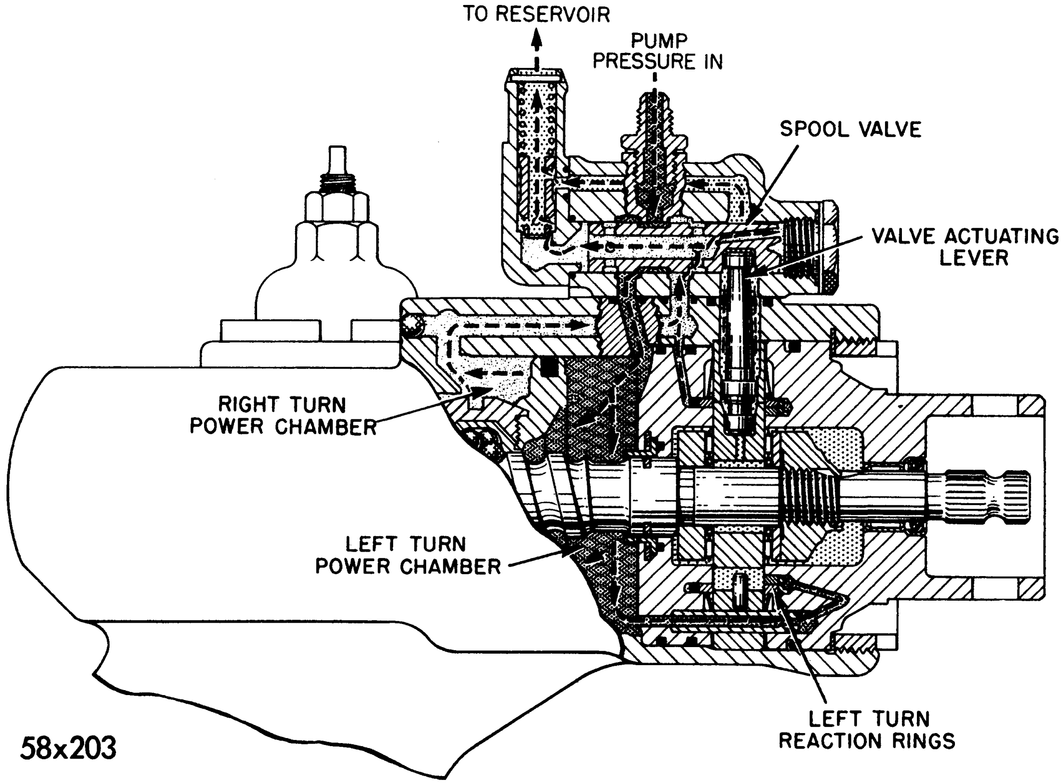

Fig. 11—Oil Flow (Left Turn Position)

piston exists, and it is pushed to the left. Its linear movement is translated into rotation of the cross-shaft sector gear (Fig. 7), and subsequently through the steering linkage to the front wheels.

This entire action takes place instantaneously whenever the steering wheel is turned to the left.

In the reaction area of the steering unit another action takes place simultaneously as the wheel is turned to the left (Fig. 11). The restraining force of the reaction spring must be overcome before the center race can move to the right. The force of the reaction spring provides positive returnability to the unit. At the instant when power assistance is no longer desired by the driver, the reaction spring and operating oil pressure move the race and spool valve back to the neutral position. Equal oil flow then is directed through the unit, and no power assist is provided.

The force of this reaction spring also contributes to increased on-center "feel". The "feel" is further provided by operating oil pressure which tends to return the center thrust bearing race to its neutral position. The driver feels this force on the reaction rings shown in Figure 6, as a force proportional to operating oil pressure. It causes the driver to exert a steering effort proportional to the total force required to turn the front wheels of the car. The force he actually exerts is only a small percentage of the total force that would be required to steer the car with a manual gear. If oil pressure is interrupted to the steering gear, it would operate with increased effort and there would be more steering wheel free play. Steering wheel movement by the driver will turn the wormshaft inside the power piston causing it to move right or left. The steering wheel movements will travel through the wormshaft and piston to turn the cross-shaft sector gear, and through the steering linkage to the front wheels. Complete steering control is retained by the driver if lack of power assist condition should ever arise.

9. REMOVING AND INSTALLING POWER STEERING UNIT

a. Removal

Disconnect battery ground cable. Disconnect horn wire. Remove horn button and horn ring and disconnect horn wire. Remove steering wheel nut and pull steering wheel with Tool C-3428.

Disconnect the direction signal wires at connectors. Remove the jacket tube support bracket at instrument panel. Loosen the two bolts attaching the jacket tube to steering housing, push the jacket tube upward to expose the steering tube coupling pin and remove pin.

Remove cotter key and nut at the drag link to steering arm ball joint.

Disconnect the pressure and return hoses at steering gear. Fasten the disconnected ends of hoses above oil level in reservoir. Cap ends of hoses and fittings on steering gear.

Remove steering arm nut and washer at steering gear shaft. Slide Tool C-3646 (Fig. 12) up on steering arm and place shoe of puller behind steering arm. Tighten tool center screw against gear shaft will pull steering arm from shaft. Remove the gear housing to frame bolts and remove steering gear at engine compartment.

b. Installation

Enter steering gear through engine compartment and install attaching bolts and spherical washers. Tighten bolts finger tight only. Align the steering tube coupling with the steering column tube and install coupling pin, insulator and teflon inserts.

Slide the jacket tube down in position over the steering gear housing and tighten clamp bolts. Install jacket tube clamp at instrument

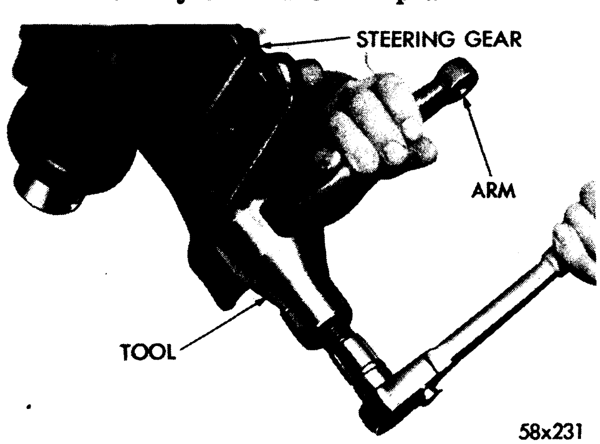

Fig. 12—Removing Steering Gear Arm with Puller C-3646

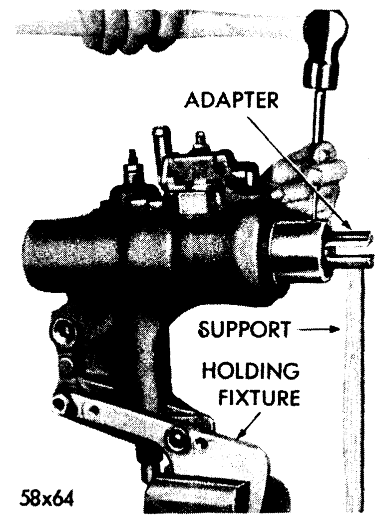

Fig. 13—Removing Coupling Pin

panel. (Do not tighten.) Connect direction signal wires at connectors. Install steering wheel and steering wheel nut. Tighten nut to 40 foot-pounds torque. Install horn wire, stationary plate, bushings, horn ring and attaching screws. Do not overtighten screws (horn ring must be free to flex.) Install steering wheel ornament.

NOTE: Check to make certain that cancelling dogs on steering wheel actuate the direction switch.

If distance between steering column jacket and steering wheel is more or less than 1/8 inch, adjust column jacket and tighten jacket clamp bolt.

Tighten the jacket to dash panel support bracket screws. Tighten the steering gear housing to frame attaching bolts to 50 foot-pounds torque. Install steering arm and tighten nut to 120 foot-pounds torque.

Connect the pressure and return hoses. Refill the reservoir and gear housing. Refer to Paragraph 19, "Final Adjustments".

10. DISASSEMBLY OF STEERING GEAR

NOTE: Prior to disassembly, clean the gear assembly thoroughly in a suitable solvent and install unit in holding fixture C-3323 (Fig. 13).

When disassembling, each part should be placed in a suitable solvent, washed, then dried by dry compressed air. Careful handling of parts must be exercised to avoid the occurence of nicks and burrs. Crocus cloth may be used to

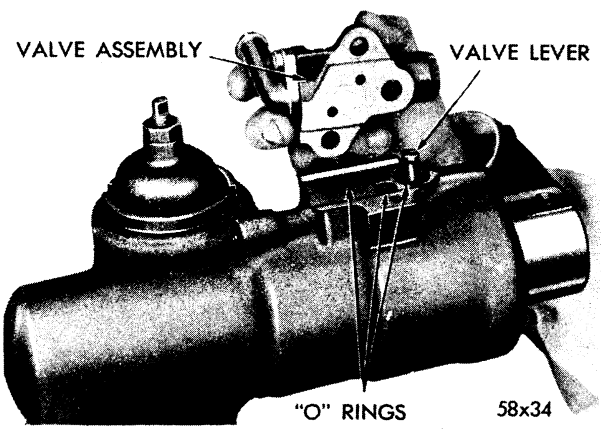

Fig. 14—Removing or Installing Valve Body Assembly

remove small nicks or burrs provided it is used carefully. When used on the steering gear valve, use extreme care not to round off the sharp edge portions of the two lands located between the valve drilled holes. The sharp edge portion of these two lands is vitally important to this type of valve.

Remove and discard all "O" seal rings and seals, using new ones lubricated with petrolatum when reassembling. To disassemble the power steering unit for repair or overhaul refer to Figure 6 then proceed as follows:

Drain the steering gear through the pressure and return connections by turning the steering tube coupling from one extreme of travel to the other.

Remove coupling pin (Fig. 13), and remove coupling.

NOTE: Support the coupling when driving the pin out to avoid damaging the bearings.

Remove the valve body housing attaching

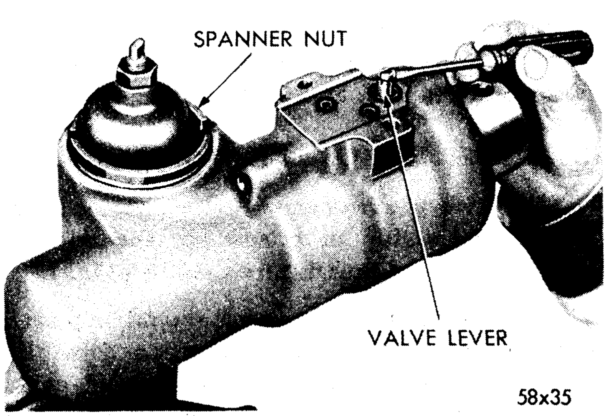

Fig. 15—Removing Valve Lever

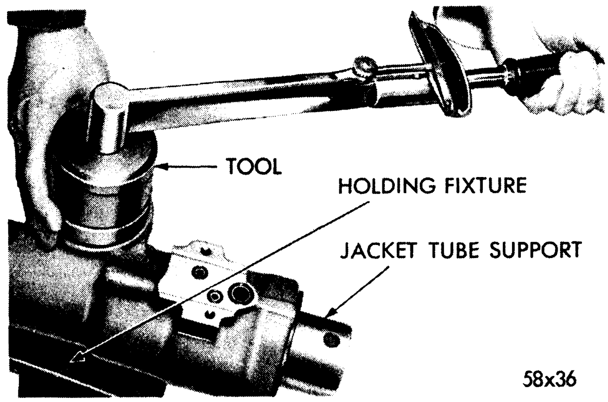

Fig. 16—Removing or Installing Gear Shaft Cover Nut with Tool C-3633

screws and remove valve body and the three "O" rings, (Fig. 14). Remove valve lever by prying under the spherical head (Fig. 15). **DO NOT USE PLIERS.**

CAUTION

Use care not to collapse slotted end of the valve lever as this will destroy the bearing tolerances of the spherical head.

Loosen gear shaft adjusting screw locknut. Remove gear shaft cover nut with wrench Tool C-3633, (Fig. 16).

Rotate worm shaft to full right turn, then return worm shaft and piston to center of travel to remove gear shaft and cover as an assembly (Fig. 17).

CAUTION

There will be a discharge of oil when shaft and cover are pulled from housing.

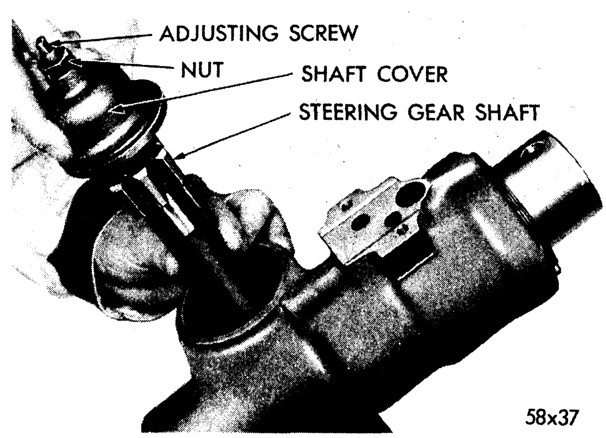

Fig. 17—Removing or Installing Gear Shaft and Cover Assembly

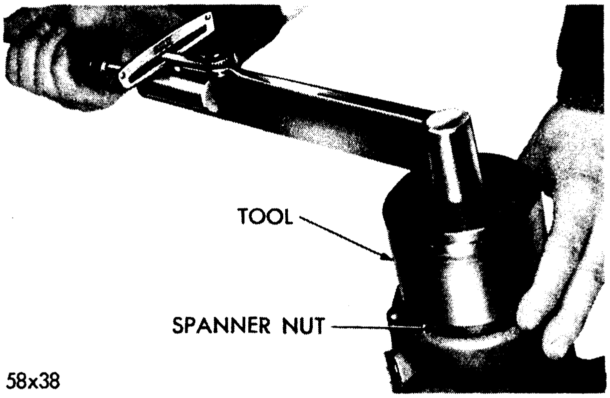

Fig. 18—Removing Steering Column Support Nut with Tool C-3634

Remove the steering column support nut with Tool C-3634 (Fig. 18), and remove tanged washer.

NOTE: Turn worm shaft to full right position to compress parts and back off as necessary to align holes in column support and worm shaft.

Enter a piece of drill rod or suitable drift through the holes in jacket support and worm shaft to keep the parts from turning and carefully remove the power train as a complete assembly (Fig. 19).

CAUTION

Oil will be expelled when the power train is being removed.

Remove steering gear housing from vise.

11. DISASSEMBLY OF POWER TRAIN

Place power train in a vise equipped with soft jaw protectors to avoid damaging the piston assembly.

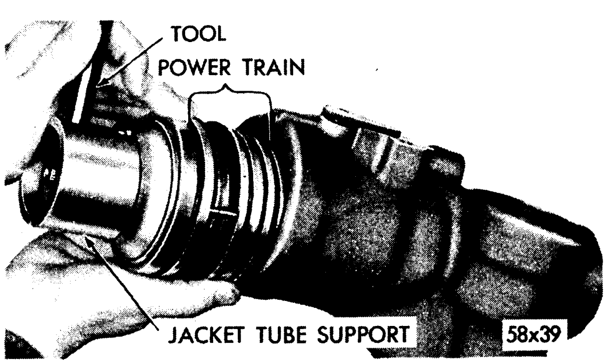

Fig. 19—Removing or Installing Power Train

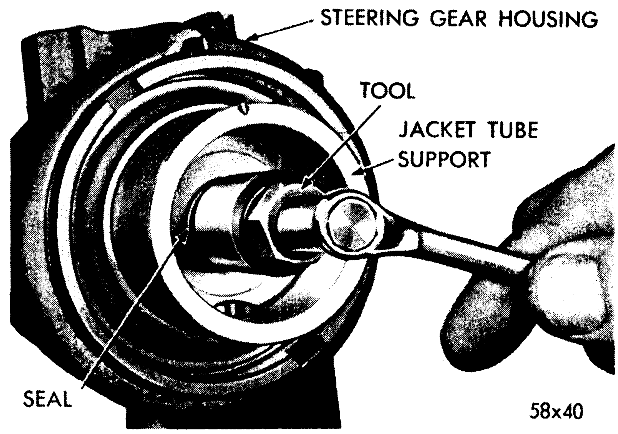

Fig. 20—Removing Worm Shaft Upper Oil Seal with Tool C-3638

CAUTION

Do not turn worm shaft more than one-half turn during disassembly.

Remove column jacket support assembly, reaction spring, reaction ring, and spacer, ferrule "O" ring center, and bearing spacer.

Hold the worm shaft from turning, then turn nut slightly to left to shear the staked portion of the nut and carefully pick out locking portion of the bearing adjusting nut out of the notch in the worm shaft.

CAUTION

Be sure staked portion is removed from slot of worm shaft to avoid damaging worm shaft threads.

Remove thrust bearing nut, upper thrust bearing race (thin), upper thrust bearing, center bearing race, lower thrust bearing, lower

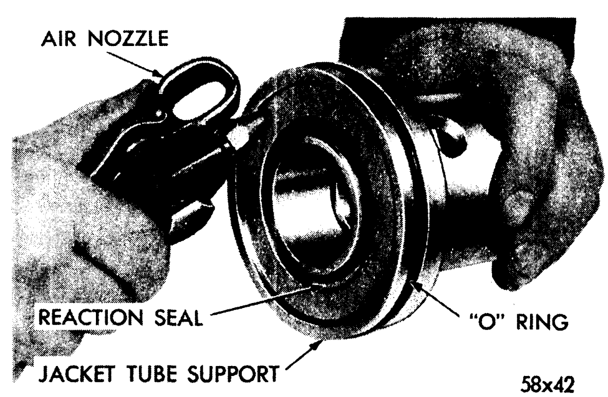

Fig. 21—Removing Reaction Seal from Jacket Support

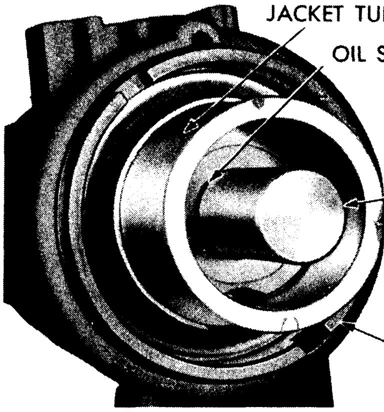

Fig. 22—Installing Worm Shaft Upper Oil Seal with Tool C-3650

thrust bearing race (thick), lower reaction ring and lower reaction spring.

Remove cylinder head assembly.

NOTE: The worm and piston assembly is furnished as a complete assembly only.

12. COLUMN JACKET SUPPORT ASSEMBLY

a. Disassembly

Remove worm shaft upper oil seal with puller Tool C-3638 (Fig. 20).

NOTE: Column jacket support and wormshaft upper bearing are serviced as an assembly.

Remove large "O" ring from groove in jacket support. Remove reaction seal from groove in face of jacket support by blowing air pressure into the ferrule chamber (Fig. 21). Inspect grooves for burrs. Make sure passage from ferrule chamber to upper reaction chamber is unobstructed.

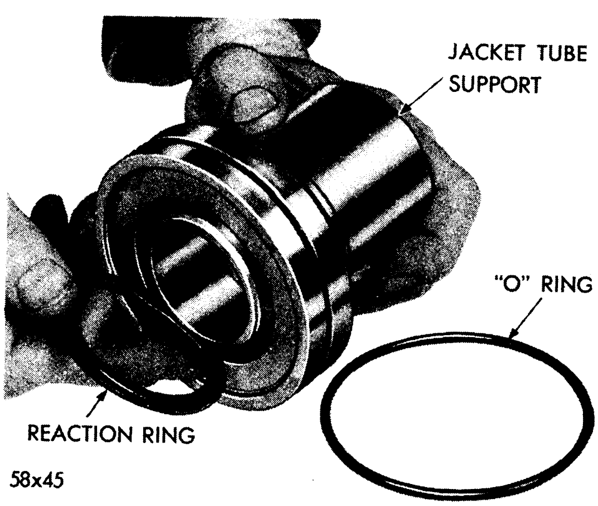

Fig. 23—Installing Reaction Seal into Jack Support

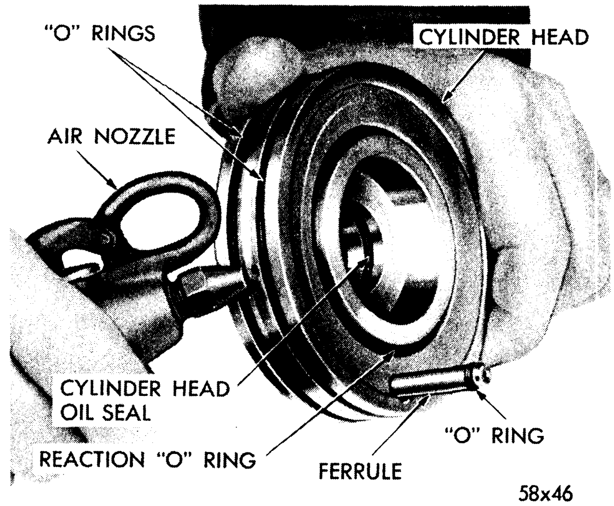

Fig. 24—Removing Reaction Ring from Cylinder Head

b. Reassembly

Install worm shaft upper oil seal with sealing lip toward bearing (Fig. 22). Use Tool C-3650 and drive seal until tool bottoms on casting to obtain proper compression on rubber seal. Lubricate reaction seal and install in groove in face of column jacket support with flat side of seal out (Fig. 23).

13. CYLINDER HEAD

a. Disassembly

Remove the two "O" rings in the two outer grooves in the cylinder head. Remove the lower

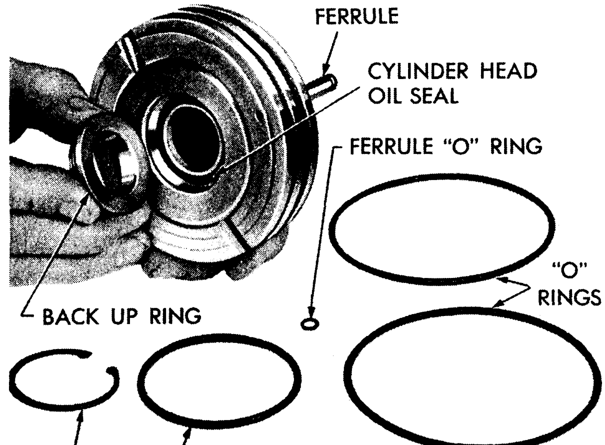

Fig. 25—Removing Cylinder Head Seal

reaction "O" ring in groove in face of cylinder head with air pressure into oil hole located in groove between the two "O" ring grooves (Fig. 24). Inspect the worm shaft seal in the cylinder head counterbore for possible damage, replace cylinder head seal if necessary (Fig. 25). Check oil passage in ferrule for obstruction. Check lands of cylinder head for burrs.

b. Reassembly

Lubricate the two large "O" rings and install in grooves on cylinder head. Install the lower reaction seal in groove in face of cylinder head. The small "O" ring for the ferrule groove should be installed after worm shaft bearing preload has been established otherwise "O" ring will be damaged by the reaction springs.

14. STEERING VALVE ASSEMBLY (Fig. 20)

a. Disassembly

Compress pressure control valve spring and remove spring retainer pin, spring and pressure control valve piston. Remove the two screws attaching the pressure control valve body to the steering valve and remove valve body. Carefully shake out the valve piston.

NOTE: If steering valve or valve housing is damaged, it will be necessary to replace the complete valve assembly. DO NOT remove the valve and plug unless inspection indicates a leak at the seal.

b. Reassembly

If steering valve was removed from valve housing, install the valve in the valve housing so that the valve lever hole is aligned with the steering gear valve lever opening in the bottom of the valve housing. Valve must fit smoothly in housing without sticking or binding. If valve end plug had been removed, install new seal and tighten plug to 50 foot-pounds torque.

Lubricate pressure control valve piston and slide it into the pressure control valve body (nose end first) (Fig. 26). Install the pressure control valve spring on top of the valve piston. Compress spring and install the spring retainer pin through both holes at top of pressure control valve body. Assemble pressure control valve body to main valve with the two attaching screws. Tighten screws to 10 foot-

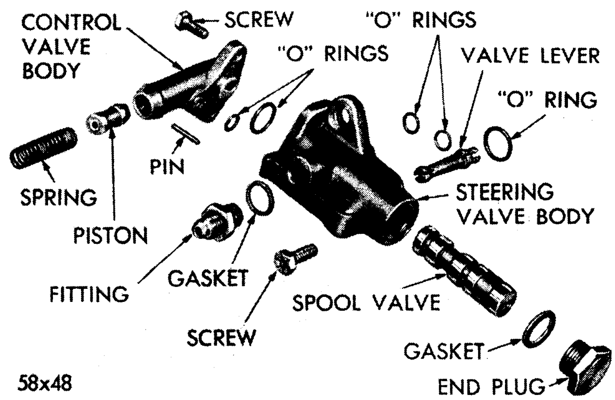

Fig. 26—Control Valve (Disassembled)

pounds torque. Install new copper sealing gasket and fitting in threaded hole on top of valve body. Tighten to 30 foot-pounds torque.

15. GEAR SHAFT

a. Disassembly

Remove gear shaft adjusting screw lock nut and unscrew cover from adjusting screw. Remove screw and washer from "T" slot in end of gear shaft. Remove small "O" ring from top of cover and large "O" ring from base of cover.

NOTE: The gear shaft cover and bearing are serviced only as an assembly.

b. Reassembly

Place adjusting screw washer over adjusting screw and slide both into the "T" slot of gear shaft. Screw cover onto the adjusting screw until gear shaft bottoms in cover. Lubricate a new small "O" ring and install it over the adjusting screw into position at top of gear shaft cover. Install adjusting screw lock nut on adjusting screw but do not tighten. Lubricate a new large "O" ring and "O" ring groove heavily with petrolatum. Install "O" ring in groove on lower face of gear cover.

16. STEERING GEAR HOUSING

a. Disassembly

NOTE: Steering gear housing with inner and outer gear shaft needle bearings is serviced as an assembly.

Attach steering gear housing on holding fixture Tool C-3323 and install holding fixture in a

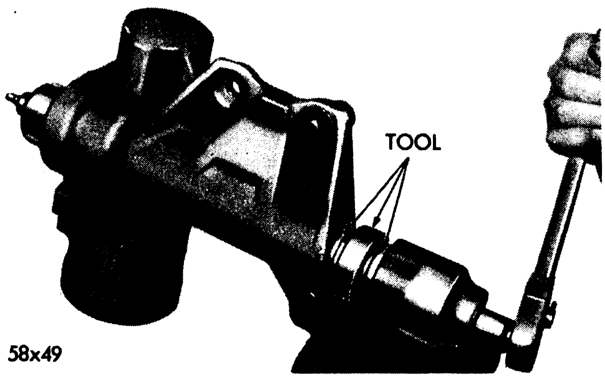

Fig. 27—Removing Gear Shaft Oil Seal

vise. Remove oil seal snap ring with pliers Tool C-760. Remove seal back-up washer. Remove the gear shaft oil seal with adapter SP-3056 and Tool C-3350 as follows: Slide the threaded portion of adapter SP-3056 over end of gear shaft and install the threaded nut section of Tool C-3350 on the shaft (Fig. 27). Maintain pressure on adapter SP-3056 with nut of Tool C-3350 while turning adapter SP-3056, forcing it into seal, until it has bottomed in the seal. Apply the two half rings and retainer over both portions of tool. As hexagon nut is removed from the shaft the seal will be pulled from the housing.

NOTE: Inspect the steering housing gear shaft needle bearings for broken or rough needles.

b. Reassembly

Install gear shaft oil seal in gear housing (lip of seal toward needle bearing) using Adapter

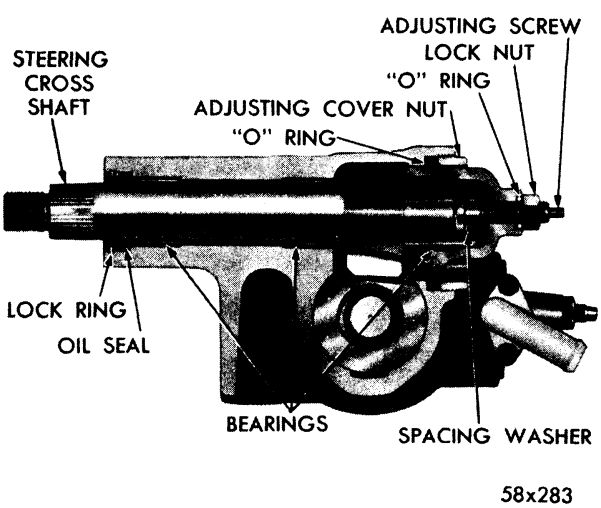

Fig. 28—Steering Gear Housing (Sectional View)

Tool SP-3052 and Tool C-3350 (Fig. 28). Place adapter against seal and the tool nut on the threaded end of gear shaft. Tighten tool nut until adapter shoulder contacts housing (Fig. 29). Install oil seal back-up washer, and snap ring.

CAUTION

Make sure snap ring is properly seated in groove.

17. ASSEMBLY OF POWER TRAIN

Refer to Figure 30 and proceed as follows: Place piston assembly on work bench in a vertical position (worm shaft up). Slide cylinder head assembly (with ferrule up) on worm shaft and against piston flange.

NOTE: Enter cylinder and seal over work shaft seal ring, making sure gap on worm shaft ring is closed to avoid breaking the ring.

Lubricate and install in the following order. Lower thrust bearing race (thick), lower thrust bearing, lower reaction spring over ferrule, lower reaction ring (with flange up so that the ring protrudes through the reaction spring), center bearing race indexing control lever hole with hole in center bearing race (Fig. 9). Install outer spacer, upper thrust bearing, upper thrust bearing race (thin) and a new worm shaft thrust bearing nut. Tighten nut as follows: Turn worm shaft counterclockwise one-half turn and hold worm shaft in this position while tightening nut to 10 foot-pounds torque.

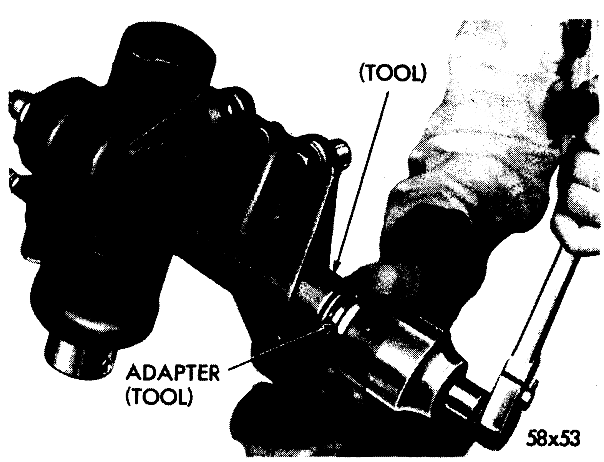

Fig. 29—Installing Gear Shaft Oil Seal

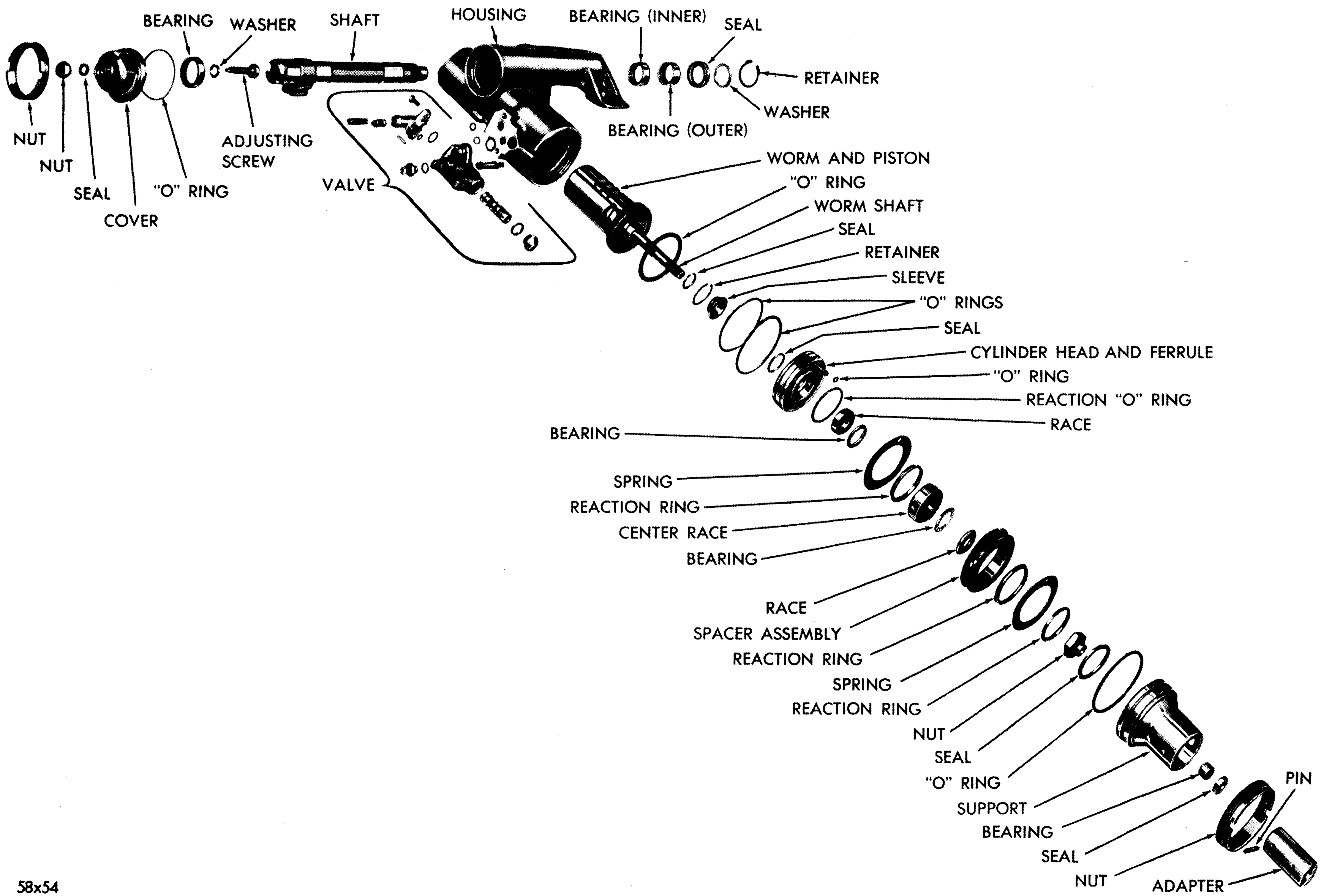

Fig. 30—Steering Gear (Disassembled View)

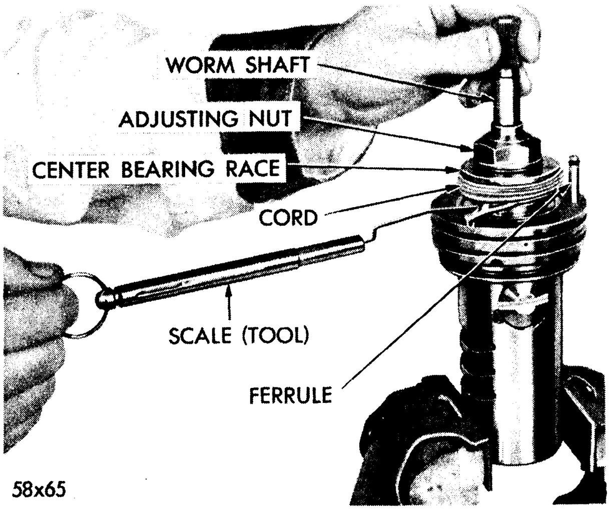

Fig. 31—Checking Center Bearing Race Preload

CAUTION

If worm shaft is turned more than one-half turn, the cylinder head seal will clear the oil ring on the worm shaft. Always check position of worm shaft oil ring before bottoming cylinder head against worm piston shoulder to avoid damaging oil ring.

Rotate the worm center bearing race several turns to position all parts, then loosen adjusting nut. Retighten the worm bearing adjusting nut to give a bearing torque of 8-16 ounces. Check torque by placing several rounds of cord around the center bearing race. Make a loop in one end of cord and hook the loop of distributor breaker arm spring scale, Tool MTU-36 in the cord loop (Fig. 31). Pulling on the cord will cause the bearing race to rotate.

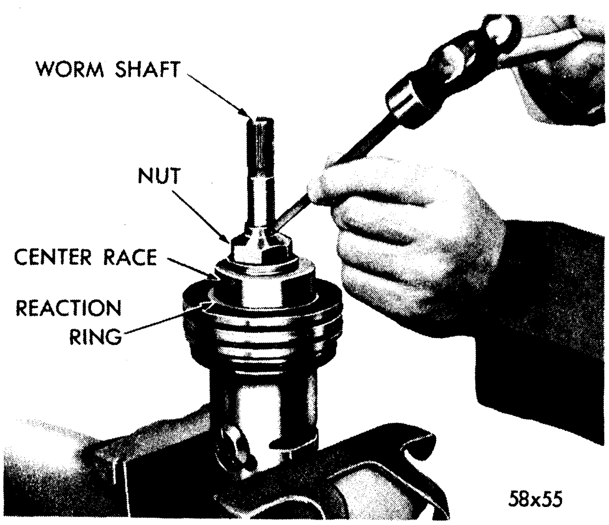

Fig. 32—Locking Worm Shaft Bearing Adjusting Nut

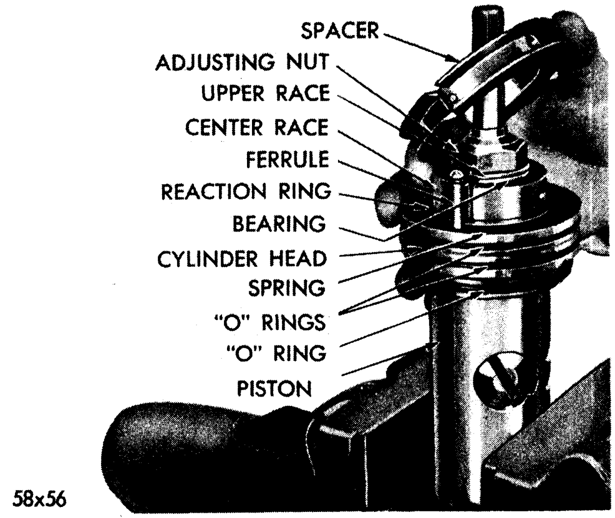

Fig. 33—Aligning Center Bearing Spacer

If adjusting nut is tightened properly, reading on scale should be 8 to 16 ounces. Depress flange of adjusting nut into the depression in worm shaft to lock securely (Fig. 32).

CAUTION

Use a chisel with a large radius on the ends to avoid completely shearing the metal.

IMPORTANT

The torque of 8-16 inch ounces must remain after the adjusting nut is securely locked.

Install center bearing spacer over center bearing race to engage dowel pin with slot in center bearing race (Fig. 33).

NOTE: Make sure that valve lever hole in center bearing race and center spacer are aligned.

Place inner and outer reaction rings over center spacer and install upper reaction spring with cylinder head ferrule through hole in spring. Install a new "O" ring in ferrule groove. Place lubricant in small bore of column jacket support (for cylinder head ferrule). Install the jacket support over the worm shaft carefully engaging the cylinder head ferrule and "O" ring making sure reaction rings enter groove in jacket support.

Align parts on power train so that valve lever hole in center bearing spacer is 90 degrees counter-clockwise from piston rack teeth and lock all parts to the worm shaft by entering a drill rod or suitable drift through jacket support and worm shaft holes.

18. REASSEMBLY OF STEERING GEAR

With steering gear housing in holding fixture Tool C-3323 in approximate car position; lubricate bore of housing with petrolatum and carefully install power train assembly (Fig. 19), with center bearing spacer valve lever hole in "UP" position to line up with control valve lever clearance hole in the steering gear housing.

NOTE: Place an .0015 inch feeler stock to cover the aligning notch in the steering gear housing to protect the "O" ring seals when installing the gear train.

CAUTION

Make sure cylinder head is bottomed on housing shoulder (Fig. 7). Do not remove power train locking pin (Fig. 19) until all parts are positioned in steering gear housing.

Align valve lever hole in center bearing spacer exactly with clearance hole in housing with aligning Tool C-3649 (Fig. 34). **Tool should not be removed until spanner nut is securely tightened.**

Install column support spanner nut, and tighten to 150 foot-pounds torque with Tool C-3634 (Fig. 18).

Set piston at center of travel and install gear shaft and cover assembly so that sector teeth index with piston rack teeth. Make sure "O" ring is positioned in face of cover, (Fig. 6).

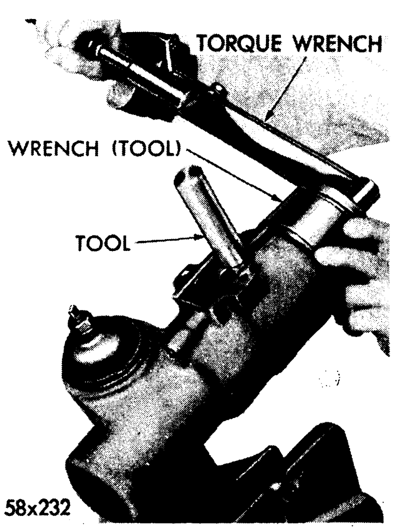

Fig. 34—Alignment of Bearing Spacer and Center Bearing Race with Aligning Tool C-3649

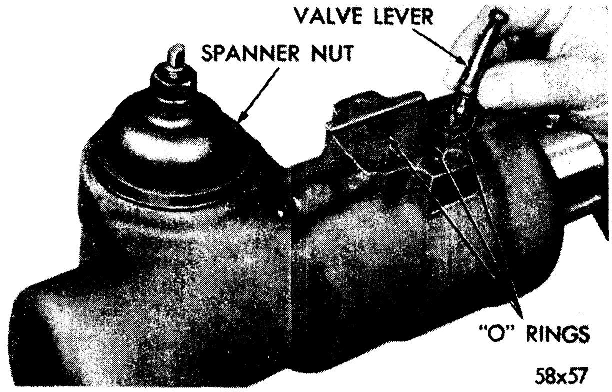

Fig. 35—Installing Valve Lever

Install cover spanner nut and tighten to 100 foot-pounds torque with Tool C-3633 (Fig. 16). Install valve lever (double bearing end first) into center bearing spacer through hole in steering housing so that slots in the valve lever are parallel to worm shaft in order to engage the anti-rotation pin in center bearing race (Fig. 35).

Install valve body on housing making sure that the valve lever enters the hole in the piston (Fig. 14). Be sure "O" ring seals are in place. Tighten valve mounting screws to 30 inch pounds torque.

19. FINAL TEST, ADJUSTMENTS AND SPECIFICATIONS

Remove oil reservoir cover and fill reservoir to level mark. Connect test hoses C-3211 and C-3318 with proper adaptors to hydraulic pump on car with pressure gauge C-3309B installed between pump and steering gear to register pressures. Start engine and operate at idle to bring steering gear to normal operating temperature. Expel all air from the unit by turning steering wheel several times to the right and then to the left. Refill reservoir before proceeding with the following test and adjustments.

a. Turn the gear shaft adjusting screw outward through the gear shaft cover to assure no mesh adjustment preload for this phase of the test. See Paragraph 15, "Assembly of Gear Shaft." Tighten steering valve body attaching screws to 7 foot-pounds torque. Apply oil pressure to complete unit and position steering valve by tapping lightly on one of the pressure control valve screws or on valve end plug to position valve, (up or down) on steering hous-

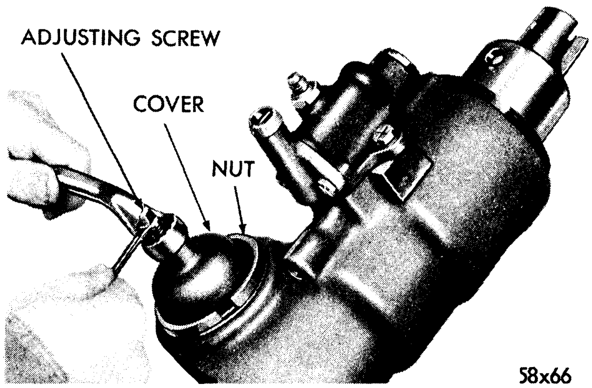

Fig. 36—Adjusting Gear Shaft Adjusting Screw

ing to give equal gear shaft torque (within 5 foot-pounds torque not to exceed 20 foot-pounds in either direction) when gear shaft is slowly turned. Perform this operation carefully to prevent a lockup in the steering gear. After valve body is located tighten attaching screws to 15 foot-pounds torque.

b. With the gear shaft on center, tighten the gear shaft adjusting screw until backlash just disappears. Tighten 1¼ turn from this position and while holding adjusting screw in this position tighten lock nut.

c. Turn off hydraulic power to unit. Operate unit manually for minimum of 180° from center in each direction, measured at worm shaft. Turn on hydraulic power to unit. Operate unit through a minimum of one complete cycle (complete rotational travel of worm shaft from one extreme of travel to the other extreme and then back). Operate unit through another cycle, this time holding unit at extreme travel in each direction while watching the oil pressure gauge. The gauge reading should be equal in each direction. If not, it indicates excessive internal leakage in the unit.

CAUTION

Holding the worm shaft at either extreme position for more than a few seconds will abnormally increase the oil temperature and cause undue oil pump wear.

With oil temperature between 150° F. and 170° F., checked with thermometer in the reservoir, the oil pressure should be 850 to 950 psi. for satisfactory power steering operation.

d. With gear shaft on center plus or minus 2 degrees, readjust the gear shaft backlash. This will require loosening the adjusting screw until backlash is evident. Then retighten adjusting screw until backlash just disappears. Continue to tighten for ⅜ to ½ turn from this position and tighten lock nut to 50 foot-pounds torque to maintain this setting, (Fig. 36).

e. Starting from a point at least one full turn of the worm shaft either side of center, the torque at the gear shaft required to turn the unit through center at 2 rpm in each direction shall not exceed 20 foot-pounds or vary more than 5 foot-pounds from left to right. Position steering valve to obtain equal torque and tighten valve body attaching screws to 15 foot-pounds torque to maintain this setting.

f. With the unit under power, but with no load, the torque required to rotate the worm shaft through an included angle of 180° (90° either side of center) shall be 5-9 inch-pounds. Disconnect test equipment and mounting fixture. Place steering gear worm at center of travel and install worm connector. Install unit in car. See Paragraph 9(b).

SLEEVE TYPE POWER STEERING PUMP

20. REMOVAL AND INSTALLATION (Fig. 37)

a. Removal

NOTE: Whenever the pump is drained or removed for servicing the pump must be filled up to the "full" mark indicated on the filler neck of reservoir before and after the engine is started. Use Automatic Transmission Fluid Type "A" oil.

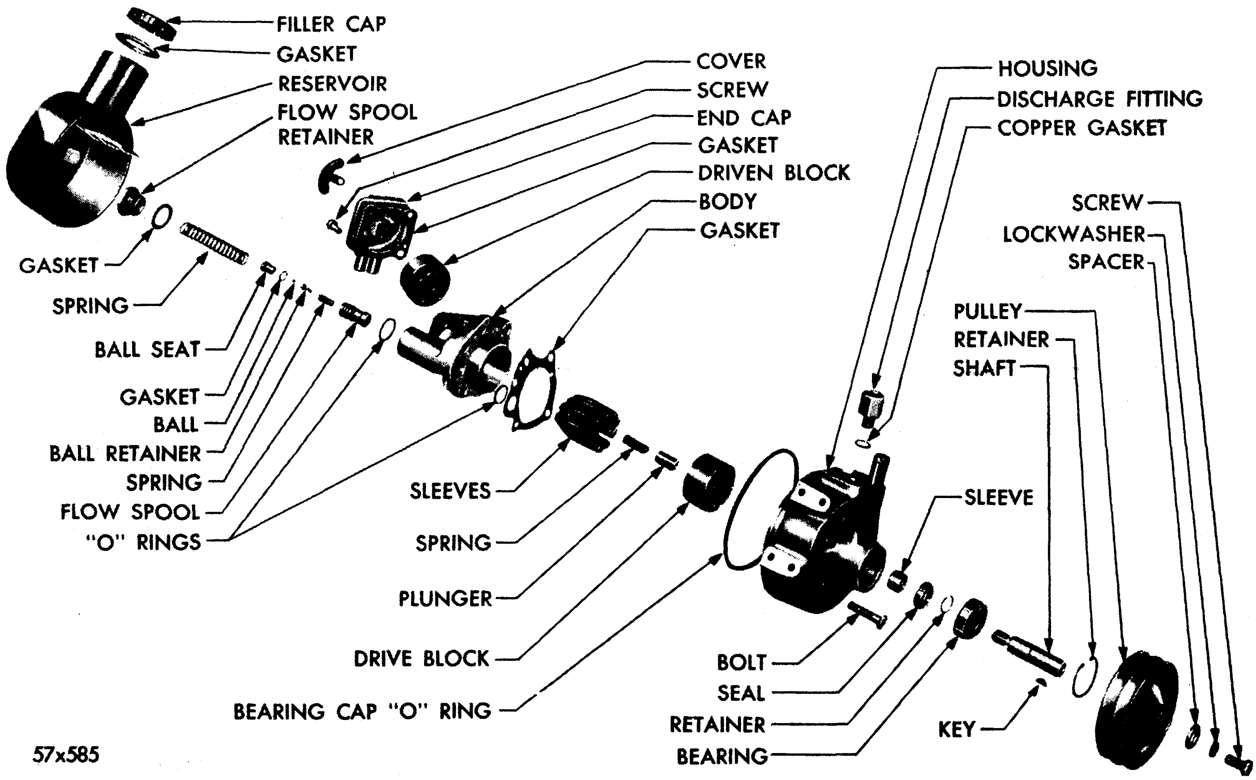

Fig. 37—Power Steering Oil Pump (Disassembled View) (Thompson Pump)

CAUTION

The oil level should never be allowed to fall below the baffle of the reservoir.

Remove hose clamp and hose from discharge outlets, (Fig. 38). Loosen bracket fan belt adjusting screw and remove fan belts. Remove pump.

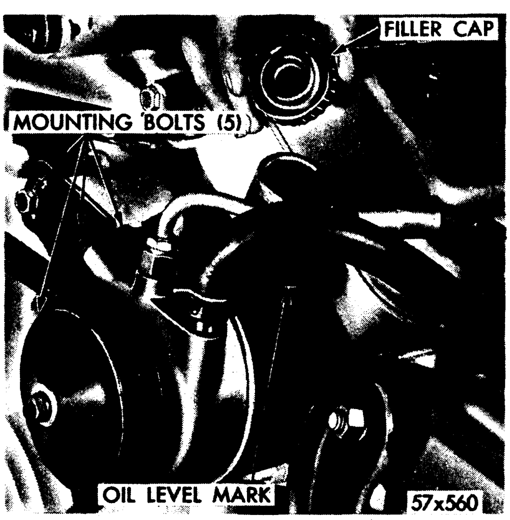

Fig. 38—Sleeve Type Power Steering Pump Installed

b. Disassembly

Do not disassemble the hydraulic pump in dirty surroundings or on a dirty work bench. Use clean paper on bench. After the pump has been disassembled, place the parts in a suitable cleaning solvent; clean and protect from dirt and grit. Drain oil from pump and reservoir. Cap discharge and return line fittings with

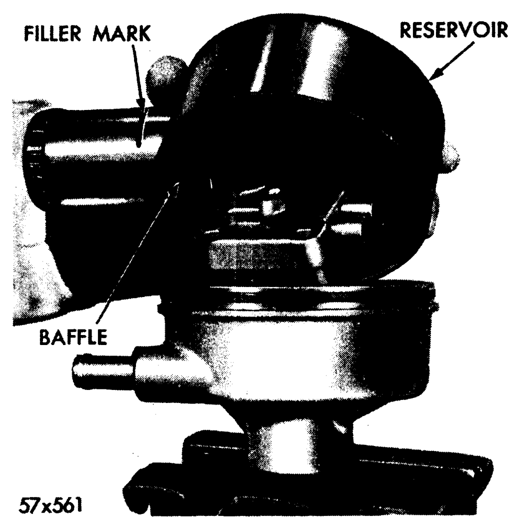

Fig. 39—Removing or Installing Power Steering Pump Reservoir

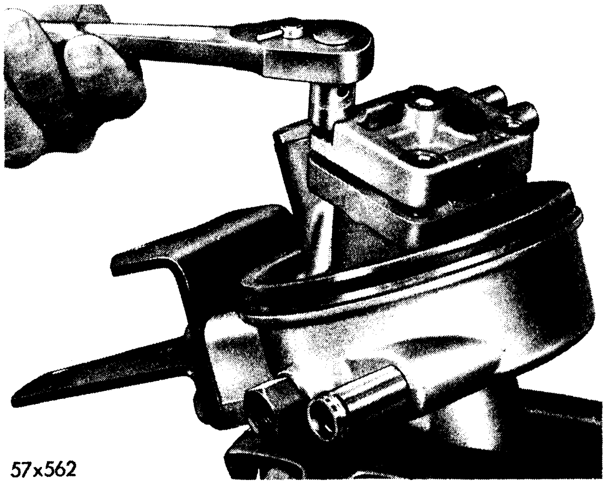

Fig. 40—Removing or Installing Inlet Cap Bolts

protective closures to exclude dirt from pump. Thoroughly clean exterior of pump. Mount pump in vise. Remove cap screw and reservoir. (Fig. 39). Loosen four cap screws at the inlet end cap (Fig. 40). Remove flow valve spring retainer fitting.

CAUTION

Flow and plunger spring are under pressure. Use care when removing cap and retainer to prevent spring and fitting from escaping due to spring force. Remove flow valve and spring. Remove and disassemble both end caps from inlet cap body and pump housing (Figs. 40 and 41). Plunger spring will tend to push the cylinder blocks out of body. Use care when disassembling.

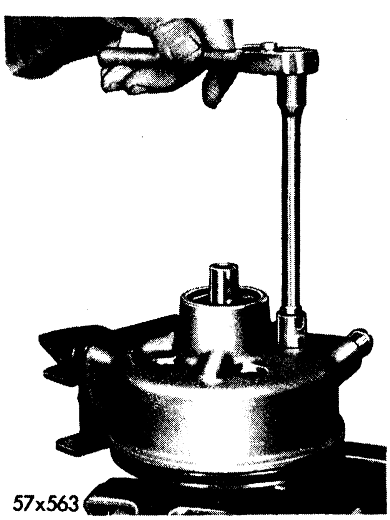

Fig. 41—Removing or Installing Pump Body from Housing

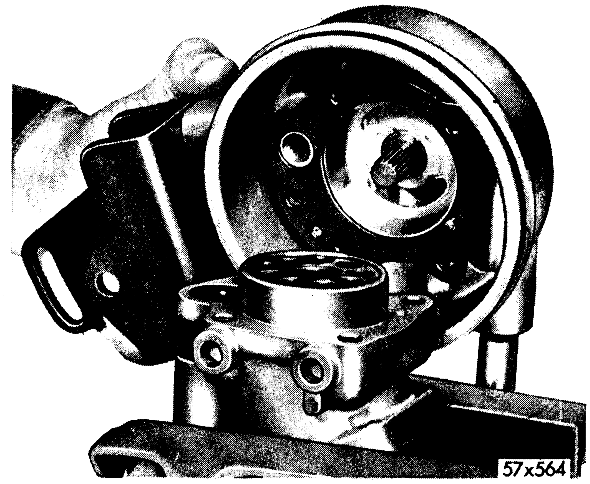

Fig. 42—Removing or Installing Housing from Pump Body

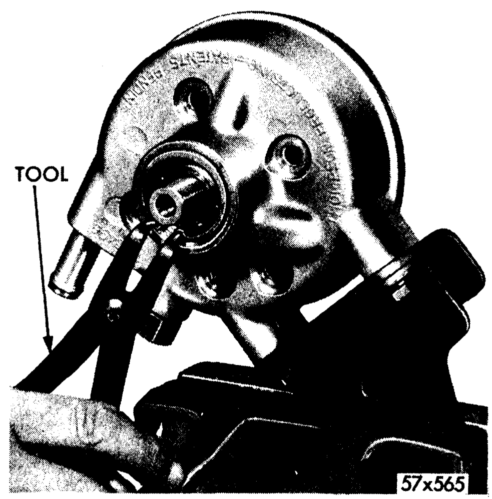

Fig. 43—Removing or Installing Snap Ring Bearing Retainer (Tool C-3106)

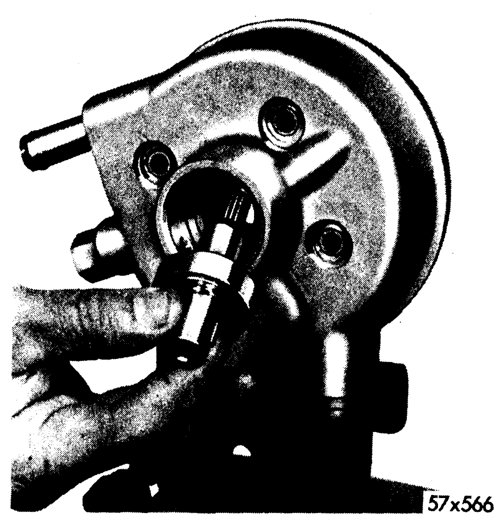

Fig. 44—Removing or Installing Shaft and Bearing

The cylinder blocks will push out of body slightly due to pressure of plunger spring between blocks. Remove cylinder drive blocks and nine sleeves from pump body (Fig. 42), as well as cylinder plunger spring. Remove ball bearing retainer ring from housing, using snap ring pliers Tool C-3106 (Fig. 43). Remove shaft and bearing (Fig. 44).

21. CLEANING AND INSPECTION

Wipe bearing and shaft assembly with clean, lint free cloths. Do not soak in cleaning solvent; the lubricants sealed into the ball bearing may become diluted by the solvent.

Inspect shaft for wear and check the ball bearing for roughness or noisy operation. If bearing must be replaced, remove shaft key, press bearing from shaft away from splined or serrated end of shaft. Examine retaining ring groove in housing, replace worn or distorted parts. If ball bearing is to be replaced, support bearing on inner bearing race and press shaft through bearing until retaining ring stops against inner race of bearing. The retaining ring must always be located between the bearing and splined or serrated end of pump shaft.

Check fit of sleeves in cylinder block bores. Sleeves must slide freely. Examine mating surfaces of sleeves and bores. Heavy scoring, if present, can impair pumping efficiency; cylinder blocks showing such scoring should be replaced. Hairline marking seen on sleeves are normal. Sleeves bearing such marks need not be replaced.

Examine flow valve spool and valve liner. Slight hair line scratches are permissible. Burrs from heavy gouges or scratches which may cause the flow spool to stick must be removed. This may be done by polishing with a smooth stone.

CAUTION

Do not break the sharp edges of the spool or liner.

Insert flow valve in valve body. (Fig. 45). By means of a pencil or other such rod which will not mar the internal diameter of valve liner, move flow spool back and forth to inspect. On each pass, rotate spool slightly. The spool must slide freely. If spool sticks or drags,

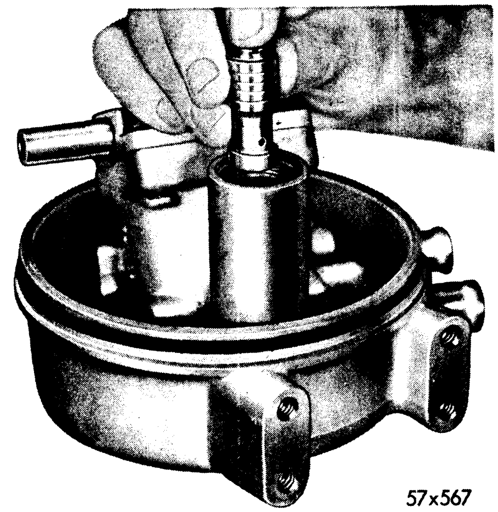

Fig. 45—Checking Flow Valve in Housing

remove it from liner. Remove dirt, nicks, and burrs, using above caution and check by repeating above procedure.

Examine shaft seal in bearing cap. If worn or damaged, replace seal.

NOTE: The lips of seal must point toward the casting. Examine running surface of bearing cap and inlet end cap. If heavy scratches or gouging are present or if port edges are damaged, the part should be replaced.

Press seal in until the shoulder stops against the bearing cap casting. Care must be used to see that seal is properly aligned. This operation should be performed on an arbor press.

Check the pressure relief valve. The pressure relief valve is located in flow valve spool. (Fig.

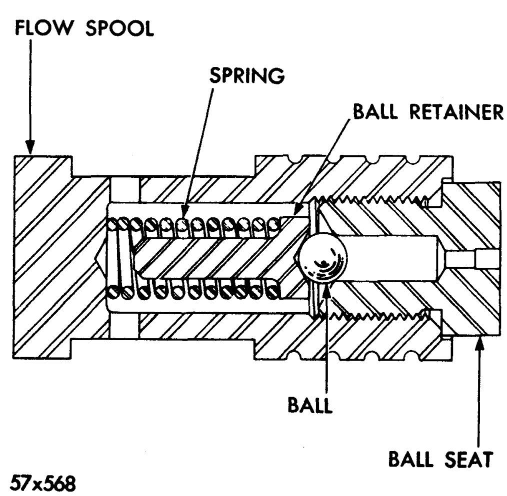

Fig. 46—Flow Valve Spool

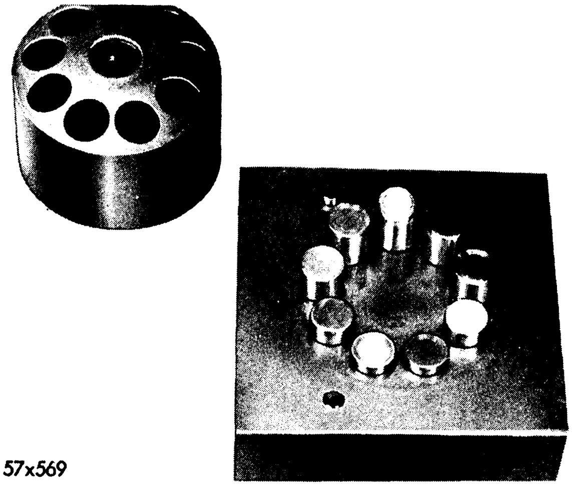

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Fig. 47—Drive Block Assembling Fixture

46). The valve must not leak at any pressure below 750 psi. and must open completely at 900 psi. Evidence of leakage will be seen at small holes in the side of flow spool. If relief valve leaks, disassemble by removing valve seat for dirt or nicks. Clean all valve parts and reassemble, replacing valve seat if nicked or damaged. Check the pressure again. If the pressure still falls below the minimum requirement, disassemble the valve again and replace the pressure relief spring or place a $\frac{1}{32}$ inch washer between spring and ball retainer. To correct pressures exceeding the maximum requirement, remove valve seat and place a $\frac{1}{32}$ inch washer between valve seat and the flow spool body.

Examine the pump body for signs of unusual wear or damage. Small scratches or burrs can be removed with fine emery paper. If body is scored or damaged, a new pump body should be used.

22. ASSEMBLY OF POWER STEERING PUMP

Clean parts thoroughly and assemble pump in a clean work place.

Press drive shaft and bearing sub-assembly into bearing cap. Check rotation of shaft to make certain shaft turns freely. Use a sleeve which bears on outer race of ball bearing, and press the sub-assembly in place.

CAUTION

Make certain that the shaft bearing and sub-assembly are properly aligned, otherwise the shaft may push sleeve bearing out of bearing cap or may scratch or mar the inside diameter of sleeve bearing.

Use an assembly fixture, Tool C-3602 as shown in Figure 47 and place driven cylinder block (without spline or serration) on assembly fixture. Lubricate (SAE 10W) and insert plunger spring, plunger, and seven sleeves in drive block, as shown in Figure 48. Place the pump body, square end down, over the cylinder drive block, and fixture locating pins; use a pointed probe to align the sleeves to a uniform spacing and install the two other remaining sleeves. Position the drive splined block with serration over the sleeves. Sighting thru the bores in the drive block for alignment, lower the cylinder block until it engages the two sleeves in the forward position. Again use

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Fig. 48—Assembling Sleeves in Drive Cylinder

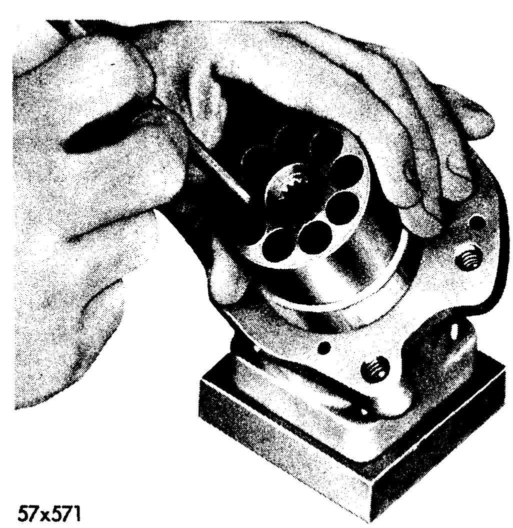

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Fig. 49—Installing Drive Block

pointed probe slightly smaller in diameter than the sleeve bores, Figure 49., correct the alignment of sleeves in the 5 and 7 o'clock position at the same time guiding cylinder block downward. Continue this procedure to the 4 and 8 o'clock positions until all of the sleeves are aligned and engaged; the block may then be pushed in all the way.

CAUTION

Do not force the cylinder block forcibly in place; proper alignment of the block and sleeves will allow the block to be pushed easily into place without excessive pressure. Tighten body to housing.

Remove body and cylinder block assembly from fixture, using care to see that blocks are not forced out of body by plunger spring. Assemble a new end cap gasket on pump body. Install end cap on body, tighten cap screws finger tight.

Insert a new "O" ring in counterbore at the flow valve liner in body. Install a new bearing cap gasket, assemble the bearing cap to the body.

NOTE: **It may be necessary to exert hand pressure on the bearing cap to get drive block down into body after bearing cap is seated.**

Tighten five cap screws finger tight. Grip end of pump shaft in a vise and rotate pump. The pump should rotate freely without binding. After making sure pump rotates freely tighten cap screws uniformly to 25 foot-pounds torque. Check pump again for rotation. Mount pump in a vise in a vertical position, gripping on the bearing hub. Install the flow valve spool with the 3/16 land down. Place flow valve spring on top of flow spool. Replace "O" ring on flow spring retainer fitting. Compress flow spring with fitting, and screw fitting into place. Tighten to 20 foot-pounds torque.

Install and align a new reservoir "O" ring on bearing cap. Lubricate "O" ring for ease in assembling reservoir. Align reservoir so that the indentation on back will mate with angular boss on suction end cap.

NOTE: **Reservoir alignment may be achieved by sighting thru the 9/32 inch hole in the back of the reservoir. Push the reservoir into place applying force around its outside diameter.**

Replace the copper gasket between the head of the 1/4 inch hex head cap screw and the back of reservoir. Tighten the 1/4 inch cap screw to 15 foot-pounds torque.

CAUTION

Do not attempt to align or pull the reservoir into place on the angular boss with the 1/4 inch cap screw.

Install shaft key, and pulley. Tighten pulley attaching bolt to 20 foot-pounds torque. Refill pump with Automatic Transmission Fluid Type "A" oil. Tighten fan belt as outlined in Accessory Belt Drives Section IV.

SLIPPER TYPE POWER STEERING PUMP

The slipper-type power steering oil pump is a positive displacement pump, bracket-mounted to the engine water pump housing, and belt-driven by the engine fan pulley.

Elimination of pulsation in oil flow is achieved by the cam surface of the pressed-in insert which evens out oil flow through the pump. Recirculation of oil from rotor outlet to rotor inlet results in a reduction of torque required to drive the pump and thus reduces the amount of engine horsepower necessary to drive the pump.

23. OPERATION

In operation, the slippers, shown in Figure 50, push the oil through the pump. Continuous slipper contact is assured by the spring loaded slippers against the eccentric inside diameter and by centrifugal force at higher speeds.

The amount of output flow from the pump

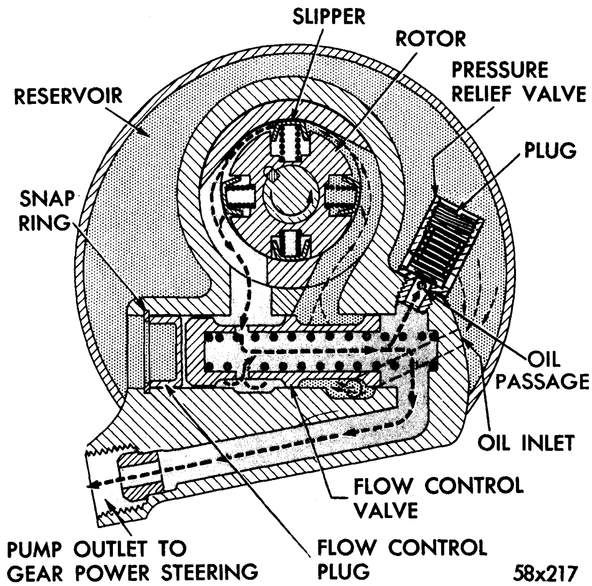

Fig. 50—Slipper Type Power Steering Pump

is limited by the flow control valve. As oil flows from the rotor outlet, it passes through orifices in the flow control valve on its way to the pump outlet and the power steering gear. Flow through the orifice causes a pressure differential to exist across the valve from the closed end to the open end. The higher pressure oil outside the valve is exposed to the left end of the valve. The difference in pressure forces the flow control valve to the right a sufficient amount to cause the center valve land to expose the inlet port allowing recirculation of oil from the rotor outlet, back to the rotor inlet. This action takes place when oil flow reaches approximately two gallons per minute.

Maximum oil pressure in the unit is limited to 850-950 psi. by the pressure relief valve. When pressure in the unit reaches this amount, it overcomes the force of the spring on the relief valve, forcing the valve plunger off its seat and allowing the oil to flow through the opening around the plunger. Openings in the pressure relief valve body return the oil to the reservoir.

a. Removal

Relieve tension and remove fan belt. Place a suitable container under the pump. Disconnect the pressure and return hoses, cap the hoses and keep the ends high to prevent loss of fluid in the power steering unit.

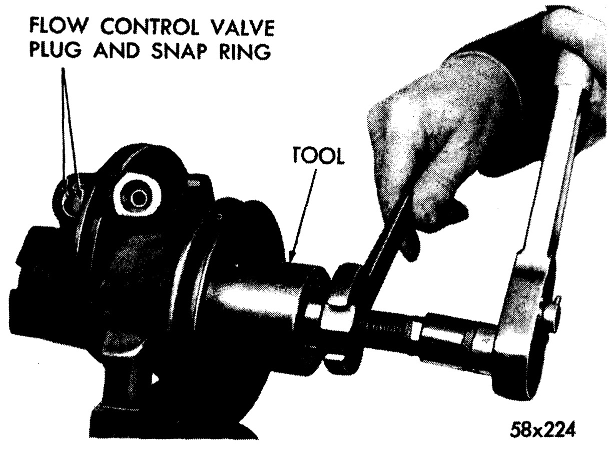

Fig. 51—Removing Pump Pulley

Remove the screws attaching the pump brackets to the water pump housing.

Clean all exterior surfaces of the pump before starting disassembly.

b. Disassembly

Remove filler cap and dipstick assembly. Drain reservoir and pump. Remove the front and rear brackets from the pump reservoir and pump. Carefully pry the reservoir from the pump. Reinstall the front bracket to the pump to be used as a holding fixture.

CAUTION

Use spacer washers between pump body and bracket to make sure bolts do not bottom in pump housing.

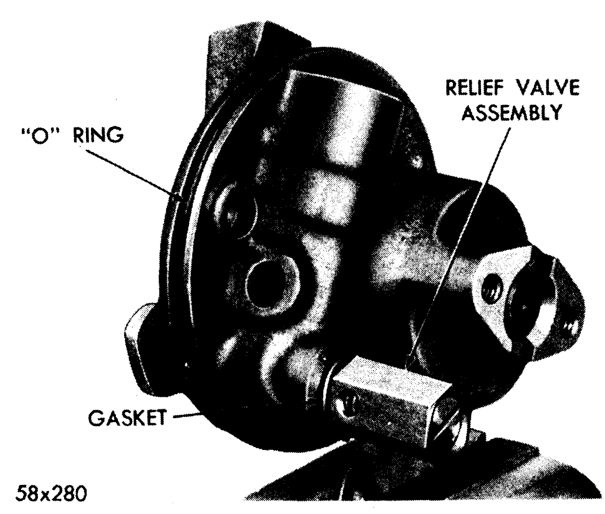

Fig. 52—Removing Relief Valve

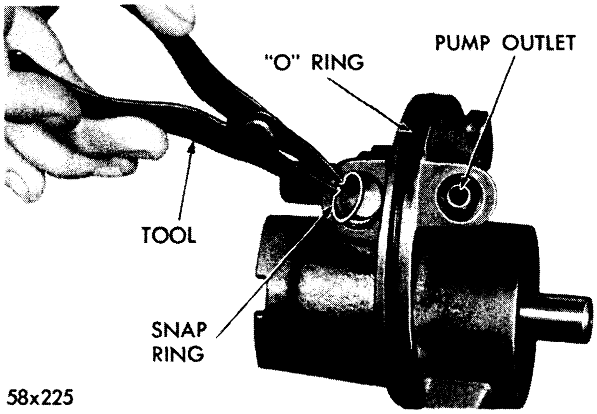

Fig. 53—Removing Flow Control Valve Plug Snap Ring

Install pulley removing Tool C-3615 (Fig. 51) by engaging the two half collars under the pulley hub flange (tapered ends toward pulley) and the flat ends of the collars engaging the collar locking the retainer of the puller screw. Install the collar sleeve to hold the collars and screw in position. While holding locknut, turn center screw to remove pulley.

NOTE: Make sure the two half collars fully engage the pulley hub and the collar locking retainer before applying pressure to the end of the pump shaft.

Remove the relief valve assembly and gasket (Fig. 52).

NOTE: Relief valve is serviced only as an assembly.

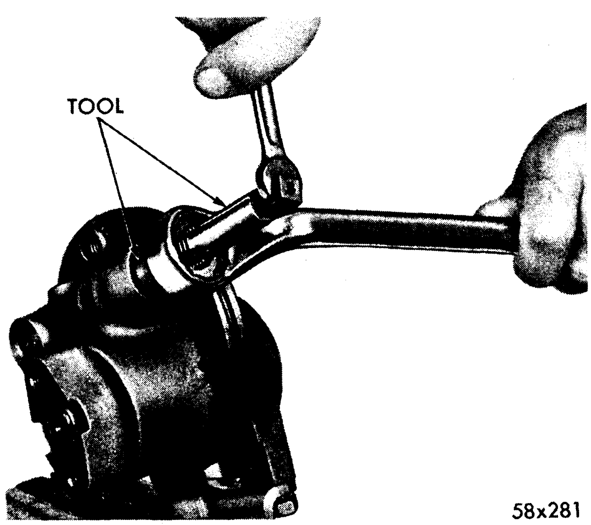

Fig. 54—Removing Flow Control Valve Plug with Tool C-3655

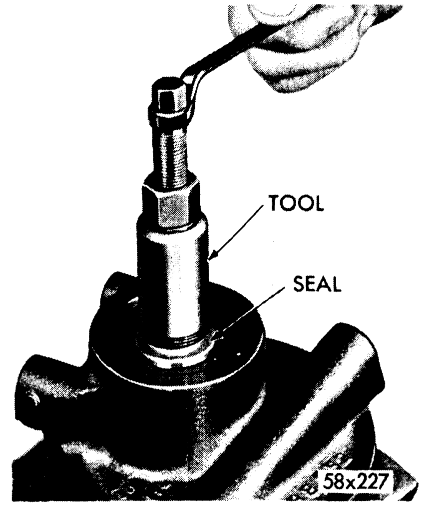

Fig. 55—Removing Pump Oil Seal

If there was evidence of a malfunction in the flow control valve, remove the flow control valve plug snap ring with snap ring pliers C-3229 (Fig. 53). Remove the flow control valve plug by threading a tap Tool C-3655 into the plug, as shown in Figure 54. With the tap securely threaded in plug, install tool spacer and nut over tap. Tightening nut while holding tap from turning will force the plug from the housing bore.

CAUTION

The flow control valve is spring-loaded and care should be used when removing the plug.

Thread the puller portion of Tool C-3642 into oil seal far enough to engage the metal portion

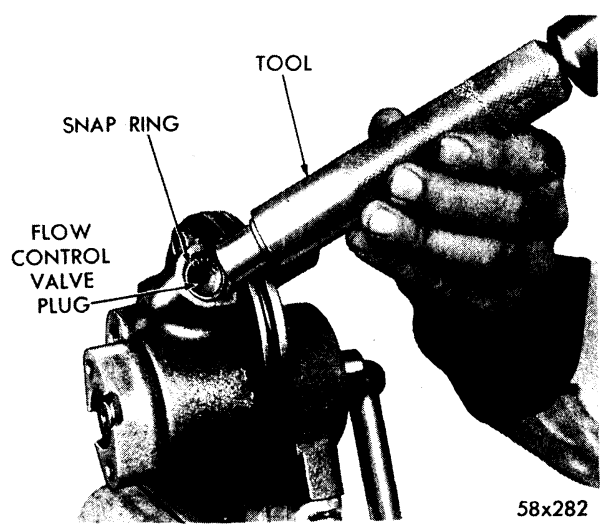

Fig. 56—Installing Flow Control Valve Plug

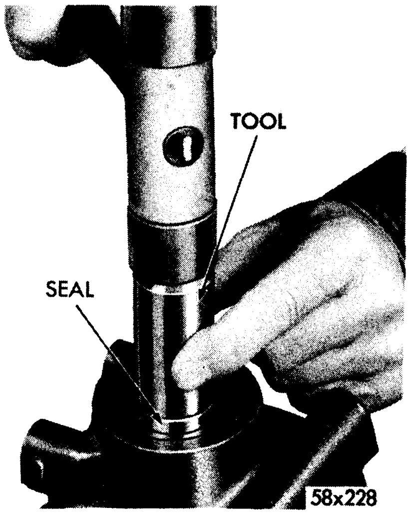

Fig. 57—Installing Pump Oil Seal

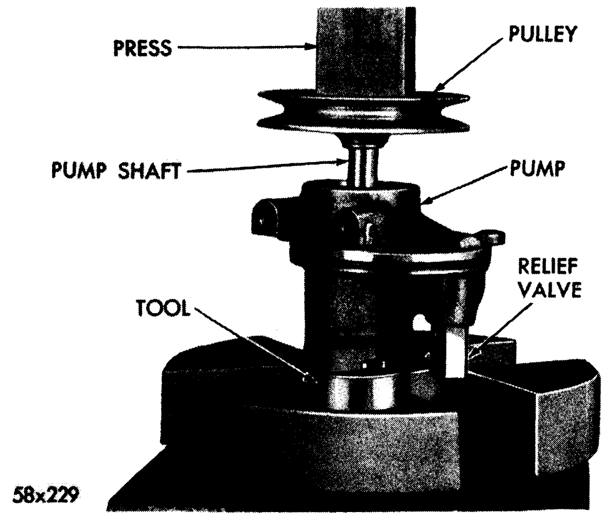

Fig. 58—Installing Pump Pulley

of the seal, (Fig. 55). Turning puller center screw while holding puller body will force the seal from the pump insert.

NOTE: Further disassembly of the pump is not recommended as component parts of the pump other than the reservoir, "O" ring and relief valve are not serviced separately.

24. CLEANING AND INSPECTION

Clean all parts thoroughly in a clean solvent, discard body to reservoir "O" ring and pump shaft oil seal. Check flow control valve and bore for burrs and scratches.

NOTE: Valve must operate freely in bore. Small scratches can be carefully removed with crocus cloth. Do not round off the square edges as they are vitally important to this type of valve.

The housing bore for the flow control valve should not be honed or machined. If the bore is scratched or worn, the pump should be replaced.

25. ASSEMBLY

Install flow control valve spring, valve and new valve plug and snap ring. Drive valve plug with Tool C-3233 (Fig. 56) far enough into bore to install snap ring, then drive snap ring and plug with Tool C-3233 until snap ring seats in its groove in housing bore. Install relief valve and gasket assembly.

Install oil seal with Tool C-3640. Lip of seal must face toward pump body and top of seal must be flush with front insert (Fig. 57).

Support pump body in holding fixture Tool C-3643 (Fig. 58) so that the pressure will be absorbed by the lower end of the pump shaft. Install pulley with a heavy duty arbor press. Pulley hub must be flush with end of shaft.

CAUTION

Pump must be supported in a manner in which all pressing force will be applied to the shaft only, otherwise pump body and rotor will be damaged.

Lubricate large "O" ring and install in outer groove in pump body. Install reservoir gasket, reservoir and reservoir attaching screws. Tighten screws to 10 foot-pounds torque. Install pump brackets.

26. INSTALLATION

Position pump on engine and install and tighten attaching bolts securely. Connect the pressure and return hoses. Tighten the drive belt as outlined under "Accessory Belt Drives", Section IV.

Fill reservoir to the full mark with Automatic Transmission Fluid Type "A".

SERVICE DIAGNOSIS (MANUAL)

27. EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL

a. Steering gear adjusted too loosely or badly worn.

b. Steering linkage loose or worn.

c. Front Wheel bearings improperly adjusted.

d. Steering gear arm loose on steering gear shaft. Check damage to roller shaft and steering gear arm.

e. Steering gear housing attaching bolts loose.

f. Steering arms loose on anchor bolts.

28. HARD STEERING

a. Low or uneven tire pressure.

b. Insufficient lubricant in the steering gear housing.

c. Steering gear adjusted too tightly.

d. Front wheels out of line.

e. Steering column out of line.

CONSTANT CONTROL FULL TIME POWER STEERING

29. HARD STEERING

a. Tires not properly inflated.

b. Low oil level (usually accompanied by pump noise).

c. Loose pump belt.

d. Oil on pump belts.

e. Steering linkage needs lubrication.

f. Power steering pump output low.

g. Steering gear malfunction.

1) Cross shaft adjustment too tight.

2) Pressure control valve stuck in closed position.

3) External oil leakage at the following points:

Lower sector shaft oil seal. Sector shaft adjusting screw seal. Sector shaft cover "O" ring seal. Valve housing-to-gear housing "O" rings.

4) Defective or damaged valve lever. If pressure gauge will build up to 850 to 950 psi., check the following points:

Defective or damaged gear shaft bearings.

Dirt or chips in steering gear.

Damaged column support worm shaft bearings.

Damaged thrust bearings or excessive preload adjustment.

Rough, hard to turn worm and piston assembly.

5) Excessive internal leakage. If pressure gauge will not build up to 850 to 950 psi., check the following points:

Cylinder head "O" rings.

Cylinder head reaction seal.

Cylinder head worm shaft oil seal assembly.

Column support-to-ferrule "O" ring seal.

Column support reaction seal.

Cylinder head "O" rings.

30. POOR RECOVERY FROM TURNS

a. Tires not properly inflated.

b. Steering linkage binding.

c. Improper wheel alignment.

d. Damaged or defective steering tube bearing.

e. Steering wheel column jacket and steering unit not properly aligned.

f. Steering gear malfunctions.

1) Improper cross shaft mesh adjustment.
2) Pressure control valve piston stuck in open position.
3) If car is self-steering or leads to either side, see "Self-Steering" or "Leads to Either Side."
4) Column support spanner nut loose.
5) Defective or damaged valve lever.
6) Improper worm thrust bearing adjustment.
7) Burrs or nicks in reaction ring grooves in cylinder head or column support.
8) Defective or damaged cylinder head worm shaft seal ring.
9) Dirt or chips in steering gear unit.
10) Rough or catchy worm and piston assembly.

31. SELF-STEERING OR LEADS TO EITHER SIDE

a. Tires not properly inflated.

b. Improper wheel alignment.

c. Steering wheel off center when car is traveling straight ahead.

d. Valve body out of adjustment.

Steering to the left—Move steering valve housing down on steering housing.

Steering to the right—Move steering valve housing up on steering housing.

e. Valve lever damaged.

f. Column support spanner nut loose.

32. TEMPORARY INCREASE IN EFFORT WHEN TURNING STEERING WHEEL TO RIGHT OR LEFT

a. Low oil level.

b. Loose pump belt.

c. Oil on pump belts.

d. Binding steering linkage.

e. Engine idle to slow.

f. Defective power steering pump.

g. Air in system. (Work steering wheel from right to left until air is expelled).

h. Gear Malfunction.

1) External leakage. See Paragraph 29, (g).
2) Improper cross shaft adjustment.
3) Excessive internal leakage. See Paragraph 29, (5).

33. EXCESSIVE STEERING WHEEL FREE-PLAY

a. Improper cross shaft adjustment.

b. Column support spanner nut loose.

c. Improper worm thrust bearing adjustment.

34. LACK OF ASSISTANCE—One Direction

Oil leaking past worm shaft cast iron oil seal ring or ferrule "O" ring.

Both Directions

a. Broken "D" ring on worm piston.

b. Piston end plug loose.

c. Reaction seal missing.

d. Pump belt slipping.

e. Pump output low.

35. NOISES

a. Buzzing noise in neutral, stop when steering wheel is turned—sticking pressure control valve.

b. Noisy power pump.

c. Damaged hydraulic lines.

d. Pressure control valve sticking.

e. Improper sector shaft mesh adjustment.

f. Air in system.

SLEEVE TYPE POWER STEERING PUMP

36. PUMP NOT PRIMING

a. Weak or broken plunger spring (compressed to a height of $^{61}/_{64}$ inch, the spring should exert a force of 29.7 to 36.3 pounds when compressed).

b. Flow valve stuck in open position. Check for dirt or burrs on flow spool or in valve liner.

37. REDUCED OR NO FLOW

a. Flow valve stuck in open position—check for dirt or burrs on flow spool or in valve liner.

b. Relief valve leaking—check for dirt or nicks on relief valve seat.

c. Weak or broken relief valve spring—when compressed to a height of $^{35}/_{64}$ inch, the spring should exert a force of 12.5 to 14 pounds when compressed.

d. Flow valve spring retainer loose, torque to mximum specifications.

e. Cap screws on either end of pump loose—torque to indicated specifications.

f. Weak or broken flow valve spring—when compressed to a height of 1½ inch, the spring should exert a force of 11.25 to 13.75 pounds when compressed.

38. LOW SHUT-OFF OR RELIEF PRESSURE

a. Weak or broken relief valve spring—replace.

b. Leak in relief valve—check for dirt or nicks on relief valve seat.

c. Flow valve stuck in open position—check for dirt or burrs on flow spool or in flow valve liner.

d. Cap screws on either end of pump loose—torque to indicated specifictions.

39. PUMP NOISE

a. Check oil level in reservoir—oil level should be up to mark on filler neck when pump is at 175° F.

b. Air in steering system—check all connections to make certain that they are tight.

c. Discharge and return line hoses—the hoses must not touch any part of the body or frame except where they are attached to the pump or steering column.

d. Loose pulley.

e. Water in oil.

40. HARD OR JERKY STEERING TOWARD END OF FULL LEFT OR RIGHT TURN

Loose drive belt—tighten drive belts to specified torque.

41. OIL LEVEL IN THE RESERVOIR

The following precautions should be observed for best performance of the sleeve-type power steering pump.

The oil level in reservoir will vary according to the operating temperature. The normal operating temperature of the pump is approximately 175° F. At this temperature, the oil should be up to the oil level mark on the filler neck. At 70° F. the oil will be approximately 3¼ inches from top of the filler neck.

NOTE: The oil level should never be allowed to fall below the baffle in the reservoir.

Automatic Transmission Fluid Type "A" is used in the steering system; however, S.A.E. 10W may be used to bring the oil level to the proper place if the level is low. If the steering system is drained, it should be filled with transmission fluid. The pump must be full before the engine is started. After starting the engine, add sufficient oil to make-up for the pump consumption to bring oil up to operating level.

42. BELT TENSION

The belt tension may be checked by applying torque wrench to the bolt which holds the pulley in place. Turning in the direction which will tighten the bolt, the torque should be 20 foot-pounds.

SLIPPER TYPE POWER STEERING PUMP

43. LEAKS

a. Pressure and return hose connections and fittings.

b. Reservoir to-pump-body "O" ring or mounting screws.

c. Drive shaft oil seal.

44. NOISE

a. Improper oil level.

b. Reservoir air vent plugged.

c. Air in system.

d. Dirt in pump.

e. Pump bushings, shaft, slippers, rotor worn, or damaged.

45. LOW OIL PUMP PRESSURE

a. Pump drive belt or pulley loose.

b. Low oil level in reservoir.

c. Pressure relief valve spring weak, or valve stuck in open position.

d. Flow control valve stuck or a broken flow control valve spring.

e. Worn pump rotor, slippers or broken and distorted springs.

Section XI

TRANSMISSION TORQUEFLITE

CONTENTS

Section XI

TRANSMISSION
TORQUEFLITE

DATA AND SPECIFICATIONS

MODELS	LC-1, LC-2, LC-3, LY-1
Type	Automatic Three Speed with Torque Converter
Oil Capacity of Transmission and Torque Converter	Refer to Lubrication Section of this manual
Lubrication	Pump (Rotor Type)
Number of Rear Clutch Plates—Discs (each)	5*
Number of Front Clutch Plates	3
Number of Front Clutch Discs	4
GEAR RATIOS	
1—Low	2.45 to 1
2—Second	1.45 to 1
D—Drive	1.00 to 1
R—Reverse	2.20 to 1
N—Neutral	——
FRONT—REAR PUMPS	
Type	Gear (Rotary)
End Clearance (Front Pump)	.001 to .0025 inch
End Clearance (Rear Pump)	.001 to .0025 inch
THRUST WASHERS	
Input Shaft	.115 to .117 inch (Natural) .097 to .099 inch (Black) .078 to .080 inch (Red) .059 to .061 inch (Orange)
Front Clutch and Sun Gear	.062 to .064 inch
Output Shaft	.062 to .064 inch
SNAP RINGS	
Kickdown Annulus Gear	.060 to .062 inch .064 to .066 inch
Rear Clutch	.060 to .062 inch
Low-Reverse Planet Pinion Carrier	.060 to .062 inch .064 to .066 inch .068 to .070 inch
Front Clutch	.060 to .062 inch

*4 on LC-1, LC-2

TORQUE CONVERTER

DATA AND SPECIFICATIONS

Torque Converter Model	Application	Ratio	Size (In.)	Cooling	Stud Size (In.)	Stud Nut Size (In.)
A-522	LY-1 LC-3 LC-3S	2.3	12½	Water—Heat Exchanger	7/16-20 (AM. NAT. THD.) NUT END	7/16-20 UNF (5/8 across flats)
A-521-2*	LC-1 LC-2	2.2	11¾		7/16-14 (AM. NAT. THD.) STUD END	

*Supersedes A-363

TIGHTENING REFERENCE TORQUEFLITE TRANSMISSION

Part Name	Foot-Pounds Torque
Accumulator Cover Screws	14—16
Band Lever Shaft Plug	30—35
Crossmember to Frame Bolts	50—55
Engine Rear Support Insulator Nuts	30—35
Extension to Transmission Case Screws	25—30
Filler Tube Nut	35—40
Front Oil Pump Housing to Transmission Case Screws	14—16
Oil Strainer Elbow Screws	14—16
Front Universal Joint Nut	33—37
Governor Body to Governor Support Screws	6—8
Governor Locating Screw	5—7
Governor Oil Pressure Take-Off Plug	10—12
Intermediate Support Locating Screws	25—30
Kickdown Band Adjusting Screw Nut	30—35
Low-Reverse Band Adjusting Screw Nut	35—40
Manual Valve Control Cable Housing Screws	14—16
Neutral Starter Switch	15—20
Oil Pan Screws	12—17
Oil Pressure Line Take-Off	10—12
Output Shaft Support to Transmission Case Screw	25—30
Transmission Case to Reaction Shaft Screws	30—35

TIGHTENING REFERENCE (Cont'd)

TORQUEFLITE TRANSMISSION

Part Name	Foot-Pounds Torque
Propeller Shaft Flange Nut	175
Rear Oil Pump Housing to Support Screws	10–12
Speedometer Pinion Sleeve Assembly	40–45
Transfer Plate to Transmission Case Screw	14–16
Torque Converter Control Valve Retainer	35–40
Torque Converter Drain Plug	10–12
Torque Converter Housing to Adaptor Screws	25–30
Torque Converter Oil Cooler Line Fitting	10–12
Transmission Case to Torque Converter Housing Screws	45–50
Transmission Regulator Valve Retainer	45–50
Valve Bodies to Transfer Valve Retainer	50–60*

*(Inch Pounds)

TORQUE CONVERTER TIGHTENING REFERENCE

Item	Thread Size (Inches)	Foot-Pounds Torque
Block to Threaded Aluminum Plate Bolt	3/8–16	30
Block to Threaded Aluminum Plate Bolt	7/16–14	45
Converter Housing and Plate to Threaded Block Bolt	3/8–16	30
Converter Housing and Plate to Threaded Block Bolt	7/16–14	50
Converter Housing to Aluminum Plate Bolt	3/8–16	30
Plate to Threaded Block Bolt	3/8–16	30
Plate to Threaded Converter Housing Bolt	3/8–16	30
Crankshaft Stud Nut	7/16–20	55
Converter Drain Plug	1/8 N.P.T.	10
Housing Dust Cover Bolt	5/16–18	15
Housing Dust Cover Bolt	1/4–20	10
Drive Flange Stud	7/16–14	35

SPECIAL TOOLS

TORQUEFLITE TRANSMISSION

C-452	Puller
C-484	Pliers
C-589	Wrench
C-748	Puller
C-760	Pliers
C-811	Wrench
C-3203A	Jack (includes Adaptor C-3502)
C-3204	Driver
C-3205	Driver
C-3275	Driver
C-3276	Pilots
C-3278	Driver
C-3280	Stand
C-3281	Wrench
C-3283	Pilots
C-3288	Pilots
C-3292	Gauge
C-3293	Gauge
C-3301	Pliers
C-3335	Straight edge
C-3339	Set-Dial Indicator
C-3380	Wrench (Torque)
C-3461	Fixture
C-3487	Support
C-3527	Gauge—Overrunning Clutch Assembly
C-3528	Stand—(pair) Valve Body Holding
C-3529	Fixture—Compressing Servo Reverse and Kickdown Spring (supersedes C-3289 which can be converted to C-3529)
C-3531	Tool—Remover and Installer Reaction Shaft (supersedes C-3297) (If C-3297 is available, use C-3535 Adapters to convert to C-3531)
C-3533	Compressor
DD-1150	Tachometer

SPECIAL TOOLS

TORQUE CONVERTER

Tool Number	Description
C-589	Wrench—5/8" hex nut
C-763	Switch—remote control
C-771	Wrench—flywheel turning*
C-3339	Set-Dial Indicator
C-3487	Fixture—engine support
C-3613	Attachment—dial indicator

*May be used in lieu of Switch C-763.

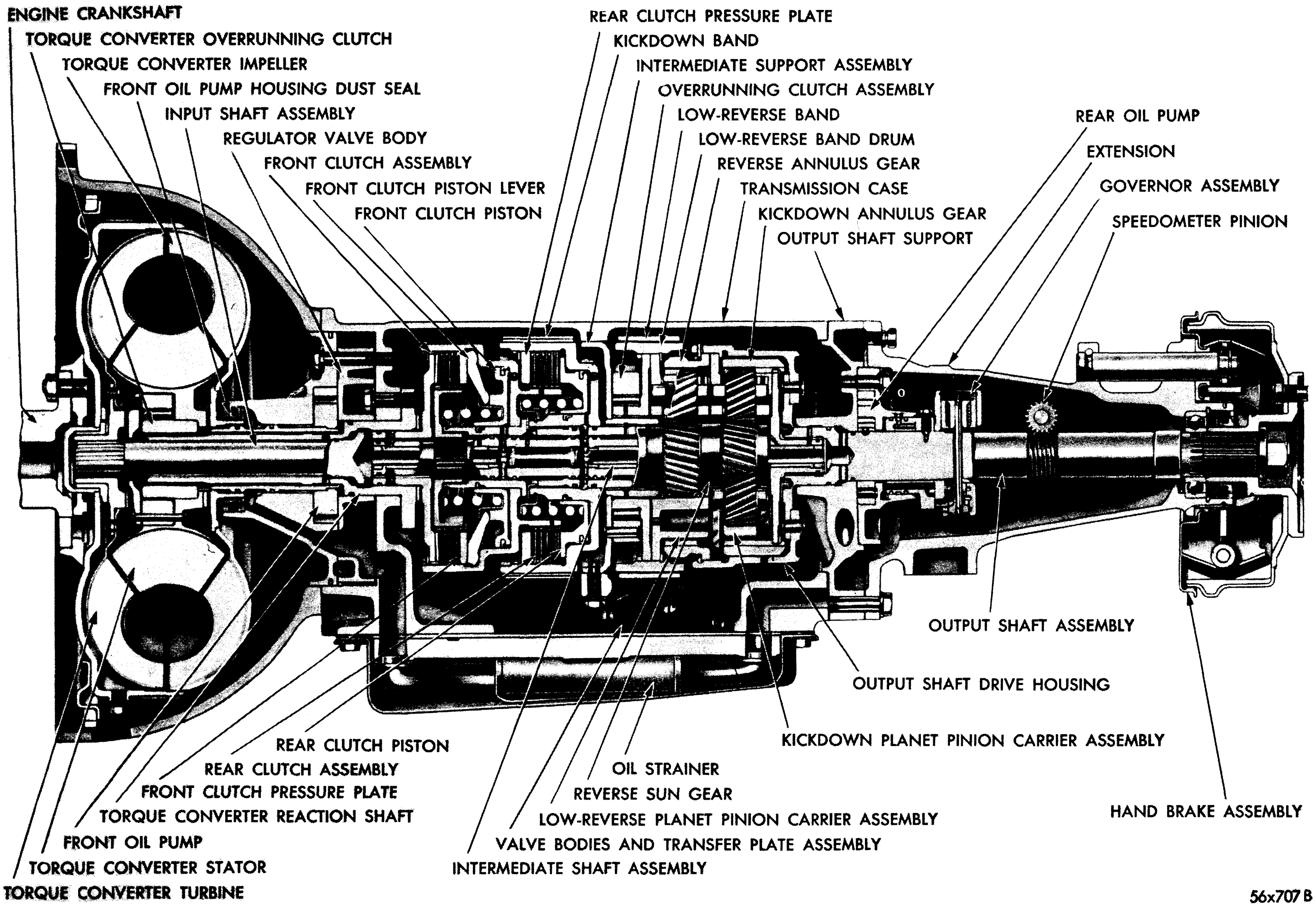

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Fig. 1—Typical TorqueFlite Transmission and Torque Converter—Air Cooled Converter Shown (Sectional View)

Section XI

TORQUEFLITE TRANSMISSION

1. DESCRIPTION OF TRANSMISSION

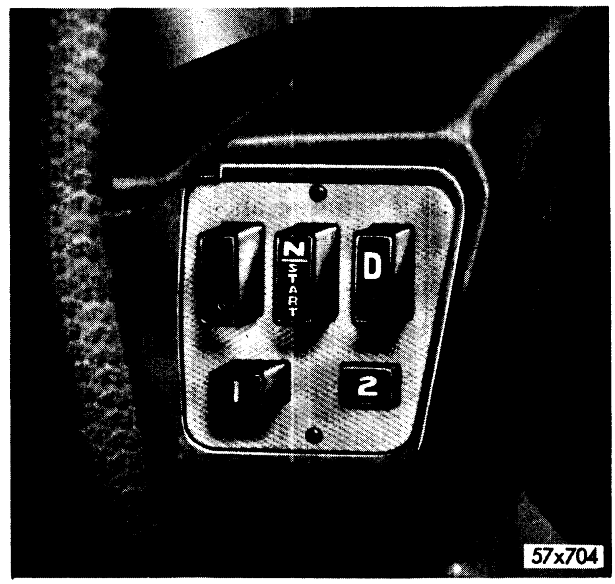
The transmission (Fig. 1) combines a torque converter and an automatic three-speed planetary gear box. The torque converter extends torque mutiplication over a wide range of engine speeds. The transmission consists of two multiple disc clutches, an overrunning clutch, two bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. With the front or forward clutch engaged and low gear reaction, transferred through the transmission overrunning clutch assembly, a low ratio of 2.45 to 1 is obtained. Engagement of the kickdown or second speed band will shift the transmission to second speed ratio (1.45 to 1). Disengagement of the kickdown band and engagement of the rear or direct clutch locks the gear set so that a direct drive ratio of 1 to 1 is obtained. Since the overrunning clutch can transmit torque only on the drive side, it is necessary to apply the low and reverse band when using low for engine braking. Reverse ratio (2.20 to 1) is obtained by application of the rear clutch and rear band. In the drive range, the transmission shifts through all three gear ratios automatically. Shift points are determined by throttle opening and car speed. If additional acceleration is desired while in drive range, the transmission will downshift (depending on vehicle speed) to second gear or breakaway automatically when the accelerator pedal is completely depressed.

The intermediate or second position range is used to operate the transmission in the first two gears only. This range is suitable for heavy city traffic where the driver may desire part throttle second gear operation for more precise speed control. It may also be used on long down grades where additional engine braking is needed. A low or first position range is also available to keep the transmission in first gear only. This position provides added handling ease in mountain driving and exceptional pulling qualities in sand and snow.

2. GEARSHIFT CONTROL UNIT

The transmission is operated by a gearshift control unit consisting of five push buttons, identified by R (reverse), N (neutral), D (drive), 2 (second) and 1 (low). Refer to Figure 2.

The control unit is located on the instrument



Top View)

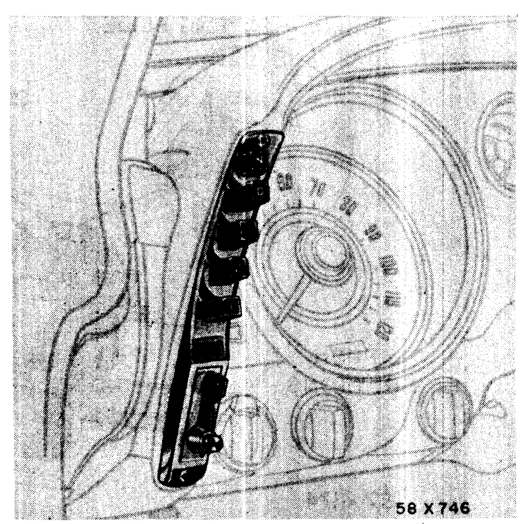


Fig. 2—Arrangement of Push Buttons (Bottom View—Imperial Models)

panel to the left of the steering column. Range selection is made by pushing the proper button.

Should the R (reverse) button be pushed in, above approximately 15 M.P.H., it will move the manual control lever to the neutral position and when car speed drops below 15 M.P.H. it will again be necessary to reposition the R (reverse) push button.

Mechanical connection between the gearshift control housing and the transmission manual control valve is obtained through the use of a single push-pull cable, as shown in Figure 3. One end of the wire cable is secured to the cable actuator in the gearshift control housing, while the other end enters the adapter housing on the transmission case to engage the manual control valve lever assembly.

Operation

When a button is pushed in, the slide contacts the cable actuator, causing it to pivot. Movement of the cable actuator about its axis moves the attached wire cable.

When the button nears its limit of travel, a lock spring on the push button slide engages the actuator shaft. This action allows the lock spring to hold the button in the engaged position. (Refer to Fig. 3).

When the operator pushes another button, to select a different range, the top or bottom portion (depending on which button was pushed) of the slide contacts the actuator, thereby releasing the first button from the restraint of the lock spring. The first button is then free to return (under spring force) to its original position.

A back-up light switch (when so equipped) is incorporated in the gearshift control housing and is operated by the R (reverse) push button slide. A motor starting switch is also incorporated into the gearshift control housing. (Refer to Fig. 3). The car is started by turning the ignition switch to "ON" and pressing the N (neutral) push button beyond the neutral position to engage the motor starting switch.

Should the car stall, it is restarted by fully depressing the N (neutral) push button.

A vacuum switch, on the engine, prevents

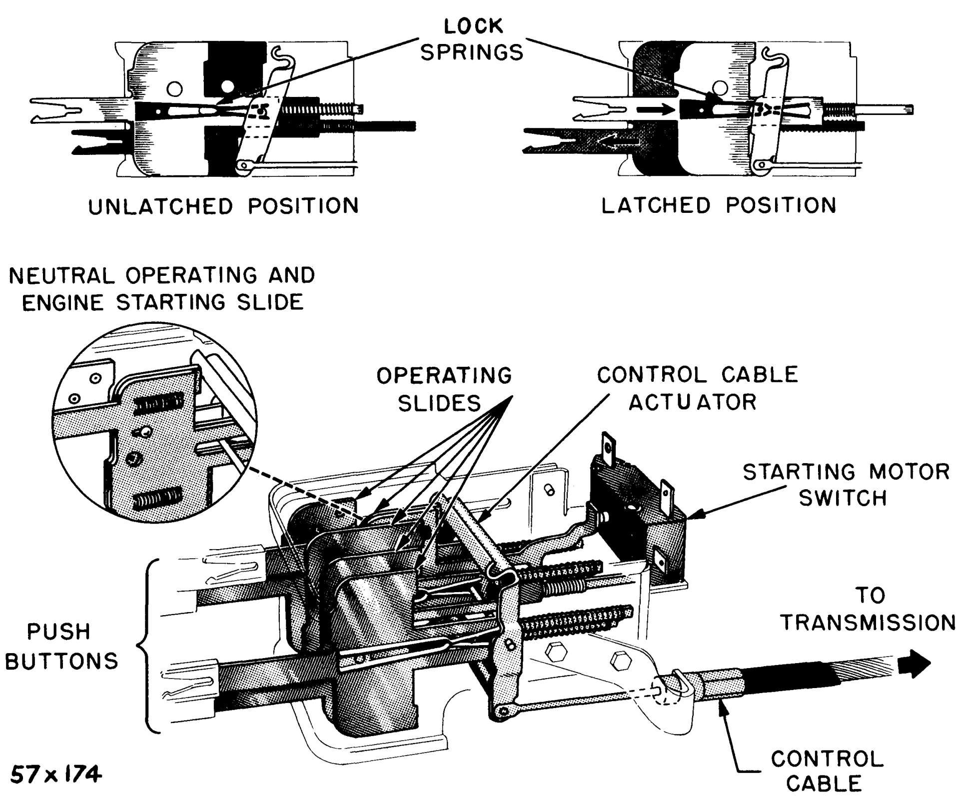


Fig. 3—Gearshift Control Unit (Operational Sketch)

the starter from being operated should the N (neutral) push button be pushed in while the engine is running.

The starting motor is also wired so that the engine cannot be started unless the neutral starting switch (at the transmission) is closed. Engaging the N (neutral) button closes the starting motor circuit at the neutral starting switch (Fig. 22). The purpose of the neutral starting switch (on the transmission) is to prevent starting the engine while the transmission manual valve is in any position other than neutral, as a result of improper control cable adjustment.

3. OPERATING INSTRUCTIONS

a. Starting the Engine

(1) As a safety precaution, apply hand or foot brake.

(2) Turn igintion key to "ON" position. Depress accelerator slightly and push in the N (neutral) push button to limit of its travel.

(3) When engine starts, release pressure on N (neutral) push button.

(4) If engine fails to start, release pressure on N (neutral) push button momentarily before attempting to start engine again.

b. Push Starting

If the engine fails to start in the normal manner, it may be started by pushing. **Towing the car to start is not recommended due to the sudden surge of power when the engine starts.**

Turn the ignition switch on, then push the 1 (low) button in and depress the accelerator pedal slightly. After the vehicle has been pushed to a speed of 15 mph. (approximately), the transmission will drive the engine.

c. How to Drive the Car

NOTE: All speeds referred to in the following paragraphs are to be considered approximate because of variations in production tolerances.

(1) **When starting** in extremely cold weather, allow the engine and transmission to warm up while in N (neutral) position. If the engine is cold (engine on fast idle), apply the foot brake lightly to prevent a tendency of vehicle to creep when making a push button selection.

(2) **D (drive).** Almost all driving is done in the D (drive) position. The transmission in this push button position selects the proper ratio automatically for road, speed, and driving conditions.

A downshift to the breakaway position always occurs below 8 M.P.H. at closed throttle. If road conditions warrant, such as pulling on a steep hill under heavy load, the 3-2 downshift may occur under part throttle, otherwise the transmission normally downshifts from 3 to 1 except during a forced kickdown at speeds below 70 M.P.H., or the condition to be covered in the following paragraphs:

The driver may select a ratio which he feels more applicable to the particular condition such as in heavy traffic, icy roads, or descending a steep hill by using either the 1 or the 2 push buttons.

(3) **2 (second).** If the 2 button is pushed in, the transmission will start in breakaway or low ratio and upshift to 2nd gear normally. There will be no further upshift unless the car is driven to speeds above 75 M.P.H. at which time the transmission will upshift to direct. This protects against unnecessary high engine R.P.M. When the car speed drops below 70 M.P.H. the transmission again downshifts to second.

If the car is being driven above 70 M.P.H. in D (drive) and the 2 button is pushed in, the transmission will not downshift until car speed is below 70 M.P.H.

When car speed is reduced to 8 M.P.H. (with the 2 button in) the transmission downshifts to breakaway. Also, a kickdown may be made to breakaway when car speed is below 30 M.P.H.

(4) **1 (low).** If the 1 button is pushed in, the transmission remains in "Low" gear regardless of car speed.

If the 1 button is pushed in at car speeds above 30 M.P.H. (but below 70 M.P.H.) the transmission will downshift to second gear until car speed decreases below 30 M.P.H., at which time the transmission downshifts to low gear and stays there regardless of car speeds.

If the 1 button is pushed in at car speeds above 75 M.P.H. either in D (drive) or 2, the transmission stays in drive or high gear until car speed decreases below 70 M.P.H., when it downshifts to second gear. When speed de-

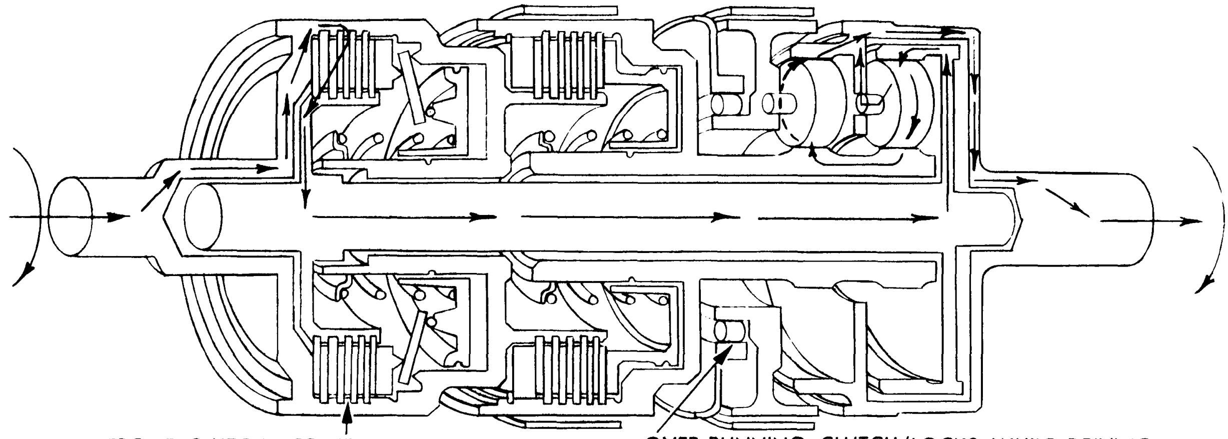


Fig. 4—Power Flow in D (Drive) Position—Breakaway

creases further to below 8 M.P.H., the transmission shifts to low and stays in low regardless of car speed.

(5) **Kickdown (forced downshift).** Below those speeds for the 3-2 and 3-1 kickdown limits shown in Shift Pattern Summary Chart (after the transmission has upshifted into direct or second gear), the transmission will automatically downshift to the next lowest gear when the accelerator is completely depressed; thereby giving maximum acceleration for passing or climbing steep grades. The transmission will automatically upshift to second if the accelerator is released or speeds shown in Shift Pattern Summary Chart (wide open throttle 1-2 upshift) are reached. In D (drive) range from second gear, the transmission will automatically upshift into direct if the accelerator is partially released or if speeds as shown in Shift Pattern Summary Chart (wide open throttle 2-3 upshift) are reached. If the vehicle is accelerated with the 2 (second) button engaged to wide open throttle upshift speed, an upshift to direct will occur thus eliminating over-speeding the engine in second gear.

(6) **R (reverse).** Stop the vehicle and with foot brake lightly applied, push the R (reverse) button in.

d. Mountain Driving

When driving in the mountains with either heavy loads or when pulling trailers, the 2 (second) or 1 (low) position should be selected on upgrades which require heavy throttle for

SHIFT PATTERN SUMMARY CHART

CONDITION	LC-1	LC-2	LC-3	LY-1	LY-1	LY-1
Closed Throttle 1-2 Upshift.....	8-12	8-12	9-13	8-13	9-14	8-11
Closed Throttle 2-3 Upshift.....	12-16	12-16	14-18	13-17	14-18	11-15
Wide Open Throttle 1-2 Upshift.....	29-45	30-46	32-50	31-48	33-51	27-42
Wide Open Throttle 2-3 Upshift.....	63-76	64-78	71-87	66-81	72-88	59-71
3-2 Kickdown Limit..................	55-69	56-70	62-78	58-75	63-79	51-64
3-1 Kickdown Limit..................	26-35	27-36	29-39	27-36	30-39	25-32
Closed Throttle Downshift............	7-11	7-11	8-12	7-11	8-13	6-10

NOTE: All shift speeds may vary somewhat due to production tolerances and rear axle ratios—which is not too important, however, the quality of the shifts is very important.

All shifts should be smooth, responsive, and with no noticeable engine runaway.

½ half mile or more. Lower ratios reduces the possibility of overheating the transmission under these conditions. (1) low position is for service operation or to obtain better control.

e. Transmission Inoperative

Tow the vehicle with a rear end pickup or remove the propeller shaft.

f. Transmission Operating Properly

The vehicle may be towed safely in N (neutral) at moderate speeds. For long distance towing (over 100 miles), the propeller shaft should be removed.

4. POWER FLOW IN THE TRANSMISSION

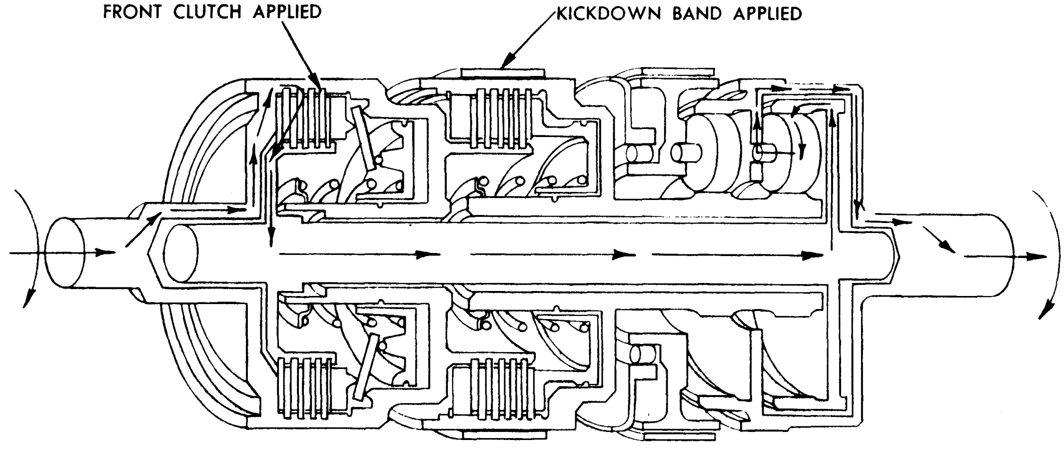
a. (Drive) Position Breakaway (See Fig. 4)

The power flow is from the converter turbine through the input shaft and front clutch retainer (one unit). The front clutch is applied and the drive continues through the clutch hub to the intermediate shaft and kickdown annulus gear (one unit). The kickdown annulus gear drives the kickdown planet pinion gears, rotating them in the same direction. The kickdown planet gears are meshed with the kickdown sun gear which in turn is integral with the reverse sun gear. Both sun gears are forced to rotate in a reverse direction by the reaction of the kickdown planet pinion carrier together with the reverse annulus gear, both of which are splined to the output shaft drive housing. The reverse planet pinion carrier is attached to and prevented from turning backward by an overrunning clutch and becomes stationary in forward drive (overruns on coast). Therefore, the reverse planet carrier pinions are forced to rotate in a forward direction and force the reverse annulus to rotate in the same direction transmitting the power flow to the output shaft with the resulting ratio of the kickdown and reverse planetary gear sets of 2.45 to 1.

b. (Drive) Position—2nd Speed and 2 (Second) Position—2nd Speed (See Fig. 5)

The power flow is from the torque converter turbine through the input shaft to the front clutch (which is applied).

From the front clutch through the intermediate shaft to the annulus gear of the kickdown (rear) planetary gear set. The kickdown band is applied which holds the sun gear stationary. The annulus gear drives the kickdown planet pinions which rotate in the same direction as the input and intermediate shafts. The kickdown planet pinions are meshed with the sun gear; therefore, they walk around this gear and exert force through the kickdown planet pinion shafts to rotate the kickdown planet pinion carrier. The carrier, which is splined to the output shaft drive housing, rotates at a slower speed than the annulus gear, thus providing a gear ratio of 1.45 to 1.



DRIVE POSITION—2ND ALSO 2ND SPEED IN 2ND POSITION 56x690

Fig. 5—Power Flow in D (Drive) Position—2nd Speed and 2 (Second) Position—2nd Speed

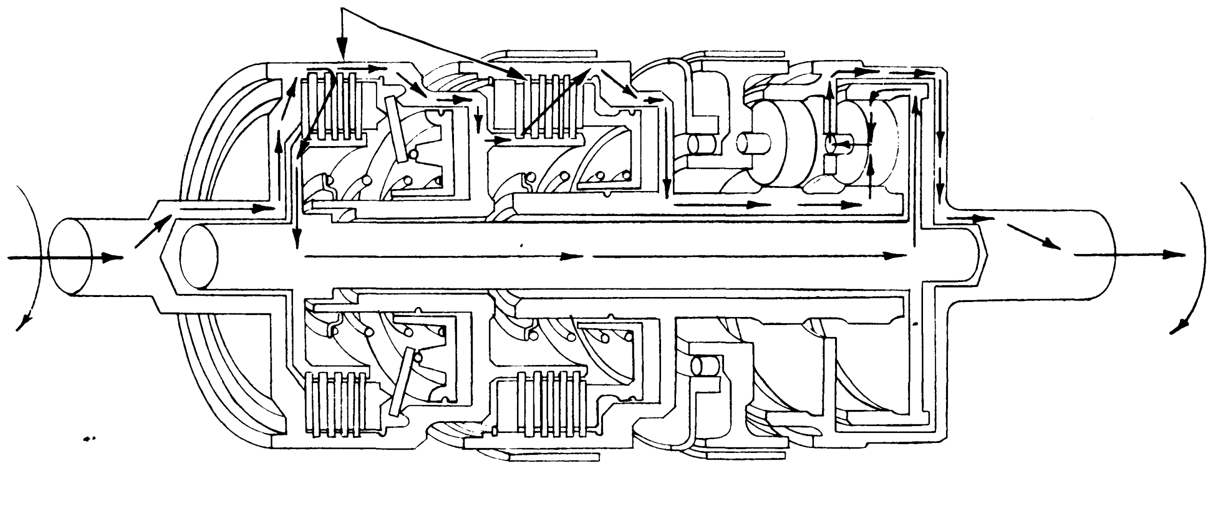


Fig. 6—Power Flow in D (Drive) Position—Direct

c. D (Drive) Position—Direct (See Fig. 6)

The power flow from the torque converter goes directly through the transmission because the planetary elements of the gear train are locked up by two mutiple disc clutches and both bands are released. The torque converter provides all of the torque multiplication.

Kickdown (Forced Downshift) in D (Drive) Position Below approx. 30 M.P.H. This will force the transmission to downshift and the power flow will be the same as D(drive) position (breakaway).

Kickdown (Forced Downshift) in D (Drive) Position at approx. 30 to 70 M.P.H. This will force the transmission to downshift and the power flow will be the same as D (drive) position 2nd speed.

d. 1 (Low) Position—Low Speed (See Fig. 7)

In 1 (low) position the power flow is the same as D (drive) position (breakaway) or 2 (second) position (breakaway) with one exception —the low-reverse band is applied, holding the reverse planet carrier to provide engine braking.

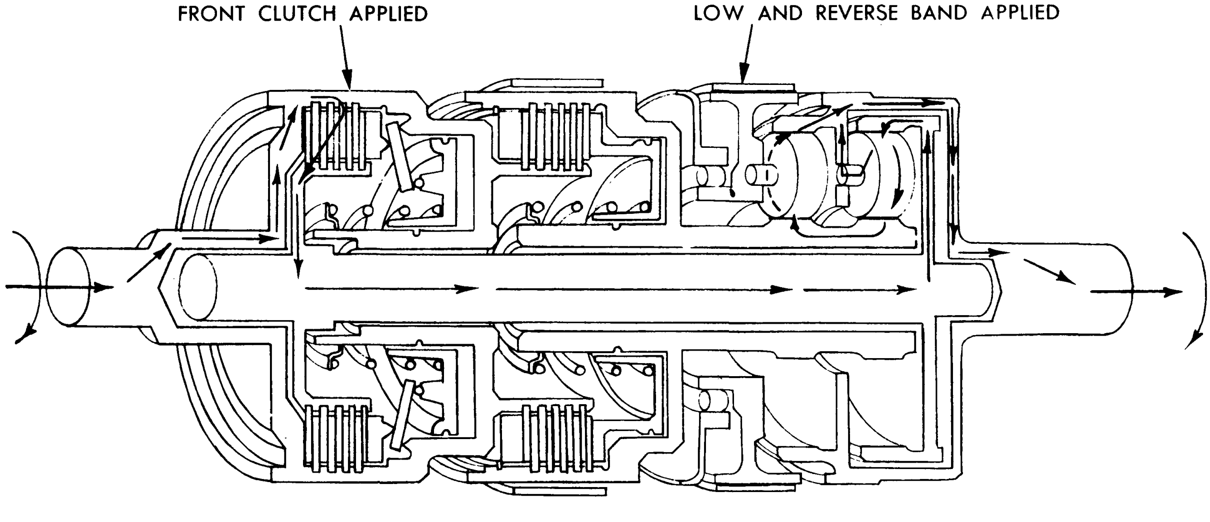


Fig. 7—Power Flow in I (Low) Position—Low Speed

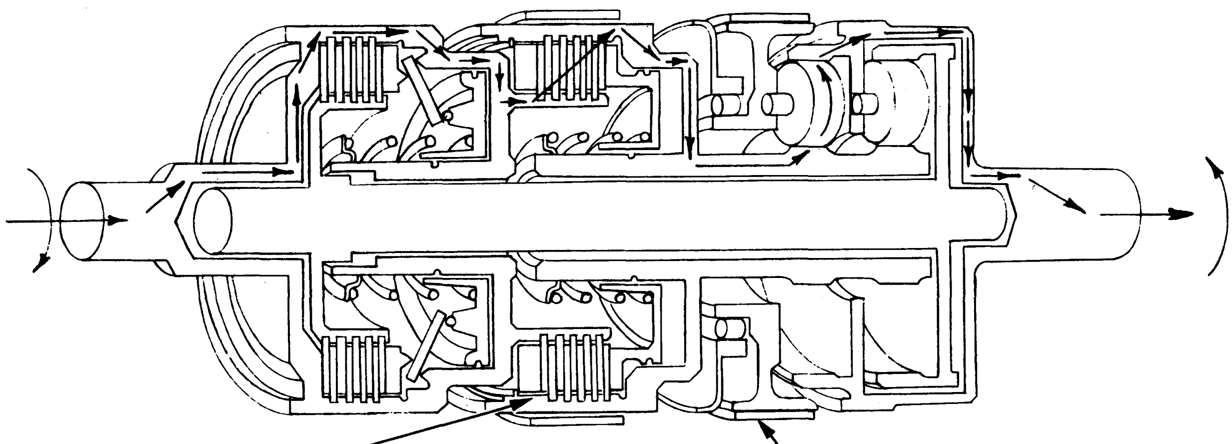


Fig. 8—Power Flow in R (Reverse) Position

e. R (Reverse) Position (See Fig. 8)

The rear clutch and the low-reverse band are applied. All other friction elements are released. The power flow is from the torque converter turbine through the input shaft to the rear clutch hub (part of the front clutch retainer). The rear clutch is splined to the reverse sun gear. The carrier of the reverse (front) planetary gear set is held stationary by the low-reverse band; therefore, the set acts as a simple reverse train through the reverse planet pinions to the reverse annulus (which is splined to the output shaft drive housing) and provides a reverse ratio of 2.20 to 1.

f. N (Neutral) Position

All friction elements are released. Hence, there is no drive connection between the engine and the rear wheels.

g. Power Flow Summary

The chart summarizes power flow conditions in the various ranges as regards to gear train elements involved and the ratios obtained.

BAND-CLUTCH APPLICATION CHART

Range	Ratio	Element Applied
D (Drive) position—(breakaway)	2.45	Front Clutch and Overrunning Clutch
D (Drive) position—second speed, 2 (Second) position—second speed	1.45	Front Clutch and Kickdown (Front) Band
D (Drive) position—direct	1.00	Front and Rear Clutches
R (Reverse) position	2.20	Rear Clutch and Low-Reverse (Rear) Band
1 (Low) position—low speed	2.45	Front Clutch and Low-Reverse (Rear) Band
N (Neutral)	—	No Elements Applied

THE HYDRAULIC CONTROL SYSTEM (REFER TO FIGS. 9 THROUGH 15)

The hydraulic control system must furnish oil pressure and route it at the proper time and pressure to the proper piston device for engaging the transmission in the desired gear. This system is composed of several parts whose functions are interrelated.

(Continued on Page 21)

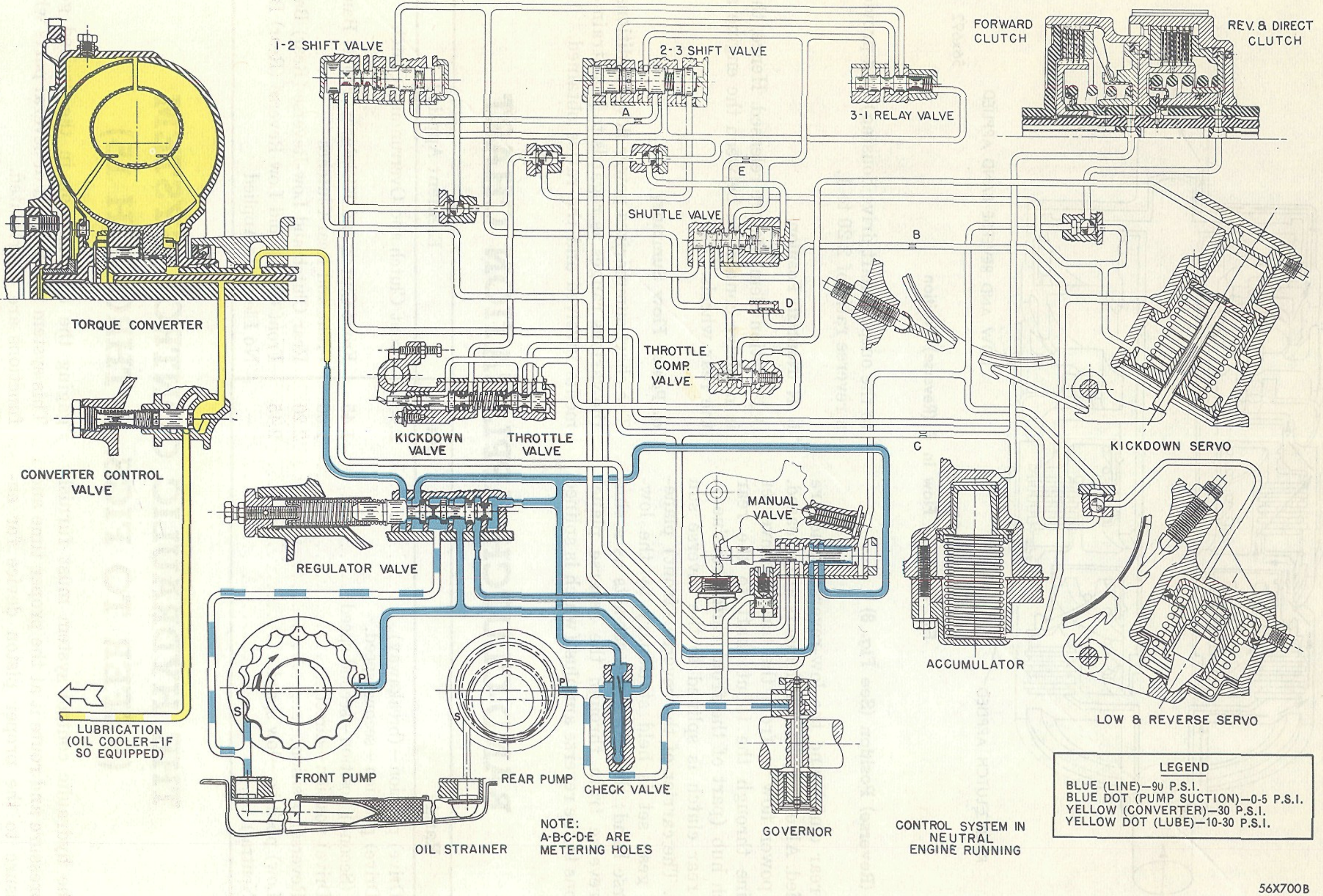


Fig. 9—Hydraulic Circuit—N (Neutral)

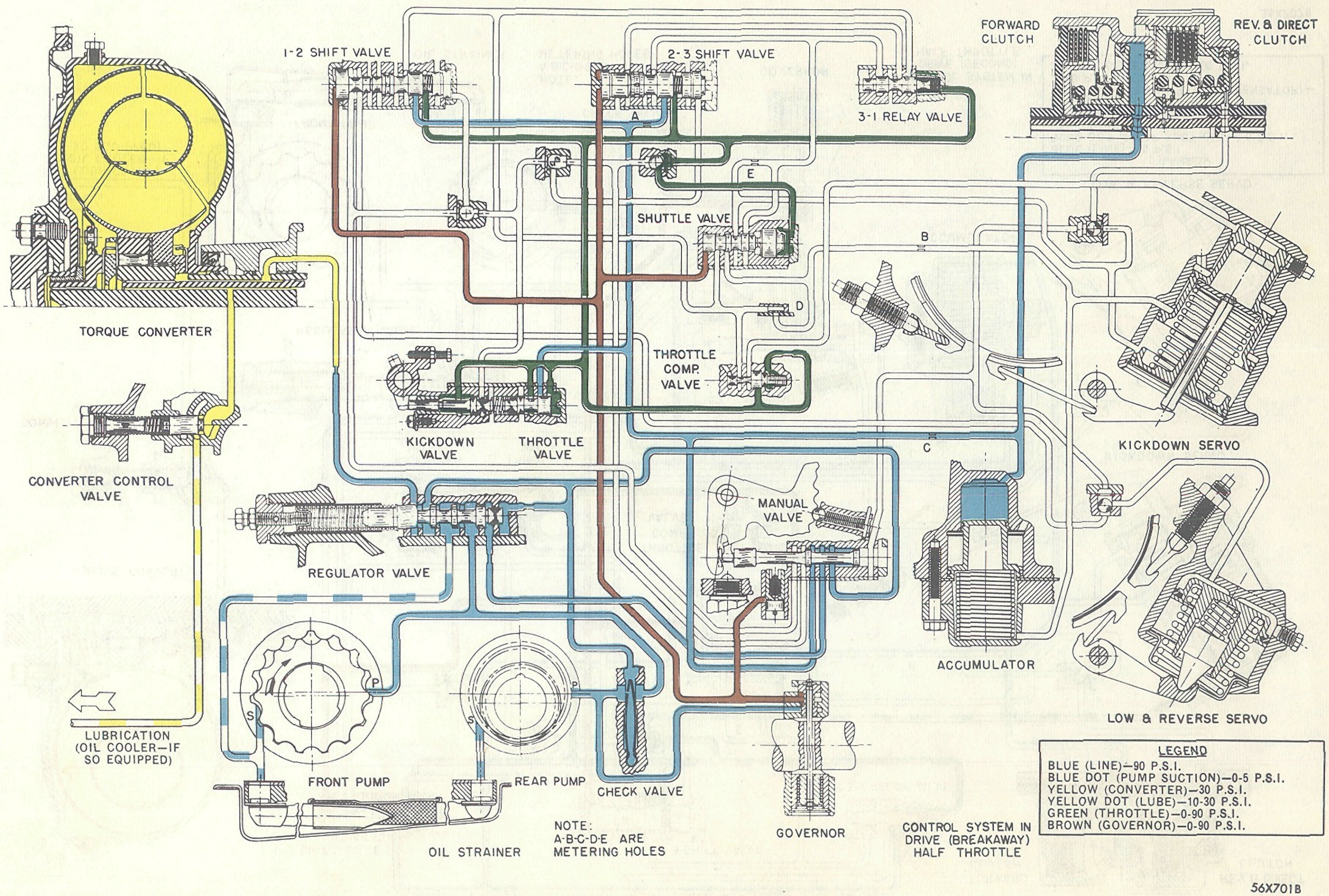


Fig. 10—Hydraulic Circuit—D (Drive)—Breakaway

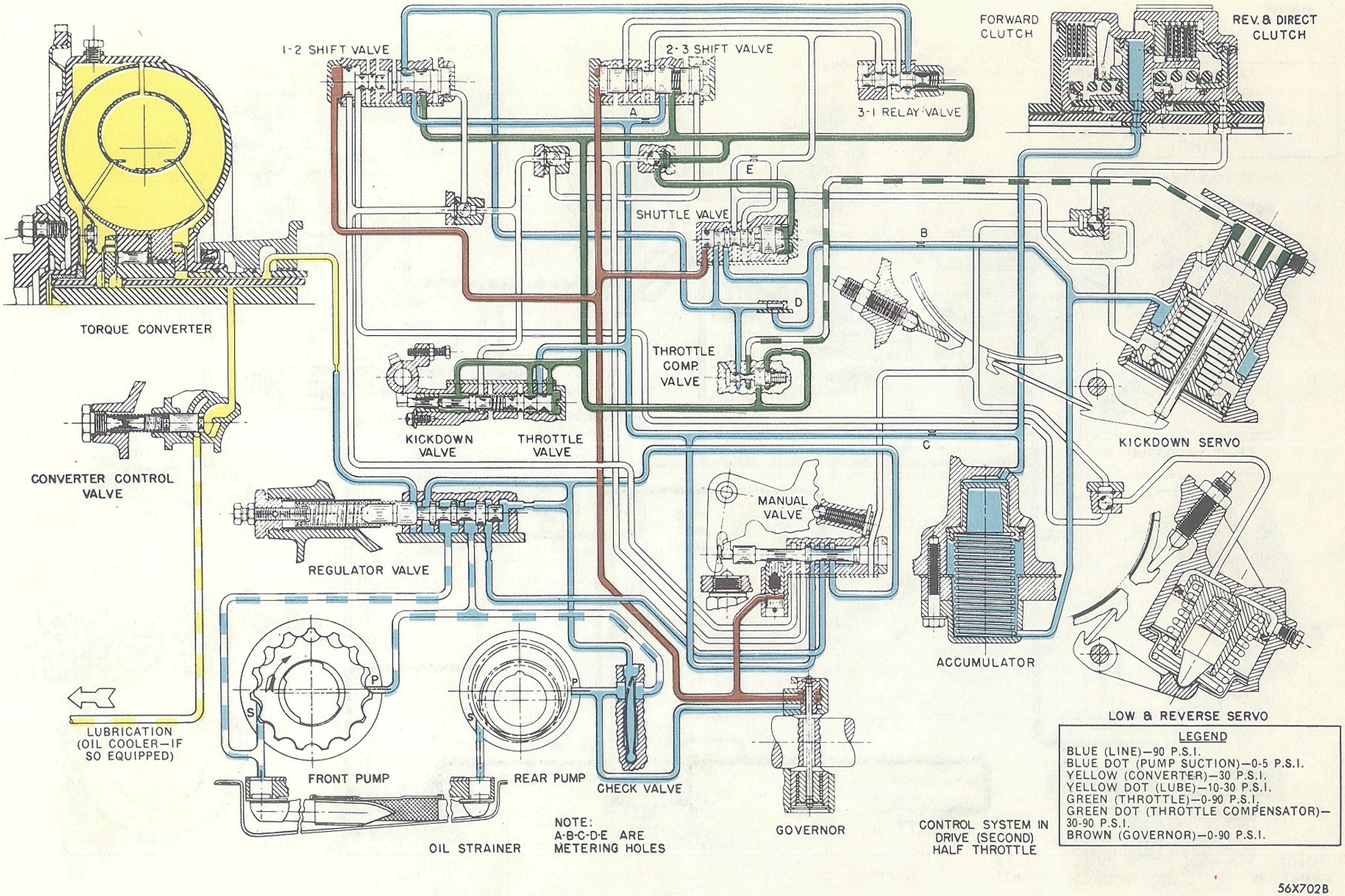


Fig. 11—Hydraulic Circuit—D (Drive)—Second

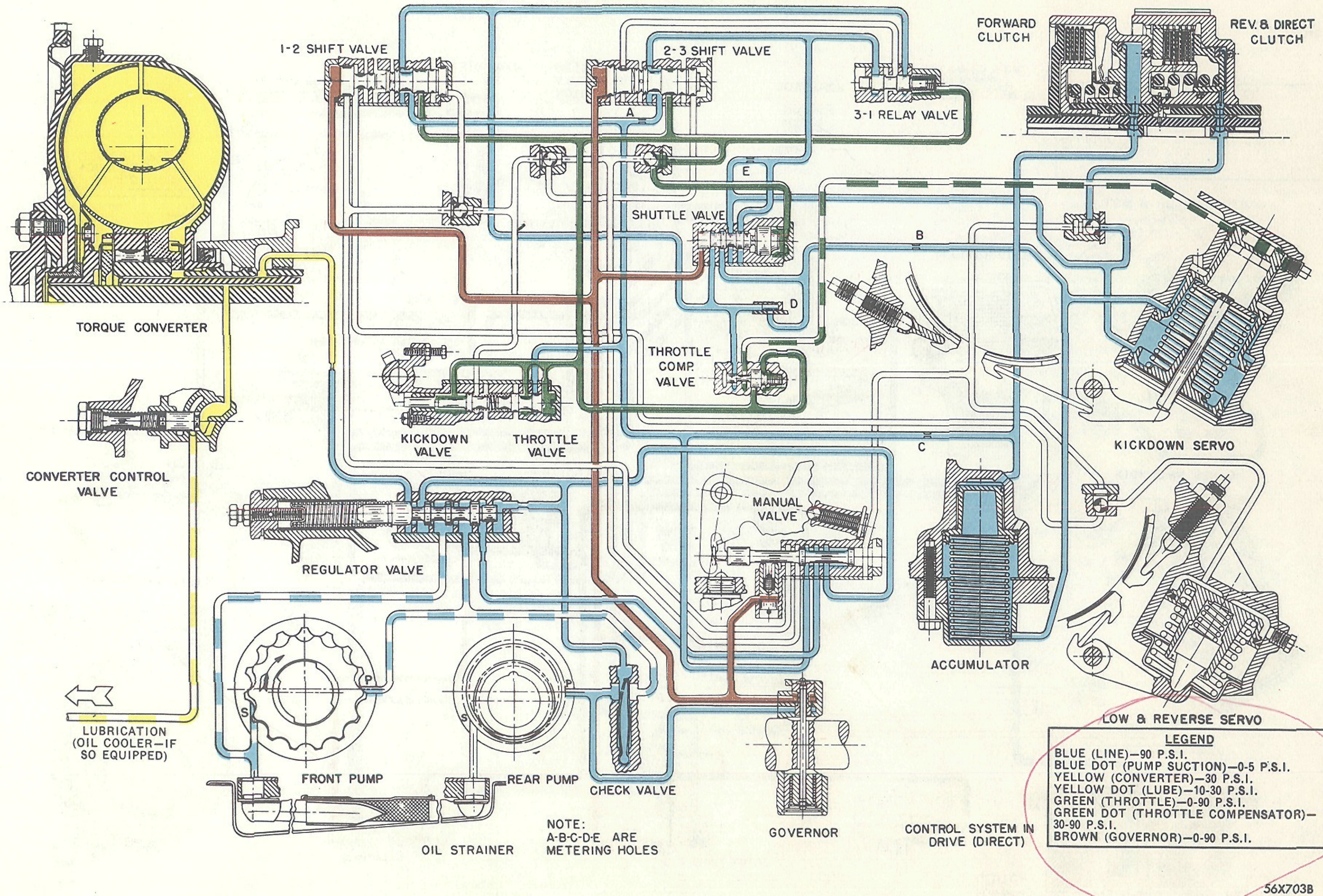


Fig. 12—Hydraulic Circuit—D (Drive)—Direct

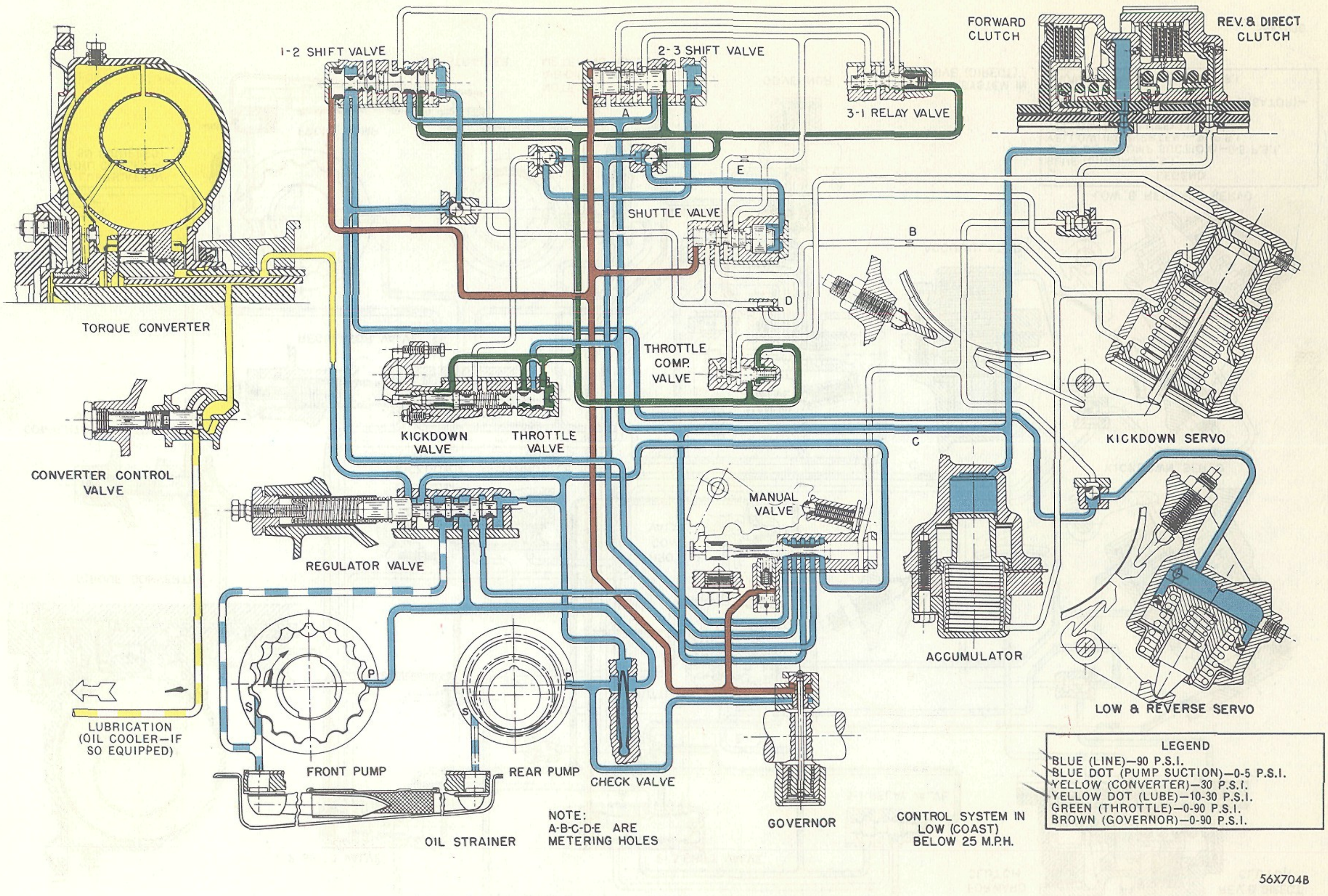


Fig. 13—Hydraulic Circuit—I (Low)—Low

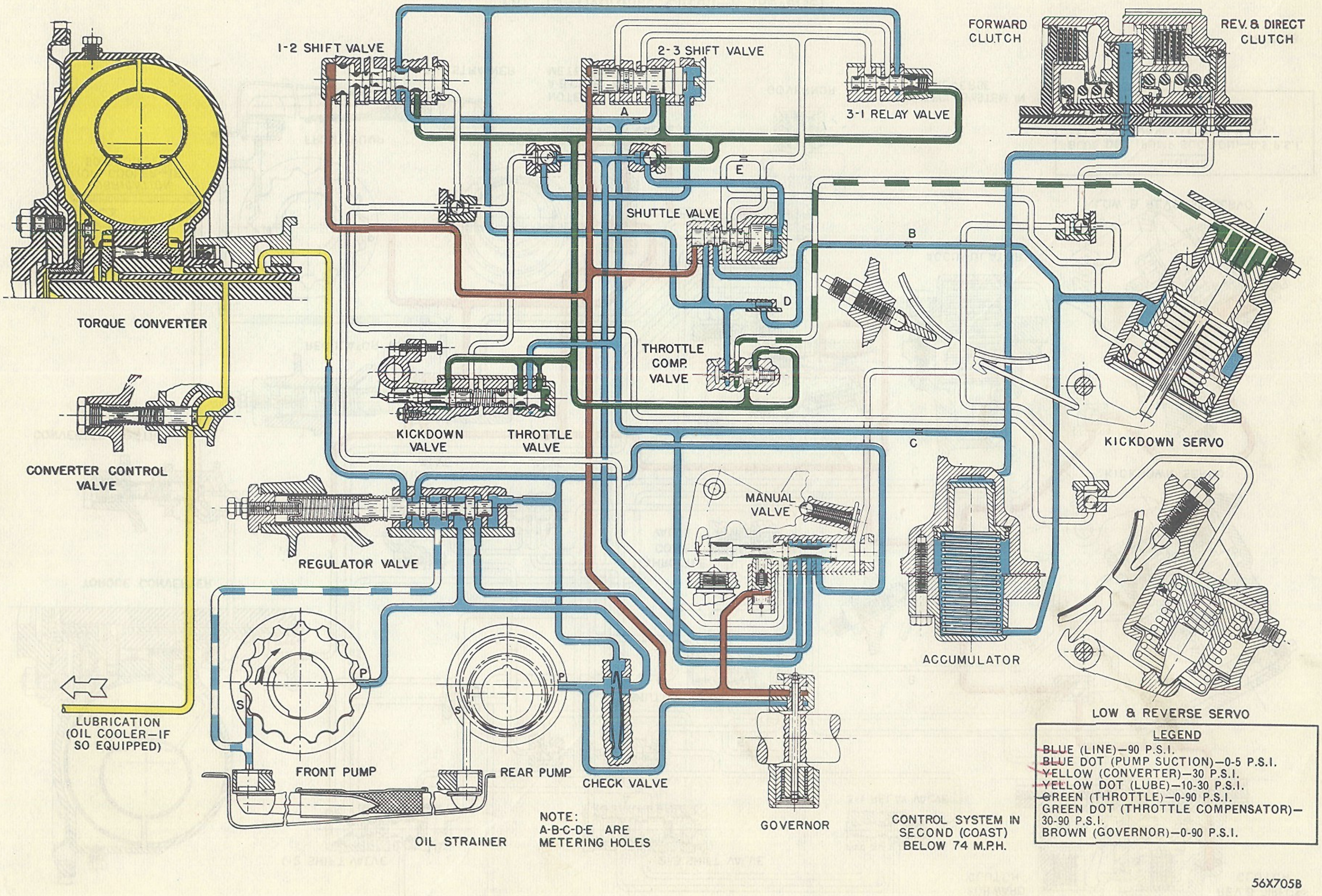


Fig. 14—Hydraulic Circuit—2 (Second)—Second

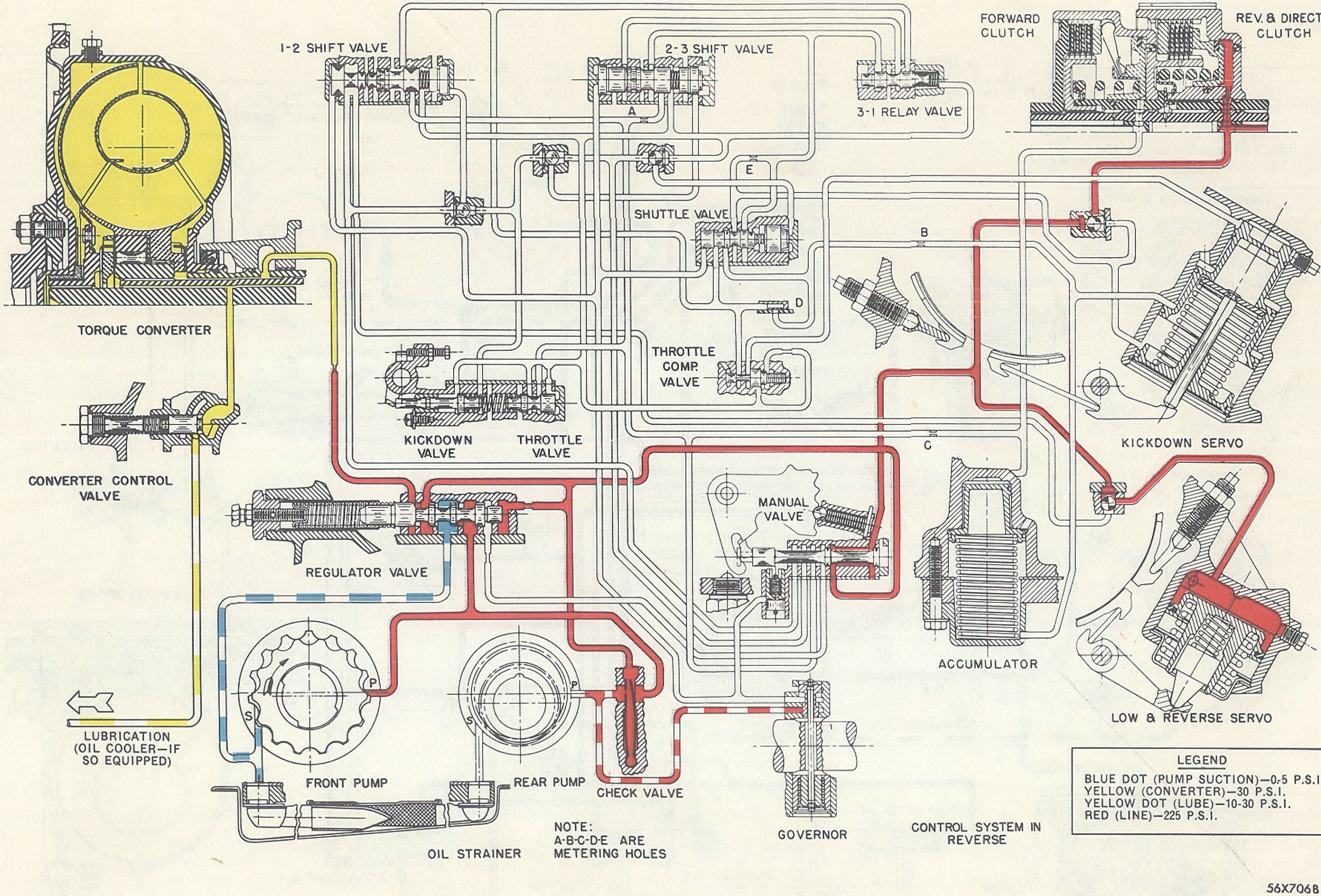


Fig. 15—Hydraulic Circuit—R (Reverse)

In a general way, the components of any automatic control system may be grouped into the following basic components or units:

(1) The pressure supply system.

(2) The clutches and band servos.

(3) The pressure regulating valves.

(4) The flow control valves.

Taking each of these basic components or units in turn, the control system may be described as follows:

5. THE PRESSURE SUPPLY SYSTEM

a. Front Pump

Under all normal operation conditions (up to a forward speed of approximately 35 mph.) the front pump, driven at engine speed, provides oil needed for torque converter pressure, control pressures, and lubrication.

The front pump delivers oil at regulated pressure of approximately 90 psi. to fulfill these conditions and also satisfy the normal amount of internal leakage in the transmission at all engine speeds above approximately 700 rpm. In reverse, the front pump regulated pressure is increased to approximately 225 psi. in order to handle the high torque loads imposed during reverse operation.

b. Rear Pump

The rear pump (smaller than the front pump and driven by the output shaft) furnishes all of the oil required by the transmission in normal driving at all vehicle speeds above approximately 35 mph. Rear pump oil pressure is routed to the regulator valve body through a drilled passage in the transmission case. The front clutch and low-reverse band are applied by the oil pressure developed by the rear pump when the engine is started by pushing.

6. CLUTCHES AND BAND SERVOS

a. Front Clutch

The front clutch transmits full engine and converter torque in all forward drive positions. The front clutch piston is moved hydraulically to engage the multiple disc clutch in all forward speeds. The clutch piston is released by means of the clutch return spring when feed of the control pressure is discontinued.

In order to develop the required capacity, a system of levers is used to actuate the clutch apply plate.

Although no pressure is applied to the front clutch piston in reverse or neutral, oil is present in the clutch piston chamber. With high rotative speeds of the clutch retainer in reverse or neutral, it is possible to build up sufficient centrifugal oil pressure to move the clutch piston. To eliminate the possibility of clutch drag caused by such movement, the clutch check valve ball is unseated by centrifugal force and the oil in the chamber is allowed to escape. For normal application of the clutch, the flow of oil under controlled pressure into the clutch piston chamber is sufficient to seat the clutch check valve ball.

b. Rear Clutch

The rear clutch locks the gear train for direct drive operation in the forward range, and also transmits full input torque to the gear train in reverse operation. Rear clutch operation is similar to that of the front clutch, except that no levers are used. When making the power upshift from second to direct, the engagement of the clutch and disengagement of the kickdown band is accomplished by application of controlled pressure.

c. Kickdown Servo

The kickdown piston actuates the kickdown band through the kickdown lever, strut, and anchor, holding the sun gear of the rear planetary set stationary and resulting in a forward ratio of 1.45 to 1 through the rear planetary gear set. The kickdown piston is hydraulically applied in 2 (second) and D (drive) second (kickdown) by two controlled pressures—line pressure and throttle compensated pressure-acting on separate areas.

In N (neutral), 1 (low), D (drive) breakaway, and R (reverse) the kickdown piston is held released by the kickdown piston spring, there being no pressures applied to the kickdown piston at these times. In the D (drive) range, for the automatic upshift from second to direct drive, the kickdown piston is released by controlled pressure acting on the "off" area of the kickdown piston. The force of the pressure on the "off" area, assisted by the kickdown piston spring, is sufficient to overcome the forces of line pressure and throttle compensator pressure acting on the apply side of the kickdown piston.

Application of the kickdown piston when shifting from breakaway to second is softened by the accumulator.

d. Low-Reverse Servo

The low-reverse servo has two functions which are performed independently. The low-reverse servo piston is moved hydraulically to apply the low-reverse band through the low-reverse band lever, strut, and anchor. The results are:

(1) To hold the carrier of the front planetary gear set stationary while the rear clutch (applied) drives the sun gear. This provides a reverse ratio of 2.20 to 1 through the front planetary gear set, as shown in Figure 3.

(2) To hold the carrier of the front planetary gear set stationary while the front clutch (applied) drives the intermediate shaft and kickdown annulus. This provides the 1 (low) range operation at a ratio of 2.45 to 1 through both planetary gear sets (see Fig. 7) which may be used for engine braking. Initial engagement of the low-reverse servo (when shifting from neutral to low or reverse) is softened by compression of the low-reverse servo cushion spring.

The servo piston is released by a return spring when the source of apply pressure is discontinued.

e. Accumulator

An accumulator cushions the front clutch engagement when a forward drive button is pushed in, and the application of the kickdown band in the upshift from breakaway to second. It is connected in parallel and to the passage which supplies line pressure to the apply side of the kickdown servo.

In neutral and reverse the accumulator piston is held released by the accumulator spring, there being no pressure applied to the piston at these times.

In the D (drive) range, for the automatic upshift from breakaway to second, the accumulator piston is again moved by line pressure (kickdown servo apply) acting on the large end of the piston. The force of line pressure (assisted by the accumulator spring) is sufficient to overcome the force of line pressure (front clutch) which is acting on the small area of the accumulator piston. This action cushions the application of the kickdown band.

7. PRESSURE REGULATING VALVES

a. Regulator Valve

The regulator valve controls line pressure at a value of approximately 90 psi. for all operating conditions except reverse. Line pressure, which is supplied by the front pump (at car speeds under 35 mph.) is routed directly to a primary reaction area in the regulator valve body. For all conditions except reverse, line pressure is also routed through the front valve body to the secondary reaction area. A line pressure of 90 psi. (acting on the two reaction areas) is sufficient to overcome the force of the regulator valve spring and move the valve to the position that will allow oil to flow through a restricting hole in the regulator valve body to the torque converter.

If the oil flow from the front pump exceeds the amount necessary to feed the torque converter and transmission line, pressure will rise slightly, causing the regulator valve to move to a new position where excess oil from the front pump pressure port is allowed to dump into the front pump suction port.

Above a car speed of approximately 35 mph., the rear pump furnishes the oil needed by the torque converter and transmission at a line pressure of approximately 90 psi. When this condition is reached, the pressure increases slightly and the regulator valve moves over to a new position where the excess flow is dumped from the line pressure port into the front pump suction port. Under this condition the front pump check valve closes and all of the oil pumped from the front pump is dumped back through the large valve opening into the front pump suction port. Thus the front pump turns with reduced effort since it is operating at a low pressure.

For reverse operation, oil must be at a pressure of 225 psi. This is accomplished by shutting off the source of line pressure to the regulator valve secondary reaction area, with the result that a line pressure of 225 psi., applied to the primary reaction area, is required to overcome the force of the regulator valve spring.

b. Torque Converter Control Valve

This valve maintains an oil pressure of approximately 30 psi. within the torque converter. Oil is fed from the regulator valve through a restricting hole in the regulator valve body to the torque converter. The oil flows through the torque converter and returns to the regulator valve body where the converter pressure is regulated by the torque converter control valve. When the torque converter pressure rises to 30 psi., the control valve will move against the spring load and allow oil to flow to the cooler then back to the lubrication circuit. Torque converter pressure acts on the valve's reaction area such that if it exceeds 60 psi., the valve is moved further against the spring load, permitting excess oil from the converter to by-pass into the oil pan. From the torque converter control valve, oil is routed through the transmission lubrication system to lubricate the gear train.

c. Governor Valve

The governor valve assembly transmits a hydraulic pressure to the transmission which is proportional to car speed. This governed pressure, in conjunction with throttle pressure, controls upshift and downshift speeds. The governor is so mounted on the output shaft that when the output shaft rotates, the governor weight assembly exerts a centrifugal force on the governor shaft. The governor shaft transmits this force to the governor valve. Oil is allowed to flow from the line pressure port to the governor pressure port, building up pressure in the governor circuit and against the valve reaction area sufficient to balance the centrifugal force of the weight.

The greater the vehicle speed, the greater is the centrifugal force of the weights, and hence the greater the governor pressure necessary to balance the centrifugal force. If the vehicle speed decreases, the decrease in centrifugal force allows the valve to move out **slightly,** venting excess oil and bringing the governor once more in balance at a lower pressure.

The governor weight assembly is constructed so that for vehicle speeds under approximately 25 mph., both weights act as a unit, with the result that small changes in vehicle speed result in comparatively large changes in centrifugal force and governor pressure. Above approximately 25 mph., the primary weight moves outward against the preload of the spring and bottoms against the snap ring leaving only the secondary weight active. Small variations in vehicle speed above approximately 25 mph., therefore, result in only small variations in governor pressure.

Governor pressure is routed to the governor pressure ports of the reverse blocker valve, shuttle valve, and the 1-2 and 2-3 shift valves governor plugs.

d. Throttle Valve

The throttle valve assembly transmits a hydraulic pressure to the transmission which is proportional to the amount of throttle opening. The throttle valve lever shaft is rotated in proportion to the amount of throttle opening of the carburetor by a linkage connecting the throttle valve lever shaft to the car's throttle linkage. The throttle valve lever shaft positions the kickdown valve and throttle valve spring in accordance with the amount of carburetor throttle opening, the spring being free (no load) at closed throttle and compressed at wide open throttle. Therefore, the throttle valve spring exerts a force on the throttle valve that increases with carburetor throttle opening.

The throttle valve allows oil to flow from the line pressure port to the throttle pressure port, which is connected by a passage to the reaction area of the throttle valve. Throttle pressure will build up in the throttle pressure circuit and against the reaction area until it reaches a value great enough to balance the force of the throttle valve spring. If throttle pressure builds up too high, the throttle valve will move **slightly** to a position such that excess oil is allowed to escape through the vent port.

Throttle pressure will vary with the amount of carburetor throttle opening from a value of 0 (zero) pressure at closed throttle to a value of approximately 90 psi. at wide open throttle. Throttle pressure is routed to the following places:

(1) Throttle pressure port of the kickdown valve.

(2) Throttle pressure port of the throttle compensator valve.

(3) Through check valve to throttle pressure port of the shuttle valve plug.

(4) To the throttle pressure port of the 3-1 relay valve.

(5) To the throttle pressure port of the 2-3 shift valve kickdown plug (W.O. throttle condition).

(6) To the throttle pressure port of the 1-2 shift valve kickdown plug (W.O. throttle condition).

e. Throttle Compensator Valve

The throttle compensator valve amplifies the variations in throttle pressure. Oil flows from the line pressure port of the 1-2 shift valve (in the upshifted position) to the throttle compensator valve pressure port. Throttle compensator pressure is controlled by throttle pressure and spring force acting on one end of the valve against a reaction area fed by compensator pressure. Throttle compensator pressure will vary with the amount of carburetor throttle opening from a value of approximately 30 psi. at closed throttle to a value of 90 psi. at approximately ¾ throttle. This arrangement makes it possible to more closely obtain the variations required for the 1-2 and 2-3 shifts. Throttle compensator pressure is routed to the throttle compensator pressure area of the kickdown servo.

8. FLOW CONTROL VALVES

a. Front and Rear Pump Check Valves

The front pump check valve prevents back flow from the rear pump into the pressure side of the pump when the pump is either stationary or merely circulating oil at a very low pressure. The check valve separates front and rear pump.

NOTE: The pump that has the higher pressure supplies the demands of the transmission.

The rear pump check valves allows oil to flow from the rear pump into the control system of the transmission. The front and rear pump check valves are combined as a leaf spring unit and mounted in the regulator valve body behind the front pump.

b. Manual Valve

The manual valve obtains the different transmission drive ranges as selected by the vehicle operator. The manual valve is moved by a cable which is connected to the push button control unit on the instrument panel. It is held in these positions by the force of a spring-loaded detent ball.

When the N (neutral) button is pushed in, the manual valve is positioned so that line pressure from the regulator valve is routed to the secondary and primary reaction areas of the regulator valve. Line pressure is, therefore, 90 psi. but neither the band nor the clutches are applied.

When the R (reverse) button is pushed in, the manual valve shuts off line pressure to the secondary reaction area of the regulator valve and routes line pressure (at 225 psi.) to the rear clutch and low-reverse servo.

When D (drive) button is pushed in, the manual valve is positioned to route line pressure to the following places:

(1) The secondary reaction area of the regulator valve (making line pressure 90 psi.).

(2) The line pressure port of the throttle valve.

(3) The line pressure port of the 1-2 shift valve and through metering hole "A" to the line pressure port of the 2-3 shift valve.

(4) Through metering hole "C" to the line pressure area of the accumulator and front clutch.

When the 2 (second) button is pushed in, the manual valve routes line pressure to the same places as in D (drive) and to the following additional places:

(1) Through ball check valve to the kickdown pressure port of the 2-3 shift valve kickdown plug.

(2) Through ball check valve to the throttle pressure port of the shuttle valve plug.

When the L (low) button is pushed in, the manual valve routes line pressure to the same places as in 2 (second) and the following additional places:

(1) The low pressure port of the 1-2 shift

valve governor plug and through the ball check valve to the low-reverse servo.

(2) Through ball check valve to the kickdown pressure port of the kickdown pressure port of the 1-2 shift valve kickdown plug.

c. Reverse Blocker Valve

The reverse blocker valve mechanically blocks the manual valve from moving into reverse position to prevent accidental reverse engagement above approximately 10-15 mph. When the reverse button is depressed above this speed the transmission shifts to neutral and remains in neutral until another button is depressed. The reverse blocker valve is activated by governor pressure.

d. 1-2 Shift Valve

This valve determines whether the transmission is either in low gear ratio or second gear ratio, depending upon whether the valve is in the upshifted or down-shifted position. The 1-2 shift valve train (consisting of shift valve kickdown plug, valve spring, shift valve and governor plug) is normally at either extreme of its travel. With the valve train down-shifted (at the extreme of travel toward the governor pressure end of the rear valve body) any oil in the kickdown servo apply area is allowed to escape through the vent port.

When the shift valve train is moved to the opposite extreme of its travel, the vent port is closed off and oil is fed by line pressure to the following places:

(1) 3-1 relay valve.

(2) Line pressure port of the shuttle valve.

(3) Line pressure port of the throttle compensator valve.

(4) Through servo pressure bleed "D" to the kickdown servo apply pressure port of the shuttle valve.

(5) The apply area of the kickdown servo.

(6) The accumulator.

(7) Line pressure port of the 1-2 shift valve kickdown plug.

The kickdown piston and accumulator are so designed that the value of the "balance pressure" is sufficient to complete a smooth band application during the time required to stop the rear clutch retainer. After completion of the 1-2 shift, the servo apply pressure rises further to the value of line pressure, providing a "safety margin" of band load.

At light throttle (low throttle pressure), the shift valve is made to upshift at approximately 10 mph. and "balance pressure" is at a low value corresponding to the small force of throttle compensator pressure on the kickdown piston. The resulting band application load is, therefore, in proportion to the light throttle engine output. At wide open throttle (90 psi. throttle pressure), the shift valve upshifts at approximately 40 mph. and throttle compensator pressure is at a high value, applying the band at a load corresponding to a high engine output.

With the 1-2 shift valve train in the upshifted position, throttle pressure is not allowed to act on the end of the shift valve. Instead, any oil trapped in that area is allowed to vent through the drilled hole in the shift valve. The shift valve spring then exerts the only force on the "throttle pressure end" of the shift valve. At throttle openings less than wide open, the shift valve will downshift to breakaway when vehicle speed drops to a point where the governor pressure can no longer overcome the force of the shift valve spring. This downshift occurs at a vehicle speed of approximately 7-11 mph.

All that is required of the 1-2 shift valve for low range operation is that it must downshift below kickdown limit in response to the movement of the push button to low position and remain downshifted regardless of vehicle speed. The shift valve is forced to downshift by the application of line pressure from the low port of the manual valve around the ball check valve to the kickdown pressure port of the 1-2 shift valve kickdown plug. To insure that the shift valve remains downshifted regardless of car speed, line pressure is also allowed to act on the low reaction area of the 1-2 shift valve governor plug.

It is necessary that whenever the forces of governor pressure and throttle pressure act on the shift valve to cause an upshift, the valve must "snap" from one position to the other without hesitating or "hunting". This is accomplished by a differential area which is subjected to supply pressure when the valve is upshifted. When the valve is upshifted, throttle pressure is cut off so that normal downshifts are not throttle sensitive.

e. 2-3 Shift Valve

This shift valve automatically shifts the transmission from intermediate to direct gear. The 2-3 shift valve train is similar in construction and operation to the 1-2 shift valve train, in that it is controlled by governor and throttle pressures and spring force. When the valve train is in the upshifted position, oil is fed by line pressure through metering hole "A" to the following places:

(1) 3-1 relay valve.

(2) Through or around metering hole "E" (depending on shuttle valve position) to the "off" area of the kickdown servo and through the ball check valve to the rear clutch piston.

With the shift valve downshifted (at the extreme of travel toward the governor pressure end of the rear valve body) any oil in the rear clutch chamber and the kickdown servo "off" area is allowed to escape through the vent port.

f. 3-1 Relay Valve

This valve obtains a 3-1 downshift. The 3-1 relay valve is a valve arranged so that the 2-3 shift valve is coupled to the 1-2 shift valve during downshift at light throttle. Under these conditions, line pressure from the 2-3 shift valve acting on the 3-1 relay valve overcomes the forces of throttle and spring pressure moving the valve to the throttle pressure end. In this position, line pressure from the 1-2 shift valve is permitted to act on the governor plug end of the 2-3 shift valve holding the 2-3 shift valve in the upshift position regardless of governor pressure.

As car speed decreases and governor pressure can no longer overcome the force of the 1-2 shift valve spring, the 1-2 shift valve will downshift, cutting off the line pressure to the 3-1 relay valve. This will permit the two shift valves to downshift at the same time resulting in a smooth 3-1 downshift.

g. Kickdown Valve

The kickdown valve makes possible a forced downshift from direct to second—second to breakaway and direct to breakaway by depressing the accelerator pedal past the detent "feel" near wide open throttle.

It is desirable to limit the maximum vehicle speed at which kickdown may be made (approximately 70 mph. from drive to second and approximately 30 mph. from drive or second to breakaway). The throttle pressure actuated kickdown detent plug on the stem of the kickdown valve, supplies the resistance necessary for a detent "feel" at kickdown. With the kickdown valve in the kickdown position, throttle pressure is routed to the following places:

(1) Through ball check valve to the 1-2 shift valve kickdown plug.

(2) Through ball check valve to the 2-3 shift valve kickdown plug.

This pressure, when applied to the end of the kickdown plugs, is great enough to make the shift valves downshift against the force of any governor pressure up to the kickdown limit speeds.

h. Shuttle Valve, Shuttle Valve Plug, and Servo Pressure Bleed Valve

The shuttle valve has two separate functions and performs each independently of the other. The first is that of providing fast release of the kickdown band, and delayed smooth rear clutch engagement when the driver makes a "lift-foot" upshift from second to direct.

The "lift-foot" upshift is made by accelerating the vehicle in breakaway or second gear and then returning the accelerator pedal to closed throttle. Without the shuttle valve, the resulting upshift to direct would consist of a series of lurches, caused first by the braking effect on the vehicle by the second gear ratio and then by the harsh engagement of the rear clutch.

Under conditions of closed throttle (no throttle pressure) and moderate vehicle speed (moderate governor pressure) the shuttle valve and shuttle valve plug are forced to their extreme of travel (toward the throttle pressure end of the shuttle valve plug). In this position, oil is allowed to flow from the kickdown servo apply pressure port to the rear clutch pressure port and kickdown servo "off" area. Because the line pressure apply area of the kickdown servo is being fed oil only through the hole in the servo pressure bleed valve, pressure on this area drops to a low value while oil from the 2-3 shift valve builds up pressure on the rear clutch and the "off" area of the kickdown servo. The kickdown band load is then reduced sufficiently to allow a smooth band release. In the meantime, pressure in the rear clutch has built up sufficiently to complete a smooth engagement.

The second function of the shuttle valve is to regulate the application of the kickdown piston when making high speed (above approximately 30 mph.) kickdowns. Kickdowns made at low vehicle speeds require very little time in which to complete the shift due to the comparatively small change in engine speed between direct and kickdown gear. The higher the vehicle speed at which the kickdown is made, the longer is the time required to make a smooth shift.

The force of the shuttle valve spring is great enough so that the force of governor pressure (at vehicle speeds under approximately 30 mph.) on the governor pressure area cannot move the shuttle valve toward the shuttle valve plug. Thus, for kickdowns below 30 mph. oil is fed to the line pressure area of the kickdown servo through both the hole in the servo pressure bleed valve and the line pressure and servo pressure ports of the shuttle valve. Speed of kickdown piston application is then at its maximum.

As further insurance against the engine "running away" during low speed kickdowns, rear clutch disengagement is delayed while the kickdown piston is applying the band. This is accomplished by the introduction of a restriction (metering hole "E") placed such that oil is "backed up" into the clutch chamber as the kickdown piston moves on. This "back up" pressure is greatest on low speed kickdowns when the kickdown piston applies rapidly and is sufficient to hold the clutch applied until the kickdown band is applied. At this time, the kickdown piston can no longer force oil into the clutch and the pressure is allowed to fall to zero.

For kickdowns at higher vehicle speeds, governor pressure attains a sufficient value to move the shuttle valve toward the shuttle valve plug, cutting off the feed of line pressure to the shuttle valve. Oil must then flow to the apply pressure area of the kickdown servo only through the hole in the servo pressure bleed valve. Kickdown piston application is, therefore, retarded.

9. OPERATIONAL SUMMARY

With the D (drive) button pushed in, the manual valve is positioned to give the full range of operation of the transmission. With the manual valve in the drive position, the front clutch is engaged and the transmission will transmit drive torque in breakaway.

At a speed which is dependent on throttle position, the transmission automatically upshifts to second gear. The change is initiated by movement of the 1-2 shift valve to the upshifted position so that pressure is directed to the apply side of the kickdown servo. When the kickdown band develops sufficient capacity to slow the rear clutch retainer, the overrunning clutch starts to over-run, so release of the previous reaction member is automatic. The band application during the shift is controlled by action of the accumulator.

At a speed which is again dependent on throttle position, the transmission makes an upshift to direct. This action is initiated by movement of the 2-3 shift valve. The upshift is accomplished by simultaneous disengagement of the kickdown band and engagement of the rear clutch.

Forced 3-2 shift is obtained below speeds shown in Shift Pattern Summary Chart, and forced 3-1 shift is obtainable below speeds shown in Shift Pattern Summary Chart. Normal downshifts are not throttle sensitive and above half-throttle, they occur in sequence 3-2, and 2-1. At throttle openings less than half-throttle the two shift valves are interlocked by means of the 3-1 relay valve and the two shift valves downshift together. The shift occurs as a 3-1 relay sequence at the normal 2-1 downshift speed. This action provides a smooth downshift since the overrunning clutch is overrunning in breakaway.

Pushing in the 2 (second) button of the control unit moves the manual valve so that line pressure is directed to the kickdown circuit of the 2-3 shift valve. When in direct, this results in a downshift to second speed only if the vehicle speed is below 3-2 kickdown limit. If the vehicle is accelerated in second gear to the wide open throttle upshift speed, an upshift to direct will occur, thus eliminating over-speeding the engine in second gear. Operation of the 1-2 and 2-1 shift occur in the same manner as in the D (drive) position.

Pushing in the 1 (low) button of the control unit positions the manual valve so that line pressure is directed to the kickdown circuit of the 1-2 shift valve. This results in a downshift to low only if the vehicle speed is below the 3-1 kickdown limit. Use of 1 (low) is intended primarily for engine braking so it is also necessary that the low-reverse band be engaged to lock the overrunning clutch. Line pressure from the low speed port of the manual valve body is fed to the low port of the 1-2 shift valve governor plug where it is blocked until governor pressure drops sufficiently so that line pressure at the kickdown plug overcomes it and the complete valve train shifts down. After the downshift, pressure at the low port of the governor plug is permitted to react on an area of the governor plug and also directed to the low-reverse servo. Then, the line pressure, acting on the combined areas of the governor plug and the kickdown plug, prevent an upshift—regardless of vehicle speed.

Pushing in the N (neutral) button moves the manual valve to a position which shuts off oil flow to the valve bodies. The torque converter and lubrication system remains pressurized.

Pushing in the R (reverse) button of the control unit positions the manual valve so that oil pressure is directed to apply the rear clutch and low-reverse band. In order to transmit the high torque loads involved in reverse operation, the system pressure is raised to 225 psi. by cutting off the pressure, and venting of the secondary reaction area of the regulator valve.

MAINTENANCE, ADJUSTMENTS AND TESTS

CAUTION

While in the process of making adjustments and tests, do not stall test the torque converter. For safety reasons and because damage to the transmission may result, wide open throttle stall operation should not be attempted.

10. ROAD TESTING THE TRANSMISSION

First check the transmission fluid level and set engine idle. Good transmission operation depends on good engine operation. Make sure the engine is operating at full efficiency. **If when tuning the engine, the throttle linkage between the carburetor and the transmission is disturbed, it will be necessary to readjust the linkage.** Before attempting to diagnose or correct the transmission operation, the engine and transmission should be warmed up to operating temperature. A short drive, approximately five to ten miles, with frequent starts and stops will create normal operating temperature of the engine and transmission.

All shifts and kickdowns should occur within speed ranges given in the Shift Pattern Summary Chart.

EXPLANATION OF INDEX ITEMS

Never remove a transmission from a car until all the possible "in car" causes have been checked for the operating difficulty and the oil pan has been removed to check for dirt, metal chips, band material, broken band ends, and burned or scored band contacting surfaces. Also, check the manual control cable and throttle linkage for adjustment and wear.

A. Oil Level—Refer to Lubrication Section of this manual.

B. Throttle Linkage—Refer to Paragraph 16.

C. Gearshift control cable—Refer to Paragraph 13.

D. Pressure tap check—Hydraulic pressure taps have been provided to check the following pressures: line, lubrication, governor, rear clutch apply, and throttle (compensated). These pressures should fall within the specified limits stated in the Hydraulic Control Pressure Check Charts.

E. Kickdown band adjustment—The kickdown band adjustment screw is found on the left side of the transmission case (Fig. 22). Refer to Paragraph 15.

TROUBLE DIAGNOSIS CHART

The Trouble Diagnosis Chart has the operating difficulties listed in three groups. After road testing, match the trouble found to its particular group and to the specific difficulty under that group. The Index and Item in the "Items to Check" column are next checked against the "Explanation of Index Items." Capital letter items refer to those operations which may be performed without removing the transmission. The small letter items refer to those operations done after removal of transmission from car.

ITEMS TO CHECK See "Explanation of Index Items" Perform Items: A, B, C, and G first INDEX ↓ ITEM ↓	OPERATING DIFFICULTY																				
	Shift Abnormalities							Response							Miscellaneous						
	Harsh N to D or N to R	Delayed N to D	Runaway on Upshift and 3-2 K.D.	Harsh Upshift and 3-2 K.D.	No Upshift	No K.D. or Normal Downshift	Shifts Erratically	Slips in Forward Drive Position	Slips in Reverse Only	Slips in All Positions	No Drive in Any Position	No Drive in Forward Ranges	No Drive in R (Reverse)	Drives in N (Neutral)	Drags or Locks	Grating, Scraping, Etc. Noises	Buzzing Noises	Trans. Hard to Fill—Oil Blows Out Fil. Tube	Transmission Overheats	Impossible to Push Start	Starter Won't Energize
A. Oil Level		●	●		●	●	●	●		●	●						●	●	●	●	
B. Throttle Link Adj.			●	●	●	●	●														
C. Gearshift Control Cable Adj.						●	●							●							●
D. Pressure Checks—Line Lube, etc.	●	●	●	●	●	●	●	●	●	●	●	●	●							●	
E. K. D. Band Adj.			●	●	●	●						●			●				●		
F. Low-Reverse Band Adj.	●								●				●		●				●	●	
G. Engine Idle	●						●														
H. Starting Switches																					●
I. Handbrake Adj.															●	●			●		
J. Regulator—Valve Spring							●			●	●						●	●	●		
K. Converter Control Valve																	●	●	●		
L. Breather																		●			
M. Output Shaft Rear Bearing S. R.							●									●					
N. T. C. Cooling																			●		
O. K. D. Servo Band-Linkage			●	●	●	●						●			●						
P. L-R Servo, Band-Linkage	●								●				●		●					●	
Q. Oil Strainer							●				●							●			
R. Valve Body—Bolts—Mating Surfaces		●	●	●	●	●	●	●	●	●	●	●		●						●	
S. Accumulator	●	●	●	●	●	●		●				●									
T. Air Pressure Check		●	●		●	●	●	●	●	●	●	●	●								
U. Governor					●	●	●						●			●					
V. Rear Pump																●			●	●	
a. Front Pump—Drive Sleeve		●					●			●	●					●		●	●		
b. Regulator Valve Body, Gasket, Surfaces								●	●	●	●						●	●	●		
c. Converter																					
d. Front Clutch	●	●						●				●		●	●	●			●		
e. Rear Clutch	●		●	●	●			●				●	●		●	●			●		
f. Planetary Gear Set															●	●					
g. Overrunning Clutch						●		●				●			●						

F. Low and reverse band adjustment—The low and reverse band adjustment screw is found on the right side of the transmission case. (Fig. 22). Refer to Paragraph 15.

G. Engine idle—Adjust to 475 to 500 r.p.m.

H. Starting switches—Check wires, connections and switch. Check clearance of N (neutral) push button slide to motor starting switch contact clearance (Paragraph 20).

Difficulty in starting the engine can often be traced to faulty operation of the vacuum safety switch. This switch can be tested by wrapping a piece of soft wire around the bottom of both terminals to by-pass the switch and complete the circuit. If engine starts (with switch by-passed) the switch is faulty. This condition is corrected by incorporating a vent hole ($\frac{1}{32}$ inch) in cap section of switch, just below fiber insulating washers. Punch hole anywhere in outer diameter of cap, using a sharp tool, such as an ice pick.

I. Handbrake—Check for excessive drag. Clearance should be .010-.015 in. Refer to Brakes Section III for method of adjusting handbrake.

J. Regulator valve, spring—The regulator valve may be removed by removing the regulator valve spring retainer which is on the right side of the transmission case (Fig. 22). Check for a stuck or scratched valve and/or buckled spring.

K. Converter control valve, spring—The converter control valve may be removed by removing the converter control valve spring retainer which is on the right side of the transmission case (Fig. 22). Check for a stuck or scratched valve and/or buckled spring.

L. Breather—Check to determine whether breather is free of dirt and undercoating.

M. Output shaft rear bearing, snap ring—Check for rough bearing and/or unseated snap ring and correct thickness snap ring.

N. Torque converter—Check oil cooler lines for being bent, kinked or having loose connections.

O. Kickdown servo, band and linkage—Check for broken seal rings, stuck servo piston or broken linkage.

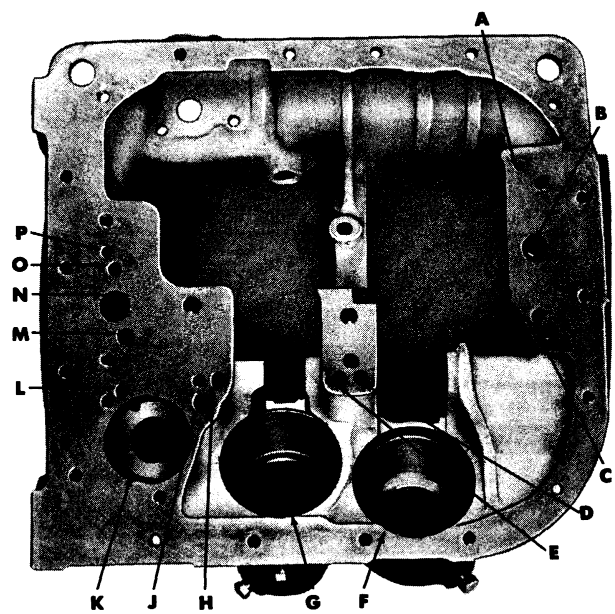
P. Low and reverse servo, band and linkage—Check for torn seal, broken band and/or linkage.

Q. Oil strainer—Check for possible air leakage.

R. Valve body attaching bolts and mating surface—Check for loose bolts, burrs or scratches on mating surfaces. Clean valve body assembly. Check for stuck valves, dirt, scratched valves or body, and burrs on valves. Torque valve body bolts to specifications.

S. Accumulator—Check accumulator cover screw tightness and piston for broken rings. Torque accumulator cover screws to specifications.

T. Air pressure checks—The front clutch, rear clutch, kickdown servo, and low and re-



A—GOVERNOR PRESSURE
B—REAR PUMP INLET
C—REAR CLUTCH 'APPLY' (Line pressure)
D—LOW AND REVERSE SERVO 'APPLY' (Line pressure)
E—KICKDOWN SERVO 'APPLY' (Throttle compensated pressure)
F—LOW AND REVERSE SERVO (Location)
G—KICKDOWN SERVO (Location)
H—KICKDOWN SERVO 'APPLY' (Line pressure)
J—KICKDOWN SERVO 'RELEASE' (Line pressure)
K—ACCUMULATOR (Location)
L—FRONT CLUTCH AND ACCUMULATOR 'APPLY' (Line pressure)
M—LINE PRESSURE
N—FRONT PUMP INLET
O—REVERSE UPSET (Reverse blocker 'Apply') (Line pressure)
P—LINE PRESSURE GAUGE 56x712A

Fig. 16—Oil Passages in Transmission Case

verse servo may be checked by applying air pressure to their respective passages when the valve body is removed. To make the complete air pressure check proceed as follows: (Refer to Fig. 16.)

CAUTION

Compressed air supply must be free of all dirt and moisture.

Raise the vehicle on a hoist, drain the transmission fluid and remove the transmission oil pan. Remove the accumulator cover and valve bodies assembly. Apply air pressure to the front clutch passage, located slightly toward the center of the transmission from the accumulator (be sure to cover accumulator piston bore to prevent piston from being blown out). Protect from oil spray by holding a clean lintless cloth, cardboard, or some other shield against the bottom of the transmission case when applying the air pressure. Listen for a dull "thud" which indicates that the front clutch is operating. Hold the air pressure on for a few seconds and observe for excessive oil leaks in the system.

Apply air pressure to the rear clutch passage (near the center rear end of the lower surface of the transmission case). Listen for a dull "thud" which indicates that the rear clutch is operating. Also check for excessive oil leaks.

Apply air pressure to the kickdown "apply" (line) pressure passage (toward the center of the transmission case and to the front of the kickdown servo. Observe the operation of the kickdown servo lever and band when air pressure is applied.

Apply air pressure to the kickdown "apply" (compensated throttle) pressure passage (toward the center of the transmission case and to the rear of the kickdown servo). Observe the operation of the kickdown servo.

Apply air pressure to the low and reverse servo passage (toward the center of the transmission case and to the front of the low and reverse servo). Observe the operation of the low and reverse servo, lever, and band, when air pressure is applied.

If the clutches and servos operate properly, "no drive" conditions as well as erratic or no upshift conditions, indicate that the malfunctioning exists in the control valve body assembly. Disassemble, clean, inspect and service the valve body assembly as described under "Reconditioning of Valve Body and Transfer Plate Assemblies."

Upon completion of the air pressure check, and servicing the valve body assembly, install the valve body assembly, accumulator cover, and transmission oil pan. Fill the transmission to proper level with fluid, and adjust the control cable and throttle linkage.

U. Governor—Clean assembly, and check weight assembly and valve for burrs, scratches or sticky operation. Examine the governor valve shaft, shaft snap rings and seal rings.

V. Rear pump—Clean and inspect assembly for side and diametral clearance. Note whether rear oil pump pinion ball is in place. Examine output shaft support face for scoring.

a. Front pump—Drive sleeve—Clean and inspect assembly for side and diametral clearance. Examine oil pump inner and outer rotor for scoring. Check front pump drive sleeve seal rings.

b. Regulator valve, mating surfaces, gasket—Clean and inspect valve body for scratches and scoring on valve bores and face which bears against the front pump housing. Examine the valve body to determine if the secondary reaction orifice is free of dirt. Check gasket for uniformness of compression by valve body.

c. Converter—Flush out converter and check converter to housing runout. Refer to Torque Converter Section of this manual.

d. Front clutch—Clean and inspect discs, plates, drive hub, return spring, piston levers, cushion spring and retainer. Check the following front clutch circuit leakage possibilities:

(1) Valve body and valve body to case mating surface.

(2) Accumulator small and large piston rings.

(3) Regulator valve body to case mating surface.

(4) Torque converter reaction shaft seal ring.

(5) Input shaft small and large seal rings.

(6) Intermediate shaft No. 1, 2, and 3 seal rings.

(7) Front clutch oil feed tube.

(8) Front clutch piston inner and outer seal ring.

(9) Front clutch check valve ball.

e. Rear clutch—Clean and inspect discs, plates, return spring and piston. Check the following rear clutch circuit leakage possibilities:

(1) Valve body and valve body to case mating surface.

(2) Output shaft support to case mating surface.

(3) Output shaft small and large seal rings.

(4) Intermediate shaft No. 4, 5, and 6 seal rings.

(5) Rear clutch oil feed tube.

(6) Sun gear rear clutch seal rings.

(7) Rear clutch piston inner and outer seal rings.

(8) Rear clutch check valve ball.

(9) Kickdown piston rod guide seal ring and rod guide to kickdown rod fit.

(10) Large kickdown piston seal ring.

f. Planetary gear set—Clean and inspect gear set for worn thrust washers, nicked or rough gear teeth, and excessive pinion end clearance.

g. Low Speed Over-running clutch—Clean and inspect the over-running clutch assembly for brinelled rollers and/or cam and improperly assembled rollers or springs.

11. LUBRICATION

For lubrication requirements of the Torque-Flite Transmission, refer to the Lubrication Section of this manual.

12. OIL LEAKS

a. Leaks Repaired with Transmission in Vehicle

Transmission output shaft rear bearing oil seal. Extension gasket. Speedometer pinion assembly in extension. Oil pan to filler tube connector. Oil pan to transmission case. Regulator valve and torque converter control valve spring retainers. Regulator valve adjusting screw.

Gearshift control cable seal ring and housing gasket. Governor, line, lubrication, rear clutch apply and throttle (compensated) pressure check plugs in transmission case or support (pressure test holes). Neutral starting switch.

If oil is found inside torque converter housing, determine whether it is Automatic Transmission Fluid or engine oil. Check torque converter drain plug for tightness.

Leaks at these locations should be corrected, regardless of how slight. Correct by tightening loose screws or plugs. Where this does not remedy the situation, replace faulty gaskets, seals or plugs.

b. Leaks Requiring Removal of Transmission from Vehicle

Sand hole in transmission case. Sand hole in front oil pump housing. Front oil pump housing screws or damaged sealing washers. Front oil pump housing seal (located on outside diameter of front oil pump housing) torque converter. Leaks at these locations may be corrected by tightening loose bolts or replacing damaged or faulty parts.

13. GEARSHIFT CONTROL CABLE ADJUSTMENT

Engage the R (reverse) push button. Raise vehicle on hoist and drain approximately two quarts of fluid from the transmission. Loosen the control cable adjusting clip screw and remove the neutral starting switch (Fig. 17). Insert a screwdriver through the neutral starting switch mounting hold and pry lightly on the lever to hold the lever in the reverse detent position.

Move the control cable in and out while observing the amount of free travel, then position the cable in the center of this free travel. Tighten the adjusting clip screw and install the neutral starting switch as outlined in Paragraph 14.

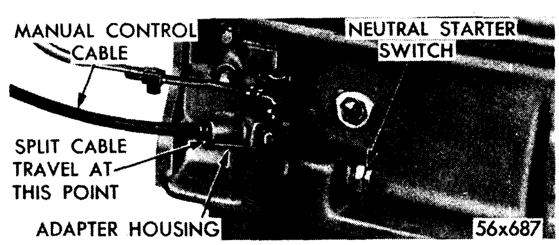


Fig. 17—Manual Control Cable Adjustment

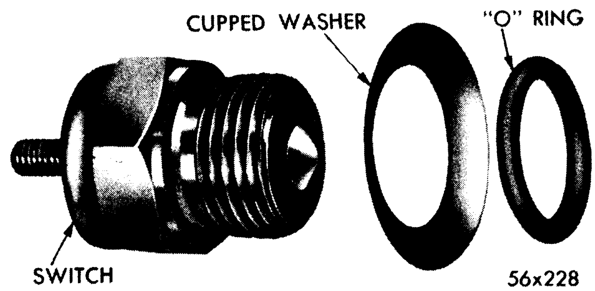


Fig. 18—Neutral Starting Switch (Disassembled)

14. INSTALLING AND TESTING NEUTRAL STARTING SWITCH (FIG. 18)

a. Installation and Tests

Install the concave spring (cupped) washer over the threads of the neutral starting switch so that the concave (cupped) side of the washer is towards the transmission case. Install the "O" ring seal over the threads of the neutral starting switch and up against the washer. Screw the neutral starting switch into the case until the spring washer contacts the transmission case, then tighten one-third of a turn.

Check operation of switch by checking the low (1) and reverse (R) button over-travel (must be equal for proper cable adjustment). Should switch still fail to function, it is recommended that the following modification be performed to the neutral starting switch.

(a) Remove the neutral starting switch and machine $\frac{1}{32}$" from the seating surface of the switch as illustrated in Fig. 19.

(b) Clean the switch, replace the concave (cupped) washer and "O" ring seal, and install the switch.

NOTE: The switch must be tight enough to prevent oil leakage. If it is not, add a thin washer and retighten.

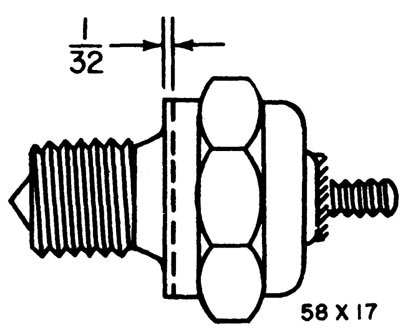


Fig. 19—Neutral Starting Switch

Refill transmission to proper level as outlined in Lubrication Section. Check starter operation by pushing the various push buttons and returning to neutral.

CAUTION

Neutral starting switch failure may occur due to very high amperage current flowing through the switch. This results when a jumper wire or remote control starting switch is improperly connected, when placed in the circuit when taking compression readings.

It is important that the jumper leads be connected to the battery terminal and ignition terminal of the starter relay.

b. Switch Lever Alignment

Remove the neutral starting switch and check the location of the neutral starting switch lever inside the transmission, as illustrated in Figure 20.

The lever should be dead center of the starter switch mounting hold in the transmission (when lever is in neutral **detent**). In instances where it is not aligned properly, install a new valve body.

15. BAND ADJUSTMENTS

a. Kickdown Band

The kickdown band adjusting screw is located on the left side of the transmission case (Fig. 22). Loosen the locknut and back off approximately 5 turns. **Check for freeness of adjusting screw in transmission case.** Using wrench, Tool

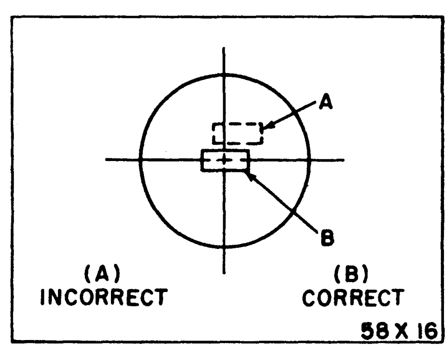


Fig. 20—Lever Alignment

C-3380 with adapter C-3583, tighten to a reading of 47-50 inch-pounds torque.

NOTE: This will be a true torque of 70-75 inch-pounds which reading should be used if torque wrench C-3380 is used without the adapter C-3583 (as may be done if adjustment is made with the transmission removed from the car).

Back off the adjusting screw 2¼ turns.

NOTE: To compensate for initial wear-in, the adjustment of a new band must be ¼ turn tighter than the specification given.

Holding adjusting screw, tighten locknut to 35-40 foot-pounds torque.

b. Low-Reverse Band (Rear)

The low-reverse band adjusting screw is located on the right side of the transmission case (Fig. 22). Loosen the locknut and back off approximately 5 turns. **Check for freeness of adjusting screw in transmission case.**

Using wrench, Tool C-3380 with adapter C-3583, tighten to a reading of 47-50 inch-pounds torque.

NOTE: This will be a true torque of 70-75 inch-pounds which reading should be used if torque wrench C-3380 is used without the adapter C-3580 (as may be done if adjustment is made with transmission removed from vehicle).

Back off adjusting screw 2⅝ turns.

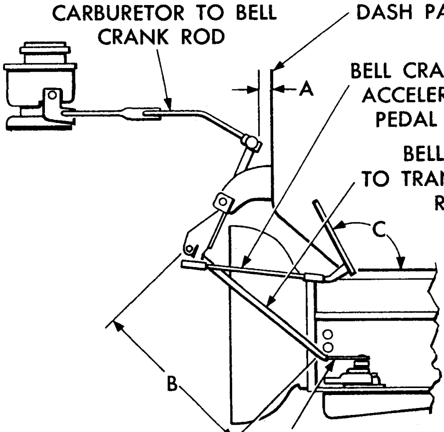
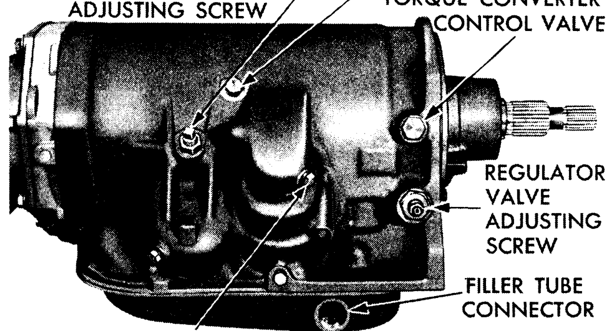


Fig. 21—Throttle Linkage Adjustments



(Right Side of Transmission)

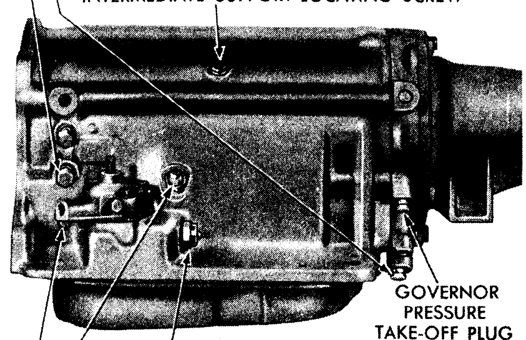


Fig. 22—Transmission Case (Left Side of Transmission)

NOTE: To compensate for initial wear-in, the adjustment of a new band must be ¼ turn tighter than the specification given.

Holding adjusting screw, tighten locknut to 35-40 foot-pounds torque.

16. THROTTLE LINKAGE ADJUSTMENTS (REFER TO FIG. 21)

(FOUR BARREL CARBURETOR)

With the engine at operating temperature and carburetor off the idle cam, adjust idle speed to 475-500 R.P.M. (use tachometer). Loosen the throttle linkage adjusting nuts on the carburetor to bell crank rod, and on the bell crank to transmission rod. Adjust carburetor to bell crank rod to position the lever ½ inch from the cowl dash panel (see "A"

Fig. 23—Checking Line Pressure

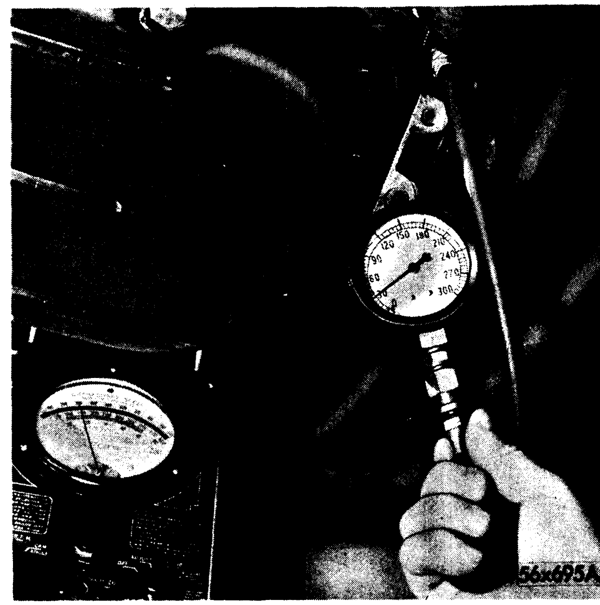


Fig. 24—Checking Governor Pressure

Fig. 21) and tighten adjusting nut. Check that proper bell crank to transmission rod has been installed. Dimension "B" (Fig. 21) should 8½ inches. Hold slight preload rearward on bell crank to transmission rod while holding the transmission throttle valve lever forward against the stop, and tighten adjusting nut.

The accelerator pedal should be at an angle of 115 degrees (see "C" Fig. 21) to the horizontal. If necessary to correct, adjust pedal angle by removing the accelerator pedal end of the bell crank to pedal rod, and shortening or lengthening the rod by loosening the lock nut at the swivel end and rotating swivel. Reinstall the rod and tighten the locknut.

NOTE: Be sure rod is properly aligned to prevent binding.

TWO BARREL CARBURETOR

All operations are the same as the four barrel, except that, since there is no intermediate throttle control assembly, adjustment is made on the bellcrank to carburetor rod.

17. HYDRAULIC CONTROL PRESSURE CHECKS AND ADJUSTMENTS

a. Line Pressure

NOTE: Line pressure adjustment must be made in D (drive) position with engine at 1200 R.P.M. and wheels free to turn. Oil must be at operating temperature (150° F.-200° F.).

Remove the pipe plug from the line pressure take-off hole located on the left side of the transmission case (Fig. 22). Install gauge, Tool C-2393 (300 psi.) at this point (Fig. 23).

If line pressure is not correct, it may be adjusted by loosening the lock nut on the adjusting screw (Fig. 22) and turning screw **clockwise** to increase or **counterclockwise** to decrease

LINE PRESSURE CHART

Push Button Position	Rear Wheels	Engine Speed (RPM)	Line Pressure (PSI)
R	Free to Turn	1600	200—240
N	————	1200	85—95
D	Free to Turn	1200	85—91
2	Free to Turn	1200	85—95
1	Free to Turn	1200	85—95

line pressure. All line pressure adjustments should fall within the limits specified in the table shown for all other push button positions.

b. Governor Pressure (Refer to Fig. 24)

Remove the pipe plug from the governor pressure take-off hole located on the lower left side of the output shaft support (Fig. 22). Install gauge, Tool C-3292 (100 psi.).

c. Lubrication Pressure

Remove the pipe plug (or oil cooler fitting) from the lubrication pressure take-off hole located on the left side of the transmission case (Fig. 22). Install gauge, Tool C-3292 (100 psi.) at this point. With engine running at 800 rpm. in neutral, lubrication pressure should be approximately 10 to 30 psi.

If the pressure is extremely high (above 50 psi.), it is a good indication that there is a restriction due to dirt or foreign matter in the lubrication passages.

d. Checking Throttle (Compensated) Pressure

Raise the vehicle off the floor (rear wheels free to turn). Install gauge, Tool C-3292 (100 psi.) at throttle pressure take-off plug. Refer to Fig. 22. Disconnect the bellcrank to transmission throttle linkage at the transmission. Start the engine, and place the transmission in D (drive) position. While holding the transmission throttle lever **toward the closed throttle** position (against the internal stop) increase engine speed slowly (using accelerator pedal or suitable throttle control fixture) to approximately 1500 rpm. to obtain an upshift into direct ratio. After the shift takes place compensated throttle pressure should read 26 to 32 psi. As throttle lever (at transmission) is advanced toward full throttle, compensated throttle pressure should begin to rise after 0° to 5° movement. If compensated throttle pressure rises immediately when the lever is moved, or if the pressure is incorrect or fails to rise after approximately 5° movement, install a new valve body.

Before stopping the engine, advance the throttle control lever (at transmission) slowly and then return to closed throttle. Compensated throttle pressure should rise to approximately 80 to 90 psi. and then fall smoothly without hesitation and should always return to a consistent reading at closed throttle. Failure to do this indicates faulty throttle compensator valve or throttle valve operation.

GOVERNOR PRESSURE CHART

(NOTE: WHEELS MUST BE FREE TO TURN)

Push Button Position	Governor Pressure (PSI)	LC-1, 2, 3	LC-1, 2, 3	LC-1, 2, 3	LY-1	LY-1	LY-1
		AXLE RATIOS					
		2.93-1	3.18-1	3.36-1	2.93-1	3.18-1	3.36-1
1	15	19–21	17–19	16–18	19–21	18–20	17–19
2	45	34–41	32–39	29–36	36–43	33–40	31–37
D	75	71–77	66–71	63–67	74–80	68–74	64–70

SERVICING THE GEARSHIFT CONTROL UNIT

18. REMOVAL AND INSTALLATION

a. Removal

Disconnect one of the cables at the battery. At rear of instrument panel, disconnect back-up light switch, starting motor switch, and illuminating lamp leads. Remove the two small screws from face plate (Fig. 25) to expose two of the bezel retaining screws. Remove the three screws securing bezel to plate and instrument panel (Fig. 25). (Two on front face of bezel—one at bottom edge of bezel.)

CAUTION

Do not attempt to remove face plate and bezel as an assembly as damage to plate casting may occur.

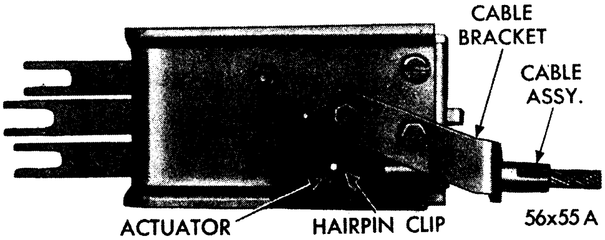
Remove screws (Fig. 25) which retain gearshift housing and plate assembly to instrument panel.

NOTE: Loosening the two trim moulding screws will aid in removal of plate assembly.

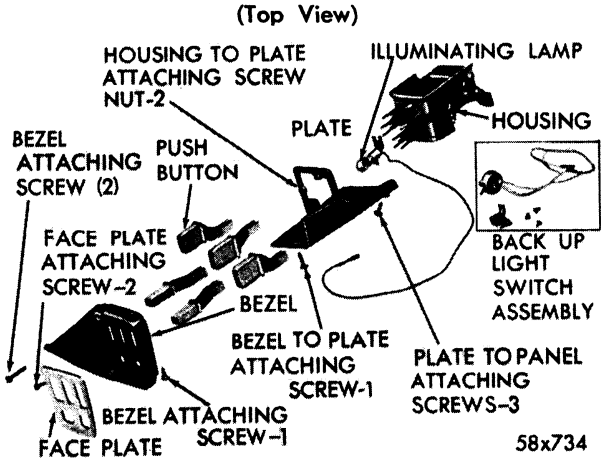
Pull gearshift housing and plate assembly straight out and partially downward from instrument panel to expose control cable and cable bracket.

NOTE: If unit is equipped with back-up light switch, use care during removal of unit, to avoid damaging switch.

Withdraw push buttons from their respective slides. Remove nuts (Fig. 25) securing gearshift housing to plate. Withdraw plate from gearshift housing. Remove hairpin clip (Fig. 25) securing control cable to actuator. Remove the two screws holding cable and cable bracket assembly housing (Fig. 25) and remove cable assembly from gearshift housing. Remove back-up light switch by bending the tabs straight with a screwdriver. The starting motor switch is removed by drilling out the rivets. Remove housing to plate support bracket by removing screws at bottom of plate.



(Top View)



(Bottom View)

Fig. 25—Gearshift Control Housing and Plate Assembly Control Cable Attached

On Imperial models, remove faceplate to expose the two gearshift housing to support retaining nuts. Remove nuts and pull gearshift housing rearward and down from back of instrument panel. Disconnect back-up light switch and starting motor switch leads.

NOTE: Illuminating lamp bulb and light conductor (Fig. 26) are fastened to the gearshift housing support bracket and need not be removed with the housing.

b. Installation

Reinstall all switches that were removed from the gearshift housing.

Install end of control cable to actuator and install hairpin clip (Fig. 25). Place cable and bracket in position on gearshift housing, install the two screws and tighten securely.

Place gearshift housing in position on plate and secure to plate with the two retaining nuts (Fig. 25). Carefully guide plate and housing assembly into position in instrument panel and secure with screws (Fig. 25). Install push buttons on their respective slides.

NOTE: If gearshift housing is equipped with back-up light switch, exercise care during installation of housing to prevent damage to switch.

Reconnect all switch and lamp leads. Install face plate and bezel (Fig. 25). Test operation of unit.

On Imperial models (after reinstalling back-up light and starting motor switches—if removed) install cable and bracket on gearshift housing. Install push buttons (if removed) and install gearshift housing to support bracket at rear of instrument panel. Secure with the two retaining nuts, then replace face plates. Test operation of unit.

19. REPLACING ILLUMINATING BULB

Remove screws from face plate and remove face plate to expose two of the bezel retaining screws (Fig. 25). Remove bezel, then remove one or more push buttons for clearance.

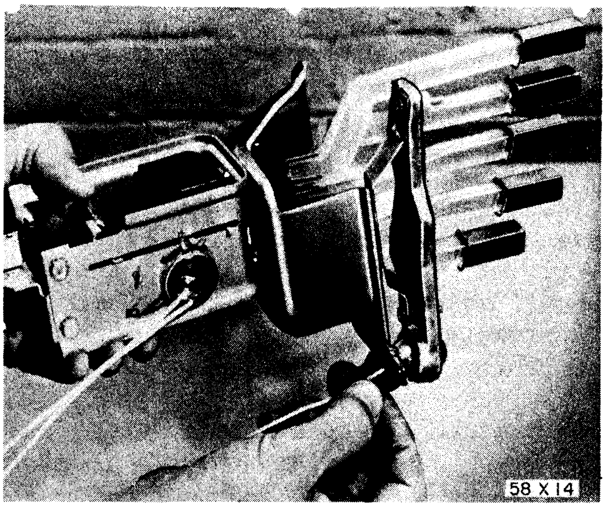


Fig. 26—Illuminating Lamp Bulb Installation—Imperial Models

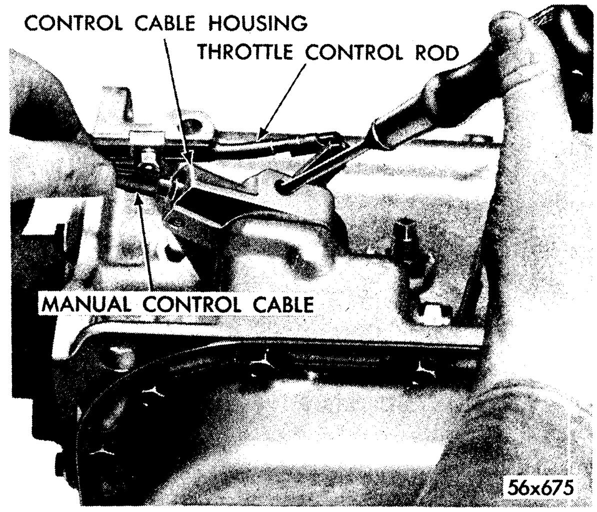


Fig. 27—Releasing Manual Control Cable Spring Lock

Using Tool C-3399, remove bulb.

NOTE: If Tool C-3399 is not available, remove as many push buttons as are necessary for clearance, then, using a piece of cloth (to protect fingers in case of bulb breakage) remove the bulb.

Replace face plate and bezel and test operation of unit.

On Imperial models, the bulb and socket are positioned in the light conductor, as shown in Figure 26. It is necessary, therefore, to reach behind the instrument panel to remove the bulb and socket. After replacing bulb, snap socket into light conductor as shown in Figure 26.

20. REPLACING BACK-UP LIGHT SWITCH AND STARTER SWITCH

The back-up light switch is mounted on the left side of the push button housing. Remove housing, as outlined in Paragraph 18. Use a long, narrow-blade screwdriver to straighten the four tabs that hold the switch. Place replacement switch in position on housing and bend over the four tabs. Replace housing, as outlined in Paragraph 18.

To replace the starter switch, first remove housing, as outlined in Paragraph 18. Drill out the two rivets holding the switch to the flange. The switch replacement kit consists of the switch and two soft tubular rivets. Install switch on flange and check clearance between end of N (neutral) push button slide and end of switch plunger. Bend the flange, on which switch is mounted, to obtain .010 to .015 inch clearance. Reinstall housing as outlined in Paragraph 18.

21. REMOVAL AND INSTALLATION OF CONTROL CABLE (TRANSMISSION END)

a. Removal

Engage the 1 (low) button to place cable adapter spring lock in line with control cable adapter plug hold in transmission case.

Remove cable adjustable mounting bracket on transmission. Remove cable adapter housing plug, insert screwdriver through hole. While exerting pressure against cable lock, spring, withdraw cable as shown in Figure 27.

b. Installation

Remove neutral starting switch (Fig. 22) from transmission case. Place manual valve lever in LOW detent. Hold the R (reverse) push button in at full travel. Insert cable assembly into its adapter in the control cable housing engaging groove in cable end with lock spring. Move cable in and out to make certain cable is securely locked in lock spring. Adjust cable!

SERVICING OF COMPONENT PARTS WITH TRANSMISSION IN VEHICLE

22. SPEEDOMETER PINION

a. Removal

Disconnect speedometer cable and housing from drive pinion and sleeve assembly. Remove speedometer pinion and sleeve assembly from transmission extension. Refer to Page 87 for Speedometer Pinion Usage Chart.

b. Installation

Install speedometer pinion and sleeve assembly in transmission extension and tighten to specifications.

23. NEUTRAL STARTING SWITCH

a. Removal

Drain approximately two quarts of fluid from transmission by disconnecting filler tube at oil pan connector, (may be necessary to loosen filler tube support bracket screw). Remove wire at switch. Remove switch.

b. Installation

Refer to Paragraph 14.

24. TRANSMISSION REGULATOR VALVE ASSEMBLY

a. Removal

Remove transmission regulator valve adjusting screw and lock nut, gasket, cup, spring and sleeve. Using a mechanical retriever or a piece of welding rod ($\frac{5}{32}''$) inserted in end of valve, remove valve (Fig. 28).

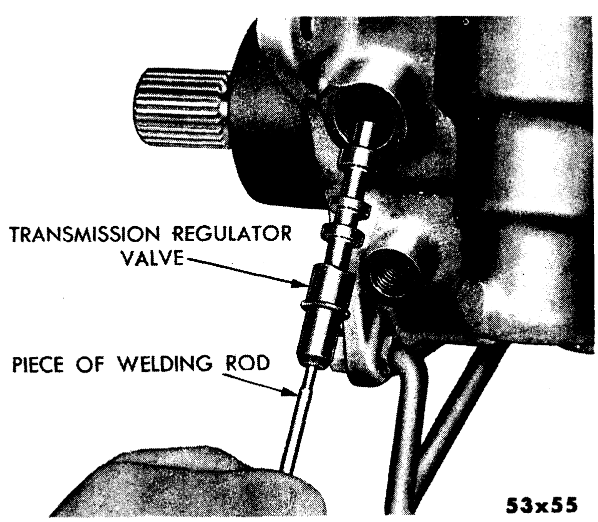


Fig. 28—Typical View—Showing Method of Removing Regulator Valve

b. Installation

With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install regulator valve spring, sleeve, cup, gasket, adjusting screw and lock nut and tighten to specifications. Check line pressure and adjust if necessary.

25. TORQUE CONVERTER CONTROL VALVE ASSEMBLY

a. Removal

Remove the torque converter control valve spring retainer (Fig. 22) gasket and spring. Using a mechanical retriever or a piece of welding rod ($\frac{1}{8}''$) inserted in end of valve, remove valve.

b. Installation

With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install torque converter control valve spring, gasket, and retainer, and tighten to specifications.

26. OIL PAN

a. Removal

Drain transmission by disconnecting filler tube connector at oil pan. (It may be necessary to loosen filler tube support bracket screw.) Remove the oil pan screws and washers, and remove the oil pan and gasket from transmission case.

b. Installation

Using a new oil pan gasket, place oil pan into position on transmission case. Install oil pan screws and washers drawing them down evenly and tighten to specifications. Install oil pan filler tube, and tighten nut connector to specifications. Tighten support bracket screw. Refill transmission with Automatic Transmission Fluid (Type A). Refer to Lubrication Section.

27. VALVE BODIES AND TRANSFER PLATE ASSEMBLY

a. Removal

Place push button control unit in 1 (low) position.

NOTE: It will be necessary for control cable adapter to be in this position (for accessibility) when removing cable from adapter housing on transmission.

Remove oil pan. Disconnect throttle link from throttle lever on transmission. Remove all dirt and foreign material from around control cable housing. Loosen throttle valve lever screw and remove lever assembly. Remove flat washer and lip seal from throttle valve lever shaft. Remove control cable adjustable mounting bracket. Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock. While exerting pressure on control cable spring lock, remove cable (Fig. 27). Using same screw driver, insert through cable opening in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten.

Remove the three control cable housing screws and washers. Remove control cable housing and gasket. Loosen manual valve control lever screw and slide lever off shaft. Remove the four oil strainer assembly screws and washers and remove oil strainer assembly. Loosen (to relieve spring load) and remove the three accumulator cover screws with washers.

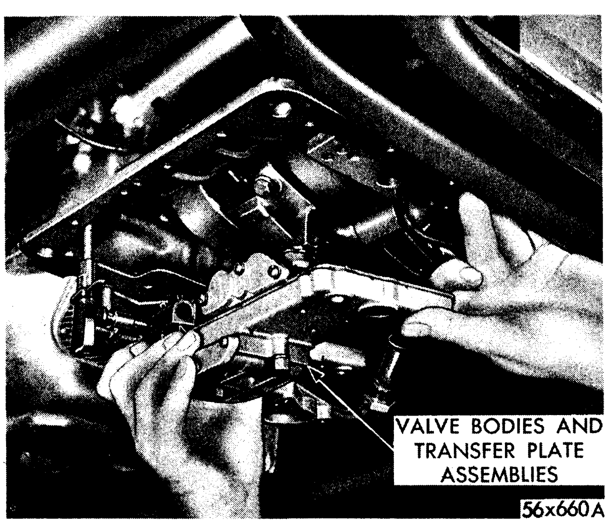


Fig. 29—Removal and Installation of Valve Bodies and Transfer Plate Assembly

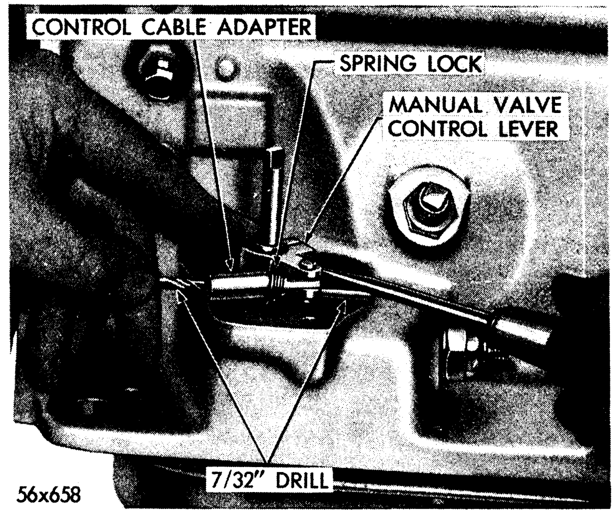


Fig. 30—Setting Manual Valve Control Lever Clearance

Remove cover and spring from transfer plate. Remove the three transfer plate screws and washers and remove valve bodies and transfer plate assembly from transmission case (Fig. 29).

b. Installation

Clean mating surfaces and check for burrs on both the transmission case and valve body transfer plate. Install valve bodies and transfer plate assembly on transmission case. Install the three transfer plate screws and washers (two in center and one on front). Draw down evenly and tighten to specifications.

CAUTION

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on screws with dished portion facing away from head.

Install accumulator spring through transfer plate and position in piston. Install accumulator cover, three screws, and washers; draw down evenly. Place oil strainer in position on transfer plate assembly. Install the four screws and washers. Draw down evenly and tighten strainer and accumulator cover screws to specifications. Install oil pan. Install manual valve control lever (locking screw to rear) on manual valve lever shaft. Position lever on shaft so there is 7/32" clearance (without gasket) between lever and transmission case.

NOTE: a 7/32" drill bit can be used for obtain-

Fig. 31—Removal and Installation of Kickdown Piston (Typical View)

ing proper clearance (Fig. 30). Tighten locking screw securely.

If control cable adapter has been removed from manual valve control lever, reinstall by positioning in lever (end of spring lock up), and installing pin. Place manual valve control lever in reverse position (last detent to rear) and install gasket, control cable housing, and screws and washers. Draw down evenly and tighten to specifications. Install lip seal, flat washer, and throttle lever control assembly. Tighten clamping bolt.

Connect throttle linkage to throttle lever on transmission. Install control cable in housing and adapter **making sure spring lock engages cable.** Replace cable adjustable mounting bracket. Adjust manual control cable. Refer to 'Maintenance, Adjustments and Tests', Paragraph 13. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage. Refer to "Throttle Linkage Adjustments", Paragraph 16.

28. KICKDOWN PISTON

a. Removal

Remove valve bodies and transfer plate assembly. Loosen kickdown band adjusting screw lock nut and back adjusting screw out sufficiently to remove anchor. Remove kickdown band strut. Install Tool C-3529 or C-3289, (modified as shown in Fig. 60), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring. Loosen compression portion of tool and remove piston rod guide, piston spring, and piston rod. Using C-484 pliers, remove the kickdown piston from transmission case (Fig. 31). Refer to "Kickdown Piston Inspection" Paragraph 92.

b. Installation

Lubricate piston rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so not to damage rings, tap lightly and bottom piston into transmission case. Slide piston spring over kickdown piston rod assembly and install in piston. While holding in position, install the kickdown piston rod guide assembly on kickdown piston rod.

Using Tool C-3529 or C-3289 (modified) compress the kickdown piston spring to the point that piston guide seal ring slightly binds on transmission case. Work seal ring into position and gradually compress spring until seal ring enters case and snap ring can be installed. Install kickdown piston rod guide snap ring, making sure it is properly seated. Loosen compressing portion of tool and remove tool from transmission case. Place kickdown band strut in position in band and lever, and compress band end sufficiently to install anchor over adjusting screw. Adjust kickdown band as outlined under "Maintenance, Adjustments and Tests", Paragraph 15. Install valve bodies and transfer plate assembly.

29. ACCUMULATOR PISTON

a. Removal

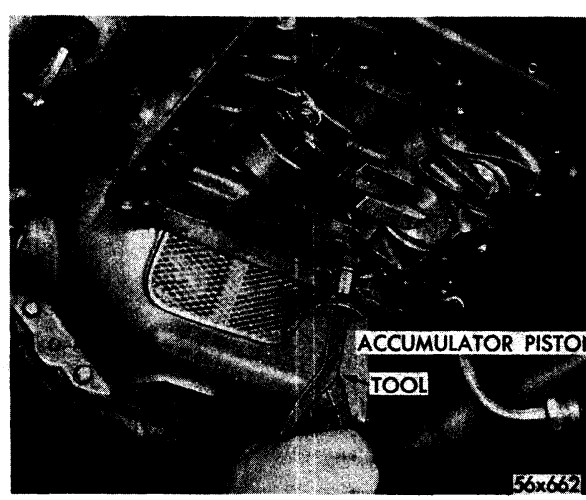


Fig. 32—Removal and Installation of Accumulator Piston (Typical View)

Remove valve bodies and transfer plate assemblies. Using Tool C-484, remove accumulator piston from transmission case, as shown in Figure 32. Refer to "Accumulator Piston—Inspection", as outlined in Paragraph 93.

b. Installation

Lubricate seal rings and place accumulator piston into position. Compress outer seal ring and tap lightly into transmission case. Install valve bodies and transfer plate assemblies.

30. TRANSMISSION OUTPUT SHAFT REAR BEARING OIL SEAL

a. Removal

Disconnect the front universal joint and secure propeller shaft out of the way. Apply the hand brake or use wrench Tool C-3281 (Fig. 42) and remove the propeller shaft flange nut and washer. Release hand brake and install puller, Tool C-452 (if necessary). Remove the propeller shaft flange and brake drum assembly. Remove the transmission brake support grease shield spring (small spring). Remove brake support grease shield from extension.

CAUTION

If screw driver or sharp instrument is used in performing this operation, care must be exercised not to damage the neoprene sealing surface at bottom of shield.

Install puller, Tool C-748 and remove the transmission output shaft rear bearing oil seal.

b. Installation

Using driver, Tool C-3205, install output shaft rear bearing oil seal (metal portion of seal facing in) until driver bottoms on extensions, (Fig. 72). Install brake support grease shield on extension housing.

CAUTION

Indent on grease shield must match groove in extension for correct positioning. Also, shield must be located on extension far enough to permit installation of spring.

Install brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Install propeller shaft flange and drum assembly. Install propeller shaft flange washer (convex side towards nut) and nut. Apply hand brake or use wrench Tool C-3281, and tighten propeller shaft flange nut to specifications. Connect front universal joint and tighten nuts to specifications.

Refill transmission (if necessary) with Automatic Transmission Fluid (Type A) to proper level.

31. EXTENSION

a. Removal

Raise vehicle off floor. Drain approximately two quarts of fluid from transmission. Disconnect front universal joint and secure propeller shaft out of the way. Apply hand brake or use Tool C-3281, and remove propeller shaft nut and washer.

Release hand brake and using puller, Tool C-452 (if necessary), remove the propeller shaft flange and drum assembly.

Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand brake support. Disengage the ball end of the cable from operating lever and remove cable from brake support. Disconnect speedometer cable and housing at transmission extension and remove speedometer drive pinion and sleeve assembly. Remove nuts and lockwashers that hold engine rear support insulator to crossmember, leaving insulator attached to extension housing.

Using suitable jack (or engine support fixture Tool C-3487) raise transmission sufficiently to allow output shaft support to clear crossmember. Remove four of the remaining extension to case screws and lockwashers and install guide studs, Tool C-3283. Due to interference of the insulator, it will be necessary to remove the bottom extension to case screw with the extension. That is, back screw out as far as possible and slide extension back and continue loosening of screw.

CAUTION

Do not remove the one output shaft support to transmission case screw.

Remove extension and hand brake as one assembly. **If care is used, it is not necessary to**

remove hand brake support and shoe assemblies from extension to replace output shaft rear bearing.

b. Installation

With guide studs, Tool C-3283 installed in transmission case, install a new extension gasket over guide studs and into position against output shaft support. **Do not use sealing material on gasket.** Using extreme care, place extension and hand brake assembly over output shaft and on guide studs. **Due to interference of the insulator, it will be necessary to start the bottom extension to case screw as the extension is pushed into position against support. Do not use hammer or attempt to pull extension in with the aid of screws: otherwise, damage to extension may result. The propeller shaft flange and drum assembly may be used to force bearing in extension on output shaft.**

Remove guide studs, Tool C-3283 and install six remaining extension to case screws and lockwashers. Draw down evenly and tighten to Data and Specifications. After screws have been properly tightened, turn output shaft to make sure it turns freely. Lower transmission and at the same time align mounting studs in insulator with holes in crossmember. Install nuts and lockwashers and tighten to specifications. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt.

Install propeller shaft flange and drum assembly, washer, and nut. Apply hand brake or using Tool C-3281 to hold flange, tighten nut to Data and Specifications. Install adjusting screw cover plate on hand brake support. Connect front universal joint and tighten to specifications. Install speedometer pinion and sleeve assembly. Tighten to specifications and connect speedometer cable and housing. Lower vehicle and refill transmission to proper level with Automatic Transmission Fluid (Type A). Refer to Lubrication Section.

32. GOVERNOR

a. Removal

Remove governor locating screw from gover-screw driver, remove the governor valve shaft snap ring from the weight assembly end. Remove governor valve shaft and valve from governor body assembly (Fig. 33).

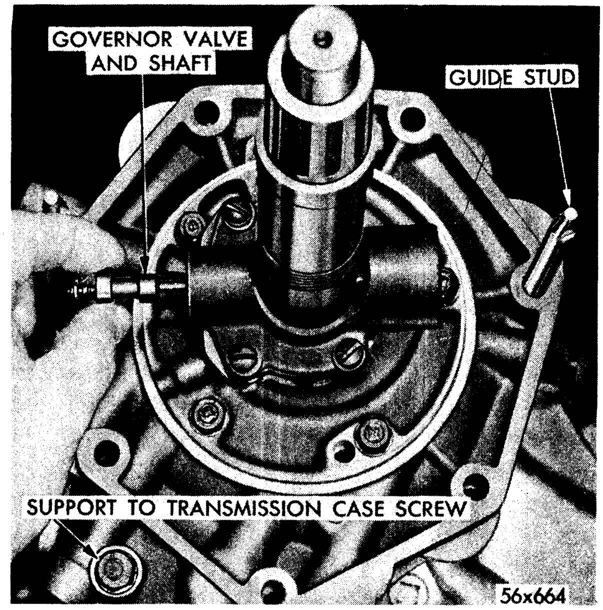


Fig. 33—Removal and Installation of Governor Valve Shaft and Valve

Using Tool C-3229, remove governor weight assembly snap ring (large) and remove governor weight assembly from governor body.

The primary cause of governor operating failures is due to improper operation of governor valve which may be sticking in housing or travel restricted by chips or other foreign matter. If inspection reveals necessity for further governor servicing, then remove governor support locating screw, and remove governor and support assembly from rear oil pump hous-

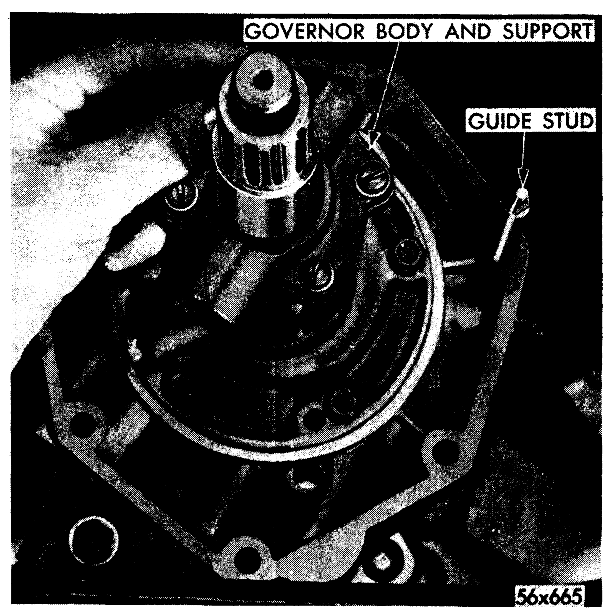


Fig. 34—Removal and Installation of Governor Body and Support Assembly

ing (Fig. 34). Normal servicing does not require removal of the governor body from the governor support. If condition warrants removal of governor body from governor support, when reassembling do not tighten governor body screws until governor body support is located on output shaft.

b. Installation

Slide governor body and support assembly into position in rear oil pump housing. Using extreme care, compress governor support seal rings as support enters oil pump housing. **Do not force.** Align locating hole in output shaft to locating hole in governor support and install screw and tighten to specifications. Holes can be aligned by turning output shaft and holding governor body. If governor body has been removed and reinstalled tighten the four governor body screws to specifications. Place governor weight assembly (secondary weight snap ring facing out) into governor body; and using Tool C-3229, install snap ring. **Make sure snap ring seats properly.** With governor valve (small end in) on governor valve shaft, slide shaft into governor body through output shaft and governor weight assembly, at the same time, position valve into body.

Install the governor valve shaft snap ring. Make sure it is locked securely to shaft. Replace snap ring if distorted. After snap ring installation, apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves. (Fig. 100). Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

33. REAR OIL PUMP

a. Removal

Remove transmission extension (Paragraph 31). Refer to "Governor—Removal", Paragraph 32. **Using a screw driver, remove the governor valve shaft snap ring from weight assembly end.** Remove governor valve shaft and valve from governor valve body assembly. Using Tool C-3229, remove governor weight assembly snap ring (large one) and remove governor weight assembly from governor body.

Remove governor locating screw from governor support. Remove the five rear oil pump housing to output shaft support screws and washers and install guide studs, Tool C-3288. Remove pump housing, gear, and governor assembly from output shaft. Use dye and mark pump gears in relation to pump housing face. **Do not use scribe. Oil pump pinion is keyed to output shaft pinion by small ball. Use care when removing pinion so as not to lose ball.** Remove governor assembly from oil pump housing.

NOTE: If output shaft is turned to a position where governor locating screw hole is up, when removing rear pump pinion, pump drive ball will also be up, preventing ball from falling out.

b. Installation

Slide governor support and body assembly into position in rear oil pump housing. **Compress governor support seal rings as support enters oil pump housing. Do not force.**

Place rear oil pump pinion ball in ball pocket in output shaft. Place rear oil pump pinion (as marked when removed) over output shaft and into position aligning keyway in pinion with ball in shaft.

With rear oil pump gear properly positioned in pump housing (check marking), slide rear oil pump and governor assemblies over output shaft and guide studs into position against support.

CAUTION

There are two extra holes in housing which are used for vents. Make definitely sure you do not attempt to install screws in these holes.

Remove guide studs and install the five rear oil pump housing to output shaft support screws and washers.

CAUTION

Dished washers are used to prevent cutting of soft metals and should be installed on screws with dished portion facing away from head. Draw down evenly and tighten to specifications. After screws have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, remove pump to determine cause.

Align locating hole in output shaft to locating screw hole in governor support; install locating screw, and tighten to specifications. **Holes can**

be easily aligned by turning output shaft and holding governor body.

Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

34. REMOVAL AND INSTALLATION OF TRANSMISSION

a. Removal

Disconnect battery. Engage 1 (low) push button and raise vehicle off floor.

NOTE: It is necessary for control to be in this position to remove cable from adapter housing on transmission.

Drain transmission and torque converter. (Refer to Lubrication Section.) When fluid has drained, replace torque converter drain plug and tighten. Disconnect the front universal joint and secure propeller shaft out of the way. Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand brake support. Disengage the ball end of the cable from the operating lever and remove cable from brake support. Disconnect speedometer cable and housing at transmission extension. Disconnect neutral starting switch wire. Disconnect throttle valve control link from lever on transmission. Remove gearshift control cable as outlined in Paragraph 21.

If adapter housing is to be removed, insert screwdriver through cable opening in adapter housing and push lever rearward to last detent. Remove transmission oil cooling lines from transmission. Remove nuts and lockwashers that hold the engine rear support insulator to the crossmember. Leave insulator attached to transmission.

Install engine support fixture, Tool C-3487 (may be necessary to remove starter to provide clearance for support ends of support fixture). Insert hooks of fixture firmly into holes in side of frame member with support ends up against the underside of oil pan flange. Adjust fixture to support the weight of the engine. Raise engine slightly, remove crossmember to torsion bar bracket bolts and remove crossmember.

CAUTION

When using fixture Tool C-3487, do not lower engine more than three inches from floor pan to avoid disrupting the set position of water hose, and other engine attachments.

Remove the two transmission case to torque converter housing screws and lockwashers from right side of transmission and install guide studs, Tool C-3276. With transmission supported by a suitable jack, remove the two transmission case to torque converter housing screws and lockwashers from left side. Slide transmission straight back to avoid damage to front oil pump driving sleeve before lowering transmission.

b. Installation

Install guide studs, Tool C-3276 in the two transmission mounting holes in right side of torque converter housing. With front oil pump drive sleeve lubricated, install, making sure driving lugs are properly engaged with oil pump pinion. **Main portion of drive sleeve will be flush with front of pump housing when properly installed (Fig. 95).**

Note position of driving lugs inside torque converter hub, then position front oil pump drive sleeve on transmission accordingly, to aid in proper engagement when transmission is installed. Slide transmission over guide studs and into position and against converter housing. Make sure driving lugs on front oil pump drive sleeve properly engage the torque converter. **To avoid damage to front oil pump, do not attempt to use transmission to torque converter housing screws to bring transmission and housing together. If oil pump drive sleeve and input shaft have been properly aligned, the transmission should slide into position relatively easy. DO NOT FORCE.**

Install two transmission case to torque converter housing screws and lockwashers in left side, do not tighten. Remove guide studs and install the two transmission case to housing screws and lockwashers in right side, then draw the four down evenly and tighten to specifications.

Place crossmember into position and install the crossmember to torsion bar bracket bolts. Tighten to specifications. Lower engine and at the same time align mounting studs in insulator with holes in crossmember.

Install nuts and lockwashers that hold engine rear support insulator to crossmember and tighten to specifications. Remove support fixture, Tool C-3487 from side of frame member. Connect oil cooling lines. Connect neutral starting switch wire to switch. Install oil pan filler tube and tighten filler tube nut to specifications. Tighten support bracket screw. Connect speedometer cable in housing etxension. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt. Install adjusting brake screw cover plate on hand brake support. Connect front universal joint and tighten nuts to 37 foot-pounds torque. Install starter (if removed).

Connect throttle control linkage to throttle lever on transmission. Install push button control cable in adapter making sure spring lock engages cable. Adjust manual control cable. Refer to "Maintenance Adjustments and Tests." Paragraph 13. Tighten cable adjustable mounting bracket nut securely. Lower vehicle and connect battery. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage (Paragraph 16).

RECONDITIONING OF TRANSMISSION

NOTE: In the event that a transmission has failed any part, it will be necessary to flush the torque converter to insure that fine metallic particles are not later transferred into the transmission controls. Refer to Torque Converter section for instructions outlining this operation.

35. PRECAUTIONS TO OBSERVE DURING DISASSEMBLY

The following precautions should be observed during disassembly of transmission: Cleanliness through the entire disassembly and assembly cannot be over-emphasized. Unit should be thoroughly cleaned when removed from vehicle, preferably by steam. When disassembling, each part should be placed in a suitable solvent, washed, then dried by compressed air. **Do not wipe parts with shop towels.** All of the mating surfaces in the transmission are accurately machined; therefore, careful handling of parts must be exercised to avoid nicks or burrs.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care so not to round off the sharp edges. The sharp edge portion is vitally important to this type valve. Sharp edges prevent dirt and foreign matter from getting between the valve and body, thus reducing the possibilities of sticking. When it becomes necessary to recondition the transmission, and vehicle has accumulated considerable mileage, install new seal rings on parts requiring their usage.

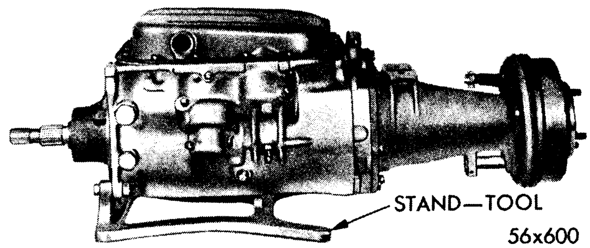


Fig. 35—Transmission Assembly Inverted in Stand

NOTE: The following procedures are based on the assumption that the transmission fluid has been drained, the unit has been removed from vehicle and prepared for disassembly.

36. OIL PAN—REMOVAL

Place transmission assembly in stand, Tool C-3280, and invert, as shown in Figure 35 remove the oil pan bolts and remove the oil pan and gasket, as shown in Figure 36. Note the construction of oil pan bolts, washers used are part of the bolt.

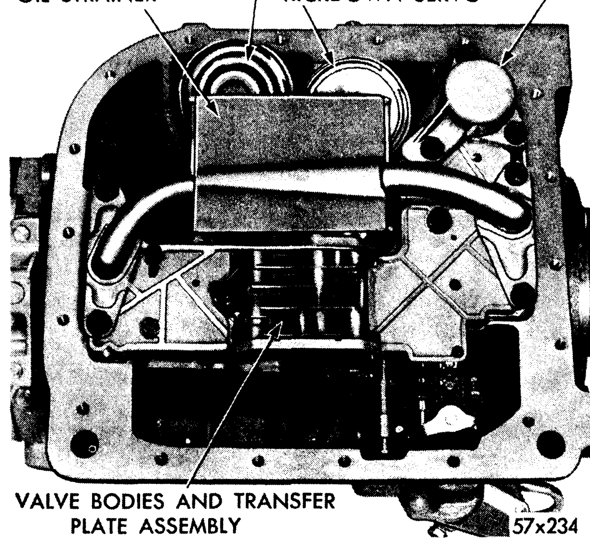


Fig. 36—Transmission Assembly—Oil Pan Removed

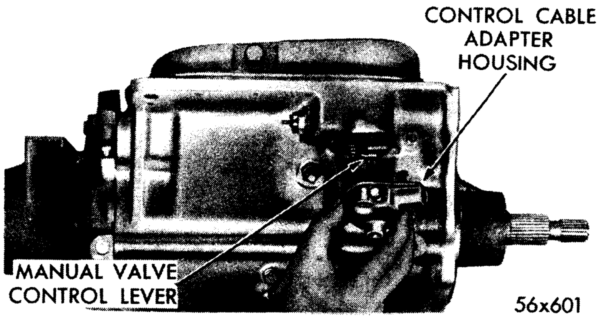


Fig. 37—Removal and Installation of Control Cable Adapter Housing

37. VALVE BODIES AND TRANSFER PLATE—REMOVAL

Remove throttle valve lever, flat washer, and lip seal. Remove the three gearshift control cable adapter housing bolts and washers. Remove housing and gasket from transmission, as shown in Figure 37. **Manual valve control lever must be moved to the reverse position before housing can be removed.** Loosen manual valve control lever bolt. Using caution to prevent loss of cable adapter pin, slide lever and cable adapter off shaft.

Remove four oil strainer assembly bolts and lock washers. Remove oil strainer assembly, as shown in Figure 38. Loosen (to relieve spring load) the three accumulator cover bolts with washers, and remove cover and spring from transfer plate, as shown in Figure 39. Remove three transfer plate bolts and washers. Remove valve bodies and transfer plate assembly from transmission case, as shown in Figure 40. **Mating surfaces are machined: use extreme care so as not to damage these surfaces. Place valve body in stand, Tool C-3528.** Remove the neutral starting switch (with cupped washer and "O" ring) located in left side of transmission case as shown in Figure 22.

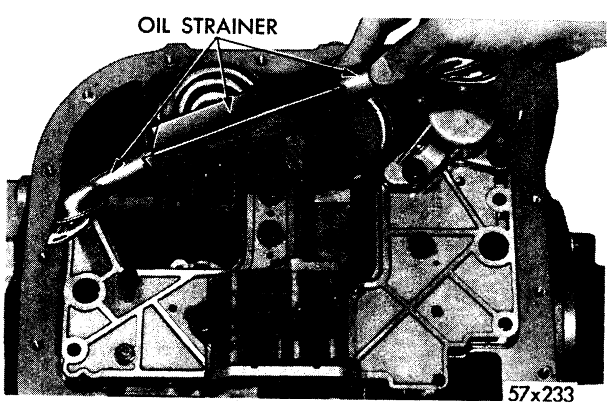


Fig. 38—Removing Oil Strainer Assembly

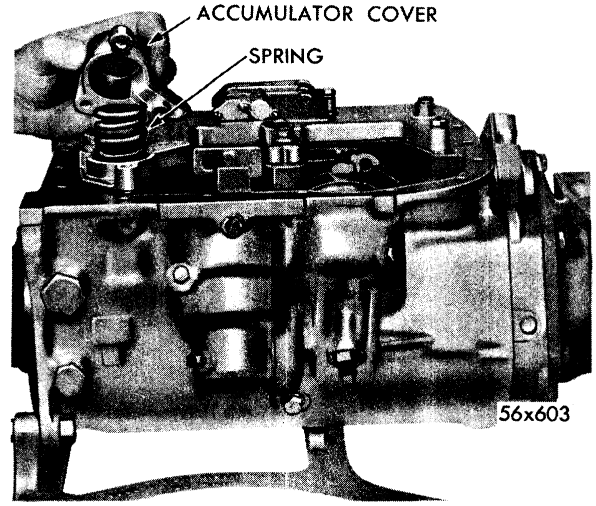


Fig. 39—Removal and Installation of Accumulator Cover

38. CHECKING FRONT CLUTCH END CLEARANCE

Prior to removal of propeller shaft flange and drum assembly, check end clearance of front clutch piston retainer assembly using dial indicator Tool C-3339, as shown in Figure 41.

To make this check, move front clutch forward by pulling on the input shaft, or by carefully inserting screw driver and prying between the front and rear clutches. Remove screw driver, and with dial indicator point contacting edge of front clutch retainer, set dial indicator to zero. Push clutch assembly

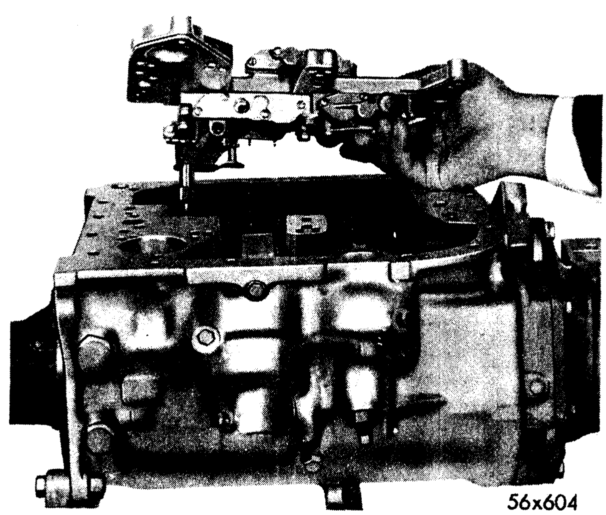


Fig. 40—Removal and Installation of Valve Bodies and Transfer Plate Assembly (Typical View)

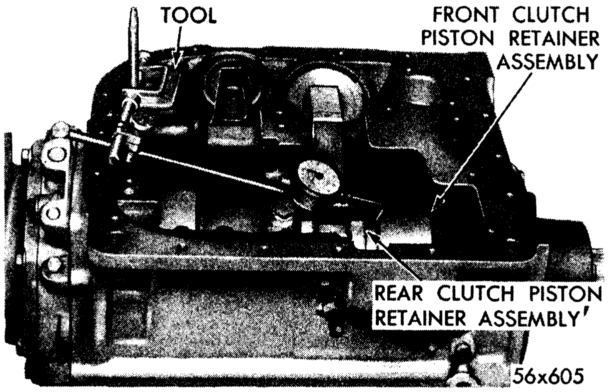


Fig. 41—Checking Front Clutch Piston Retainer Assembly End Clearance

rearward against rear clutch, and take indicator reading. This clearance should be from .020 to .050 inch. If this clearance exceeds the specified limits, particular attention should be paid to the condition of the input shaft thrust washer when disassembling transmission.

39. HAND BRAKE ASSEMBLY—REMOVAL

Remove the transmission flange nut and washer. Use wrench, Tool C-3281, to hold brake drum and flange assembly, (Fig. 42). Attach puller, Tool C-452 (if necessary) and remove propeller shaft flange and drum assembly. Inspect oil seal surfaces. Inspect lining contact surfaces on brake drum assembly for scoring and inspect brake lining for wear.

Remove transmission brake support grease shield spring. This spring has two purposes, it acts as a guide for the brake shoes and retains the brake support grease shield to the transmission extension. Remove the brake support grease shield from extension. **If a screw driver or sharp instrument is used in removing this shield, care must be exercised not to damage the neoprene sealing surface at bottom of shield. Note the indent on grease shield for correct positioning on extension.**

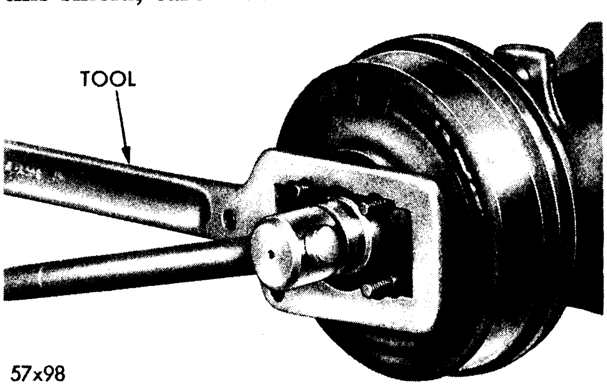


Fig. 42—Removing Handbrake Drum and Flange (Assembly Nut)

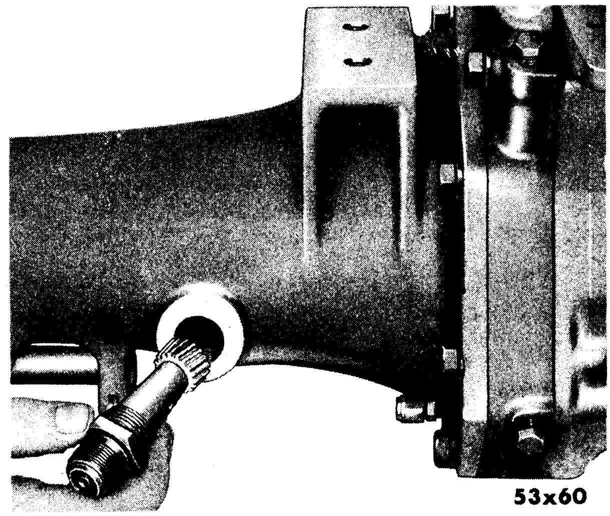


Fig. 43—Removal and Installation of Speedometer Drive Pinion Assembly

Using a suitable drift, remove pin which secures brake shoe anchor in extension housing. Slide balance of handbrake assembly intact from extension housing. Inspect spacer (neoprene) on back of support plate for deterioration and note the steel sleeve used between neoprene spacer and extension.

40. TRANSMISSION EXTENSION—REMOVAL

Remove speedometer drive pinion and sleeve assembly, as shown in Figure 43. **Nylon gear can be easily damaged if extension is removed without first removing the speedometer drive**

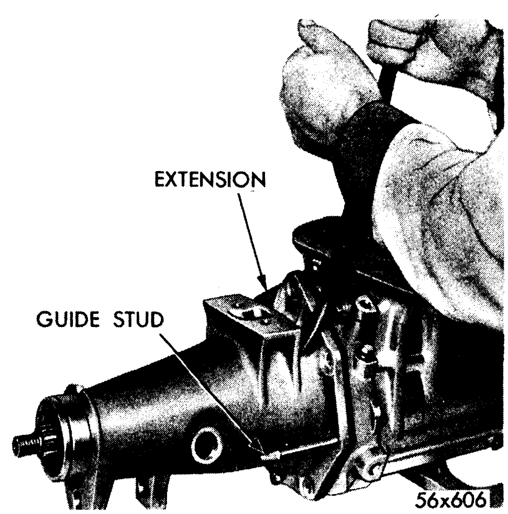


Fig. 44—Removal of Extension

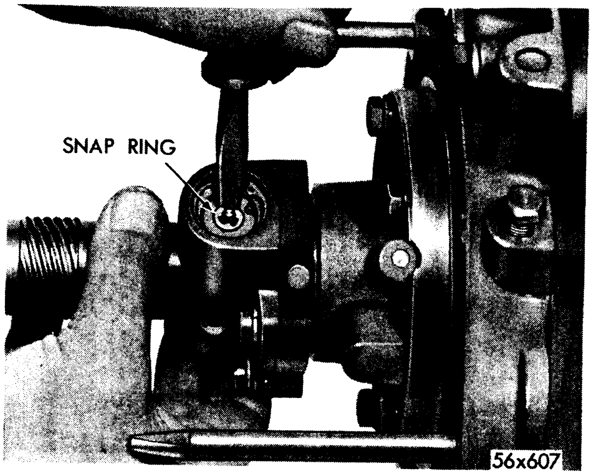


Fig. 45—Removal and Installation of Governor Valve Shaft Snap Ring

pinion and sleeve assembly. Inspect the output shaft rear bearing oil seal and remove (if necessary) using puller, Tool C-748. Remove the seven transmission extension to case bolts and lockwashers. Install guide studs, Tool C-3283 and remove extension from output shaft support assembly by tapping housing lightly with a soft hammer. **Housing may be separated by using a pry bar against support screw, as shown in Figure 44.** Remove extension gasket.

41. GOVERNOR AND REAR OIL PUMP HOUSING—REMOVAL

Using a small screw driver, remove the governor valve shaft snap ring from the weight assembly end as shown in Figure 45.

Remove governor valve shaft and valve from

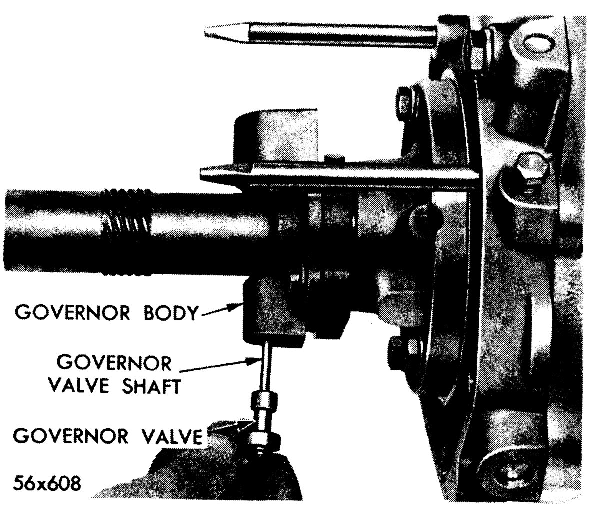


Fig. 46—Removal and Installation of Governor Valve and Shaft

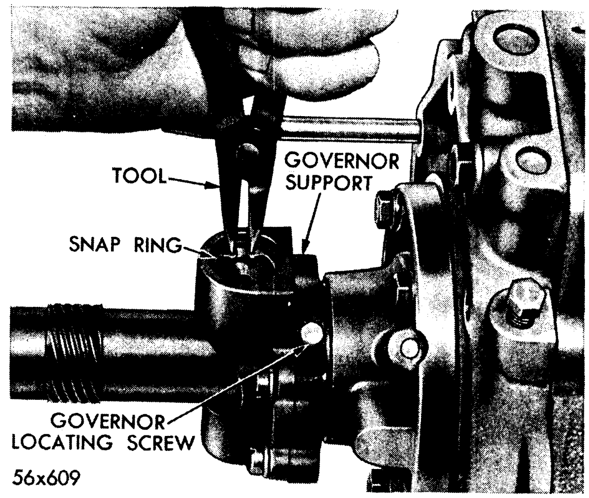


Fig. 47—Removal and Installation of Governor Weight Assembly

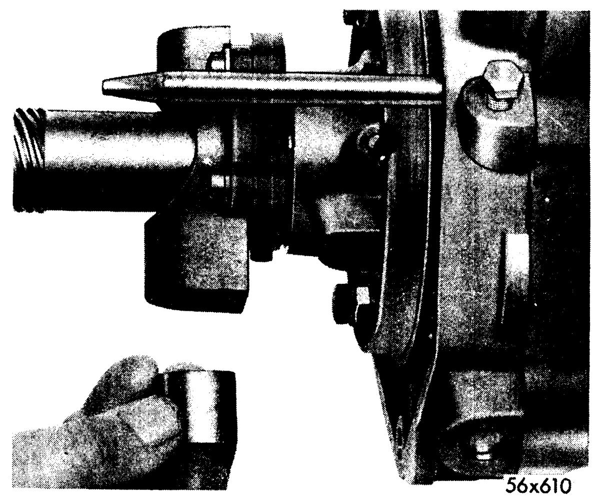


Fig. 48—Removal and Installation of Governor Weight Assembly

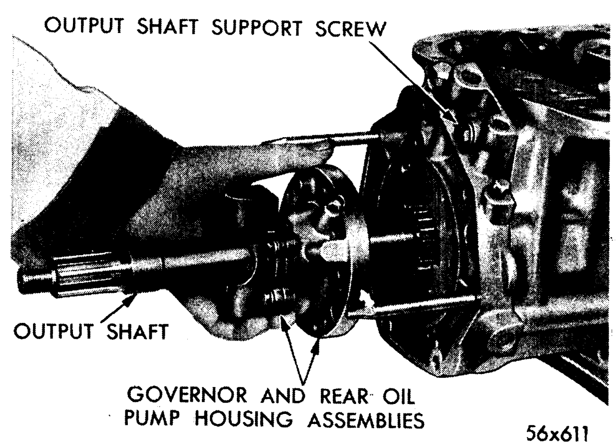


Fig. 49—Removal and Installation of Governor and Rear Oil Pump Housing Assemblies

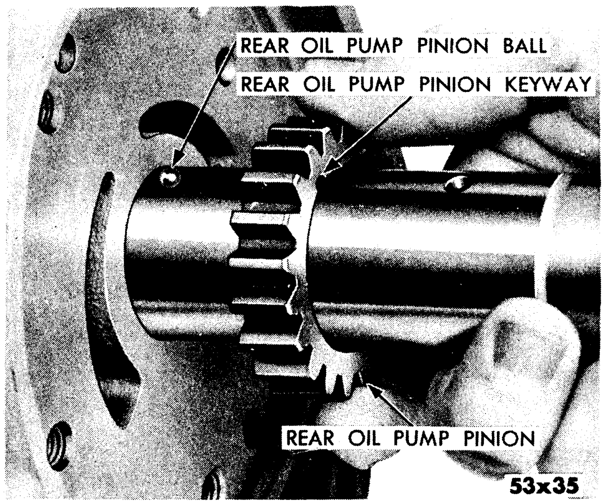


Fig. 50—Removal and Installation of Rear Oil Pump Pinion

governor valve body assembly, as shown in Figure 46. Using pliers, Tool C-3229, remove governor weight assembly snap ring (large), as shown in Figure 47, and remove governor weight assembly from governor body (Fig. 48).

Remove governor locating screw from the governor support. Remove the five rear oil pump housing to output shaft support bolts and washers. Remove pump housing, gear, and governor assembly from output shaft, as shown in Figure 49. Use dye and mark face of pump gear in relation to pump housing.

Do not use scribe. Oil pump pinion is keyed to output shaft by a small ball. Use care when removing pinion so as not to lose ball. Remove rear oil pump pinion from output shaft, as shown in Figure 50. Mark in the same manner as previously described.

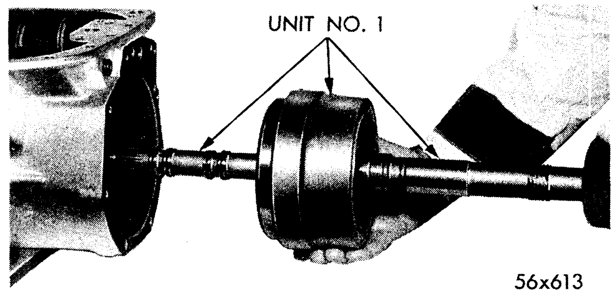


Fig. 52—Removal and Installation of Unit No. 1

42. OUTPUT SHAFT SUPPORT—REMOVAL

Remove output shaft support to transmission case screw and washer (Fig. 49). Slide the output shaft rear support assembly and gasket from transmission case, as shown in Figure 51. If rear support is stuck to transmission case, it can be loosened by tapping lightly with a soft hammer. Remove guide studs, Tool C-3283 from transmission case.

43. REMOVING POWER TRAIN UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)

Remove by sliding unit out rear of transmission case (Fig. 52). **Support unit as much as possible, when removing, to prevent damage to seal rings on intermediate shaft.**

44. REMOVING POWER TRAIN UNIT NO. 2 (SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH ASSEMBLIES)

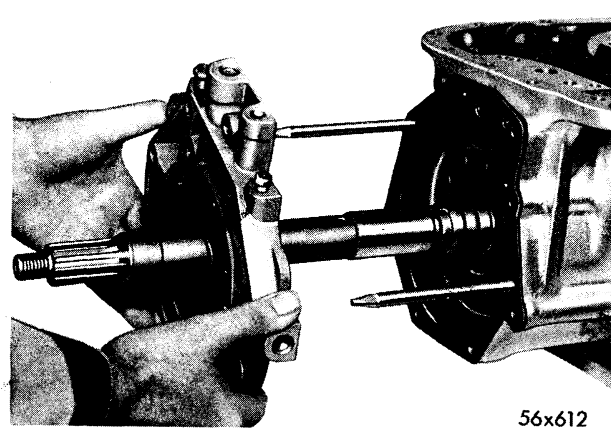


Fig. 51—Removal and Installation of Output Shaft Support

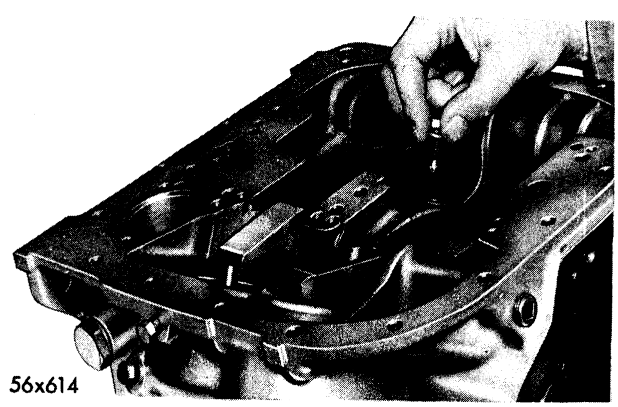


Fig. 53—Removal and Installation of Intermediate Support Locating Screw

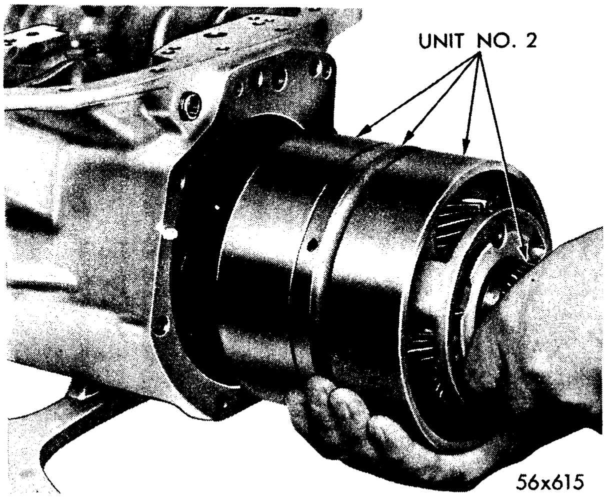


Fig. 54—Removal of Unit No. 2

Loosen lock nuts on low-reverse and kickdown band adjusting screws, and back adjusting screws out 2 to 3 turns. Remove the three intermediate support locating bolts and lockwashers (two outside of case and one inside). (Figs. 22 and 53). **When removing unit, identify locating hole in the intermediate support to correspond with the hole in the case—for installation purposes. (Fig. 99.)**

Keep unit centered as much as possible to prevent binding of intermediate support, and remove assembly from transmission case, as shown in Figure 54. **Make sure front clutch and sun gear thrust washer remains in position in front of unit.**

45. REMOVING UNIT NO. 3 (FRONT CLUTCH PISTON RETAINER AND INPUT SHAFT ASSEMBLIES)

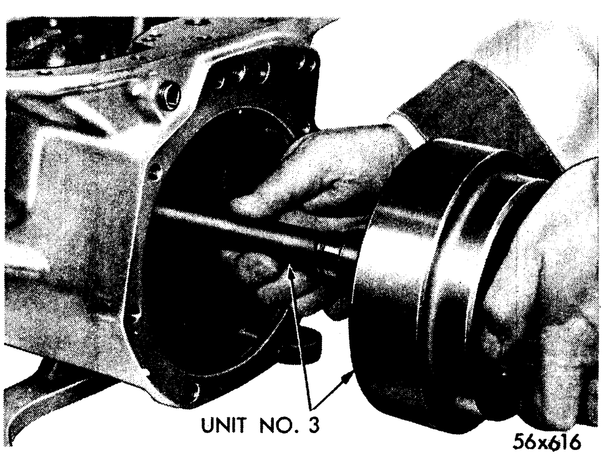


Fig. 55—Removal and Installation of Unit No. 3

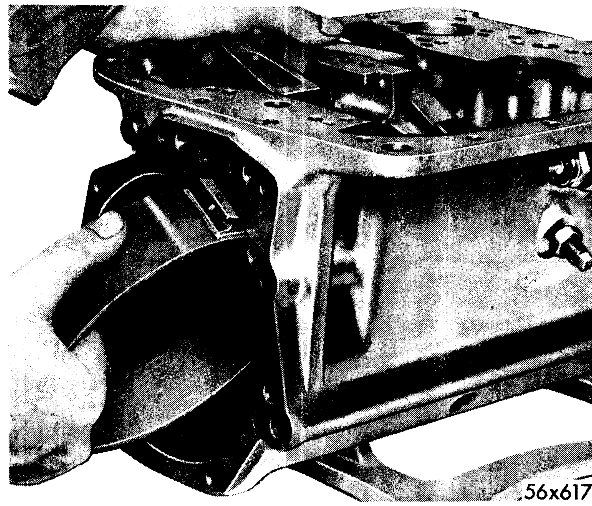


Fig. 56—Removal and Installation of Low-Reverse Band

Keep unit centered as much as possible, and remove from transmission case, as shown in Figure 55. Use extreme care when removing to prevent damage to seal rings on input shaft and sealing surfaces in reaction shaft (aluminum).

46. LOW-REVERSE BAND ASSEMBLY—REMOVAL

Mark the low-reverse band assembly for installation purposes; then compress ends of band sufficiently to remove the low-reverse band strut. (Strut grooved at one end to receive band.) Remove low-reverse band assembly by rotating band ends through rear opening in transmission case, as shown in Figure

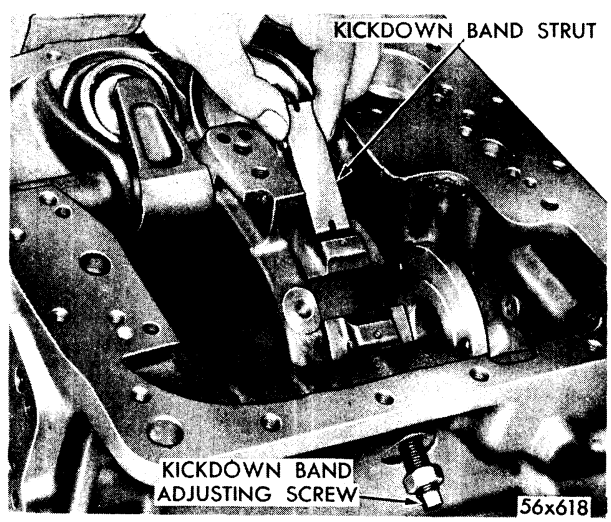


Fig. 57—Removal and Installation of Kickdown Band Strut

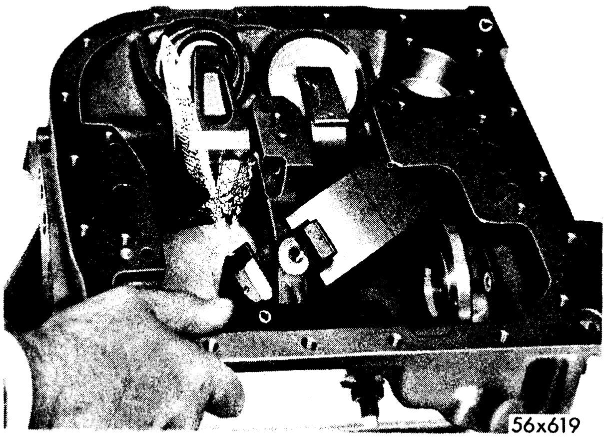


Fig. 58—Removal and Installation of Kickdown Band

56. Remove low-reverse band anchor from adjusting screw.

47. KICKDOWN BAND—REMOVAL

Compress kickdown band ends sufficiently to remove the kickdown band strut. (Fig. 57). (Note that strut is grooved to act as a guide.) Remove the kickdown band anchor from adjusting screw. Remove kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 58. **Use extreme care when removing band so as not to damage lining against edges of transmission case.** Both bands have bonded lining and no attempt should be made to reline them. The kickdown band is **wider** and has **different** lining material.

48. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES—REMOVAL

Remove kickdown and reverse lever shaft stop plug at rear of transmission case. Using pliers, remove kickdown and low-reverse shaft lever spacer (flat). Thread a guide stud, Tool C-3288, into shaft, and remove shaft from case, as shown in Figure 59. Remove kickdown and low-reverse servo levers.

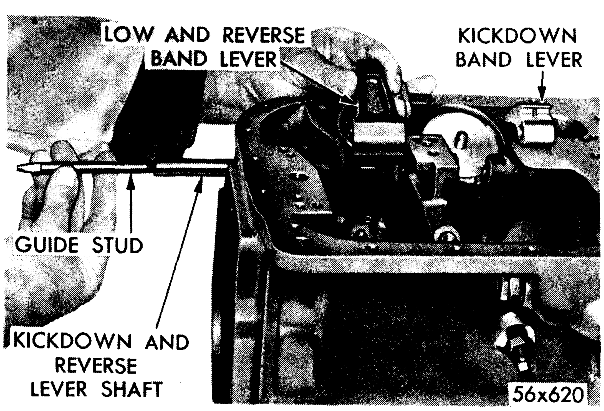


Fig. 59—Removal and Installation of Kickdown and Reverse Lever Shaft

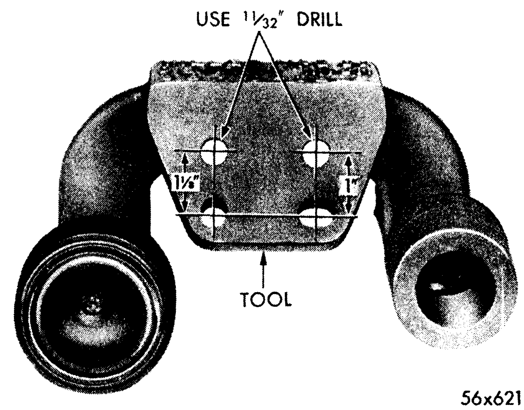


Fig. 60—Modification of Tool C-3289

49. LOW-REVERSE SERVO—REMOVAL

Install Tool C-3529 or C-3289 (modified, as shown in Fig. 60) on transmission case and compress piston spring retainer. **Due to modification of tool, only one attaching bolt can be used.** Using a screw driver, remove the low-reverse servo piston spring retainer snap ring, as shown in Figure 61. Loosen compression portion of tool, and remove. **Spring retainer may require guiding out of transmission case.** Remove the spring retainer, spring and servo piston and plug assembly.

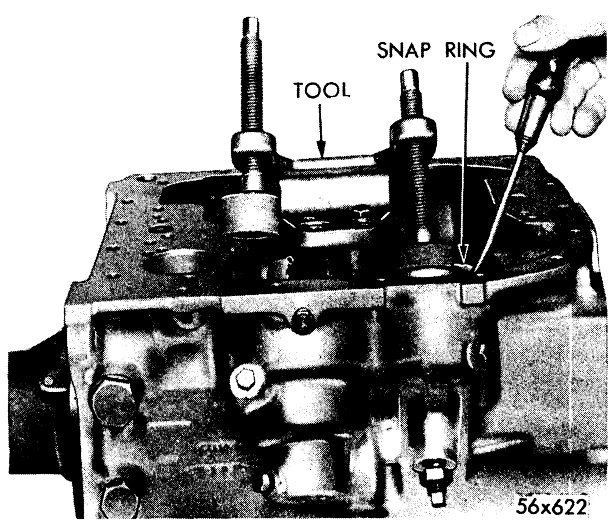


Fig. 61—Removal and Installation of Low-Reverse Servo

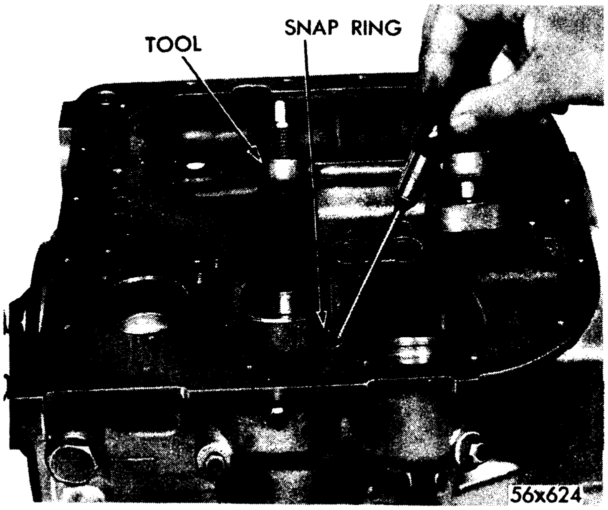


Fig. 62—Removal and Installation of Kickdown Piston Rod Guide Snap Ring

50. KICKDOWN SERVO—REMOVAL

Reinstall Tool C-3529 or C-3289 (modified, as shown in Fig. 60), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring, as shown in Figure 62. Loosen compressing portion of tool and remove from transmission case. Remove piston rod guide, piston spring, and piston rod. Using pliers, Tool C-484, remove the kickdown piston from the transmission case. Using pliers, Tool C-484, remove the accumulator piston from transmission case, as shown in Figure 63.

51. FRONT OIL PUMP—REMOVAL

Remove front oil pump drive sleeve (if installed). Remove the transmission regulator

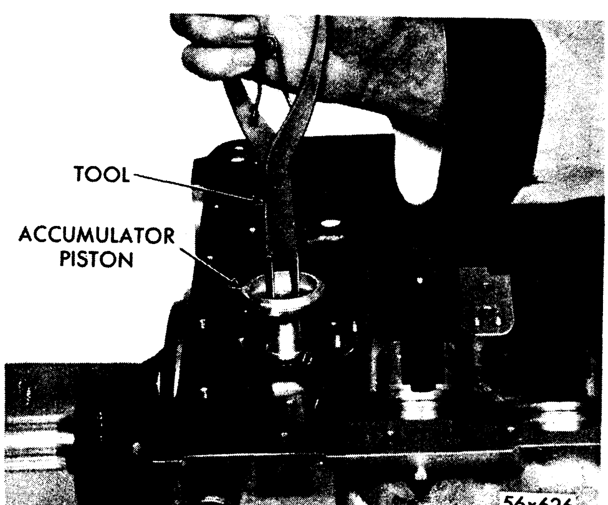


Fig. 63—Removal and Installation of Accumulator Piston

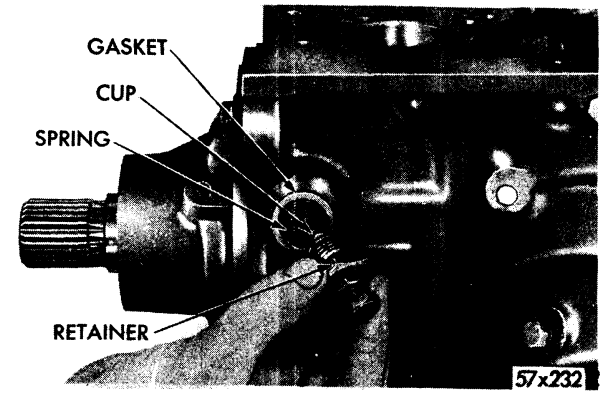


Fig. 64—Removal and Installation of Regulator Valve Retainer

valve spring adjusting screw, locknut, gasket, cup, spring, sleeve and valve. (Figs. 64, 65, and 66). Remove the torque converter valve retainer, gasket, spring, and valve. These valves can be removed with the aid of a mechanical retriever or a piece of welding rod ($\frac{5}{32}$ inch for regulator valve and $\frac{1}{8}$ inch for torque converter valve) inserted in end of valve, as shown in Figure 28. The converter valve is so

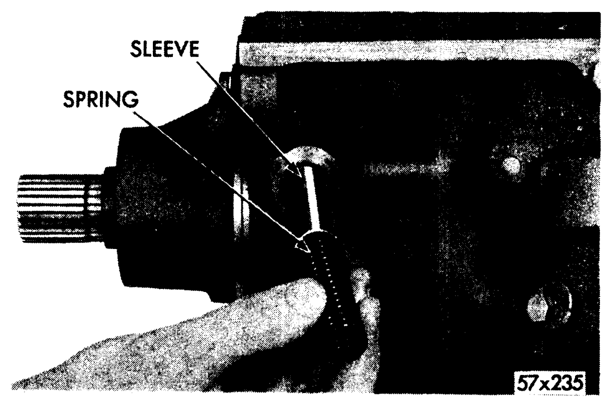


Fig. 65—Removal and Installation of Regulator Valve Spring

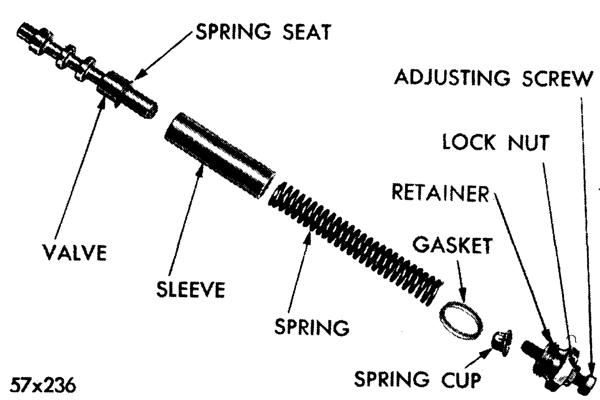


Fig. 66—Regulator Valve Assembly (Disassembled View)

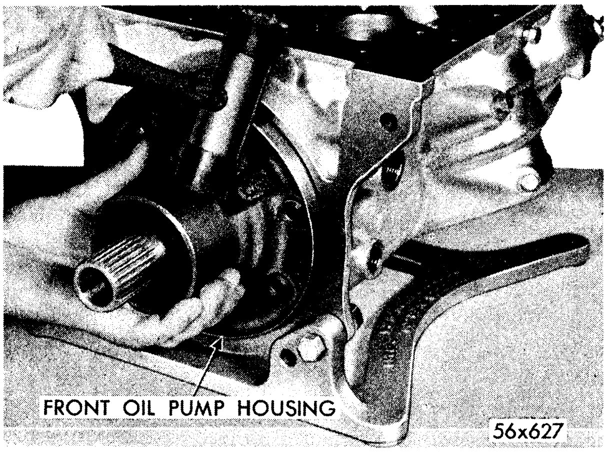


Fig. 67—Removal of Front Oil Pump Housing Assembly

constructed that it will not drop into front housing during removal.

Remove the seven front oil pump housing to transmission case bolts and washers. Sealing washers, used under bolts, are made from aluminum; replace by new washers if damaged. Remove oil pump housing assembly from transmission case by tapping housing lightly with a soft hammer, as shown in Figure 67. **Using dye, mark pump gears in relation to face of oil pump housing for reassembly purposes. DO NOT SCRIBE.**

52. REGULATOR VALVE BODY—REMOVAL

Install guide studs, Tool C-3288; and using the two threaded holes provided in the regulator valve body, install guide studs, Tool C-3283, as shown in Figure 68. Pull regulator valve body

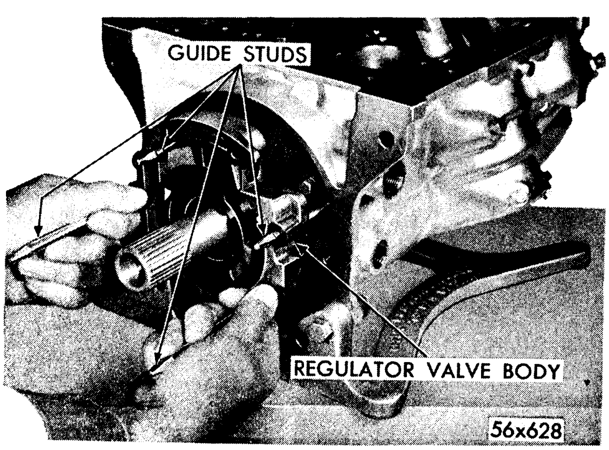


Fig. 68—Removing Regulator Valve Body

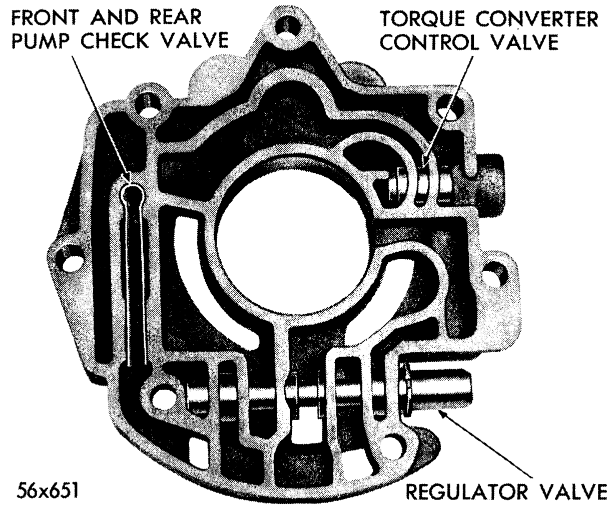


Fig. 69—Regulator Valve Body and Valves

off of torque converter reaction shaft and remove gasket. **Regulator valve body (Fig. 69) is made of aluminum and requires care in handling to avoid damage.**

53. TORQUE CONVERTER REACTION SHAFT—REMOVAL

Refer to "Inspection of Torque Converter Reaction Shaft," Paragraph 55. If inspection reveals it is necessary to remove torque converter reaction shaft, proceed as follows: Remove torque converter reaction shaft seal ring (neoprene). Remove three transmission case to reaction shaft bolts and washers. Using Tool C-3531*, press reaction shaft out of transmission case, as shown in Figure 70.
*Refer to "Special Tools".

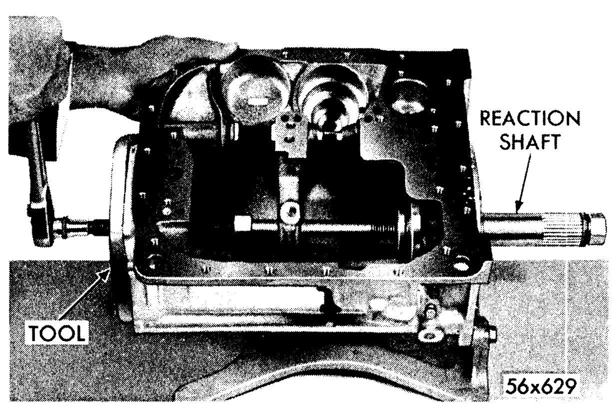


Fig. 70—Removal and Installation of Torque Converter Reaction Shaft

DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPONENT PARTS

54. PRECAUTIONS TO OBSERVE DURING DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPONENT PARTS

The following precautions should be observed during assembly of component parts. Where lubrication is required, use Automatic Transmission Fluid (Type A). **Do not use a sealing material on any gasket or mating surface, always use new gaskets.** Torque all bolts and nuts to correct specifications. Where snap rings are used, always make sure they are seated properly. If mating parts do not go together properly, always check reason. **Do not force.**

55. TORQUE CONVERTER REACTION SHAFT—INSPECTION

Inspect inside of torque converter reaction shaft for burrs. Inspect splines on shaft for burrs and wear. Inspect the reaction shaft seal ring (neoprene) for deterioration and hardness. Inspect thrust surface for wear and slight scores. **Do not remove the torque converter reaction shaft unless inspection reveals it is necessary to do so.**

56. TRANSMISSION CASE—INSPECTION

Inspect transmission case for cracks, sand holes, and stripped threads. Check for burrs on mating surfaces. Blow compressed air through all passages to make sure they are open. Check pressure take-off plugs for tightness.

Using straight edge, Tool C-3335, inspect valve body mating surface on transmission case for any burrs or irregularity in surface. Surfaces should be smooth and flat.

Inspect servo and accumulator bores for any scores or scratches. Light scratches may be removed with crocus cloth. Check regulator valve body mating surface in front of case for any irregularities. **Disregard any scratches which may have been caused by torque converter reaction shaft bolt lock washers.**

It is vitally important that band adjusting screws fit freely into transmission case. **When lock nuts are loose, the adjusting screws must be finger free. If not, inspect screws and nuts for pulled threads or foreign material in threads. This is very important in obtaining proper band adjustments.**

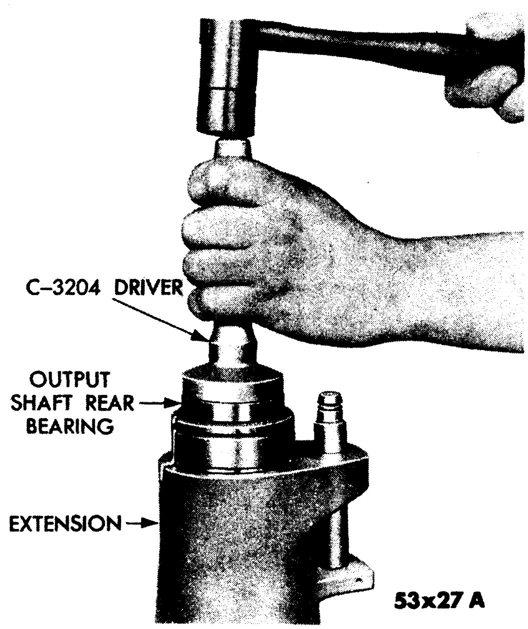


Fig. 71—Installing Output Shaft Rear Bearing

57. TRANSMISSION EXTENSION—INSPECTION

Inspect extension for cracks in casting and remove burrs from gasket surface. Inspect vent (drive type) in top of extension and make sure it is open and free from dirt, undercoating, etc. The purpose of this vent is to prevent vacuum from forming in transmission case when it is drained. Vent also releases fumes and expansion of oil caused by heat. Clean output shaft rear bearing and dry with compressed air. **Do not spin bearing with air pressure.** Inspect bearing for rough spots. Do not remove bearing from extension unless inspection reveals it is necessary to do so.

58. OUTPUT SHAFT REAR BEARING—REMOVAL

If necessary to remove rear bearing, proceed as follows: Remove output shaft rear bearing oil seal—if installed. Using pliers, Tool C-760 remove the output shaft rear bearing snap ring. Inspect ring for distortion. Using driver, Tool

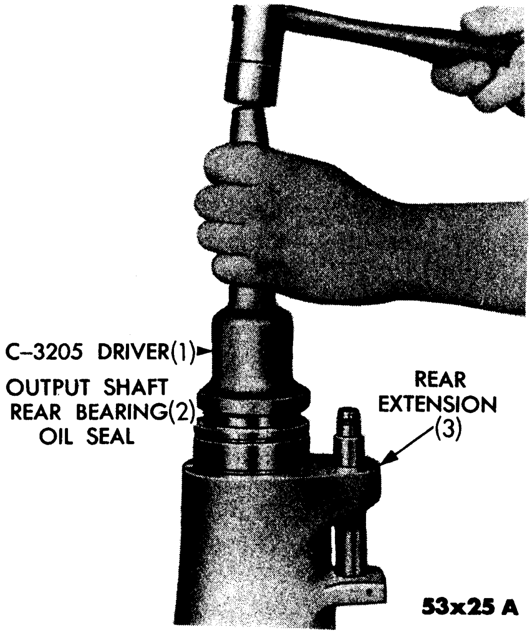


Fig. 72—Installing Output Shaft Rear Bearing Oil Seal

C-3275, drive output shaft rear bearing out of rear extension.

59. OUTPUT SHAFT REAR BEARING AND OIL SEAL—INSTALLATION

Using driver, Tool C-3204, install the output shaft rear bearing in extension, as shown in Figure 71. Make sure bearing is properly seated, lubricate with Automatic Transmission Fluid (Type A). Install output shaft rear bearing snap ring. **Snap rings available in two sizes, select one to give minimum clearance.** Using driver, Tool C-3205, install output shaft rear bearing oil seal (with metal portion of seal facing in) until tool bottoms on extension, as shown in Figure 72.

60. GOVERNOR DISASSEMBLY AND INSPECTION (Fig. 73)

Using pliers, Tool 3229, remove snap ring from governor weight assembly. **Keep thumb pressure against secondary weight when removing snap ring (spring loaded).** Remove governor secondary weight and spring. Inspect all parts for burrs and wear. Check secondary weight for free movement in primary weight by placing secondary weight in primary weight without the spring. Primary weight should fall freely when both parts are clean and dry. Inspect governor weight spring for distortion.

Place secondary weight and spring in primary weight, compress spring and install snap ring. Make sure snap ring is seated properly. Slide governor body and support from rear oil pump housing. Remove the two governor support seal rings and inspect. Remove the four governor body to support bolts and lockwashers. Separate body from support. **Washers are part of bolt and serviced as an assembly. Mating surfaces are machined and can be easily damaged. Inspect oil passages and make sure they are free from dirt or foreign matter. Clean passages with compressed air. Inspect governor valve and body for slight scores. Valve should travel freely in governor body.**

61. REAR OIL PUMP—INSPECTION

Inspect oil pump housing machined surfaces for nicks and burrs and housing ball plug for leaks. Inspect oil pump gears for scoring or pitting. With gears cleaned and installed in pump housing (as marked) and using straight edge, Tool C-3335 (and feeler gauge), check clearance between pump housing face and face of gears, as shown in Figure 74. Clearance limits are from .001" to .0025".

62. GOVERNOR ASSEMBLY—REASSEMBLY

Lubricate the two governor support seal rings with Automatic Transmission Fluid (Type A) and install on the governor support. Make sure rings are free to rotate in grooves. Position governor body on support and install the four

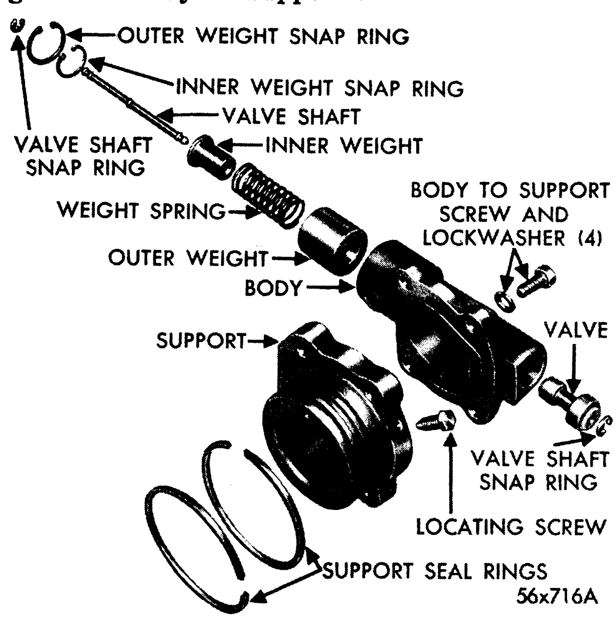


Fig. 73—Governor Assembly (Disassembled View)

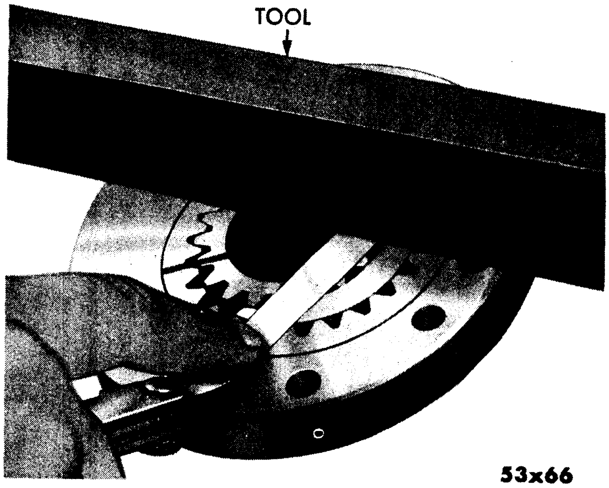


Fig. 74—Checking Clearance Between Rear Pump Body and Gears

bolts with attached lockwashers. **Do not tighten bolts at this time.** Slide governor support and body assembly into position in rear oil pump housing. **Compress governor support seal rings with fingers as support enters oil pump housing. Do not force.**

63. OUTPUT SHAFT SUPPORT—INSPECTION

Inspect all oil passages in output shaft support for any obstructions. Remove pressure take-off plugs and clean passages with compressed air. Check rear oil pump mating surface for burrs and score marks. Check for stripped threads in support. Inspect gasket surfaces for burrs and dirt. Inspect inside bearing surface for wear and scoring.

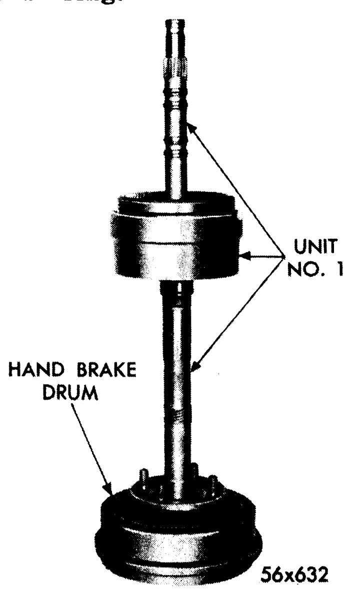


Fig. 75—Using Propeller Shaft Flange and Brake Drum Assembly (As a Holding Fixture for Unit No. 1)

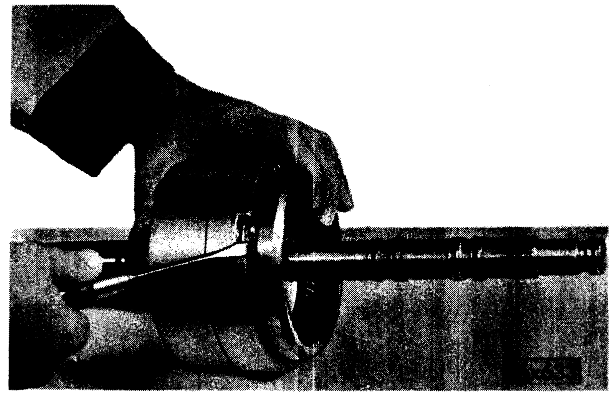


Fig. 76—Removal and Installation of Output Shaft Drive Housing Snap Ring

64. DISASSEMBLY, INSPECTION AND ASSEMBLY OF POWER TRAIN UNITS

Unit No. 1 (Output Shaft, Kickdown Planet Pinion Carrier, and Intermediate Shaft Assemblies)—Disassembly.

Unit can be placed in the propeller flange and brake drum assembly to aid in disassembly, as shown in Figure 75. Using a screw driver, remove output shaft drive housing snap ring, as shown in Figure 76. Refer to Figure 77 and complete disassembly of unit as follows: Remove reverse annulus gear (B) from output shaft assembly (K). Remove thrust plate (C) from kickdown planet pinion carrier. Remove intermediate shaft (D) and kickdown carrier assemblies (F) from output shaft assembly. Remove output shaft thrust washer (E) located inside of housing. Remove kickdown planet pinion carrier assembly (F) from intermediate shaft assembly (D). **The kickdown planet pinion carrier assembly used in this unit is identical to the low-reverse planet pinion carrier assembly used in Unit No. 2 but should not be interchanged.** Remove kickdown carrier thrust washer (G) from carrier assembly (F). Remove sun gear roller thrust washer (H) from intermediate shaft assembly. With a screw driver, remove kickdown annulus gear snap ring (I) and separate gear (J) from intermediate shaft assembly (D).

65. OUTPUT SHAFT—INSPECTION

Inspect speedometer drive gear for any nicks or burrs. Nicks or burrs on gear surface can be removed with the use of a sharp edged stone. Inspect thrust surfaces, journals, and inner bushing for scores or excessive wear. Inspect

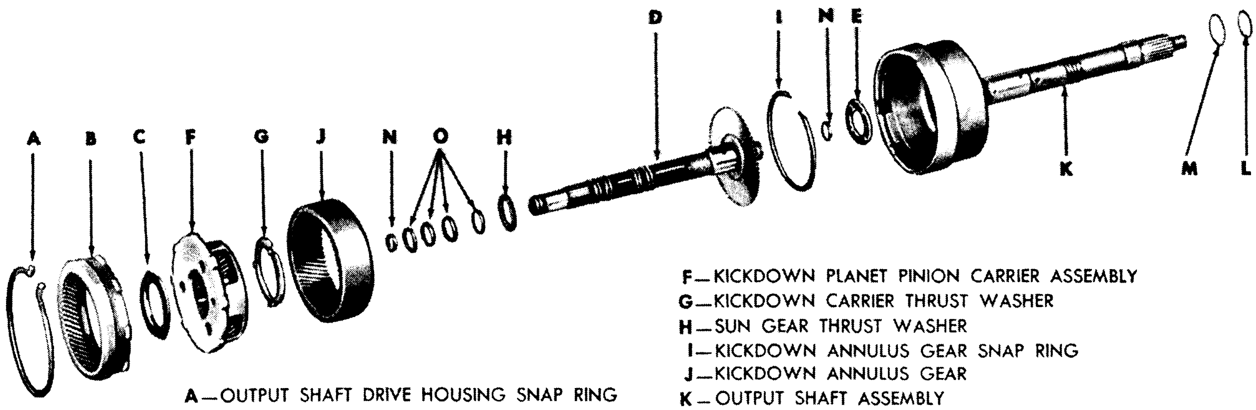


Fig. 77—Unit No. 1 (Disassembled View)

riveting and housing for any cracks and internal driving lugs for excessive wear. Housing and output shaft is serviced as an assembly.

Inspect interlocking seal rings (L—M) on output shaft (K) for wear or broken locks, and make sure they turn freely in the grooves. Do not remove rings unless condition warrants. When replacing rings, use extreme care so as not to damage interlocking portion of ring. Make sure all oil passages are open by blowing out with compressed air. Inspect output shaft and kickdown carrier thrust washers (E—G) for scratches or excessive wear. Inspect sun gear (roller type) thrust washer (H) for pitted or cracked rollers.

66. INTERMEDIATE SHAFT ASSEMBLY—INSPECTION

Inspect all bearing and thrust surfaces for scoring or scratches. Blow compressed air through all oil passages; make sure they are open and free of foreign matter. Inspect the four large (O) and two small (N) interlocking seal rings for excessive wear, broken ends, and make sure they rotate freely in the grooves. Intermediate shaft and clutch feed tubes are serviced as an assembly.

67. KICKDOWN PLANET PINION CARRIER ASSEMBLY—INSPECTION

Inspect planet pinion carrier for cracks and pinions for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006" to .017". Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. (.001 inch max. loose in hole). Make sure pinion shaft lock pins are installed. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly.** Inspect kickdown carrier thrust washer (G) for scratches or excessive wear.

NOTE: Scuffing of the carrier does not affect its operation and the carrier should not be replaced for this reason alone.

68. REVERSE AND KICKDOWN ANNULUS—GEARS—INSPECTION

Inspect for worn, cracked, or broken gear teeth.

69. UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER AND INTERMEDIATE SHAFT ASSEMBLIES)—ASSEMBLY

To aid in the assembly of Unit No. 1, use the propeller shaft flange and brake drum assembly which was removed from the transmission. With output shaft assembly (K) in the upright position, lubricate output shaft thrust washer (E) with Automatic Transmission Fluid (Type A) and place into position in housing. Place kickdown annulus gear (J) in position on intermediate shaft assembly (D) and install snap ring (I) (select fit). Using a feeler gauge, check the clearance under the

Fig. 78—Checking Clearance Between Kickdown Annulus Gear Snap Ring and Intermediate Shaft Assembly

kickdown annulus gear snap ring (Fig. 78). Clearance limits are as close to zero as possible. Snap rings are available in the following two thicknesses:

PT #1636357	.060" to .062"
1636358	.064" to .066"

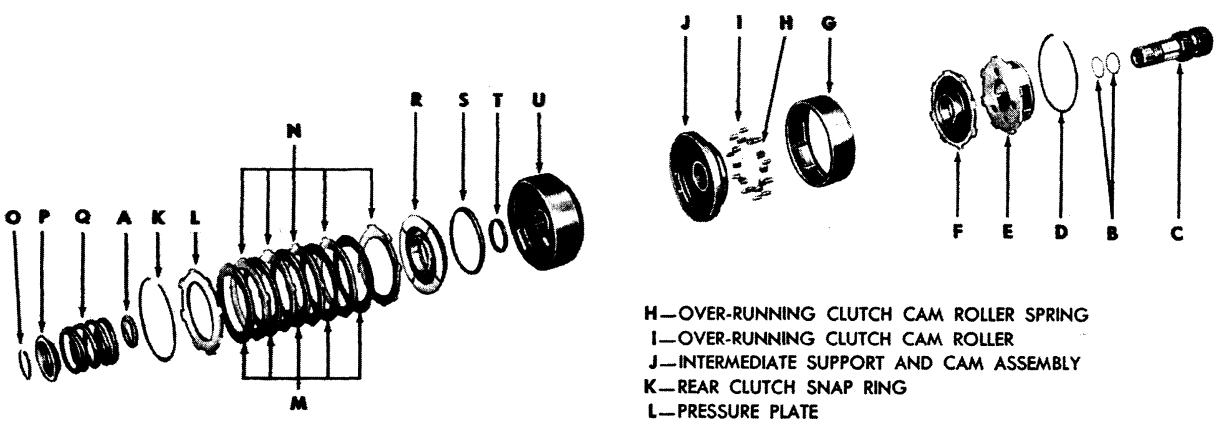
When checking clearance, support annulus gear on edge of bench so intermediate shaft will seat properly in gear. Make sure ring seats properly.

Place intermediate shaft assembly (D) in output shaft housing (K). Lubricate kickdown carrier thrust washer (G) with Automatic Transmission Fluid (Type A) and place in position on kickdown planet pinion carrier assembly (F). Place carrier assembly (F) in position in kickdown annulus gear (J). Make sure thrust washer (G) remains in position. Place thrust plate on carrier. Be sure pilot enters bore in pinion carrier. Place reverse annulus gear (B) in position in housing (K) and install output shaft drive housing snap ring. Make sure snap ring seats properly in housing. Lubricate and install sun gear (roller type) thrust washer (H) over intermediate shaft and into position in carrier assembly.

70. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH PISTON RETAINER ASSEMBLIES)—DISASSEMBLY

The letters referred to in the Disassembly, Inspection, and Assembly of this unit pertain to Figure 79.

With unit setting in upright position, remove sun gear and front clutch thrust washer (A). Using two screw drivers, inserted between clutch and intermediate support, remove rear clutch retainer assembly from sun gear, as



A—SUN GEAR THRUST WASHER (same as output shaft thrust washer)
B—SUN GEAR REAR CLUTCH SEAL RING
C—SUN GEAR ASSEMBLY
D—REVERSE BAND SNAP RING
E—REVERSE PLANET PINION CARRIER ASSEMBLY
F—OVER-RUNNING CLUTCH HUB ASSEMBLY
G—LOW AND REVERSE BAND DRUM
H—OVER-RUNNING CLUTCH CAM ROLLER SPRING
I—OVER-RUNNING CLUTCH CAM ROLLER
J—INTERMEDIATE SUPPORT AND CAM ASSEMBLY
K—REAR CLUTCH SNAP RING
L—PRESSURE PLATE
M—DRIVING DISC
N—CLUTCH PLATE
O—PISTON RETURN SPRING SNAP RING
P—RETURN SPRING RETAINER
Q—RETURN SPRING
R—PISTON
S—PISTON SEAL RING—OUTER
T—PISTON SEAL RING—INNER
U—PISTON RETAINER ASSEMBLY

56 x 710

Fig. 79—Unit No. 2 (Disassembled View)

NOTE: Number of Clutch Plates and Discs is Dependent Upon Vehicle Model.

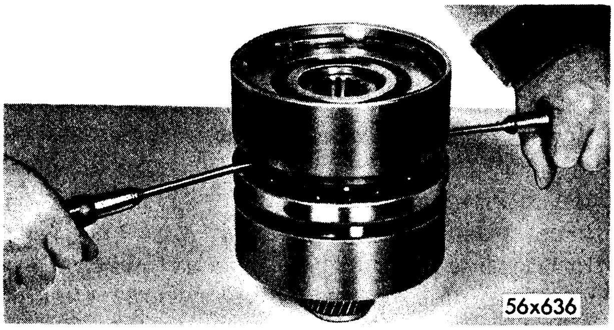


Fig. 80—Removing Rear Clutch Piston Retainer Assembly from Sun Gear

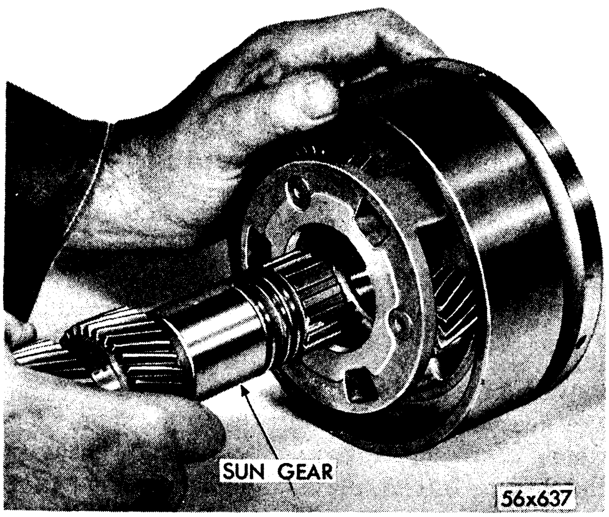


Fig. 81—Removal and Installation of Sun Gear (Reverse Planet Pinion Carrier and Overrunning Clutch Assembly)

Fig. 82—Installation of Tool C-3527 in Intermediate Support and Cam Assembly

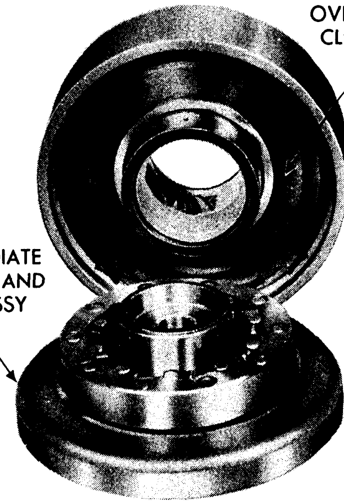


Fig. 83—Removal and Installation of Intermediate Support and Cam Assembly from Overrunning Clutch Hub

shown in Figure 80. Remove the two rear clutch seal rings (neoprene) from sun gear. Remove reverse sun gear from overrunning clutch and reverse planet pinion carrier assemblies, as shown in Figure 81.

Install gauge, Tool C-3527, in intermediate support and cam assembly, as shown in Figure 82. Remove intermediate support and cam assembly from overrunning clutch hub (Fig. 83). Using a screw driver, remove snap ring (D) from low and reverse band drum assembly (G). Remove the low and reverse planet pinion carrier assembly (E) from reverse band drum. Remove overrunning clutch hub assembly from reverse band drum, as shown in Figure 84.

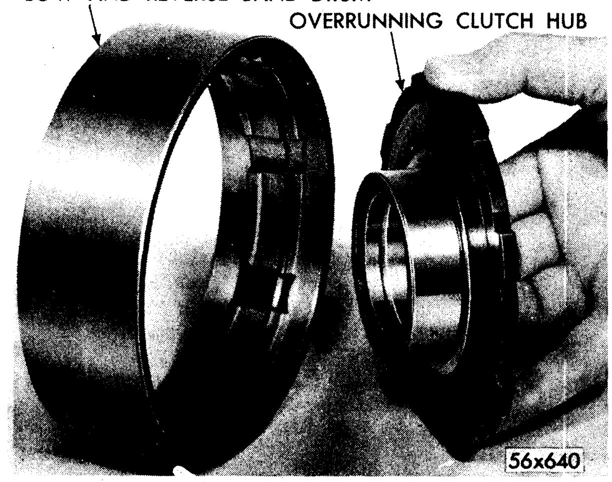


Fig. 84—Removal and Installation of Overrunning Clutch Hub in Low and Reverse Band Drum

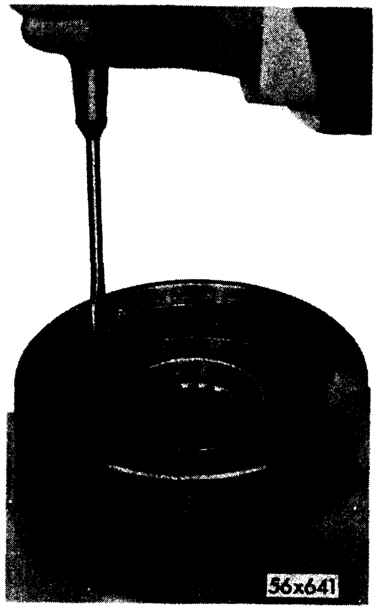


Fig. 85—Removal and Installation of Rear Clutch Piston Retainer Snap Ring

Remove overrunning clutch cam roller springs (H) and rollers (I) (ten each) by removing gauge, Tool C-3527, from intermediate support and cam assembly. **Have assembly over bench when removing tool.**

71. REAR CLUTCH PISTON RETAINER ASSEMBLY—DISASSEMBLY

Using screw driver, remove snap ring (large) from rear clutch piston retainer assembly, as shown in Figure 85. Remove rear clutch pressure plate (L) from retainer assembly. Invert clutch piston retainer assembly and remove the clutch plates (N) for driving disc (M) assemblies. Using compressor, Tool C-3533, slightly compress the rear clutch piston return spring retainer, as shown in Figure 86. **Use extreme care not to damage piston return spring retainer by compressing spring too far.**

Release compressor, Tool C-3533, and remove the clutch return spring retainer (P) and spring (Q) from clutch piston retainer assembly. Spring retainer may require guiding past snap ring groove as tool is released. Using a twisting motion, remove the clutch piston assembly (R) from retainer. Remove rear clutch piston inner and outer seal rings (S and T).

72. CLUTCH DRIVING DISC AND PLATE—INSPECTION

Inspect driving discs for evidence of wear, burning, glazing and flaking off of facing material. If grooves in facing are worn off, or if facing is burned, or flaking off, replace all of driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates and pressure plate surfaces for evidence of burning, scoring, and damaged driving lugs; replace if necessary.

73. PISTON AND SEAL RINGS—INSPECTION

Inspect seal ring surfaces in piston retainer for nicks or deep scratches. Light scratches will not interfere with sealing of neoprene rings. Inspect inner and outer piston seal rings (neoprene) for deterioration, wear, and hardness. Install new seal rings if necessary. Inspect seal ring groove in piston for nicks or burrs.

Inspect inside bore of the piston for score marks; if light, remove with crocus cloth; if heavy, replace the piston. Inspect piston spring, retainer, and snap ring for distortion.

74. REAR CLUTCH PISTON RETAINER ASSEMBLY—INSPECTION

Note the ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when transmission is in neutral or operating in drive (breakaway) and engine speeds are increased; otherwise clutch may engage. Make sure ball operates freely.

Inspect the band contacting surface for deep scores and burns, especially if the band lining is worn to the point where the steel band has

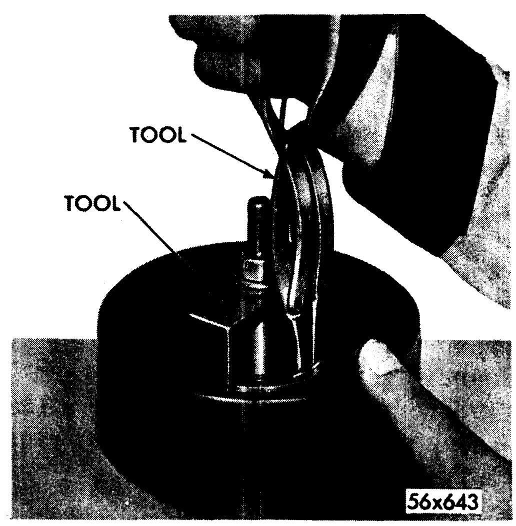


Fig. 86—Removal and Installation of Rear Clutch Spring Retainer Snap Ring

been contacting the rear clutch piston retainer. **Do not machine the piston retainer in a lathe to remove score marks.** Install new retainer if necessary.

Inspect steel clutch plate contacting surfaces for burrs or brinelling. Make sure clutch driving lugs on steel clutch plates travel freely into retainer. Remove any metal pickup on hub of retainer.

75. REAR CLUTCH PISTON RETAINER—ASSEMBLY

Lubricate and install inner piston seal ring (T) on hub of clutch retainer. **Make definitely sure that lip of seal is facing down and seal is properly seated in groove.** Lubricate and install outer seal ring (S) on clutch piston (lip of seal toward piston head). Place piston assembly (R) in clutch retainer (U) and with a twisting motion, seat piston in bottom of retainer. Install piston return spring on hub and position spring retainer and snap ring on spring.

Using compressor, Tool C-3533, compress the clutch spring sufficiently to seat the snap ring. Piston spring retainer may require guiding past the clutch hub. Make sure snap ring is properly seated. Remove compressor, Tool C-3533. Lubricate all clutch plates and drive discs with Automatic Transmission Fluid (Type A). Assemble by placing one of the rear clutch steel plates, in the clutch retainer followed by a driving disc. Repeat this procedure until all discs and plates have been installed. Install pressure plate (L) and snap ring (K). Make sure ring is properly seated.

76. REVERSE SUN GEAR ASSEMBLY—INSPECTION

Inspect gears for cracked or broken teeth. Inspect steel back bronze type bushing for scoring or excessive wear. Bushing and reverse sun gear are serviced as an assembly. Inspect intermediate support bearing surface of gear for wear and slight score. Inspect rear clutch seal ring grooves on gear for nicks or burrs. Inspect inner ring sealing area in bore of sun gear for grooves or scratches.

Inspect thrust area of sun gear for nicks, scratches, or burrs. Inspect seal rings (neoprene) for deterioration, wear nicks, or hardness. Install new seal rings if necessary. Inspect front clutch and sun gear thrust washer for scratches or excessive wear.

77. INTERMEDIATE SUPPORT AND CAM ASSEMBLY—INSPECTION

Inspect riveting of cam to intermediate support. Inspect cam roller surface for brinelling. Inspect roller spring retaining tabs for being bent or distorted. Inspect bearing surface on hub for scoring.

Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. Bushing and intermediate support are serviced as an assembly. Inspect overrunning clutch cam rollers for being pitted or scored. Inspect overrunning cam roller springs for distortion. Replace if necessary.

78. LOW AND REVERSE PLANET PINION CARRIER ASSEMBLY—INSPECTION

Inspect planet pinion carrier for cracks and pinions for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006″ to .017″.

Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. Make sure shaft lock pins are installed. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly.**

NOTE: Scuffing of the carrier does not affect its operation and the carrier should not be replaced for this reason alone.

79. LOW AND REVERSE BAND DRUM—INSPECTION

Inspect the band contacting surface for deep scratches and burns, especially if band lining is worn to the point where steel band has been contacting the drum. **Do not attempt to machine the drum in lathe to remove score marks.** Inspect driving lugs inside of drum for excessive wear.

80. OVERRUNNING CLUTCH HUB ASSEMBLY—INSPECTION

Inspect cam roller contacting surface for brin-

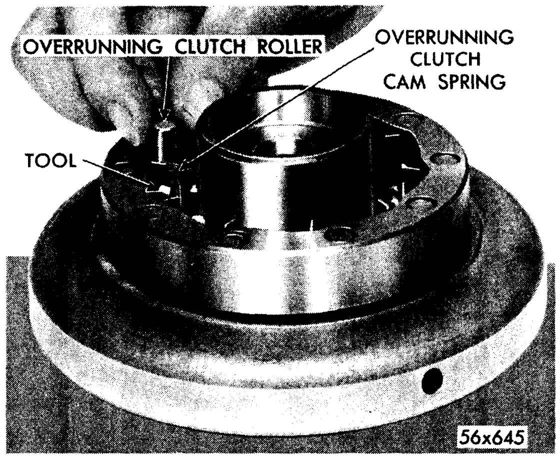


Fig. 87—Installation of Overrunning Clutch Rollers and Springs in Intermediate Support and Cam Assembly

elling. Inspect steel back bronze type bushing in hub for scratching or scoring and excessive wear. Bushing and hub are serviced as an assembly.

Inspect lubricating hole and make sure it is free from foreign matter by cleaning with compressed air. Inspect reverse band drum snap ring (select fit) for being distorted.

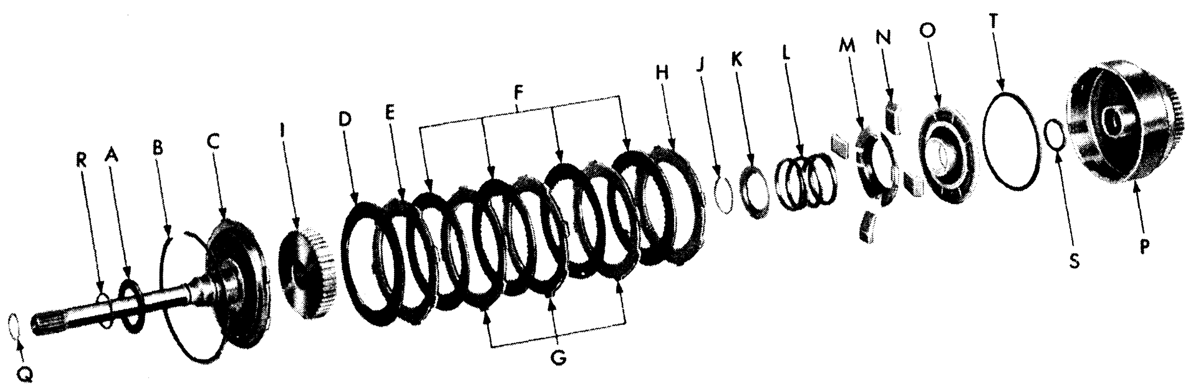
81. UNIT NO. 2—ASSEMBLY

Install overrunning clutch hub assembly (hub first) into snap ring side of the low and reverse band drum, (Fig. 84). Place low and reverse planet pinion carrier assembly (E) in position in low and reverse band drum (G). With drum supported, select snap ring to give minimum clearance. Snap rings are available in the following three thicknesses:

PT #	1636315	.060″ to .062″
	1636316	.064″ to .066″
	1636317	.068″ to .070″

Place gauge Tool C-3527, in position in intermediate support and cam assembly, and install cam springs and rollers, as shown in Figure 87. **Make definitely sure that cam springs and rollers are properly seated against cam; otherwise, damage to springs will result when overrunning clutch hub is installed.** With intermediate support and cam assembly resting on bench, lubricate bushing and install low and reverse band drum assembly over hub. While holding the two assemblies together, remove gauge, Tool C-3527. Lubricate bearing surface on reverse sun gear and install intermediate support and planet pinion carrier assembly.

Lubricate the two sun gear-rear clutch seal rings (neoprene) with Automatic Transmission Fluid (Type A) and install on reverse sun gear. Install rear clutch piston retainer assembly on reverse sun gear. **To prevent personal injury, do not place the fingers under the clutch retainer assembly when installing.** Install the front clutch and sun gear thrust washer (A). **Lubriplate may be used to hold the thrust washer in position.**



A—INPUT SHAFT THRUST WASHER
B—FRONT CLUTCH SNAP RING
C—INPUT SHAFT AND BUSHING ASSEMBLY
D—CUSHION SPRING
E—CUSHION SPRING RETAINING PLATE
F—DRIVING DISCS
G—CLUTCH PLATES
H—CLUTCH PRESSURE PLATE
I—DRIVING DISC HUB
J—PISTON RETURN SPRING RETAINER SNAP RING
K—RETURN SPRING RETAINER
L—PISTON RETURN SPRING
M—PISTON LEVER RETAINER
N—LEVER
O—PISTON
P—PISTON RETAINER ASSEMBLY
Q—OIL SEAL RING—SMALL
R—OIL SEAL RING—LARGE
S—PISTON SEAL RING—INNER
T—PISTON SEAL RING—OUTER

58x61

Fig. 88—Unit No. 3 (Disassembled View)

82. UNIT NO. 3—(INPUT SHAFT AND FRONT CLUTCH PISTON RETAINER ASSEMBLIES) —DISASSEMBLY

The letters referred to in disassembly, inspection and reassembly of this unit, pertain to Figure 88.

Remove the input shaft fibre thrust washer (select fit) (A). **During assembly, the front clutch cushion spring (D) was preloaded to 500 pounds. To remove snap ring (B) and input shaft, the front clutch assembly must be placed in an arbor press. With the rear of retainer resting on a suitable support, press the input shaft only far enough into retainer to permit removal of the snap ring with a screw driver.**

If an arbor press is not available, two large "C" clamps may be used by placing them 180° apart and applying equal pressure. If "C" clamps are used, make sure they are positioned so as not to damage the ball check located in back side of retainer.

Slowly release pressure on input shaft, then remove the retainer and input shaft from the arbor press. Remove the input shaft assembly (C) from the clutch piston retainer (P). Invert the front clutch piston retainer, and remove cushion spring (D), cushion spring retaining plate (E), driving discs and clutch plates (F and G), pressure plate (H) and clutch hub (I). Install compressor Tool C-3533, then compress the front clutch piston return spring retainer (K).

Using pliers, Tool C-3301, remove the piston return spring snap ring (J). Release and remove fixture, Tool C-3533. Remove the clutch piston return spring retainer (K) and spring (L). Remove lever retainer (M) and levers (4) (N) from front clutch piston retainer (P). Using a twisting motion, remove the piston assembly from the retainer.

83. INPUT SHAFT—INSPECTION

Inspect the input shaft thrust washer (A) for cracks or excessive wear. Inspect front clutch snap ring (B) for distortion. Inspect interlocking seal rings (Q and R) for wear or broken locks. Make sure they turn freely in the grooves. **Do not remove rings unless condition warrants.** When replacing rings, use extreme care not to damage interlock portion of ring. Make sure all oil passages are open by blowing out with compressed air.

Check splines and lugs for nicks or burrs. Inspect bearing and thrust surfaces for nicks or scratches. Inspect steel back bronze type bushing for scratches or scoring or excessive wear. Bushing and input shaft are serviced as an assembly.

84. CLUTCH DRIVING DISCS, PLATES, AND HUB—INSPECTION

Inspect driving discs (F) for evidence of wear, burning, glazing, and flaking off of facing material. If grooves in facings are worn off, or if facings are burned, or flaking off, replace all driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates (G), cushion spring retaining plate (E), and pressure plate (H) surface for evidence of burning, scoring, and damaged lugs; replace if necessary. Inspect cushion spring (D) for distortion and evidence of scoring.

Inspect lever contacting surface on pressure plate for evidence of wear. Inspect clutch hub (I) splines for wear and remove any metal pickup which may have accumulated on either side of the hub. (Oil passages in hub are to lubricate clutch plates.) Make sure they are free of foreign matter.

85. FRONT CLUTCH PISTON, SEAL, AND LEVERS—INSPECTION

Inspect levers (N) for wear and scoring. Remove and inspect inner and outer piston seal rings (T and S) (neoprene) for deterioration, wear and hardness. Install new seal rings if necessary. Inspect seal ring groove in piston for nicks or burrs.

Inspect inside portion of piston hub for score marks. If score marks are light, remove with crocus cloth; if scores are deep, replace the piston (O). Inspect lever retainer (M), return spring (L), spring retainer (K) and snap ring (J) for distortion.

86. FRONT CLUTCH RETAINER—INSPECTION

Note ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when clutch is in released position (neutral and reverse) and engine speeds are increased; otherwise, clutch may engage. Make sure ball operates freely. Inspect seal ring surface in the retainer hub; if intermediate shaft seal rings have excessively worn or grooved this surface, replace the clutch piston retainer (P) assembly. Inspect steel clutch plate contacting surfaces for scores or brinelling. Make sure clutch driving lugs on steel plates travel free in retainer. Inspect splines on rear of retainer for nicks, burrs, or brinelling. Inspect thrust surface on rear of retainer for scratches or scoring. Make sure all clutch feed and lubricating passages are free of foreign matter.

87. UNIT NO. 3—ASSEMBLY

Lubricate and install inner (neoprene) seal ring (S) on hub of clutch retainer (P). **Make definitely sure that lip of seal is facing down and seal is properly seated in groove.** Lubricate and install outer seal ring (T) on clutch piston with lip of seal toward head of piston.

Place piston assembly (O) in clutch retainer and with a twisting motion, seat piston in bottom of retainer. Place lever retainer (M) in piston and install the four levers (N). **Make sure levers are free and properly seated in piston slots.**

Install clutch return spring (L) over hub of clutch retainer (P) and position spring retainer (K) and snap ring (J) on spring. Using compressor, Tool C-3533, compress the clutch return spring sufficiently to seat snap ring with pliers, Tool C-3301. **Spring retainer may require guiding past the piston retainer hub. Make sure snap ring is properly seated.** Remove spring compressing portion of Tool C-3533. Install pressure plate (H) (smooth side up) in retainer. Install discs and plates by placing one of the driving discs (F) in the clutch retainer followed by a steel plate (G). Repeat this procedure until all driving discs and steel plates have been installed.

88. CHECKING FOR PROPER TRAVEL OF CLUTCH PRESSURE PLATE

It is very important that the front clutch pressure plate has the proper amount of travel. Insufficient travel may cause the clutch plates to drag. Excessive travel may cause delayed engagement, or may allow slippage of the clutch. To check for proper travel of the clutch pressure plate, proceed as follows: Check clearance by temporarily installing pressure plate (part NO. 1732114) on top of the clutch pack.

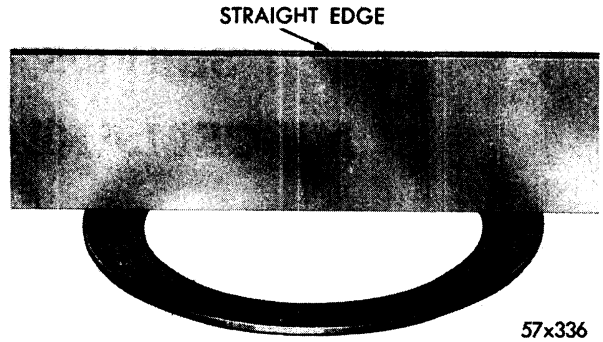


Fig. 89—Identification of Front Clutch Cushion Spring

NOTE: Pressure plate (part NO. 1732114) is the rear clutch pressure plate used in the early model transmissions. If not available, it is suggested that one be obtained and kept with the special TorqueFlite service tools.

Hold this rear pressure plate firmly in place, by hand, and insert a feeler gauge between it and the top disc in the assembly. Total clearance should be .020-.040 inch. If the measured clearance is not within these limits, the discs will have to be replaced with any combination of new discs that will provide the required clearance.

Clutch discs are in three different thicknesses. Sizes and part numbers are as follows:

Part Number	*Thickness*
1636260	.060-.063 inch
1636372	.073-.076 inch
1636373	.087-.090 inch

When right clearance is obtained, remove clutch plate (part # 1732114).

Install the front clutch hub, (I), cushion spring retaining plate (E), and cushion spring (D) (concave side, as shown in Figure 89, toward retaining plate) (E). The front clutch cushion spring must be preloaded to 500 pounds for assembly. Place front clutch and the input shaft assembly in an arbor press with the rear of the piston retainer resting on a suitable support. Press the input shaft into the clutch retainer until snap ring (B) can be installed. **If arbor press is not available use two "C" clamps placed 180° apart as described previously.**

Remove the input shaft and front clutch assemblies from the arbor press (or remove "C" clamps) and install the input shaft thrust washer.

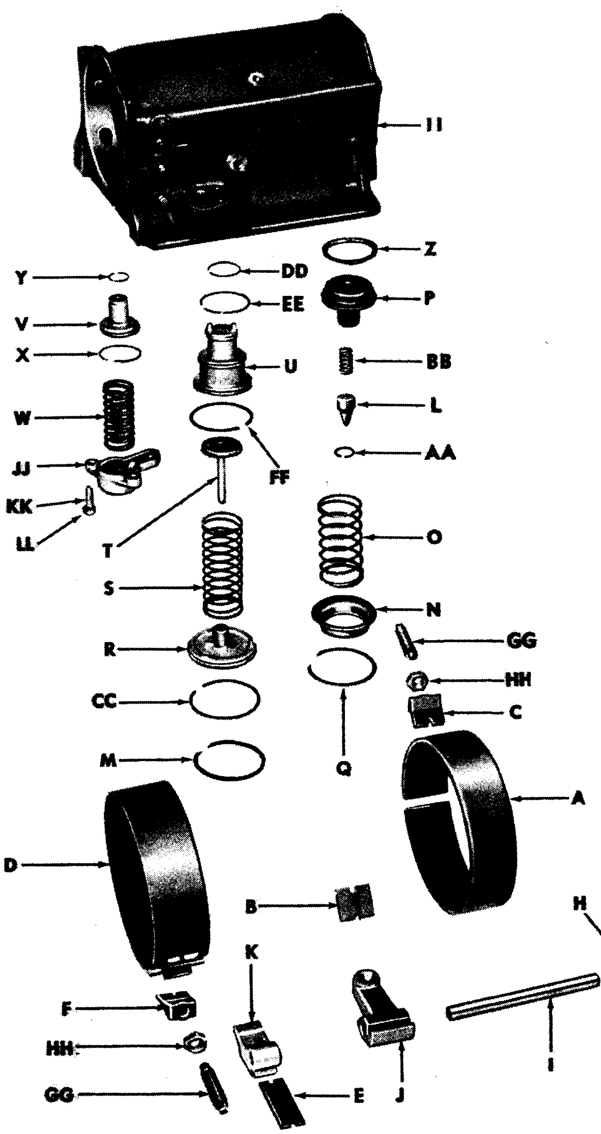
SERVOS, BANDS AND MISCELLANEOUS INSPECTION

89. BAND—INSPECTION

All letters referred to in inspection of these parts pertain to Figure 90. Make visual inspection of bands and lining for wear and bond to metal. If lining is worn to the point that grooves are no longer visible, band assemblies must be replaced. The lining is bonded to the band and no attempt should be made to reline them. Inspect bands for distortion or cracked ends. The reverse band is **narrower** than the kickdown band. Therefore, it should be identified for proper installation.

90. LEVER ASSEMBLIES—INSPECTION

Inspect levers (J and K) for being cracked or worn and make sure they are free to turn on shaft and have side clearance when installed. Inspect lever shaft (I) for excessive wear.



A—LOW AND REVERSE BAND
B—REVERSE BAND STRUT
C—ANCHOR
D—KICKDOWN BAND
E—KICKDOWN BAND STRUT
F—ANCHOR
G—LEVER SHAFT PLUG
H—LEVER SHAFT SPACER
I—LEVER SHAFT
J—LOW AND REVERSE BAND LEVER
K—KICKDOWN BAND LEVER
L—LOW AND REVERSE SERVO PISTON PLUG
M—PISTON ROD GUIDE SNAP RING
N—LOW AND REVERSE SERVO PISTON SPRING RETAINER
O—LOW AND REVERSE SERVO PISTON SPRING
P—LOW AND REVERSE SERVO PISTON
Q—SPRING RETAINER SNAP RING
R—PISTON ROD GUIDE
S—KICKDOWN SERVO PISTON SPRING
T—PISTON ROD
U—KICKDOWN SERVO PISTON
V—ACCUMULATOR PISTON
W—ACCUMULATOR SPRING
X—PISTON RING—LARGE
Y—PISTON RING—SMALL
Z—LOW AND REVERSE SERVO PISTON RING
AA—PLUG RETAINING RING
BB—PISTON PLUG SPRING
CC—PISTON ROD GUIDE SEAL RING
DD—PISTON SEAL RING—SMALL
EE—PISTON SEAL RING—MEDIUM
FF—PISTON SEAL RING—LARGE
GG—BAND ADJUSTING SCREW
HH—ADJUSTING SCREW LOCK NUT

II—TRANSMISSION CASE
JJ—ACCUMULATOR COVER
KK—COVER SCREW
LL—COVER SCREW WASHER

56 x 708 A

Fig. 90—Servos and Bands (Disassembled View)

91. REVERSE SERVO PISTON ASSEMBLY—INSPECTION

Inspect lever contacting surface on plug (L) for excessive wear. Remove and inspect reverse servo piston seal ring (Z) (neoprene) for deterioration and hardness. Inspect seal ring groove for nicks or burrs. Inspect servo piston return spring (O), retainer (N), and snap ring (Q) for being distorted.

92. KICKDOWN PISTON ASSEMBLY—INSPECTION

Inspect riveting of kickdown piston rod (T). Also inspect guide (R) contacting surface for nicks or burrs. Inspect seal ring (CC) on guide for wear and make sure it turns freely in the groove. Check fit of guide (R) on piston rod. Inspect the three rings (GG, EE, DD) (two interlocking) on piston for wear or broken locks. Make sure they turn freely in the groove. It is not necessary to remove rings unless condition warrants. When replacing new rings, use extreme care so as not to damage the interlocking portion of the ring. Inspect kickdown piston (U) for light scores and wear. Inspect kickdown piston spring (S) and rod guide snap ring (M) for being distorted.

93. ACCUMULATOR PISTON AND SPRING—INSPECTION

Inspect the two seal rings (X and Y) (one interlocking) for wear or broken locks and make sure they turn freely in the grooves. It is not necessary to remove rings unless condition warrants. When replacing new interlocking seal rings, use extreme care so as not to damage interlocking portion of ring. Inspect accumulator piston (V) for nicks, burrs, and excessive wear. Inspect the accumulator spring (W) for being distorted.

94. DRIVE SLEEVE

Inspect the front seal ring (neoprene) for nicks, deterioration and hardness. Inspect the interlocking seal ring for wear or broken locks, and make sure it turns freely in the groove. It is not necessary to remove rings unless condition warrants. Inspect driving lugs for excessive wear and bearing surface on outer diameter for nicks, burrs, or scratches.

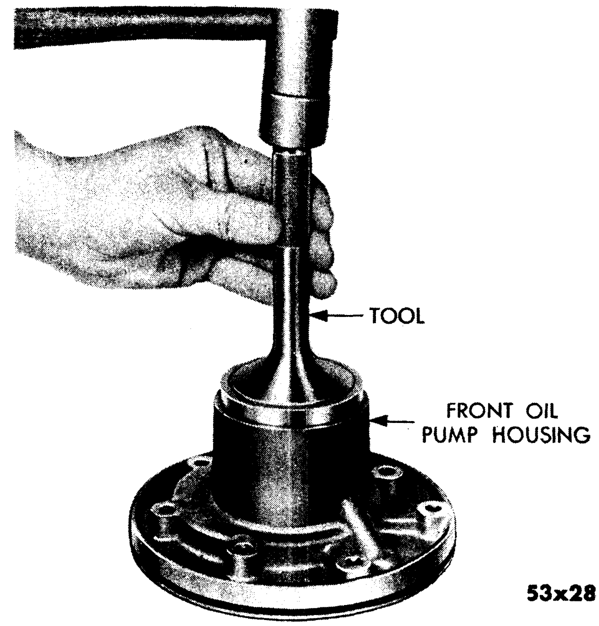


Fig. 91—Installing Front Pump Housing Oil Seal

95. FRONT OIL PUMP

Inspect front oil pump housing outer seal (on circumference of housing) and oil seal for deterioration and hardness. Do not remove oil seal from housing unless inspection reveals that it is necessary. To remove oil seal, use a brass drift and drive seal out of housing. To replace front oil pump housing oil seal, position seal in housing with seal lip toward rotor bore, (metal portion of seal down) and use driver, Tool C-3278 to drive seal until tool bottoms on face of housing, as shown in Figure 91. Inspect drive sleeve seal ring contacting surface in housing for wear and scratches. Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. (Bushing and housing are serviced as an assembly.) Remove oil pump rotors and inspect rotor contacting surfaces for high spots, scratches, burrs, or grooving.

Inspect regulator body contacting surface on pump housing face for nicks or burrs. Inspect housing passages and make definitely sure they are free from dirt and foreign matter. Clean and install oil pump gears in housing. Replace gears, as identified when removed, with counterbore in pinion gear facing down. Using straightedge, Tool C-3335 and feeler gauge, check clearance between pump housing face and face of rotors, as shown in Figure 92. Clearance

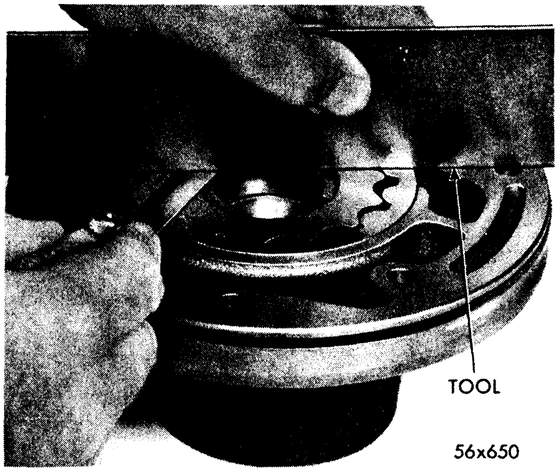


Fig. 92—Checking Clearance Between Front Pump Body and Gears

limits are from .001″ to .0025″. After checking pump gear clearance, lubricate pump rotors with Automatic Transmission Fluid (Type A).

Measure the tip clearance between the rotor lobes. The manufacturing limits are .005″ to .008″. Replace the rotors if this clearance exceeds .010″.

Measure the diametral clearance between the outer rotor and pump housing bore. The manufacturing limits are .008″ maximum. Replace the rotors or pump housing if the clearance exceeds .010″.

96. REGULATOR VALVE BODY AND VALVES

Place body and valves in pan containing a clean solvent, wash thoroughly, and dry with compressed air. Inspect the reaction shaft seal ring surface in bore for scratches, nicks, or burrs. Inspect both valves for free movement in valve body; they should fall in and out of bores when both the valves and body are dry. Crocus cloth may be used to polish valves providing care is exercised not to round the sharp edge portion of the valves. The sharp edge portion is vitally important to this type of valve, it helps to prevent dirt and foreign matter from getting between the valve body, thus reducing the possibilities of sticking.

Check all fluid passages for obstructions and inspect all mating surfaces for burrs and distortion. If regulator valve body should have a slight nick or raised portion on mating surfaces, it may be removed by using a surface plate and crocus cloth. Inspect front and rear pump check valve for proper seating on both surfaces. If necessary to remove valve, use a pair of long nose pliers. When installing check valve, make definitely sure rear pump check valve (with metering hole) is positioned toward outside of regulator valve body.

Check regulator valve spring seat (snap ring). After the valves and regulator valve body have been thoroughly cleaned and inspected, the valves should be reinstalled in body, (Fig. 69). Place assembly on a clean surface and cover until ready for installation. Inspect regulator valve and torque converter control valve springs for distortion. Check regulator valve spring sleeve and cup for burrs. Check adjusting screw and locknut in retainer, for freeness and pulled threads.

ASSEMBLY OF UNITS IN TRANSMISSION CASE

97. TORQUE CONVERTER REACTION SHAFT—INSTALLATION

Using heat lamps, heat front of transmission case to approximately 170 to 190 degrees F. Install guide studs, Tool C-3283 in front face of reaction shaft flange. Lubricate portion of reaction shaft that presses into case with Automatic Transmission Fluid (Type A). Position torque converter reaction shaft into front of transmission case so that guide studs in shaft align with threaded holes in case.

Using Tool C-3531*, press reaction shaft into place, as shown in Figure 70. Remove the guide studs and start the three transmission case to reaction shaft bolts and washers draw down evenly, and tighten to specifications. Coat torque converter reaction shaft seal (neoprene) with Automatic Transmission Fluid (Type A) and install on shaft.

*Refer to "Special Tools".

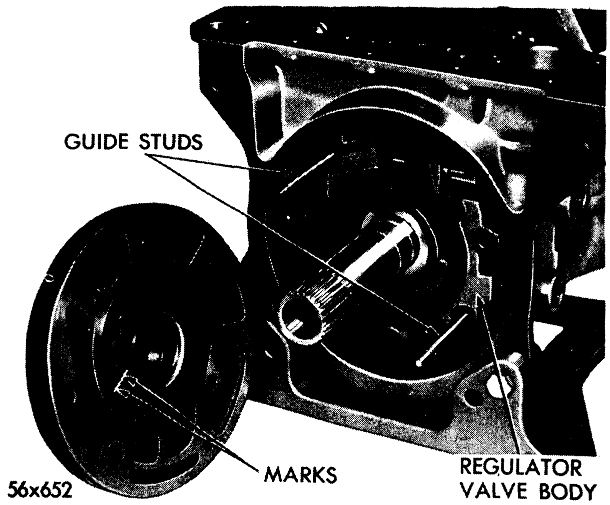


Fig. 93—Installing Front Oil Pump Assembly

98. REGULATOR VALVE BODY

Install guide studs, Tool C-3288, as shown in Figure 68. Install regulator valve body gasket over guide studs and into position on the transmission case. With seal ring (neoprene) in position on reaction shaft, install regulator valve body and valves over guide studs and into position. **Hold valves in place to prevent damage while installing valve body.**

99. FRONT OIL PUMP ASSEMBLY—INSTALLATION

With inner and outer seals lubricated and pump rotors in position in housing (Fig. 93) (counterbore in pinion gear facing down as identified when removed), place oil pump housing over studs and slide into position. Start five of the bolts (with aluminum washers) and draw housing down evenly until it is seated in transmission case. Remove guide studs and install the two remaining bolts and washers, then tighten to specifications. **Improper tightening of these bolts may cause pump gears to bind.** Lubricate and install front pump drive sleeve (bearing into surface first), as shown in Figure 94, then engage the driving lugs of the oil pump inner rotor to determine if oil pump rotors turn freely. Main body of driving sleeve should be flush with oil pump housing when properly installed, (Fig. 95). If gears do not turn freely, remove pump and check for foreign matter between pump rotors and housing.

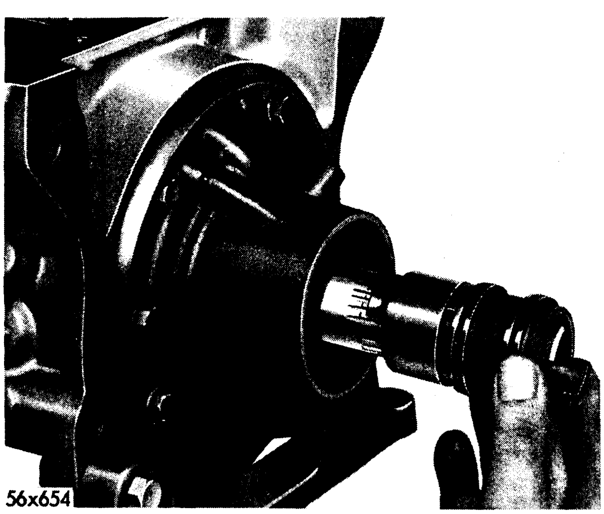


Fig. 94—Installing Front Oil Pump Drive Sleeve

Install the torque converter control valve spring, retainer and gasket. Tighten to specifications. Reinstall the transmission regulator valve spring, sleeve, cup, gasket and retainer (with adjusting screw and lock nut installed). Tighten to specifications.

100. KICKDOWN PISTON—INSTALLATION

Lubricate piston seal rings and place on kick-

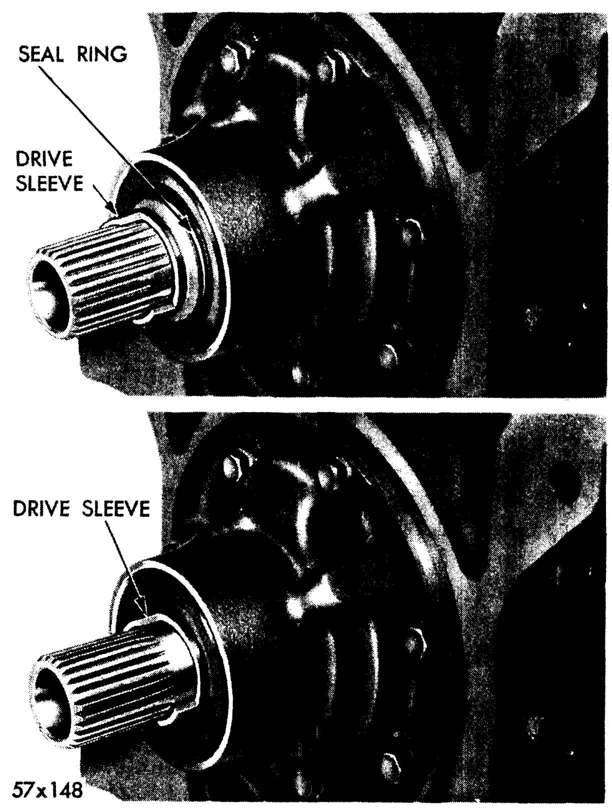


Fig. 95—Front Pump Drive Sleeve—Installation—
Incorrect Installation (Top View)
Correct Installation (Bottom View)

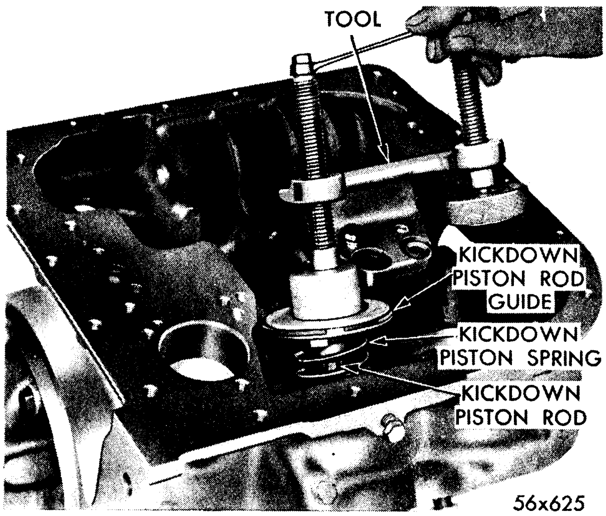


Fig. 96—Removal and Installation of Kickdown Piston Rod Guide and Spring

down piston. Compress outer ring and start assembly into case. With piston properly centered so as not to damage rings, tap lightly and bottom piston into case. Place kickdown piston rod assembly in piston and slide piston spring over kickdown piston rod. Install Tool C-3529 or C-3289 (modified) to compress piston rod guide spring.

Place the kickdown piston rod guide over spring and compress spring while guiding piston rod through piston rod guide, as shown in Figure 96. Using extreme care, compress the kickdown piston spring to the point that piston rod guide seal ring slightly binds on case. Then work seal ring into position by gradually compressing spring. Install snap ring (Fig. 62) and make sure it is properly seated. Loosen compressing portion of tool and remove.

101. REVERSE SERVO PISTON—INSTALLATION

Lubricate the low-reverse servo piston seal ring and install on piston (lip of seal facing top end of piston). Install cushion spring and plug into servo piston and secure with snap ring. (Make sure snap ring seats properly). Install piston assembly into transmission case.

Place reverse servo piston spring over piston and position spring retainer over spring. Install Tool C-3529 or C-3289 (modified) for reverse servo piston installation. Compress spring (Fig. 97) sufficiently to install snap ring. Spring retainer may require guiding into case. **Make sure snap ring seats properly.** Loosen compressing portion of tool and remove from transmission case.

102. KICKDOWN BAND—INSTALLATION

Install the kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 58. **Use extreme care when installing bands so not to damage lining on edges of transmission case.** Install anchor on kickdown band adjusting screw.

103. LOW-REVERSE BAND—INSTALLATION

Install anchor on reverse band adjusting screw. Install band by rotating band ends through rear opening in transmission case, as shown in Figure 56.

104. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES AND STRUTS—INSTALLATION

Place levers in position in case and slide shaft through levers from rear of transmission case, as shown in Figure 59. Remove guide stud, Tool C-3288 from threaded end of shaft and install shaft lever flat spacer and plug. Tighten plug to specifications. Position kickdown band over anchor and compress band in sufficiently to install kickdown band strut, as shown in Figure 57. Place low-reverse band into position on anchor and compress band end; and with the aid of a screw driver, install strut.

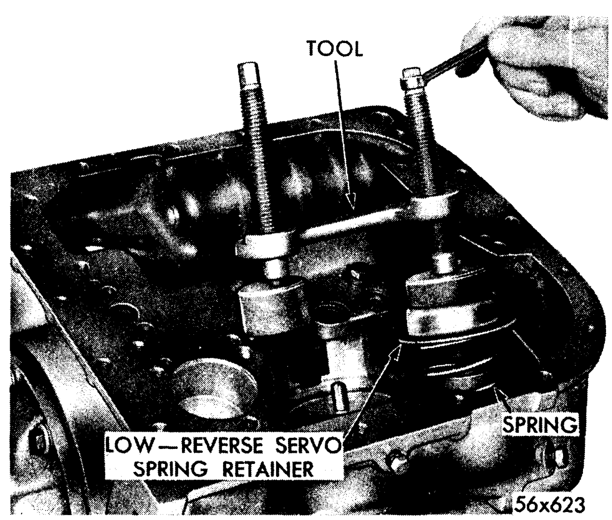


Fig. 97—Compressing Low and Reverse Servo Spring and Retainer

POWER TRAIN UNITS (Fig. 98) – INSTALLATION

105. UNIT NO. 3—(FRONT CLUTCH AND INPUT SHAFT ASSEMBLIES)—INSTALLATION

If when transmission was disassembled, the end clearance was found to be incorrect, correction can be made at this time by selection of proper input shaft thrust washer. To accomplish this, use a micrometer and measure the thickness of the thrust washer which was removed. Then, select a thicker or thinner washer to give proper clearance. Thrust washers are available in the following thicknesses:

Part No.	*Thicknesses*	*Color*
1638669	.115″ to .117″	Natural
1638670	.097″ to .099″	Black
1638671	.078″ to .080″	Red
1823872	.059″ to .061″	Orange

With input shaft thrust washer in position and input shaft seal rings lubricated, start unit through rear of transmission case, as shown in Figure 55. By supporting and keeping unit centered as much as possible, guide through bands and reaction shaft into position.

106. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH AND REAR CLUTCH ASSEMBLIES)—INSTALLATION

Start unit through rear of transmission case. Align identified locating hole in intermediate support with threaded locating hole inside of transmission case, as shown in Figure 99. By supporting and keeping unit centered as much as possible, guide it through bands until it contacts the hub on the front clutch. While pushing in on assembly, rock sun gear to engage clutch plates of rear clutch on hub of front clutch. Be careful thrust washer does not fall out of place.

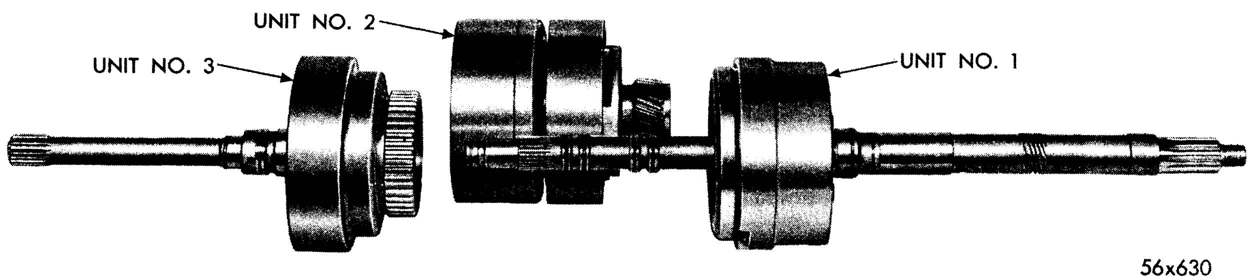


Fig. 98—Power Train Units

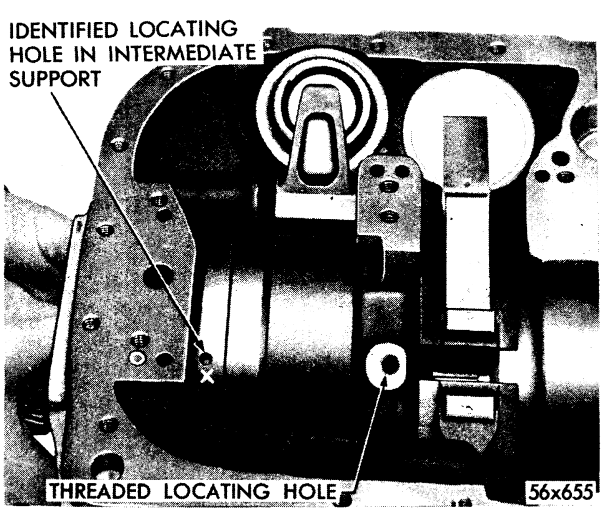


Fig. 99—Installing Unit No. 2

While rocking sun gear, make sure unit does not bind on bands or in intermediate support. Do not use excessive force when installing this unit so as to prevent damage to clutch discs in rear clutch. A drift may be used to assist in alignment of intermediate locating holes.

Install the three intermediate support locating bolts (Fig. 22), lockwashers, and tighten to specifications. Use extreme care when installing the locating bolt (inside of case) to prevent loss of lock washer. Check input shaft and sun gear for free rotation.

107. UNIT NO. 1—(OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)—INSTALLATION

Be sure reverse sun gear thrust washer (roller type) is in position in planet pinion carrier assembly. Lubricate seal rings and bearing surface on intermediate shaft with Automatic Transmission Fluid (Type A). Install unit by guiding intermediate shaft in sun gear, as shown in Figure 52. Keeping unit centered as much as possible and slowly turning output shaft, slide into position (large seal ring on output shaft flush with rear of transmission case). **Use extreme care when installing to prevent damage to seal rings on intermediate shaft.**

108. OUTPUT SHAFT SUPPORT—INSTALLATION

With guide studs Tool C-3283 installed in rear of transmission case, place output shaft support gasket over guide studs and into position on rear of case. Lubricate output shaft seal rings. Install support over shaft and guide studs, and position against transmission case, as shown in Figure 51. **Use care when installing support so as not to damage ring sealing surfaces.** Install the one (short) output shaft support to transmission case bolt and lockwasher (Fig. 49) and tighten finger tight.

109. REAR OIL PUMP AND GOVERNOR ASSEMBLIES—INSTALLATION

Place rear oil pump pinion ball in ball pocket in output shaft. Lubricate rear oil pump drive pinion. Place over output shaft and slide into position aligning keyway in pinion with ball in shaft, as shown in Figure 50. **Pinion was marked when removed in disassembly. Make sure it is installed correctly.**

Lubricate rear oil pump gear and position in pump housing. Make sure gear is installed correctly; check marking. Slide rear oil pump and governor assemblies over output shaft and position in the support, as shown in Figure 49. **There are two extra holes in housing which are used for vents. Make definitely sure that no attempt is made to install bolts in these holes. Check each threaded hole before installing bolts.** Install the five rear oil pump housing to output shaft support bolts and washers.

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from bolt head. Draw down evenly, tighten to specifications. **After bolts have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, disassemble pump to determine cause.**

110. GOVERNOR WEIGHTS AND VALVE ASSEMBLY—INSTALLATION

Align locating hole in output shaft to locating bolt hole in governor support and install locating bolt, tighten to specifications. **Holes can be easily aligned by turning output shaft and holding governor body. If governor body has been removed and reinstalled, tighten the four governor body bolts to specifications.**

Dry governor weight assembly and valve with compressed air, but do not lubricate when assembling. Place governor weight assembly (secondary weight snap ring facing out) into governor body (Fig. 48) and using pliers, Tool C-3229, install snap ring (Fig. 47). Make sure snap ring seats properly. With the governor valve (small end up) on governor valve shaft slide into governor body through the output shaft and governor weight assembly (Fig. 46); at the same time positioning valve in body.

Install the governor valve shaft snap ring (weight assembly end). Make sure it is properly locked to shaft, as shown in Figure 39. **After snap ring installation, apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves (See Fig. 100). Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in governor body.**

111. TRANSMISSION EXTENSION—INSTALLATION

Install new transmission extension gasket over guide studs and into position against output shaft support. Do not use sealing material on gasket. Place extension over output shaft and guide studs and into position against support. **Propeller shaft flange and drum assembly can**

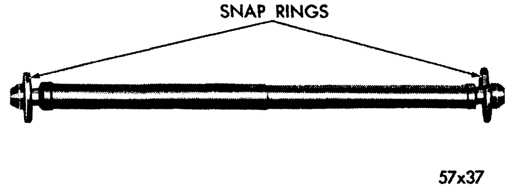


Fig. 100—Positioning Governor Valve Shaft Snap Rings in Grooves

be used if necessary to draw extension bearing on output shaft. DO NOT USE HAMMER.

Start the transmission extension to case bolts and lockwashers then draw down evenly and tighten to specifications. **After these bolts have been properly torqued, turn output shaft to make sure it turns freely.** Install speedometer drive pinion and sleeve assembly in transmission extension, as shown in Figure 44 and tighten to specifications.

112. HAND BRAKE—INSTALLATION

Make sure the brake support spacer (neoprene) is in position on back of brake support and spacer sleeve is in center of support. Slide hand brake assembly (intact) over rear of extension. Make sure spacer sleeve remains in center of support.

Indent in shield is for correct positioning on extension. Also, shield must be located on extension far enough to permit installation of spring.

Install the brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Slide the brake shoe return spring behind the grease shield spring and hook into position, as shown in Figure 101. Reinstall pin through brake anchor and extension. Install propeller shaft flange and drum assembly. Install the propeller shaft flange washer and nut. Tighten to specifications. Use wrench, Tool C-3281 to hold brake drum and flange assembly while tightening nut (Fig. 42).

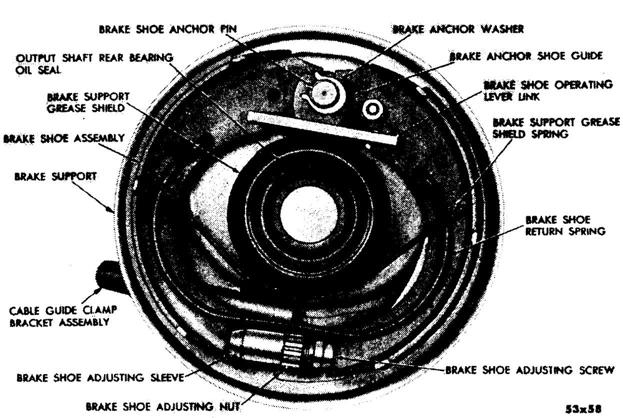


Fig. 101—Internal Expanding Handbrake (Drum Removed)

113. RECHECKING FRONT CLUTCH END CLEARANCE

Prior to installing the valve bodies and transfer plate assembly, recheck front clutch end clearance using dial indicator, Tool C-3339, as shown in Figure 41. To make this check, pull front clutch forward by pulling on the input shaft, or by carefully inserting screw driver between the front and rear clutch. Remove screw driver and with dial indicator, point contacting edge of front clutch retainer set dial indicator to zero. Then push front clutch assembly rearward against rear clutch, and take indicator reading. This clearance should be from .020″ to .050″. If the clearance is not within these limits, then transmission will have to be partially disassembled in the following manner to allow an input shaft thrust washer of proper thickness to be installed:

Remove the seven bolts and lockwashers from the transmission extension and install guide studs, Tool C-3283. Then, remove the one output shaft support to transmission case bolt and washer (Fig. 49) and remove the hand brake assembly, extension, output shaft support, and Unit No. 1 (one assembly) as shown in Figure 102. **Support assemblies as much as possible when removing to prevent damaging seal rings on intermediate shaft. Refer to "Power Train Units—Removal." Unit No. 2 and Unit No. 3.**

Using a micrometer, measure the thickness of the input shaft thrust washer and select a washer to give correct clearance. Thrust wash-

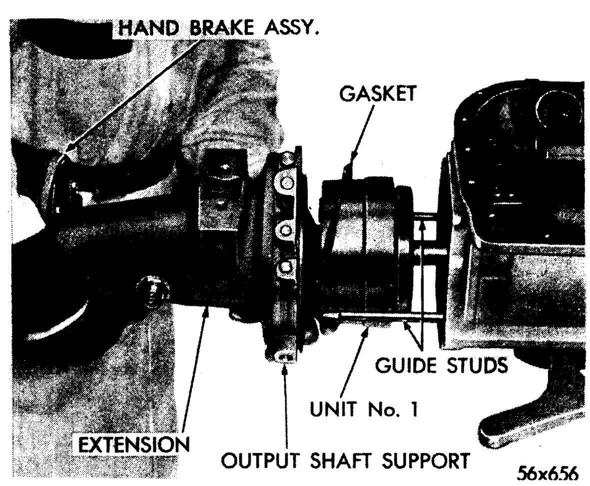


Fig. 102—Removal of Output Shaft Support, Extension, Handbrake Assembly and Unit No. 1 as an Assembly

ers are available in the following thicknesses:

Part No.	*Thickness*	*Color*
1638669	.115″ to .117″	Natural
1638670	.097″ to .099″	Red
1638671	.078″ to .080″	Black
1823872	.059″ to .061″	Orange

Install power train units. Refer to "Power Train Units—Installation"; Unit No. 3, and Unit No. 2.

Install hand brake assembly, extension, output shaft support, and Unit No. 1 in one assembly as removed, following the procedure as described in the installation of Unit No. 1. With assembly in position in transmission case, install the one support to case bolt and lockwasher finger tight. Remove the guide studs and install the seven extension to case bolts and lockwashers, draw down evenly and tighten to specifications. After bolts have been properly torqued, turn output shaft to make sure it turns freely. Recheck front clutch end clearance.

114. BAND ADJUSTMENTS

Since both band assemblies have been removed, it is very important that the hand brake drum is turned in a clockwise and counter-clockwise direction to center bands on retainers prior to making band adjustments.

Low-Reverse (Rear) Band

Refer to "Maintenance, Adjustments and Tests," Paragraph 15.

Kickdown (Front) Band

Refer to "Maintenance, Adjustments and Tests," Paragraph 15.

115. VALVE BODIES AND TRANSFER PLATE ASSEMBLY—INSTALLATION

Check mating surfaces of valve body assembly for cleanliness. Then place the valve bodies and transfer plate assembly into position on transmission case, as shown in Figure 40. Install the three transfer plate bolts (short) and washers, two in center, and one in front. Draw down evenly and tighten to specifications. **Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from head.**

Install accumulator spring through transfer plate and position in piston. Install accumulator cover, as shown in Figure 39, (three bolts with washers) and draw down evenly. Place oil strainer assembly in position on transfer plate assembly. Install the four bolts and washers, draw down evenly, and tighten strainer assembly and accumulator cover bolts to specifications. Install neutral starting switch.

116. OIL PAN—INSTALLATION

Using a new oil pan gasket, place oil pan in position on transmission case. Install the oil pan bolts and washer assemblies; draw down evenly, and tighten to specifications. Position the manual valve operating shaft lever so there is $7/32$ inch clearance (without gasket) between bottom of lever and transmission case. Tighten locking screw securely. **A 7/32 inch drill can be used for obtaining proper clearance (Fig. 30).** Place control cable adapter (with spring lock in position) in lever and install pin. Place manual valve control lever in **reverse** position and install gasket, control cable housing, and three bolts and washers. Draw down evenly and tighten to specifications. Install lip seal flat washer, and throttle valve lever assembly over shaft. Tighten clamping bolt.

RECONDITIONING OF VALVE BODY AND TRANSFER PLATE ASSEMBLIES

117. LOWER VALVE BODY—REMOVAL

Place the valve bodies and transfer plate assembly in stand, Tool C-3528. **Never clamp any portion of any valve body assembly in a vise or use force when removing or installing valves and plugs.** Remove the two valve body bolts (long) from retainer plate located between front and rear valve bodies, (Fig. 103) and remove plate. Invert valve bodies and transfer plate and remove the two lower valve body bolts and lockwashers. Remove lower valve body and plate from transfer plate, as shown in Figure 104.

118. REAR VALVE BODY—REMOVAL

Remove the two transfer plate to rear valve body bolts and lockwashers, and remove rear valve body from transfer plate assembly, as shown in Figure 105. **Remove the servo pressure bleed valve to prevent loss.** Invert valve bodies and transfer plate assembly and replace on stand Tool C-3528.

119. FRONT VALVE BODY—REMOVAL

Remove the two front valve body to transfer plate bolts and lockwashers and separate front valve body from transfer plate assembly, as shown in Figure 106. **Remove upper valve body plate from transfer plate.**

120. CLEANING AND INSPECTION

Place all parts in clean solvent, wash thoroughly, and dry with compressed air. Make definitely sure all passages are free from obstructions.

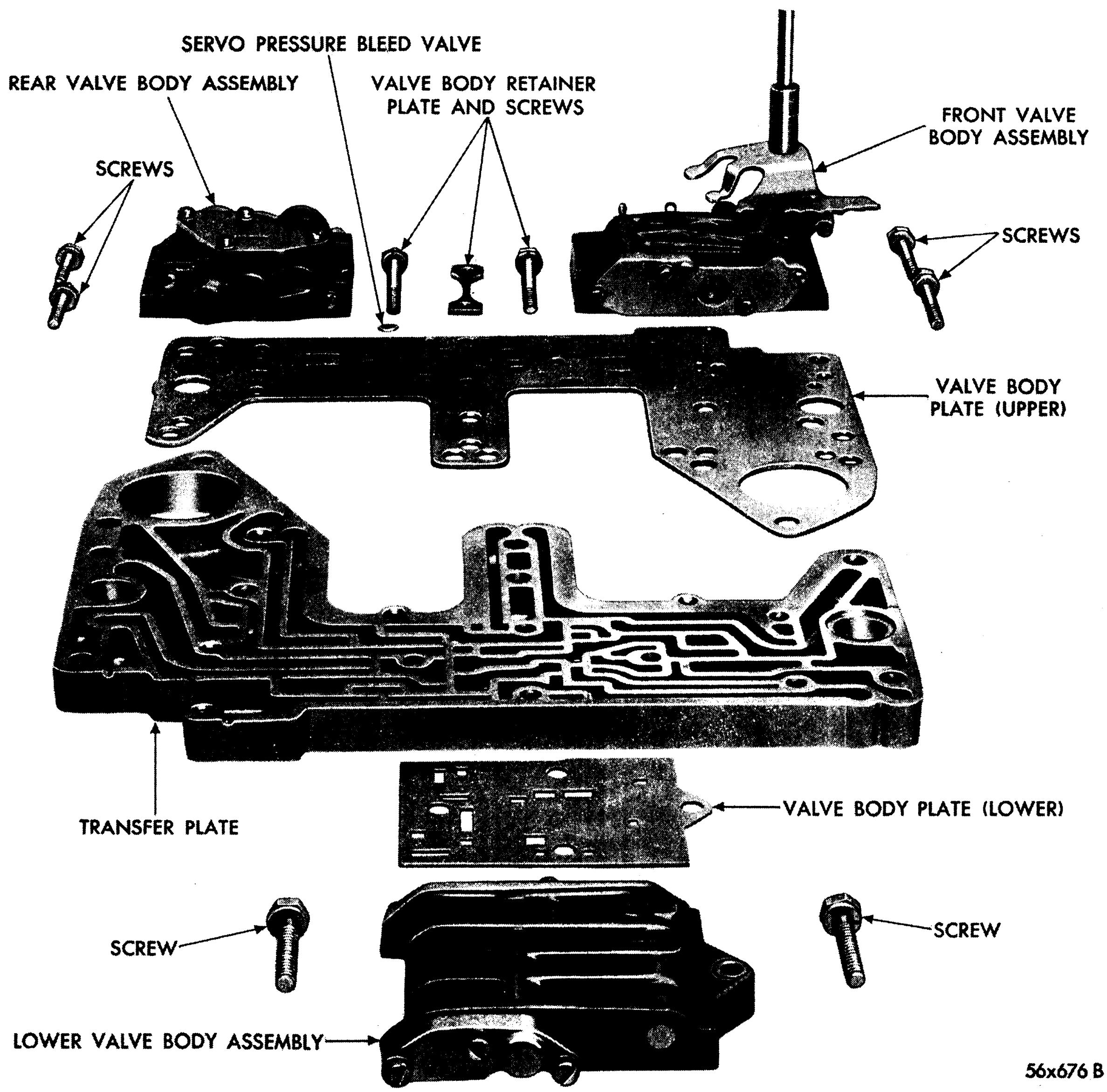


Fig. 103—Valve Bodies and Transfer Plate (Separated)

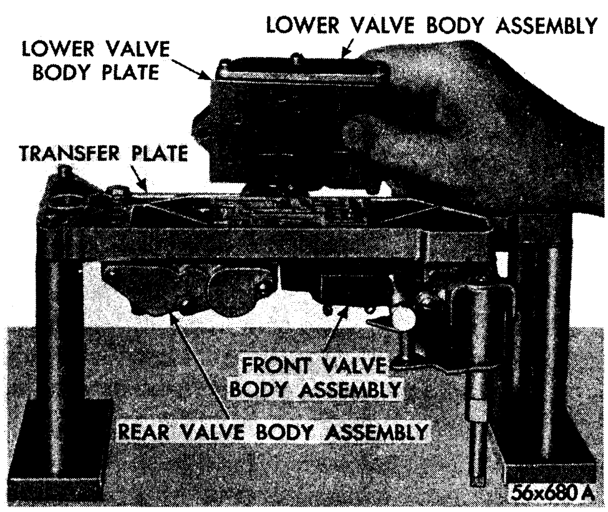


Fig. 104—Removal and Installation of Lower Valve Body Assembly and Plate

When inspecting, also check for porous castings. Inspect all mating surfaces for burrs, nicks and grooves. Small ones may be removed

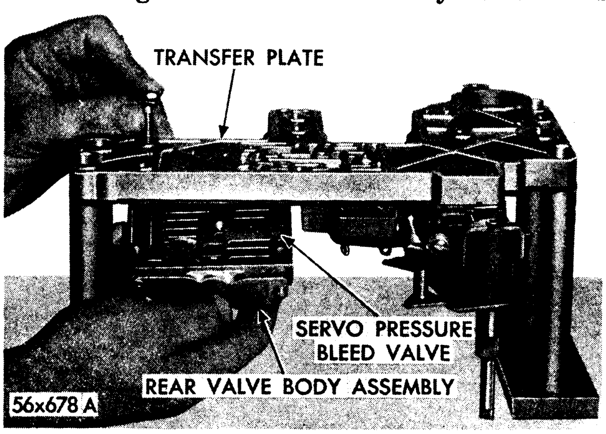


Fig. 105—Removal and Installation of Rear Valve Body Assembly

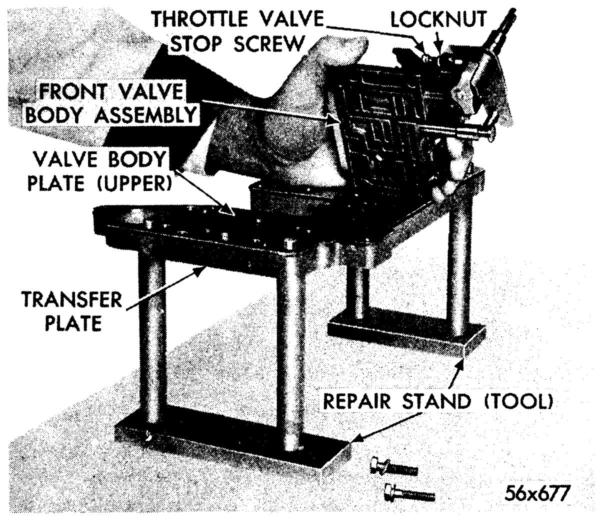


Fig. 106—Removal and Installation of Front Valve Body Assembly

with crocus cloth; otherwise, damaged parts must be replaced. Using straight edge, Tool C-3335, check all mating surface for distortion.

Using a pen light, inspect bores in valve body for score marks, pits, and irregularities. Inspect all springs for distortion and collapsed coils. Inspect all valves and plugs for burrs, nicks, and scores. Small ones may be removed with crocus cloth providing extreme care is used not to round off the sharp edge portion of valve. The sharp edge portion is vitally important to this type valve. The sharp edge helps to prevent dirt and foreign matter from getting between valves and body, thus reducing possibilities of sticking. Check valves and plugs for free operation in bores; they must fall freely in bores when valves, plugs and bores are clean and dry.

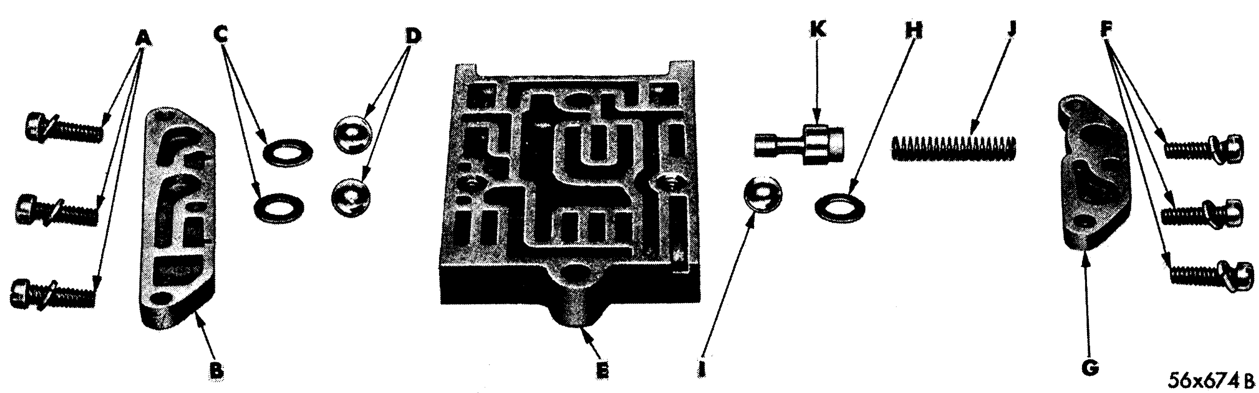


Fig. 107—Lower Valve Body (Disassembled View)

A—Cover Screws and Lockwashers
B—Valve Cover
C—Lower Valve Body Check Valve Ball Seats
D—Lower Valve Body Check Valve Balls
E—Lower Valve Body
F—Throttle Compensator Valve Cover Screws and Lockwashers
G—Throttle Compensator Valve Cover
H—Lower Valve Body Check Valve Ball Seat
I—Lower Valve Body Check Valve Ball
J—Throttle Compensator Valve Spring
K—Throttle Compensator Spring

121. VALVE BODY AND PLATES (UPPER AND LOWER) AND TRANSFER PLATE—INSPECTION

Inspect valve body plates (upper and lower) for nicks, scratches, or burrs; and make sure metering holes are open. Visually inspect transfer plate for porosity. Inspect machined surface for nicks or burrs. Inspect threaded holes for damaged threads.

122. LOWER VALVE BODY—DISASSEMBLY (Fig. 107)

Remove the three screws from cover (B) (large). Using care to prevent loss of the two check valve balls (D) and sets (C), remove cover.

NOTE: If check ball seat washers are staked in place, do not remove.

While holding throttle compensator valve cover (G) in place (spring loaded), remove the three screws and lockwashers (F). **Use care when removing cover to prevent loss of check valve ball (I) and seat (H).** Remove throttle compensator valve spring (J) and valve (K).

123. LOWER VALVE BODY—ADDITIONAL INSPECTION

Inspect check ball contacting surface in valve seats and valve body for nicks or burrs. Inspect covers for flatness and porosity.

124. LOWER VALVE BODY—ASSEMBLY (Fig. 107)

Place valve body in an upright position and install throttle compensator valve (K) and spring (J). Make sure spring is properly seated in valve. Place check ball (I) and ball seat (H) in position in valve body (E).

NOTE: Ball seat must have smooth side (rounded edge) towards ball.

Place throttle compensator valve cover (G) in position over spring and body, and install the three screws and lockwashers. Draw down evenly and tighten.

Place the two check valve balls (D) and seats (C) in position in valve body; and install cover (B), screws, and lockwashers (A). Draw down evenly and tighten.

125. REAR VALVE BODY—DISASSEMBLY (Fig. 108)

Keeping thumb pressure against the kickdown plug cover (B) (spring loaded) remove the three screws and lockwashers.

CAUTION

Use caution when removing cover to prevent loss of the 3-1 relay valve spring (E) 1-2 shift valve kickdown plug (C) and 2-3 shift valve kickdown plug (D).

Remove the 1-2 shift spring (G) and valve (H). Remove the 3-1 relay valve (F). Remove the 2-3 shift valve spring (I) and valve (J). Remove the three governor plug cover screws and lockwashers (K). **Use caution when re-**

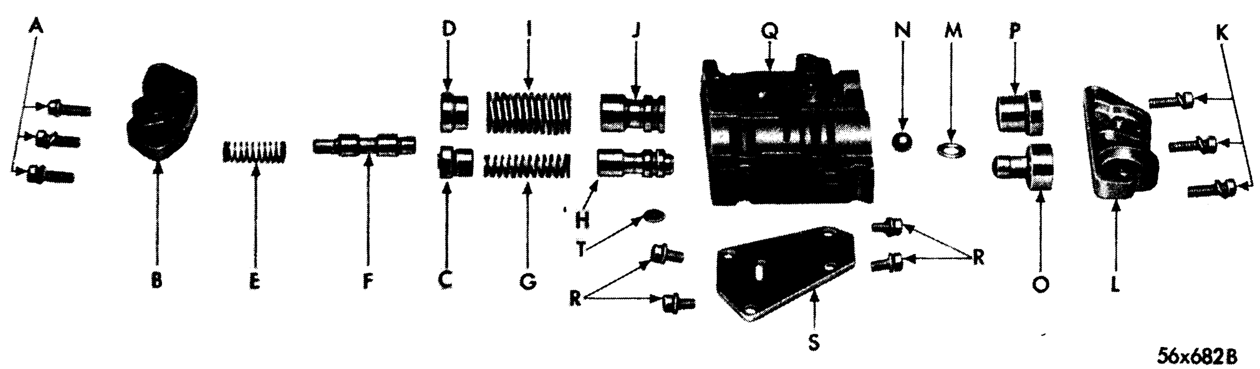


Fig. 108—Rear Valve Body (Disassembled View)

A—Rear Valve Body Kickdown Plug Cover Screws and Lockwashers
B—Rear Valve Body Kickdown Plug Cover
C—1-2 Shift Valve Kickdown Plug
D—2-3 Shift Valve Kickdown Plug
E—3-1 Relay Valve Spring
F—3-1 Relay Valve
G—1-2 Shift Valve Spring
H—1-2 Shift Valve
I—2-3 Shift Valve Spring
J—2-3 Shift Valve
K—Rear Valve Body Governor Plug Cover Screws and Lockwashers
L—Rear Valve Body Governor Plug Cover
M—Check Valve Ball Seat
N—Check Valve Ball
O—1-2 Shift Valve Governor Plug
P—2-3 Shift Valve Governor Plug
Q—Rear Valve Body
R—Rear Valve Body Plate Screws and Lockwashers
S—Rear Valve Body Plate
T—Servo Pressure Bleed Valve

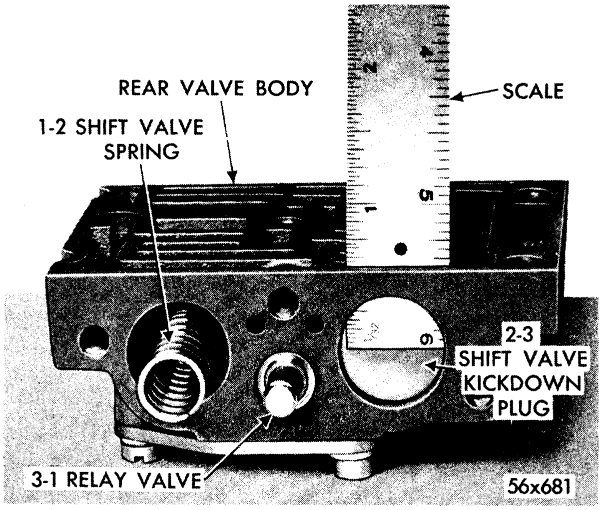


Fig. 109—Using Scale to Hold 2-3 Shift Valve Kickdown Plug in Body During Assembly

moving cover (L) to prevent loss of check valve ball seat (M) and ball (N).

NOTE: If check ball seat washers are staked in place, do not remove.

Remove the 1-2 shift valve governor plug (O) from valve body. Remove the 2-3 shift valve governor plug (P) from valve body. Rear valve body plate (S) can be removed for cleaning purposes by removing the four screws and lockwashers.

CAUTION

Be sure to use same screws when installing the cover.

126. REAR VALVE BODY—ASSEMBLY

With valve body (Q) setting in an upright position, install the 1-2 shift valve (H) (small end first) into valve body. Place the 2-3 shift valve (J) (spring pilot facing out) into position in valve body. Position the 1-2 and 2-3 shift valve springs (G and I) in valves.

Place the 2-3 shift valve kickdown plug (D) (identified by larger pilot) over 2-3 shift valve spring (I). Compress spring sufficiently to seat plug in valve body and secure by placing a thin piece of metal (6″ scale) behind plug, as shown in Figure 109. Install the 3-1 relay valve (F) (large end first) into valve body and place spring (E) on pilot. Place the 1-2 shift valve kickdown plug (C) over the 1-2 shift valve spring (G). Place kickdown plug cover over 3-1 relay valve spring and 1-2 kickdown plug. Compress springs and guide the 1-2 kickdown plug into valve body. Install the three cover screws and lockwashers and draw down evenly and tighten. Remove piece of metal or 6″ scale.

Install rear valve body plate (S) (if removed). Be sure to use correct length screws. Place the 1-2 shift valve governor plug (O) (small end first) in position in valve body. Place the 2-3 shift valve governor plug (P) (small end first) in position in valve body. Install check ball (N) and seat (M).

NOTE: Ball seat must have smooth side (rounded edge) towards ball.

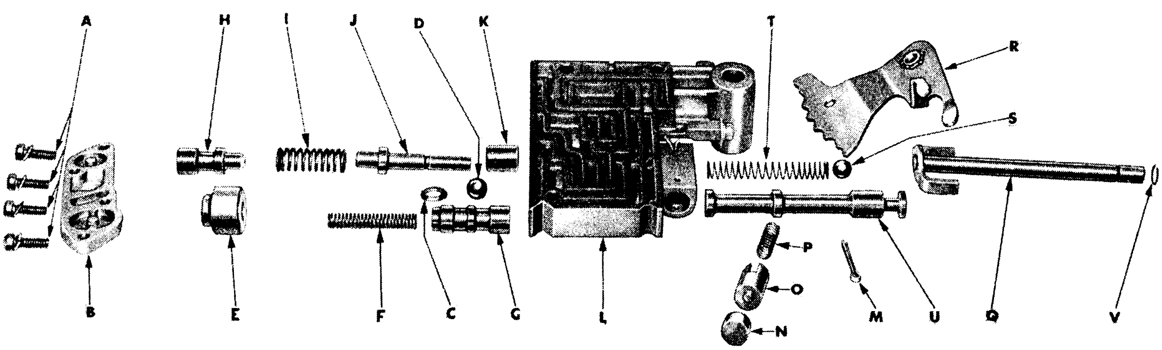


Fig. 110—Front Valve Body (Disassembled View)

A—Shuttle Valve Cover Screws and Lockwashers
B—Shuttle Valve Cover
C—Front Check Valve Ball Seat
D—Front Check Valve Ball
E—Shuttle Valve Plug
F—Shuttle Valve Spring
G—Shuttle Valve
H—Throttle Valve
I—Throttle Valve Spring
J—Kickdown Valve
K—Kickdown Detent Plug
L—Front Valve Body
M—Reverse Blocker Valve Pin
N—Reverse Blocker Valve Plug
O—Reverse Blocker Valve
P—Reverse Blocker Valve Spring
Q—Throttle Valve Lever Shaft
R—Manual Valve Lever Assembly
S—Manual Valve Lever Detent Ball
T—Manual Valve Detent Ball Spring
U—Manual Valve
V—Throttle Valve Lever Shaft Snap Ring

Place governor plug cover (L) in position on valve body and install the three screws and lockwashers. Draw down evenly and tighten.

127. FRONT VALVE BODY—DISASSEMBLY

All letters referred to in disassembly of front valve body pertain to Figure 110.

Keeping thumb pressure against shuttle valve cover (B) (spring loaded) remove the four screws and lockwashers. Use caution when removing cover to prevent loss of front check valve ball seat (C) and ball (D).

NOTE: If check ball seat washers are staked in place, do not remove.

While holding thumb over throttle valve, invert valve body and remove shuttle valve plug, spring and valve, as shown in Figure 111.

Remove throttle valve, spring, kickdown valve, and detent plug, as shown in Figure 112. It is unnecessary to remove detent plug retaining bolt and lockwasher. Remove cotter pin from valve body in outer end of reverse blocker valve. Remove reverse blocker valve plug (N), blocker valve (O), and spring (P). Normally it isn't necessary to remove the throttle valve lever shaft (Q) manual valve lever assembly (R) or manual valve (U). If condition warrants, however, such as damage, proceed as follows:

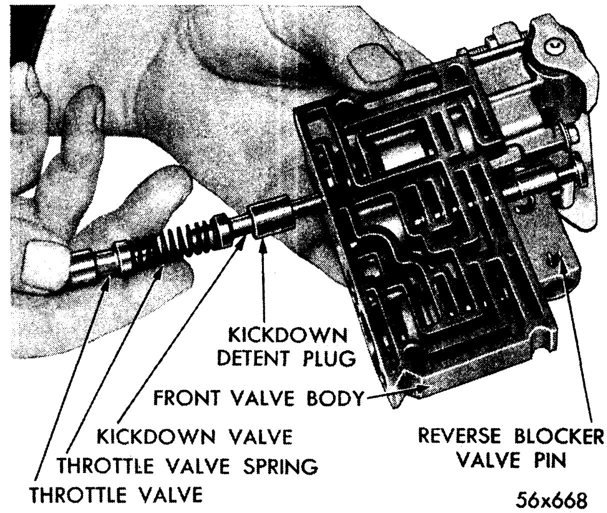


Fig. 112—Removal and Installation of Throttle Valve, Spring, Kickdown Valve and Detent Plug

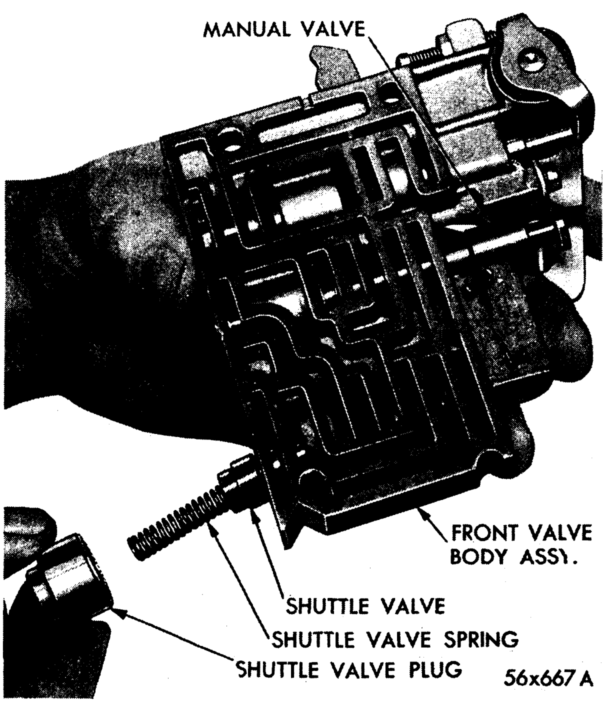


Fig. 111—Removal and Installation of Shuttle Valve, Plug, Spring and Valve

Remove the throttle valve lever shaft snap ring (V) (Fig. 110). Remove any burrs from throttle valve and manual valve lever shafts and slide them from valve body. Slide throttle valve lever shaft (Q) out of manual lever assembly (R). Using caution to prevent loss of detent ball (S) and spring (T), remove manual valve lever assembly (R) from valve body. Using a twisting motion, remove manual valve (U).

128. FRONT VALVE BODY— ADDITIONAL INSPECTION

Inspect the manual valve detent ball (S) and make sure it slides freely into valve body. Inspect staking of manual lever and throttle cam to their respective shafts. Inspect kickdown valve detent plug to make sure it slides freely on valve. Inspect check valve ball seat in valve body (faulty casting).

While compressing detent ball in position with right index finger, install manual valve control lever by sliding over detent ball placing shaft of manual valve control lever in bore of valve body. **This assembly may be held in position by the use of a rubber band.**

While holding manual lever assembly in position against valve body, install throttle valve lever assembly through manual valve lever assembly, with flat portion on end of shaft facing away from valve body (to allow maximum travel of lever). While holding levers in position in valve body with rubber band, install shaft snap ring (V). Remove rubber band.

With reverse blocker valve spring in position in valve (O) and with slots in valve aligned with pin, install reverse blocker valve in valve body. Install reverse blocker valve plug (N) and compress spring sufficiently to install pin (M). Lock pin in position. Check kickdown detent plug stop screw for being tight. Install detent plug (larger inner diameter first) on kickdown valve (J) and position kickdown valve (detent plug first) into valve body.

Install throttle valve spring (I) and throttle valve (H) into valve body. Install shuttle valve (G) and spring (F) in the valve body. Install plug (E) into position in valve body. Place front check valve ball (D) and seat (C) in position in valve body.

NOTE: Ball seat must have smooth side (rounded edge) towards ball.

Place shuttle valve cover (B) in position on valve body and install four bolts and lockwashers. Draw down evenly.

129. VALVE BODY PLATE (UPPER)—INSTALLATION

Place valve body transfer plate in an upright position on fixture Tool C-3528. Place steel plate (upper) over pilots on Tool C-3528, and into position on transfer plate.

132. FRONT VALVE BODY—INSTALLATION

Position front valve body on steel plate (upper), as shown in Figure 106, and install two bolts and lockwashers in outer end of valve and draw down finger tight.

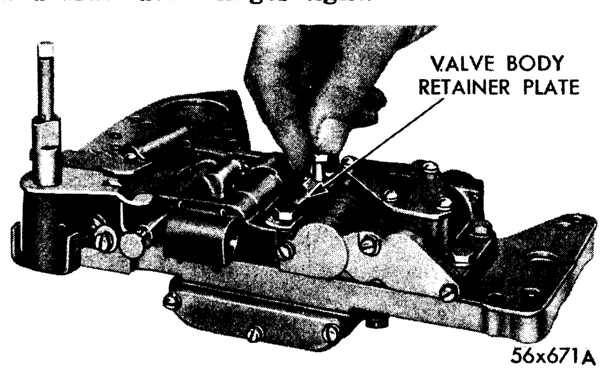


Fig. 113—Installation of Valve Body Retainer Plate

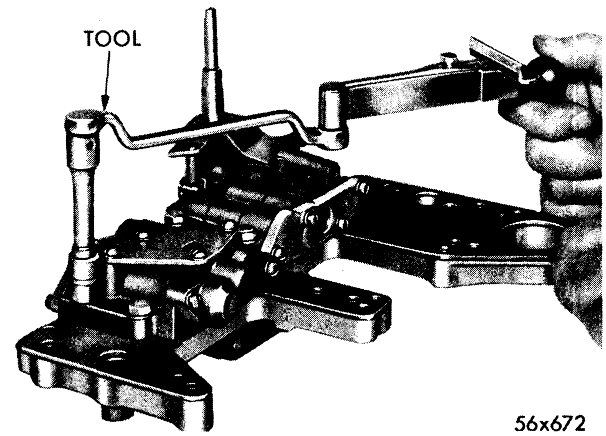


Fig. 114—Tightening Valve Body Screws

130. REAR VALVE BODY—INSTALLATION

Invert transfer plate assembly and replace on fixture, Tool C-3528. With servo pressure bleed valve in place, hold rear valve body up into position against steel plate, as shown in Figure 105, and install the two outer bolts (short) with lockwashers through the transfer plate and into lower valve body. Draw up finger tight.

131. LOWER VALVE BODY—INSTALLATION

Position steel plate (lower) on lower valve body. Place valve body and steel plate into position on transfer plate. Install the two bolts (intermediate length) and lockwashers, and tighten the two lower valve body and two rear valve body bolts to specifications.

Invert valve bodies and transfer plate and replace on fixture Tool C-3528. Install valve

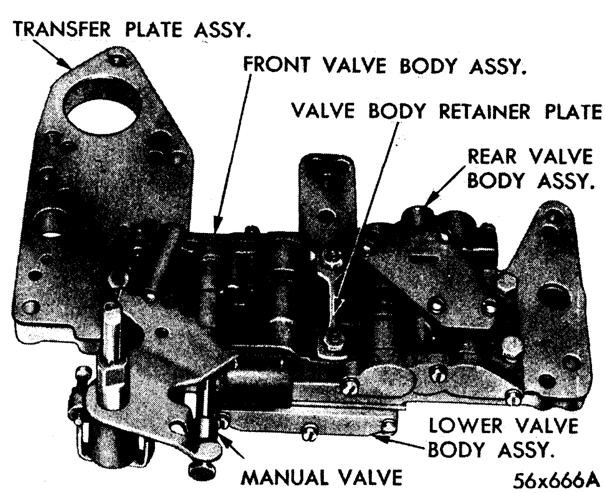


Fig. 115—Valve Bodies and Transfer Plate Assembly (Bottom View)

bodies retainer plate and two bolts (long) with lockwashers (Fig. 113), and tighten the two retainer plate bolts and two front valve body bolts to specifications, as shown in Figure 114. Overtightening will cause distortion to valve body and result in sticky valves. Check manual valve operation to make sure it operates freely. Place transfer plate and valve bodies assembly (Fig. 115) in transmission case. Remove stand, Tool C-3528. Install transmission as outlined under "Removal and Installation of Transmission," Paragraph 34.

TORQUE CONVERTER SERVICE PROCEDURES

132. REMOVAL AND INSTALLATION OF TORQUE CONVERTER AND HOUSING

a. Removal

Remove transmission, as outlined in transmission section. Remove the torque converter housing-to-adapter plate bolts and washers. As the housing is doweled to the adapter plate, care must be exercised during removal. Do not remove adapter plate unless inspection reveals it is necessary to do so. **Do not hammer or pry between the mating surfaces to loosen, as the metal may be distorted which can result in misalignment.**

After removing housing, inspect mating surfaces of housing and adapter plates. Remove all burrs or rough spots with emery cloth. Remove all obstructions, dirt etc. from vent hole screens (when so equipped).

Remove the bolts holding metal dust shield to converter housing adapter plate. Using wrench, Tool C-589, remove stud nuts and lock washers which hold converter unit to the crankshaft. **The torque converter assembly is a welded unit and cannot be serviced, except as an assembly.** If torque converter is being removed for replacement of starter ring gear, refer to Paragraph 133.

b. Installation

If a new torque converter is being installed, make sure all visible foreign matter, such as raised metal around studs, burrs, chips, etc. have been removed from the converter and crankshaft drive flanges.

Check crankshaft flange runout (maximum is .002 inch total indicator reading) by installing dial indicator set, Tool C-3339 at one of the housing-to-adapter bolt holes. Checking crankshaft flange runout will determine whether or not the crankshaft flange may be contributing to torque converter hub runout.

If crankshaft flange runout is within tolerance, proceed to install torque converter and housing as follows:

Position torque converter unit on crankshaft flange. Using wrench, Tool C-589 tighten stud nuts to 55 foot-pounds torque.

Before installing torque converter housing, it is recommended that the torque converter hub runout be checked (and corrected if necessary) as outlined in Paragraph 134. If torque

Fig. 116—Removing Starter Ring Gear

converter hub runout is within specifications, continue to install housing in the following manner:

Position housing over dowels and against mating face of adapter plate. Tighten mounting bolts and nuts just snug enough to retain housing in position.

Check (and correct if necessary) torque converter housing bore and face runout as outlined in Paragraph 135. If bore and face runout are within specifications, tighten housing bolts and nuts to 45 foot-pounds torque. Install transmission as outlined in appropriate transmission section.

133. REPLACING STARTER RING GEAR

a. Removing Ring Gear

Remove torque converter and housing as outlined in Paragraph 132. Support the torque converter assembly in a vise. With a file carefully remove the staking lugs which retain the ring gear to the torque converter. Be careful to avoid distortion when supporting torque converter in the vise. Place torque converter on blocks of wood (for support) while removing gear. Using a blunt chisel, or drift. Tap around ring gear until it comes off torque converter (Fig. 116).

NOTE: A small amount of heat, directed on gear, will aid in its removal—if ring gear is to be discarded.

b. Installing Ring Gear

Remove burrs or raised spots (left on the gear contact surface of the torque converter) with a file. Do not remove more metal from the torque converter than is required to remove burrs and rough surfaces.

Any of the following methods may be used to heat the starter ring gear for installation on converter:

Oven—Use Oven C-794 and set temperature at 150 degrees F. Allow ring gear to remain in oven for approximately 15 to 20 minutes.

Boiling Water—Place ring gear in a shallow container, add water, and heat for approximately eight minutes after water has come to a boil.

Steam—Place ring gear on a flat surface and direct the steam flow around the gear for approximately two minutes.

Flame—Place ring gear squarely on a flat surface. Using a medium-size tip, direct a slow flame around the inner rim of the gear, being careful not to direct the flame onto the teeth of the ring gear. Place a few drops of water on the face of the gear at intervals during the heating process. When the gear is hot enough to boil the drops of water, installation of gear to torque converter can be made.

Place starter gear over flange surface of torque converter, making sure that the rear face of gear contacts flange on torque converter evenly around the entire diameter.

Reweld ring gear to torque converter, using extreme care to place, as nearly as possible, the same amount of metal in exactly the same location as original assembly. This is necessary in order to maintain proper balance of the unit. Place welds alternately on opposite sides of the converter to minimize distortion.

The following suggestions are offered as an aid in making the weld:

(a) Use a welding current of 200 amps.

(b) Use a D.C. welder that is set straight polarity or an A. C. welder.

(c) Use $\frac{5}{32}$ inch diameter, No. 47 or a $\frac{5}{32}$ inch diameter No. W2B welding rods (or their equivalent). To prevent burning through the torque converter, the arc should be directed at the intersection of the gear and the housing from an angle of approximately 45 degrees from the face of the gear. **DO NOT GAS WELD.**

Before installing the torque converter, inspect all gear teeth and remove all nicks where metal is raised, welding splatter, etc. as these will cause noisy starter operation.

Reinstall torque converter and housing. Refer to Paragraph 132.

134. TORQUE CONVERTER HUB RUNOUT

a. Checking Hub Runout

It is not necessary to remove the torque converter housing to make this check.

Install attachment, Tool C-3613 to dial indicator set, Tool C-3339. (Refer to Fig. 117.)

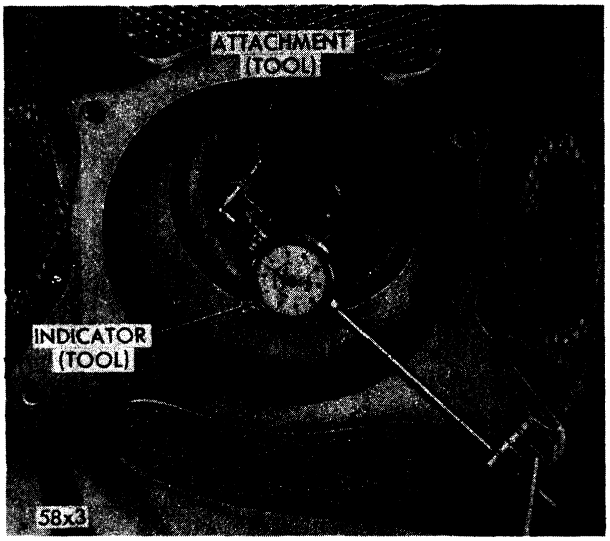


Fig. 117—Checking Torque Converter Hub Runout (Typical View—Housing for Air Cooled Converter Shown)

Install dial indicator support rod in one of the transmission to torque converter mounting bolt holes, as shown in Figure 117.

With remote control starter switch, Tool C-763, properly installed at a convenient "hot" terminal, crank engine while noting indicator needle deflection. Torque converter hub runout must not exceed .004 inch.

b. Correcting Hub Runout

If hub runout exceeds .004 inch total indicator reading, correct by using heat. **Before using heat, make definitely sure that torue converter has been drained.**

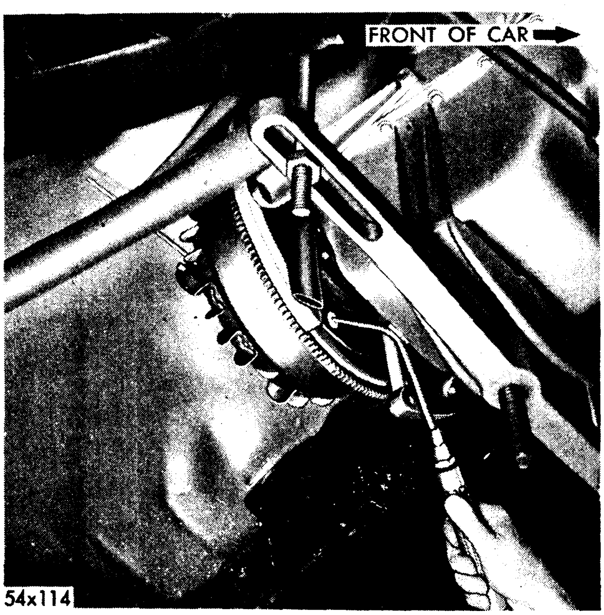


Fig. 118—Heating Torque Converter (Housing Removed to Show Heating Operation)

NOTE: It will not be necessary to remove housing to perform the heating operation.

Mark the position of the hub low spot as accurately as possible on the impeller shell. Rotate the converter so that this mark is directly down.

Remove the dust shield from the front of the adapter plate. Using a piece of chalk, mark the front cover radius directly opposite the hub low spot previously marked on the impeller shell. The subsequent heating operation can now be done through the opening in the adapter plate, as shown in Figure 118.

The size of the spot to be heated is governed by the magnitude of hub runout and is usually about ½ inch diameter for .008 inch total indicator reading. Using an acetylene torch containing a No. 3 tip, and set to maximum heat, apply it to the selected spot until it becomes a dull red. Rapid heating of a local area is essential and if the torch is adjusted properly, the spot will become red within a few seconds. If sparks are noted, it is an indication that torch is too close and metal is starting to burn; move back slightly. **Care should be taken to remove the torch the instant the selected spot becomes a dull red, to avoid over correction or damage to the unit.**

The area is then quenched (as rapidly as possible) with cold water (hose or wet rags). It is suggested this be done by starting around the heated area and working in toward the

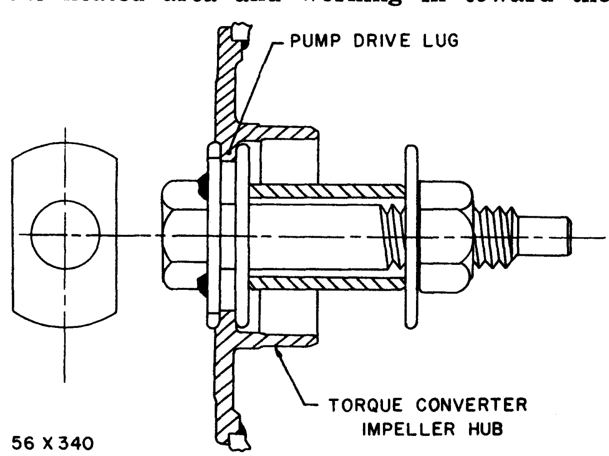


Fig. 119—Tool C-3461 Installed in Torque Converter Hub

spot. This prevents the heat from spreading.

The hub runout should not be rechecked until the converter has returned to a uniform room temperature.

If the converter hub runout exceeds .016 inch total indicator reading, remove the converter and recheck the drive flanges for raised metal chips, etc. Check crankshaft flange runout (maximum .002 inch). If the hub runout remains in excess of .016 inch total indicator reading, install a new converter.

135. CHECKING AND CORRECTING HOUSING FACE AND BORE RUNOUT

a. Bore Runout

Torque converter housing bore and face alignment, as well as converter hub runout, should be checked anytime that the transmission is removed to correct leakage at the front pump oil seal or front pump failure—also whenever an engine replacement is made.

Mount Tool C-3461, as shown in Figure 119, inside the converter with ears of the washer behind the converter pump drive lugs. The square end of the bolt can be held with a wrench as the nut is tightened. Dial indicator set, Tool C-3339, can now be attached, as shown in Figure 120.

Locate the indicator so that it is bearing on the transmission pilot bore of the converter housing and rotate the converter as outlined in Paragraph 134 (a-3).

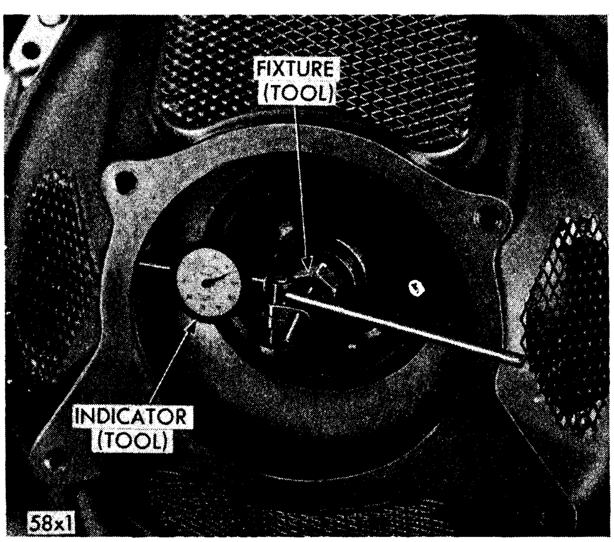


Fig. 120—Checking Housing Bore Runout (Typical View—Housing for Air Cooled Converter Shown)

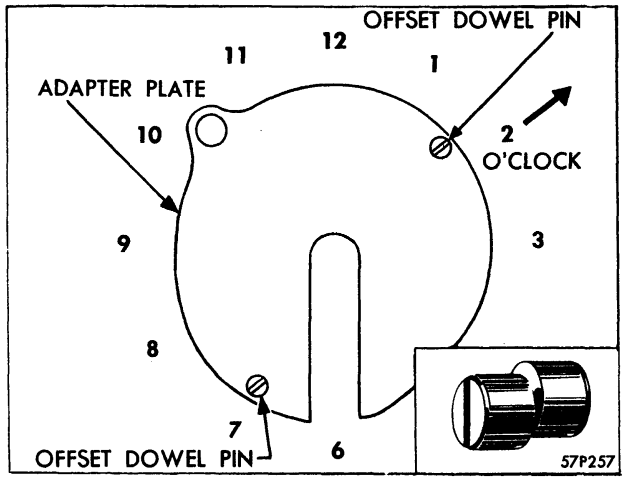


Fig. 121—Eccentric Dowel Orientation Diagram

Runout must not exceed .010 inch total indicator reading. To illustrate the recommended correction procedure, assume that the total indicator reading is .016 inch, in a direction which approximates 2 o'clock, on the adapter plate. (Refer to Figure 121.)

In this case the housing is off crankshaft centerline .008 inch (one-half total indicator reading) which is .003 inch greater than the allowable limit of .005 (one-half total indicator reading).

To correct an off-center condition three offset dowels (Fig. 121) are available in the following sizes:

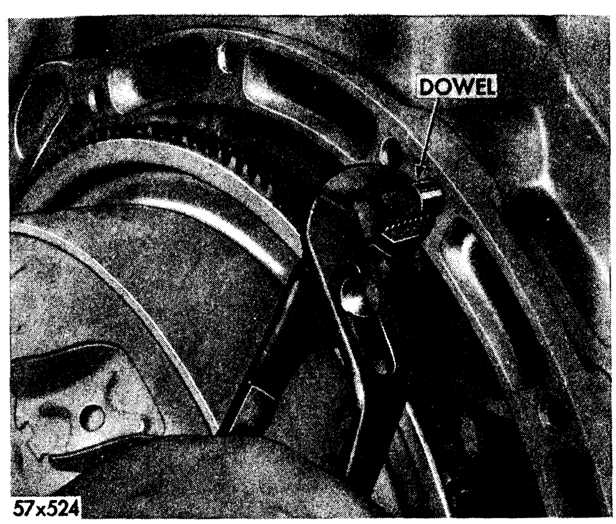


Fig. 122—Removing Dowel Pin

Dowel Offset (inches)	Part Number
.007	1736347
.014	1736348
.021	1736353

In the case, under consideration, use of the .007 inch offset dowels (pair) will bring the runout well within the allowable limit of .005 inch, or: .008 inch minus .007 inch (offset dowels) equals .001 inch runout. **Dowels must be used in pairs (same part number).**

To install the dowel pins (pair), remove the torque converter housing as outlined in Paragraph 132 (a). Remove dowel pins from adapter plate, as shown in Figure 122.

Select eccentric dowels (pair) as indicated in Eccentric Dowel Chart.

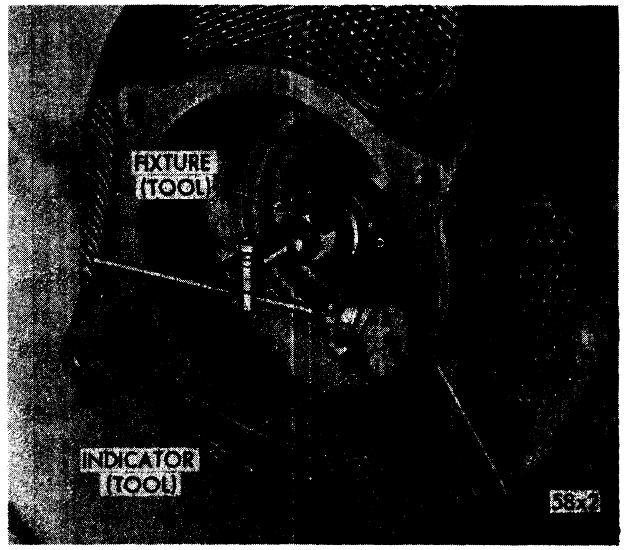


Fig. 123—Checking Face Runout (Typical View—Housing for Air Cooled Converter Shown)

ECCENTRIC DOWEL CHART

Total Indicator Reading	One-Half Total Indicator Reading	Size Dowel to be Used	Dowel Part Number
.012″ to .020″	.006″ to .010″	.007″	1736347
.022″ to .034″	.011″ to .017″	.014″	1736348
.036″ to .052″	.018″ to .026″	.021″	1736353

Install both dowels with the slots parallel and aligned in the direction to correct the bore runout. (Slot indicates the direction of maximum dowel eccentricity.) Majority of corrections will be for one direction only; but it is possible that the housing bore may be out in two directions. In the latter case, it may be necessary to use the next higher step dowels, adjusting these dowels with the housing installed to bring within tolerance. **Care should be taken to back up adapter plate when inserting lower dowel to avoid distortion or breakage of adapter plate. Both dowels should be inserted into adapter plate up to off-set shoulder.**

Install and tighten converter housing bolts to 50 foot-pounds torque. Remount dial indicator and recheck bore runout. Small corrections can be made by loosening housing mounting bolts and turning dowels with a screw driver to shift the housing and bring bore within limits.

b. Face Runout

Relocate dial indicator set, Tool C-3339, as shown in Figure 123. Rotate converter as outlined in Paragraph 3 (a-3). If the total indicator reading is greater than .008 inch note the amount of the total indicator reading and the location of the lowest indicator reading (i.e., the point where the indicator arm or follower is extended the furthest).

Place the shim or shims on one or more of the transmission to housing bolts in position

Part Number	Thickness
1610442	.002″
1610443	.003″
1610444	.005″

between transmission and housing. Consult the following table for shim thicknesses.

136. FLUSHING THE TORQUE CONVERTER

In the event that a transmission has failed any part, it will be necessary to flush the torque converter to insure that fine metallic particles are not later transferred into the transmission controls. This should be done by slowly pouring 2 qts. of new, clean kerosene into the torque converter hub, using a long spouted can. Before this can be done it is necessary to reach into the torque converter with a screwdriver and turn the torque converter stator hub counter-clockwise (large splined hub) by lifting on the right side of the spline so that one of the 1/8 inch x 3/8 inch rectangular slots on this assembly is visable at the top. Since there is a second slot (directly below), an adequate opening is provided for the kerosene (if poured slowly). After the kerosene is in the torque converter, close the hub opening with masking tape.

Rotate the converter approximately 10 seconds by cranking engine.

NOTE: Disconnect coil wire to prevent engine from starting.

Drain the converter by removing the drain plug and masking tape.

Realign the stator hub and repeat the above procedure at least once more (or if there is excessive contamination, until the kerosene drained out is clear). To complete the flushing procedure, rotate the converter with the drain plug removed. This will remove any residual solvent and trapped dirt. Reinstall the drain plug or plugs. Install transmission as outlined in transmission section.

SHIM THICKNESS TABLE

Location of Housing Face Low Point	Location of Shim	Total Indicator Reading Observed on Housing Face	Total Shim Thickness
Near one of the lower trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .013″ 2) .020″ 3) .026″
Near one of the upper trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .014″ 2) .021″ 3) .029″
Between the two lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .010″ 2) .015″ 3) .020″
Between the two upper trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .003″ 2) .012″ 3) .016″
Between the upper and lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) upper .010″ lower .014″ 2) upper .015″ lower .020″ 3) upper .020″ lower .027″

The above shims, when used in combination, will satisfy any of the required shim thickness listed in the table. **Before reinstalling transmission, check for any transmission leakage or damaged parts (seals and bushings). In most cases, the torque converter hub oil seal should be replaced.**

Tighten housing bolts to 50 foot-pounds torque. Install transmission as outlined in appropriate transmission section.

SPEEDOMETER PINION USAGE CHART

(8-TOOTH GEAR INTEGRAL WITH OUTPUT SHAFT)

AXLE RATIO—SPEEDOMETER PINION OPERATION

(INDICATING NUMBER OF PINION GEAR TEETH AND COLOR)

TIRE SIZE	2.92:1 AND 2.93:1	3.15:1 AND 3.18:1	3.31:1 AND 3.36:1	3.54:1	3.73:1	3.90:1	3.91:1	4.1:1	4.3:1	4.56:1	4.89:1
7.50 x 14	17-Red	19-L.Purple	20-L. Blue	21-Yellow	21-Yellow	21-Yellow	21-Yellow				
8.00 x 14	17-Red	19-L.Purple	20-L. Blue	21-Yellow	21-Yellow	21-Yellow	21-Yellow				
8.50 x 14	17-Red	18-Black	19-L.Purple	20-L.Blue	21-Yellow	21-Yellow	21-Yellow				
9.00 x 14	17-Red	18-Black	19-L.Purple	20-L.Blue	21-Yellow	21-Yellow	21-Yellow	21-Yellow	21-Yellow	21-Yellow	21-Yellow
9.50 x 14	17-Red	18-Black	19-L.Purple	20-L.Blue	21-Yellow						
9.50 x 15				18-Black							

Section XII

UNIVERSAL JOINTS AND PROPELLER SHAFT

CONTENTS

DATA AND SPECIFICATIONS

Models	LC-1, 2	LC-3	Town & Country LC-1	Town & Country LC-3	LY-1
Propeller Shaft					
Number Used	1	1	1	1	2
Diameter					
With TorqueFlite Transmission	3.0 in.	3.0 in.	3.25 in.	3.25 in.	2.75 in.
Diameter with Air Conditioning					
And TorqueFlite Transmission	3.25 in.	3.25 in.	3.25 in.	3.25 in.	2.75 in.
Length					
Centerline to Centerline of "U" Joints					
With TorqueFlite Transmission	58.96	58.96	58.96	58.96	63.64

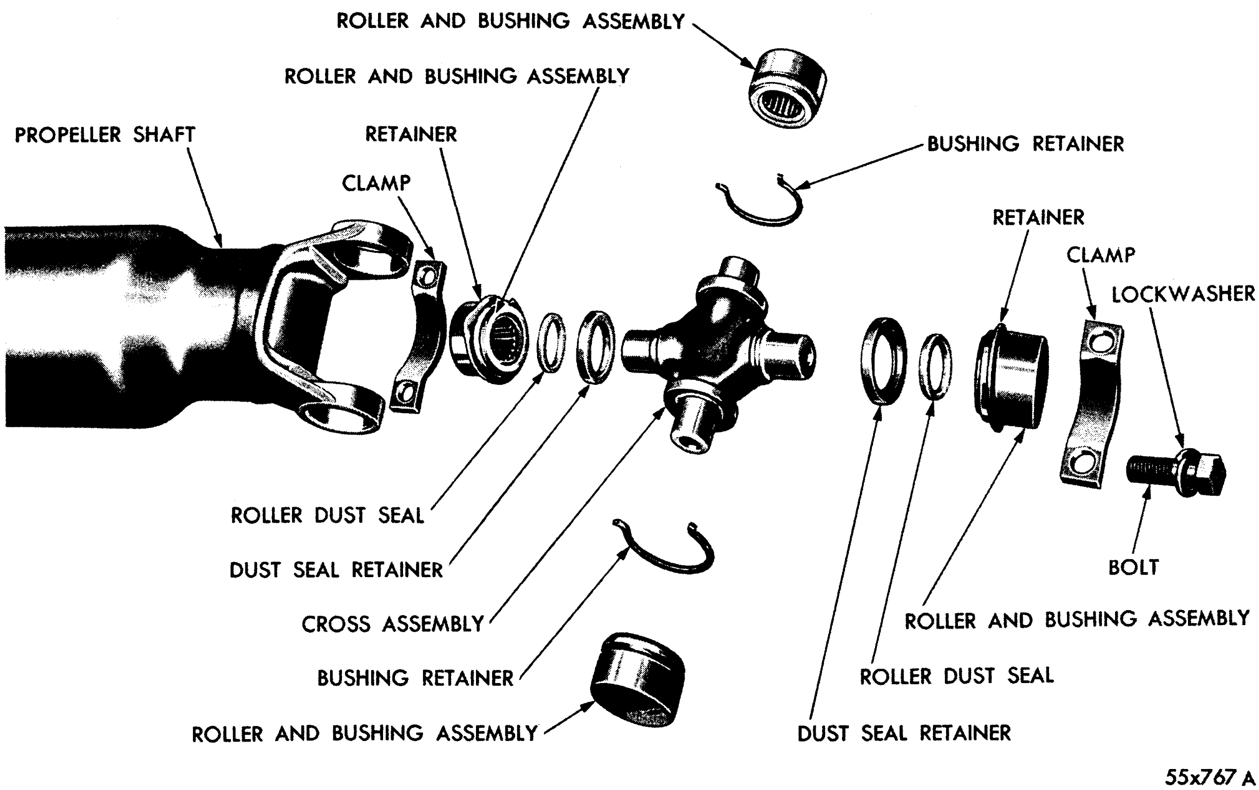


Fig. 1—Rear Universal Joint—Cross Type (Disassembled View)

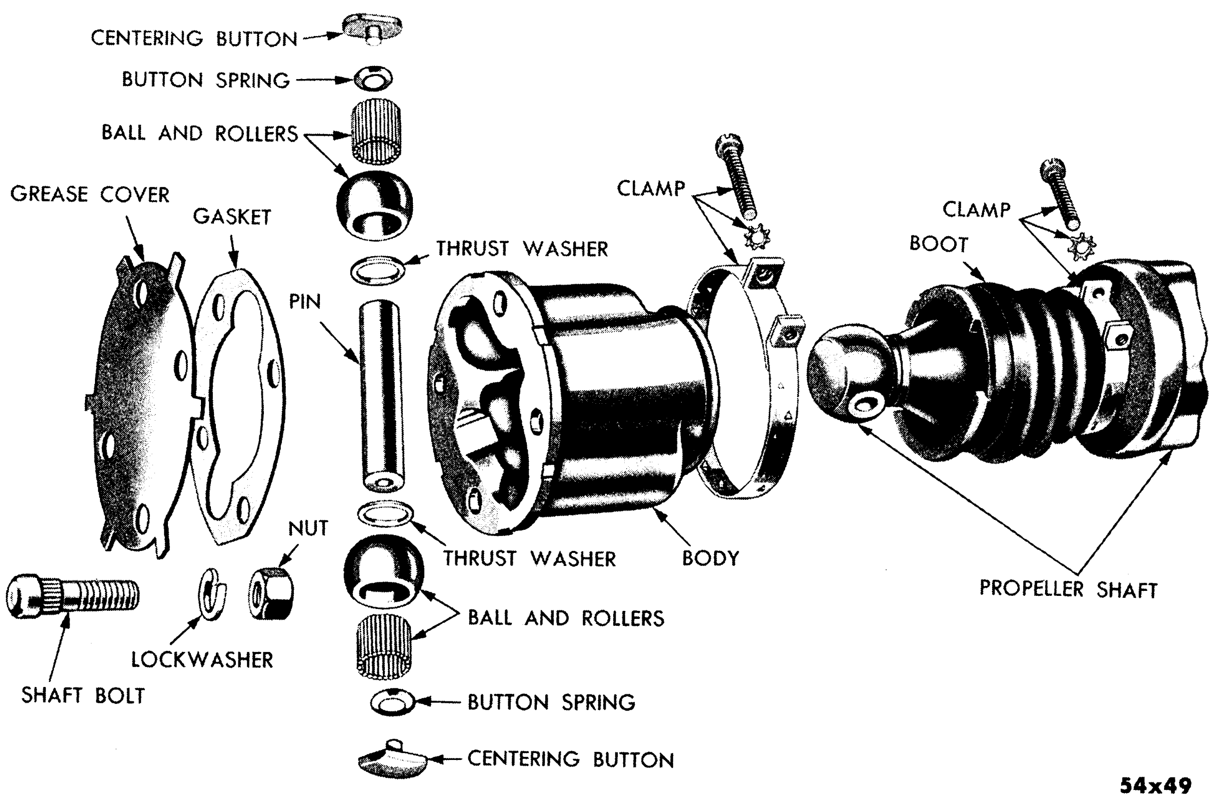


Fig. 2—Front Universal Joint—Ball and Trunnion Type (Disassembled View)

DATA AND SPECIFICATIONS (Cont'd)

Models	LC-1, 2	LC,3	Town & Country LC-1	Town & Country LC-3	LY-1
Flange to Flange Length With TorqueFlite Transmission......	61.10	61.10	61.10	61.10	64.14
Lubrication..........................		*PRE-PACK			
Universal Joints Type............................		(Front) Ball and Trunnion (Rear) Cross Type			Cross Type (Only)
Bushing-Bearing Type................		ANTI-FRICTION			

*Every 20,000 miles.

Section XII

UNIVERSAL JOINTS AND PROPELLER SHAFT

UNIVERSAL JOINTS

Two types of Universal Joints are used on 1958 Chrysler Models and are as follows: The Cross Type, as shown in Figure 1, and Ball and Trunnion Type, as shown in Figure 2.

The ball head of the Ball and Trunnion Type, is an integral part of the tubular propeller shaft and is covered by the joint body. The pin, with balls, needle bearings, thrust washers, centering button, and button spring at each end, extends through the propeller shaft ball head and rides in ball channels in the body of the joint assembly. This balanced installation is designed to absorb thrust and torque of the drive line. This type of joint is used in Chrysler Models LC-1, 2 and 3 at front universal joint.

The Cross Type universal joint is used at rear joint of all models, and front and center bearing joints of Imperial Models which are equipped with center bearing and two propeller shafts.

No adjustments are provided to compensate for wear in universal joint assembly. Parts that show excessive wear must be replaced.

CAUTION

When disassembling universal joints, keep parts identified as to original position. Failure to assemble parts in their original positions may cause an unbalanced condition in the propeller shaft. Retorque mounting nuts after the initial 1,000 miles of operation.

CROSS TYPE

1. SERVICING CROSS TYPE UNIVERSAL JOINTS (Fig. 1)

Remove propeller shaft from the vehicle. Remove two bushing retainers holding bushings in shaft yoke and remove bushings. Tilt cross so that it may be removed from propeller shaft yoke. Straighten out end of retainer lock and remove two roller and block assemblies. Remove dust seals and retainers. Inspect parts and replace parts that show wear. Lubricate roller and bushings with universal joint grease (extreme pressure) and assemble joint in reverse order of disassembly.

BALL AND TRUNNION TYPE

2. SERVICING BALL AND TRUNNION TYPE UNIVERSAL JOINT

To disassemble universal joint for repair or inspection of all component parts, refer to Fig. 2 and proceed as follows: Remove joint body metal cover and gasket by bending tabs of cover away from body; remove cover and gasket. Slide body down on propeller shaft exposing two centering buttons. Remove centering buttons and spring washers from ends of trunnion pins. Slide two balls, rollers, and thrust washers off trunnion pin. Wash all parts with solvent and blow dry with compressed air. Inspect and replace worn parts.

NOTE: Reconditioning of ball and trunnion type universal joints will only be necessary when excessive backlash exists between balls and trunnion. In some instances, it will be found that universal joint body has worn, and it will be necessary to replace all parts, including body pin, thrust washers, and centering buttons. Worn rollers should also be replaced.

3. UNIVERSAL JOINT MAINTENANCE (BALL AND TRUNNION)

The universal joints, propeller shaft, and hand brake drum are accurately balanced during process of manufacture. Care should be exercised to maintain this condition of balance by close adherence to the following: Do not use more than 2½ ounces of lubricant in a universal joint (ball and trunnion type) of the LC-3 and 2 ounces in the LC-1 and 2 at any time. Keep propeller shaft, hand brake drum, flanges, etc. free from undercoating, dirt and ice.

CAUTION

When installing trunnion pin in propeller shaft care should be taken to see that trunnion pin is centered in shaft. Each end of pin should protrude the same distance, with variation of no more than .003 inch. If one side of pin extends more than .003 inch farther than the other, propeller shaft will be out of balance. Tool C-3534 (LC-1 and 2 models), Tool C-3211 on the LC-3, as shown in Figure 3, will facilitate removal, installation, and centering of trunnion pin.

Failure to observe these recommendations may result in an out-of-balance condition causing vibration.

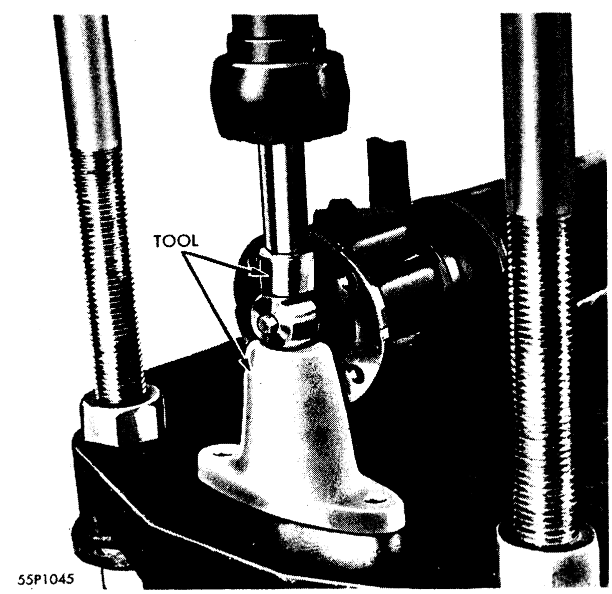


Fig. 3—Installing Joint Pin

4. SERVICING EXTERNAL TYPE UNIVERSAL JOINT DUST COVER

To replace an external type universal joint dust cover (Fig. 4) that is damaged, remove propeller shaft assembly from car and clamp lightly in vise. One end of shaft should be resting on bench in a horizontal position, disassemble joint, removing all parts except body and pin. Clean body, ball head, and pin, thoroughly.

A complete coating of grease (or suitable rubber lubricant) must be smeared on outside and inside of dust cover, entire surface of ball head, pin, and inside of body. **(It is very important that this instruction be followed.)** Stretch grease-soaked boot or dust cover over pin and ball head, as shown in Figure 5. Work dust cover into body as far as possible.

CAUTION

USE NO TOOLS FOR THIS OPERATION.

With body in position so pin can enter ball channels, pull body sharply over pin, thereby forcing dust cover into body. With one hand, grip end of dust cover, protruding through back end of body. With other hand, pump body back and forth, as shown in Figure 6, until entire dust cover has passed through body. During operation cone may have reversed itself inside dust cover. Pull it out to its normal position.

Insert 2½ ounces of heavy fiber, universal joint grease in joint of LC-3 (2 ounces in the LC-1 and 2) and assemble balls to pin. Install cover.

Install shaft, using new lockwashers. Be sure to double check flange bolts for tightness, to insure against grease leakage. Recheck after 1,000 miles of operation.

CAUTION

Never attempt to use a needle-like arrangement for forcing lubricant into boot (or dust cover) on universal joints. Excessive grease can be forced into boot and cause shaft to be thrown out of balance, burst boot, or lubricant can be lost through injection hole during high speed operation. The joints must be disassembled and packed with universal joint grease.

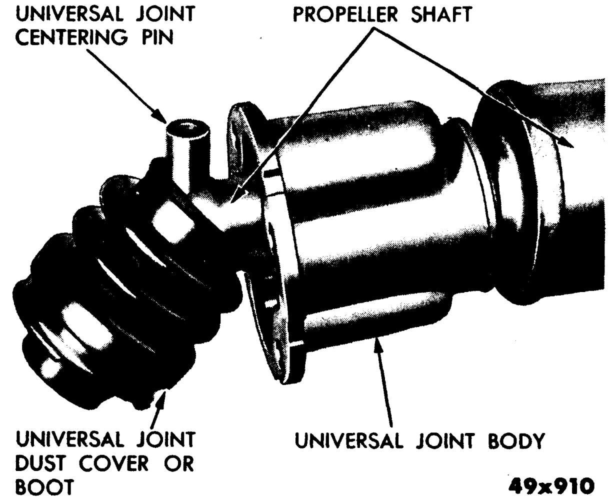


Fig. 5—Sliding Cover Over Ball Head and Fin

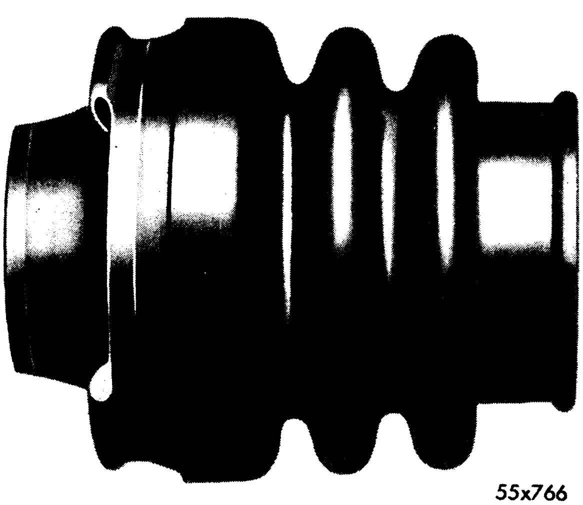


Fig. 4—External Type Dust Cover

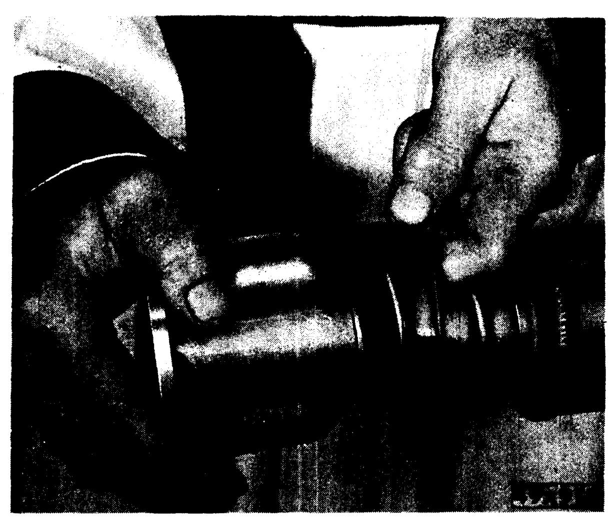


Fig. 6—Working Dust Cover Through Body

CROSS AND YOKE TYPE PROPELLER SHAFT

5. SERVICING CROSS AND YOKE TYPE PROPELLER SHAFT (Fig. 7) (Imperial Models)

a. Removal

Remove nuts, lockwashers and bolts holding universal joint and propeller shaft to differential and transmission companion flanges and center bearing to frame crossmember. Remove propeller shaft assembly.

b. Disassembly

Place assembly in bench vise and remove splined yoke cross bushing retainers. Press out bushings and remove cross from yoke. Remove bearing blocks, dust seals, and dust seal retainers. Remove retainers from cross roller bearings. Press out bearings and cross. Remove dust seals and retainers from cross. The cross roller bearing block and its component parts, also form an assembly. These parts are **not** serviced separately. After disassembly, clean and inspect parts and replace those worn or damaged as necessary.

c. Assembly

Lubricate all parts before assembling. If splined joint at rear of front propeller shaft has been disassembled, fill cavity with one ounce (by weight) of MS 1124. The center bearing is a sealed bearing and does not require lubrication. Install dust shields and retainers on cross. Press cross roller bearing and bushing assembly into yoke with cross in proper location.

CAUTION

Make certain that all of roller bearings are correctly placed in roller bushing. Also, be sure balance arrows are in alignment (Fig. 7).

d. Installation

Place propeller shaft in its correct position under car. Make certain that slip-spline end of shaft is located toward front of car. Insert attaching screws and tighten securely.

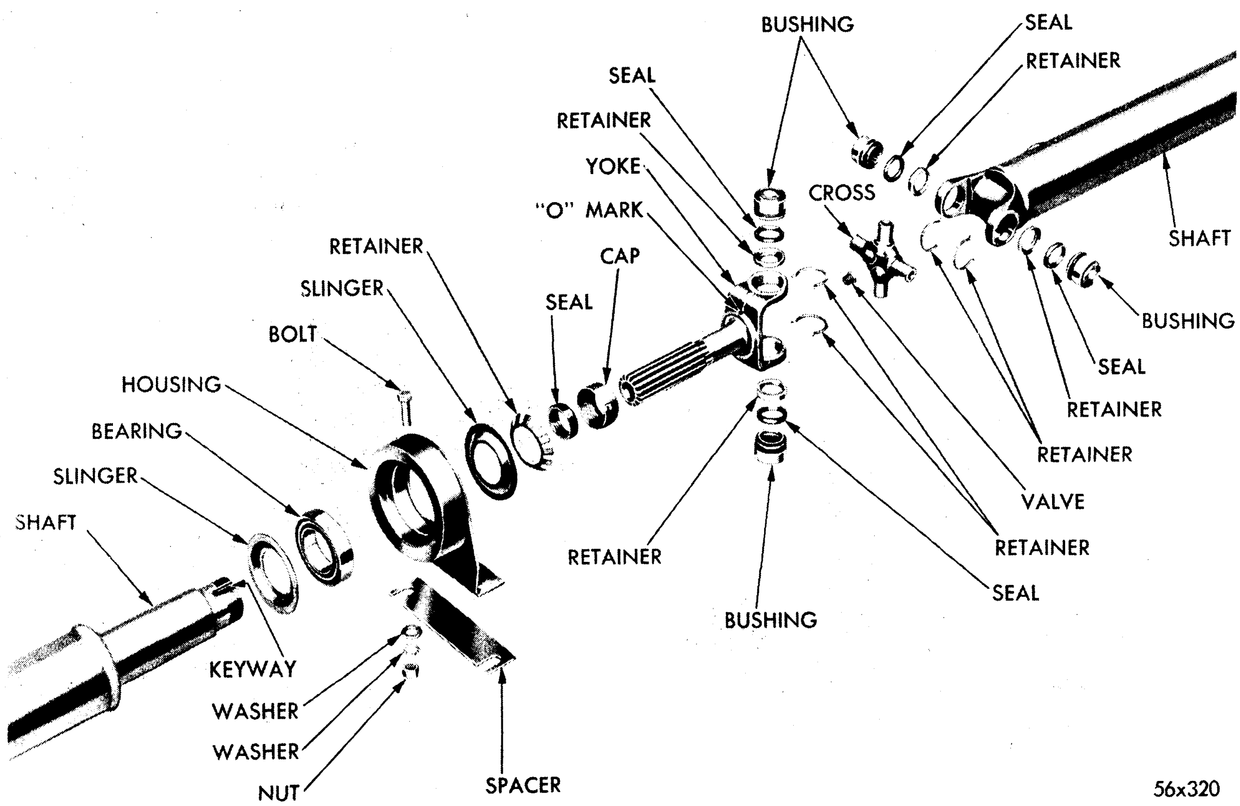


Fig. 7—Propeller Shaft and Center Bearing Assembly (Disassembled View)

6. SERVICING PROPELLER SHAFT CENTER BEARING (Figure 7)

The center bearing and housing must be removed as a unit, together with front propeller shaft, for servicing.

CAUTION

Do not extend two piece center bearing propeller shaft to its full length. The seal may be damaged by the splines on universal joint yoke.

With yoke all the way into front propeller shaft, bend up tang on dust seal cover. Remove cover, seal, lock and dust slinger and remove center bearing assembly. Inspect bearing, bracket, seal. Replace necessary parts and reassemble.

REAR AXLE CONTROL STRUT

The 1958 Imperials are designed with two propeller shafts and a propeller shaft center bearing, as shown in Fig. 8. Conditions may arise under certain passenger loads which may create a propeller shaft shudder or vibration at speeds of 15 to 20 miles per hour.

In order to control this shudder or vibration, a rear axle control strut, as shown in Figure 9, has been incorporated in rear axle design for purpose of controlling rise of nose of rear axle carrier under varying load conditions. Corrections of propeller shaft shudder should be made as follows: Before diagnosing a shudder condition, make sure engine has been tuned and is operating smoothly with no hesitation or stumble on accelerator.

NOTE: A rough engine can aggravate or produce a shudder.

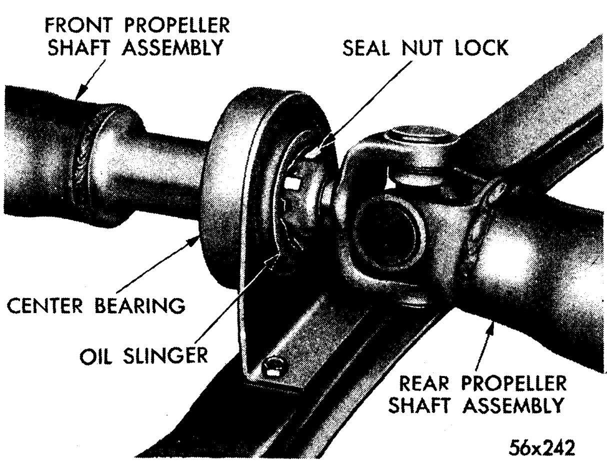


Fig. 8—Center Bearing Installed

With fuel tank approximately $\frac{3}{4}$ full, determine under what speed and passenger load a shudder is present and if shudder is light, moderate or heavy. Check the indexing of universal joints and propeller shaft assembly, as shown in Figure 7. The letter "O" on front

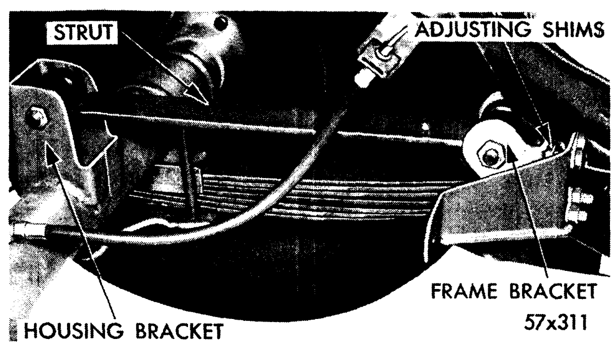


Fig. 9—Rear Axle Control Strut

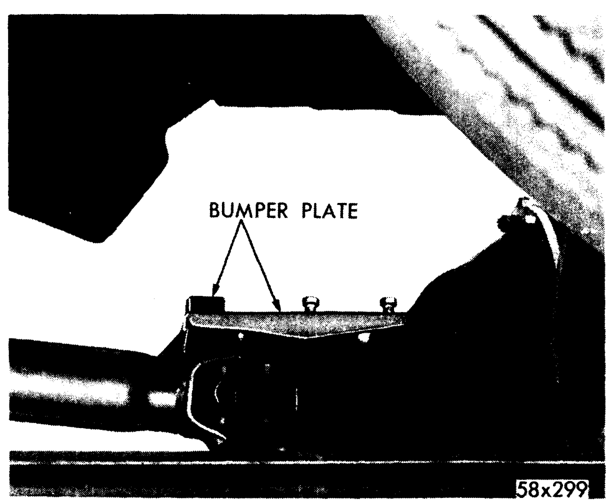


Fig. 10—Differential Carrier Bumper Plate

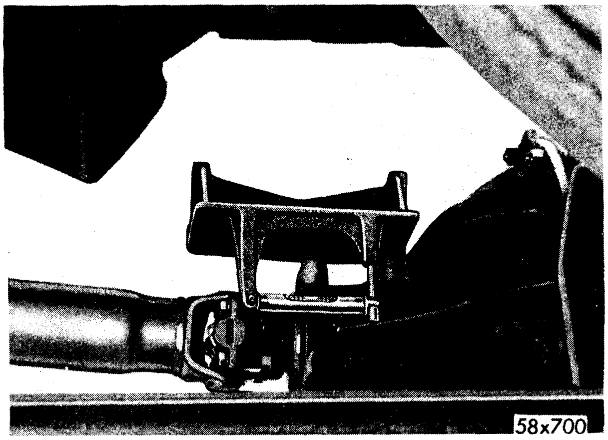


Fig. 11—Indexing Gauge Installed

face of spline should be lined up with key slot at rear of front shaft.

Place car on platform with weight of vehicle on rear wheels. With fuel tank between ¾ and full and weight of vehicle on wheels, remove differential carrier rebound bumper plate, Figure 10.

Working from the left side of car, place and index the aligning gauge Tool J-6845 on the machine pads of the differential carrier, as shown in Figure 11.

Adjust bubble of gauge to show zero or level position. With zero remaining in the level position, remove gauge from differential housing and install gauge along the underside of rear propeller shaft as shown in Figure 12.

With gauge properly located under shaft (with level readable from the left side of shaft, Fig. 12), note the location of the leading edge of bubble in level gauge; if bubble is still at zero or level position or within three graduation marks fore or aft, rear axle joint angle is within specifications and should be considered standard adjustment.

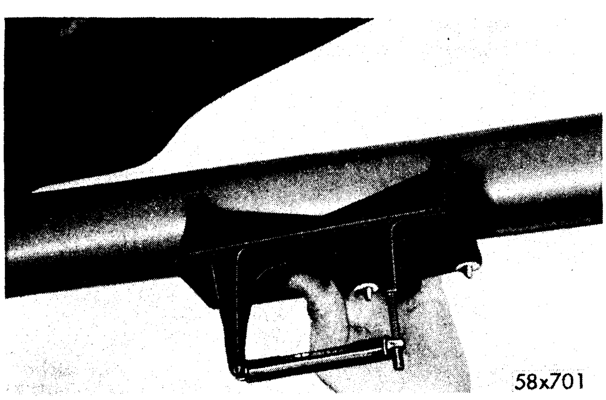


Fig. 12—Indexing Gauge Under Shaft

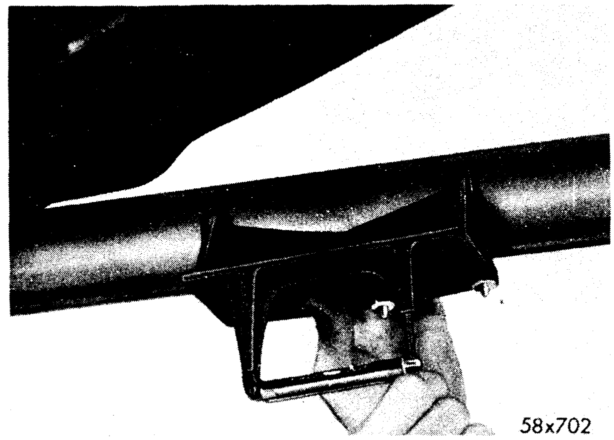


Fig. 13—Checking Propeller-Shaft Angle

If leading edge of bubble is forward of the third graduation, the propeller shaft angle should be corrected by placing a 2 degree tapered shim between the rear axle housing pads and both rear springs with the thick end of shim towards the front of car.

NOTE: To install shim the rear spring "U" bolts should be loosened just enough to allow for installation of tapered shim without misalignment of spring center bolt and housing pad.

To allow the differential carrier to reposition itself or assume the new angularity after installation of tapered shims between housing pad and rear spring, the control strut frame

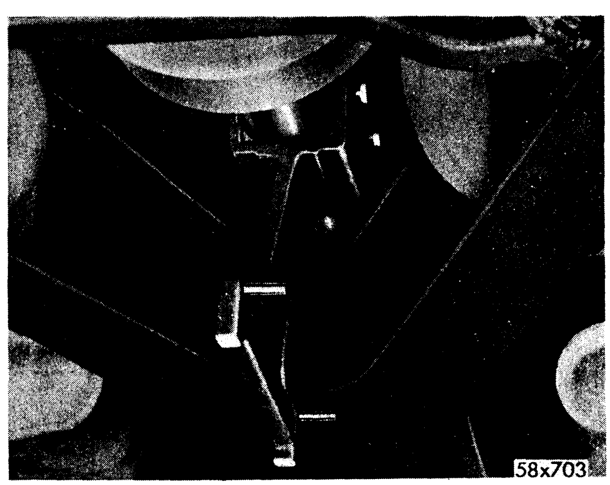


Fig. 14—Gauge Adapter Installed

to bracket bolts should be loosened to unload the strut.

Reshim strut bracket after installing tapered shim between rear axle housing pads and rear spring.

To check the center propeller shaft angle, refer to Figure 13 and proceed as follows:

Index the aligning gauge squarely under the rear propeller shaft and reset level to zero (Fig. 14).

Install front propeller shaft adapter on front shaft with pins of adapter pointing towards the left of car, (Fig. 14). Locate gauge to adapter on front shaft making sure that locating pins are placed squarely on adapter and gauge, (Fig. 15).

Note the location of leading edge of bubble in level. For each graduation the leading edge of bubble is forward of the center, (Figure 16) add a shim beneath the center bearing support bracket.

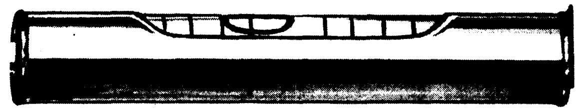
For each graduation the trailing edge of the bubble is to the rear of center in level, (Fig. 17) subtract or remove one shim from beneath center bearing support bracket.

NOTE: Always recheck center joint working angle, after shimming center joint working angle.

To check propeller shaft alignment with protractor proceed as follows:

Measure rear universal joint working angle. This angle should be 1 to 3 degrees at zero

Fig. 15—Indexing Gauge to Adapter



ADD SHIMS

58x705

Fig. 16—Bubble Location (Forward of Center)

passenger load. Reasonable care must be exercised to obtain accuracy of this measurement.

NOTE: If car is located on a hoist that supports rear of car on axle housing, the angle of the universal joints will be influenced.

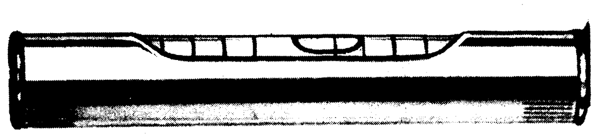
If measured angle is not 1 to 3 degrees, correction should be made by shimming axle with 2° taper shim. After rear universal joint angle has been adjusted as near to two degrees as possible, measure middle universal joint working angle. This working angle should be 1¼ degrees (more or less) with the apex upward, for rear universal joint angle of two degrees at zero passenger load.

For other angles, see table below:

TABLE

Rear Joint	Middle Joint
1	1½°
1½	1½°
2	1¼°
2½	1¼°
3	1°
3½	1°

The middle universal joint angle is adjusted by adding or removing shims between center



SUBTRACT SHIMS

58x706

Fig. 17—Bubble Location (Rear of Center)

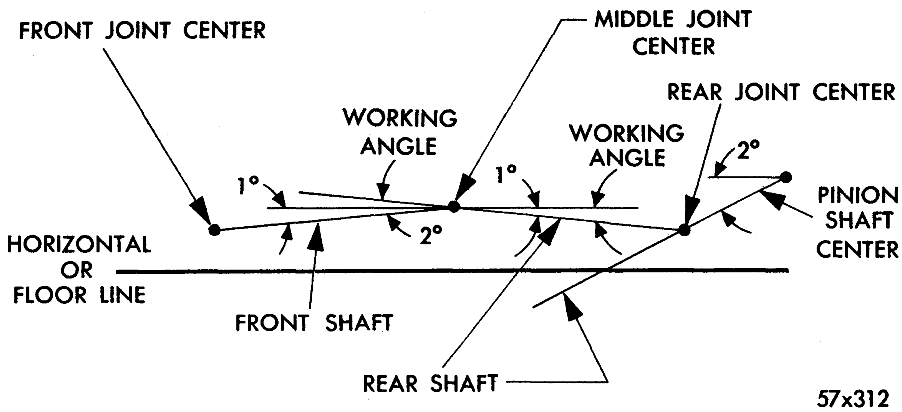


Fig. 18—Determining Working Angles—Front and Rear Propeller Shaft

bearing insulator and crossmember. Adding ⅛ inch shim will increase middle universal joint angle about ½ degrees; likewise, removing ⅛ inch shim will reduce angle about ½ degree.

In measuring the angles of front and rear propeller shafts and the pinion shaft, a spirit level protractor must be used to determine amount the shafts are below horizontal (or the end of the shaft is pointing down). Determine working angles, as shown in Figure 18.

Since adjacent shafts are pointing in different directions (up or down) when viewed in same direction (from front to rear of car) the working angles are obtained by adding the angles below horizontal. Therefore, the middle joint working angle as shown in Figure 18, is 2° and the rear joint working angle is 3°. If the adjacent shafts were pointing in the same direction then the angles below horizontal would be subtracted to obtain the joint working angle.

Fig. 20—Checking Rear Propeller Shaft Angles

If large number of shims must be added or removed at center bearing, rear universal joint angle should be rechecked to be assured that it has not been appreciably altered from two degrees.

When these adjustments have been made, the least amount of propeller shaft shudder should occur at a loading of two passengers. If, after road testing, it is desirable to obtain the least amount of propeller shaft shudder at large pas-

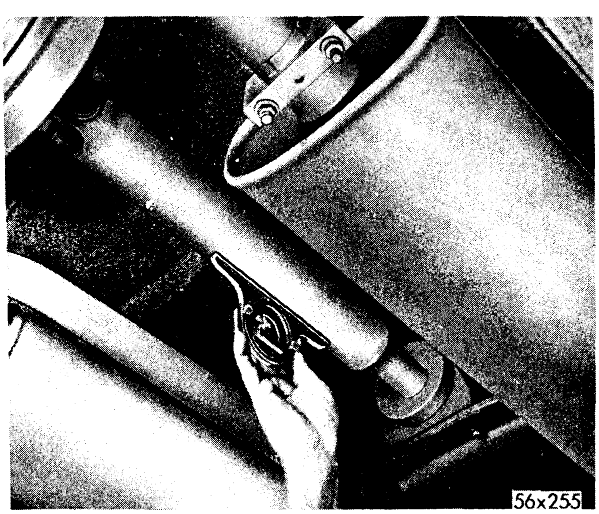


Fig. 19—Checking Front Propeller Shaft Angles

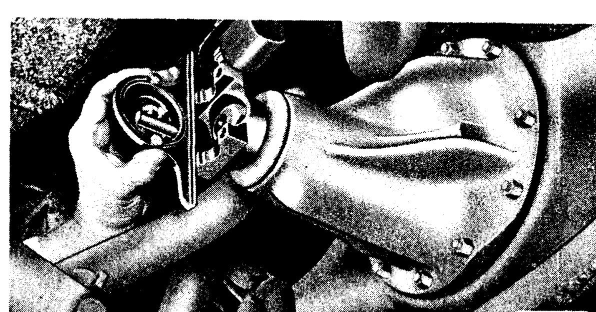


Fig. 21—Checking Companion Flange Angle

senger loading, center bearing must be raised slightly by means of shimming. Lowering center bearing will move point of least shudder to a lower passenger loading.

7. CHECKING PROPELLER SHAFT ANGLES

Locate car over pit with wheels supporting car. Check universal joint angles with a spirit level protractor, as shown in Figures 19 and 20. Measure angles of front propeller shaft, middle propeller shaft, and rear axle pinion drive shaft flange.

The rear axle drive pinion shaft flange angle should be obtained by removal of rear end of rear propeller shaft, and measuring angle of front face of companion flange, as shown in Figure 21.

SERVICE DIAGNOSIS

8. PROPELLER SHAFT VIBRATES

a. If propeller shaft, drum and flange are not shielded while car is being undercoated, the undercoating material may accumulate on underside of propeller shaft and cause vibration. To remedy such a condition, inspect shaft and remove undercoating material (if present) with solvent.

b. Check transmission flange nuts and rear axle differential flange nuts for looseness. Tighten to Data and Specifications.

c. Check alignment of balance arrows on both shaft and front universal joint. These arrows must be exactly in line. If not, reposition splines so that arrows are properly aligned.

9. UNIVERSAL JOINTS NOISY

a. Check universal joint for possible damage and tighten propeller shaft flange bolts to Data and Specifications.

b. Disassemble universal joints and inspect all parts for wear or damage. Replace parts as required, pack bearings with universal joint grease and reassemble.

c. Inspect universal joint bearings for wear and replace as necessary.

d. Check for flange runout. In many instances, it is possible to correct a flange runout condition by repositioning universal joint 180 degrees with companion flange. Reposition only one universal joint at a time and road test car after each repositioning operation.

e. Check splines. If excessively loose, inspect splines on shaft or in flange for wear or damage. Replace shaft or flange, as necessary, to correct condition.

Section XIII

WHEELS AND TIRES

CONTENTS

DATA AND SPECIFICATIONS

MODELS	LC-1	LC-2	LC-3	LY-1
WHEELS				
Type	Steel Disc			
Rim	Drop Center—Safety Wheel			
Size	14 x 5½	14 x 6	14 x 6½	14 x 7
Flange Type	K	K	K	L
No. of Nuts to Attach Wheel	5	5	5	5
Stud Hole Circle (diameter)	4½	4½	4½	5½
Stud Size	½-20	½-20	½-20	9/16-18

DATA AND SPECIFICATIONS (Cont'd)

MODELS	LC-1	LC-2	LC-3	LY-1
TIRES				
Type	Super Soft Cushion Tubeless			
Cord Material	Rayon	Rayon	Rayon	Rayon
Size	8.00 x 14	8.50 x 14	9.00 x 14	9.50 x 14
TIRE PRESSURE				
Pounds—Cold—Front	24	22	22	22
Rear	22	22	22	22

TOWN AND COUNTRY WAGON

	Two Seater	Three Seater	Two Seater	Three Seater
	LC-1	LC-1	LC-3	LC-3
WHEELS				
Type	Steel Disc			
Rim	Drop Center—Safety Wheel			
Size	14 x 6	14 x 6½	14 x 6½	14 x 6½
Flange Type	K	K	K	K
No. of Nuts to Attach Wheel	5	5	5	5
Stud Hole Circle (diameter)	4½	4½	4½	4½
Stud Size	½-20	½-20	½-20	½-20
TIRES				
Type	Super Soft Cushion Tubeless	Captive Air	Super Soft Cushion Tubeless	Captive Air
Cord Material	Rayon	Nylon	Rayon	Nylon
Size	8.50 x 14	8.50 x 14	9.00 x 14	9.00 x 14
TIRE PRESSURE				
Pounds—Cold—Front	24	24	22	22
Rear	24*	24*	22*	22*

*28 lbs. when carrying heavy load on rear only.

Section XIII
WHEELS AND TIRES
WHEELS

1. SAFETY RIM WHEELS

The wheel rim incorporates a special safety feature to give added protection in case of a blowout or rapid deflation of the tire while the car is in motion. It is a raised section between the rim flange and the rim well, as shown in "A" of Figure 1. Inflation of the tire snaps the tire bead over this raised section and out against the flange. The force required to pull the bead back over this raised portion tends to keep the tire out against the flange even though rapid deflation occurs.

2. TIGHTENING WHEEL HUB NUTS

Tighten wheel hub nuts evenly while tire is off ground. Lower tire to ground to tighten nuts securely. **Make sure these nuts are tight.**

3. CHECKING WHEELS FOR ECCENTRICITY

Dismount tire and test with wheel mounted on brake drum. Position dial indicator on firm surface to prevent deflection. With the anvil of indicator bearing on the inner tire bead surface of wheel, as shown in Figure 2 slowly rotate wheel and note the total runout. Mark high and low spots and the amount on wheel. If radial runout of wheel exceeds .045 inch, replace the wheel.

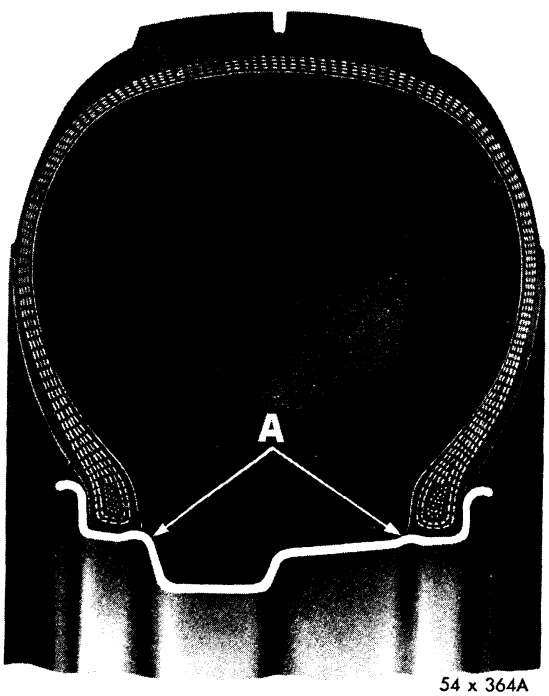
NOTE: Do not check runout on outside of wheel rim since this method can easily give a false reading.

4. CHECKING WHEEL FOR WOBBLE (LATERAL RUNOUT)

Before checking a wheel or wobble (lateral runout), make sure tire is properly mounted. Mount a dial indicator on firm base, with anvil of indicator resting against the flange of wheel. Rotate the wheel. If lateral runout is more than 1/8 inch. (.125), straighten or replace wheel.

5. BALANCING WHEEL AND TIRE ASSEMBLIES

Proper balance of wheel and tire assemblies promotes smooth steering action and is a safeguard against vibration and front end shake. To check front wheels for balance, place jack under center of front of car and raise both



54 x 364A

Fig. 1—Safety Type Rim

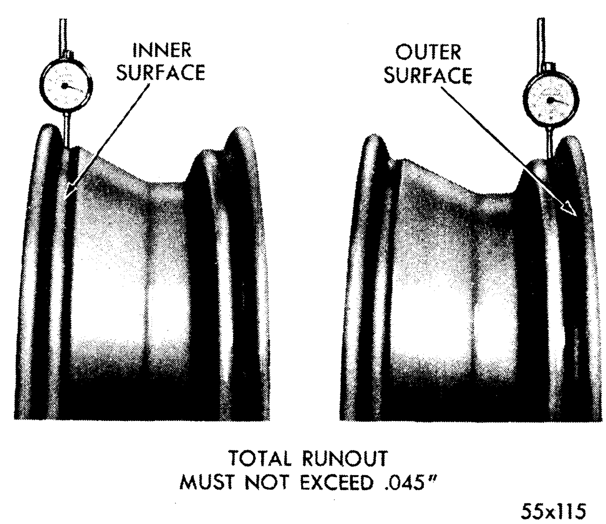


Fig. 2—If Radial Runout Exceeds .045 inch, replace Wheel

front wheels off floor. **Do not place jack under lower control arms as this will tend to minimize vibration.**

NOTE: Remove caked mud or tar from wheel so that balance condition will not be affected.

Using a spinner, rotate the wheel at a higher rate of speed than that encountered in actual highway driving. Place crumpled cloth or towel on front fender above center of wheel. Rotate the wheel up to high speeds. The wheel will vibrate profusely, if it is out of balance. If wheel is in balance, there will be no vibration at any speed.

If wheel is out of balance, mount it on master drum of wheel balancer to determine the proper location and amount of weight needed, or use wheel balancing equipment which checks balance with wheel on car. With this type of equipment, the balancing mechanism is clamped to the wheel assembly. When location and size of weights needed to balance wheel are determined, divide the amount and attach half of weight to inner rim and the other half to the outer rim of wheel.

To check balance of rear wheels, place jack under frame side rail about 12 inches forward of rear spring front hanger. Raise one wheel off the floor at a time. Block the other wheel. Place a crumpled cloth or towel on fender above wheel. With the engine running and transmission in direct drive, spin the wheels through speed ranges of 20, 30 and 40 miles per hour. **Do not exceed 40 miles per hour on the speedometer.**

The balance is correct if the cloth or towel does not vibrate. If wheel and tire assembly is out of balance, check with wheel balancing equipment and attach weights as needed.

TIRES

6. TUBELESS TIRES

The Tubeless Tires provide longer life and added protection against blowouts and punctures. A puncture can be repaired by using the repair plugs and other materials in the Tubeless Tire Repair Kit. Refer to Paragraph 10, for puncture repair procedures.

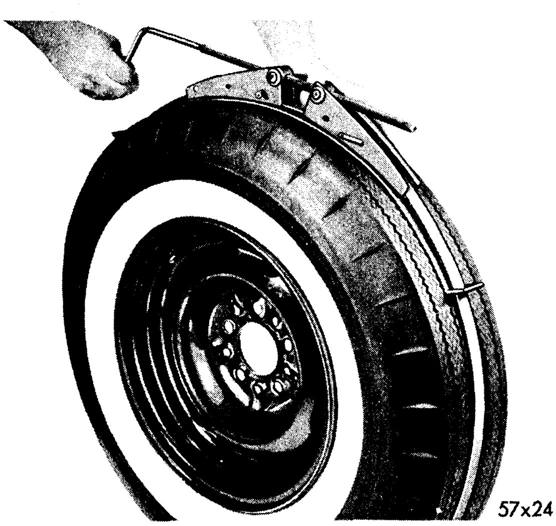


Fig. 3—Constricting Centerline of Tire with Mechanical Tool

7. DISMOUNTING TIRES

Remove tire and wheel. Deflate tire. **When dismounting, do not use hammer or tire irons to loosen sealing bead from flange.**

8. MOUNTING TIRES

Clean rim flanges and bead seats with wire

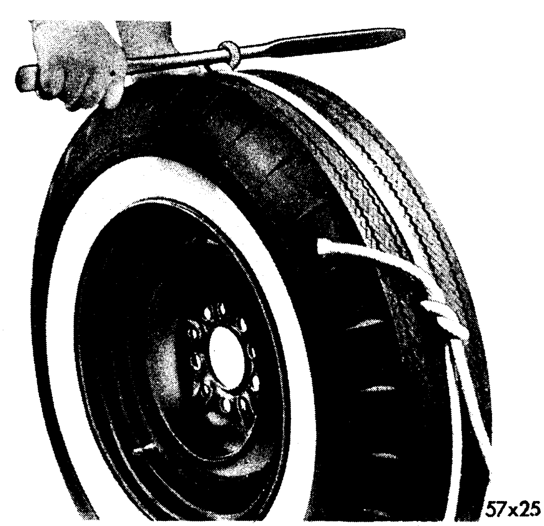


Fig. 4—Constricting Centerline of Tire with Rope Tourniquet

brush or steel wool. Install valve stem from inside the rim. The rubber stems snap into valve stem hole.

Apply MOPAR Ruglyde (or mixture of 12 parts water and one part liquid soap) to the tire beads to facilitate mounting. Mount the inside and outside in the usual manner. **Make sure the tire irons do not have sharp or burred edges and work with care to avoid damaging the tire beads.**

Apply a blast of air, after tire is mounted on rim. If beads do not seat sufficiently to hold the pressure, spread by constricting the centerline of tread with a tire mounting band, as shown in Figures 3 and 4 or a rope tourniquet. To make a tourniquet around the tires use one or more turns of rope. Tighten by twisting rope with tire tool, and pound on tread at various places to evenly distribute the tension.

When the tire beads seat, remove the mounting band or rope tourniquet.

CAUTION

Release tension on mounting band or rope tourniquet when inflation takes effect and before pressure begins to build up.

Install valve core and inflate tire to recommended pressure. Test tire and wheel assembly for leakage, in Paragraph 9.

9. TESTING THE TIRE AND WHEEL ASSEMBLY FOR LEAKAGE

When testing for leakage, do not remove tire from rim. Examine tire carefully for puncturing object. If tire is flat, inflate and listen for first air leak. If air leakage is slow and cannot be heard, remove tire from car and submerge in water test tank.

Apply a soap solution, if test tank is not available, covering surface of tire, the valve stem, and the juncture of tire and rim flange. A slow leak will be indicated by an accumulation of soap bubbles.

10. REPAIRING PUNCTURES

a. Tire on Wheel (Outside Method)

Simple punctures can usually be repaired with tire mounted on wheel, using items in repair kit, (Fig. 5). The operation can best be performed when tire is flat. It can also be accomplished while tire is inflated.

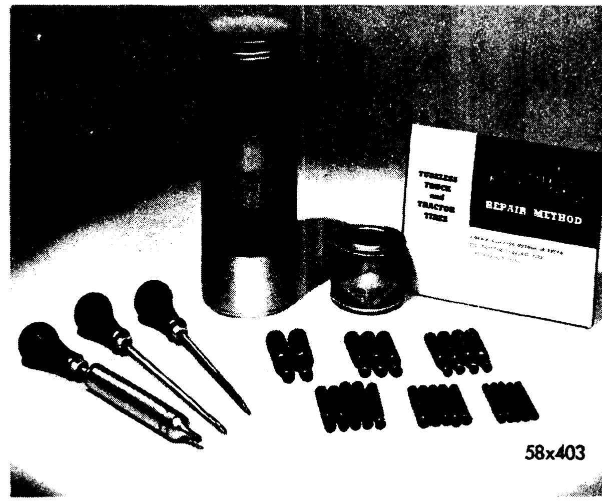


Fig. 5—Tire Repair Kit

Remove the puncturing object. Dip needle inserting tool in the cement provided in repair kit, and carefully probe in hole to determine its direction. After direction of hole is determined, continue to probe until the rubber around the hole is well covered with cement, as shown in Figure 6.

CAUTION

If the needle appears to be blocked, do not force it into hole as otherwise, an additional hole may be made, and two holes will be difficult to seal. Twist and turn needle to find the hole, if needle does not insert freely.

Select a repair plug according to size of hole. The repair plug should have a diameter about twice the size of hole, because soft rubber will stretch when inserted with needle. Roll small end of repair plug into "eye" of needle, $3/8$ inch

Fig. 6—Lubricating Puncture with Cement

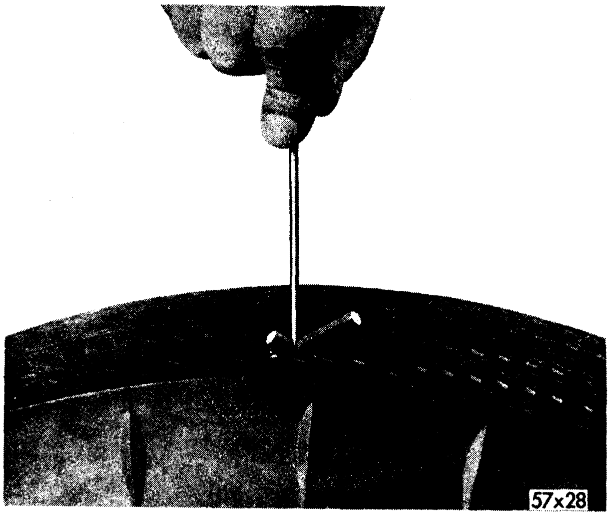


Fig. 7—Inserting Needle and Plug in Puncture

from end of the plug, as shown in Figure 7.

Dip repair plug and needle into cement, and immediately insert in hole with a firm, steady motion, until short end of repair plug snaps through tire, as shown in Figure 8. Pull needle straight out of hole. The plug will automatically unhook from the needle as this is done. Trim plug about $\frac{1}{8}$ inch above tread of tire. Inflate tire, check for leakage, and tire is ready for use.

The portion of plug, which protrudes slightly above the tire tread, will wear down to the tread surface. The portion of the plug inside the tire will not affect normal operation.

b. Tire Off Wheel (Inside Method)

When the tire has been punctured by an irregularly-shaped object, a slow leak may occur at the repair after an attempt has been made to seal the opening with a repair plug. If such is the case, repair as follows: Place tire in a spreader. Trim the inside end of repair plug flush with the liner, and buff the liner approximately one inch around the puncture. Leave the repair plug in hole to keep moisture out of the tire fabric. If a repair plug is not in tire, work a little extra repair gum into the hole before applying the patch. It is not necessary to use cement to obtain a good adhesion.

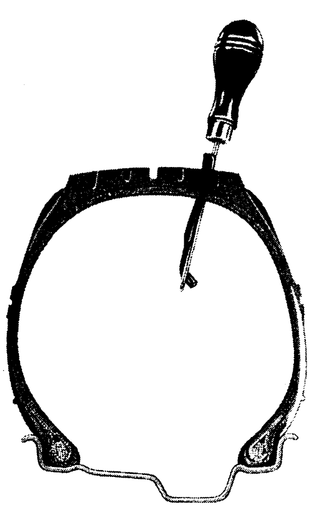


Fig. 8—Plug and Needle in Puncture (Sectional View)

Two types of equipment are available for curing inside patches—the Electric and the Match Patch. The Electric type has a "fuse" plug that automatically cuts off the power when the curing is completed. The Match Patch, or powder burning type, depends upon the heat resulting from a slow fire. "C" clamps are used with both types of equipment to apply pressure during the curing process. **All inside patches used must be Hot Patches.** Peel the strip from the rubber patch on the metal curing plate and center it over puncture. Follow instructions provided with the equipment, apply pressure, and cure the patch.

11. CLEANING WHITE SIDEWALL TIRES

CAUTION

A protective, water-soluble coating is applied to the white sidewalls of tires at the factory. Wash the sidewalls with water ONLY to remove this coating. DO NOT USE gasoline or a wire brush.

To clean white sidewall tires, use a good kitchen cleanser and a stiff brush. **Do not use gasoline or any wire, metal, brush, etc. as they will scratch the sidewalls.**

12. RECOMMENDED TIRE PRESSURES

The tires must receive proper care to insure maximum tire life. Under-inflation contributes to wear and causes excessive heat. Over-inflation causes excessive strain and, as a result, the tire is subject to break or bruise. Tire pressure should be checked at least once a week. Consult data and Specifications for correct tire pressures. Tire pressures will increase approximately 3 psi in city driving and 5 psi for country driving. **NEVER BLEED BUILT UP PRESSURE IN A TIRE.**

CAUTION

Alawys use an accurate gauge when checking tire pressure. An inaccurate gauge can be in error as much as 2 or 3 pounds, which is approximately 10 per cent of the recommended tire pressure.

Make sure the valve caps are tight, after checking tire pressure.

13. TIRE ROTATION

Rotating tires at intervals of 3,000 miles is the only known method of controlling certain types of tire wear. Tire life (Fig. 9) can be increased as much as 25 per cent by regularly rotating the tires, including the spare.

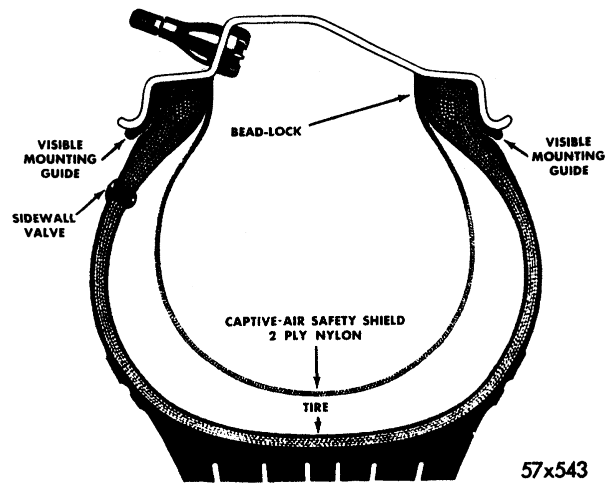


Fig. 10—Captive-Air Safety Tire (Sectional View)

14. CAPTIVE—AIR SAFETY TIRE (Fig. 10)

NOTE: The captive-air safety tire is used on the three seat Town and Country wagon only.

The captive-air safety tire is actually a tire within a tire, forming two air chambers. The inner chamber is known as the shield and the outer chamber the tire. Basically, the shield and tire form two independent air chambers, one enclosing the other. If the outer chamber is collapsed, the inner chamber remains inflated and intact.

IMPORTANT: When outer chamber of tire is deflated, it is recommended that continued driving speed should not exceed 40 M.P.H. until tire has been repaired.

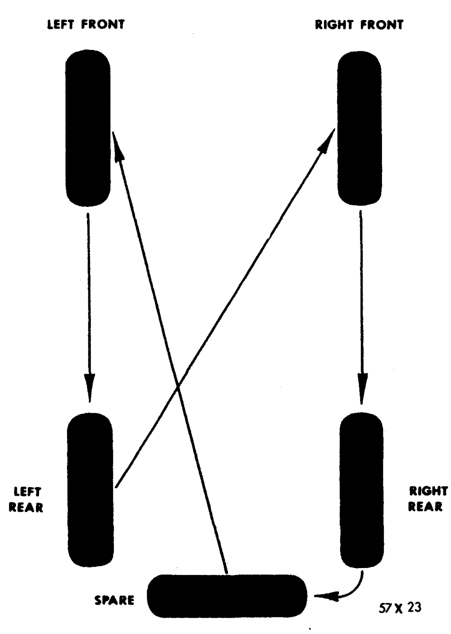


Fig. 9—Tire Rotation

15. RIM PREPARATION

Scrape off all rust flakes and clean rim flanges and bead seats with a wire brush or steel wool.

To prevent leakage, badly rusted pitted rims should be heavily coated with vulcanizing cement to fill the rust cavities. Install tubeless tire valve.

16. INSTALLING THE SAFETY SHIELD

With tire flat on the floor, insert the safety shield into tire and set the molded channel shaped edge over the top tire bead. Smooth out wrinkles and distribute uniformly by working and rubbing the bead channels by hand until the shield wing is set firmly and smoothly against the tire bead. Turn the tire over and repeat the same procedure on the second bead.

17. LUBRICATION

Apply a liberal coating of soapy water (made of high grade soap flakes or vegetable oil soap and water to consistency of paste) to the outer bead surfaces (flange and base) of the safety shield and also to the corresponding surface of rim.

CAUTION

Do not use detergents or any substance that might be harmful or injurious to rubber or rim surface. Use care not to let soap get between the tire bead and safety shield.

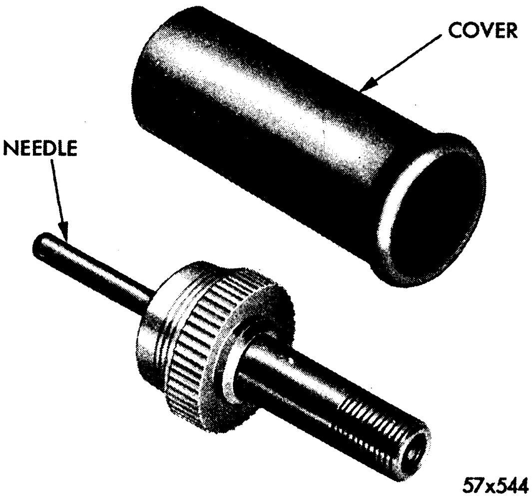


Fig. 11—Captive-Air Safety Tire Inflating Needle

18. MOUNTING THE TIRE

When mounting tire with a tire changing machine, use care to avoid wrinkling, tearing or cutting the flange of the safety shield. Motor driven attachment should not be used.

When mounting with tire irons, work the beads over the rim flange carefully in short sections. Make sure the shield is properly seated on the first bead before starting the second bead over the rim flange. Should the captive-air safety shield slip off either tire bead while mounting, it can be repositioned after the tire bead is in the rim well.

19. INFLATION

IMPORTANT

Insert the inflating needle into tire sidewall valve full length (Figs. 11 and 12).

With valve core in the rim valve, apply air pressure. If the beads do not contact the rim bead ledge sufficiently to catch the pressure, use a bead expanding device as used on tubeless tires.

Inflate the safety shield through rim valve to desired pressure. Inflate outer compartment through sidewall inflating valve to desired pressure. Inflating valve may tilt down toward rim when the safety shield is inflated, in which case air should be introduced with sidewall valve in this tilted position.

Should additional pressure be required to seat tire beads firmly against rim flanges, apply it to the outer compartment and then release to the desired operating pressure through the needle valve in the tire sidewall.

Under this procedure, pressure in the inner compartment will be 2 or 3 pounds above original inflation, which provides a reserve that will filter slowly through the walls of the safety shield to replenish a slight pressure drop in the outer compartment resulting from tire growth during the first few days a new tire is in service.

If tire beads do not seat against the rim flange at 40 lbs. inflation pressure, deflate tire and relubricate safety shield and readjust tire for better centering to remove any binding action that may have taken place.

CAUTION

BECAUSE OF THE DANGER OF BREAKING TIRE BEADS, DO NOT USE MORE THAN 40 LBS. INFLATION PRESSURE FOR SEATING THE TIRE BEADS AGAINST THE RIM FLANGES.

When safety shields are properly mounted and locked on the rim, the mounting guides or small rubber beads on the edges of the shields will be visible and uniform around both sides of the tire at the top edge of the rim flange.

If mounting guides are not visible around both sides of the tire, deflate the tire and loosen the beads from the rim to permit readjustment of the safety shield.

Fig. 12—Inserting Inflating Needle into Sidewall

This condition may be caused by the following:

Insufficient lubrication. Safety shield not distributed uniformly on tire beads. Tire beads started to seat on rim unevenly. Wide tire beads which the safety shield does not fit properly. Excessive amount of rubber on the toe of the tire bead.

NOTE: Excessive rubber on the toe of tire beads may be trimmed off with sharp knife or special bead trimming knife using care to avoid cutting into the fabric in the tire bead.

20. TESTING FOR LEAKS

Test for leaks in same manner as tubeless tires.

NOTE: When tire is submerged in water or treated with soap and water solution, occasionally a small amount of air trapped between the safety shield flanges and the tire beads will escape for a short period while the beads are seating against the rim flanges.

21. PRESSURE CHECK

2 or 3 days after original assembly of the tire on the wheel, pressure checks taken through the rim valve represent the pressure contained in both compartments.

This condition results from slow filtration of air through the walls of the safety shield until the pressure is equalized in both compartments.

22. AIR REPLENISHMENT

Under normal conditions where the air pressure is not more than 4 pounds under the desired operating pressure, replenishment air is added through the rim valve into the safety shield **only.**

In such cases the inner compartment should be inflated to double the amount required to restore the desired operating pressure.

EXAMPLE:

Should the pressure check taken through the rim valve be 18 lbs., and the desired operating pressure is 22 lbs., the inner compartment should be inflated to 26 pounds.

Slow filtration of air through the safety shield in 4 or 5 hours, will result in relieving the inner compartment of the over-inflation strains with return to normal size as the inflation of the two compartments approaches equalization.

In cases where more than 4 lbs. pressure is required to restore desired operating pressures, air replenishment should be made through both rim valve and tire sidewall valve to the desired operating pressure.

Needle valve should always be lubricated with glycerin before insertion. Use the glycerin contained in the padding inside the case in which the valve is supplied. If inflation valve does not insert easily into tire sidewall because of contact with inflated inner chamber, tilt inflating valve slightly toward rim.

23. DISMOUNTING

Remove valve core from rim valve to permit escape of all air from safety shield.

Deflation of the outer compartment will not be required for dismounting after the safety shield has been deflated, for only a few pounds of air pressure will be retained in the outer compartment. Remove tire in same manner as tubeless tires.

NOTE: Use standard head unseating tools (do not use hammer or tire irons) to loosen the tire beads from the bead seats, then apply a liberal coating of soapy water lubricant to the head surfaces of the shield and the outside rim flange.

24. REPAIRING

If tires containing safety shields are punctured by objects (nails, etc.) of considerable length, continued operation with the puncturing object remaining in the tire may result in puncture or damage to the safety shield.

When puncturing objects 1¼ inch or more in length are found in tire, the tire should be dismounted and the safety shield examined for possible damage which would require repair for restoring complete blowout protection.

Punctured safety shields may be repaired by the following procedure:

Trim the ragged edges of the injury so that all corners have a rounded shape. Buff lightly

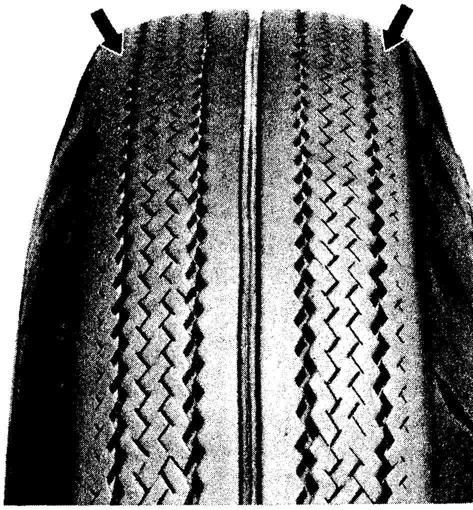

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Fig. 13—Under-Inflation Wear

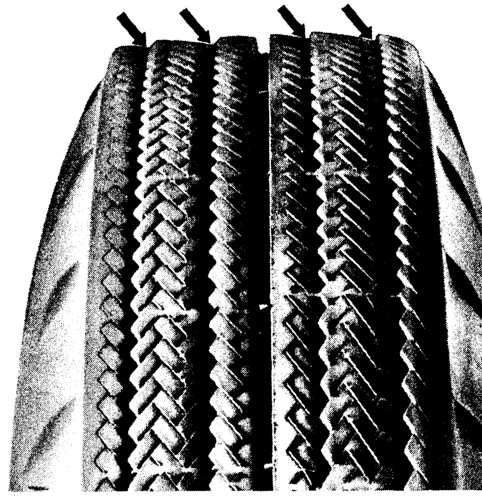
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Fig. 16—Toe-Out Wear

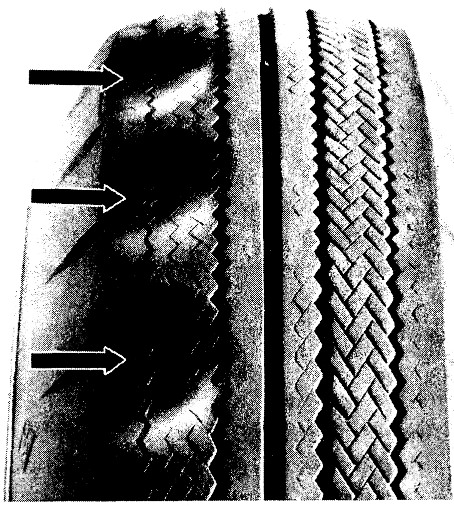
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Fig. 14—Spotty Wear


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Fig. 17—Camber Wear

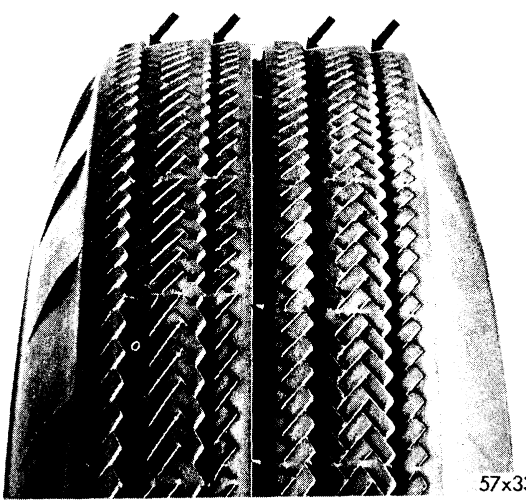
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Fig. 15—Toe-In Wear

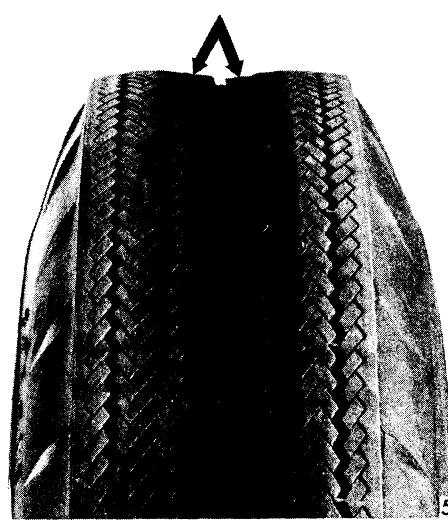
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Fig. 18—Over-Inflation

with hand wire brush or medium grit emery cloth and wash with rubber solvent, 2 inches in all directions from the edges of the injury, on both inside and outside surfaces of the safety shield.

Apply one coat of quick cure vulcanizing cement 1 inch in all directions from the edge of the injury on the inside surface of the safety shield and ½ inch from the edges of the injury on the outside surface. Permit cement to dry 15 to 20 minutes. Then apply a patch of $\frac{1}{16}$ gauge quick cure tube repair gum to the inside surface. Cut gum to extend 1 inch in all directions from the edges of the injury and stitch tightly to the shield.

Apply a patch of $\frac{1}{32}''$ gauge quick cure tube repair gum to the outside surface of the safety shield. Cut gum to extend ½ inch in all directions from the edges of the injury and stitch tightly to the safety shield.

Vulcanizing procedures are similar to those for curing inner tubes. Clamp repaired safety shield onto Holland covered hot plate and cure 8 minutes at 307 degrees F. (60 lbs. steam), with inside of the shield against the hot plate.

Electrically heated or powder burning patches and equipment may also be used for repairing safety shields. Cure patches of the proper size on the inside and outside surface of the safety shield as outlined above, with the heat generation unit against the inside surface of the shield.

25. REPLACEMENT

Used in severe service, captive-air safety shields may, on occasion, be chafed through one or both plies in the areas which cover the base of the tire bead. In such cases, the shield should be removed from service and replaced with a new one.

When captive-air safety shields are removed to replace tire or for tire inspection, etc., inspect the outside surface of the bead channels and safety shield surface for chafing or excessive wear. If no fabric chafing is apparent, safety shields may be reapplied for further use.

SERVICE DIAGNOSIS

26. LEAKAGE CAUSES AND CORRECTIVE METHODS

Valve Leak—This type of leak is usually indicated by bubbles at the valve stem after soap solution is applied at this point. Make sure that the rim is clean around the valve hole. If a "snap-in" type rubber valve leaks, it must be replaced.

Rim Leaks—If the leak is at the top of rim flange (between flange and tire bead, mark location of leak on tire and rim, and dismount tire).

Rusty Rim—Remove rust with scraper and finish the operation with wire brush or steel wool. Apply MOPAR Rubber Cement thickly to tire and rim flange. Mount tire to rim while cement is still wet.

Foreign Material Embedded In Sealing Grooves of Rim—Remove with wire brush or screwdriver blade. Apply MOPAR Rubber Cement thickly to the cleared area, and mount tire while cement is wet.

Bent Flange—Inspect flanges of wheel to determine if they are bent. A bent flange can be straightened if damage is not too severe.

Cracked Welds—Cover weld area with soap solution and check for pin hole leak. If leak is evident, repair or replace wheel as necessary. **(DO NOT WELD RIM.)**

Heavy Rim Weld—A slow leak may result if rim weld has not been dressed down. Use a flat file to smooth off the weld in the flange area. Apply MOPAR Rubber Cement in the area to help "make" the seal.

Cracked Rim—A rim seldom cracks unless it has been welded or badly overloaded. **Do not try to repair a welded rim, install a new wheel.**

27. TIRE THUMP

Tire thump is a pounding action that occurs each time a tire rotates. In most instances, tire thump is evident at speeds under 45 miles per hour on a smooth road, **and is usually restricted to a small speed range.** If the thump is slight and difficult to detect, the condition may be considered acceptable, and tire life will not be affected.

When checking for cause of tire thump, inspect all tires for uneven wear, and make sure the beads of all tires are properly seated in the wheel rims. Inflate all tires to 50 pounds pressure. This will eliminate or reduce thump, if it is due to tire irregularities.

Drive the car on a smooth road. If the thump still occurs while the tires are inflated to 50 pounds, the condition is caused by factors, such as brake drum circle eccentric in relation to center line of axle, wheel retaining bolt circle eccentric in relation to the wheel rim, large patch in tire, or excessive universal joint angularity can cause a condition similar to tire thump or roughness. However, if thump disappears when tires are inflated to 50 pounds pressure, make the following test:

Deflate one tire to 25 pounds and drive car on smooth road. If thump appears, the deflated tire is at fault. Repeat test until all tires, including spare, have been checked. Only one tire at a time should be deflated to 25 pounds pressure for testing. Reinflate the tire already tested before proceeding to the next tire.

NOTE

Sometimes, a thumping tire will operate satisfactorily when changed from one side of the car to the other. This changes the direction of the tire's rotation. In severe cases of tire thump, it may be necessary to replace the tires in question.

28. TIRE WEAR

Inflate tires to proper pressure recommended in Data and Specifications. (Refer to Fig. 13). When tires are under-inflated, excessive wear occurs at the two tread ribs next to the inner and outer shoulder ribs. Wear occurs at center of tread when tire is driven over-inflated.

a. Spotty Wear (Fig. 14) usually becomes evident on front tires when tires are not rotated every 3,000 miles.

b. Excessive toe-in or toe-out (Figs. 15 and 16) of front wheels affects the rate of tire wear more than any other factor.

c. (Refer to Fig. 17). Excessive positive camber will develop noticeable wear on the outer ribs of tires. Excessive negative camber will result in noticeable wear on the inside ribs.

d. Check for wheel wobble. Straighten or replace wheel, if necessary.

e. Check for worn ball joints. Replace as necessary.

f. Check for wear caused by sustained high speed driving, and driving around corners too fast.

g. Check for over-inflation (Fig. 18).

Section XIV

BODY, BODY WIRING AND SHEET METAL

INCLUDING TOWN AND COUNTRY WAGON

CONTENTS

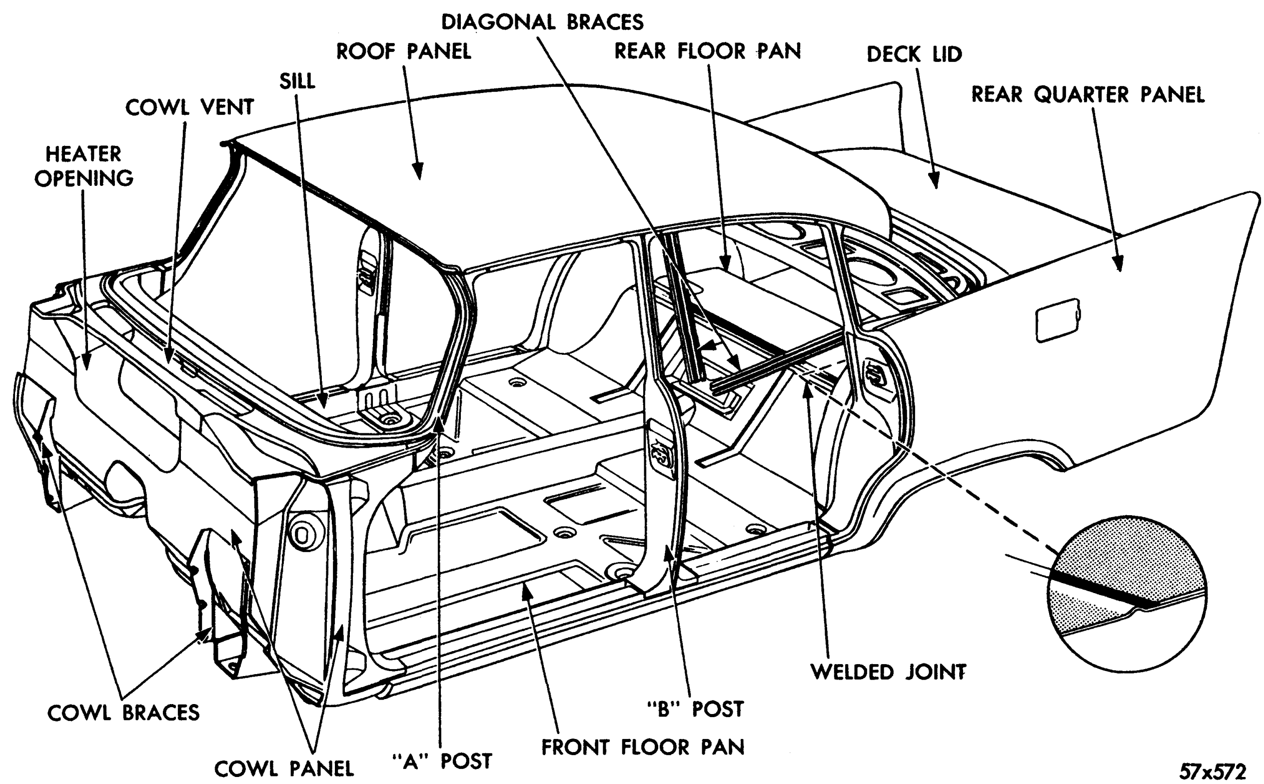

Fig. 1—Basic Body Construction (LC-1, LC-2, LC-3 Models)

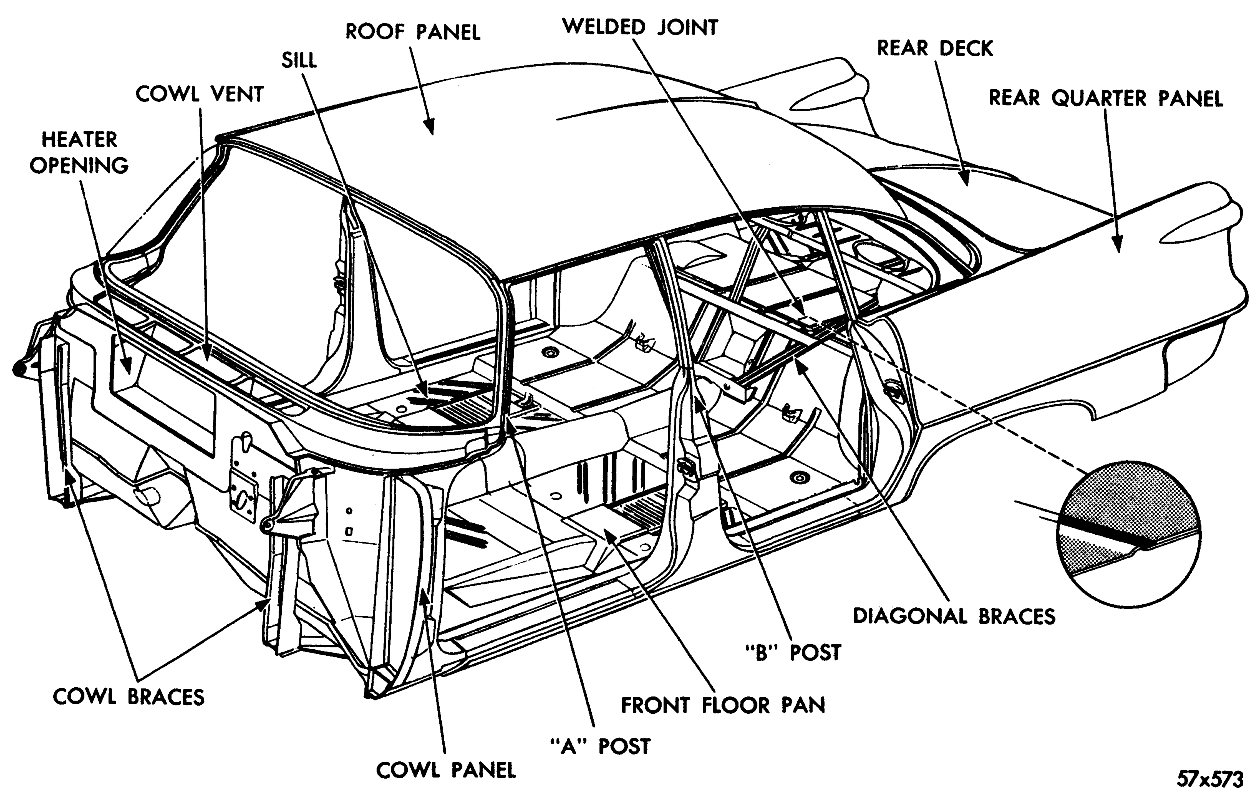

Fig. 2—Basic Body Construction (LY-1 Imperial)

Section XIV

BODY, BODY WIRING AND SHEET METAL

BODY

1. BODY MAINTENANCE

The following structural body features are incorporated in the 1958 Chrysler Model cars: Heavier section center posts for added body rigidity, box section construction roof rails, windshield and rear window headings to impart added strength to upper body superstructure.

Stiffness welded to underside of floor pan to minimize vibration. A metal-to-metal welded lap joint to eliminate dust and water from body. Diagonal braces behind the rear seats with quarter panel welded to floor pan forming a box section structure to increase body rigidity. The new step-down sill construction, life guard door latches and six-way power seat adjustment contributes to body safety, comfort and serviceability. See Figures 1 and 2 for basic body construction of these bodies.

Body bolt inspection and tightening should be performed regularly. All models of the Chrysler and Imperial have 12 body bolts, except the convertible which has 14.

If tightening bolts and screws located on such assemblies as deck lid, doors, hood, radiator support, and front end does not eliminate squeak or rattles, the trouble is probably caused by misalignment; in such cases, follow alignment and adjustment procedures.

Anti-squeak material slipping out of position may also cause squeak and rattles. Relocating and cementing material in position will eliminate this difficulty.

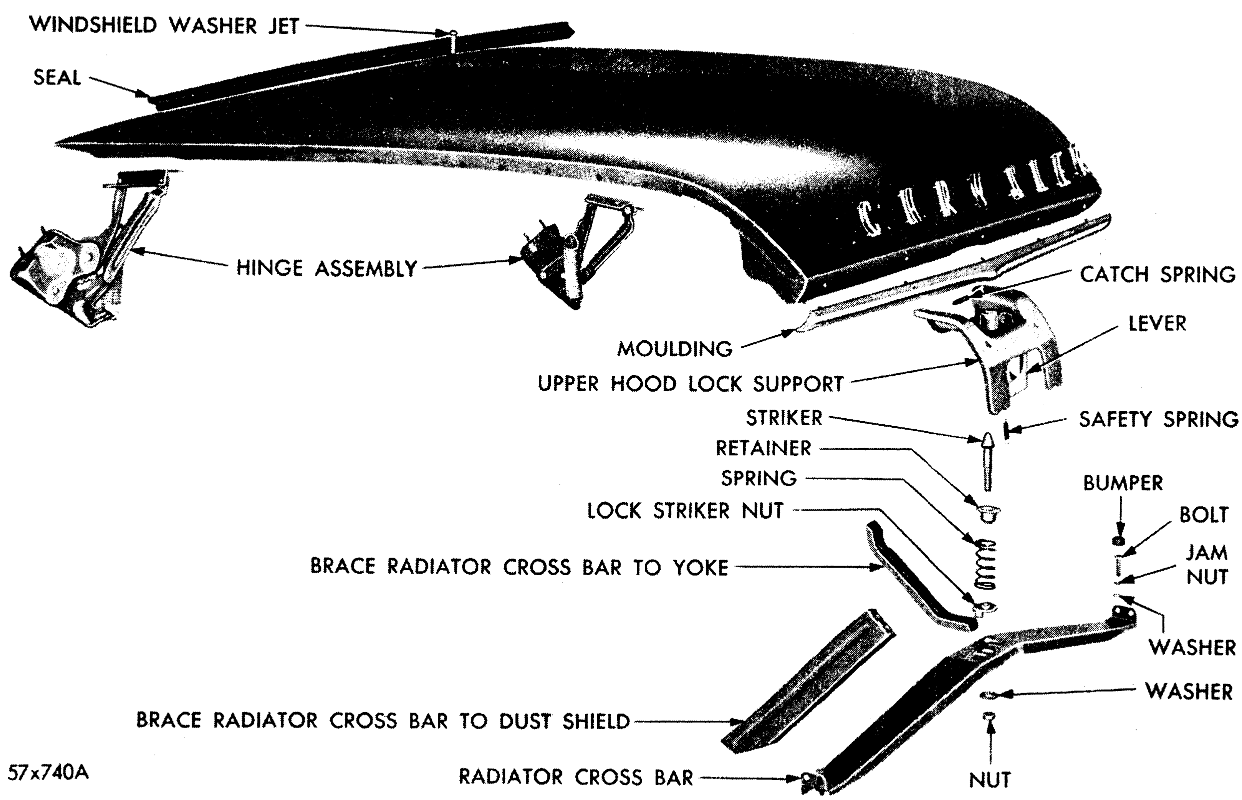

Fig. 3—Hood (Disassembled View) (Chrysler Models)

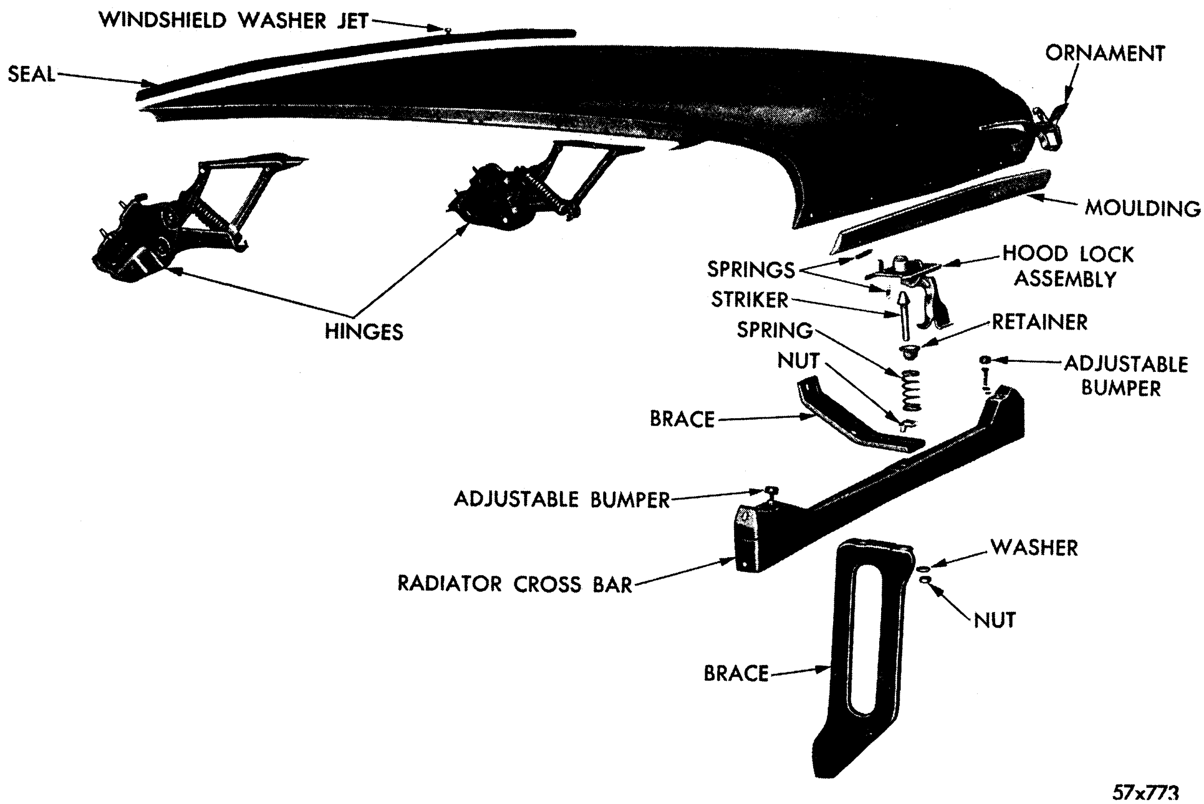

Fig. 4—Hood (Disassembled View) (Imperial)

2. REMOVAL, INSTALLATION, AND ADJUSTMENT OF HOOD

a. Removal

The method of hood attachment is shown in Figures 3 and 4. Raise hood and remove three of four nuts and washers attaching hood to hinge on each side of hood. Mark outline of hinge on hood with chalk to facilitate aligning. Brace hood so that it will not slide to rear, damaging painted surfaces of cowl or fenders. With helper, remove other two attaching nuts and washers and lift hood from car.

b. Installation

When installing, use helper to assist in mounting hood to hinges. Install attaching washers and nuts; align hinges with aligning marks. Tighten nuts a little more than finger tight. Close hood, align and adjust. Seal top of hood hinge bracket to dash panel with sealing putty.

c. Adjustment

Hood Fits Cowl Loosely—If one side of hood is raised at cowl and the other side is low, adjust hood hinges to body. Loosen all fastenings (hinge to body) (Fig. 5), close hood and position within hood opening and then tighten rear fastening of hinges. Open hood and tighten balance of fastenings. Equalizing the hood fit may result in center of hood being higher than cowl surface. If this happens, bend hinge rear

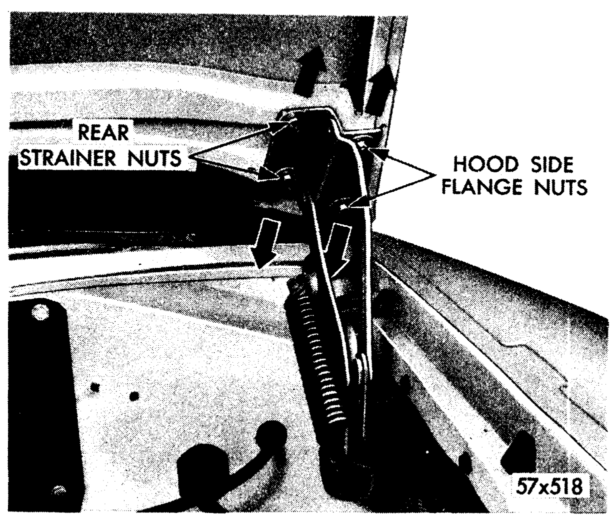

Fig. 5—Hood Attachment

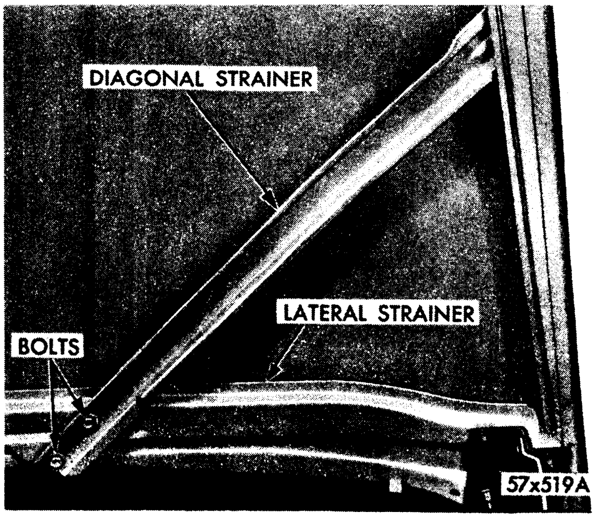

Fig. 6—Diagonal Strainers

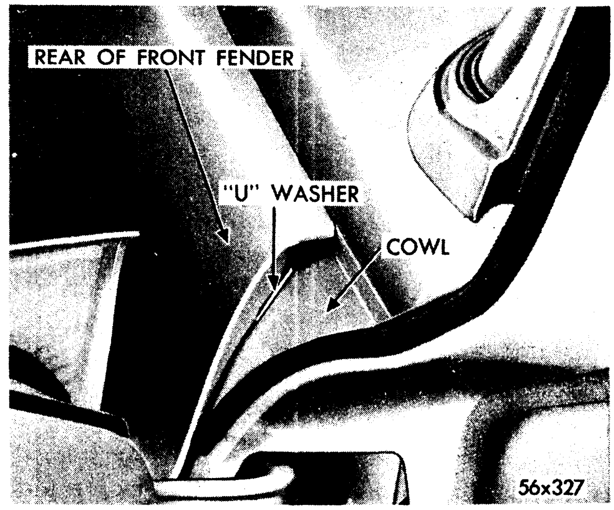

Fig. 8—Shimming Front Fender

strainer (Fig. 6) to obtain correct fit. To bend strainer, place on "S" hook over center strainer. Slide a bar, (Fig. 7) through lower opening of an "S" hook so that end of bar is hooked under cowl. Pry gently on strainer and check hood to cowl fit.

Rear of Fender Lower than Cowl Panel—To raise rear of fender at door-cowl meeting, loosen bolts that attach fender to cowl quarter, raise fender, using jack until correct position has been obtained. Install horseshoe shims between cowl and fender bracket, as shown in Figure 8. Retighten bolts securely.

Hood Does Not Follow Contour of Fender—Insert small block of wood about one inch square between fender flange and hood opposite low spot on hood. Close hood slowly. With hand placed ahead of wood block apply pressure gently to hood. Repeat operation about every six inches until correct hood fit is obtained.

Hood Projects Beyond Front of Fender—This condition can be corrected by shifting fender forward with standard bumper jack with 10½ inch steel plate welded to base, as shown in Figure 9. To correct this condition, loosen bolts holding front fender to cowl side of panel. Place extension end of jack against hinge bracket on side of cowl panel and base of jack against upper section of radiator support, as shown in Figure 9. Extend jack carefully while checking clearance between rear edge of fender and lead-

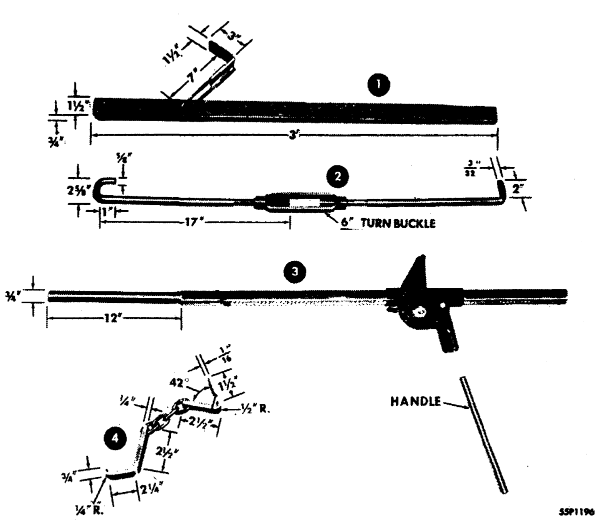

Fig. 7—Body Adjusting Tool

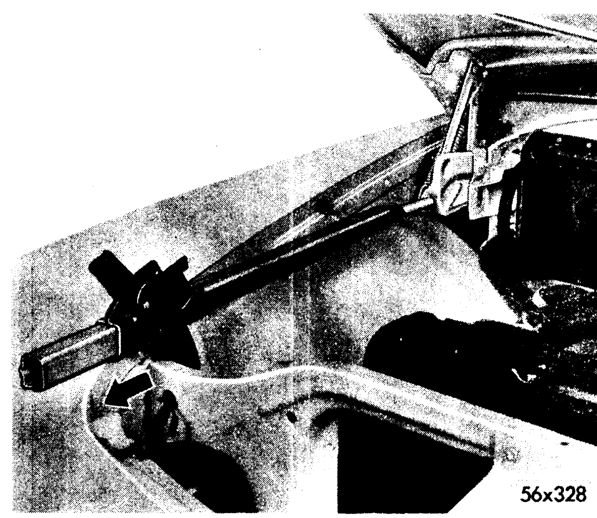

Fig. 9—Moving Fender Forward (Typical)

ing edge of front door. When correct hood to fender fit is obtained, tighten fender to cowl bolts securely. Remove jack.

Front of Hood is Higher Than Fenders—Check rear edge of hood to see if hood fits correctly at cowl. If fit at cowl is correct, check hood striker and latch assembly. If striker plate is lowered, front of hood will be drawn down. The front hood bumper on grille panel should also be adjusted to compensate for lowering of hood.

Hood Low at Cowl Panel—Prop open hood to relieve tension on hinge springs. Loosen nut at plate attaching hinge-to-cowl support bracket. Drive front portion of hinge downward and forward with a blunt drift, until correct spacing is obtained between hood and cowl panel. Tighten hinge retaining nut securely.

Excessive Space Between Leading Edge of Front Door and Edge of Fender—To correct this condition, adjust as follows:

Loosen fender-to-cowl bracket stud nuts and fender-to-cowl side panel bolts. Install drawbar by hooking one end of bar over hood hinge support bracket on cowl and other end over radiator support, as shown in Figure 10. Tighten turnbuckle until fender-to-door spacing is correct at front pillar. Also, check to see if front of fender is flush with front of hood. When correct fitting has been obtained, tighten bolts previously loosened and remove tool.

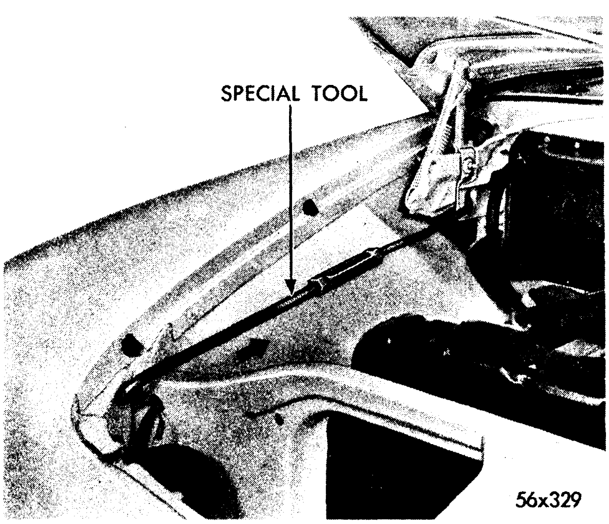

Fig. 10—Pulling Front Fender in Position (Typical)

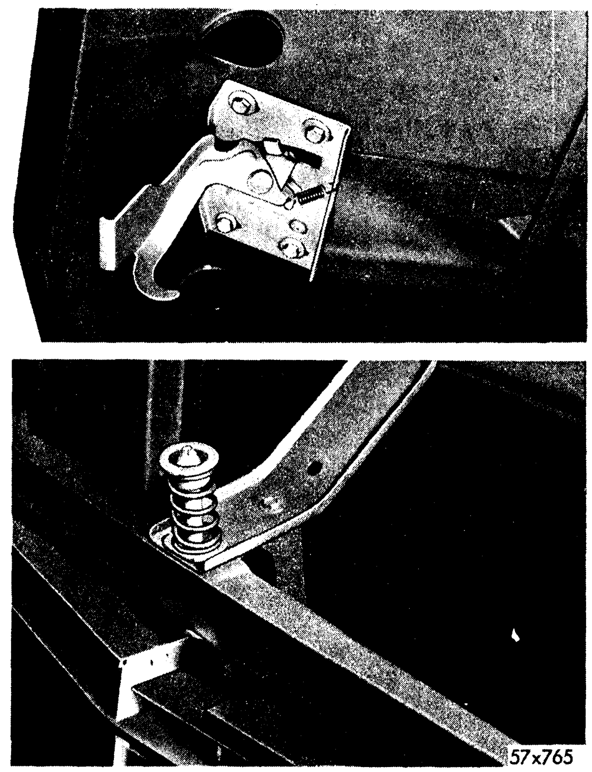

Fig. 11—Hood Striker Plate Adjustment

Adjustment of Hood Striker and Lock Assembly (Fig. 11)—The hood striker is mounted on a plate which is attached to the underside of hood. The bolt holes in plate are elongated to allow striker to be adjusted fore-and-aft. The hood lock plate is fastened by five bolts, in slightly oversized holes, which will allow lock plate to be shifted slightly in any direction. The striker stud and spring assembly is located on outer panel and is adjustable. To adjust striker (to lengthen or shorten), loosen lock nut, turn striker in or out with screwdriver until correct adjustment has been obtained. **After making any adjustment that requires shifting of hood or fender, always check hood striker for proper length, and lock plate assembly for alignment.**

After hood has been centered in opening and hinge bolts have been tightened, check hood for ease of opening and closing. Move striker plate in or out, up or down, as necessary, until hood opens and closes easily, and fits snugly against weatherstrip. Make sure top face of striker plate is parallel with bottom face of hood guide block. This prevents hood rattles when car is in motion.

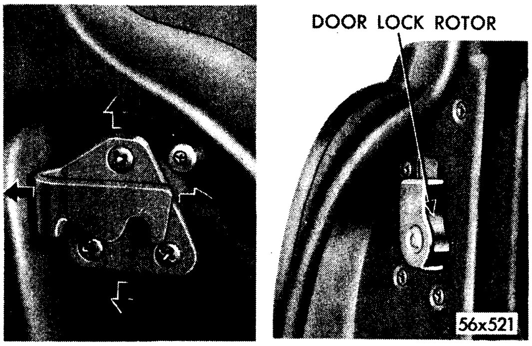

Fig. 12—Striker Plate Adjustment (Typical)

3. FITTING DOORS

Make thorough inspection of door before attempting adjustment. A properly fitted door has evenly spaced gaps on all sides.

CAUTION

When an adjustment requires loosening the hinge bolts of only *one* hinge, be careful about causing a strain on the opposite hinge. When the adjustment has been completed, and the bolts tightened, *always* loosen the bolts in the opposite hinge to permit it to align itself to the new position of the hinge which has just been moved.

After door has been fitted properly to opening, adjust striker plate as necessary (Fig. 12).

a. To Raise or Lower Door (Front Doors) (Fig. 13)

To raise or lower door, place jack under door as near hinge as possible. (This will hold weight of door as hinge bolts are loosened). The amount of vertical movement is limited; however, the amount of movement can be determined by scribed line previously made. Loosen the mounting bolts on both hinges ¼ to ½ turn. Raise or lower jack until desired clearance is obtained. Tighten hinge bolts securely. **Check scribe lines to make certain rear portion of door did not move forward or rearward during above operation. Adjust striker plate if necessary.**

b. Moving Door Ahead or Back (Front Door)

Moving door ahead or back is accomplished by loosening either upper or lower hinge bolts. (See Fig. 14). To move upper portion of door ahead or back (trim panel removed), loosen upper hinge strap bolts and either pull or push upper portion of door in desired direction.

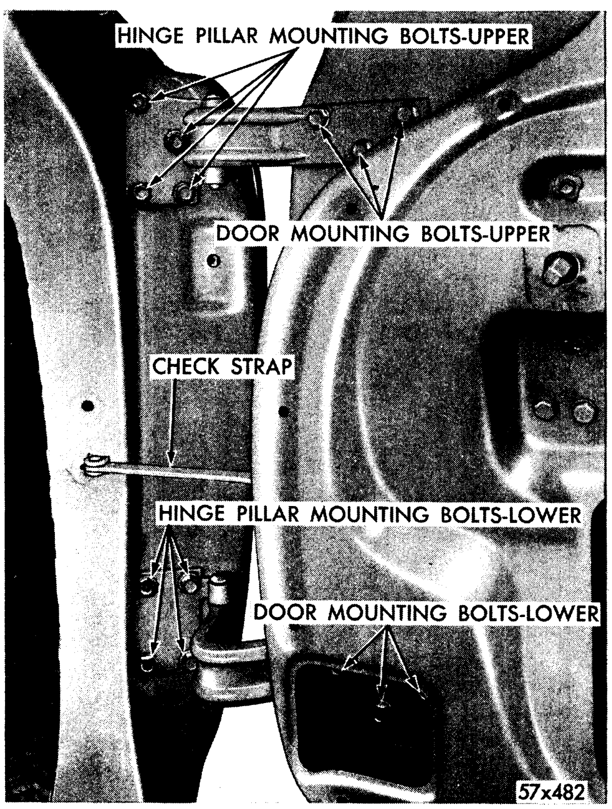

Fig. 13—Front Door Hinge Assembly

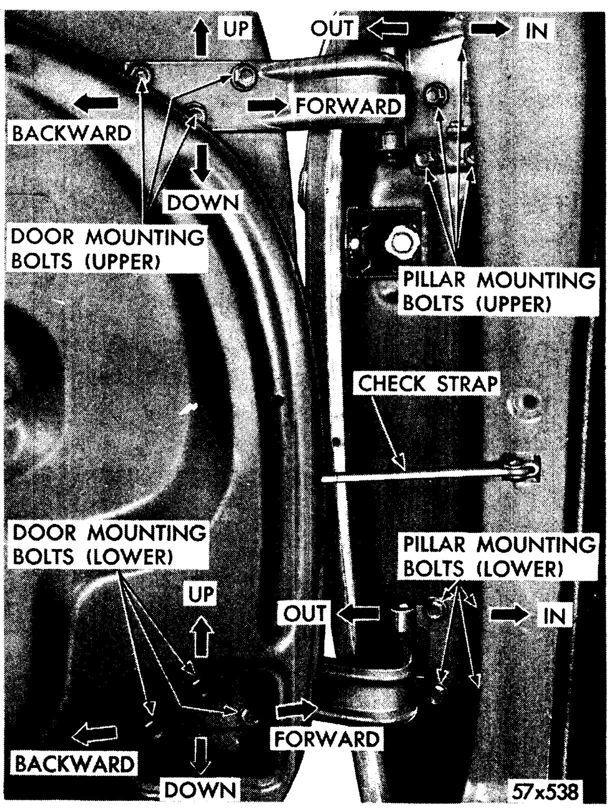

Fig. 14—Adjusting Door Hinges (Front)

Tighten hinge strap bolt and check fit. To move lower portion of door ahead or back (trim panel removed), loosen lower hinge strap bolts and either pull or push lower portion of door in desired direction. Tighten hinge strap bolts and check fit. When correct, reinstall door trim panel.

c. Fitting Front Door Flush with Adjacent Panels

If door is not flush with adjacent panels, correct by loosening four hinge strap screws (on front doors or three hinge strap screws on rear doors).

It should be remembered that when loosening upper hinge and pulling "out" or pushing "in" on front corner of door, lower corner of door will be moved inward or outward also. The opposite corners of door will also be affected in a similar manner when lower hinge is moved "in" or "out". This applies to both front and rear doors. If, after making hinge adjustments as described above, upper portion of door is still out too far, open door ventilating wing and door glass. With Tool Model "G" Double Bar Unit, bend door to its correct position. If door is sprung or bowed out at center, mount Tool Model "H" Single Bar Unit. Tighten lower clamp to force door back to original position. After using Bar Units, check door for proper fit and ease of window operation.

d. Striker Plate Adjustment (Fig. 12)

NOTE: Front and rear door glass window frames are removable and should not be adjusted or aligned to roof line until doors and striker plates are properly adjusted.

After door has been centered in its opening and all hinge bolts have been tightened 18 to 20 foot-pounds torque, check door for easy opening and closing.

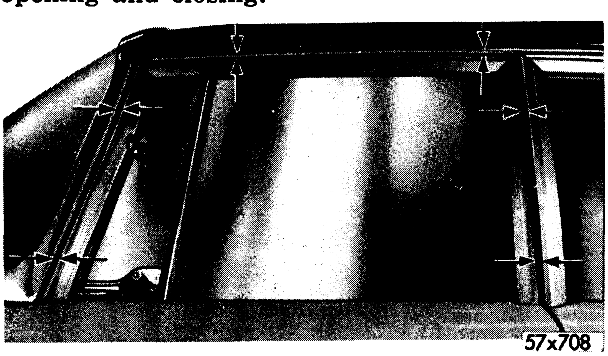

Fig. 15—Aligning Upper Door Glass Frame to Roofline and Rear Door

Fig. 16—Checking Seal of Door

To obtain this easy operation, move striker plate in or out, up or down, as necessary, until easy operation is obtained, and door fits snugly against weatherstrip. Be sure the top surface of striker plate is parallel with bottom face of door latch. The striker plate is properly positioned when door has a very slight lift as it is closed. This also prevents door noise when car is in motion. If proper adjustment cannot be obtained, use of shims between latch plate and pillar should be used. The shims are available in $\frac{1}{32}$ and $\frac{1}{16}$ inch thickness. The shims are used to bring latch plate closer to door, for full engagement.

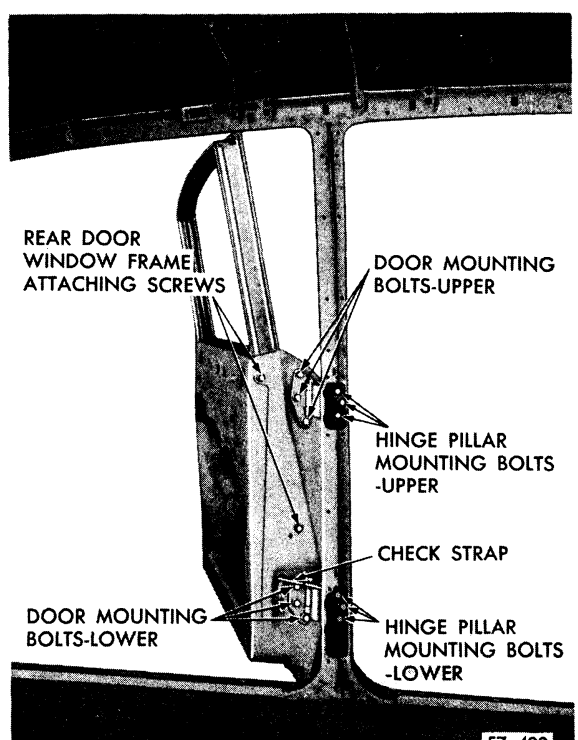

Fig. 17—Rear Door Hinge Assembly

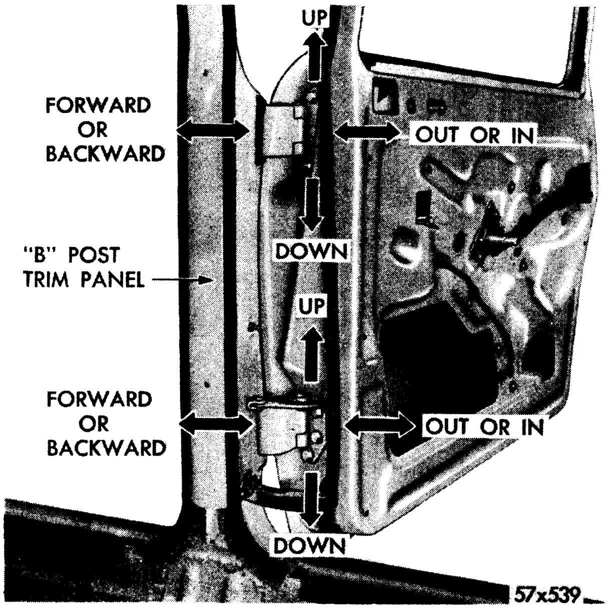

Fig. 18—Adjusting Door Hinges (Rear)

NOTE: The door frame and glass assembly should now be aligned to roofline. (See Fig. 15)

The door weatherstrip seal can be checked by holding a heavy piece of paper (similar to a shipping tag) Fig. 16, against lock pillar and closing door. A slight drag should be felt as paper is being pulled out. If no drag is felt, move striker plate in closer. This paper test should be made all around door at about six inch intervals. If no drag is felt on paper, make necessary adjustments to either or both hinge pockets or striker plate.

e. Rear Door Adjustments

To move door up or down in body opening or to move door in or out to bring door panel flush with body, proceed as follows:

Loosen hinge attaching bolts at "B" pillar (Figs. 17 and 18). Move door as required to obtain proper fit with door opening. Tighten bolts securely. To move the **upper part** of the door fore or aft, loosen only the **upper hinge bolts** at the pillar. Open the door a few inches. Lift the rear door edge, or pull down on the rear edge—depending on adjustment needed. Retighten the bolts.

To move the **lower part** of the door fore or aft, loosen only the **lower** hinge bolts at the pillar. Open the door a few inches and pull down

Fig. 19—Weatherstrip and Sealing Lip

at the rear edge, or lift up as needed. Retighten the bolts. Loosen the upper hinge bolt to let the hinge realign itself, and retighten the bolts.

4. 4-DOOR HARDTOP DOOR ADJUSTMENTS

a. Front Door

Adjust the same way you adjust front doors on other models, to get a good door fit. Hinges and striker are the same, but at the top edge of the front vent frame—where it seals at the roof rail weatherstrip exercise extra care.

The weatherstrip as shown in Figure 19, at this point has three sealing lips: an outside deflector lip; a primary sealing lip; and, a secondary sealing lip. As the door is closed, the glass frame should just clear the outside lip.

The frame should put enough pressure on the primary lip for a good seal. Adjust the top edge of the frame to make it lean into the body for a good secondary seal at the third lip as shown in Figure 20.

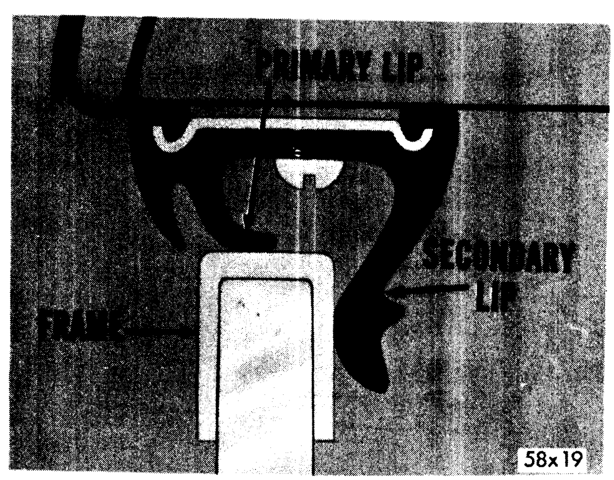

Fig. 20—Primary and Secondary Lip

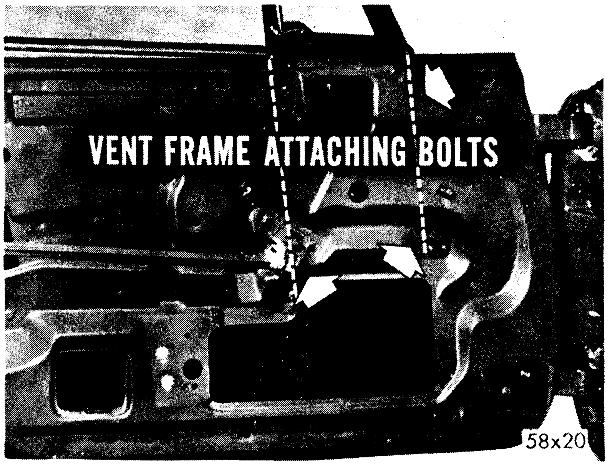

Fig. 21—Vent Frame and Division Bar Assembly

b. Vent Window Frame Adjustment

Adjust the vent frame and division bar assembly in or out at three attaching points. Loosen the upper frame attaching bolt from the front face of the door, as shown in Figure 21.

Loosen the lower frame attaching bolt at the bracket inside the inner panel. Loosen the bolt that holds the lower end of the division bar to its bracket inside the door, move the frame in or out for a good fit and seal. Tighten the three attaching bolts and check the over-all fit by opening and closing the door.

c. Front Door Glass Adjustment

Raise the front door glass and see if it forms a straight line with the top edge of the vent frame. If you need to level the glass, loosen the cross-arm pivot shaft nut and the upper glass stops. Loosen the small bolt that holds the division bar bracket, as shown in Figure 22.

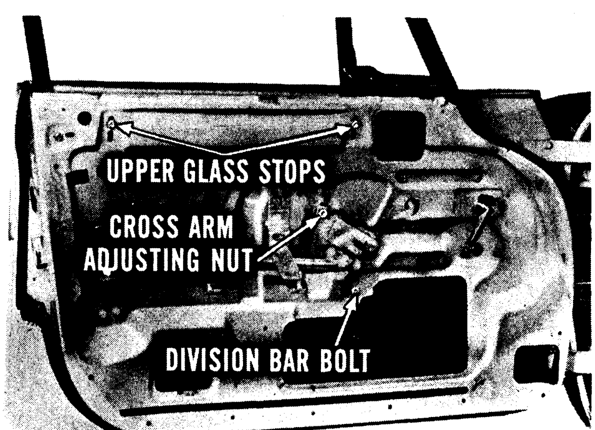

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Fig. 22—Front Door Glass Adjustment (4-Door Hardtop)

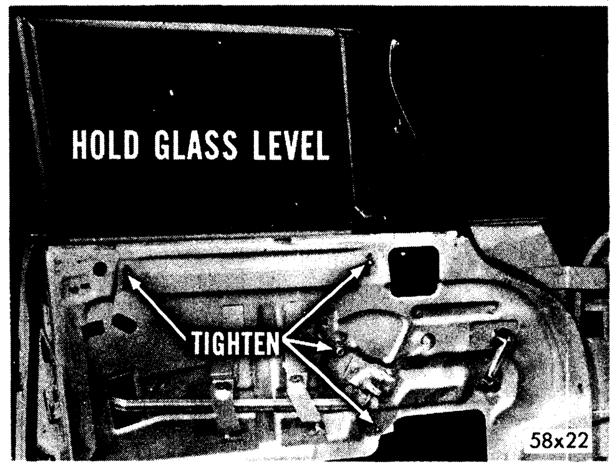

Fig. 23—Leveling the Glass and Rear Channel

Raise the glass all the way, and shift it by hand so the top edge is level. Hold it in that position, and retighten the bolt, the pivot shaft nut, and the upper glass stops. Check glass operation again. If it runs too tightly, or too loosely in the channels, adjust the rear channel, as shown in Figure 23.

Loosen the bolts of the two brackets that hold the rear run channel. Lower the glass and shift the rear channel forward until it makes even contact with the rear edge of the glass. Tighten the brackets to hold the adjustment as shown in Figure 24.

d. In-Or-Out Glass Adjustment at the Rear Edge of the Door

Loosen the two rear run-channel-to-bracket attaching bolts from the rear face of the door. Move the glass in or out as needed. Tighten the rear channel bolts. Check glass fit at the

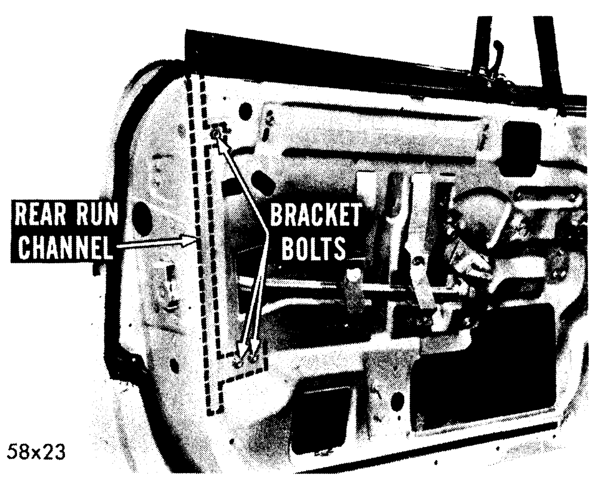

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Fig. 24—Adjusting Rear Run Channel

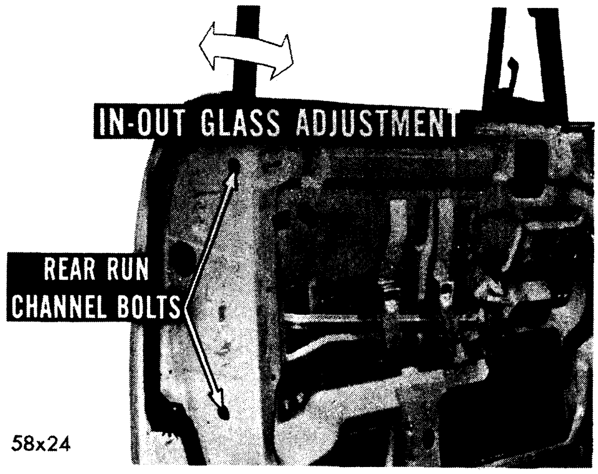

Fig. 25—In and Out Glass Adjustment

weatherstrip by opening and closing the door, as shown in Figure 25.

e. Rear Door Glass Adjustment

Loosen the front channel adjusting bolts to provide any up-and-down movement required to level the glass in its opening as shown in Figure 26.

Loosen the rear run channel bolts for any fore-and-aft movement needed. For in-and-out adjustment of glass, loosen the center channel support bracket bolts. Tighten the bolts when the glass is in or out as much as is needed. Adjust the upper stops to control the amount of rear door glass travel.

If the upper glass stop restricts glass travel, loosen the two upper stop screws. Run the glass up to match the glass height of the front door glass. Position the upper stop to limit travel at that height, and tighten the stop screws.

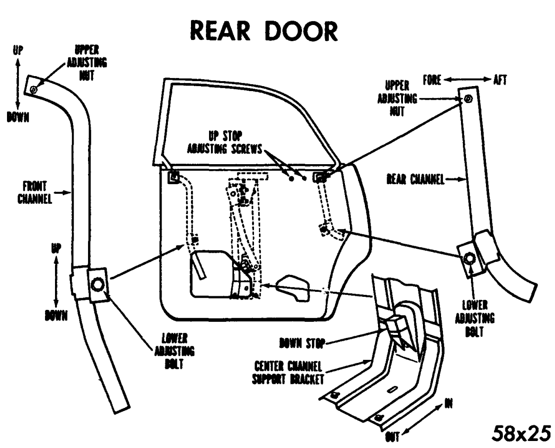

Fig. 26—Rear Door Glass Adjustment

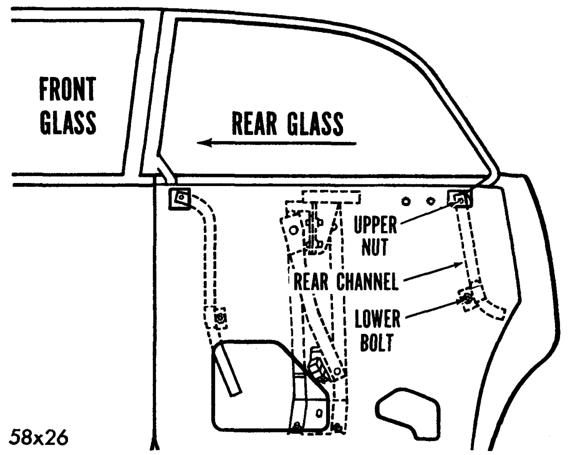

Fig. 27—Checking Rear Glass Operation

f. Rear Glass Loose at Rear Edge of Front Door

Loosen the rear channel upper attaching nut and the rear channel lower attaching bolt. Adjust the rear channel fore or aft until you get a good seal at the rear edge of the front door. Tighten the upper rear channel nut to hold this adjustment. Lower the glass, and tighten the rear channel lower attaching bolt as shown in Figure 27.

Always check glass operation. Lower and raise the glass. If there is any bind, loosen the front channel lower attaching bolt. Lower the glass so that the nylon roller on the glass frame will move the channel into alignment. Tighten the front channel attaching bolt. Recheck smoothness of glass operation. Also, adjust the glass lower stop—inside the inner panel—so the top edge of the glass is flush with the top edge of the door panel when the glass is fully lowered. **This is an important appearance adjustment.**

5. TWO-DOOR HARDTOP MODELS

On these models, door and glass adjustments are like those on the 4-door hardtops. Remove the rear quarter inside trim, however, to get at the adjusting screws and bolts. Front door adjustments are handled the same as for 4-door hardtops.

At the roof rail on the two-door hardtops, the weatherstrip that forms the seal for the rear quarter window is a channeled section. The quarter glass runs inside the channel instead of sealing against a lip as at the front door.

6. IMPERIAL HARDTOP MODELS

a. 4-Door Sedan Rear Door

Because of the curved glass on these models, aluminum frames are also curved. Five frame mounting bolts—two at the rear, and three at the front—as shown in Figure 28. Remove them from the faces of the door without removing any trim. To improve the fit and seal above the belt line, you can loosen these mounting bolts, then move the frame in or out and retighten the bolts.

b. Glass Adjustment

Check glass operation. If it doesn't raise or lower smoothly, or is cocked in the channels, loosen the four regulator and power unit assembly attaching screws. Shift the entire assembly to realign the glass and retighten the screws.

c. Front Door

The rear edge of the glass doesn't follow a conventional run channel course as the glass is lowered. A nylon roller at the rear of the glass frame follows a curved, box-type metal channel, as shown in Figure 29. This rear channel is attached to the rear leg of the aluminum frame. Whenever you move the frame, you also adjust the rear channel. To tip the rear leg of the frame in or out, loosen the three frame mounting bolts at the rear face of the door; adjust and retighten.

At vent wing, a curved division bar acts as the front run channel. Move the lower end of the division bar in or out by loosening the lock

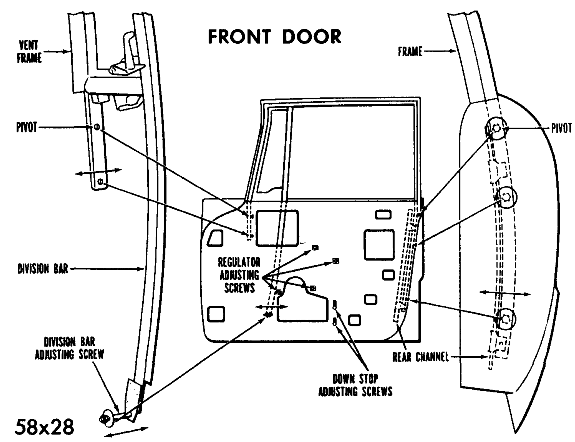

Fig. 29—Front Door Glass Adjustment (Imperial)

nut on a special adjusting screw. Turn the screw to pull or push the division bar in or out. Retighten the lock nut to hold the adjustment. An elongated hole also provides fore-and-aft adjustment of the division bar. Adjust for a loose or tight fit between the front glass edge and division bar channel .The front leg of the frame is attached to a bracket inside the inner panel through an access hole at the upper front part of the door. Mounting bolts, in elongated holes, allow for an in-or-out adjustment of frame at the front.

7. IMPERIAL HARDTOP MODELS (SOUTHAMPTON)

a. Rear Door

There is no center support and guide channel on this as on other hardtop models. A curved, box-type front and rear channels, plus a scissor-type regulator, guide and support the glass, as shown in Figure 30. Adjust the rear run chan-

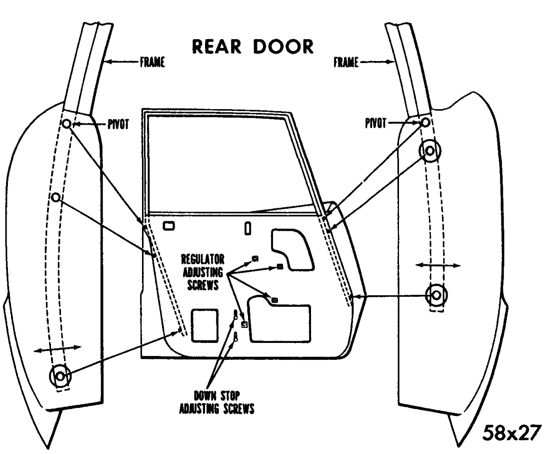

Fig. 28—Imperial Door and Glass Adjustments

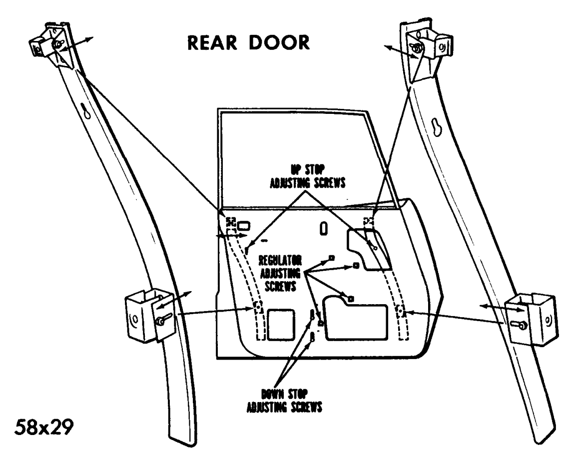

Fig. 30—Rear Door Guide Channels

nel in or out at either top or bottom end. At both points, bolts and nuts attach the channel to brackets inside the door. Moving the channel in or out also adjusts the rear edge of the glass in or out.

Adjust the front channel in or out in the same manner. Adjust the upper bracket fore or aft to move the leading edge of the glass for a good fit at the trailing edge of front glass.

To control glass fit and the roof-rail weather-strip, loosen and tighten the screws at two upper stops. Lower stops can also be adjusted to level the glass with the sill when the glass is fully lowered.

b. Front Door

Front door adjustments are the same as on the Imperial 4-Door Sedan Models. Vent frames have the same adjustment at the bottom of the division bar. The front leg of the vent frame is attached by two bolts inside the inner panel. Elongated holes allow for any in-or-out adjustment necessary, also move the division bar in or out to tip the frame when needed. Shift the division bar fore or aft to get a good fit between the front run channel and leading edge of the glass.

At the rear of the front door, a box-type steel channel can be moved in or out at the top or bottom to tip the glass as needed. You can also adjust the lower channel bracket fore or aft to level the top edge of glass.

To improve glass operation if necessary raise the glass and loosen the four regulator and power-unit assembly screws as shown in Figure 31. Shift the regulator as needed to level the glass and smooth out operation. Finally, loosen and adjust the two upper stops for proper glass travel.

NOTE: Front and rear door glass window frames are removable and should not be adjusted or aligned to roof line until doors and striker plates are properly adjusted.

After door has been centered in its opening and all hinge bolts have been tightened 18 to 20 foot-pounds torque, check door for easy opening and closing.

To obtain this easy operation, move striker plate in or out, up or down, as necessary, until easy operation is obtained, and door fits snugly against weatherstrip. Be sure the top surface of striker plate is parallel with bottom face of door latch. The striker plate is properly positioned when door has a very slight lift as it is closed. This also prevents door noise when car is in motion. If proper adjustment cannot be obtained, use of shims between latch plate and pillar should be used. The shims are available in $\frac{1}{32}$ and $\frac{1}{16}$ inch thickness. The shims are used to bring latch plate closer to door, for full engagement.

8. FRONT DOOR HINGE ADJUSTMENTS

The screw holes are slotted horizontally so that door or hinge can be shifted in or out about $\frac{3}{8}$ inch. To make a vertical or fore-and-aft adjustment, remove inside door hardware and trim panel. After adjustment is accomplished, hold door in adjusted position and secure hinges by tightening hinge screws.

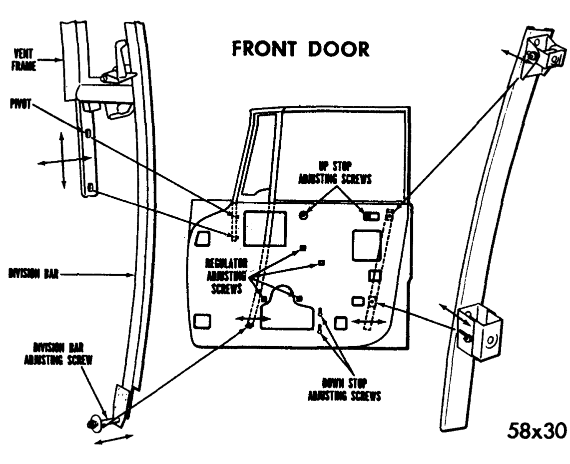

Fig. 31—Determining Proper Glass Travel

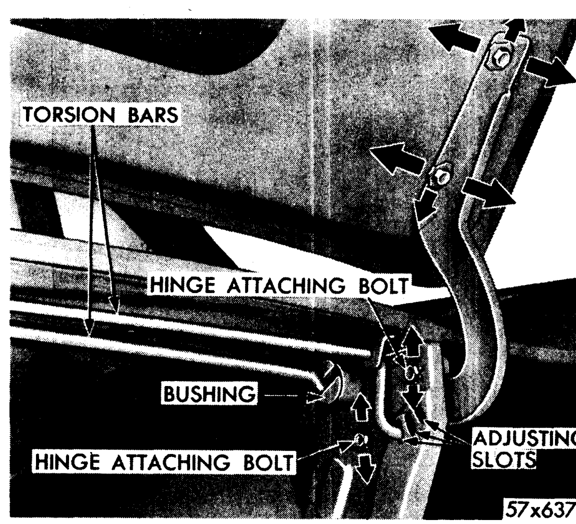

Fig. 32—Torsion Bar Hinge Mechanism

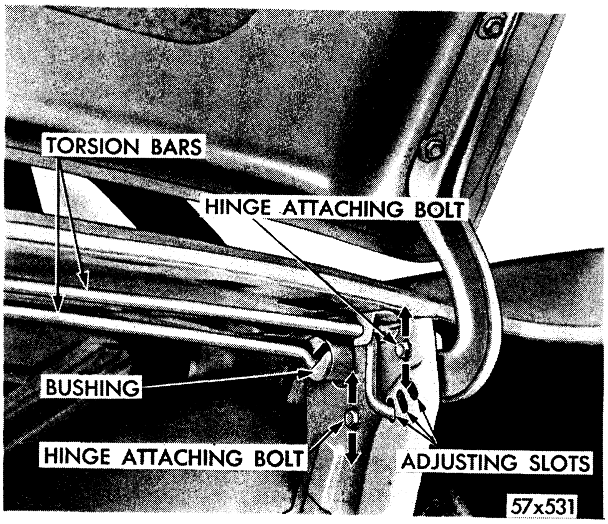

Fig. 33—Deck Lid Torsion Bar

9. REAR DOOR HINGE ADJUSTMENTS (Fig. 16)

Hinge mounting holes are oversize and slotted to allow for up and down or in and out movement on pillar post. If hinge is mounted to reinforcement panel **inside** door, remove door trim, loosen hinge screws and adjust position of door as necessary. Tighten screws and replace trim. **Do not try to bend hinge while it is on car; otherwise body pillar or mounting face may become damaged. Remove hinge from car and bend on an arbor press, if necessary.**

10. REAR DECK LID, HINGES AND LOCKS

(Figures 32 and 34)

The rear deck lid provides a cover and weatherstrip for rear compartment. The rear compartment is sealed against entry of water and dust by lid closing against rubber weatherstrip which is cemented to channel around deck lid opening. The lid is attached to body with two hinges and is held closed by lid latch and lock.

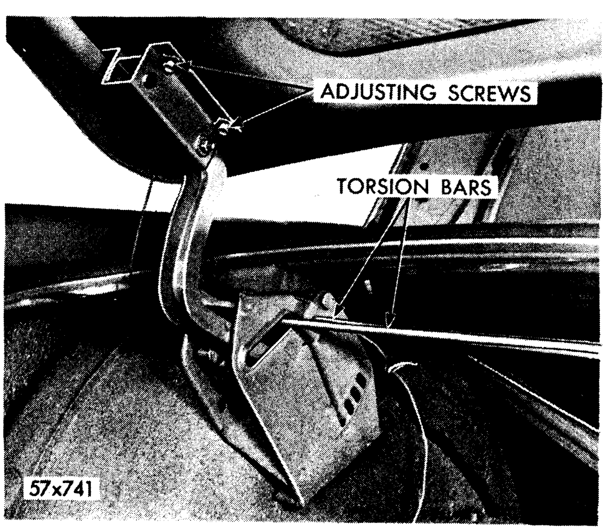

Fig. 34—Rear Deck Hinge Assembly (Imperial)

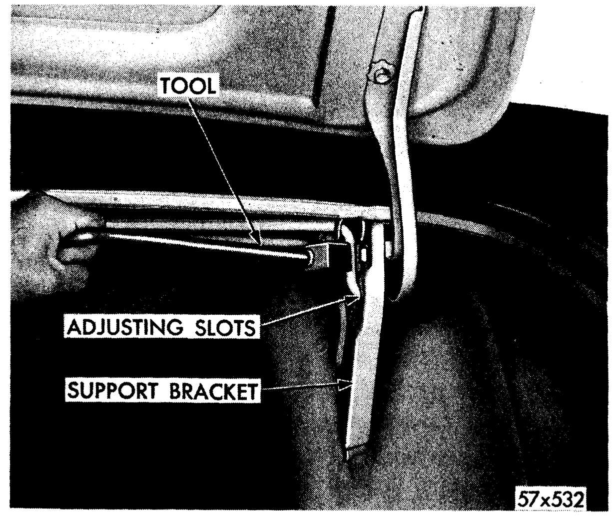

Fig. 35—Adjusting Torsion Bar

All Chrysler cars have a balanced deck lid, made possible by a new torsion bar hinge mechanism. Lifting deck lid is accomplished with a finger tip—the weight of heavy lid is counterbalanced in all positions by spring tension of two torsion bars. (See Fig. 32). The torsion bars are long, small diameter steel bars, that are free at one end and anchored to support bracket at other. (See Fig. 33). A roller sleeve on free end, operates against a "cam contour" on back face of hinge. As deck lid is raised, action of rollers against hinges cause bars to twist, exerting a torsional spring resistance that balances lid. To permit adjustment of torsion bar tension, four slots are located in each support plate, on Imperial Models, and three slots are located in each support plate on Chrysler Models, as shown in Figure 34. To adjust rod tension, insert slot in Tool C-3445, behind lower rod, roll tool forward to disengage lower rod from bracket.

Be sure to prop deck lid in wide open position before changing adjustment, to avoid personal injury in case lid should drop. Bend rod toward front of car to lessen tension and toward rear to increase tension. When lid has been adjusted correctly, lid should hold any position when released. The torsion bar roller ends are lubricated at factory and should require no further lubrication. If a new torsion bar, however, has been installed, coat roller sleeve with Lubriplate.

To remove torsion bar for replacement, refer to Figures 32 and 34, and proceed as follows:

Support deck lid with suitable prop, disengage bars from adjusting slots, using Tool C-3449, as shown in Figure 35.

CAUTION

Use extreme care when removing bars as tension will cause them to "unwind" suddenly.

Slide bars out of center support bracket and slide bar in opposite direction to disengage roller from hinge. Disengage rod from support bracket, and remove. To install torsion bars, refer to Figures 32 and 34 and proceed as follows:

Slide bar into position in same manner as when removing. Lubricate roller sleeves with Lubriplate, slide on end of bars. Engage bars with center support, engage slot in Tool C-3449, with bar, and force bar end into adjusting slot in support bracket. Install other side in like manner. **It may be necessary to have some one hold the roller sleeve in place, using a short length of wood during installation.** Remove prop and check lid for operation. If necessary, adjust as described previously. After adjustment has been made, tap ends of bars with hammer to be sure they are fully engaged in adjusting slots.

a. Removing and Installing the Deck Lid

Adjustment of deck lid is obtained by loosening bolts and shifting lid from side to side or front to rear. It is often possible, however, to properly fit deck lid by adjusting striker plate, latch or both. Should it become necessary to remove deck lid for replacement or repair, refer to Figure 32, and proceed as follows:

Raise deck lid and remove one of two bolts in each hinge that attach lid to hinge arm. (Leave remaining two bolts finger loose).

Brace deck lid in such a manner so as to hold lid in position while removing last two bolts. (This will keep lid from sliding down and damaging rear deck). Remove last two bolts and lift deck lid up and away from rear of car.

When installing deck lid, observe same precaution. Lift lid and slide down into position, install attaching bolts. Do not tighten, just snug down. Lower lid and check fit. If necessary, adjust lid, check adjustment of latch and striker plate.

b. Removing and Installing Deck Lid Hinges

The deck lid hinge upper mounting flange is fastened to deck lid by two bolts at each hinge. The bolt holes are slotted and slightly oversize to permit fore-and-aft and lateral adjustment of deck lid.

Should it become necessary to remove and install either of rear deck lid hinges, for repair to complete replacement, refer to Figures 33 and 34 and proceed as follows: Raise deck lid and brace lid on corner where hinge is to be removed. Remove torsion bar from side on which hinge is to be removed. (Remove torsion bar as described previously.)

Remove bolts that hold deck lid to hinge arm. Remove three bolts that hold hinge pivot plate on support bracket. Disengage hinge from bracket and remove from rear compartment.

To install hinge, slide hinge into position in trunk compartment, install bolts. Do not tighten, just snug down. Install bolts that hold hinge to deck lid. Do not tighten, just snug down. Remove prop and lower lid to check fit. Make necessary adjustments to center lid in opening. Also, check adjustment of latch and striker plate. After adjustments have been made prop lid open and install torsion bar.

c. Rear Deck Lid Adjustments

The deck lid hinges, lock and striker plate are

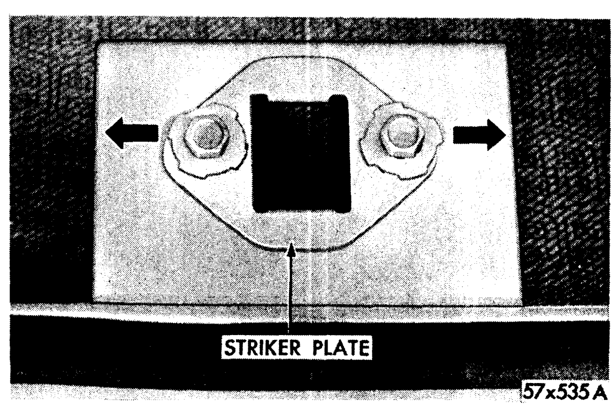

Fig. 36—Adjusting Striker Plate (Rear Deck)

adjustable (Fig. 36), enabling a proper fit of deck lid with little effort.

d. Centering Deck Lid in Opening

The two bolt holes in each of deck lid hinges are oversize, thereby permitting lid to be moved ahead or back, and from side to side. When positioning, locate lid so extreme rear portion along sides are both flush with body panel as well as equally spaced in opening. To adjust, loosen hinge bolts (one hinge at a time) as shown in Figure 33. Move lid in desired direction, retighten bolts. Repeat this operation on opposite side until lid fits flush with body panel all around.

e. Correcting Deck Lid Contour

Incorrect contour of deck lid should not be confused with deck lid being improperly located on its hinges. The lid spacing across top must be uniform but at the same time, must be flush with rear body quarter panels. The lid contour can be increased or decreased a slight amount by bending, but when doing so, space across top of lid is also increased or decreased. For instance, if contour were increased, lid would become shorter whereas, if contour were decreased, lid would become longer. Each time lid contour is changed, in all probability lid would have to be relocated on hinges.

f. To Increase the Deck Lid Contour

Insert plastic mallet between lid and quarter panel, as shown in Figure 37, then apply pressure on lower corner of lid. Remove mallet and check fit and flushness at rear of deck lid. Readjust lid on hinges, if necessary.

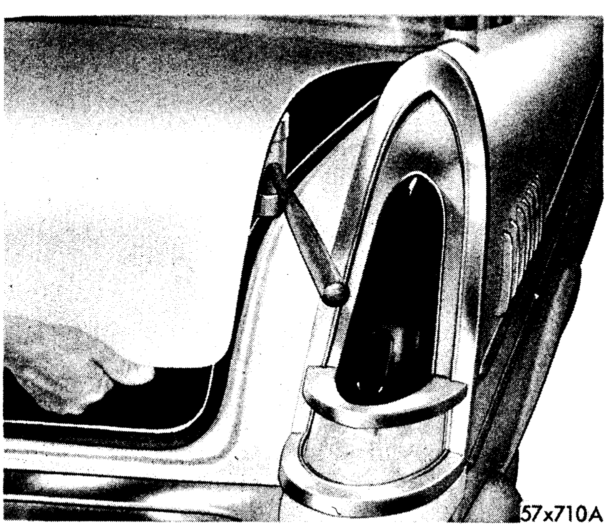

Fig. 37—Increasing Rear Deck Lid Contour

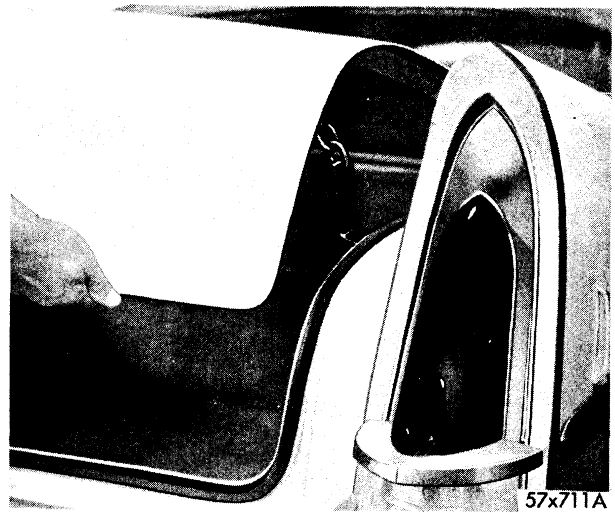

Fig. 38—Increasing Rear Deck Lid Contour

g. To Decrease Deck Lid Contour

Insert large end of Tool C-3011 in opening of underside of lid, hooking exposed end of Tool under rear quarter panel, as shown in Figure 38. Pull out on rear end of deck lid to decrease contour. Remove Tool and check fit of lid at lower body panel and space across top. Readjust lid on hinges if necessary.

h. Raising or Lowering Upper Corners of Deck Lid

To Raise—If either of upper corners are too low, open deck lid and loosen bolts that hold hinge bracket. Insert small fiber block under low corner between lid and side panel. Slightly lower lid. Tighten bolts and check fit.

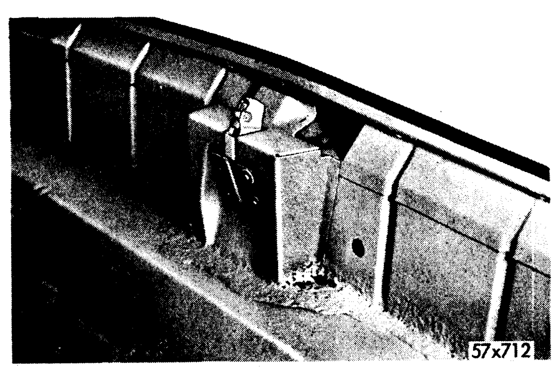

Fig. 39—Adjusting Rear Deck Lid Latch (Imperial)

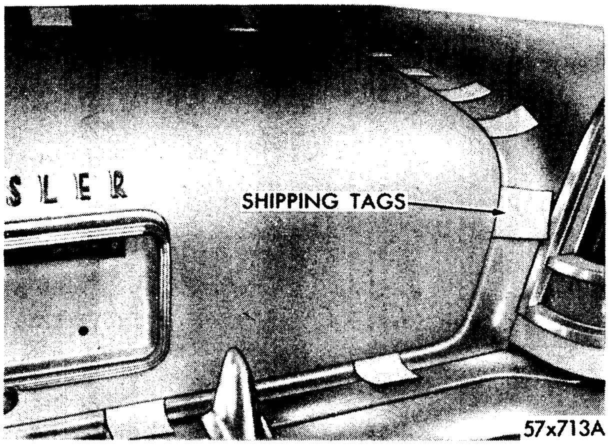

Fig. 40—Checking Seal of Deck Lid

To Lower—Raise deck lid and loosen bolts as in paragraph above. Press down on top of deck lid at high corner until correct fit has been obtained. Tighten bolts, check adjustment of latch and striker plate.

i. Checking Latch and Striker Plate

Both latch and striker plate are adjustable, but better results can be obtained by adjusting striker plate. The striker plate is adjustable in two directions, forward and backward, and to either side, as shown in Figure 39. As plate moves to rear, it also rises making it easier to close lid. Moving plate forward lowers it and makes the lid harder to close.

j. Adjusting Latch

Loosen the mounting bolts, as shown in Figure 26, and move latch into proper engaging position. Tighten bolts securely.

When adjusting latch, care must be taken to be sure latch is not moved away from push button latch release. If this happens, lid will not open.

k. Checking for a Correctly Fitted Deck Lid (Fig. 40)

A correctly fitted deck lid is one that is centered in opening, and fits flush with body panels. A check for proper fitting and seal of deck lid can be made with strips of paper. Insert strips of paper (about an inch wide) along edge of deck lid opening, close lid. (See Fig. 40). If papers fit snug all along edges of lid as they are pulled out, a good seal is evident. If paper fits loosely on one side, and tight on other, deck lid should be aligned.

11. BODY ALIGNMENT

When checking alignment of body that is badly damaged, frame should be inspected and necessary repairs, if any, made to frame before taking measurements for squaring up of body. The door and other glass should be removed to prevent breakage. Reinforcement brackets and other construction parts may have to be removed to permit restoration of outer shell and pillars to prevent excessive strain on parts during and after repairs. If such parts must be removed to be straightened and aligned, they must be reinstalled and secured in place before attempting to align body.

In cases where it may be necessary to use heat, part should be heated in area of damage. Parts should never be heated more than a dull red. Any attempt to cold-straighten a severely bent part may cause ruptures or cracks which may weaken the part structurally.

12. SHIMMING THE BODY FOR DOOR ALIGNMENT

To get enough door movement to fit the door properly, check the shimming at the body bolts. A slight misalignment of the body on the frame, can result in misalignment of the door opening.

Proper tightening at the body bolts affects body and door alignment. If body bolts are loose, raise the car and check compression of the rubber insulators at the body bolts as shown in Figure 41. Uneven compression is a sign of

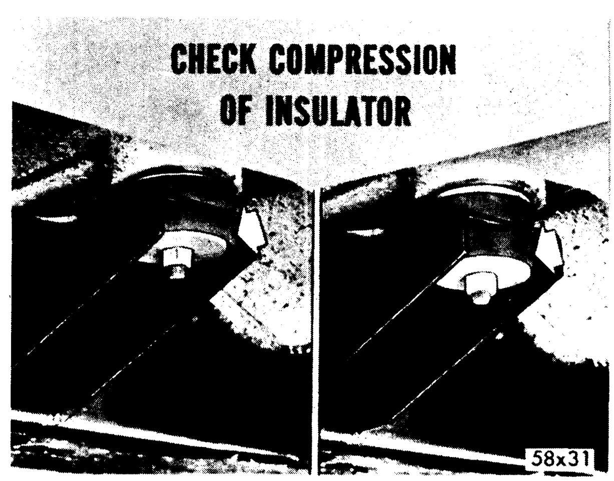

Fig. 41—Checking Compression of Rubber Insulators

uneven torque. Right and left front body bolts have no insulator. They are solid mounts. Make sure the nuts turn freely on the bolt to get a true reading on the torque wrench.

If the opening is not square with the door, and proper tightening of the bolts does not correct it, you may have to add or remove the shims at the body bolts as shown in Figure 42. If you add or remove shims, loosen all the body bolts on the side you're working on. After adding shims at any bolt, shim the adjacent bolts if you find it's needed to keep the body supported evenly on the frame.

If adjustment of door hinge does not correct door misalignment, shim body. To install shims between frame bracket and body at any body mounting bolt, loosen all body bolts on that side. Place a 2 x 4 or fiber block on a floor jack and raise body slightly at location to be shimmed. Add sufficient number of shims to correct misalignment as shown in Figure 43. After inserting shim at any one body bolt, be sure adjacent body bolts are shimmed to support body on straight line contour. When shims are inserted, barely tighten down body bolts and check door alignment before tightening bolts to specified torque. In some instances, shims may be removed to correct door misalignment. If front door is high at rear edge, remove shims from the Number Two body bolts. Excessive shims on the Number Four body bolt will be indicated at rear door binding at bottom.

a. Body Mounting Bolts

The body mounting bolts (except four at rear) are accessible from under car. The four at rear

Fig. 42—Removing or Installing Shims

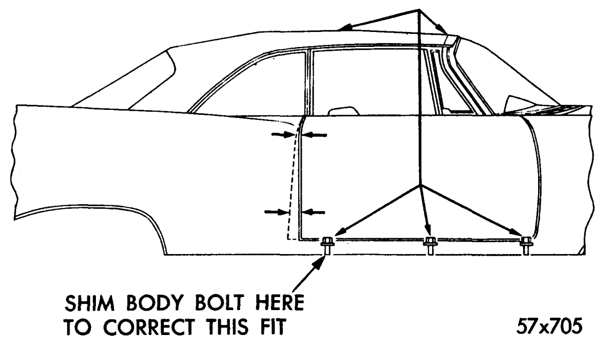

Fig. 43—Shimming Body for Door Alignment

are accessible from luggage and rear compartment. On Town and Country models, pry out plug in floor of rear compartment near tire-well to reach bolt.

b. Body Mounting Bolt Torque Specifications

Tighten body mounting bolts on all models, except Convertibles, 18 foot-pounds torque. Tighten front body mounting bolt on Convertible 18 (minimum) to 20 foot-pounds torque. Rubber insulators should be compressed 1/8 inch (visually) when body bolt is tightened.

c. Conditions Requiring Body Shimming

If rear door binds near top of lock pillar and spacing is correct at hinge pillar, shim at Number four body bolts. Add shims until spacing between lock pillar and rear door is same as between door and hinge pillar. Check adjustment by opening and closing door to determine if interference is eliminated. If several shims are added, it may be necessary to add shims

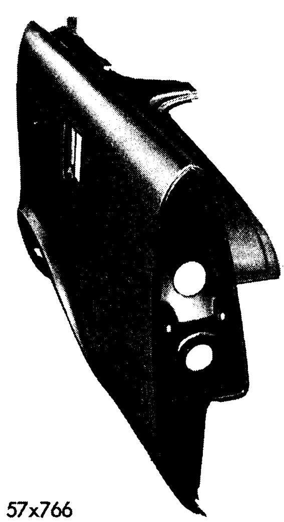

Fig. 44—Body Panel (Chrysler Models)

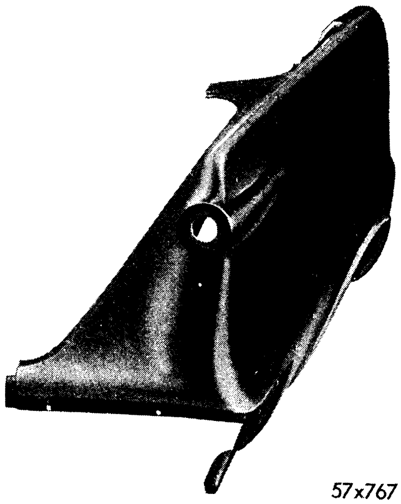

Fig. 45—Body Panel (Imperial)

at Number Three body bolt. If rear door sags when opened, shim Number Three body bolt, inserting enough shim to center door vertically in door opening. If front door sags when opened, shim Number Two body bolt, inserting shims to center door vertically in door opening. Door must open and close freely before body bolts are tightened.

NOTE: The door glass and frame assembly should be aligned to roofline after shimming of body bolts.

13. BODY PANEL REPLACEMENT

The rear fender is an integral part of quarter panel and cannot be separated. This does not necessarily mean that part of panel cannot be replaced. With proper equipment, an experienced body repair man can replace rear fender or quarter panel or part thereof, by following procedures: (Figs. 44 and 45).

Rough out and reshape as much of damaged area as is possible. Measure piece of metal to be cut out. Measurements should be taken from a given point, such as moulding, bead, corner, or "A" post. Make corresponding measurements on repair panel; for accuracy, make sure measurements are taken from same points on each panel.

Scribe line around area to be cut from repair panel and drill ¼ inch hole at corner of scribed line, as starting point for cutting, and cut out new piece along scribed line. Straighten out and finish edge of piece that was cut from repair panel and use as a template to scribe line around damaged area. After scribing line, drill ¼ inch hole and use suitable tool to cut out damaged section. Straighten out cut edge of panel, and fit section cut from repair panel into body panel, making sure that edge does not overlap. Tack-weld section in spots, about 6 inches apart at a time (to prevent excessive distortion) make a continuous weld around repair section, until section is completely welded into place. Hammer weld approximately ⅛ inch below contour of original surface. Metal-finish area; fill area with solder, taking care that sufficient solder is applied so that final metal finish will compare with original body, fender, or

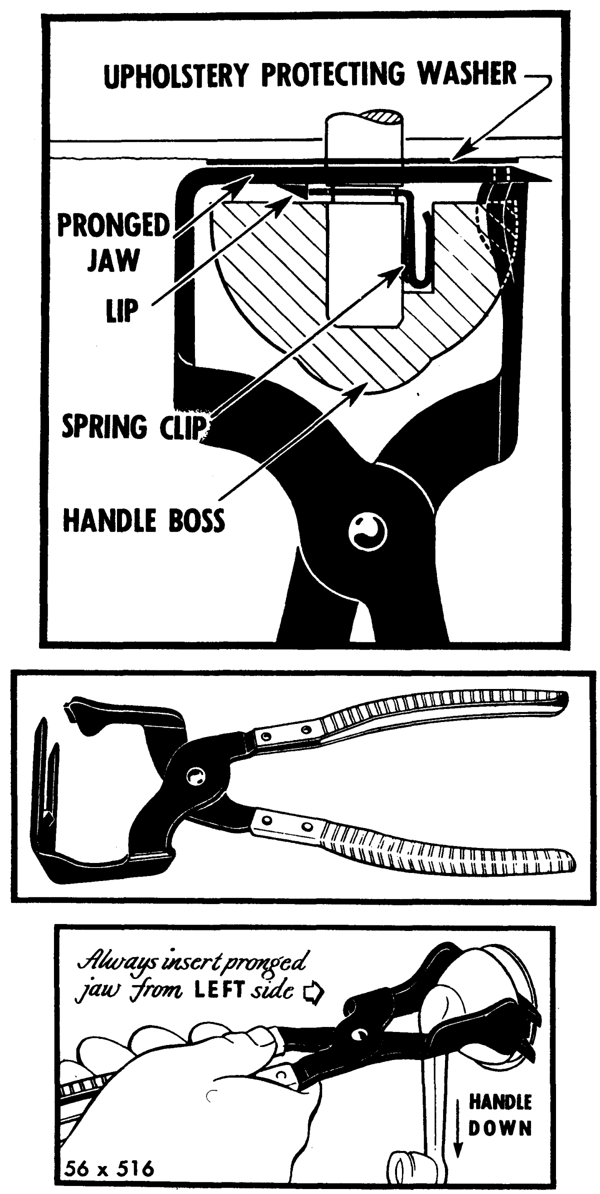

Fig. 46—Regulator Handle Removing Tool

panel contour without indentations and prepare for painting. The same procedure can be followed when replacing other sections of body.

14. REMOVAL AND INSTALLATION OF DOOR AND WINDOW REGULATOR HANDLES
(Cars without Electric Window Lift)

The door and window regulator handles are attached to regulator with a spring type clip. Refer to Figure 46 and insert the pronged jaw of tool between handle and washer, with handle in down position. This will keep handle from cocking and binding on shaft. Squeeze handle of tool together after making sure tool is in proper position and remove handle.

When installing handle, make certain concave side of washer is facing outward and handle is in downward position. Slide handle over shaft and press it on until clip engages locking groove on shaft. On cars equipped with electric window lift, remove remote control handle, as outlined in Paragraph 16.

15. REMOVAL AND INSTALLATION OF DOOR TRIM PANEL
(Cars without Electric Window Lift)

Remove door and window regulator handles, garnish moulding, (if so equipped). Starting at lower corner of panel, (Fig. 47) work panel out from door. (Screwdriver can be used in operation if necessary).

When installing panel, make sure all clips are secured in place and install panel in position on door. Force each clip into position with

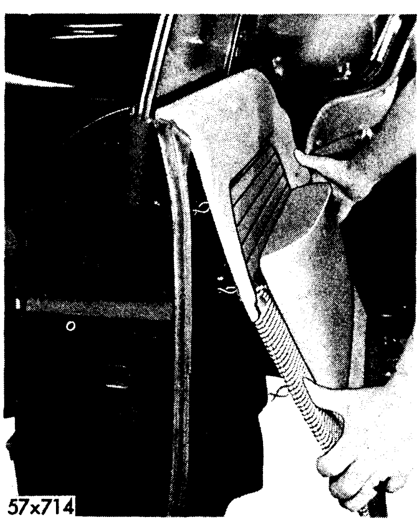

Fig. 47—Removing Door Trim Panel

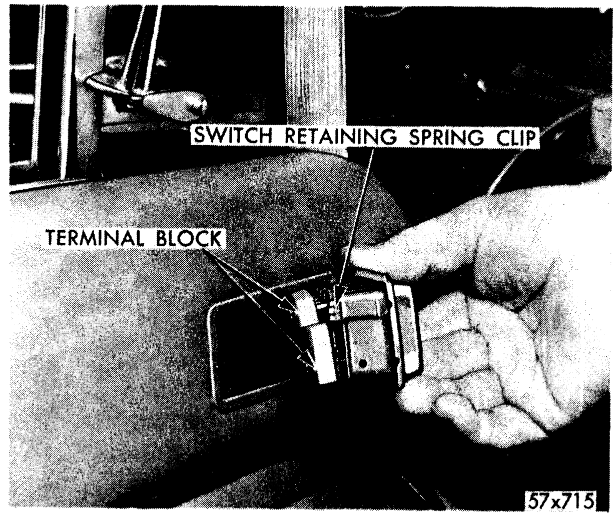

Fig. 48—Removing or Installing Door Glass Control Switch

palm of hand. Install garnish moulding, arm rest and handles.

NOTE: On models equipped with Electric window lift, remove switch and terminal block (Fig. 48). Remove trim panel and arm rest assembly.

16. REMOVAL AND INSTALLATION OF REAR DOOR WINDOW LIFT REGULATOR
(Cars without Electric Window Lift)

Remove garnish moulding, remote control handles, arm rest and door trim panel assembly. Remove trim panel and weatherproof lining. Avoid tearing weatherproof lining. Remove door glass and window regulator attaching screws (see Fig. 49) and slide regulator as-

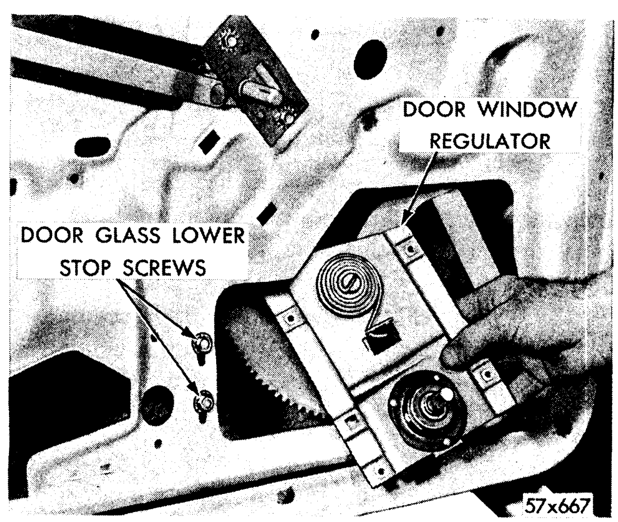

Fig. 49—Removing or Installing Door Glass Control Switch

sembly out through large opening at bottom of door.

When installing new regulator assembly, be sure that gear teeth and gear are liberally coated with MOPAR Lubriplate, and that weatherproof lining is securely cemented to door.

17. REAR DOOR ALUMINUM UPPER FRAME

a. Removal (Fig. 50)

Remove the garnish moulding and door trim panel. Remove the extrusion bolt mouldings "N."

Lower the window and remove the extrusion retaining bolts "A," "B," "C" and "D."

Cut the door weatherstrip approximately 6 inches below the top of door. Disengage the glass run channel from the window frame and remove frame.

NOTE: The glass run channel is cemented to the lower ends of the glass run.

b. Installation

NOTE: When installing the window frame, be sure the glass is in the glass run channel and the lower ends of the frame are mounted on the inner side of the mounting bolts.

Slide the window frame into position and install

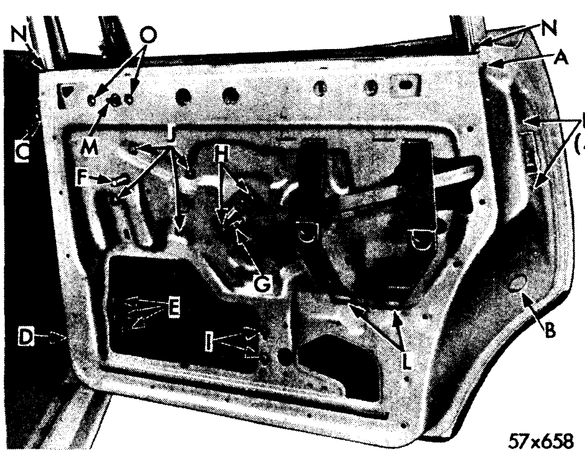

Fig. 50—Rear Door Assembly (Four-Door Sedan)

A-D—Rear Door Window Frame Mounting Bolts
E—Lower Hinge Mounting Bolts
F—Window Regulator Shaft
G—Remote Control Shaft
H—Remote Control Mounting Bolts
I—Lower Window Stop Mounting Bolts
J—Regulator Mounting Bolts
K—Rotor Mounting Screws
L—Pull Handle Bracket Mounting Screws
M—Safety Lock Shaft
N—Rear Door Window Mounting Bolt Mouldings
O—Safety Lock Mounting Screws

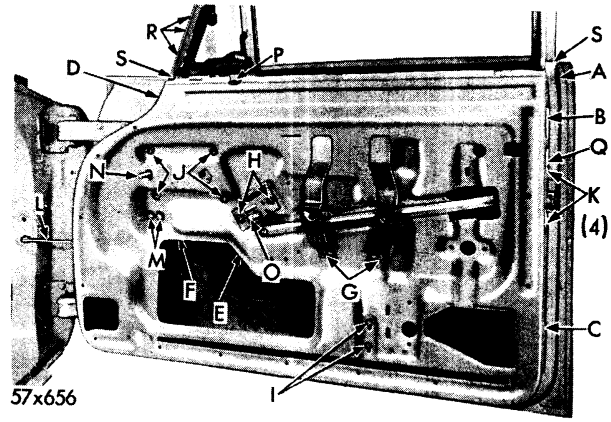

Fig. 51—Front Door Assembly (Four-Door Sedan)

A-D—Window Frame Mounting Bolts
E—Division Bar Mounting Bolt
F—Window Frame Mounting Bolt
G—Arm Rest Mounting Bracket Screws
H—Remote Control Mounting Bolts
I—Lower Glass Stop Bolts
J—Window Regulator Bolts
K—Lock Rotor Mounting Screws
L—Door Check Arm
M—Front Extrusion Mounting Bracket Bolts
N—Regulator Handle Shaft
O—Remote Control Handle Shaft
P—Ventilator Bracket Screw
Q—Lock Rotor Release Link Screw
R—Ventilator to Window Frame Screws
S—Window Frame Bolt Covers

the attaching screws. Install the glass run channel and re-cement the lower ends.

Check operation of glass and regulator. Repair any damage to water curtain. Install the trim panel and garnish moulding.

c. Adjustments

To adjust the frame IN or OUT, loosen the frame mounting bolts and raise the glass all the way. Move the frame IN or OUT as necessary to get a good fit against the roof rail.

CAUTION

Never bend the aluminum frame to get a good fit.

In cases where only the front or rear edge is out of line, it is only necessary to loosen the two mounting bolts which control the particular edge requiring adjustment.

18. FRONT DOOR ALUMINUM UPPER FRAME

a. Removal (Fig. 51)

Remove the garnish moulding and trim panel. Remove the frame bolt mouldings "S." Lower the window and remove the frame mounting bolts "A," "B," "C," "D," and "F." Remove the three ventilator frame moulding screws "R." Cut the door weatherstrip approximately 6 inches below the top of door.

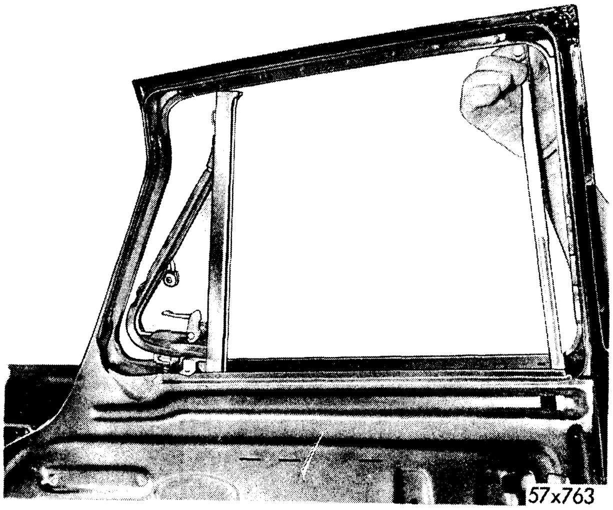

Fig. 52—Replacing Glass Run Channel

Disengage the glass run channel from the window frame and remove the frame.

NOTE: The glass run channel is cemented to the lower ends of the glass run.

b. Installation

Carefully center the door window frame through the top opening in door and install the attaching screws "A," "B," "C," "D" and "F," but do not tighten screws at this time.

Install screws "R" and engage glass run channel in the window frame. Tighten the frame attaching screws securely and check operation of window. Check the window frame alignment with the door opening.

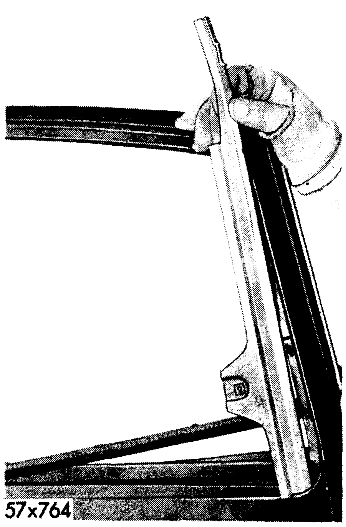

Fig. 53—Removing Glass Run Channel

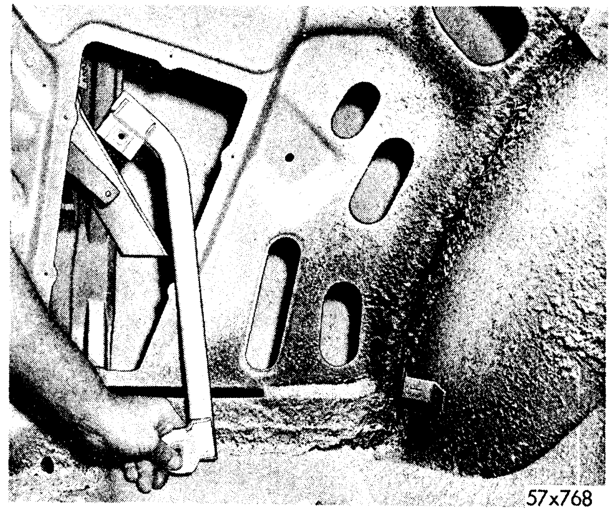

Fig. 54—Installing Glass Run Channel

Install the frame bolt moulding "S" and re-cement the upper weatherstrip to the door. Install the water curtain and repair any damage.

Install the trim panel and garnish moulding.

c. Adjustments

Refer to Figure 51 (57x656) and proceed as follows: Loosen frame mounting bolts "A," "B," "C," "D" and "F." Loosen the division bar mounting bolt "E."

Push the frame IN or OUT as necessary for a good fit around the window opening. Tighten all mounting bolts, except division bar bolt "E," and check the fit of the frame.

Run the glass UP and DOWN. To relieve a

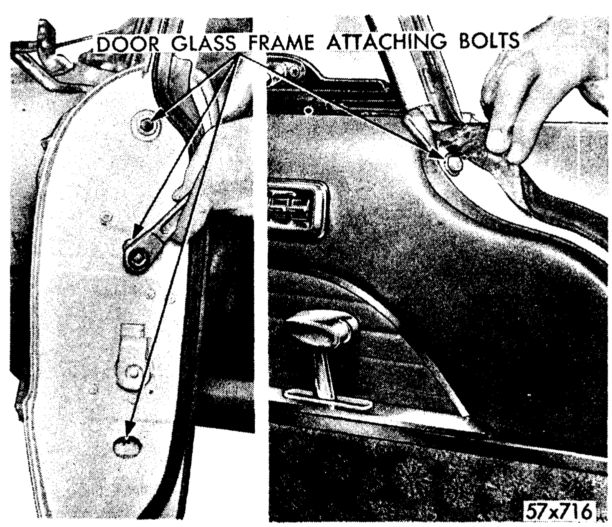

Fig. 55—Removing and Installing Adjusting Frame and Glass Assembly

binding condition at the lower end of the division bar, shim between the bar and its bracket until a smooth operation is made.

NOTE: On Imperial models, an adjusting bolt is provided on the lower end of the division bar for IN or OUT adjustment.

19. REPLACING GLASS RUN CHANNEL (Cars without Removable Frame Assembly)

Work lower portion of door trim panel away from door to facilitate disengaging lower end of channel from support. Lower door window and loosen garnish moulding screws and disengage upper section of channel, as shown in Figure 52. Disengage end of glass run from ventilation window division bar, and pull the glass run channel down from top. Pull remaining portion of run up and out of door, as shown in Figure 53.

When installing new glass run channel, use old run as pattern for length and curved portion. Install by sliding vertical length into door to the curve (see Fig. 54) and across top. Engage with ventilator window division bar, raise door window glass, and engage lower end of run in channel. Tighten garnish moulding screws and reinstall trim panel and arm rest assembly.

NOTE: To replace glass run channel, front ventilator assembly and window glass, refer to Figure 55. Remove frame to door attaching screws and frame and glass assembly.

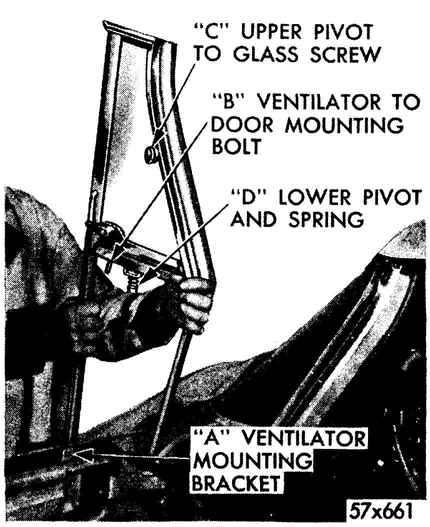

Fig. 56—Removing Ventilator

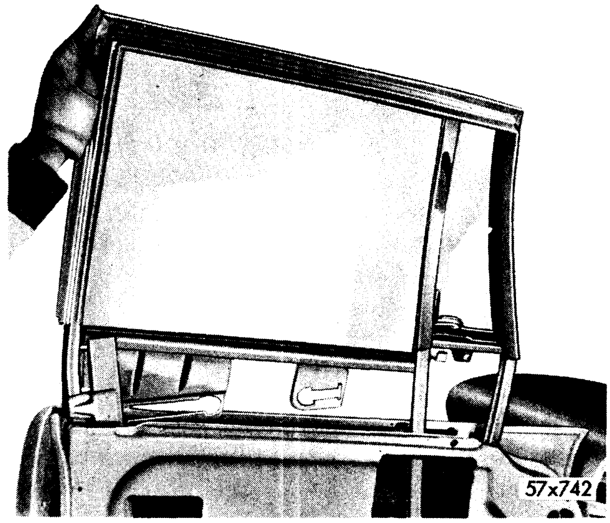

Fig. 57—Removing or Installing Glass Frame and Door Ventilator

20. REMOVAL AND INSTALLATION OF DOOR VENTILATOR ASSEMBLY (Cars with Removable Glass Frame Assembly)

Remove garnish moulding, remote control handles, arm rest (if so equipped), and door trim panel. Remove screws that attach ventilator window to door frame, as shown in Figure 56. One screw is on front face of door. Remove bolt holding division bar (anchor) of ventilator window to inside door panel. Lower front door window glass against its bottom stop. Slightly twist ventilator window and, at same time, tilt it toward inside of car to disengage lowered door window glass from division bar run. Slide ventilator window up and out of door panel, as shown in Figure 57.

When installing ventilator window, engage door glass with division bar as outlined in the removal procedure. After installing ventilator assembly, check door window glass for operation and adjust as needed.

NOTE: Care should be taken to align glass frame assembly to roofline and door opening (Fig. 15). Check door for proper sealing (Fig. 16).

21. REMOVAL AND INSTALLATION OF DOOR GLASS (Cars without Removable Door Glass Frame Assembly)

Remove garnish moulding, inside door handles, arm rest, and trim panel assembly. Remove trim panel and weatherproof liner. Avoid damaging liner. Remove glass run and screws that hold lower window stop to door panel and remove stop.

Lower window far enough to facilitate disengagement of regulator arm pivot roller. Raise window and tilt glass inward until glass clears to raise window until the other regulator arm pivot roller clears door. Disengage pivot arm and remove window glass.

When installing new window glass, be sure that slots in bottom of channel frame are coated liberally with lubriplate and that the pivot rollers are free. After installing window glass, adjust division bar so that the vertical sliding glass does not bind when window is raised or lowered. Align door glass and frame assembly and check door seal as indicated in Paragraph 3 (Fig. 15 and 16).

22. REMOVAL AND INSTALLATION OF DOOR LATCH AND REMOTE CONTROL (Fig. 58)

Remove garnish-moulding, trim panel and arm rest assembly, and remote control handles. Remove screws holding remote control base to door panel. Raise window and bend bottom catch of window felt run channel outward (toward center of door). Work door latch and remote control assembly out through opening in door.

When installing remote control assembly, coat all parts liberally with lubriplate. Install assembly through opening in door and secure with attaching screws. Bend bottom catch of window felt run channel inward and install cap screws holding remote control base to door panel. Check the assembly for proper operation. Install trim panel, garnish moulding, and door handles.

23. REMOVAL AND INSTALLATION OF QUARTER WINDOW GLASS (Special Club Coupe and Convertible Coupe Models)

a. Special Club Coupe

Refer to Figure 58 and proceed as follows: Remove rear seat cushion, regulator handle, and trim panels. Lower glass and remove Allen screw locking pivot arm pin. Pull forward vertical section of felt run channel up and out of body opening. Carefully raise glass and disconnect regulator arm from quarter glass lower channel. Remove glass from opening. If glass is to be replaced, drive the seal and channel off glass with hardwood block and mallet.

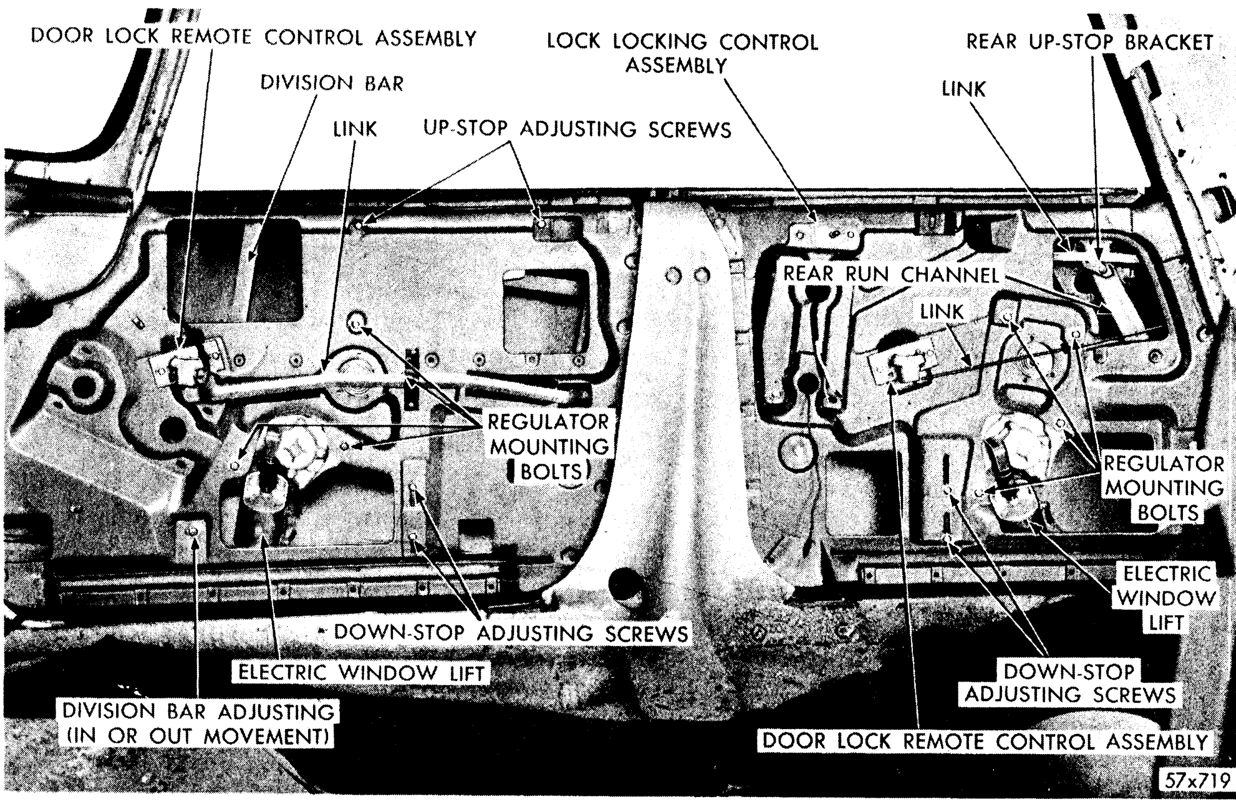

Fig. 58—Front and Rear Door Control Assembly

When installing quarter window, slide seal and lower channel on glass. Wind regulator arm up until the end protrudes above window opening. Connect arm to lower channel. Guide glass in rear portion of glass run channel and carefully lower glass. Install top and forward portion of felt run channel. Make certain that upper and lower side clips are engaged when front portion of felt run channel is installed. Refer to **c.**, below, for adjustment of rear quarter window. Install trim panel and the other components that were removed.

b. Convertible Coupe

Lower top, position quarter window, and remove retainer and washer that holds regulator arm to lower glass channel. Remove pivot bracket hinge screws, (see Fig. 59). Work window assembly up and out of quarter panel. When installing quarter window, make sure regulator arm-to-lower glass channel is installed correctly and is secure. Complete remainder of installation operations.

c. Adjustment of Rear Quarter Window

The rear quarter window can be adjusted in or out by use of four adjusting screws threaded into pivot bracket, (see Fig. 59). The rear of window can be adjusted in or out by adjustments located at top and bottom of guide track. Upward travel of window is controlled by an adjustable stop located at the rear of window. Downward travel is controlled by a non-adjustable stop in reinforcement of pillar post.

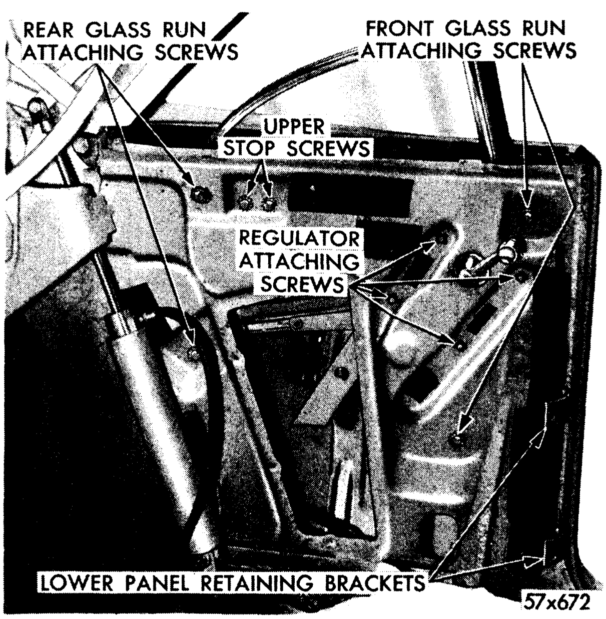

Fig. 59—Rear Quarter Window Adjustment (Club and Convertible Coupe)

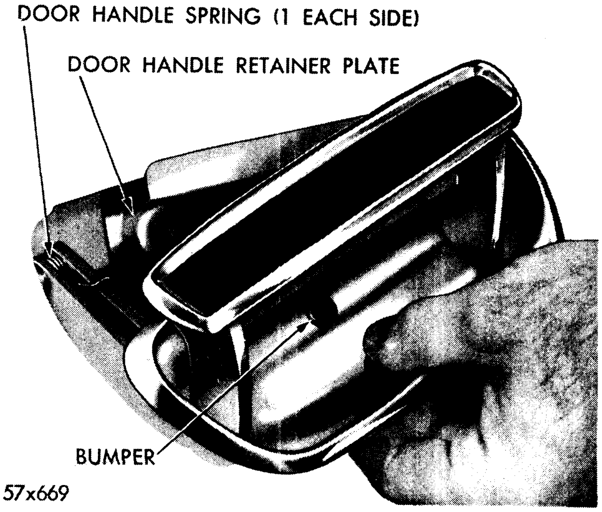

Fig. 60—Removing or Installing Door Handle

24. REMOVAL AND INSTALLATION OF OUTSIDE DOOR HANDLE (All Models)

The combination push-pull type door handle is used on all models. The handle attaching screw is accessible from inside of door handle opening (Fig. 60). Remove remote control handle garnish moulding (if so equipped). Remove trim panel and arm rest assembly. Remove lock assembly attaching screws. Remove access plug in door (Fig. 61) and remove handle to lock attaching link screws. Lift door handle slightly, and slide handle from door opening, as shown in Figure 60. Assemble handle, trim panel components and remote control handle in the reverse of disassembly.

Do not damage finish of handle when installing. Check body of handle for burrs on edges and use a copper or aluminum chafing pad to protect finish. Apply small amount of lubriplate to handle actuator, and carefully slide handle into place. Install attaching nuts, connect lock strap, check handle for proper operation and tighten strap attaching screw.

25. REMOVAL AND INSTALLATION OF DOOR LOCK CYLINDER (All Models)

a. Removal

Remove the door trim panel and arm rest assembly and remote control handle. Remove the

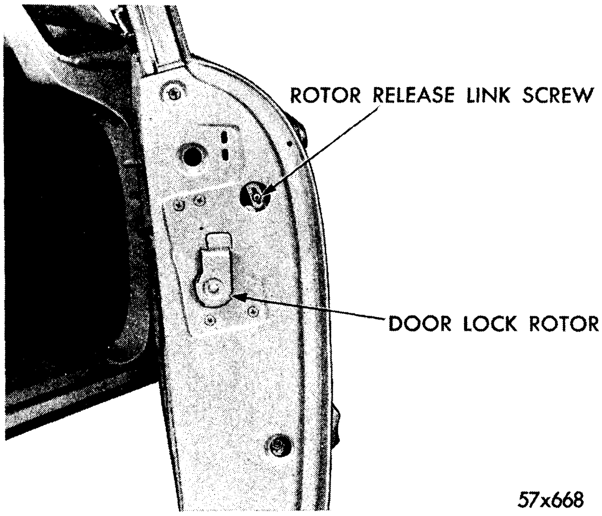

Fig. 61—Door Lock Rotor Release Link Adjusting Screw

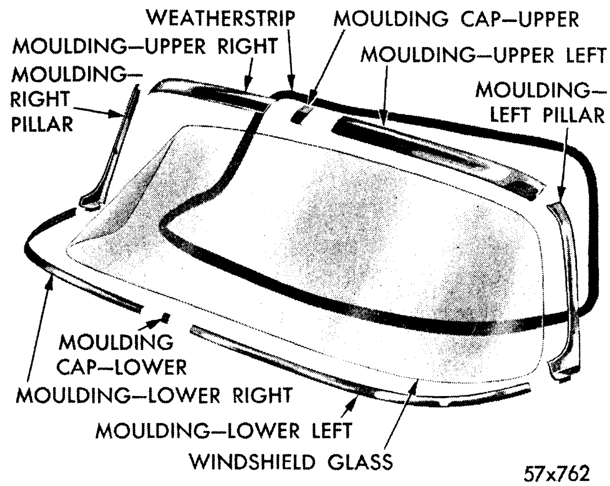

Fig. 63—Windshield and Moulding Assembly (Imperial Models)

attaching lock link adjusting screw plug (Fig. 61), and remove the lock strap attaching screw. Remove two nuts holding the door handle to door from trim panel side of door and remove door handle. Remove barrel to handle assembly set screw. Insert key in lock and remove barrel.

b. Installation

Assemble lock barrel to handle, tighten barrel set screw. Check key and barrel assembly fo proper operation in handle. Install the handle in door and secure the two handle to door panel securely by installing and tightening attaching nuts. Adjust the lock release, connecting strap and tighten adjusting screw.

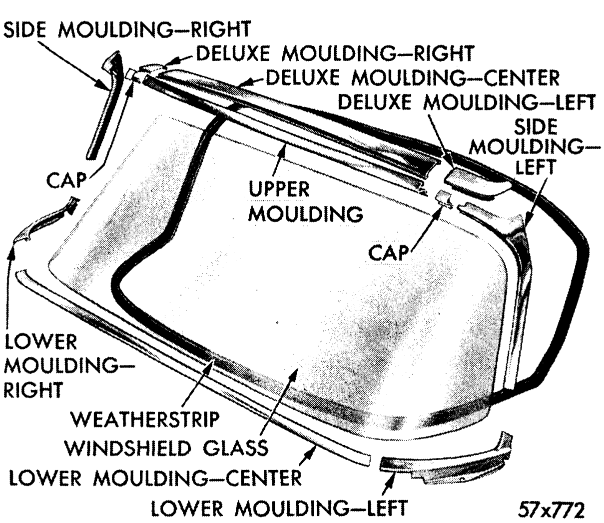

Fig. 62—Windshield and Moulding Assembly (Chrysler Models)

NOTE: Whenever the door handle or lock and barrel assembly is replaced, the door lock rotor must be checked in the lock and release position for proper operation before re-installing trim panel. Install strap plug in door, and trim panel assembly. Check door and lock assembly.

26. REMOVAL AND INSTALLATION OF WINDSHIELD GLASS (Refer to Figs. 62 and 63)

The following procedure also applies to Convertible Coupe models, except for removal and installation of inner garnish moulding and trim. When removing glass on convertible models, raise top high enough to facilitate operation. Remove upper right and left garnish

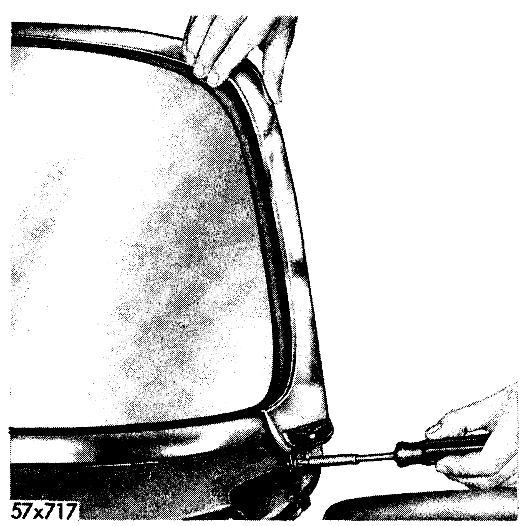

Fig. 64—Removing or Installing "A Post Side Moulding"

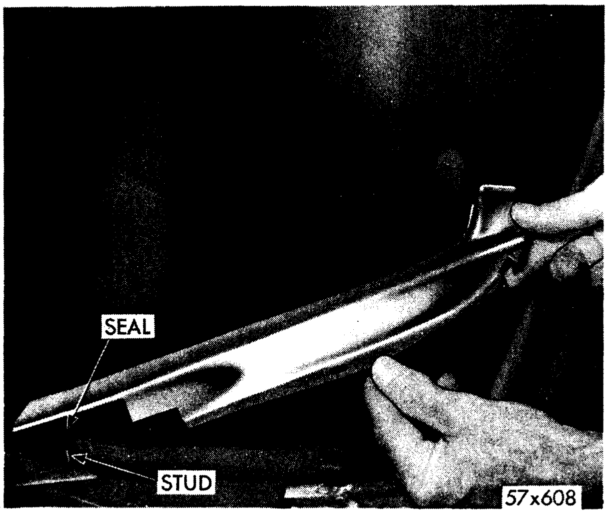

Fig. 65—Removing or Installing Lower Side Moulding

moulding from "A" post. Remove windshield header trim and garnish moulding from weatherstrip.

a. Removing Mouldings

Protect hood and other necessary components of car with protective covering to avoid damaging finish. Remove "A" post side moulding (Fig. 64) attaching screws. **Avoid damaging door-to-"A" post seal.** Remove lower mouldings, as shown in Figure 65, lift upper horizontal moulding out of weatherstrip. Remove windshield wiper blades. Remove lower horizontal moulding clips and mouldings. (Fig. 66).

On Imperial Models, remove "A" post side mouldings and upper and lower moulding retaining clips, as shown in Figure 67, and remove horizontal mouldings. Remove moulding retaining screws, as shown in Figure 68. Remove head lining and remove upper moulding attaching screws and moulding (Fig. 69).

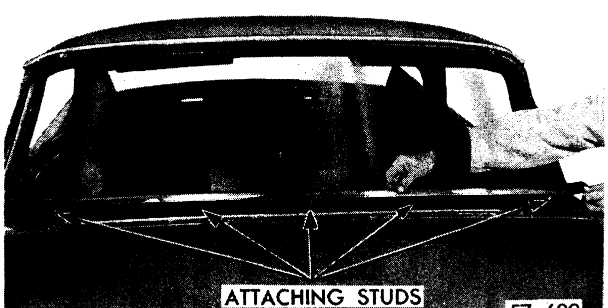

Fig. 66—Removing or Installing Horizontal Moulding

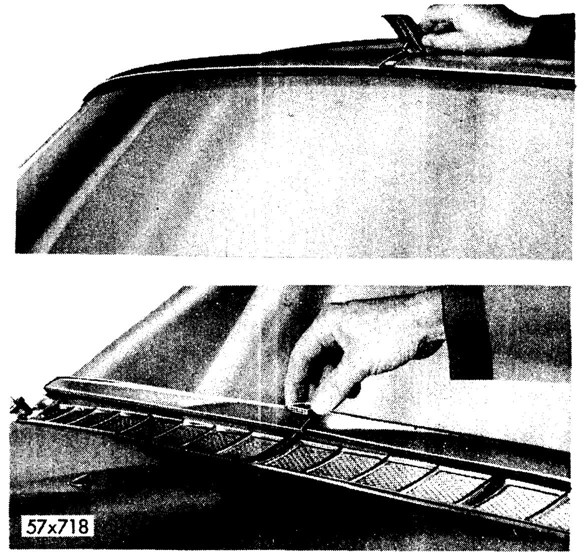

Fig. 67—Removing or Installing Upper and Lower Moulding Clips (Imperial Models)

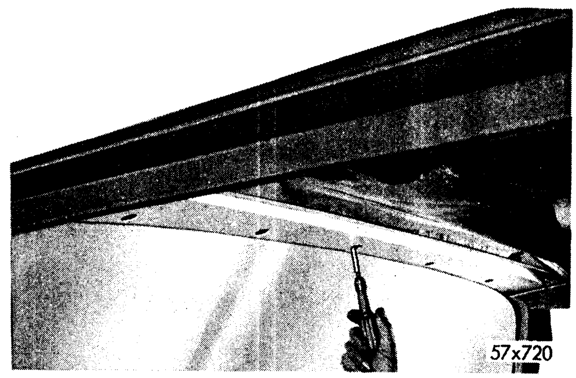

Fig. 68—Removing or Installing Moulding Retaining Screws (Imperial Models)

b. Removal and Installation of Windshield Glass

Unlock weatherstrip with wedge, as shown in Figure 70, (all around windshield). When removing glass from weatherstrip, it may be necessary to wear gloves to protect hands. With helper assisting on outside of car, remove glass

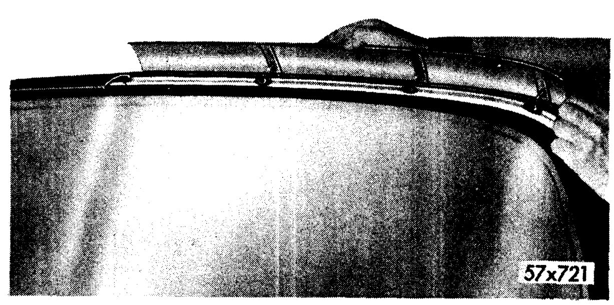

Fig. 69—Removing or Installing Upper Windshield Moulding (Imperial Models)

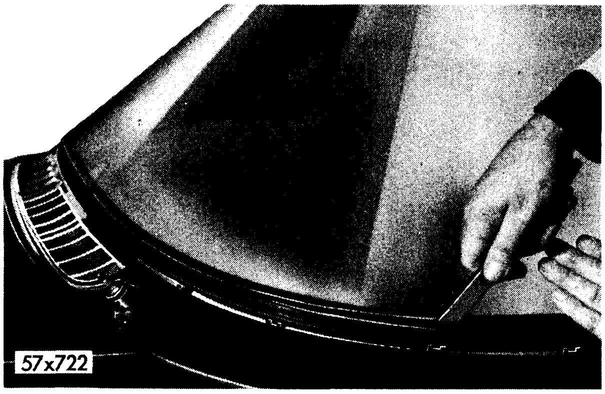

Fig. 70—Unlocking Windshield Weatherstrip

from inside of car by exerting pressure at either corner to force glass out of the weatherstrip.

When installing glass on Imperial models, relocate moulding clips, as shown in Figures 71, 72, and 73.

NOTE: Make sure each clip is all the way down on body fence before installing weatherstrip.

Install windshield weatherstrip on body fence carefully, making sure the weatherstrip is properly seated. Coat weatherstrip with naphtha solution, using 2-inch brush, as shown in Figure 74.

Do not use a strong solution. Coat weatherstrip with Sealer and center and insert upper end of glass in weatherstrip, as shown in Figure 75. Hold glass in position and insert wedge in weatherstrip groove, as shown in Figure 76,

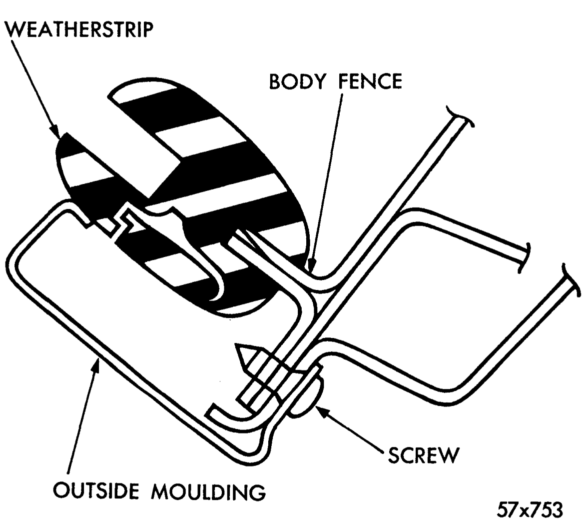

Fig. 71—Locating Retaining Clips on Body Fence

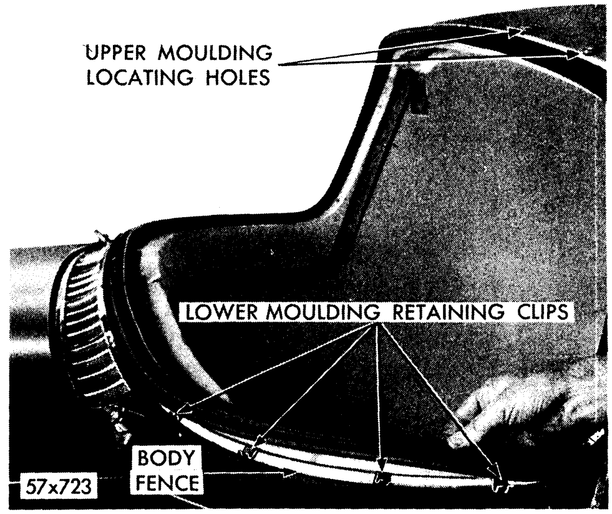

Fig. 72—Windshield Weatherstrip and Moulding—Sides

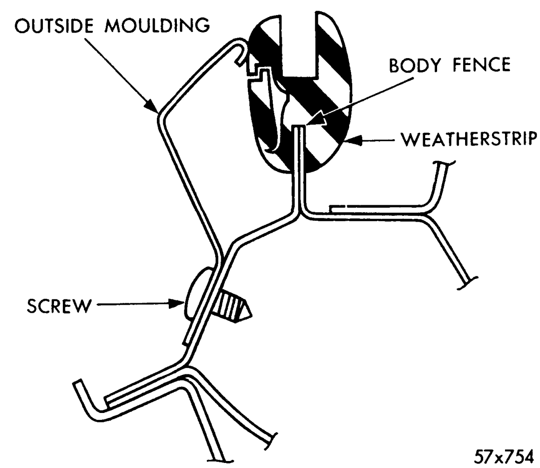

Fig. 73—Windshield Weatherstrip and Moulding—Lower

strip glass into weatherstrip. Pound glass into place with palm of hand. The weatherstrip will slip under lip of moulding with a slight popping noise.

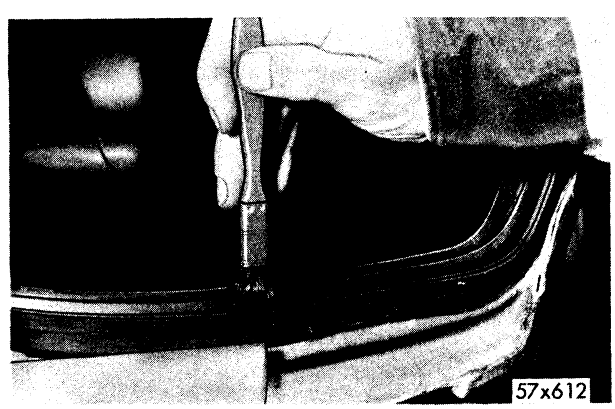

Fig. 74—Applying Naphtha Solution to Windshield Weatherstrip

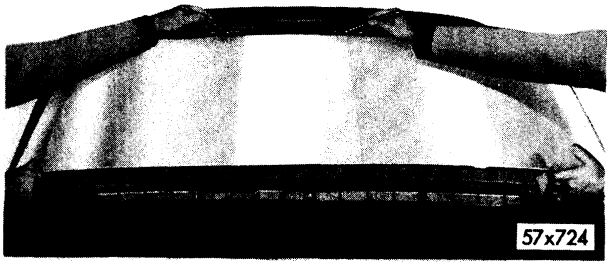

Fig. 75—Installing Windshield Glass

CAUTION

Make sure glass is locked into weatherstrip properly all around glass.

c. Installation of Mouldings

On LY models equipped with bolted type upper moulding, align moulding attaching clips to holes in body. Apply sealer, install moulding, and tighten retaining screw. Reinstall horizontal and side mouldings, clips. (Install head lining, on Imperial Models if removed). Reinstall windshield wiper blades and check for water leaks as indicated in Paragraph 38.

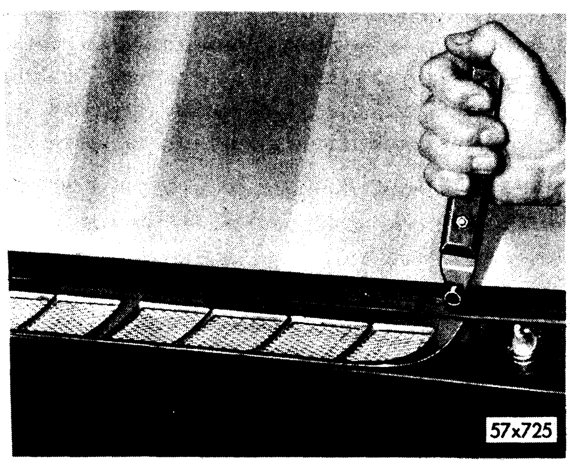

Fig. 76—Stripping Glass into Weatherstrip

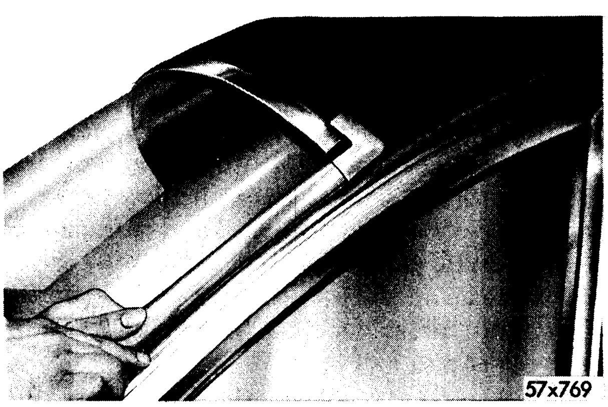

Fig. 77—Removing Rear Window Chrome Mouldings

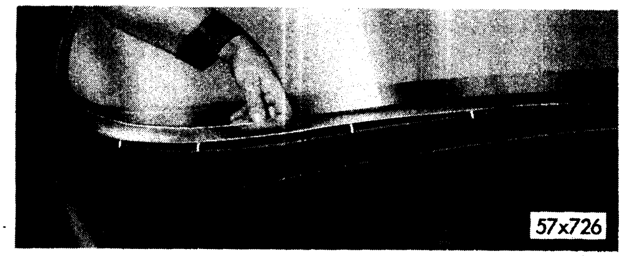

Fig. 78—Removing Rear Window Belt Mouldings

Fig. 79—Removing Lower Corner Moulding

27. REMOVAL AND INSTALLATION OF REAR WINDOW (ALL MODELS EXCEPT CONVERTIBLE COUPE AND TOWN AND COUNTRY WAGON

Cover rear deck fenders and other components to protect finish. Pry up on ends of upper chrome mouldings (Fig. 77) to release them from corner mouldings and remove mouldings. Remove belt moulding center cap. From inside luggage compartment, remove nuts and washers from belt moulding studs (see Fig. 78).

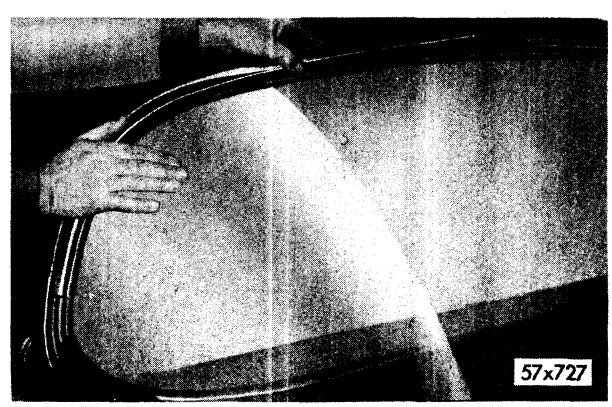

Fig. 80—Removing or Installing Upper Corner Moulding

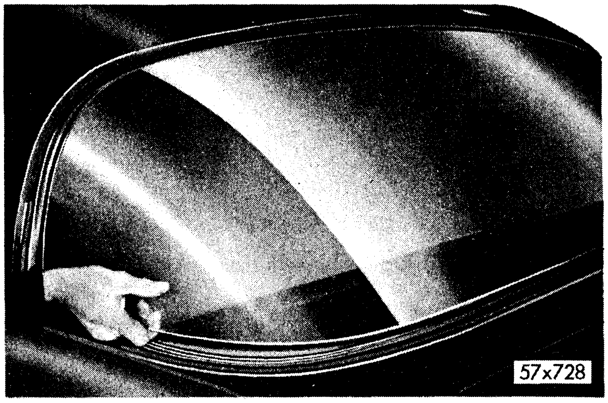

Fig. 81—Removing or Installing Rear Glass

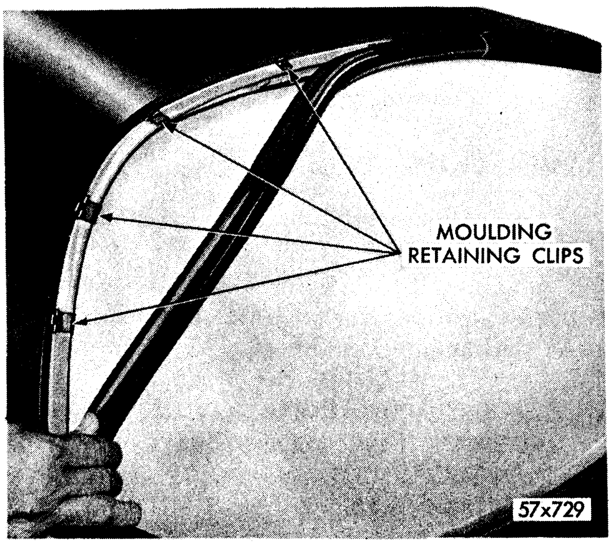

Fig. 82—Removing Weatherstrip (Rear Glass)

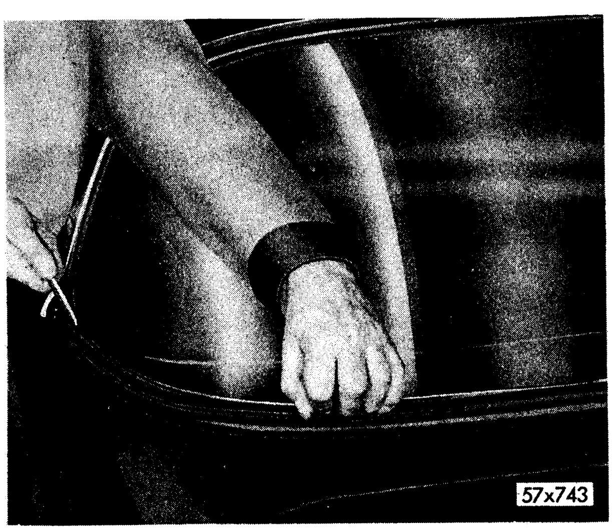

Fig. 83—Stripping Rear Glass in Body

Fig. 84—Locking in Rear Glass

The belt moulding is attached to door lock pillar and rear deck panel with clips. Remove clips, then remove belt moulding. **After removing belt moulding center cap and stud nuts, it may be possible to raise the moulding at center opening and slide moulding out of rear lock pillar moulding cap without loosening clip nut in passenger compartment. If this cannot be done, remove headlining at door pillar post so rear lock pillar moulding clip nut can be removed.**

Remove corner mouldings, as shown in Figure 79. Remove upper and lower mouldings clips from weatherstrip. Remove upper and lower horizontal moulding (Fig. 80). Insert wedge tool in weatherstrip locking strip and twist it slightly while sliding it around weatherstrip to unlock it from glass opening and remove glass (Fig. 81).

NOTE: When installing rear glass weatherstrip on Imperial Models, space moulding retaining clips equally apart on body fence, as shown in Figure 82.

Coat weatherstrip liberally with a naphtha solution, using 2-inch brush. Cover components to protect finish. Slide upper edge of glass into weatherstrip channel and allow glass to settle. Strip glass in lower end and seal glass in weatherstrip, using wedge tool. (Fig. 83). Start at inserted side and work across bottom, up the sides, and across top. Lock glass in weatherstrip, as shown in Figure 84.

Install upper trim moulding with aid of pull cord inserted in moulding slot of weatherstrip.

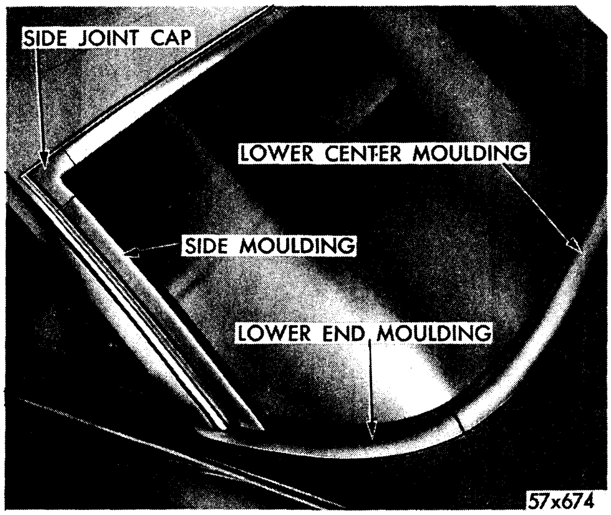

Fig. 85—Rear Window and Mouldings Installed

Coat moulding slot with naphtha solution before installing moulding. Install upper moulding, lower left and right mouldings, and upper corner caps, as shown in Figures 85, 86 and 87 for Chrysler Models. Install belt moulding. On Imperial and Special Club Coupe Models, install inside garnish moulding, lower belt moulding and tighten retaining screws. Check for leaks with trace powder as indicated in Paragraph 44.

28. REMOVAL AND INSTALLATION OF ELECTRIC WINDOW LIFT MOTOR

Remove garnish moulding (if so equipped), trim panel, arm rest assembly, and remote control handles. Refer to Fig. 88, and remove electrical wire leads, motor to bracket attaching screws and remove electric motor.

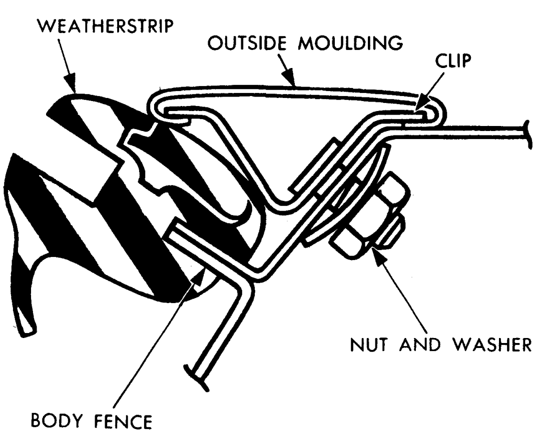

Fig. 86—Upper Rear Window Weatherstrip and Moulding

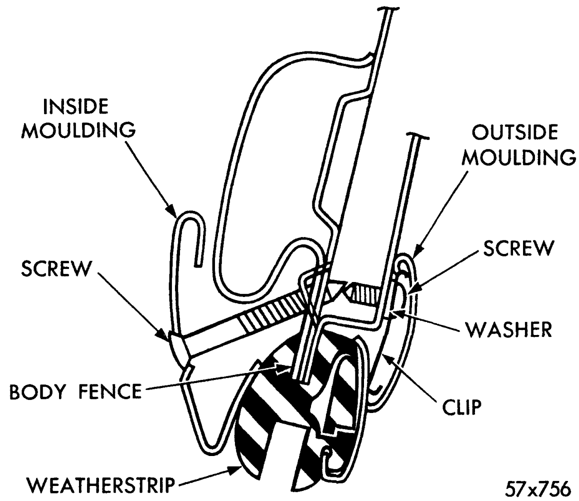

Fig. 87—Lower Rear Window Weatherstrip and Moulding

CAUTION

When installing window lift motor, make sure the motor shaft to gear box coupling is properly aligned beforc tightening bracket assembly.

29. FRONT FENDERS (ALL MODELS)

a. Removal

Refer to Figures 89 and 90 and proceed as follows:

From engine compartment unclip headlamp and parking wires from fender and fender shield (left front fender). Remove head and parking lamps wires from terminal block. Remove splash shield-to-fender attaching bolts. Remove parking, headlamp and lead in wire.

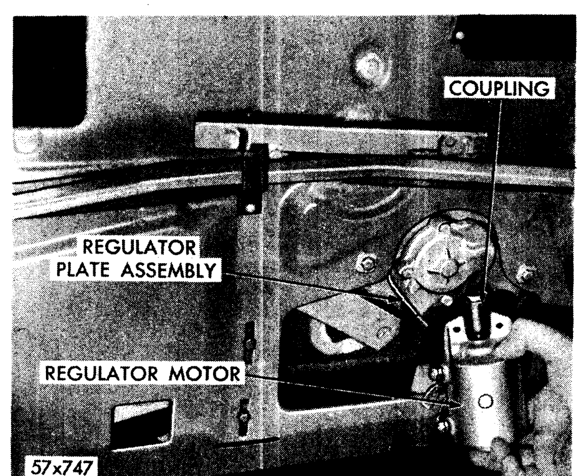

Fig. 88—Removing and Installing Window Lift Regulator Motor

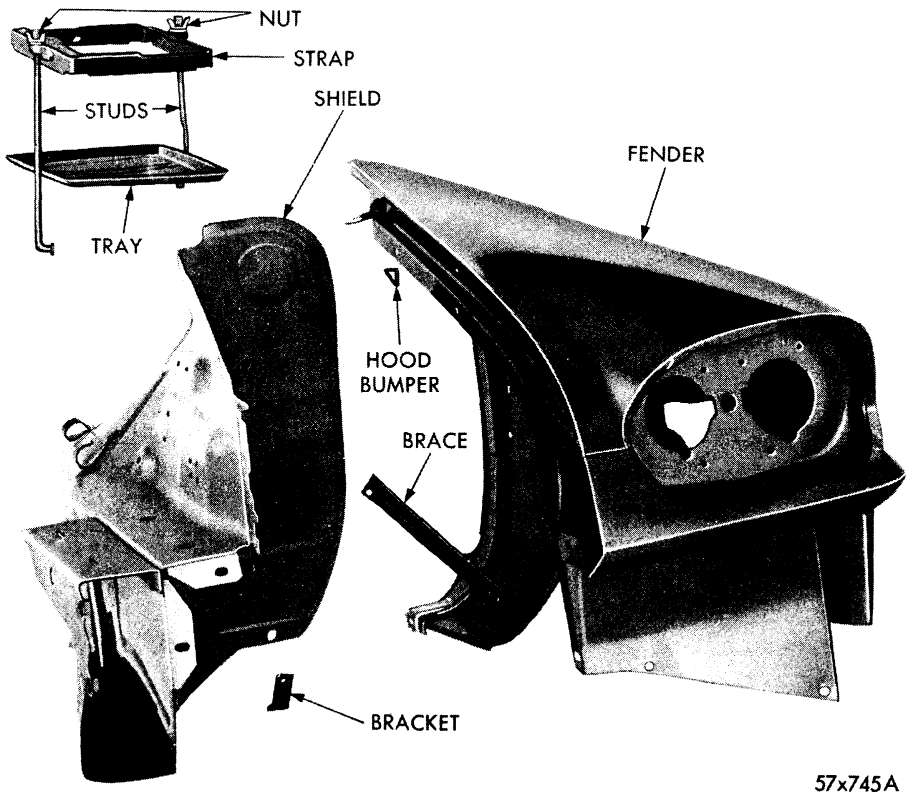

Fig. 89—Front Fender Assembly—(Chrysler Models)

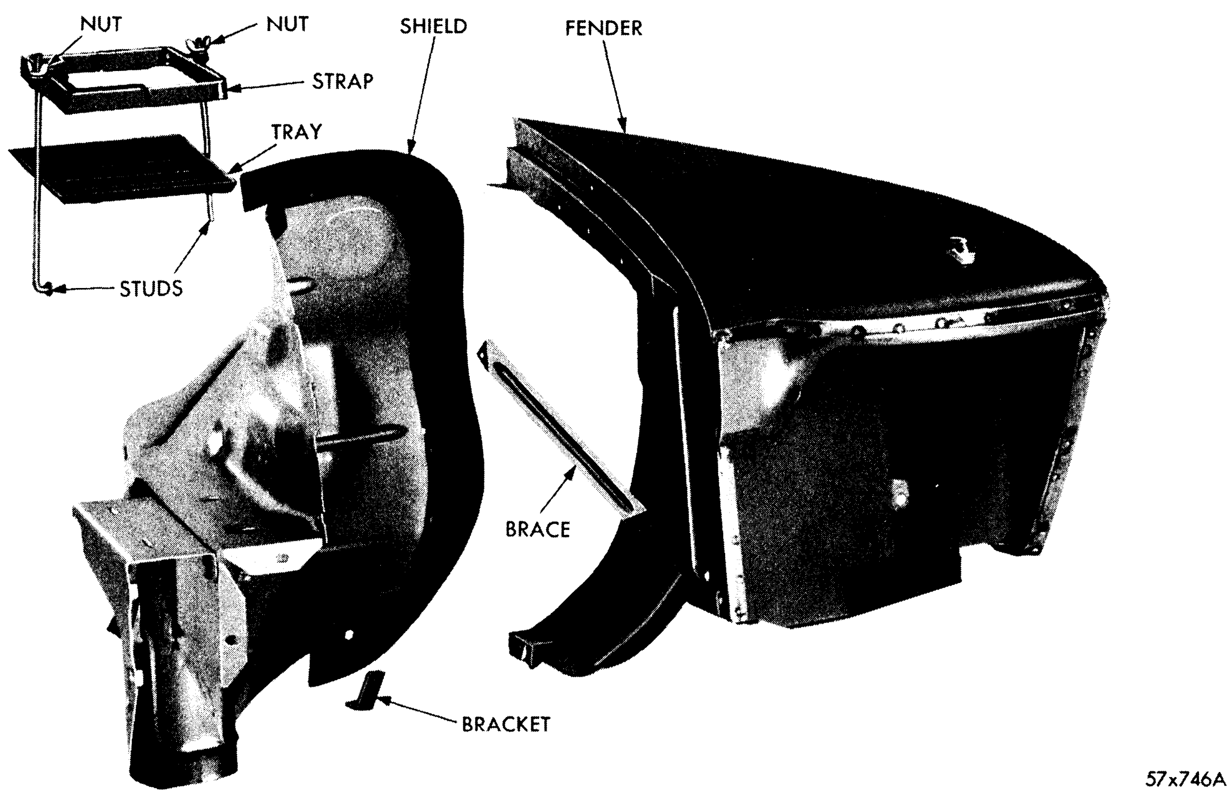

Fig. 90—Front Fender Assembly—(Imperial Models)

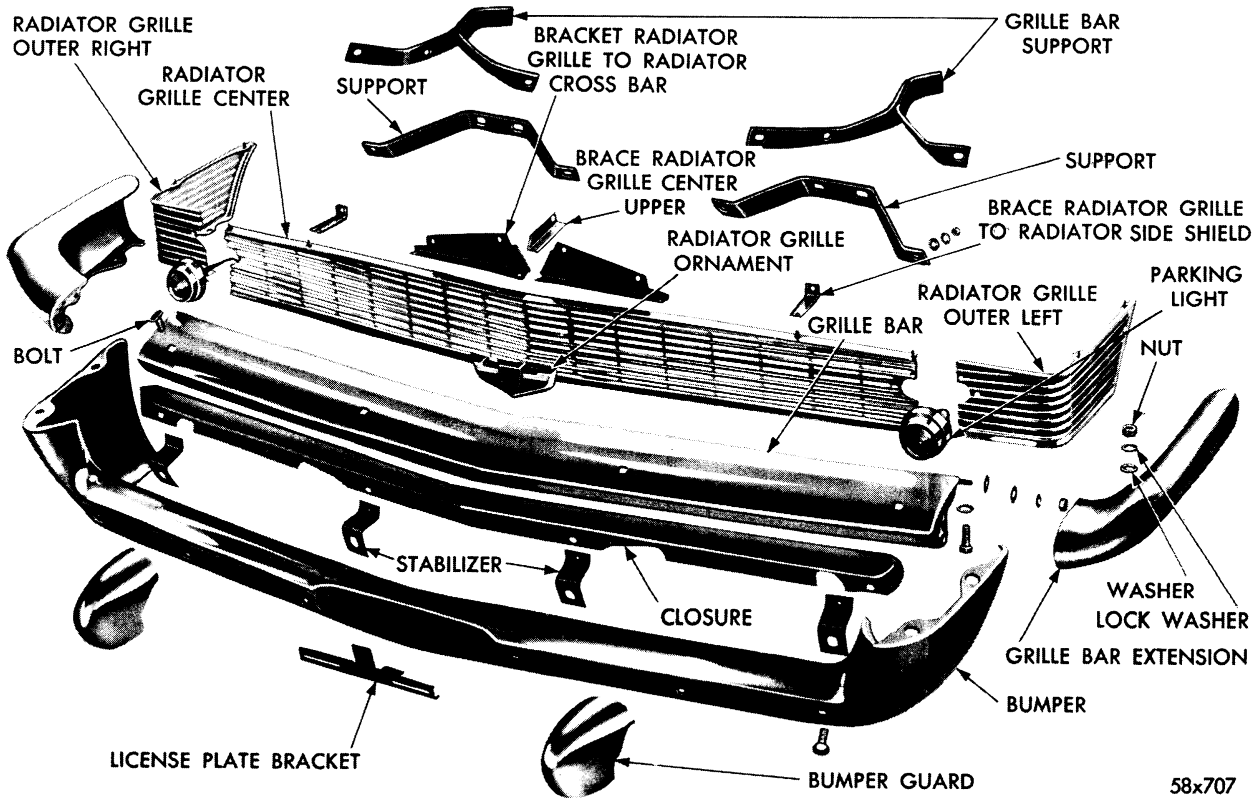

Fig. 91—Bumper and Grille Assembly (Saratoga and New Yorker Models)

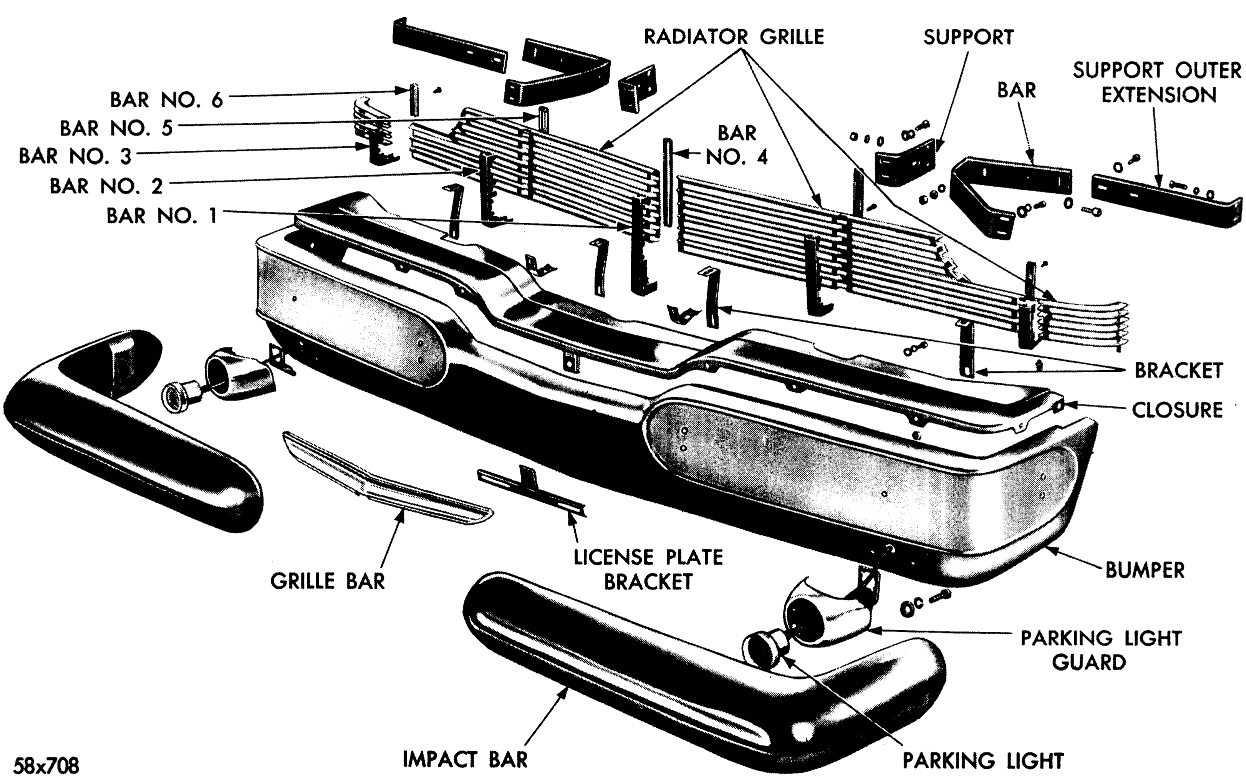

Fig. 92—Bumper and Grille Assembly (Imperial Models)

Remove grille panel-to-fender attaching bolts. Remove upper and lower splash shield and fender chrome moulding. On New Yorker and Imperial Models, remove lower chrome bar on fender. Remove fender-to-body, front and rear splash shields, grille panel, and fender yoke attaching bolts. From inside passenger compartment, remove fender-to-cowl quarter attaching bolts. Disconnect radio antenna (if so equipped) and remove fender.

b. Installation

When installing fender, do not scratch dash panel and other finish. **Fender must be assembled to dash body attaching stud. Hang fender loosely in position until cowl and splash shield seals are properly lined up with fender and cowl before starting and tightening attaching bolts.** The fender should be assembled in position and lined up with hood and grille panel before headlight is installed. Check hood and fender alignment.

30. REMOVAL AND INSTALLATION OF FENDER SPLASH SHIELD (ALL MODELS)

Refer to Figures 89 and 90 and disengage splash shield at rear lower fender bracket, radiator support, and fender. If removing left hand splash shield, remove battery, unclip the wire harness and remove lead wires that connect starting motor solenoid. Disengage splash shield support bracket at radiator support and remove bracket. Remove fender-to-cowl and rear splash shield attaching bolts, lift rear of fender slightly, and pull shield approximately 6 inches away from body. Support fender in this position, and pull splash shield out at rear, pushing down and back and sliding out from under car.

To install splash shield, slide it under car and up into position. Install attaching bolts, but do not tighten. Push fender back toward body, lift shield slightly, and slide shield into position. Install attaching bolts and screws, but do not tighten. Check hood-to-fender alignment and tighten all attaching bolts, nuts and screws securely. Install and connect the battery, clip wire harness to shield, and install lead wires to starting motor solenoid (if left-hand splash shield was removed).

31. REMOVAL AND INSTALLATION OF RADIATOR GRILLE AND BUMPER ASSEMBLY (ALL MODELS)

Refer to Figures 91 and 92 and proceed as follows:

The radiator grilles are assembled as separate units within grille panel and can be removed separately without interfering with other components. Remove grille-to-grille panel attaching bolts and remove grille. Remove lower half hook lock assembly and brace. Remove head and parking lamp terminals from terminal block. Remove both head and parking lamps. Remove grille moulding and extensions; loosen front fender to radiator yoke bolt. Remove panel-to-fender and splash shield attaching bolts. Disengage outer panel and pull panel out and away from fender openings. If installation necessitates removal of lower stone deflector, remove front bumper and remove attaching nuts and bolts and remove stone deflector.

When installing outer grille panel, leave radiator yoke-to-fender and fender-to-splash shield loose until proper hood alignment is obtained.

MAINTENANCE

32. HEADLINING

a. Removal

To remove the headlining on all models, except Convertible Coupe and Station Wagon, remove dome light assembly, rear seat cushion, and side and upper windshield garnish mouldings. On Special Club Coupe, remove "flipper" quarter window weatherstrip retainer and roof rail cover. Remove quarter glass garnish moulding and front pillar and roof side rail weatherstrip. On Chrysler and Imperial Models remove rear window glass and garnish moulding. On Windsor Models remove rear window glass and pull headlining out at top and down sides of window opening.

Pull headlining from under the rear package shelf and away from rear quarter panel and

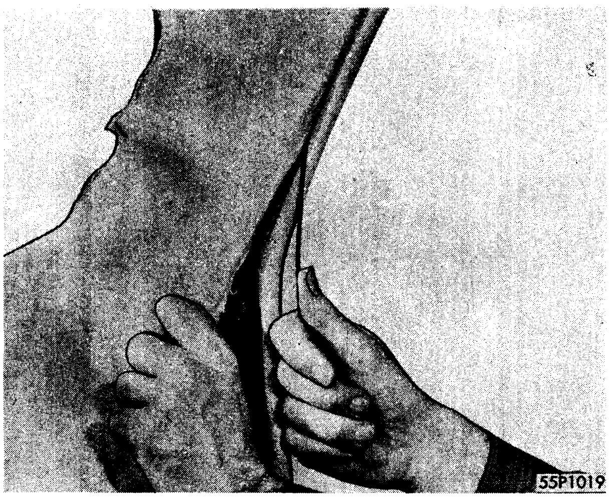

Fig. 93—Removing Headlining with Stiff Wire

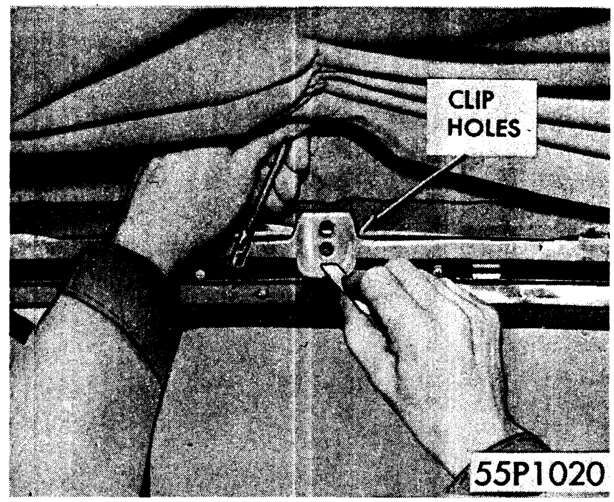

Fig. 95—Marking Holes

wheel housing. With screwdriver, pry headlining retainer strip (four-door sedan models only) away from roof rail above doors. Insert a piece of stiff wire, about eight inches long, between retainer strip and headlining to lift the headlining off retaining barbs, as shown in Figure 93. Pull headlining off retaining barbs at windshield header.

On all models, retaining brackets hold the rear headlining bow in position at the center. (Fig. 94) Pull the bow from brackets, spring the bow, and remove the end from holes in roof rail. Two sets of holes are provided in roof rails. Mark set of holes used, as shown in Figure 95. **On Imperial Limousine the front seat partition must be removed when installing headlining.**

Inspect roof pad silencer and cement silencer in place if necessary. **On Special Club Coupe Models,** remove the body front pillar and roof side rail weatherstrip and the drive nails at ends of headlining seams. Use a dull putty knife to separate the headlining from the roof rail. Carefully remove the material from the cemented surfaces on Special Club Coupe.

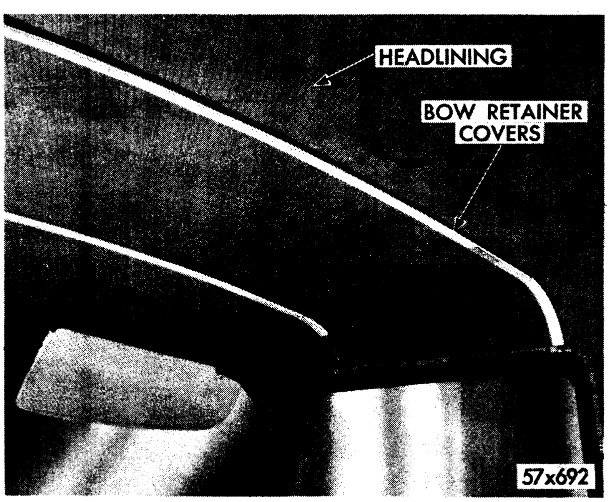

Fig. 94—Headlining Bows in Position

If new headlining is to be installed, remove the clips from bow ends, as shown in Figure 96, to permit removal of bow from listing. Bend up locking tab of clip and remove clip. Starting at rear of headlining, remove each bow from the old listing and install bow in position in new headlining. This will assure correct installation of bows. Before installing bows in new headlining, trim excess listing even with edges of headlining. Notch headlining at front and rear ends by making small V-shaped cuts to indicate the center of material, as shown

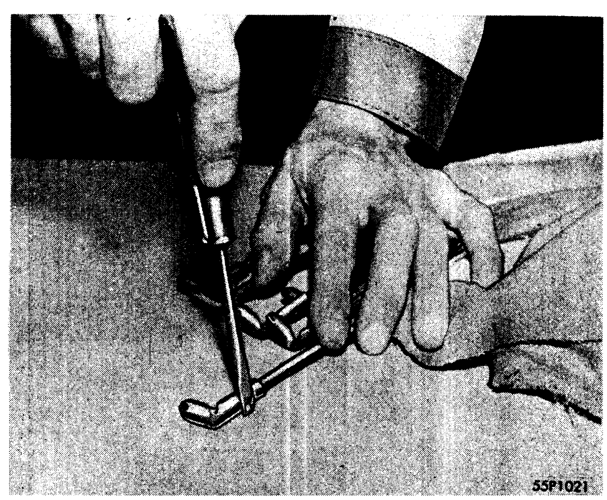

Fig. 96—Bending Locking Tab to Remove Clip from Bow

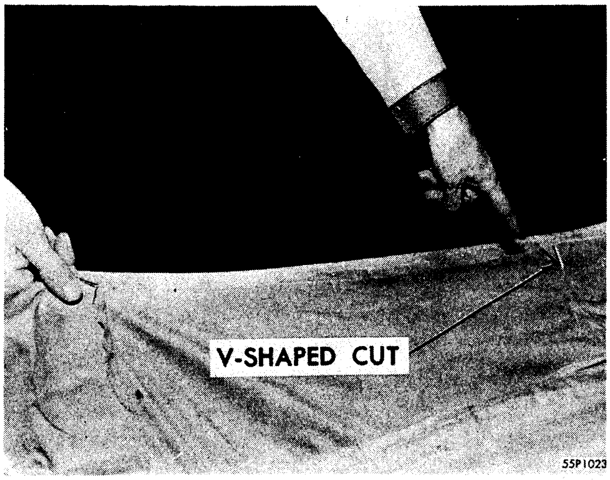

Fig. 97—Marking Headlining with Small V-Shaped Cuts

in Figure 97. Use these marks as guides to properly center the headlining.

b. Installation

Begin headlining installation at rear of car. Install rear bow in holes previously marked in roof rail. (On Imperial Models install on end of bows). Cut small hole in middle of listing for rear headlining bow support clip, as shown in Figure 98. This will prevent headlining from wrinkling. Bend the retainer clip around the rear bow.

Install the remaining bow, stretching headlining evenly so that approximately the same amount of material hangs down at both sides. Apply cement to windshield header bar and rear glass ventilator and rear window opening

Fig. 98—Cutting Holes in Listing for Support Clip

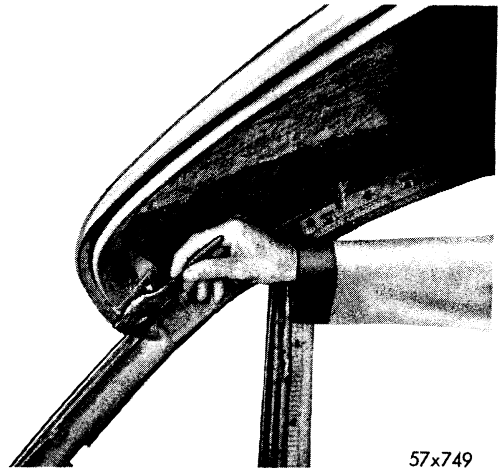

Fig. 99—Cementing Upper Rear Glass Quarter and Header Bar

Fig. 99. Cement to quarter panel and tack listings and seams to quarter panel opening. When cement is tacky, stretch headlining forward and over the cemented area end onto the barbs on windshield header. Make sure the first seam of headlining is straight. In most cases, the listing is longer than necessary. Cut the material at ends to prevent wrinkling at the seams when it is tucked or cemented in place. Cut listing from end up to clip. Do not cut listing too far up the bow. Otherwise, the headlining will not fit properly. After listings are cut, start at front and trim headlining so that only ½ to 1 inch of material, hand down below door windcord on all models, except Special Club Coupe (Fig. 100).

Tuck in first and second seams between roof side rail and retainer with a dull putty knife,

Fig. 100—Trimming Excess Material from Windcord

Fig. 101—Tucking Headlining between Roof Rail and Retainer

as shown in Figure 101. Tuck remaining material in place. When one man is performing the installation, work alternately from one side to other and complete one section at a time. Make certain that seams are straight. Keep material free from wrinkles until all of headlining is tucked in place between roof rail and retainer.

On Special Club Coupe Models, apply cement to the outside surface of roof rail, Fig. 102. Press headlining into position after cement is tacky. Make sure material is free from wrinkles. To prevent headlining from pulling loose, use drive nails to fasten material at seams to outside surface of rail, as shown in Figure 103.

To secure headlining at rear windows (all models except Town and Country Wagon), apply a light coating of cement to surface of opening, use cement sparingly. While allowing

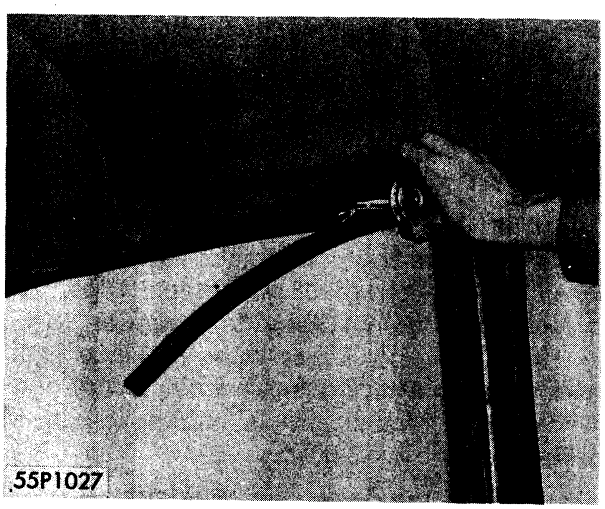

Fig. 102—Cementing Material to Underside of Side Rails at Quarter Window

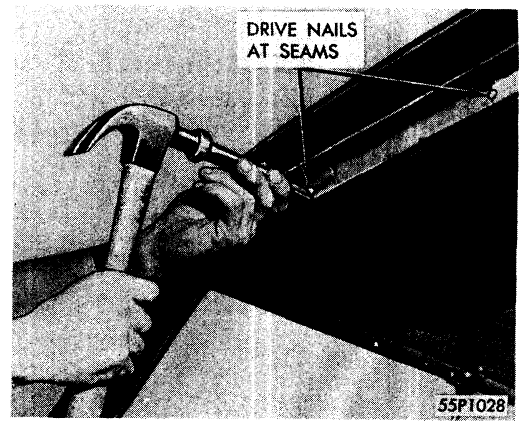

Fig. 103—Securing Material to Side Rails on Special Club Coupe

cement to become tacky, apply cement at quarter panel where material is to be cemented. Starting at center, press headlining onto cemented surface. Install the material across top and to a point about six inches from lower corners of window. Press material in place at quarter panel.

Install remaining portion of headlining at rear window and work out wrinkles. Tuck in remaining portion at forward edge of quarter panel. Locate center of dome light bracket. Cut a small hole in headlining at this point and pull wires through opening. Install wires to housing, apply a small amount of cement to inner edge of dome light bracket and install dome light. Install rear window, rear seat cushion, visors dome light windshield mouldings, and garnish moulding lights.

33. CLEANING OF INTERIOR UPHOLSTERY

The interior and exterior of body should be frequently cleaned during life of car to guard against deterioration. Frequent washing and polishing of body exterior and chrome parts will protect the finish.

Most stains can be removed quite easily from fabrics while they are fresh and have not hardened and set into the fabric. An exception is mud or clay, which should be allowed to dry so that most of it can be brushed off. It is also very helpful, though often not possible, to know the nature of standing matter so that proper solvent may be used. Most common stains can be removed with either a dry cleaning solvent, such as MOPAR Fabric Cleaner or carbon tetrachloride cleaning fluid, or with a water solution containing one-half of 1% of a non-alkaline detergent. Thus, if the nature of staining matter can only be guessed at and a dry cleaning fluid does not remove the stain, it should then be cleaned with a one-half of 1% solution of a detergent in water, or vice-versa. Some of the more common upholstery stains can be removed as follows:

Type of Seat Material	Type of Soil	Cleaners Recommended	Cleaning Procedure
Fabric	Oil, Grease, Tar Trim Cement	MOPAR Fabric Cleaner Part #680183	Wet a piece of clean white cheesecloth with a little cleaning fluid. Wring out excessive solvent. Wipe the fabric with a lifting motion working from the perimeter of the spot toward the center. Repeat the procedure with a clean piece of cheesecloth until spot is removed.
Fabric	Candy, Ice Cream, Soda, Catsup, Mustard	0.5 solution of household detergent in water	Same cleaning procedure as above using recommended cleaner.
Fabric	Dirt	MOPAR Kar Kleen, Part #1643100 and fairly stiff bristled brush.	Dip the brush in a container of Kar Kleen and scrub the entire cushion or seat back. Wipe dry as possible with a turkish towel. Allow to dry over night before sitting on cushion or seat back.
Vinyl and real leather	Oil, Grease, Tar, Trim Cement	MOPAR Fabric Cleaner Part #690183. Household detergent and water.	Wet a piece of clean white cheesecloth with a little solvent cleaning fluid and wring out excess. Rub out the spot. Use a brush on stubborn spots. Go over cleaned area with cheesecloth wetted with solution of household detergent and water. Wipe dry with clean piece of cheesecloth.
Vinyl and real leather	Candy, Ice Cream, Soda, Catsup, Mustard	MOPAR Kar Kleen, Part #1643100	Wet a piece of clean white cheesecloth with recommended cleaners and rub out spot. Use a brush on stubborn spots, wipe dry with a clean piece of cheesecloth.
Vinyl and real leather	Dirt	MOPAR Kar Kleen, Part #1643100, and a fairly stiff bristled brush.	Dip the brush in a container of the Kar Kleen and scrub the entire cushion or seat back. Wipe dry with a turkish towel or equivalent.

34. PAINT FINISH CONDITIONS

a. Dark Spots Appearing on Paint (Polychromatic)

This condition can be caused by foreign particles that are carried through the air and settle on the flat surfaces of paint.

If any of this foreign substance, containing acid-like particles, is allowed to remain on paint for any length of time, it may result in a spotting condition. This spotting condition is caused by the reaction of such particles with the aluminum, used in all polychromatic paints, causing the aluminum flakes to disappear, leaving the base color. These same acid-like particles can also attack a non-metallic paint, but it will usually result in an etched condition rather than a discoloration.

In view of the foregoing, it is advisable to wash cars frequently to prevent the possibility of such conditions occurring.

b. Foreign Material in Paint

In some instances where minute particles of foreign material have embedded themselves in the horizontal surface of paint, they are quite likely abrasives, such as metal particles, that have been carried through the air. If particles are allowed to remain on paint surfaces for any length of time in the presence of moisture, a chemical reaction will take place, resulting in metal particles eating into paint surface. Early removal of this material by a thorough washing will prevent this from happening. When above described condition is encountered in the field, it is often mistakenly diagnosed as rust coming up from the metal below the paint.

BODY SEALING

35. BODY SEALING PROCEDURE

The following sealing procedures apply to all Chrysler and Imperial sedan and hardtop bodies, except in those specific cases where the particular model or body type is specified.

Always make the necessary adjustments to the doors, extruded aluminum door upper frames, window frames, vent windows, and luggage compartment lid before attempting to seal any part of the body where such adjustments may be required. If the sealing operation is performed first, changing of the adjustment will destroy the good sealing. **MAKE THE ADJUSTMENT FIRST.**

Locate the source of the leaks, by water test, or the use of trace powder and the testing bulb. When performing a water test, it is preferred that water be confined to a small area where the source of leaks are suspected. Water in a small stream or spray should be applied to the lowest

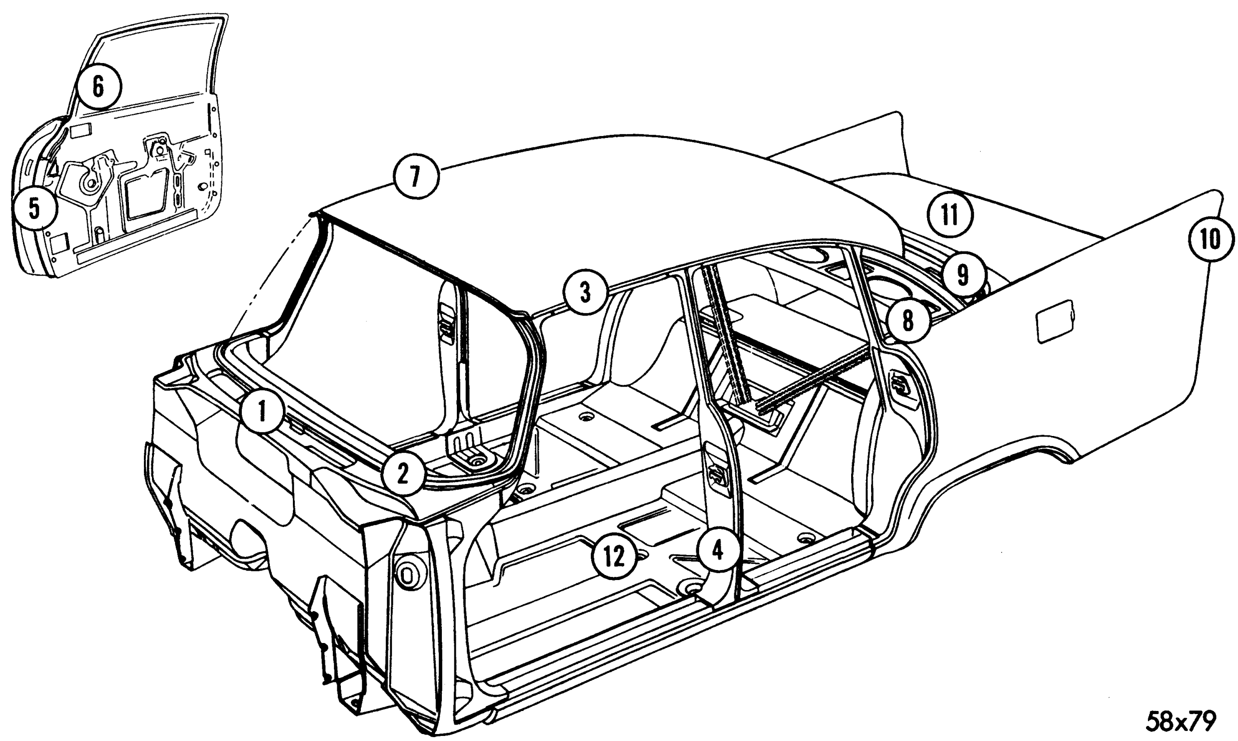

Fig. 104—Body Sealing Points (Chrysler Models)

1—Cowl
2—Windshield
3—Roof
4—Door Openings
5—Doors
6—Front Door Vent Window
7—Window Frame Weatherstrip (H.T.)
8—Rear Quarter Vent or Window (Sedan)
9—Rear Window
10—Rear Quarter Panel
11—Luggage Compartment
12—Floor Panel

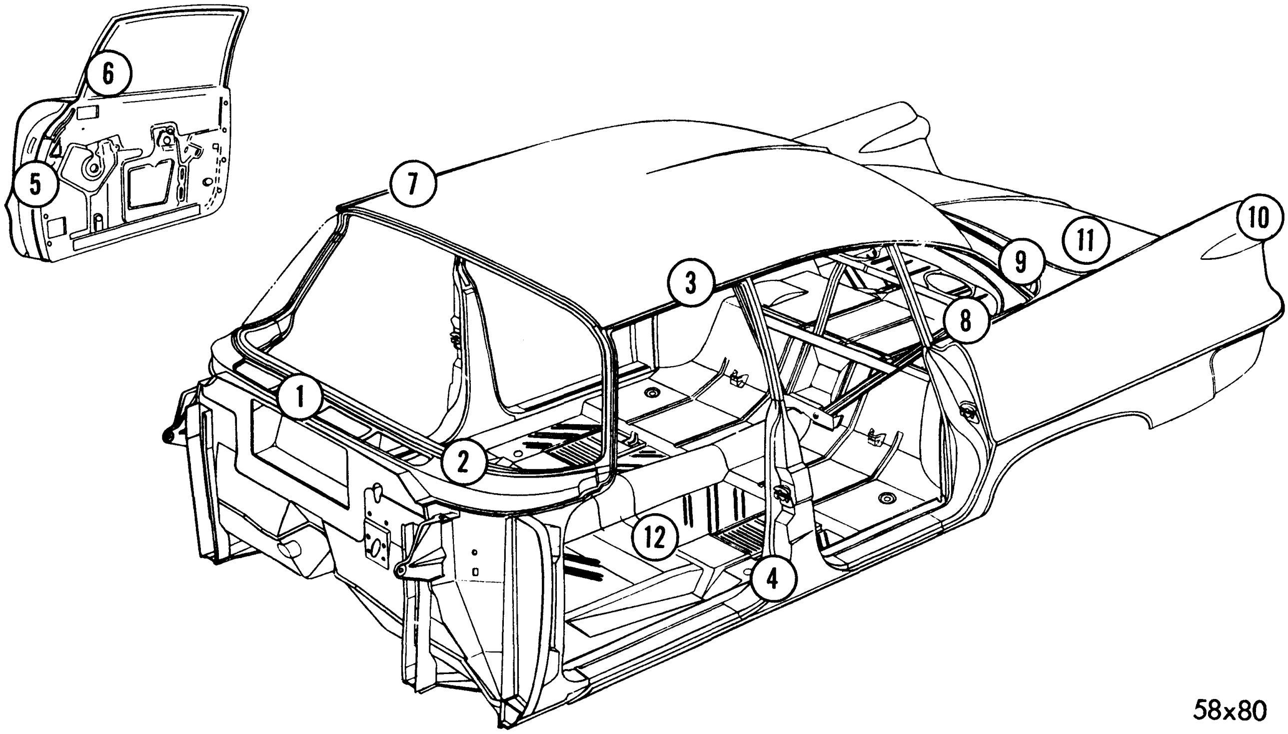

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Fig. 105—Body Sealing Points (Imperial Models)

1—Cowl
2—Windshield
3—Roof
4—Door Openings
5—Doors
6—Front Door Vent Window
7—Window Frame Weatherstrip (H.T.)
8—Rear Quarter or Window (Sedan)
9—Rear Window
10—Rear Quarter Panel
11—Luggage Compartment
12—Floor Panel

point of the suspected area, then gradually move the water up slowly until the source of the leak is located. Water running down from the top of the car may run in at more than one point; by moving the water up from the bottom, each leak can be located and marked before moving on up to check for other possible points of leakage, as shown in Figures 104, 105.

Do not attempt to seal a car that is wet or

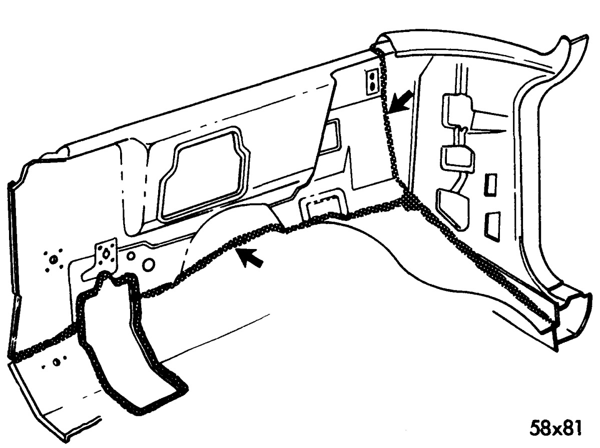

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Fig. 106—Dash Panel (Inner)

dirty. An effective seal cannot be accomplished under these circumstances. Dry the car (with compressed air if necessary) after the water test before proceeding with the sealing operation. The weatherstrip must be absolutely dry. Use a heat lamp or compressed air to dry the weatherstrip.

The door weatherstrips, luggage compartment lid weatherstrips, and most other seals are made of porous sponge rubber, which will absorb water. All adhesion surfaces should be completely cemented for a permanent and effective installation. When working with cement, use the "two coat" method. A thin coat should be applied to each surface to be bonded. Let the cement almost completely set up, then bond the two surfaces together.

Always use the correct sealing material designed for each specific application. Substitution may result in poor sealing.

Many of the difficulties encountered in obtaining good tight seals are due to rough or uneven contact surfaces. Smooth in the coach joints and the junction points of the "A" and

"B" posts at the roof rail with sealer or body putty that can be painted. Rough or uneven windshield or rear window fences should be straightened and smoothed to obtain a good seal at this point.

36. COWL

a. Dash Panel (Inner)

Carefully inspect these seams (Fig. 106) from one end to the other for possible openings or breaks. Seal with black mastic or body caulking putty depending upon the size of the opening. Seal the cowl dash panel to side seams in the same manner.

b. Dash Panel (Outer)

Plug and seal every screw hole, clip hole, punch out plate, brackets, and grommets on the dash panel (Fig. 107). Inspect the seal around the heater and blower housing. Be sure the drain tubes are properly installed.

The master cylinder bracket, accelerator linkage bracket, and the grommets around the wiring harness, wires, control cables, etc., through the dash panel, should be thoroughly packed around the top, bottom, and the sides with body caulking putty. Be sure the slot in the grommet is down. Seal the slot with liquid body sealer. Place a bead of black mastic or body sealer around the outer edges of the grommets to seal them to the dash panel. The type of sealer used will depend upon the individual requirement.

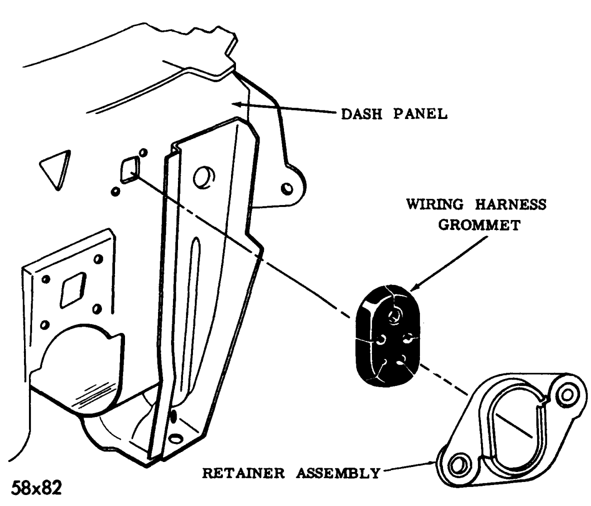


Fig. 107—Dash Panel (Outer)

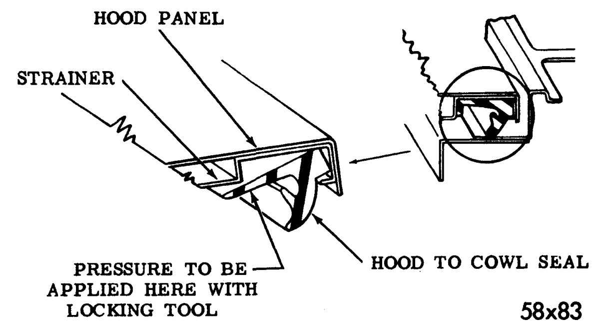


Fig. 108—Hood

c. Hood

Locate the hood to cowl seal weatherstrip (lacing) on the hood properly, and lock in place (Fig. 108). Inspect the hood hinge mounting since water can enter through the mounting stud openings. Seal around the hinge mounting plate with a sufficient amount of black mastic sealer. It is also advisable to seal around both the fender to cowl upper attaching bolt and bracket.

37. COWL UPPER PANEL AIR INTAKE

On Chrysler models snap out the intake screen. Refer to Figure 109 and pack body caulking putty into the flange joint seams and at the junction of the heater plenum chamber to the cowl upper panel around and at the outer ends of the air intake. Seal around the rubber strip seal at the rear edge of the air intake with body sealer. Pack body caulking putty around the welded joint of the brake pedal and master cylinder mounting pad. Seal the lower edge of the heater plenum chamber with black mastic or body sealer. Pack the junction of the air intake opening bridges at the rear edge of the opening and plenum chamber with body caulking putty.

On Imperial models to remove the fresh air intake screen will require removal of the heater housing and core, or the removal of the fresh air door from the heater plenum chamber inside the vehicle to gain access to the screen attaching stud nuts. In most cases to seal around the brake master cylinder bracket, liquid body sealer may be injected through the left end of the screen and blown into place by compressed air. The sealer may be cleaned off the screen by a cloth saturated with solvent. If

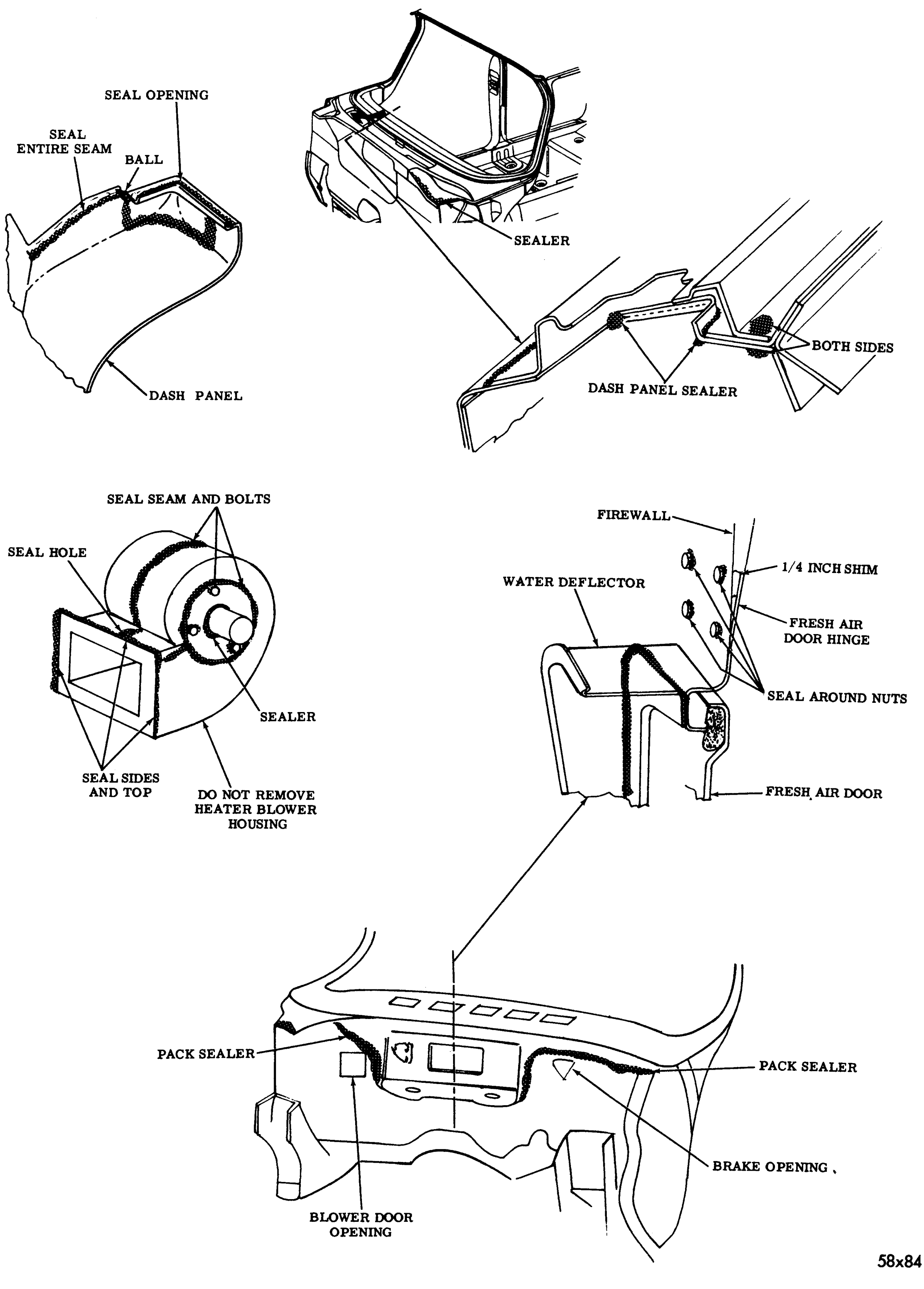


Fig. 109—Cowl Upper Panel Air Intake

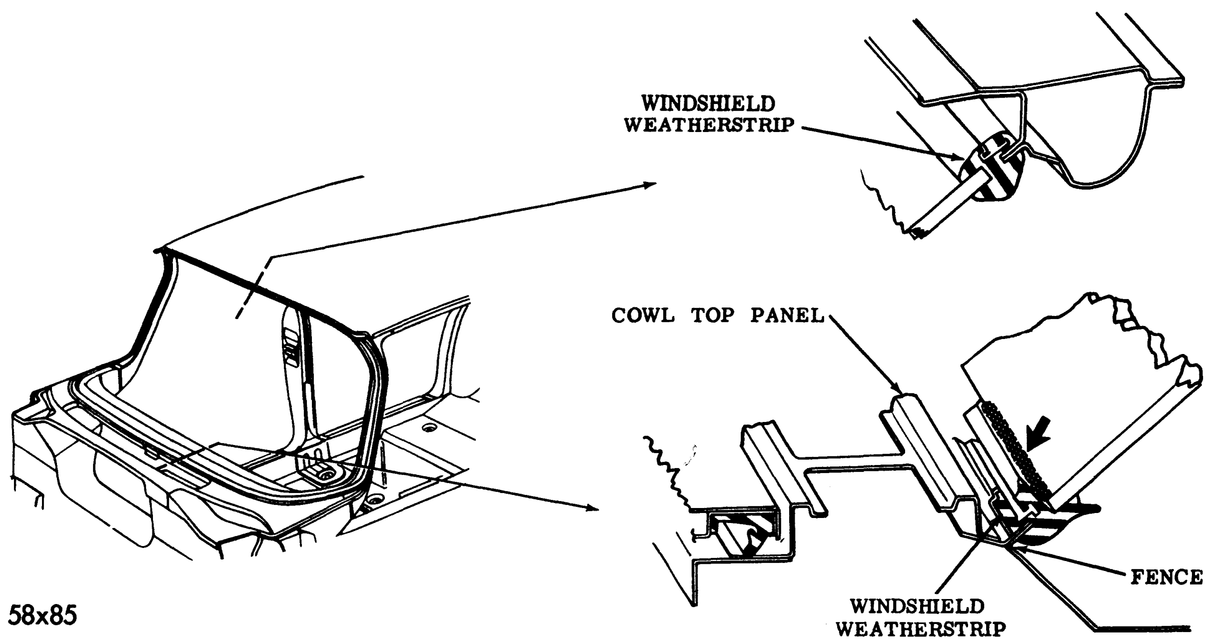


Fig. 110—Windshield Glass and Weatherstrip

further sealing around the air intake or plenum chamber is necessary, the air intake screen will have to be removed.

38. WINDSHIELD

Windshield water leaks are usually caused by one of three causes: Leaks between the glass and weatherstrip are caused by the weatherstrip not fitting the contour of the glass tightly, often caused by overlapping of the weatherstrip lock. Leaks between the weatherstrip and the windshield opening flange or fence, usually

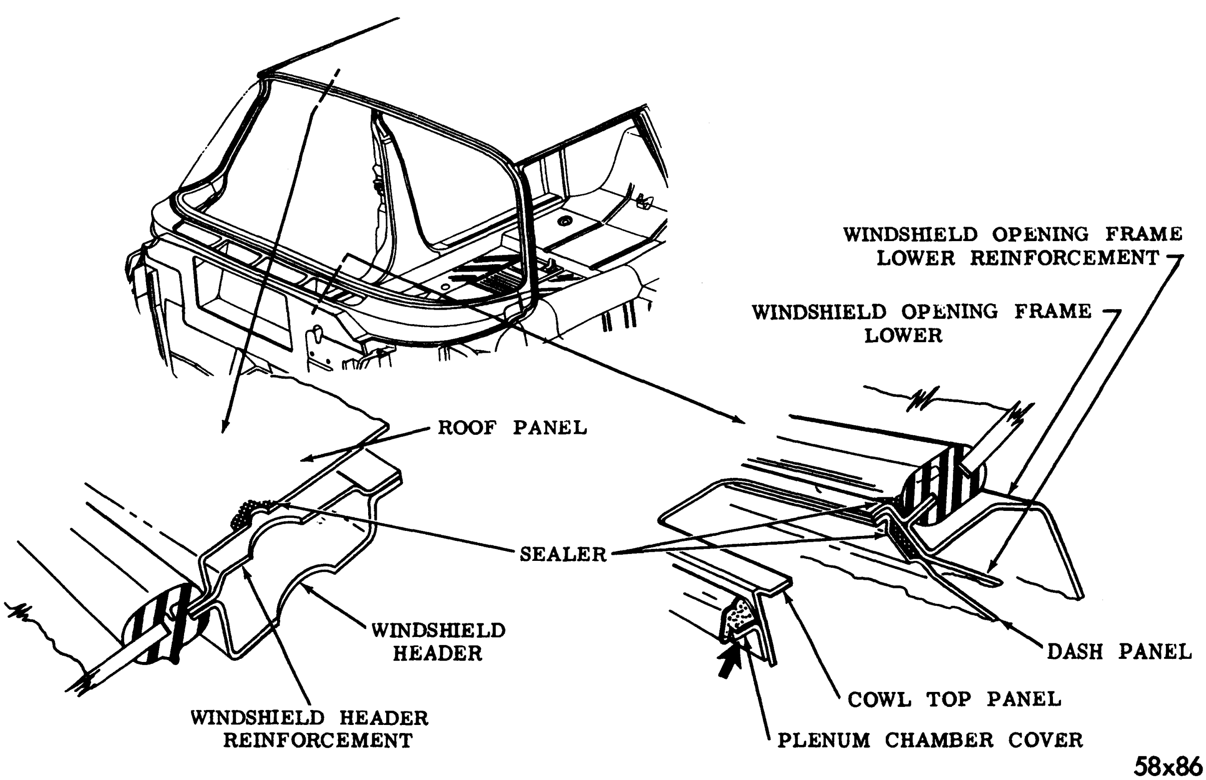


Fig. 111—Windshield Weatherstrip and Vents

result from improper fit of the weatherstrip to the fence, caused by a low, bent or rough fence. Leaks because of a gap between the glass edge and the weatherstrip are caused by the windshield opening fence being too large for the glass. This is generally indicated by the upper corners of the glass coming out of the weatherstrip.

a. Windshield Glass and Weatherstrip

Use weatherseal cement to seal between the windshield glass and the weatherstrip (Fig. 110). Using this material, insert the pointed nozzle of the dispensing gun about 1/8 inch between the glass and the weatherstrip and apply a bead of cement all around between the glass and weatherstrip. Apply about three feet at a time, wiping off the excess with a dry cloth as you proceed. When the seal is completed, clean the remaining excess off with a cloth moistened with solvent. The use of the weatherseal cement between the glass and weatherstrip will also correct crunching noises at the windshield.

To correct a gap between the windshield glass and weatherstrip, it is necessary to remove the glass from the weatherstrip. Insert a piece of 3/16 inch round plastic welt or insulated wire in the lower glass channel of the weatherstrip to hold the glass and seal as described in paragraphs above.

b. Windshield Weatherstrip and Vents

To correct water leaks between the windshield weatherstrip and opening fence (Fig. 111), remove the windshield trim mouldings. Inspect the weatherstrip lock for proper engagement. Apply body caulking putty at the lip of the weatherstrip where it contacts the opening frame; completely around the weatherstrip. If leaks occur at the top of the windshield, it is

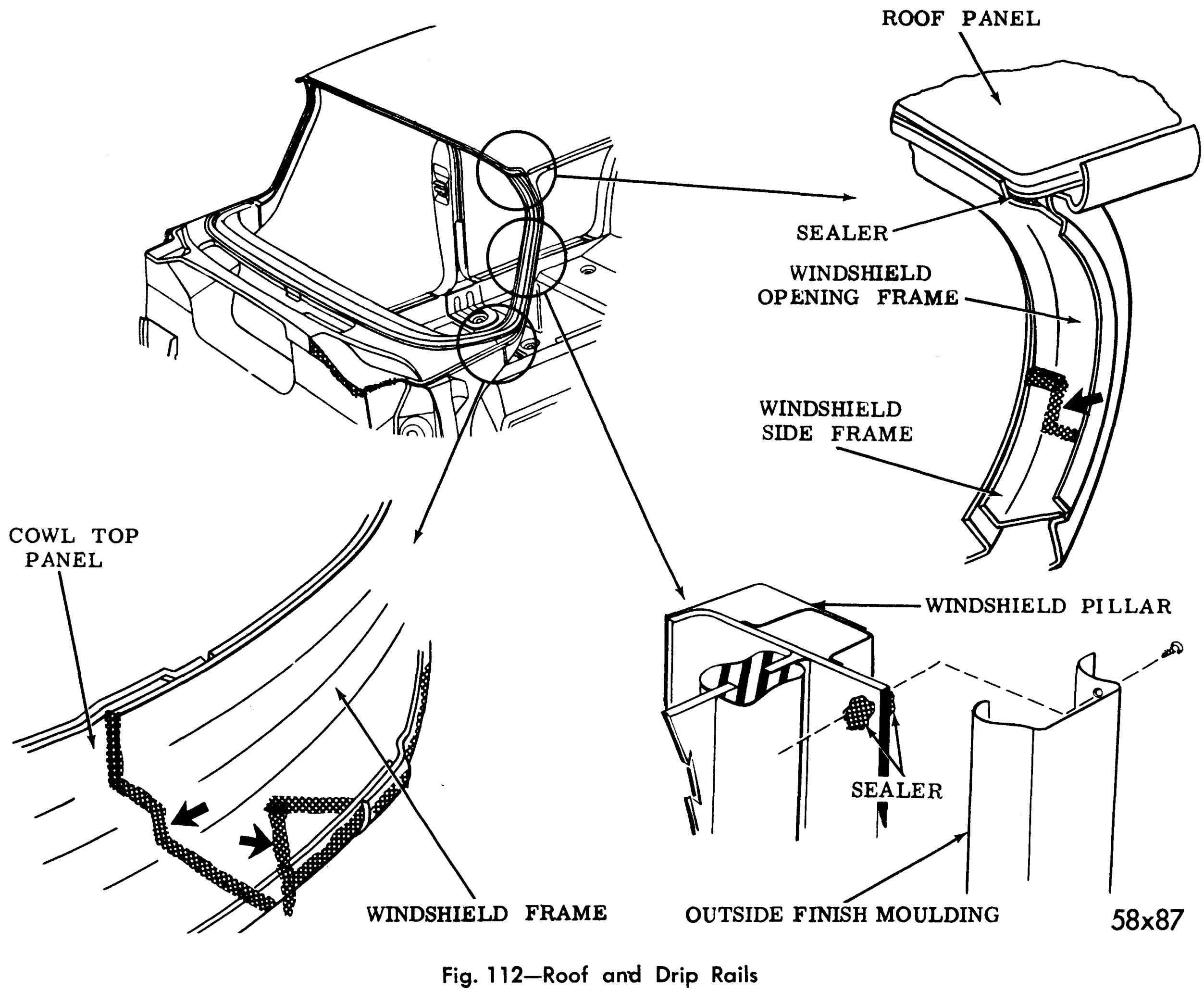


Fig. 112—Roof and Drip Rails

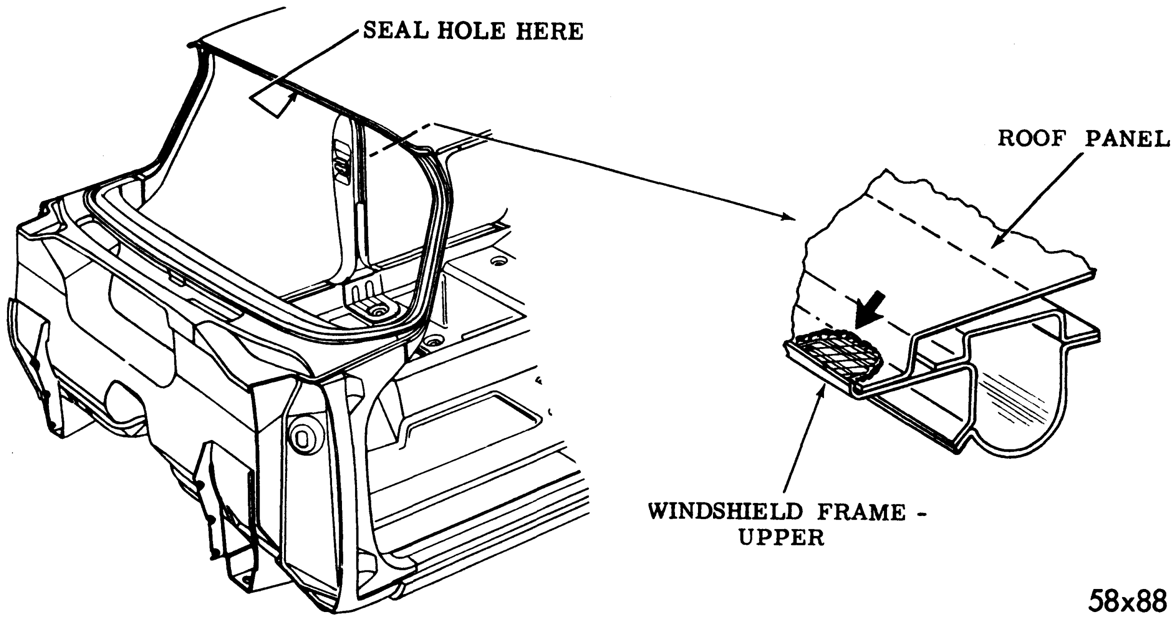


Fig. 113—Roof (Front Section) (Chrysler Models)

advisable to inspect and seal the seam joint between the roof panel and windshield opening frame flange. Form a ball of putty and place it in each moulding retaining clip bolt hole. When installing the mouldings, press the retaining clip both through the ball of putty. Install the windshield mouldings and seal around all moulding retaining clips and screws using body caulking putty.

39. ROOF

Before proceeding with the roof water leak correction, the roof should be carefully water tested to locate exactly where the water is coming in. A leak at the flange joint of the roof to the windshield frame, or the joint of the roof to the drip rail at the forward end, will often appear as a leak in the joint seam at the knee of the front door hinge pillar ("A" pillar) (Fig. 112).

Inspect the roof drip rails (Fig. 112) carefully from one end to the other, for skips or breaks in the seal between the roof flange and drip rail. Inspect for spot weld burns in the roof

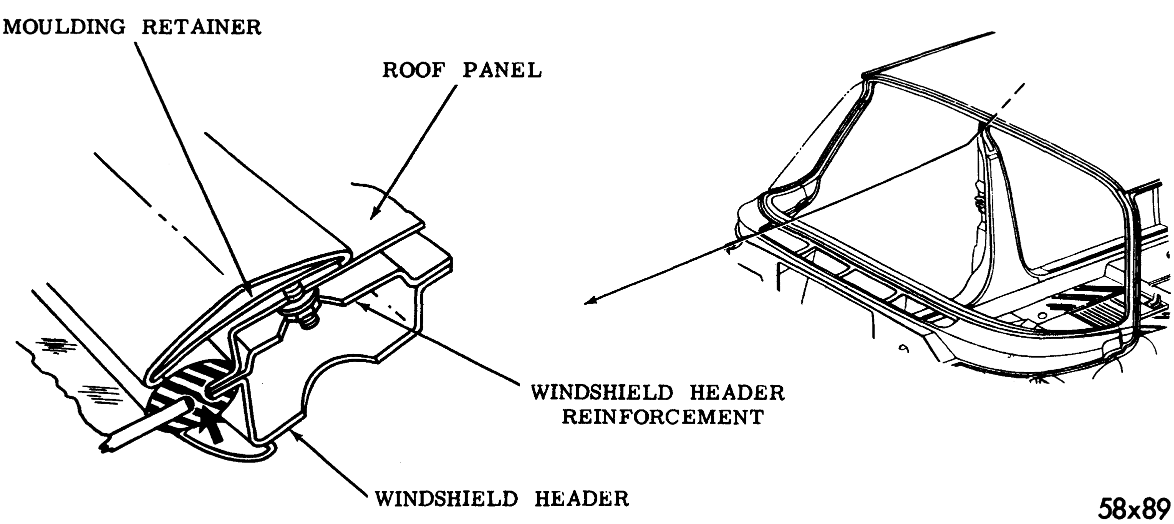


Fig. 114—Roof (Front Section) (Imperial Models)

flange. Clean the roof drip rail thoroughly. Lay one or two strands of body caulking putty (black or neutral, depending upon the color or body). Press the putty down and out toward the edge of the roof flange. Press it into the seam joint using a putty applicator. Clean off the excess putty with a cloth moistened with solvent. If necessary, the putty seal can be painted.

It is advisable to inspect the seam joint sealing under the drip rail. Occasionally the seal is incomplete or broken. Seal completely using body caulking putty.

On Chrysler models when correcting a water leak at the front end of the roof (Fig. 113), be sure to fill the slotted notches in the roof flange at the front end of roof with body caulking putty. These notches can be seen by removing the windshield pillar mouldings.

On the Imperial models, to correct water leaks at the roof trim mouldings (Fig. 114), it is necessary to remove that portion of the headlining to expose the attaching nuts. After removing the headlining, remove the trim mouldings and seal around each retaining stud and clip with body caulking putty.

On Imperial Southampton models, inspect the joint seam where the front and rear sections of the roof are joined together (Fig. 115). Seal this joint with liquid body sealer. Form a ball of putty and place it into each moulding retaining clip bolt hole. Push the clip bolt through the ball of putty when installing the moulding. Seal around each moulding bolt inside the body with body caulking putty. Install the washers and nuts and tighten firmly.

When correcting leaks at the front end of hardtop models, while the headlining is down, inspect the sealing at the junction of the roof rails, windshield opening header, and windshield pillar (upper "A" pillar). Seal these joints with body caulking putty.

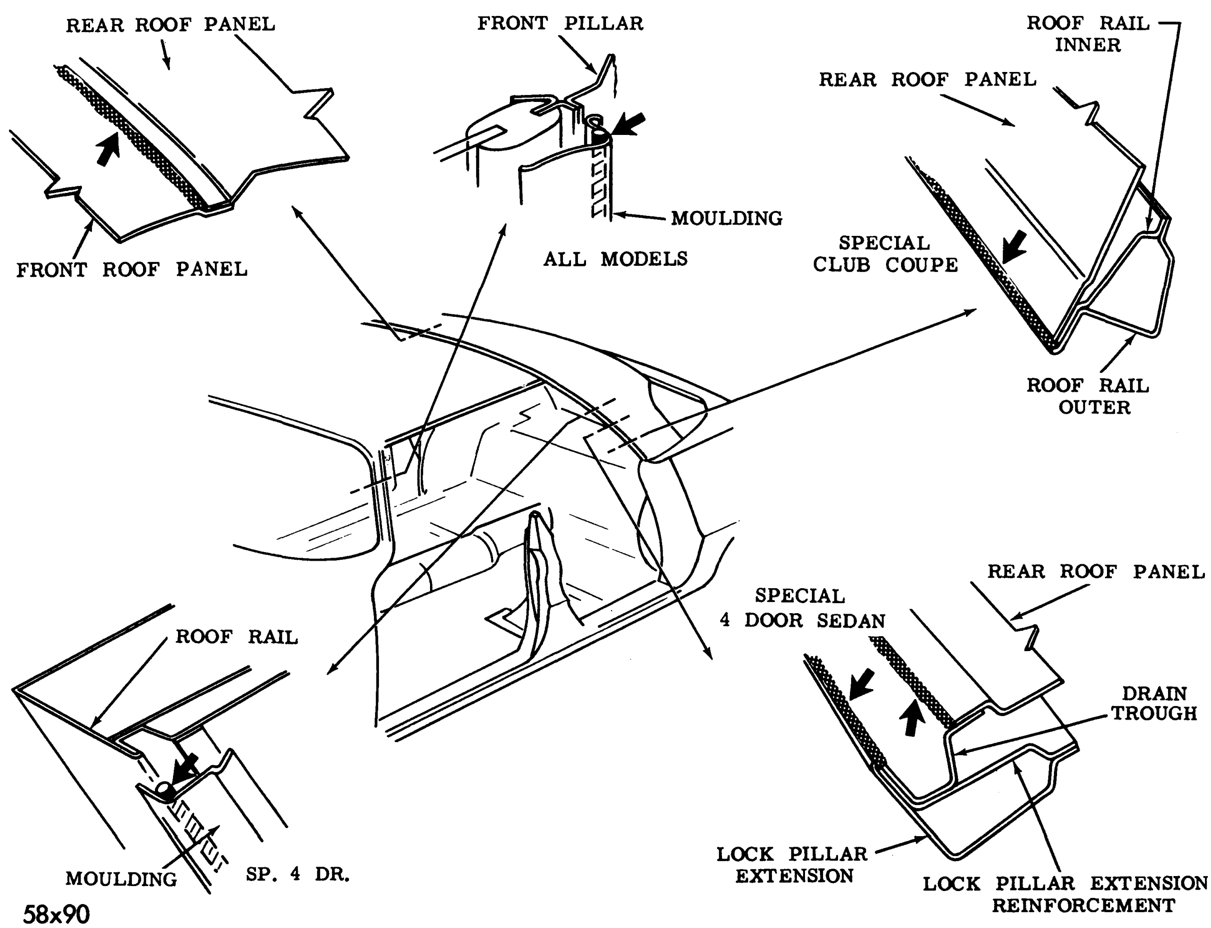


Fig. 115—Roof (Rear Section)

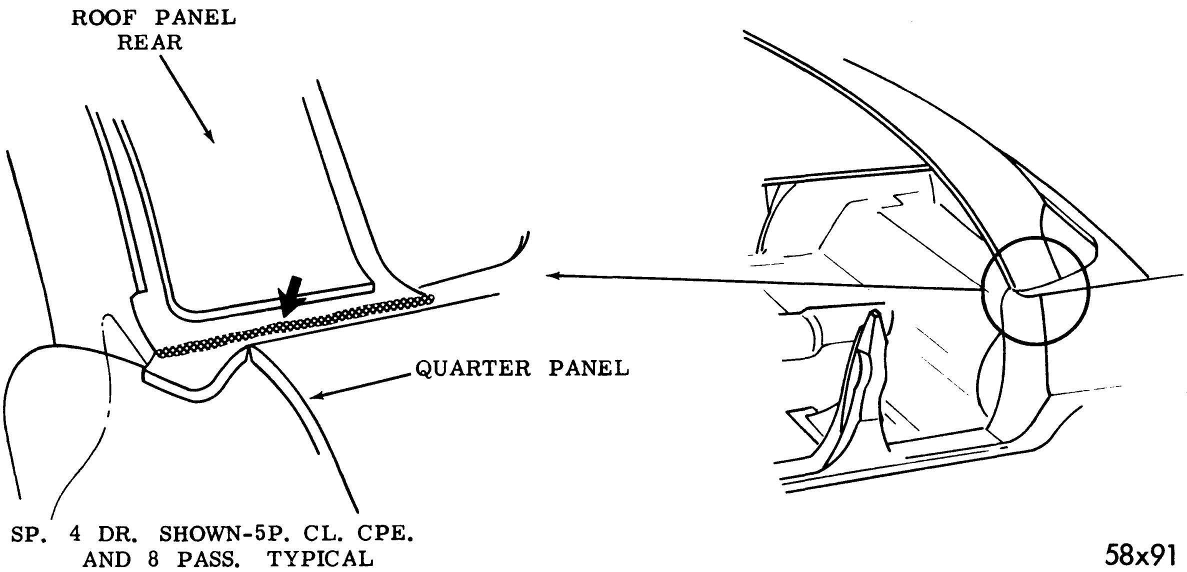


Fig. 116—Roof Panel (Rear)

On Imperial Southampton models if the headlining gets wet in the area of the rear quarter, it may be possible that the leak is coming in at the side roof rail rear moulding or through the seam joint where the rear roof panel joins the drain trough, and the lock pillar extension reinforcement (Fig. 116).

To correct this leak it is necessary to remove the rear roof rail side moulding. Seal the entire seam between the lock pillar extension reinforcement ,the drain trough and the rear roof panel. Use body caulking putty, or brush in liquid body sealer.

Apply body caulking putty between the outside moulding and the side roof rail rear along the entire length of the moulding. Install the moulding.

40. DOOR OPENINGS

Door openings (Fig. 117), contribute to water leaks in two ways: First, there may be leaks at the metal joint seams, and secondly, the roughness of the door opening metal or coach joints may not provide a good sealing contact surface for the door weatherstrip.

Inspect for rough, exposed or unsealed metal joint seams (Fig. 117). If the seams are shallow and small, apply liquid sealer and allow to dry. If the seams are rough, large or deep, smooth by metal finishing. Then apply cold solder with a spatula or putty knife smoothing it down as much as possible, and let it completely set up. Finish off with a sander and paint.

Note particularly the metal seam joints and the coach joints at the junction of the floor side sill to floor pan and the "A," "B" and "C" pillars (Fig. 118). Water and dust can get through this joint and under the sill scuff plate. It is recommended to seal under the full length of the seam and around the coach joints using liquid body sealer, applying it with a dispensing gun.

41. DOORS

Before attempting to correct door weatherstrip water leaks (Fig. 119), it is most important that the doors be properly adjusted to the body door opening, and that the window frames be properly adjusted to fit the contour of the door opening. Refer to the adjustment procedure Paragraph 3 of this section. Sufficient adjustments are provided to obtain fore and aft, up and down, and in and out adjustment of the window frames. **Be sure the door and window frame fits the door opening and body contour.**

Leaks around the door weatherstrip may be detected by water test, blue carpenters chalk, or the use of tracepowder and testing bulb. When using chalk or trace powder, a good seal will be indicated by an unbroken chalk line. A weakness in the seal will be indicated by-pass or blow through of the powder.

Rolled, kinked, or creased weatherstrip, as

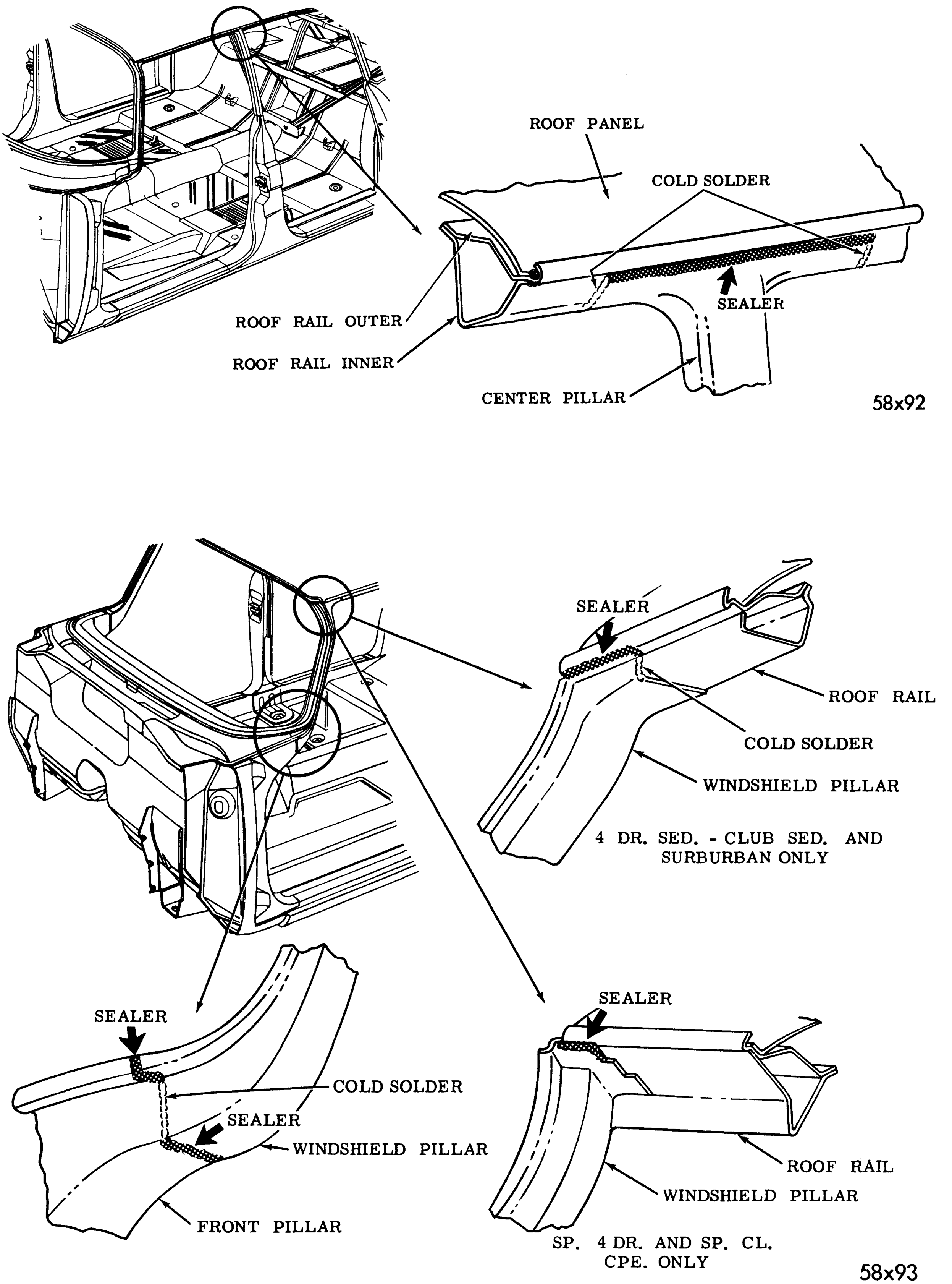


Fig. 117—Door Openings

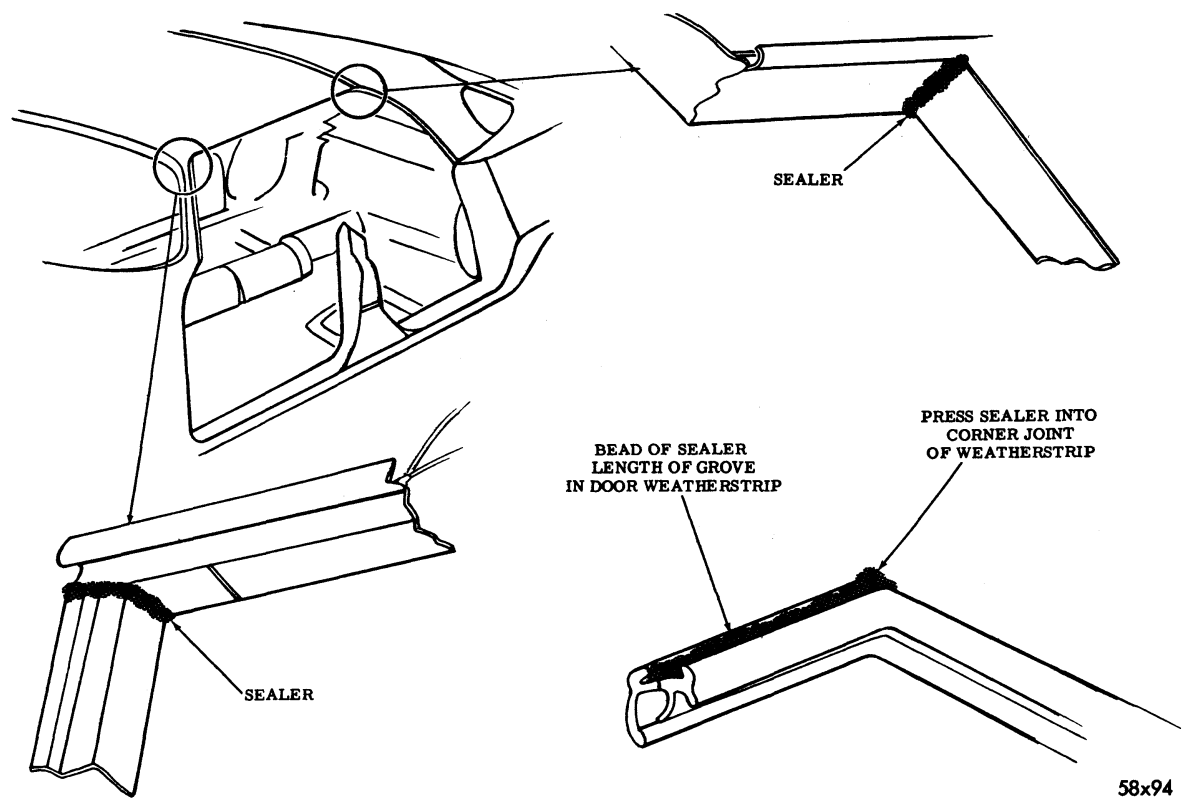


Fig. 118—Door Pillars (Chrysler Models)

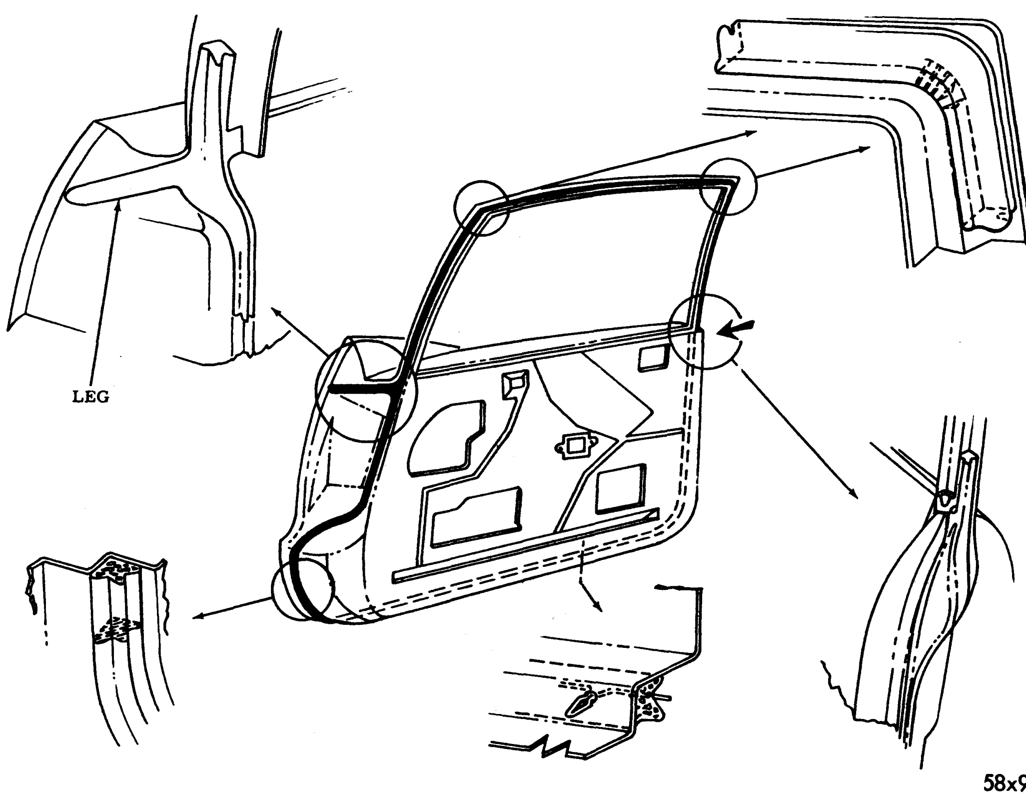


Fig. 119—Doors (Imperial Models)

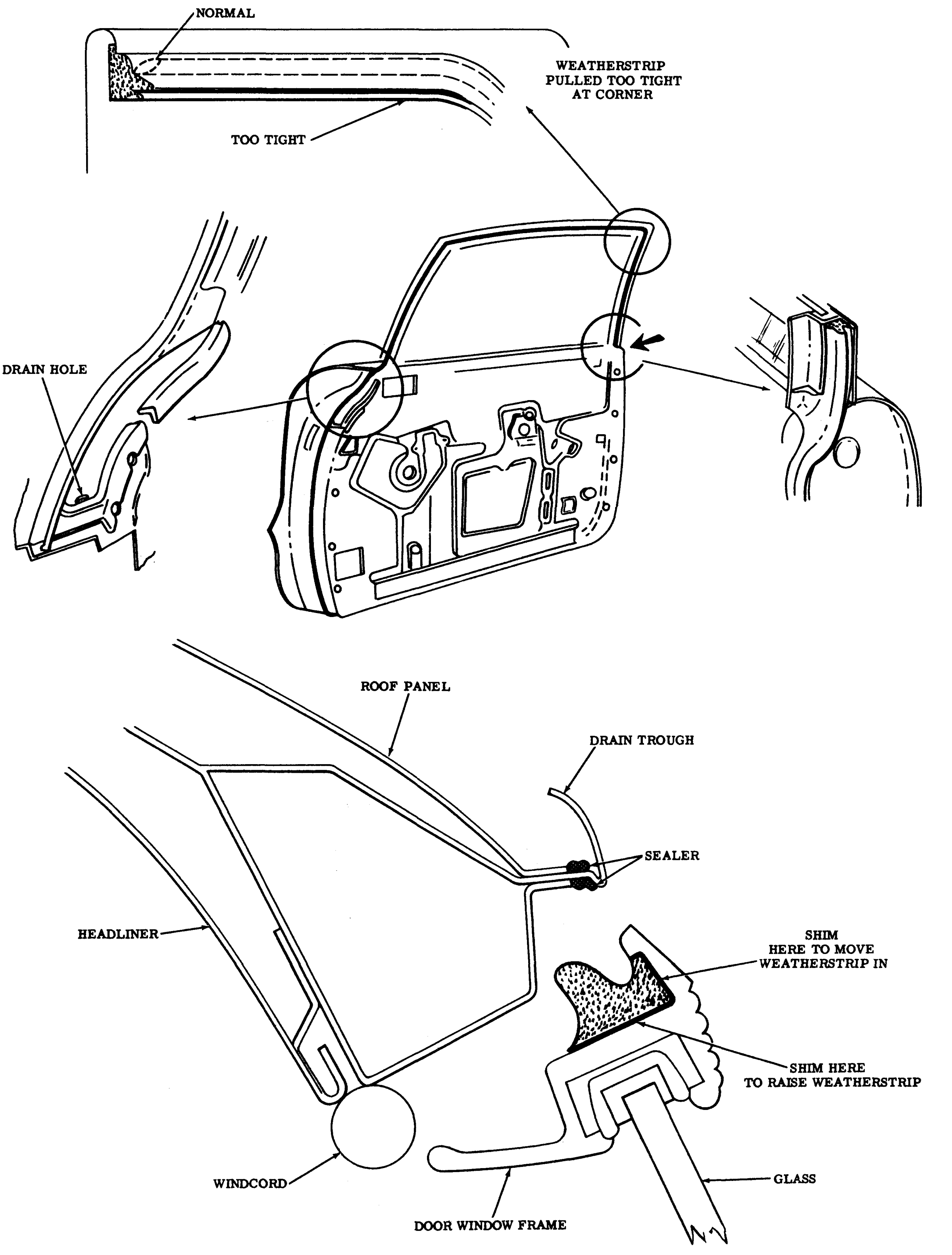


Fig. 120—Door Weatherstrip

well as breaks and openings or gaps between the ends of the weatherstrip, and loose weatherstrip or shallow areas all can contribute to dust and water leaks.

Faulty weatherstrip should be removed and the old weatherstrip cement should be carefully cleaned off. The weatherstrip is moulded so that certain areas of the weatherstrip must fit into the window frame clearance radius in the roof rail, and other contour areas of body when the door is closed. Weatherstrip that has worked loose should be stripped from the door, the old cement removed with solvent, and the weatherstrip recemented with new cement.

When installing new weatherstrip (Fig. 120), apply a thin coat of weatherstrip cement to the two surfaces that are to be bonded to the door flange and window frame and let it set up until tacky, while a thin coat of cement is applied to the door inner panel and flange and the window frame areas which are to be bonded to the weatherstrip. Allow the cement to set until tacky, and then carefully and firmly press the weatherstrip into place.

Build up the low areas of the weatherstrip to obtain a greater overlap of the weatherstrip against the door opening, install the closed cell rubber shim stock under the weatherstrip. To obtain greater compression of the weatherstrip against the door opening, install the closed cell rubber shim between the weatherstrip and the flange of the door or the extruded aluminum frame. Be sure to taper off the ends of the shim stock, since blunt ends will cause water leaks. Loosen the weatherstrip where the shim is to be installed. Clean off the old cement with solvent. Apply weatherstrip cement to both sides of the shim, and to the weatherstrip and door

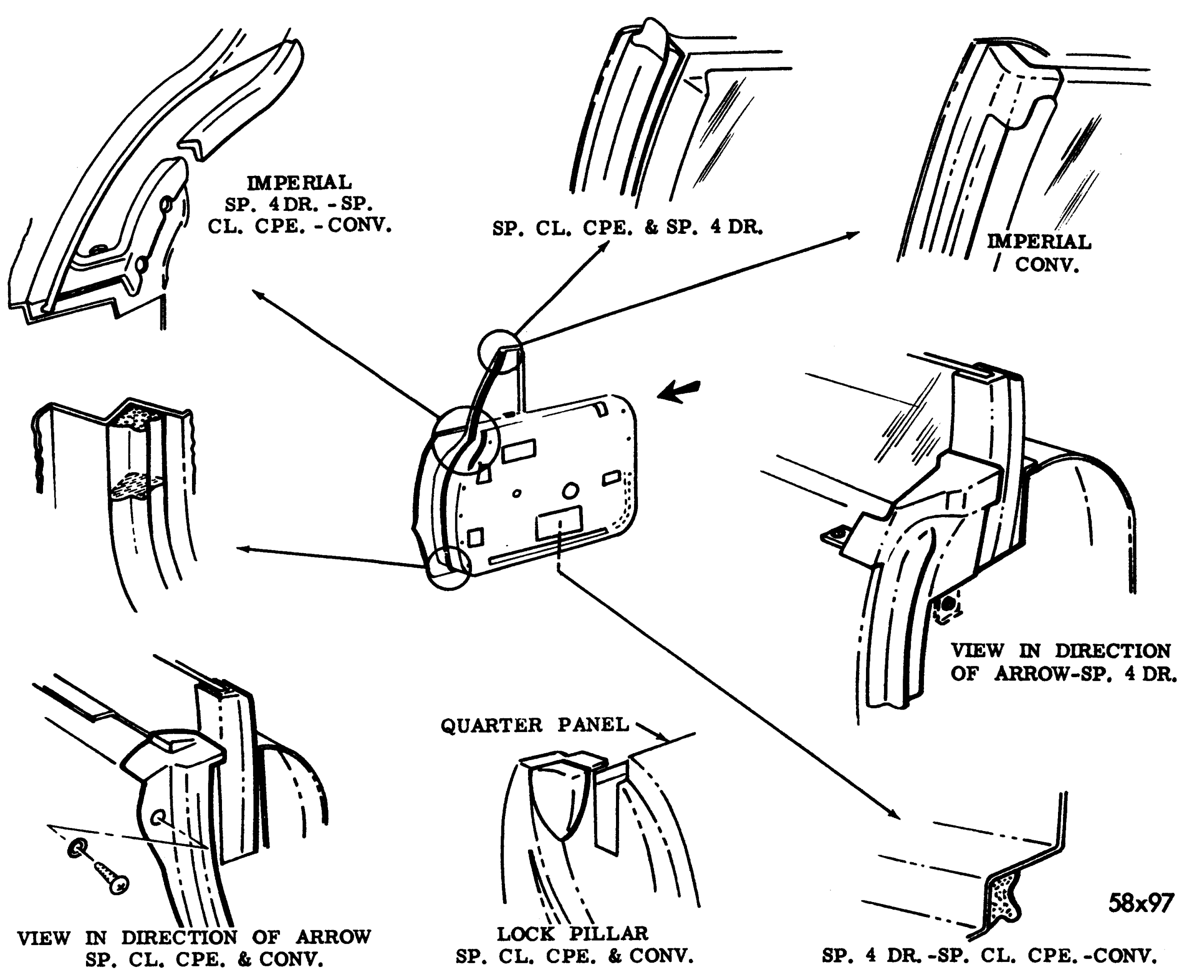


Fig. 121—Auxiliary Weatherstrip Installation (H.T.)

bonding areas. Allow to set up until tacky. Install the shim and press the weatherstrip firmly in place (Fig. 121).

To obtain a smooth radius of the weatherstrip around the corners of the door window frame, slot the weatherstrip on the inside of the radius to allow the weatherstrip to bend smoothly around the corner. Fill the slots with weatherstrip cement or black mastic sealer.

If the weatherstrip is pulled too tightly around the corners (Fig. 121), is may be corrected by loosening the weatherstrip along the window frame and carefully cutting the cord on the back corner of the weatherstrip in several places to allow the weatherstrip to stretch up so that enough weatherstrip stock is available to provide a gentle curve around the door window frame corner. Clean off the old weatherstrip cement, and recement the weatherstrip in place as previously described.

Hand brush weatherstrip cement to the molded weatherstrip sections before assembly. Apply weatherstrip cement to all doors to weatherstrip bonding surfaces and locate as shown:

Install the front door hinge pillar weatherstrip, locating the upper tab of the weatherstrip 1/8 inch above the top of the vent window frame (Fig. 121). On convertible models the hinge pillar weatherstrip must be flush with the top of the vent window frame.

On the front door of 4-door hardtop models, locate the inner tab of the lock pillar weatherstrip inside the rear flange of the inner door panel and fasten with the attaching screw. Locate the upper metal tab in the groove on the upper edge of the door inner panel and fasten with the attaching screw. Attach door bottom weatherstrip with cement and formed wire retainer. Locate front door knee weatherstrip, align with trim panel clip holes, and the hole on the shut face of door inner panel. The foot of the (knee) weatherstrip must contact the upper weatherstrip on the shut face.

On 2-door hardtop and convertible models, locate the lock pillar weatherstrip in the depression on the door inside panel and fasten with the attaching screw and washer.

Splice the upper and lower weatherstrips with cement to form a water tight joint. Locate the lock pillar auxiliary weatherstrip and cement to the upper end of the lock pillar.

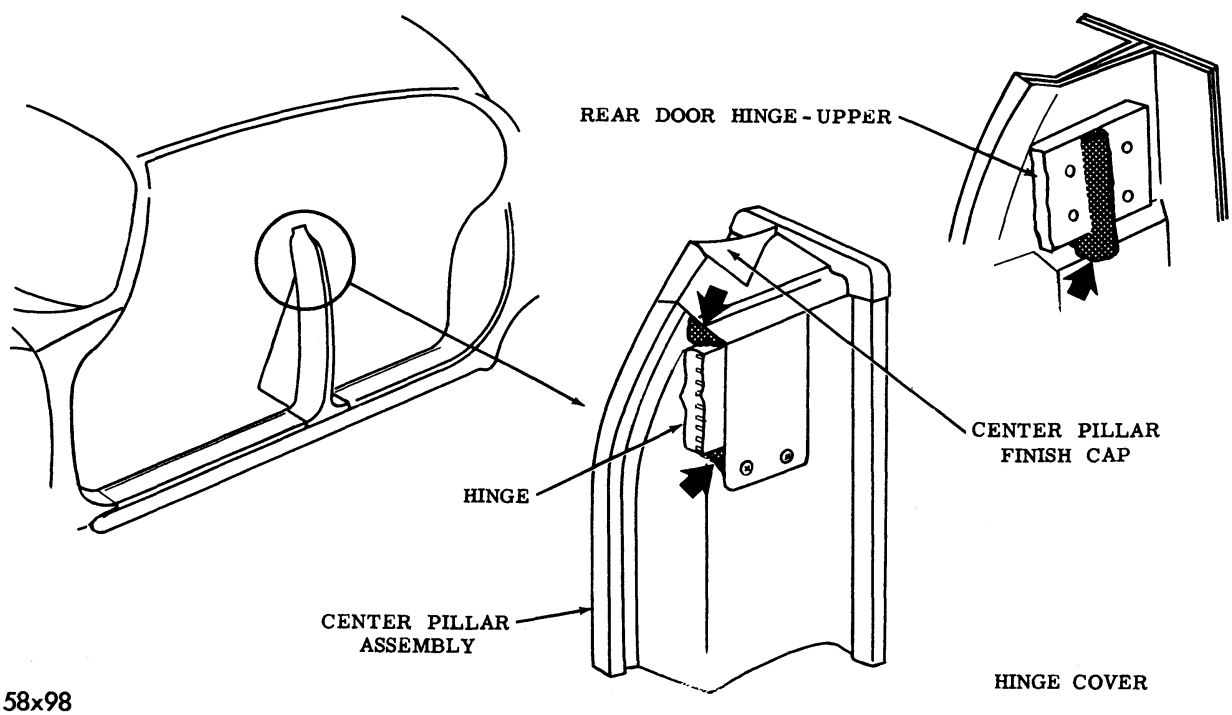


Fig. 122—Door Hinges

Pack around the door hinge pockets (Fig. 122) with body caulking putty. Pack body caulking putty around the hinge cap on the rear door hinge pillar ("B" pillar) on four-door hardtop models.

Water entering the car from the outside of the window generally drains out through the drain holes in the bottom edge of the door inner panel. However, water often seeps in to dampen the door trim panels. This is due to the water falling against the door inner panel and leaking to the door trim panel through any openings in the door inner panel (Fig. 123).

To correct this type of leak, remove the door trim panel. Seal off all holes in the door inner panel using a waterproof masking tape. Additional sealing may be obtained by using body caulking putty. Be careful in removing the plastic water shield so that it can be reused, otherwise, a new plastic water shield will have to be installed. Cement the plastic water shield in place using weatherstrip cement.

Be sure to tuck in the bottom edge of the shield through the long slot at the lower edge of the door inner panel. Seal at corners with waterproof tape. Seal around all the bolts, screws and washers. Seal around all the trim panel retaining clips using body caulking putty or white mastic.

42. FRONT DOOR VENT WINDOW

Leaks through the vent windows can be located by water test. After locating the leak area, inspect the condition of the vent weatherstrip, the fit of the vent glass in the vent opening, and the compression of the vent glass weatherstrip (Fig. 124).

In most cases simple adjustments will correct leaks between the vent glass and the weatherstrip. To increase the pressure of the glass against the upper portion of the weatherstrip, install shims made from the closed cell rubber shim stock between the upper vent pivot bracket and the outside of the vent glass (Fig. 124).

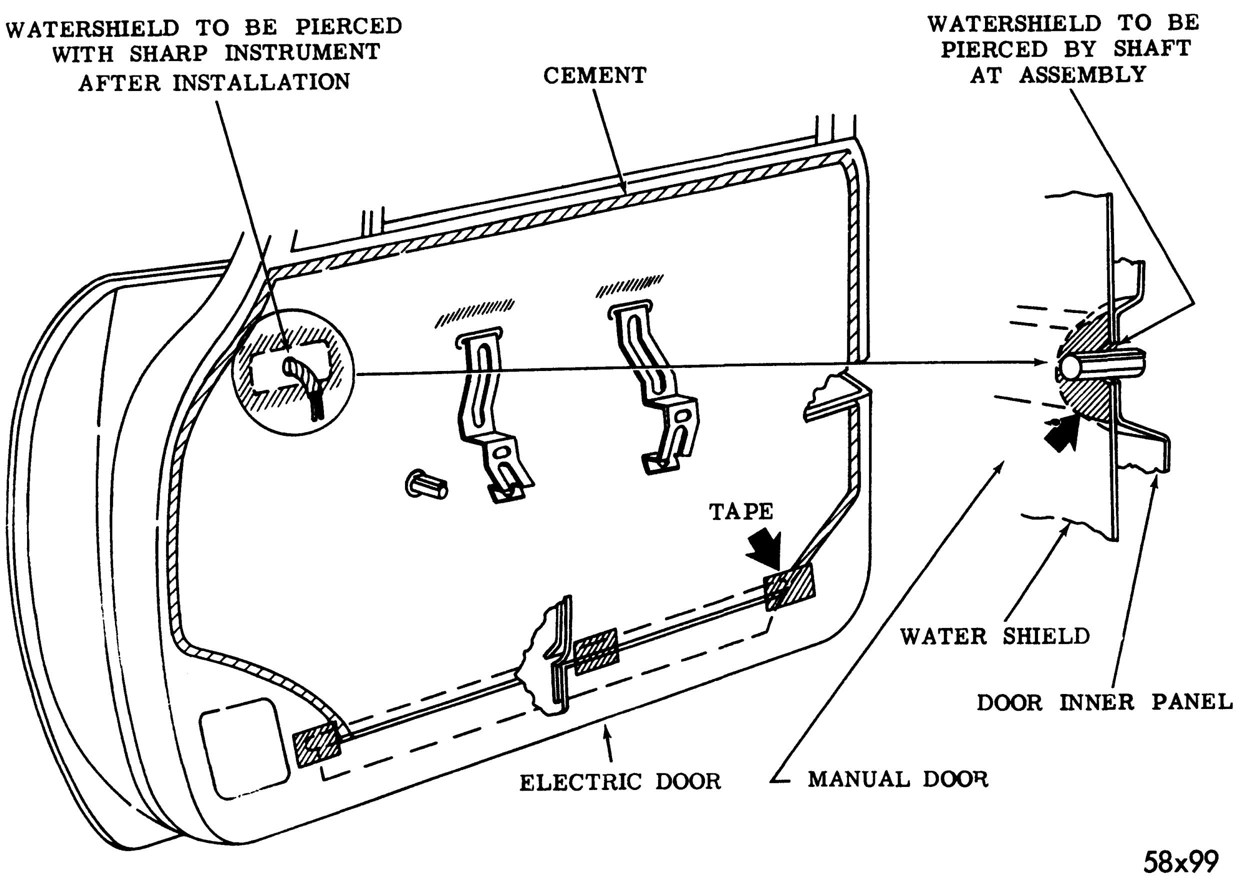


Fig. 123—Door Watershield Openings

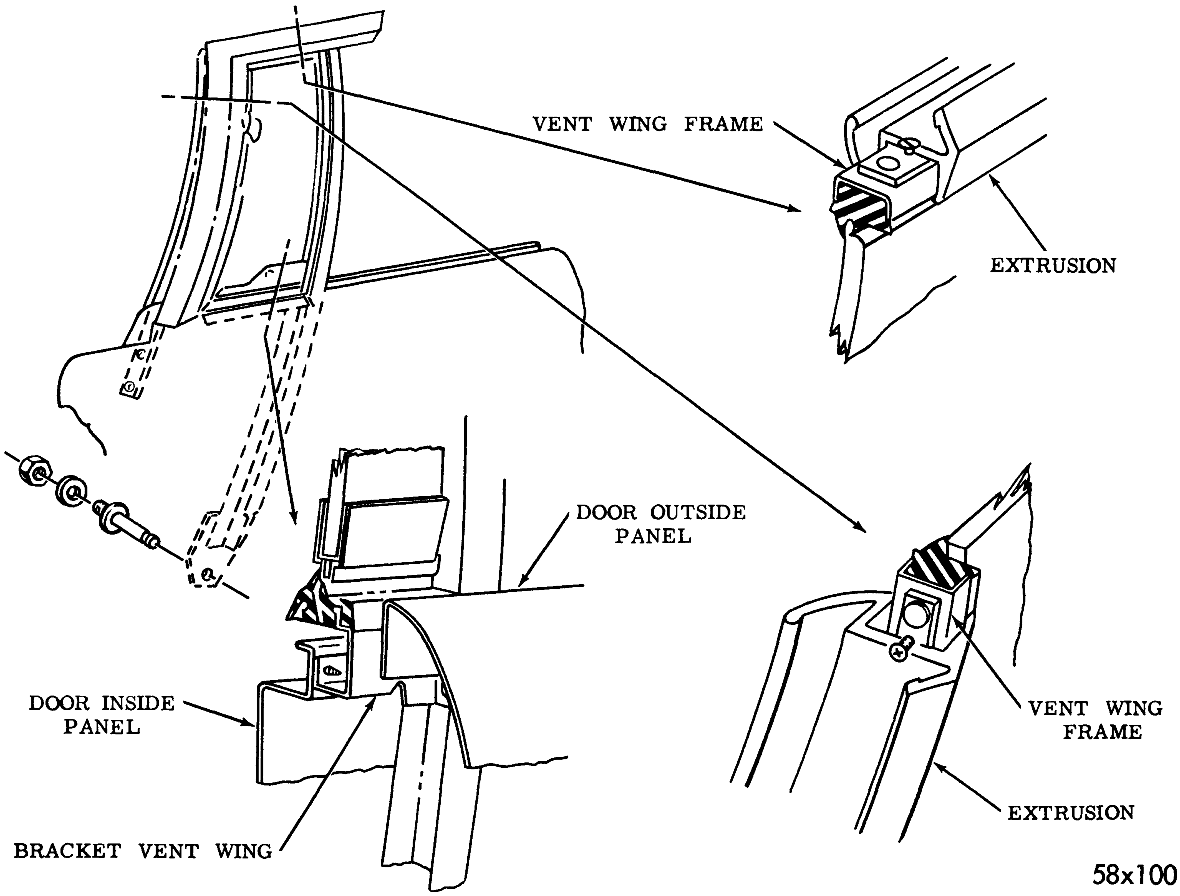


Fig. 124—Vent Weatherstrip

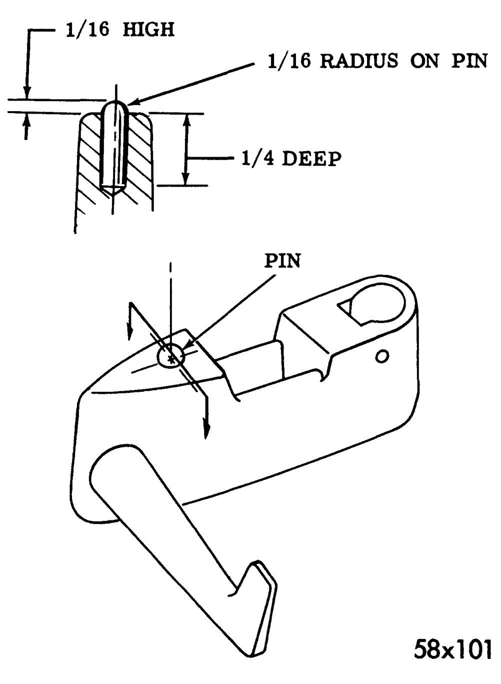


Fig. 125—Vent Latch Handle

To increase the pressure of the rear edge of the vent glass against the weatherstrip, build up the latch portion of the vent handle $1/16$ inch. Remove the vent latch handle from the vent window. (Fig. 125) Drill a hole in the center of the latch face using a #32 drill. Drive a piece of $1/8$ inch bronze or brass rod into this hole. Cut off the brass rod so that $1/16$ inch protrudes from the latch face. File off the protruding brass rod creating a chamfer or radius so the rod will not interfere when locking the vent window. Adjust the vent window in the opening.

Application of black mastic or body sealer to the corners of the vent weatherstrip (Fig. 126), generally corrects the leak in this area if the weatherstrip overlaps. If the weatherstrip is severely damaged, install a new vent window assembly.

Leaks around the pivots can be corrected by the use of black mastic. Fill the openings in the

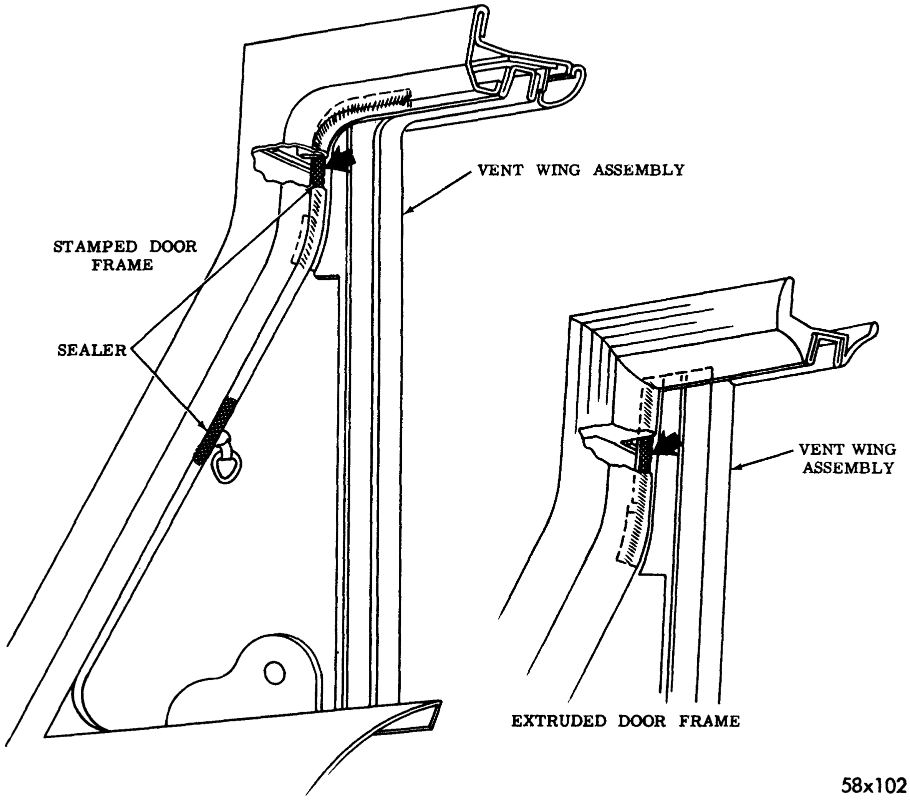


Fig. 126—Vent Wing Assembly

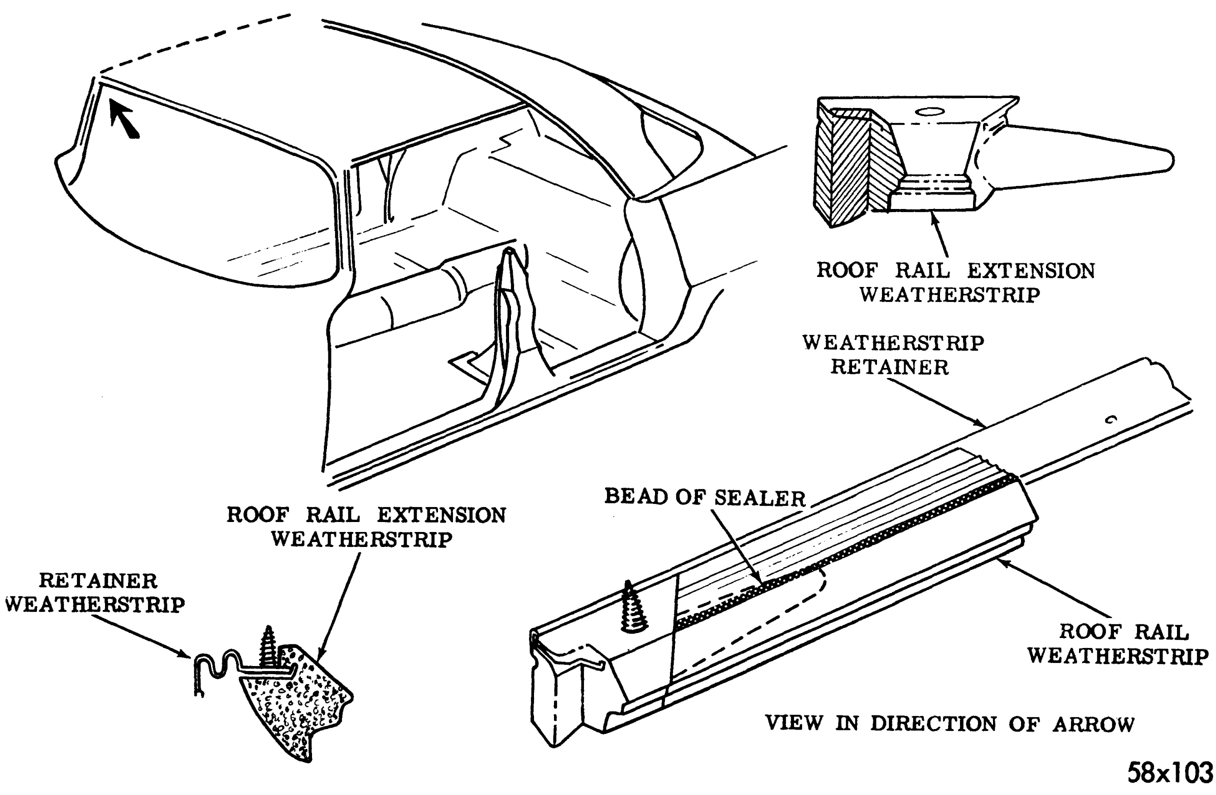


Fig. 127—Window Frame Weatherstrip

weatherstrip where the vent pivot goes through the weatherstrip. On Chrysler sedans, seal around the upper pivot bracket at the door frame and at the junction of the division bar and door frame.

The first and most important requirement to obtain a good water tight seal between the door window frames and the roof rail weatherstrip is precise adjustments of the doors, the window frames and channels. Adequate adjustments are provided for up and down, in and out, and fore and aft adjustment of the window frames. It is important that the weatherstrip (Fig. 127) has sufficient pressure against the frame, but too great pressure will push the window frame out of alignment and will prevent proper contact with the mating window weatherstrip.

In some cases it may be necessary to shim or adjust the weatherstrip along the roof rail. Proper use of closed cell rubber shim stock and body caulking putty will aid greatly in obtaining a good seal at the weatherstrip. Weatherstrip that is curled, distorted ,torn or tattered should be replaced by new weatherstrip.

43. REAR QUARTER VENT OR WINDOW (SEDANS)

Leaks at the rear quarter vent or window (Fig. 128) are sometimes difficult to locate since the water that leaks in often appears in other areas. Leaks at the forward upper and lower corners may cause water to wet the quarter trim panel or under the rear carpet. It sometimes causes water to accumulate in the depression in the floor panel for the front seat track. Leaks at the rear corner of the vent may cause water to appear in the luggage compartment between the outside of the rear wheel housing and the rear quarter panel. A careful water test will help locate the exact source of the leaks. When leaks are found to be originating from the rear quarter window, do not attempt to try to seal it from the outside.

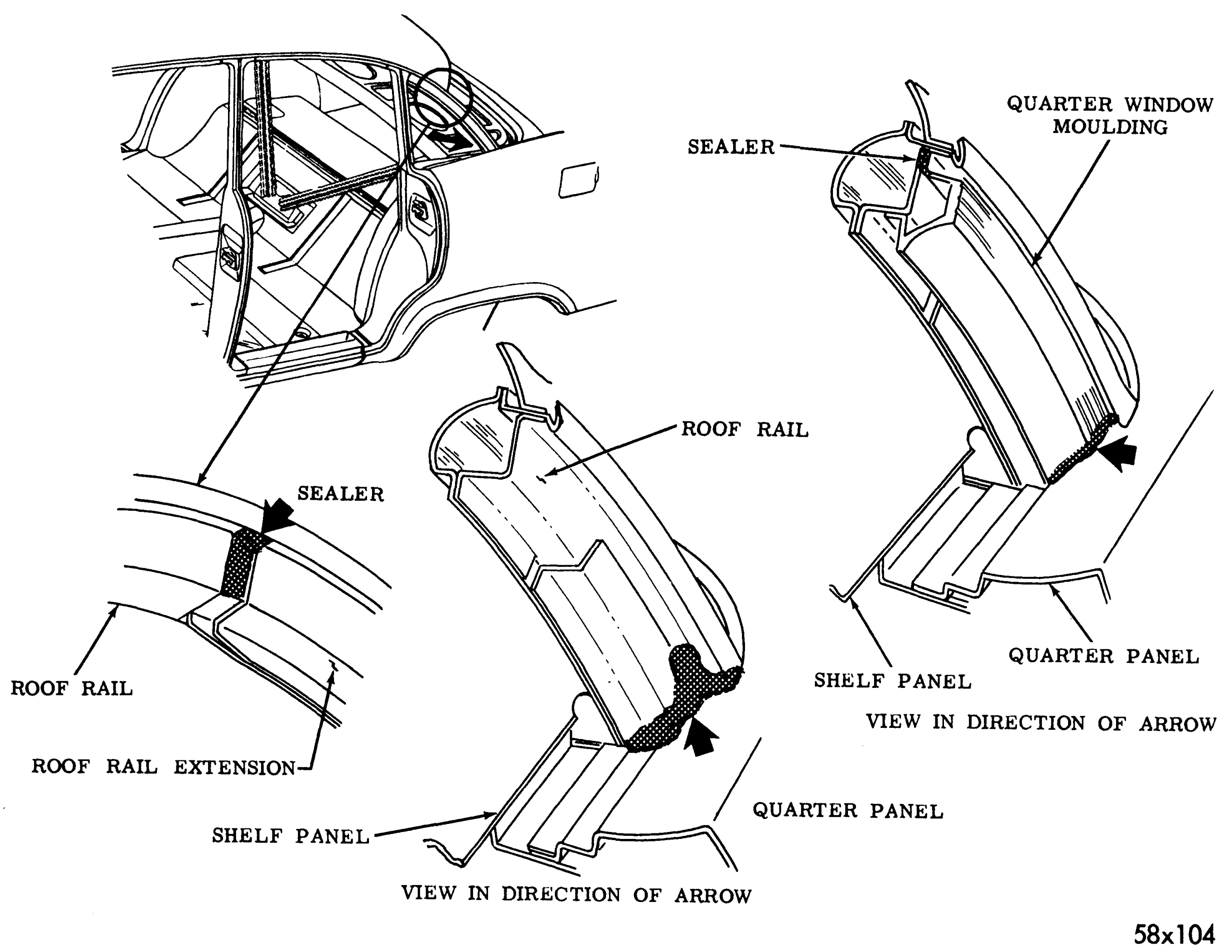
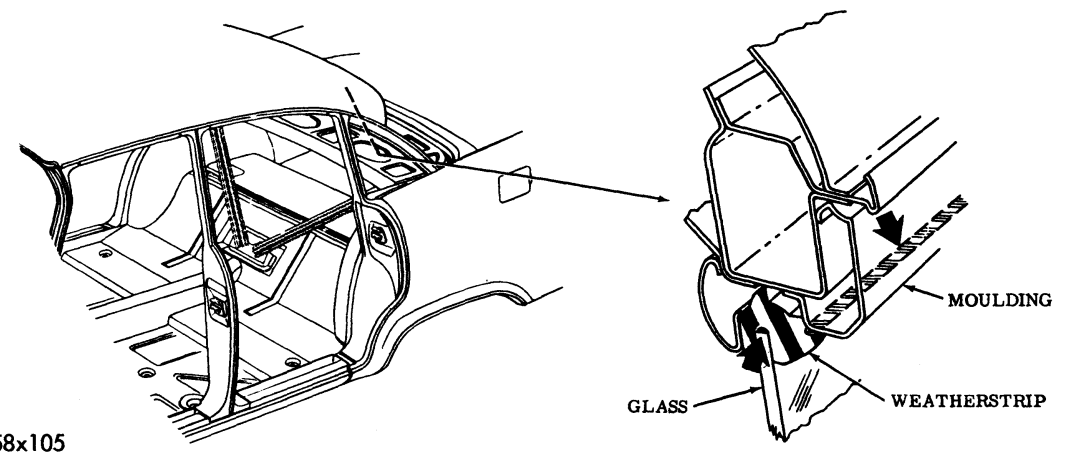


Fig. 128—Rear Quarter Vent or Window

On the movable type vent, determine if the compression of the weatherstrip is adequate. If not, it must be adjusted with the quarter window assembly out before it is installed. Remove the garnish mouldings and remove the rear quarter window assembly.

On Saratoga, New Yorker, and Imperial four-door sedans, remove the extruded aluminum roof rail mouldings. **CAUTION: Do not attempt to remove the painted rear quarter window mouldings on the Windsor sedan.** Seal between the extruded aluminum moulding and the roof rail and the junction of the end of the moulding to the rear quarter panel (Fig. 128). Seal between the extruded aluminum moulding and the front edge of the quarter window frame (upper portion of "C" pillar). Install the extruded aluminum mouldings. Pack all three



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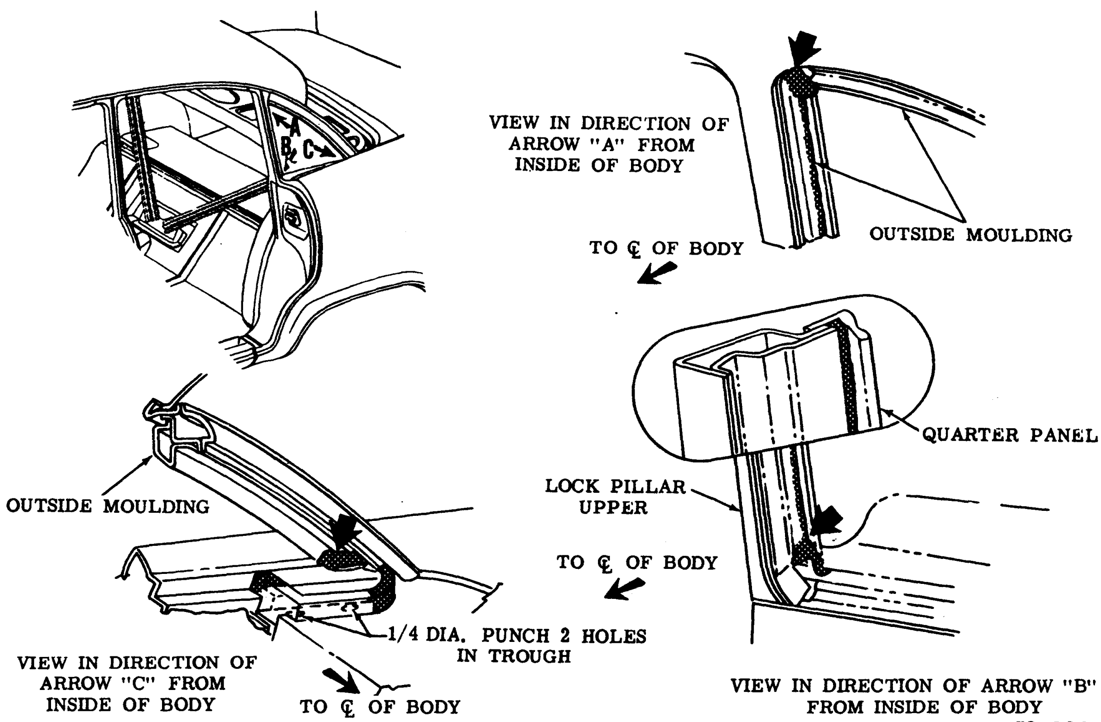

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Fig. 129—Rear Quarter Window Opening

corner joints of the extruded aluminum mouldings with body caulking putty. Be sure to pack the rear corner junction of the roof rail and quarter panel to plug all holes and openings.

Lay a bead of body caulking putty **all around** the inside of the rear quarter window opening

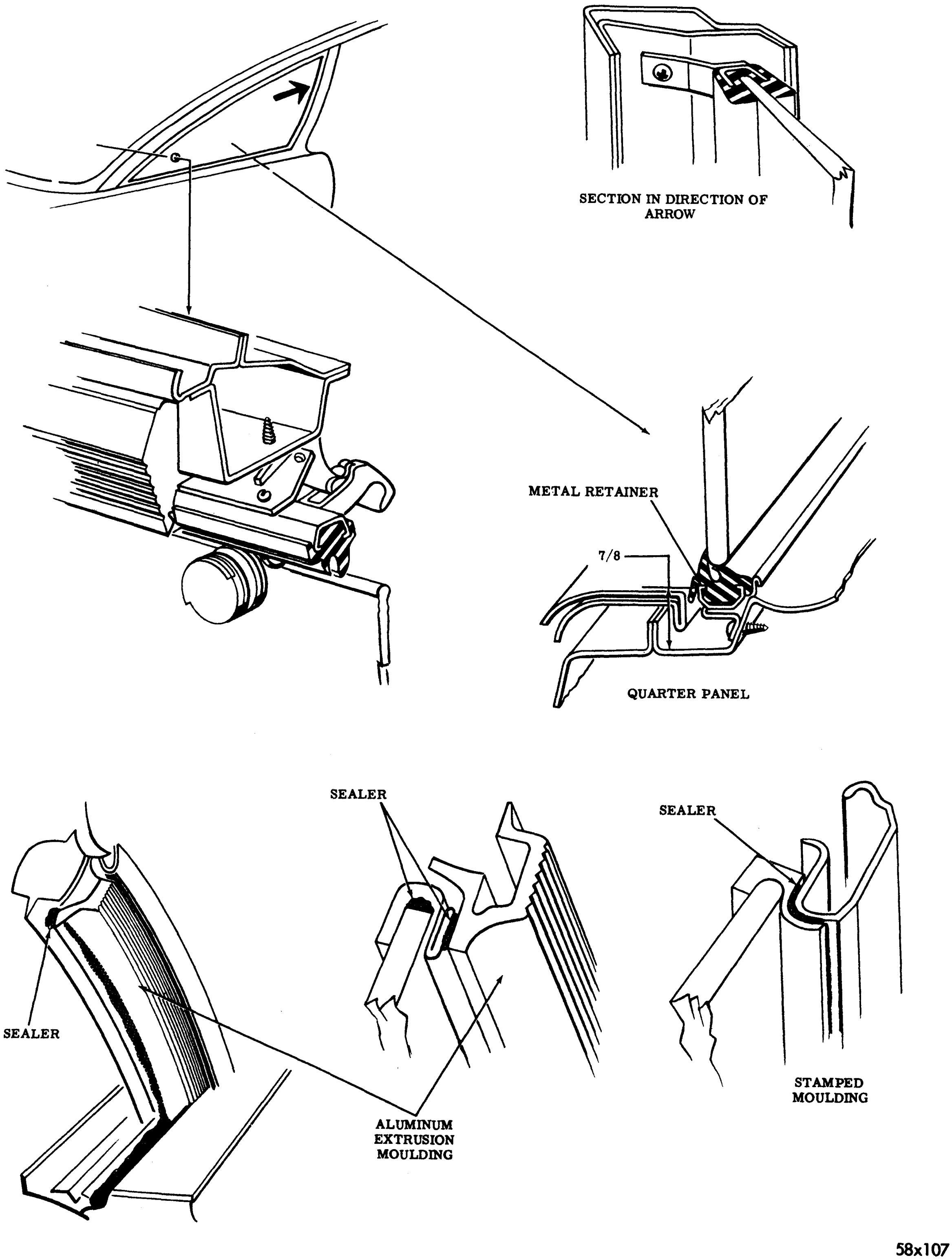

Fig. 130—Rear Quarter Window Weatherstrip

to obtain a good seal between the quarter window and the opening (Fig. 129). Build up a dam of putty to prevent water coming inside the car.

On the Windsor quarter window, leaks between the quarter window glass and frame can be corrected by the use of weatherstrip cement between the glass and the window frame.

On the Saratoga, New Yorker, and Imperial ventilating type quarter window, **before installation,** adjust the compression against the weatherstrip by adjusting the latch bracket so there is firm contact between the glass and the weatherstrip.

Install the rear quarter window. On the Windsor sedan, the outer lip of the weatherstrip should be worked out to the outside of the window opening.

On the Saratoga, New Yorker and Imperial sedans, the lip of the weatherstrip should fit against the bead of body caulking putty inside the quarter window opening (Fig. 130). On the Imperial sedan, attach the toggle lock and adjust so that the upper and lower sealing lips of the weatherstrip press firmly against the glass.

Install the garnish mouldings. When properly tightened there will be adequate pressure of the weatherstrip against the window opening to squeeze out some of the body caulking putty. Clean off the excess body caulking putty.

On two-door hardtop models it is essential to have a waterproof shield between the rear quarter window space in the rear quarter panel and the luggage compartment. Otherwise, water that would enter the rear quarter past the rear quarter window could blow into the luggage compartment. Make sure that the plastic water shield (Fig. 131) is installed correctly on the rear quarter inner panel. Be sure to seal all holes and openings using waterproof tape and body caulking putty.

44. REAR WINDOW

The sealing procedure for around the rear window is basically the same as that for the windshield using adequate cement to seal the glass. Inspect carefully for leaks around the rear window lower moulding clip bolts and the former drain holes near the ends of the trough below the rear window. These leaks will generally appear in the luggage compartment on the up-

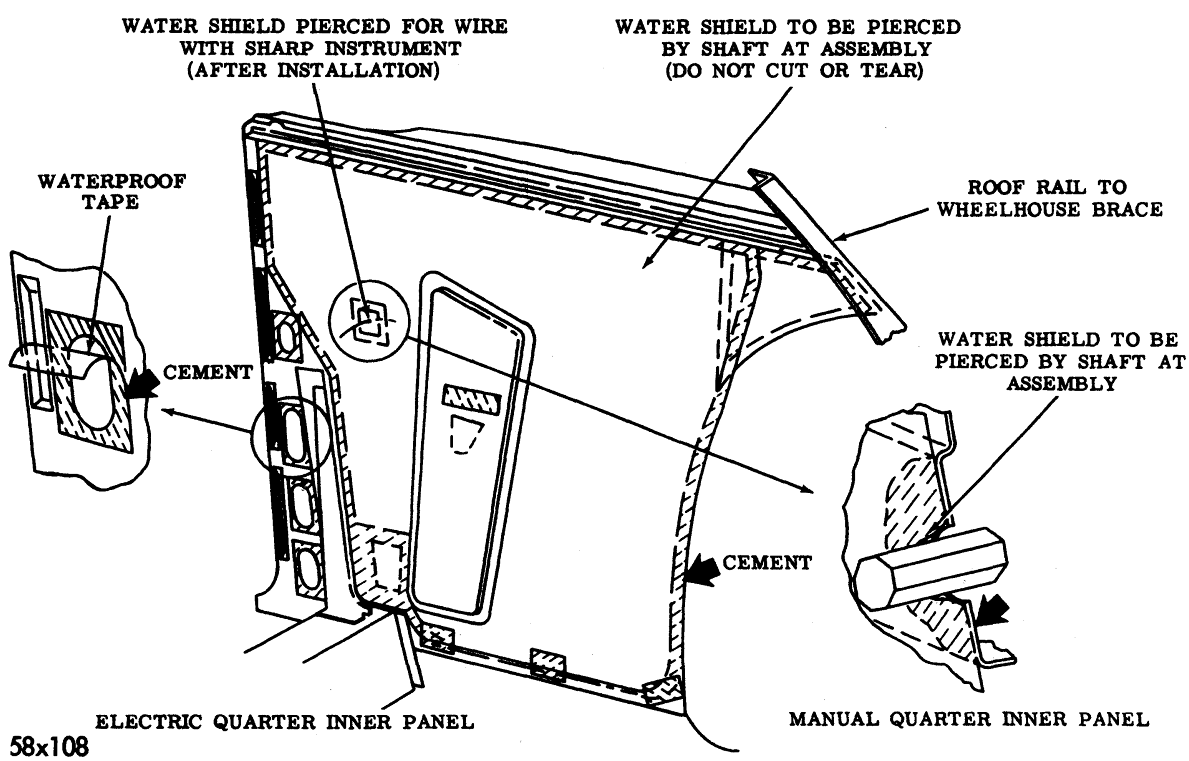

Fig. 131—Rear Quarter Panel Watershield

per portion of the rear wheel housing and/or across the forward portion of the luggage compartment floor.

To seal the trough below the rear window: Remove the rear window lower moulding (belt moulding). Remove all the old sealer from the trough. Fill the "V" shaped trough for about 18 inches from each end with body caulking putty (Fig. 132). Fill all unused holes and pack the putty at the junction of the roof rail, rear window trough and quarter panel. Make a ball of body caulking putty and push it into each moulding retaining bolt hole. Install the rear window lower moulding, pushing the retaining bolts through the balls of putty. Install the sealing type nuts and tighten. Pack body caulking putty carefully around each attaching nut to provide extra sealing.

On Imperial bodies while the rear window lower moulding is removed, pack and seal off the rear window trough drain holes with body caulking putty. Apply liquid body sealer along the outer edge of the upper portion and sides of the rear window weatherstrip (Fig. 133). Be sure to seal around each clip and under the lip of the weatherstrip. Water leaking around these clips may appear on the rear window shelf panel or inside the luggage compartment.

On Imperial bodies, a leak at the rear window corner moulding (joint cover) retaining bolt may cause water to appear in the luggage compartment or cause wicking of the headlining. Remove the rear window upper garnish moulding to gain access to the corner moulding retaining bolt nut. Seal around bolt and nut with body caulking putty. Install garnish moulding.

45. REAR QUARTER PANEL

The increased use of bright metal and medallions on the rear quarter panel results in more clip and bolt holes, which may leak. Leaks from this area will generally appear in the luggage compartment, floor extensions near the quarter panel.

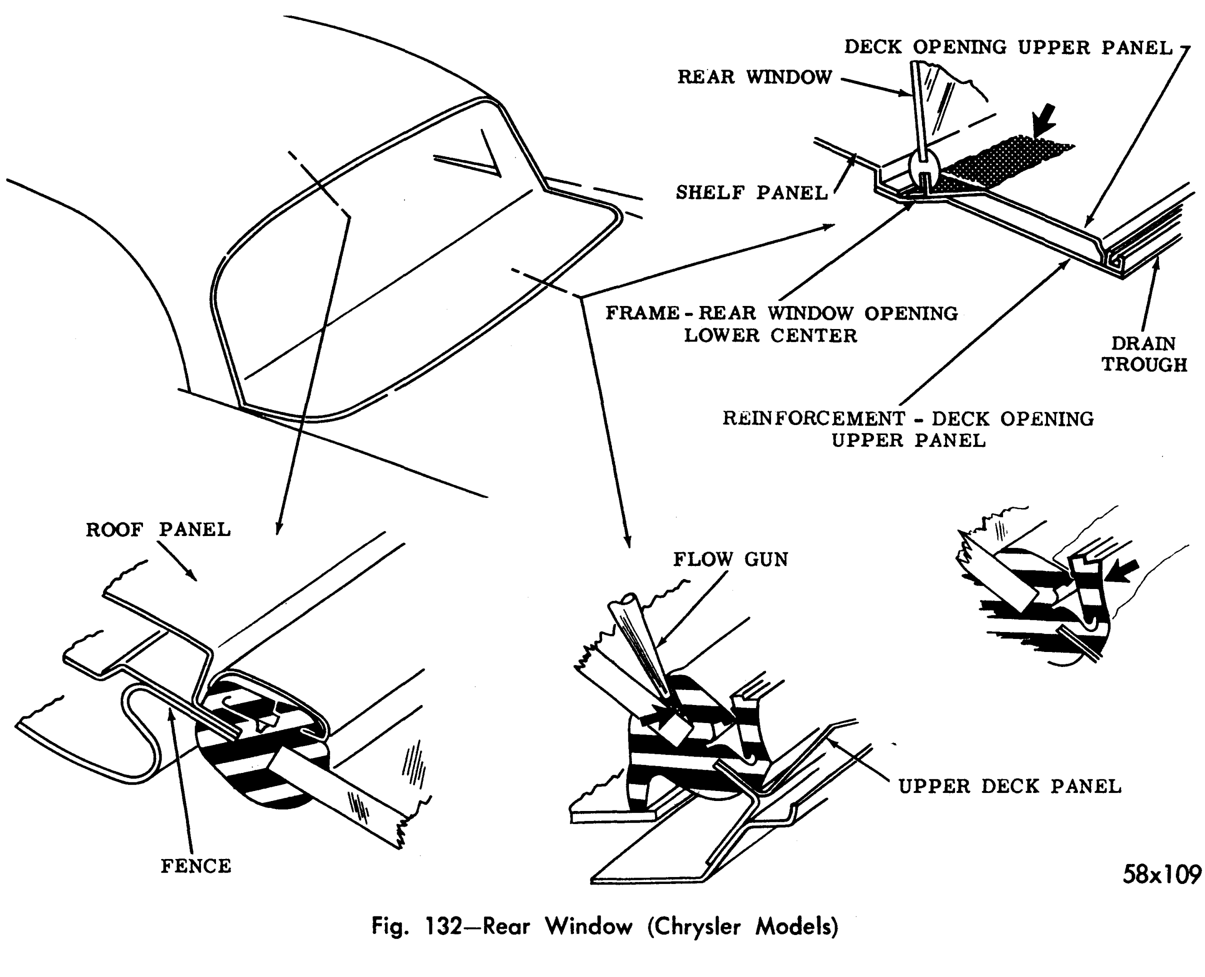

Fig. 132—Rear Window (Chrysler Models)

Seal around all attaching clip and bolt holes with body sealer or body caulking putty. Seal around all the tail lamp reinforcement seams with black mastic sealer (Fig. 134).

Seal all seam joints with liquid body sealer. Seal the joint between the rear quarter panel and the floor panel extension with black mastic sealer or liquid body sealer (Fig. 135), depending upon the size of the opening at this joint.

46. LUGGAGE COMPARTMENT

Before attempting to correct luggage compartment leaks, carefully determine the real source of the leak. As it was explained in the previous paragraphs, water on the upper portion of the wheel housing may be coming in because of a leak at the lower moulding of the rear window. A leak inside the luggage compartment between the outer wheel housing and quarter panel may originate at the corner of the rear quarter window. **CAUTION: Do not confuse condensation on metal parts with water leaks.** When the actual source of the leaks has been traced to the luggage compartment itself, correct as follows:

Be sure to obtain proper fit and alignment of the luggage compartment lid before trying to correct the leak at the lid weatherstrip. Inspect the luggage compartment lid drain trough and weatherstrip retainer joints for rough and porous welds. Seal with body caulking putty or body sealer as required (Fig. 136). Brush a continuous coating of weatherstrip cement around entire weatherstrip trough. Install the deck lid weatherstrip into the retainer. Be sure weatherstrip retaining lips are engaged in the retainer trough. Be sure to obtain a good fit and compression of the lid weatherstrip. Adjust deck lid if necessary to obtain proper compression. Test with the use of trace powder and testing bulb.

Leaks at the deck lid weatherstrip retainer trough joints on Chrysler bodies can best be sealed by loosening the weatherstrip at the joint and applying sealer to the entire seam at the inside of the trough and then recement

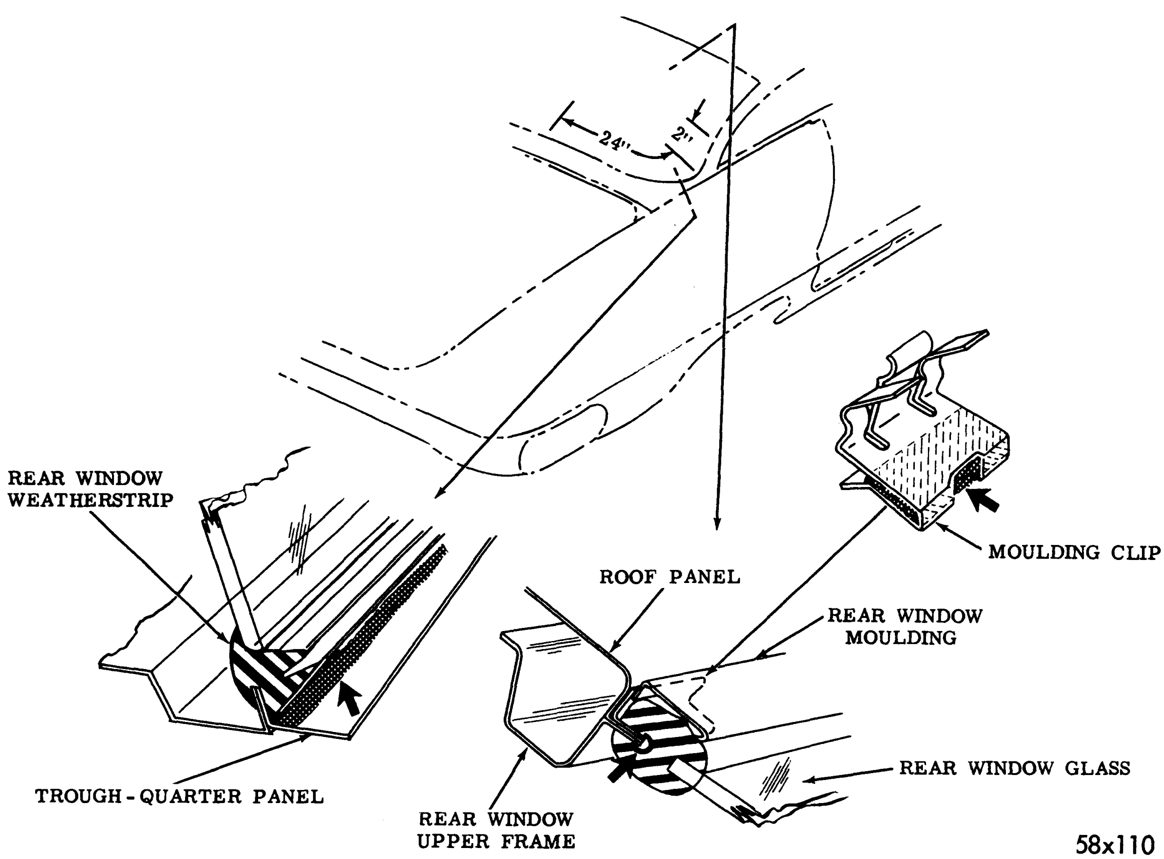

Fig. 133—Rear Window (Imperial Models)

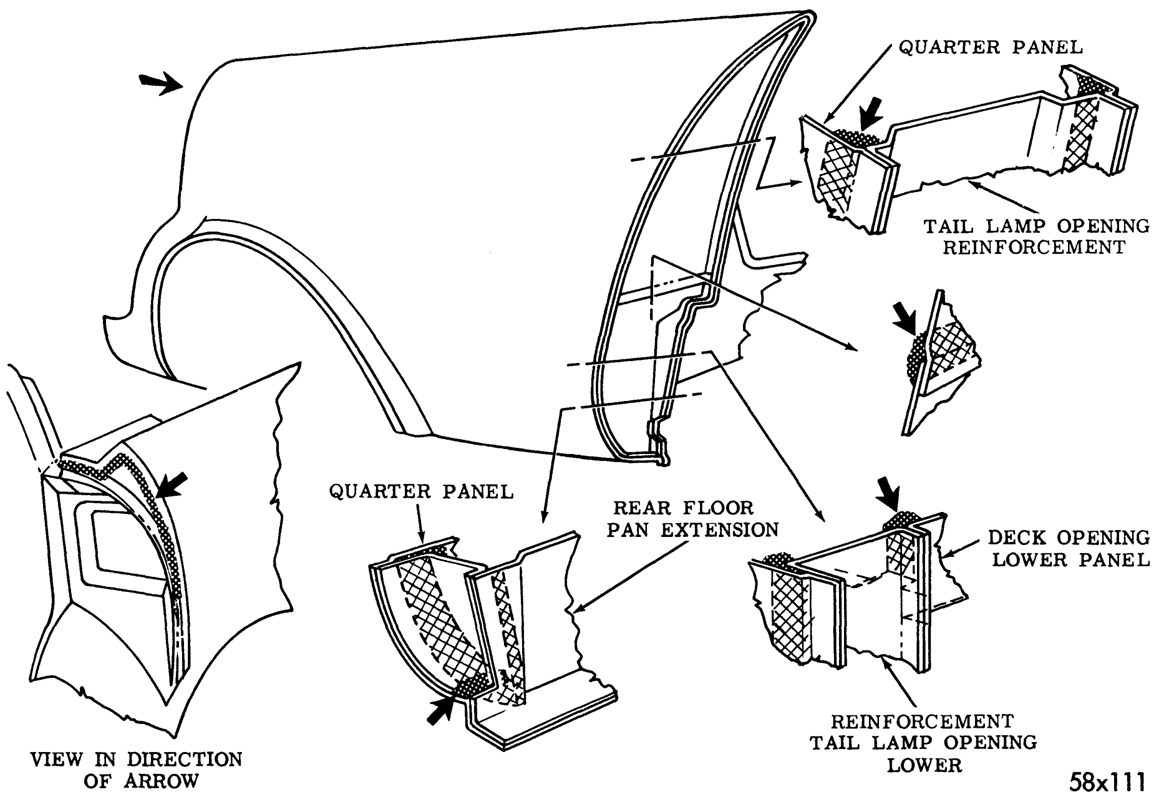

Fig. 134—Tail Lamp Opening

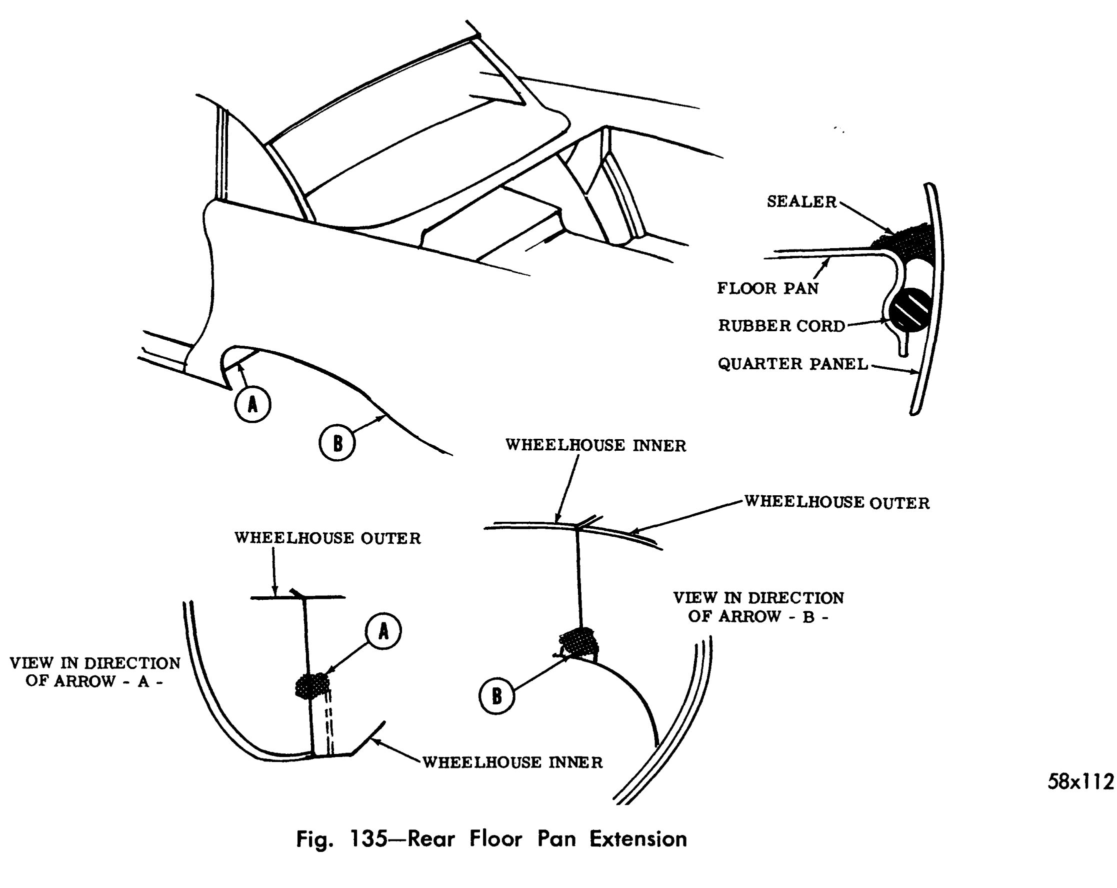

Fig. 135—Rear Floor Pan Extension

the weatherstrip. On Imperial bodies apply sealer, as shown in Figure 137. On bodies having license inserts, seal around the license frame mounting retainers with body caulking putty. Seal the deck lid at the lifting handle attaching screws. Seal around license lamp by reseating and sealing the gasket.

On the Imperial models having a simulated spare tire cover on the luggage compartment deck lid, seal around each moulding attaching bolt nut with body caulking putty. If the seam joint between the outer periphery of the cover and the deck lid is leaking, seal with liquid body sealer from the inside. (In some instances it may be necessary to remove the moulding and seal this seam joint from the outside.) Seal around the periphery of the hub cap (Fig. 138) with clear liquid sealer.

Seal all openings and joint seams on the inside of the luggage compartment lower panel, especially the back-up lamp wire grommets. Seal all luggage compartment floor panel seams with liquid body sealer (Fig. 139). Seal between the luggage compartment lower panel and floor panel with black mastic sealer.

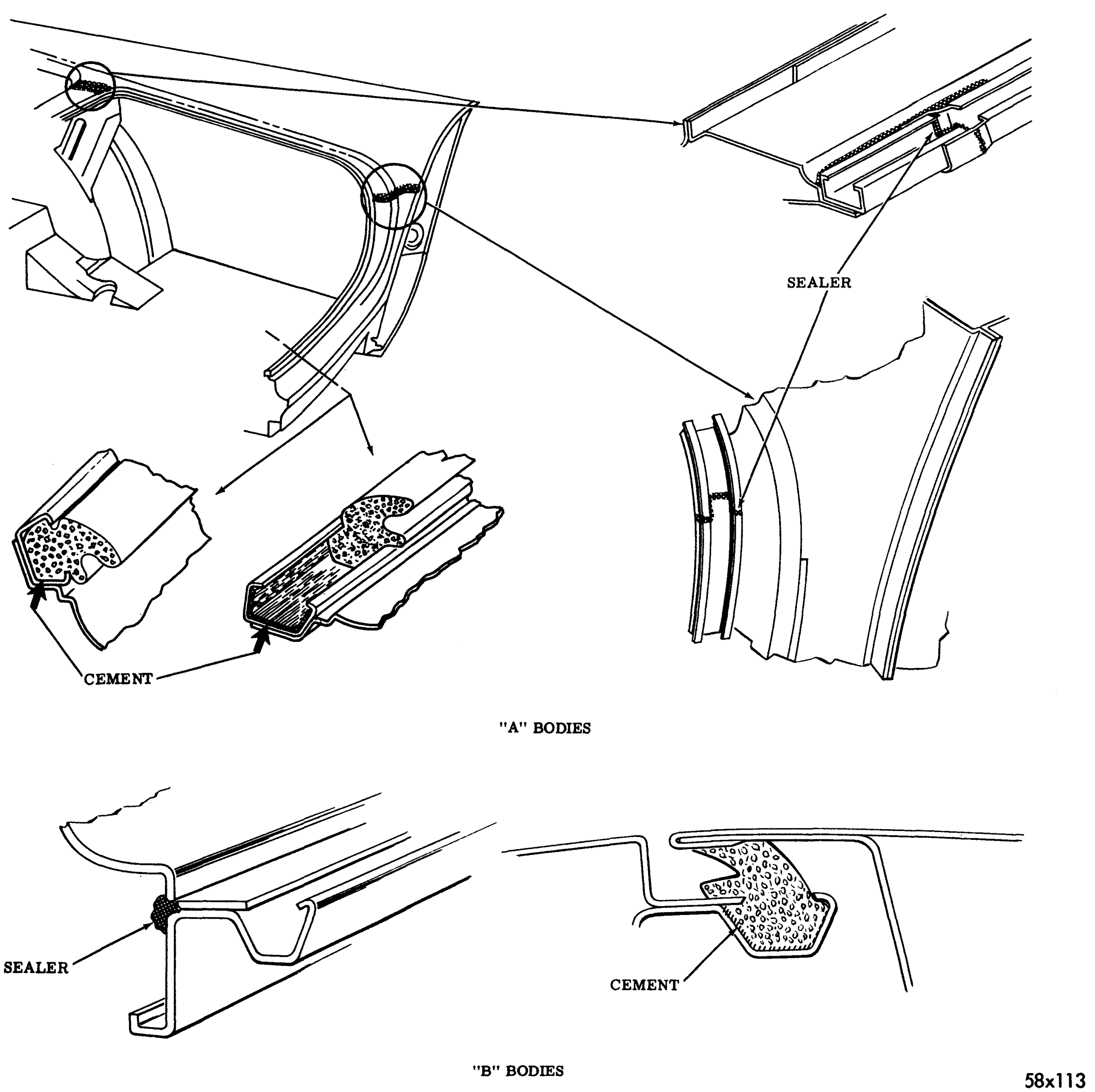

Fig. 136—Luggage Compartment

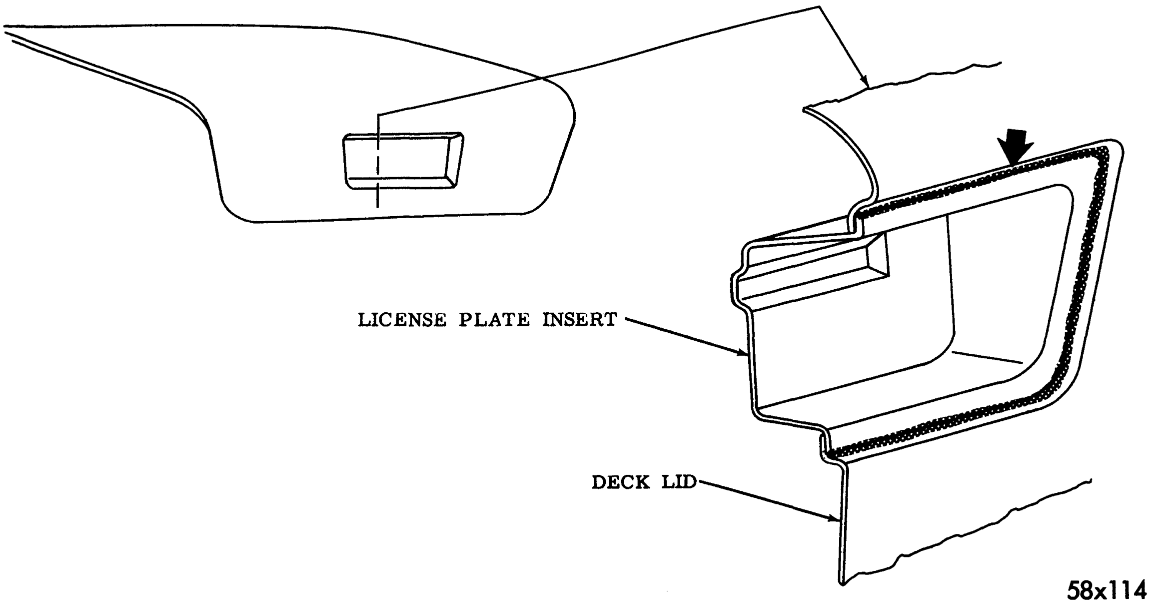

Fig. 137—License Frame Mounting

On Chrysler models, a leak at the fuel filler outer housing may be corrected by packing body caulking putty around the fuel filler tube housing flange under the fuel filler door on the rear quarter (Fig. 140). Seal around the housing flange reinforcement inside the rear quarter panel by packing with body caulking putty. Seal around the fuel filler tube housing at the luggage compartment floor.

47. FLOOR PANEL

Before correcting water and dust leaks at the floor panel, be sure to determine the exact source of the leak. Be sure all under body plugs are in the floor panel. Be sure all door sill drain openings are open. (Often undercoating closes off these openings.)

Using liquid body sealer, reseal all joint seams of the floor, the luggage compartment floor, the quarter extension panels and all excess opening covers (Fig. 141). Seal the floor panel to cowl panel joint seams, floor panel to side sill joint seams, the floor panel joint over the rear axle kick-up, and the floor panel to wheel housing joint seams.

48. TOWN AND COUNTRY WAGON

Sealing procedures pertaining to the roof, cowl, firewall, fresh ir vent, doors and openings are essentially the same as contained in the section

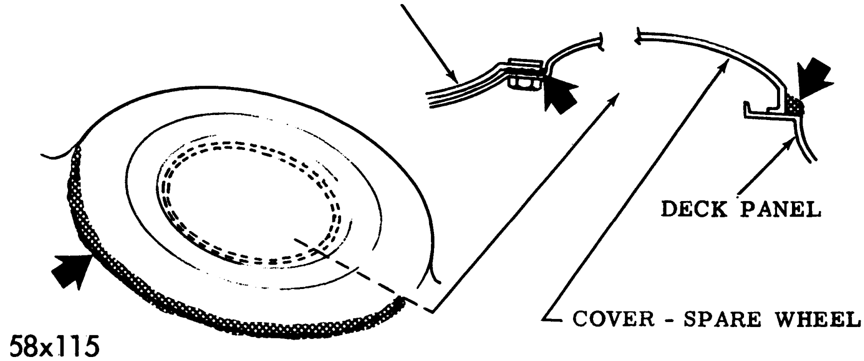

Fig. 138—Spare Tire Carrier (Imperial Models)

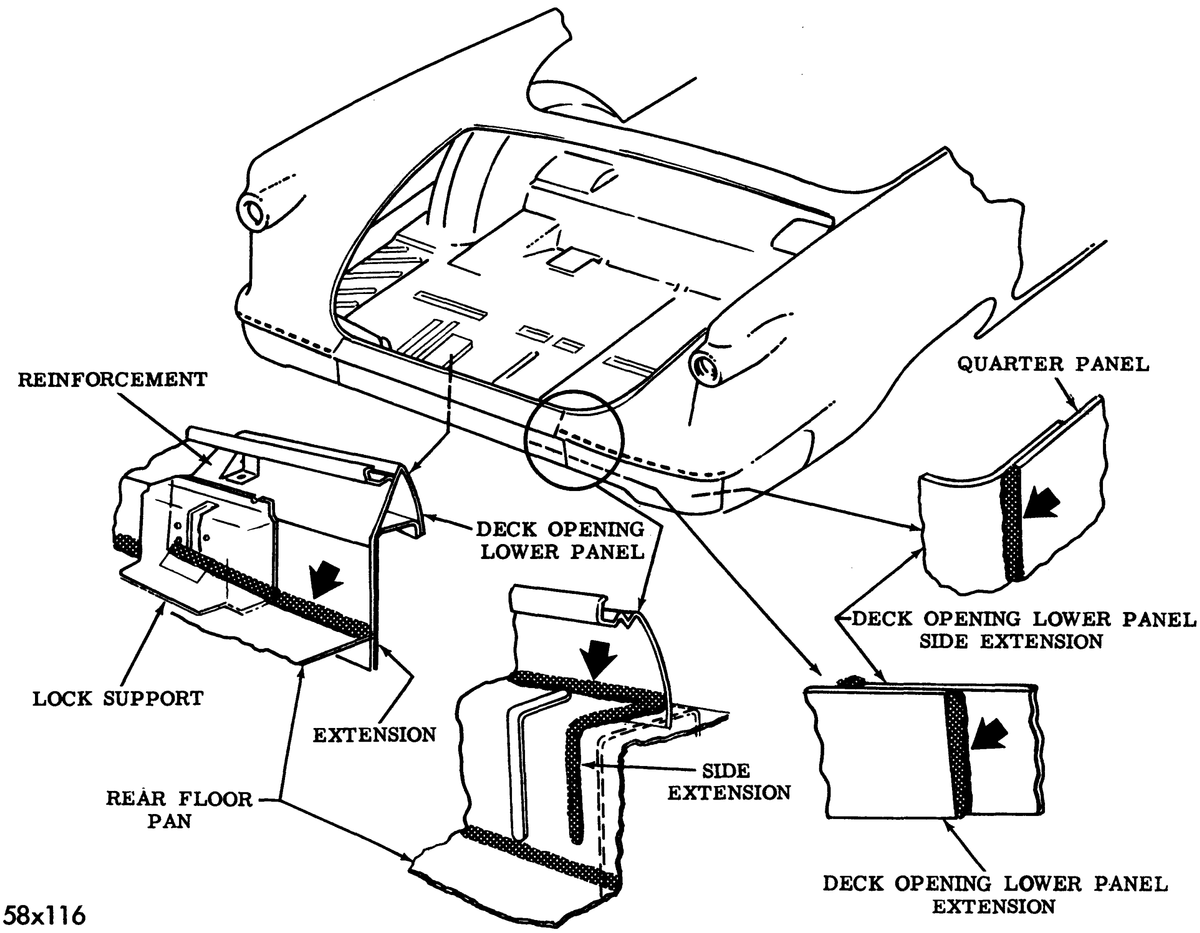

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Fig. 139—Luggage Compartment Lower Panel

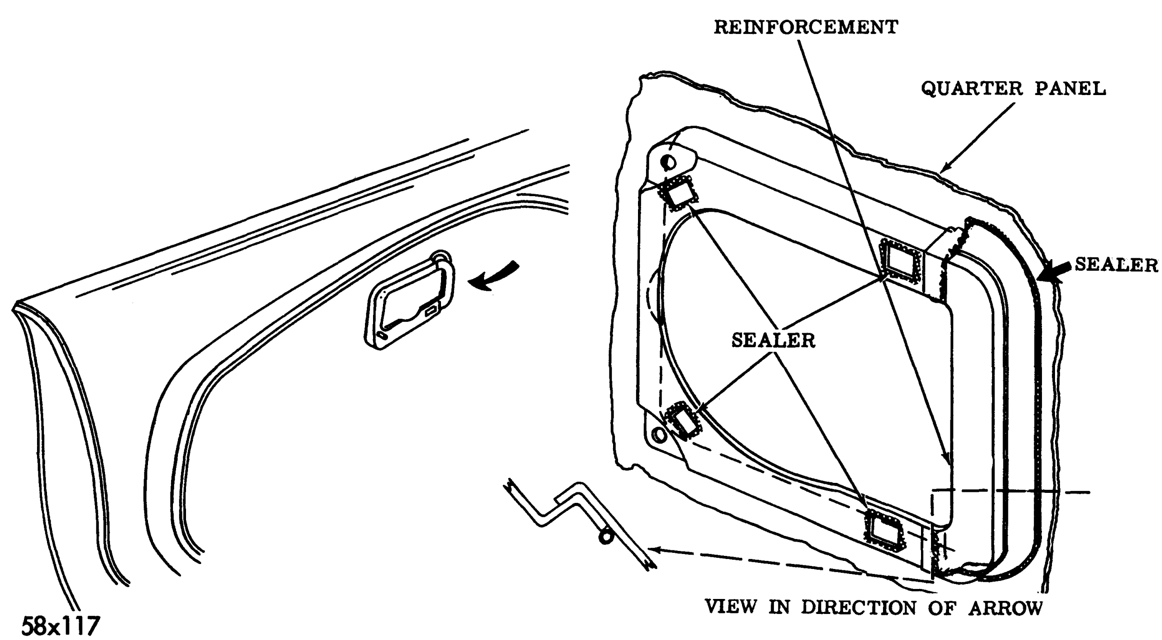

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Fig. 140—Fuel Filler Housing

devoted to sedans and coupe models. Body features that are pertinent to Town and Country Wagon bodies are contained in this section.

49. REAR FLOOR PAN (At Rear)

Seal around the entire periphery of the brace with black semi-fluid sealer or body caulking putty, as indicated in Figure 142 (1) to eliminate dust and carbon monoxide penetrations. Apply sealer to the seam between the reinforcement lower tail gate opening panel and rear floor pan side extention as indicated at (2).

Install tape over hole in brace as indicated in (3). Press additional sealer into seams from under body.

50. REAR FLOOR PAN (At Front)

Apply black semi-fluid sealer to seams as indicated in Figure 143 (1) and (2). It will be necessary to reach through the access hole at the rear seat back filler, as shown in Figure 143 in order to seal (2).

51. REAR PILLARS

Water may leak into improperly sealed seams in the rear body upper pillar and work down the pillar into the interior of the body, also check for skips in the sealer around the quarter window opening mouldings. Press body sealer into the seam around the upper finish moulding cap as indicated in Figure 144 (1). Wipe off surplus and match color of paint.

Water may also be rammed into the front corers of the rear pillars around the quarter glass weatherseal. Force sealer around the weatherstrip and into the corners. Clean off surplus sealer.

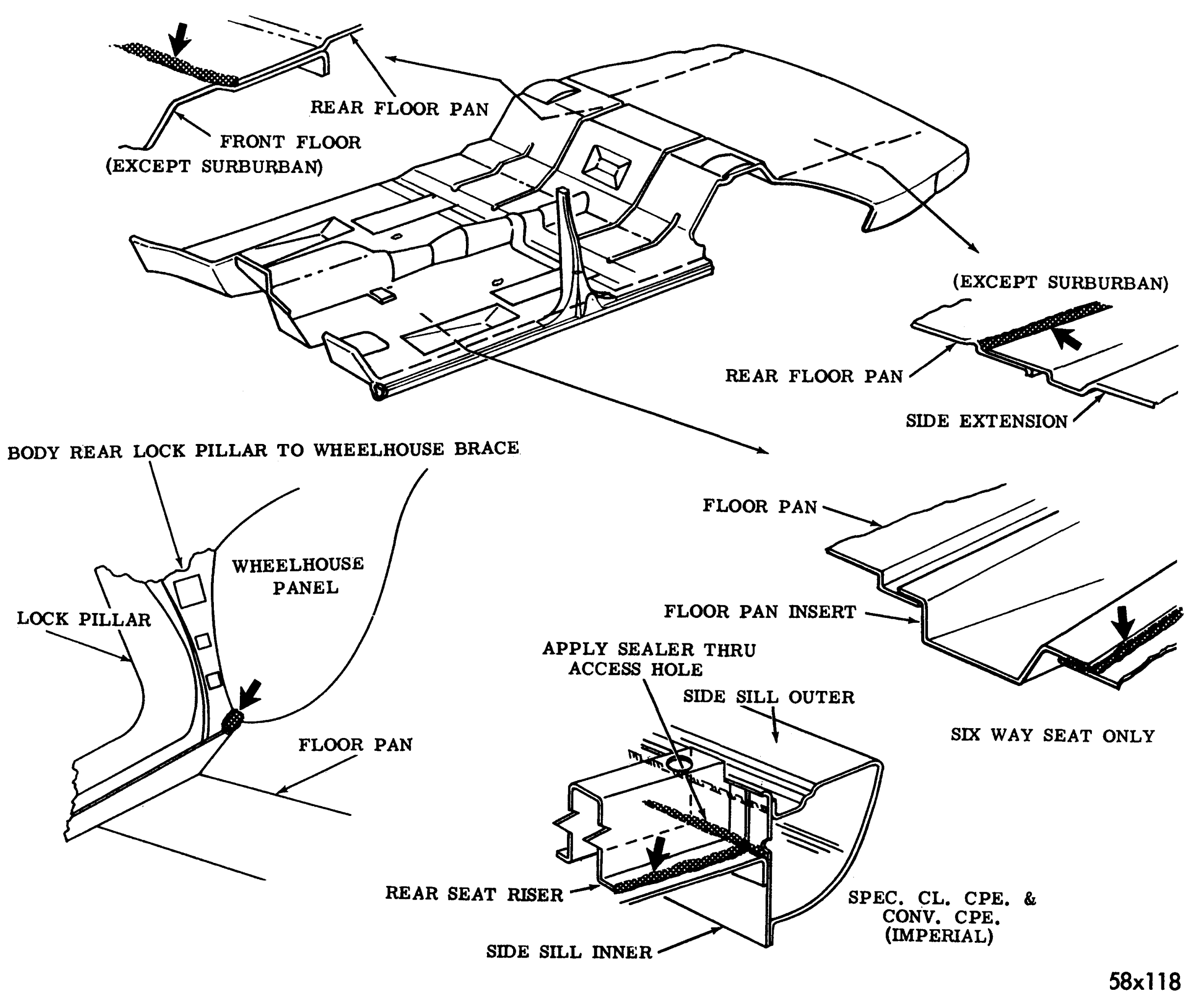


Fig. 141—Floor Panel Assembly

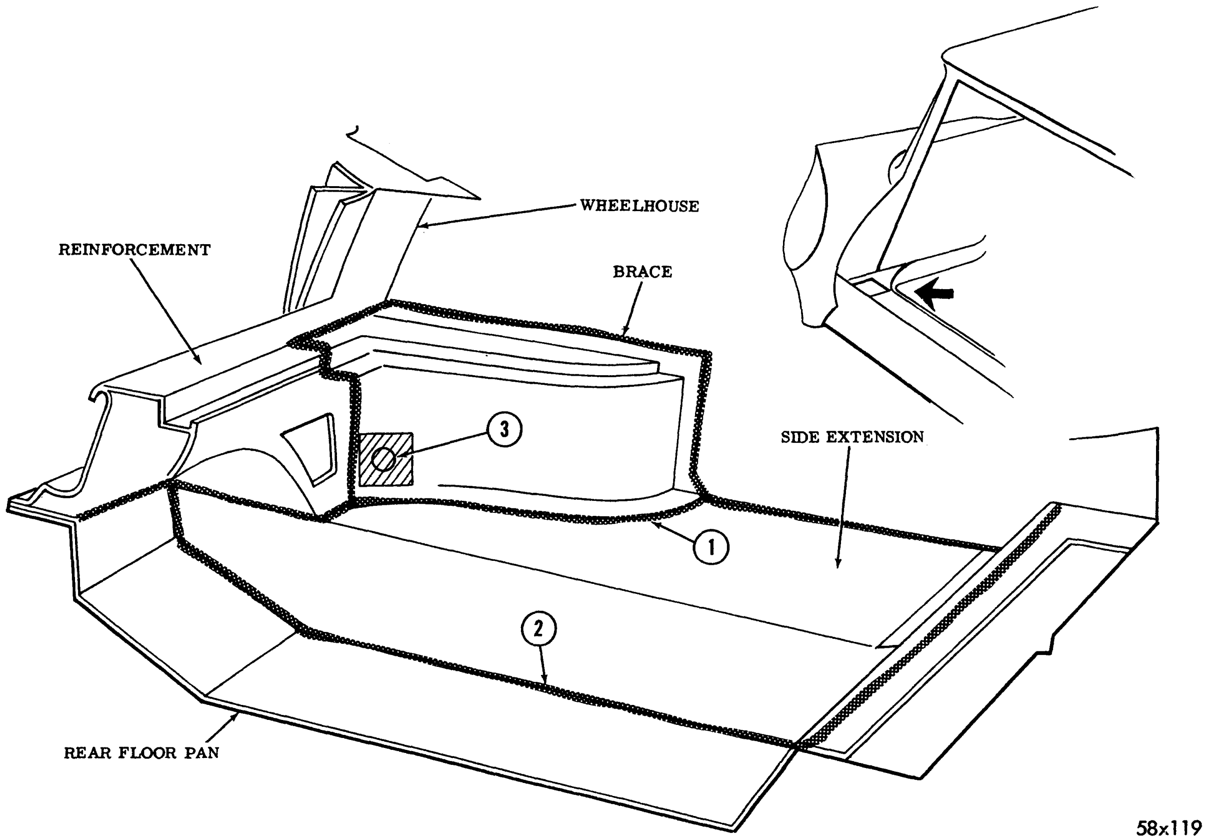


Fig. 142—Town and Country Sedan Floor Pan (Rear Corner)

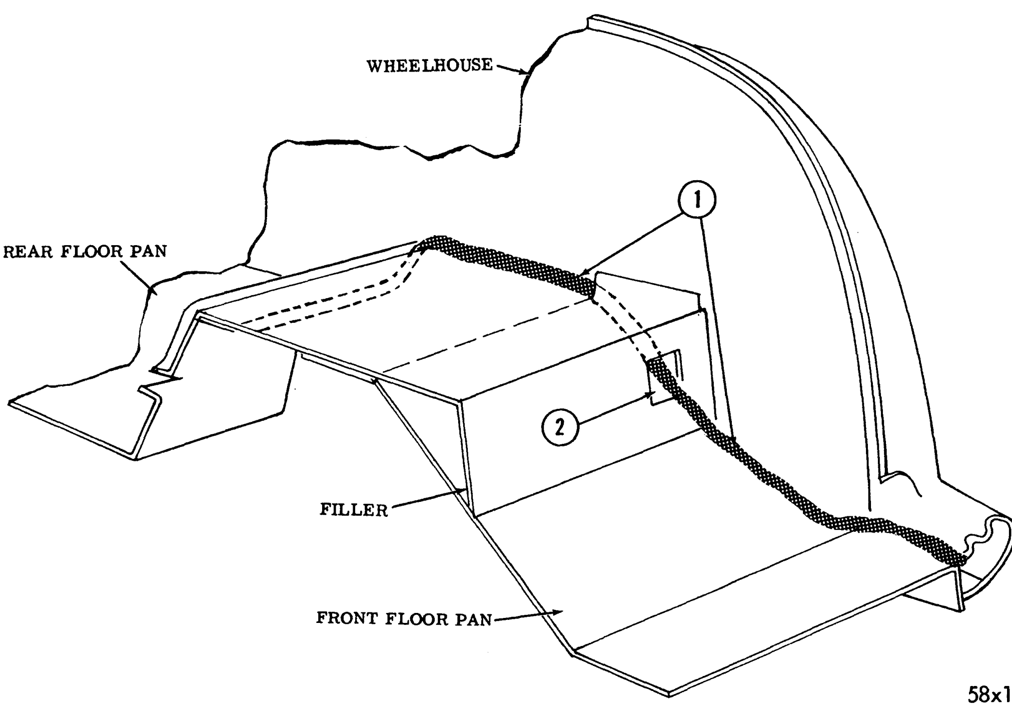


Fig. 143—Town and Country Floor Pan (Front of Wheel House)

Water may also drip down from the upper pillar and strike the trim about one foot ahead of the tail gate. This may be caused from insufficient sealing of the "D" shaped opening at the rear of the pillar as indicated at (2) in Figure 144. Repack this area with caulking putty.

Remove the garnish moulding from the inside of the pillar. Pack the "L" shaped opening with a ball of putty. Inspect the roof drip rail and seal any openings found in the drip rail and along the seam underneath it. Make certain the seams in the cap at the upper rear of the pillar are sealed. Water test area and paint sealer to match car color.

52. TAIL GATE GLASS RUN CHANNEL

Water leaking past the glass run around the channel may be sealed off (Fig. 145) and applying sealer at indicated points. Water leaking around glass run may be sealed by removing glass run and applying additional beads of sealer to the glass run channel. Press a bead of rope type seal into moulding seams and clean off surplus. While rear pillar garnish moulding is removed, inspect the outer "D" shaped opening, as shown in Figure 145 (2). This opening should be filled with caulking putty.

53. TAIL GATE WEATHERSTRIP

The tail gate weatherstrip is designed to fit under a lip and into a channel at the sides of the tail gate opening. At its upper end a piece extends out and fits up into the bottom of the pillar. Remove all weatherstrip that is not installed properly. Clean the channel and the weatherstrip with cement removing solvent. Apply a coat of cement to each part and reinstall weatherstrip. At the bottom of opening it is sometimes necessary to remove the weatherstrip and after cleaning shim the weatherstrip surfaces and reinstall.

54. TAIL GATE GLASS

Check glass for proper fit. Be sure to adjust lift so that when glass is raised it fits squarely into top channel and compresses against run. If glass does not seat in run when in closed

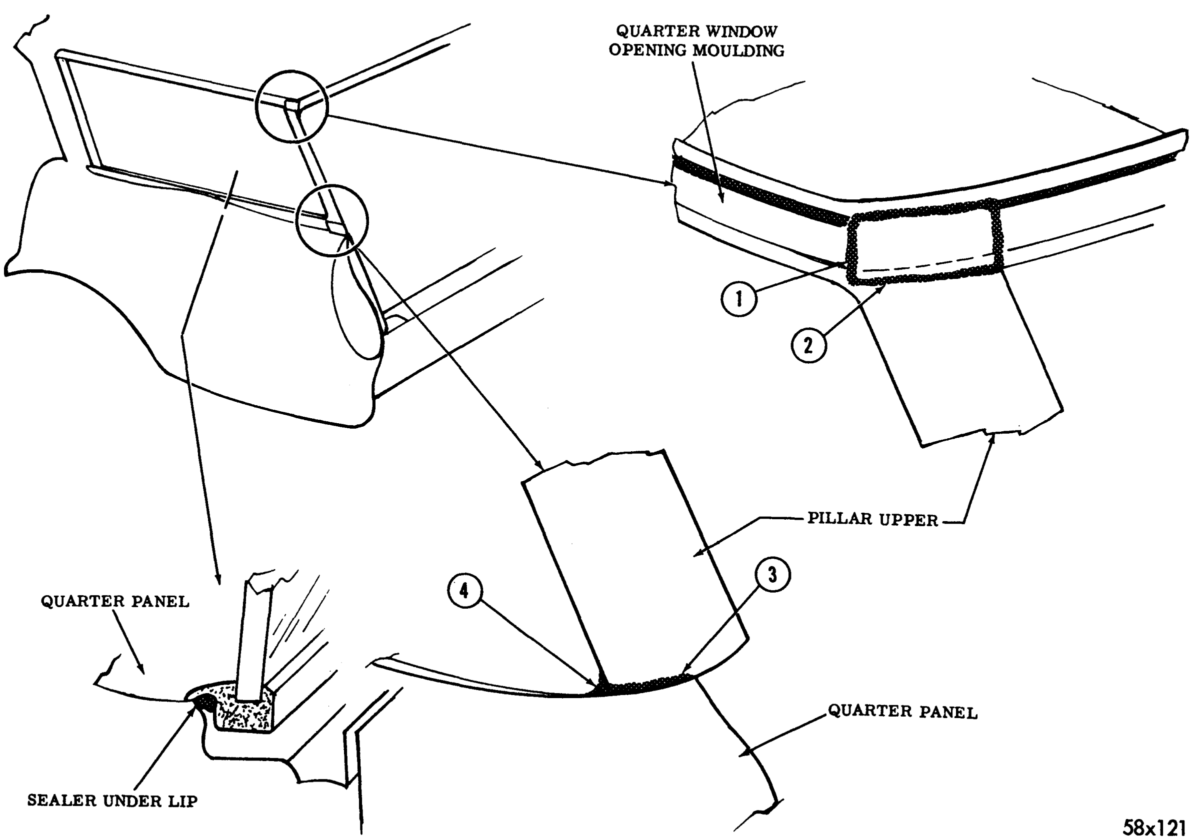


Fig. 144—Sealing Rear Pillars

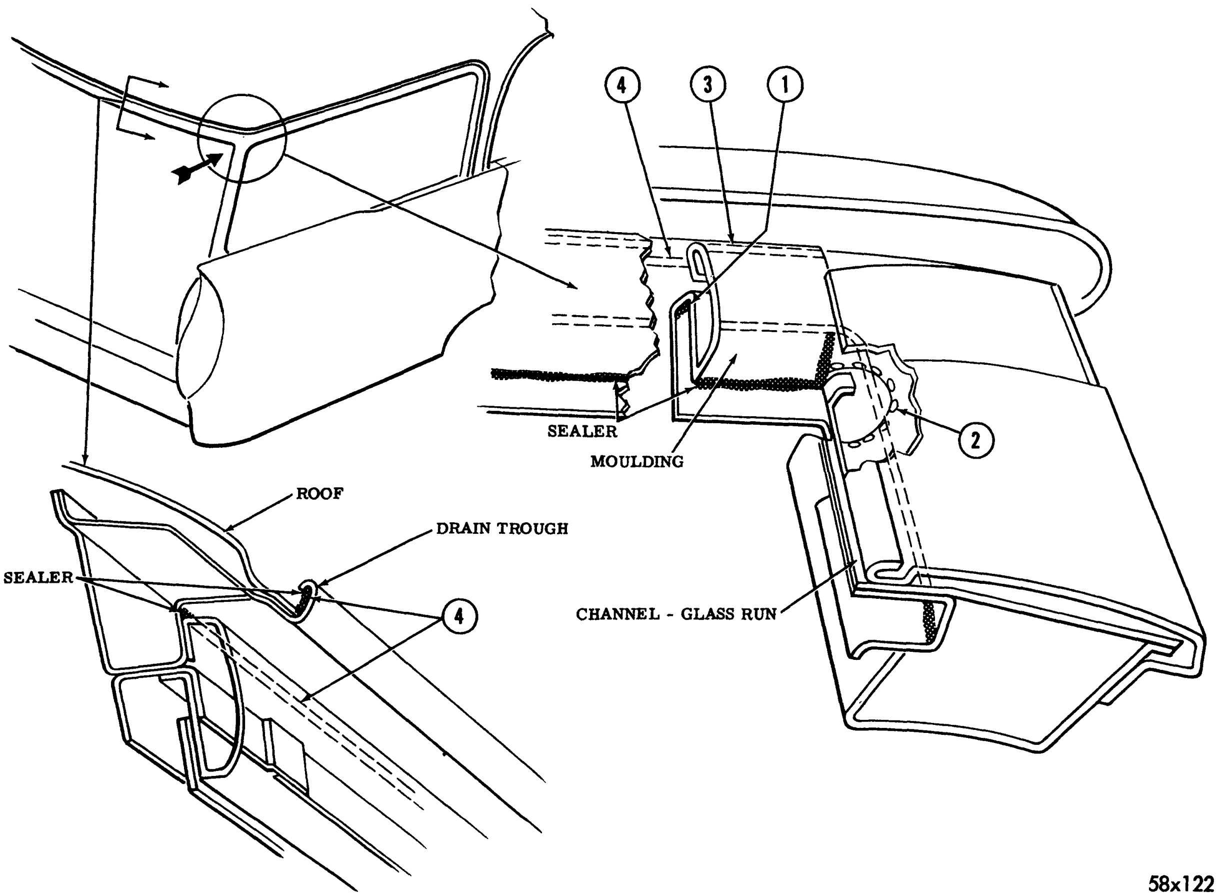


Fig. 145—Tail Gate Glass Runs and Mouldings

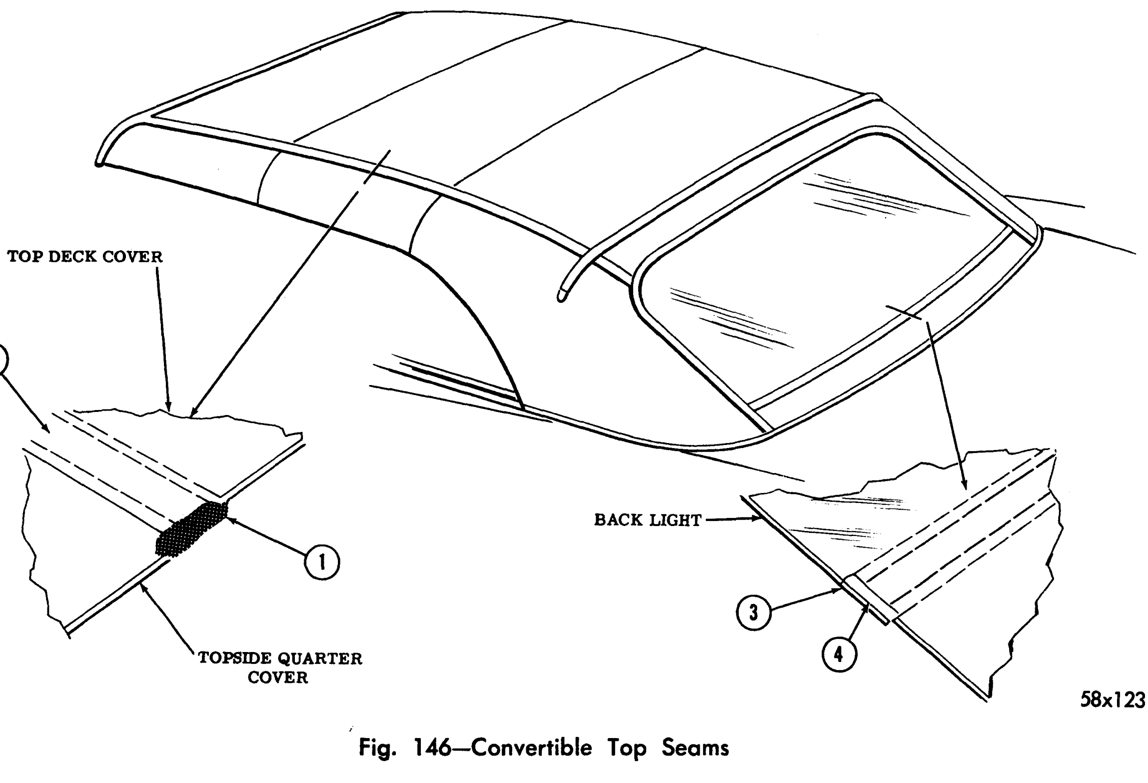


Fig. 146—Convertible Top Seams

position, it is possible for dust, water and carbon monoxide gas to be pulled in around top of glass.

55. QUARTER GLASS AND SLIDE WINDOWS

Water may leak down along the side trim panels at regularly spaced intervals. This may be caused from water leaking around the glass weatherstrip or around the slide window and down into the trough under the garnish moulding. Inspect and reseal the seams of the "B" post. Inspect weatherstrip and seal all loose or broken areas. Apply sealer between the fixed windows and body. Water leaking in around the sliding window past the weatherstrip may be caused from the weatherstrip not being long enough. The weatherstrip should be at least ¼ inch longer than the aluminum extrusion at the bottom and at least ⅛ inch longer at the top. Water may also run in past the weatherstrip at the lower front face. Install a tapered rubber shim about 6 inches long under the weatherstrip to hold it in against the glass. Apply sealer to all surfaces before installing shim.

The sliding glass weatherstrip should be installed with ⅛ inch extending above the glass and a surplus of ¼ inch at the bottom. A bead of sealer should also be squeezed between the weatherstrip and the pillar moulding.

Water in the lower glass run channel passes under the garnish moulding behind the panel trim and onto the floor or through garnish screw slots and runs over trim inside. At small drain hole at the forward end helps. On the upgrade, water runs away from the drain. Install another larger drain plus a deflector underneath the body pillar at the rear edge of the sliding glass. Remove the quarter trim panel and cut metal between the two cutouts in inner panel. Form a trough like deflector from aluminum sheet and fasten tc inner panel with sheet metal screws.

Cut a slot about 3 inches long above the deflector through the lower run channel and its retainer. Build a dam of body sealer at the rear end of lower run channel seal and garnish moulding screw slots. Reinstall trim sliding glass upper run channel and garnish moulding.

On Convertible top seams water seepage may occur along the seams of the top and may be corrected by applying convertible top seam sealer into the seams with a stiff bristle brush. This should be applied from the underside only. Thoroughly brush sealer the full length of the seams as shown in Figure 146. Water and dust leakage may also occur at the front corners of the top where the top vent wing and windshield meet. Adjust the vent wing and windows. Shim weatherstrip out to form a proper seal.

CONVERTIBLE COUPE TOP

56. OPERATING THE CONVERTIBLE COUPE TOP

a. To Lower Top

To lower the Convertible Coupe top, on the Chrysler, turn sun visors to one side and unlock both top latches (Fig. 147). To release top unzip both rear side curtains and remove top cover bag from top well. Move top control switch lever located on instrument panel to left and hold in this position until top is completely lowered.

On Imperial Models, release safety catch on locking handle located in center of header, pull handle down all the way back. This will release top.

CAUTION

Never lower top when it is wet. The top cover should be placed in the top cover bag and stored in luggage compartment. Never store top cover in top well compartment.

b. To Raise Top

WARNING

Never attempt to raise or lower the top while the car is in motion. It is advisable to raise and lower the top at least once a month to keep the top mechanism in working condition.

Remove well compartment cover. Move top control switch to right and hold it in this position until top is completely raised. Install rear curtain and engage zipper—Chrysler Models. Pull top down firmly on top header. Engage and lock both top latches to lock top securely in position.

On Imperial Models—pull top down firmly on top header. Push locking handle all the way forward until safety catch engages.

NOTE: Be sure both sides are engaged when latching.

c. Roof Side Rail Alignment (All Models)

The adjustment of front side rail and header panel to windshield is controlled by the rear control link which is fastened to the quarter panel compartment (Fig. 147).

Also affecting the side rail weatherstrip sealing at top of door glasses are front side rail hinge adjusting screws and rear side rail hinge adjusting screws, as shown in Figure 87 (Chrysler Models). If front side rail joints are open when top is fully raised, turn front side rail hinge adjusting screws counter-clockwise until joints are closed. If after making this adjustment, the clearance between door glass and side rail is increased or decreased, adjust the rear adjusting screw to obtain the desired clearance.

On All Models leveling of top can be accomplished by lowering or raising the rear control link bracket. When adjusting the rear control link, care should be taken to adjust both sides equally to maintain parallelism between header panel and windshield frame. Before making this adjustment, loosen top header at windshield to remove tension from linkage.

d. Top Header Panel Adjustment

If the header does not close easily on dowels, loosen the header panel-to-side rail screws and shift header panel forward or backward as required. If this is not possible, it will be necessary to adjust the power guide link to obtain the desired clearance. (See Fig. 148). On Imperial Models—lateral adjustment of dowels may be made by loosening nut and setting dowels to line up with hole in removable sun visor bracket.

57. ADJUSTING THE TOP

There are six adjustments on each side of roof rail to control alignment of top with the windshield header, doors, roof rail, and quarter windows. Refer to Figures 147 and 148, and proceed as follows:

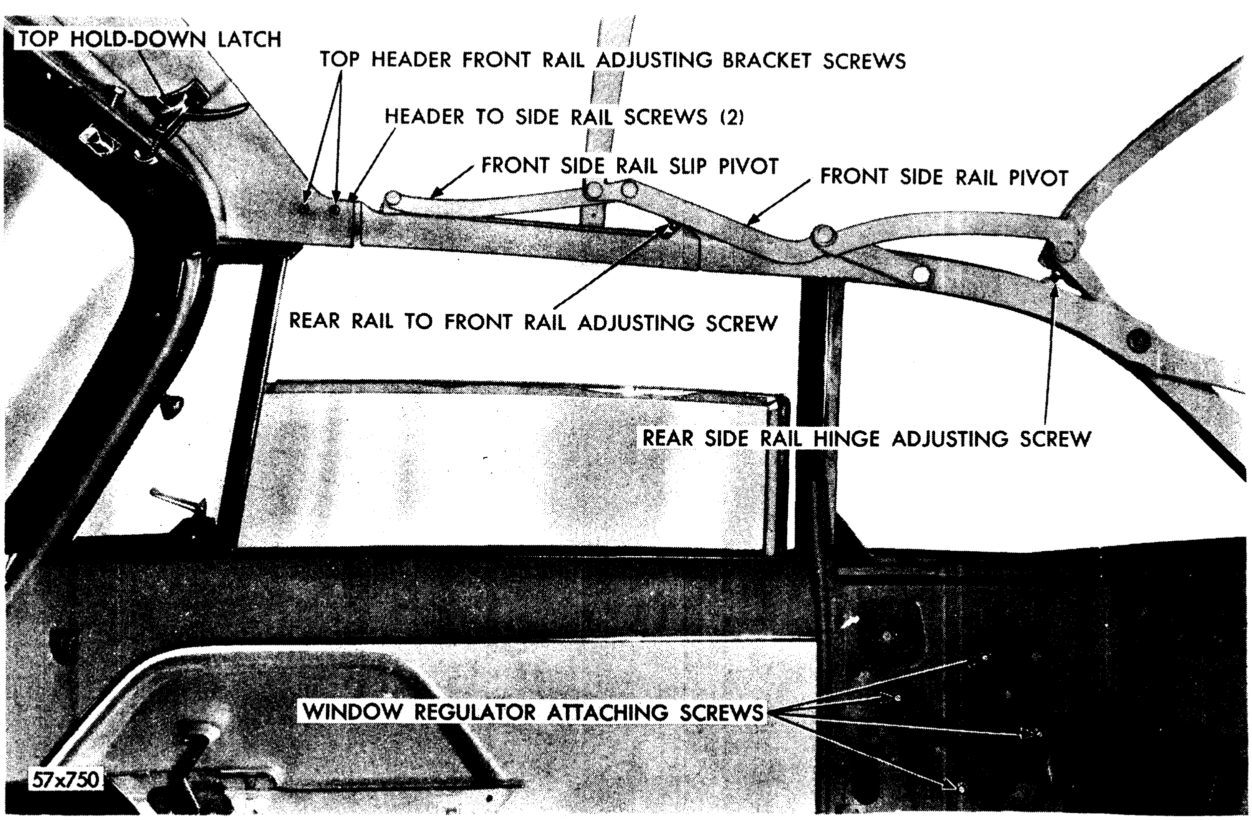


Fig. 147—Convertible Top Side Rail and Latch Assembly

a. Body Adjustment

Before making any adjustments of top header panel, roof side rails, or power links, tighten body bolts to 18 foot-pounds torque. **Shimming body to obtain proper top alignment should only be done in extreme cases where there is doubt as to proper frame-to-body alignment. If body must be shimmed, refer to Figure 43 for correct body shimming methods.**

CAUTION

To avoid stripping adjusting screw threads, loosen Allen set screw locking the adjusting screws in hinge and rail brackets (Fig. 147) before attempting to adjust locking screws.

b. Power Link Adjustment

With top and all door and quarter window glasses in raised position, carefully inspect door and quarter window glass for correct fit at side rail and vertical seals Fig. 149. Adjustment for proper alignment of quarter window glass-to-roof rail weatherstrip is made at the power guide link adjusting plate (Fig. 148) with top in partially raised position. Refer to Figures 147 and 148 for door glass-to-roof rail weatherstrip clearance.

NOTE: On Imperial Models there is no power guide link.

Adjust the lower outside power link for fore and aft and up and down movement. To decrease or increase clearance between quarter window glass and roof rail weatherstrip, loosen power guide link adjusting plate bolts and spread or shorten link as case may require, to obtain the desired clearance.

58. SERVICING THE TOP FOLDING MECHANISM

The electric-hydraulic top folding mechanism consists of two cylinders, a piping system, an electric motor, a pump and reservoir assembly, and a double-throw rotary switch. The wiring and motor are protected by a separate circuit breaker, as shown in Figure 150.

The pump is a two-direction, reversing motor type and is connected to the cylinders by flex-

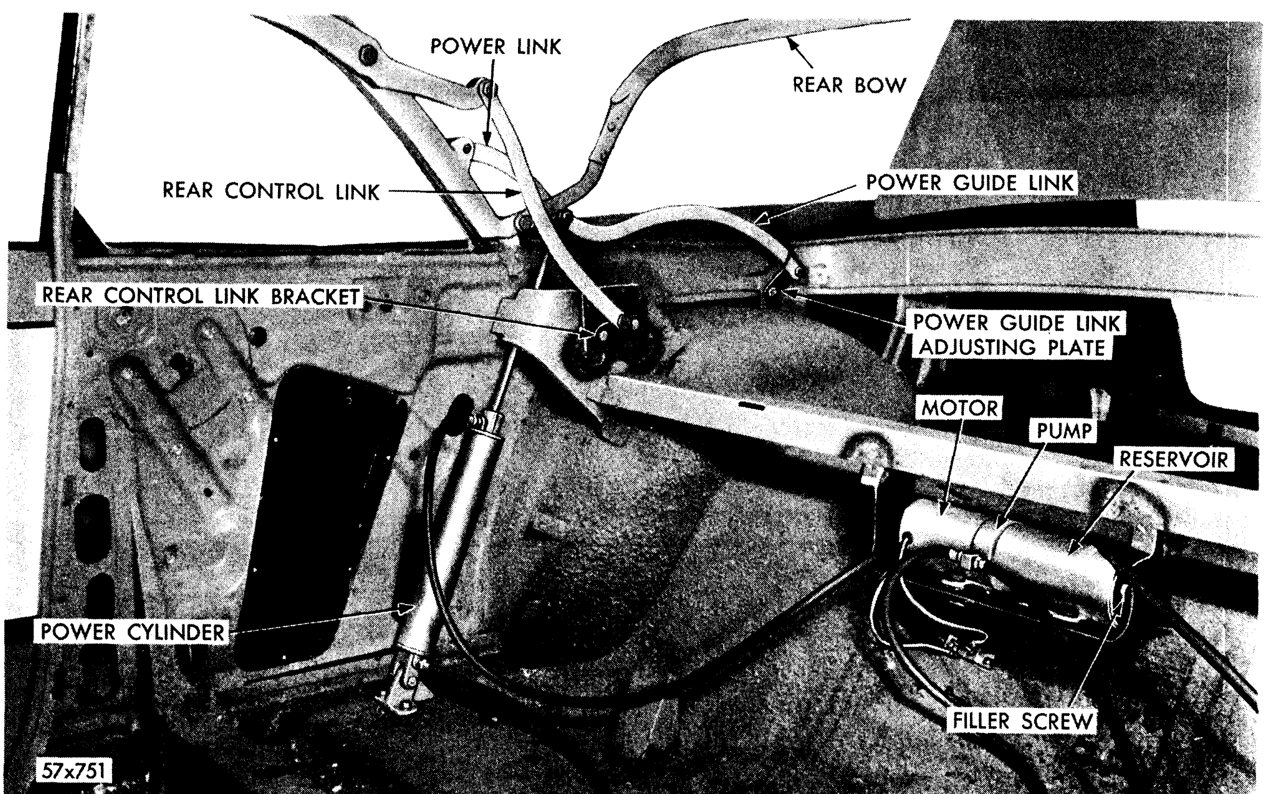


Fig. 148—Convertible Top Hydraulic Folding Mechanism

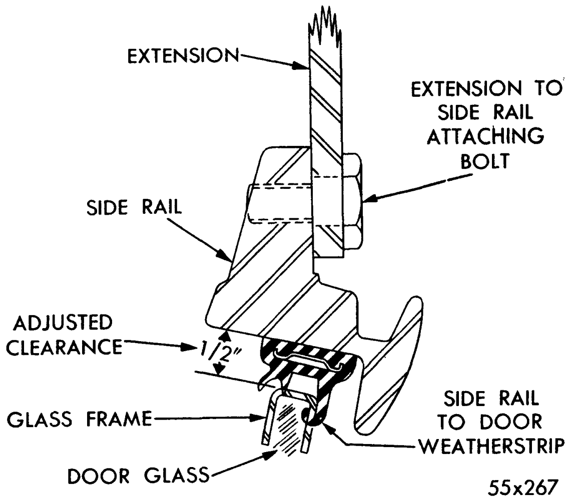


Fig. 149—Convertible Side Rail Weatherstrip

ible lines and tubing. A valve and port assembly in the reservoir directs flow of fluid in system. The motor, pump, and reservoir assembly can be replaced as a unit, or electric motor can be replaced separately. The cylinders are sealed units and must be replaced as assemblies. If difficulty is encountered in raising or lowering the top with motor running, with sufficient fluid in the reservoir, and with pivot points operating freely without binding, the cause is probably improper linkage alignment and adjustment.

59. CHECKING FLUID LEVEL IN RESERVOIR

Insufficient fluid in system may cause top to raise slowly or cause noise in the pump and motor during operation. Check fluid level in reservoir. If low, check for a leak due to broken line or loose connection. Replace line or tighten connection as necessary. Fill reservoir until fluid runs out of filler hole. Use Heavy Duty Brake Fluid.

After filling reservoir, raise and lower top several times to force out air that may be trapped in system. Always check fluid level when top is lowered.

60. TOP WILL NOT RAISE OR LOWER

Hook one wire of a test lamp to a good ground and the other wire of test lamp feed to terminal on control switch. The test lamp should light. If test lamp does not light, test on each side of circuit breaker, and replace faulty wire or circuit breaker, as necessary.

61. TESTING THE TOP CONTROL SWITCH

Disconnect the **black** wire at top control switch and hold it firmly against black and red wire terminal on control switch. The top (if raised) should start to lower. Repeat this test with green wire. The top (in lowered position) shoud start to rise. If top operates during these tests, but fails to operate when control switch lever is moved to right or left, the switch is at fault and should be replaced. If top fails to operate during these tests, follow procedure outlined in Paragraph 57, 59 and 62.

62. TESTING WIRES BETWEEN CONTROL SWITCH AND PUMP MOTOR

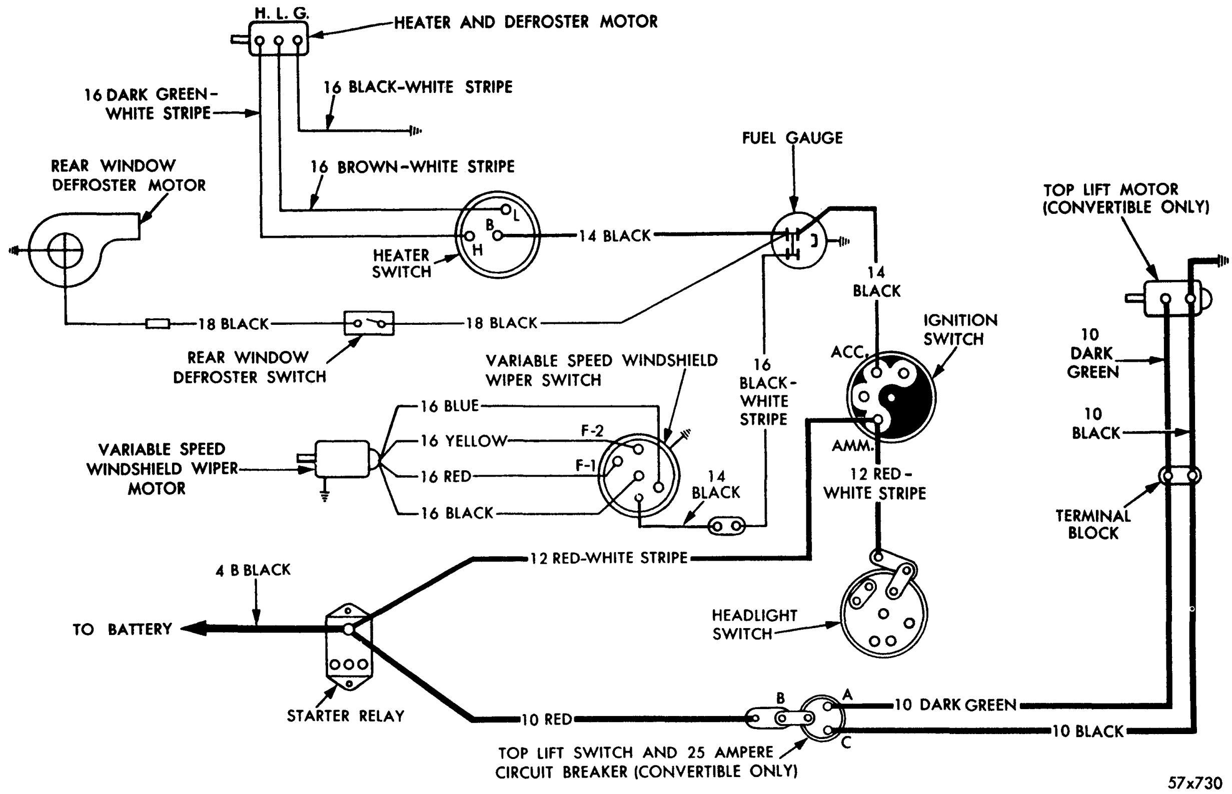
This test can be made from the luggage compartment. Check pump motor ground wire (black wire between pump motor and ground) to make certain it has a good, clean ground connection. Hook one wire of test lamp to black wire terminal on pump motor and ground the other wire of test lamp. Move top control lever to right. The test lamp should light. If test lamp does not light, the black wire between pump motor and control switch is defective and should be replaced. Repeat this test at green wire terminal, moving top control lever to left. If test lamp lights in both cases, but the pump motor fails to operate, replace the pump motor.

63. REAR WINDOW (CONVERTIBLE COUPE)

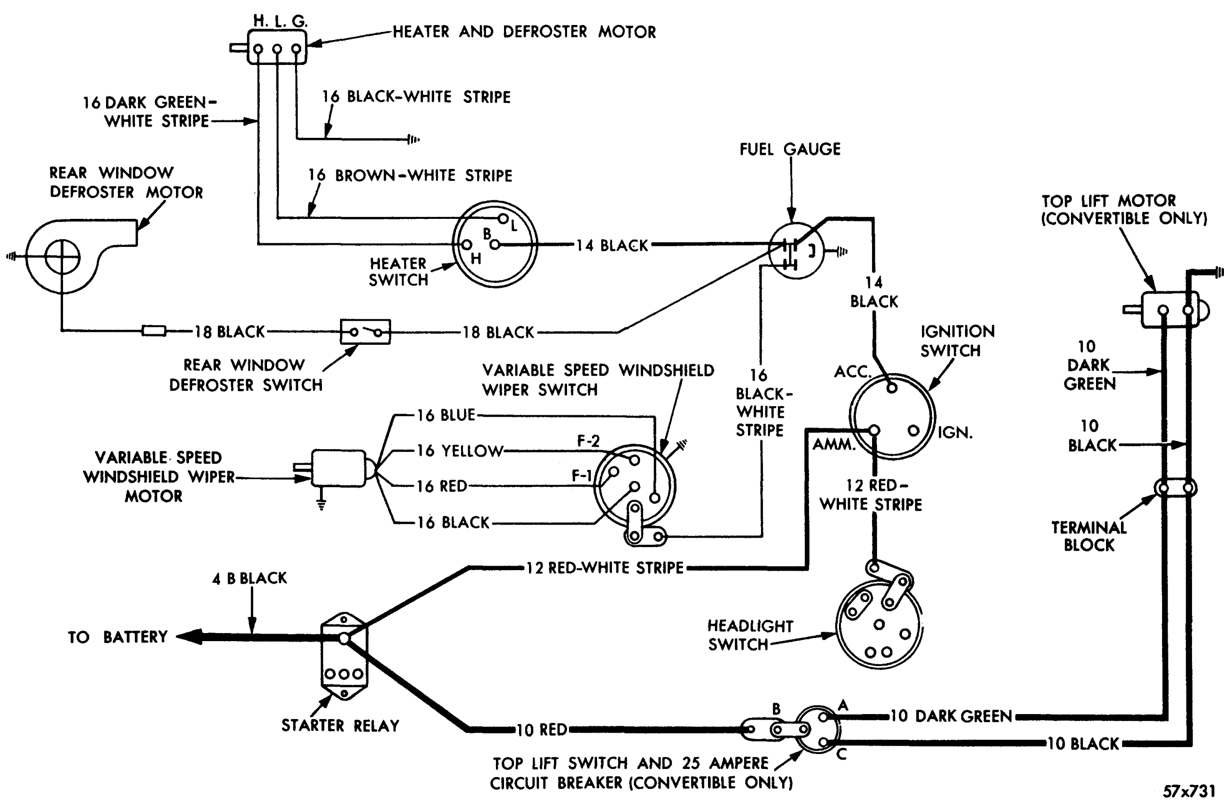
The rear window is made from flexible vinyl plastic material and special attention should be given to cleaning and storage of window. To clean window, rinse with cold water spray to remove grit and dirt. Lather the surface with suds of a mild soap, (such as Castile), using the palm of hand. Rinse thoroughly and allow to air dry. **Do not use towel, sponge, or chamois to apply suds or to dry the window. Otherwise, the surface may become scratched.** If this procedure does not clean the window thoroughly, a solution of 40 per cent rubbing alcohol and 60 per cent clean water should be used. Apply with palm of hand and rub surface of window with circular motion. Use solution generously.

64. CARE OF THE TOP

The worn fabric top material can be waterproofed with Windshield Rubber Sealer, Part Number 13162201. Clean top thoroughly before



Chrysler Models



Top Lift Circuit Wiring Diagram—Imperial Models

Fig. 150—Windshield Wiper, Heater, Rear Window Defroster

applying sealer. Remove spots with an art gum eraser and brush off dust and road dirt with a whisk broom. Using a sponge or brush, wash top thoroughly with warm water and mild soap. Scrub top with soap suds, starting in center and gradually working toward edges. When top is clean, wipe off excess suds with a clean, wet cloth. Allow top to dry and apply sealer evenly with a brush.

Before lowering top, make sure the fabric is completely dry. Dampness may cause formation of mildew and damage to the fabric will result.

SERVICING THE TOWN AND COUNTRY WAGON

For information relative to servicing of the Town and Country Wagon engine, transmission and axle components other than the tail gate, rear quarter panel and windows, refer to the Section covering these items in this Manual. To service the tail gate and rear quarter window, refer to Figure 151 and proceed as follows:

SERVICE PROCEDURES

65. TAIL GATE

a. Removal

To remove the tail gate proceed as follows:

NOTE: On electric operated models, disconnect battery ground cable and wiring at tail gate. Lower tail gate glass, open tail gate so that tail gate is in straight up position.

Remove the four screws and hinge at each end (Fig. 151) (body half of hinge), remove tail gate as an assembly.

b. Installation

Position tail gate straight up on body. Install hinge, attaching screws, but do not tighten securely. Align and adjust position of tail gate

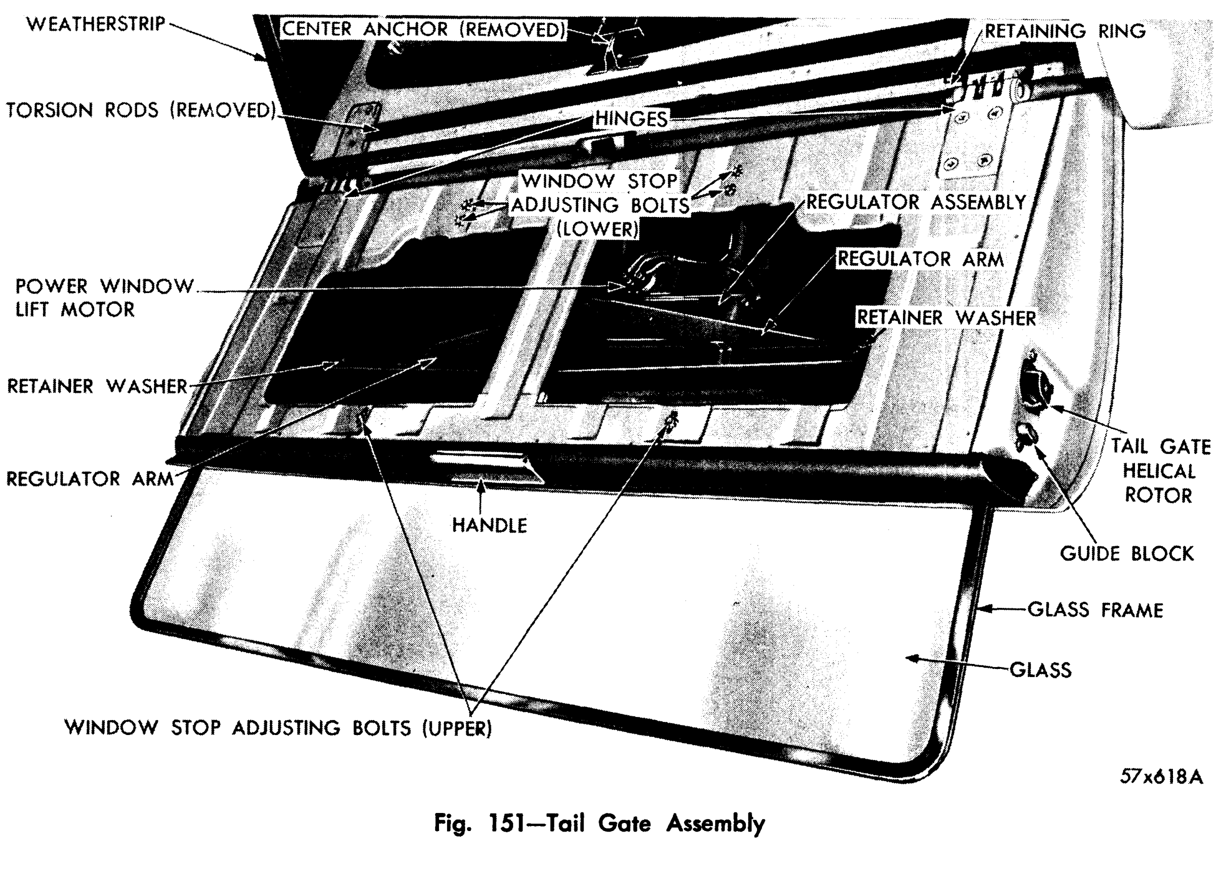


Fig. 151—Tail Gate Assembly

in body opening. Refer to Paragraph "c" below. After tail gate is adjusted to opening, tighten hinge screws securely.

c. Alignment of Tail Gate

The adjustments provided for proper alignment of tail gate with body opening is as follows:

The floating nuts in the tail gate panel hinge provide for up and down movement. The tapping plates in the body hinge provide adjustment from side to side and fore and aft at bottom of tail gate.

66. REMOVAL OF TAIL GATE REGULATOR HANDLE

Lower rear window glass. Remove regulator handle attaching screws, lower tail gate to open position and remove regulator handle.

67. REMOVAL OF TAIL GATE GLASS AND/OR RUN CHANNELS

Lower rear window glass, unlock and pull tail gate down to the fully opened position. Remove inner panel, and remove retainer washer from each window regulator arm (Fig. 151).

Raise glass to facilitate removal, disengage regulator arms from glass channel slots and remove upper window stops, remove glass. Remove upper and lower attaching screws located inside of tail gate and remove glass run channels.

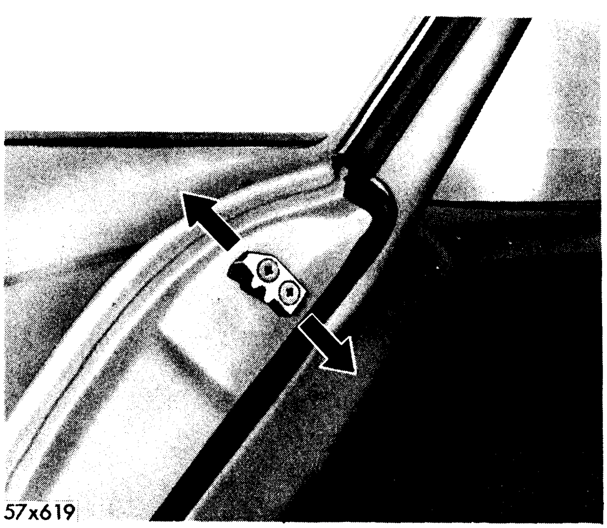


Fig. 152—Tail Gate Lock Striker

68. INSTALLATION OF TAIL GATE LOWER GLASS RUN CHANNEL AND TAIL GATE GLASS

Install lower glass run channels and tighten screws securely. Install rear window glass. Install upper stops. Slip regulator control arms into glass channel slots and install the retaining washers. Lower the tail gate glass to fully lowered position. Close tail gate. Check operation of rear window regulator and fit of rear window glass in upper glass run channel by raising and lowering the rear window glass.

NOTE: The rear window may be repositioned by loosening 4 adjusting screws and by adjusting the regulator.

If glass binds in channel, re-check adjustment. The tail gate glass run channel screws, two on each side of tail gate, are used to adjust fore and aft and tilt.

NOTE: If additional fore and aft adjustment is required at top of tail gate adjust lock strikers (Fig. 152).

69. REMOVAL AND INSTALLATION OF TAIL GATE REGULATOR

The tail gate regulator is bolted to the tail gate stress brackets by attaching bolts. Remove attaching bolts and remove regulator. The attaching bolt holes are elongated for proper aligning of regulator in relation to the glass travel.

When installing regulator, care should be taken to see that regulator is installed to permit total travel in both directions.

a. Torsion Bars

The tail gate is designed to assist the operator in opening and closing of the tail gate. The two torsion bars are located between the hinges and the ends are retained by the body half of the hinges. A center anchor is located at center of tail gate.

b. Removal of Torsion Bars (Fig. 153)

Remove tail gate and hinges from body as an assembly. Remove one hinge from tail gate. Slide out two torsion bars.

c. Installation

Install two torsion bars. (Fig. 153). Install

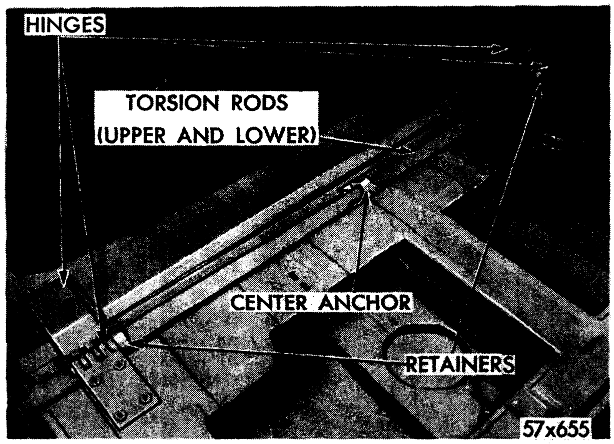


Fig. 153—Tail Gate Torsion Bars Installed

hinge to tail gate. Install tail gate and hinges as an assembly.

d. Removal of Door Latch

Remove glass run channel. Remove three attaching screws and door latch. When installing door latch make sure it is properly aligned with striker. (Fig. 152)

e. Replace Door Latch Pull Wire

Remove inner panel and replace wires. To adjust length of latch pull wire, loosen screw holding adjusting bracket (located under inner lip of door inner panel) and place wire in proper groove to apply tension. Tighten screws.

f. Removal Upper Glass Run Channel

Remove attaching screws and pry out channel from retaining strip.

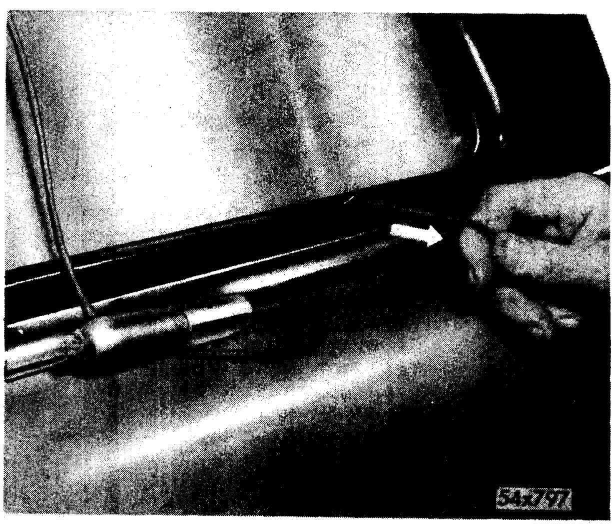


Fig. 154—Removing Pull Cord from Weatherstrip

70. REMOVAL AND INSTALLATION OF REAR QUARTER WINDOW

Remove rear quarter window garnish moulding attaching screws and remove garnish moulding. Exert pressure on the outside of glass and carefully force it out of opening.

Before installing the rear quarter window glass, remove old sealer from weatherstrip and window frame. Apply a bead of new sealer all around window opening. Install glass in the weatherstrip and insert pull cord in sealing lip slot, as shown in Figure 154. The pull cord should be installed so ends of cord are on bottom and outside of vehicle.

Slide window glass and weatherstrip into position in window opening. Press glass firmly to compress the sealing bead. Install garnish moulding and attaching screws. Do not tighten screws. Pull cord and position sealing lip over edge of window reveal, as shown in Figure 149. If pull cord is not available, a wood or fiber wedge can be used to position lip of weatherstrip, as shown in Figure 154. Tighten garnish moulding attaching screws securely.

71. SPARE TIRE MOUNTING

Spare tire assembly is located in the right rear fender. (Fig. 155) To remove tire and wheel assembly, the fender skirt and wheel clamp must be removed.

72. INSTRUMENT PANEL AND BODY WIRING ASSEMBLY

For body wiring diagrams refer to Figures 156 through 157.

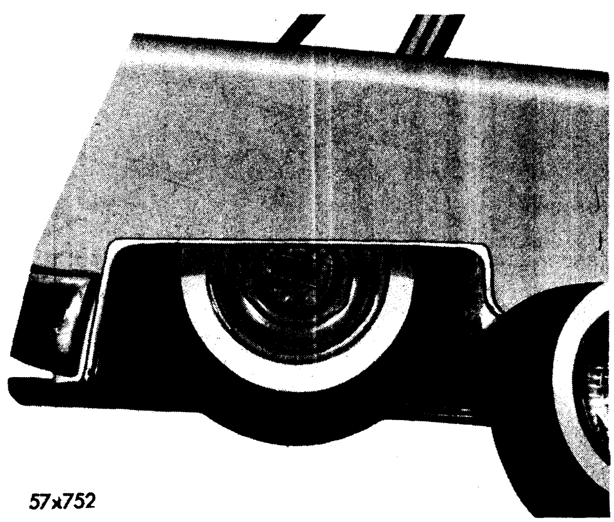


Fig. 155—Spare Wheel Mounting (Typical)

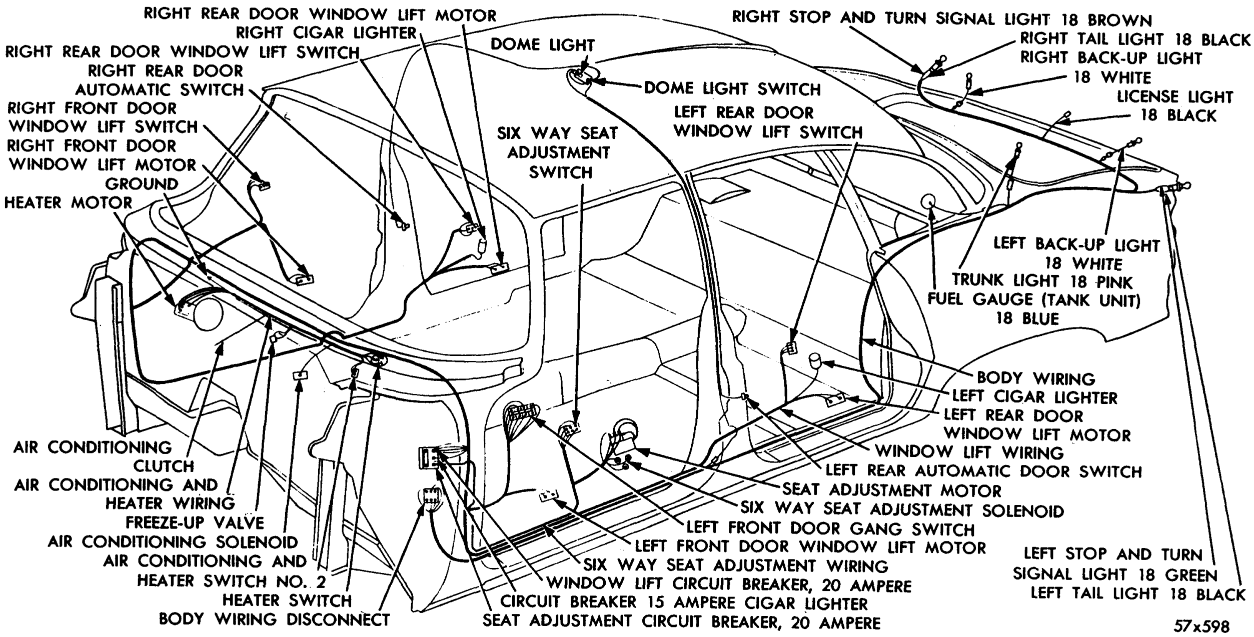


Fig. 156—Imperial Basic Body Wiring

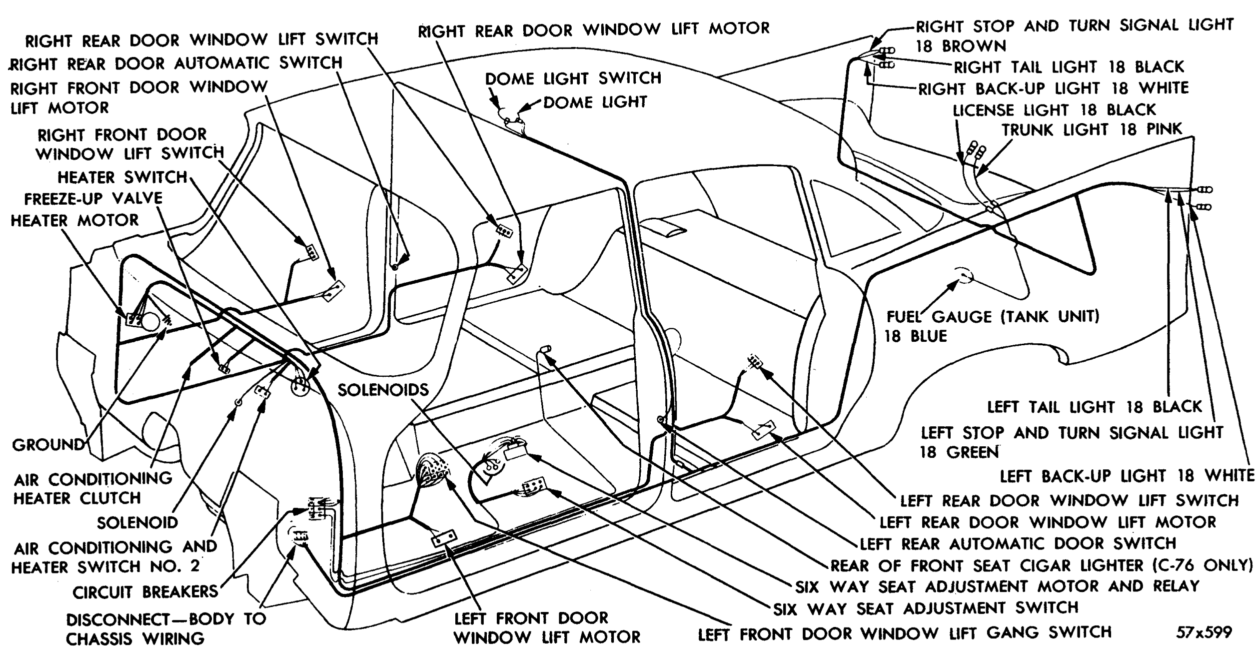


Fig. 157—Body Wiring—Chrysler Models

Section XV
LUBRICATION
CONTENTS
LUBRICATION RECOMMENDATIONS

1. ENGINE OIL RECOMMENDATIONS (FIG. 1)

The use of a good quality engine oil is recommended. In selecting an engine crankcase oil for Chrysler Corporation cars, it is important that the owner obtain a lubricant of good quality from a reputable refiner, and that it has the proper viscosity for the prevailing temperature. The following viscosity designations will indicate the correct engine oil to use at any anticipated atmospheric temperature.

Anticipated Lowest	Recommended SAE Viscosity Number	Recommended Viscosity Range—if Multi-Viscosity Oils Are Used
Above + 32° F.	SAE 30	SAE 20W 40
		SAE 10W 30
Above + 10° F.	SAE 20W	SAE 20W 40
		SAE 10W 30
Above (—10° F.)	SAE 10W	SAE 10W 30
		SAE 5W 20
Below (—10° F.)	SAE 5W	SAE 5W 20

When using Multi-Viscosity Oils, make sure the SAE weight range coincides with the atmospheric temperature chart.

2. A.P.I. ENGINE OIL CLASSIFICATIONS

The type of service for which an engine oil is intended is usually designated by the letters MS, MM, or ML on the container. These are service classifications established by the API (American Petroleum Institute.) This system does not replace the SAE (Society of Automotive Engineers) grade number of the oil which indicates the Viscosity or consistency of the oil recommended.

For best performance and engine protection, the factory recommends that the car owner select:

a. An oil which conforms to the requirements of API classification "For Service MS".

b. An oil of proper SAE number in accordance with the recommendations for the anticipated temperature as shown in Paragraph 1.

The factory does not recommend the use of any lubricant which does not have both an SAE designation and an MS service classification on the container.

3. MULTI-VISCOSITY OILS

When using multi-viscosity oils, be sure that the SAE weight range coincides with the atmospheric temperature chart shown in Paragraph 1.

4. ENGINE OIL CHANGE PERIODS

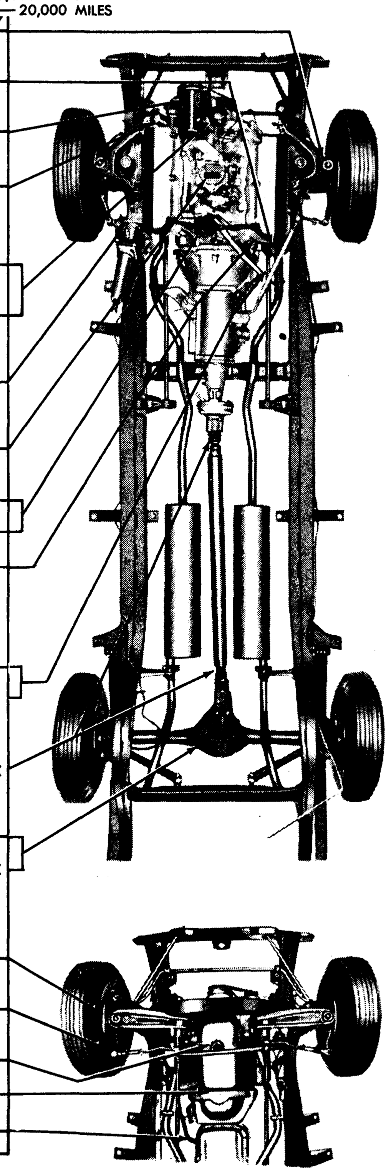
During the first 1,000 miles, leave the factory installed oil in the engine. If it is necessary to add oil during this driving period, use the proper viscosity oil according to the atmospheric temperature chart. Refer to paragraph 1, Figure 1. Drain the crankcase after the first 1,000 miles and refill with the proper viscosity oil for the lowest anticipated atmospheric temperature.

Periodic oil changes, thereafter, using the proper grade of oil for the anticipated temperature range and designated "For Service MS" should be made every three months or 5,000 miles, whichever occurs first, more often if winter driving consists of short trips, or extreme dust or contaminated atmospheric conditions are encountered. Four quarts are necessary for refill on LC-1 and 2 and 5 quarts are necessary on LC-3 and LY-1 for refill. Add an additional quart when the oil filter element is changed. The oil level indicator is located on the left side of the engine.

5. UNUSUAL CONDITIONS

Under certain conditions, more than usual care is advisable in order to keep the engine operating smoothly. In cold weather, for example,

	1,000 MILES	5,000 MILES	10,000 MILES	15,000 MILES	20,000 MILES
UPPER AND LOWER BALL JOINTS 4 fittings—CL	X				
OIL FILTER Replace		X			
GENERATOR 2 oil cups—5 drops EO	X				
POWER STEERING RESERVOIR (When so equipped) Add lubricant as necessary Automatic Transmission Lubricant Type A	X				
INTAKE PIPE AIR CLEANER Wash with kerosene—re-oil SAE 50		X			
ENGINE CRANKCASE Drain and refill—EO as per seasonal recommendations		X			
STEERING GEAR Manual—add lubricant as necessary SAE 90 Fluid Gear Lubricant	X				
CARBURETOR AIR CLEANER Change filter element				X	
DISTRIBUTOR Oil cup—5 drops EO	X				
Wick—2 drops EO			X		
OUTLET PIPE AIR CLEANER (Export only) Wash in Kerosene. Reoil with SAE 50		X			
TORQUE-FLITE TRANSMISSION Check level	X				
Drain and refill Automatic Transmission Fluid Type A					X
UNIVERSAL JOINTS Ball and trunnion type—Disassemble, clean and repack— 2 oz. UJG					X
REAR AXLE DIFFERENTIAL Add lubricant as necessary	X				
Drain and refill—MP					X
FRONT WHEEL BEARINGS Clean and repack—WBG			X		
TIE ROD BALL JOINTS 4 fittings—CL	X				
ENGINE OIL PAN DRAIN PLUG					
CONVERTOR OIL DRAIN PLUG					
TORQUE-FLITE TRANSMISSION drain plug					



KEY TO LUBRICANTS

CL—Chassis Lubricant
EO—Engine Oil
MP—Gear Lubricant Multi-Purpose
UJG—Universal Joint Grease
HGL—Hypoid Gear Lubricant
WBG—Wheel Bearing Grease

SPECIAL ATTENTION

Recommended lubricants are based on average driving conditions. A car driven in extreme dusty, cold, or high humidity climate will require more frequent lubrication and maintenance.

Replace oil filter cartridge after 5-thousand miles of operation.

THESE POINTS REQUIRE NO LUBRICATION

- Rear Wheel Bearings
- Starting motor.
- Rear spring bolt and shackles.
- Foot accelerator and brake pedal.
- Propeller shaft center bearing (on long wheelbase models).
- Carburetor linkage and automatic choke.
- Rubber parts (pads, bushings, seals).
- Water pump and fan belt idler puller.
- Upper and lower control arm pivots.
- Steering idler arm pivot.
- Steering center link pivots.
- Carburetor air cleaner.
- Sway eliminator bar pivots.

ADDITIONAL LUBRICATION POINTS

1,000 Miles—CL; Parking brake linkage, *Lubriplate;* Door hinges and springs, hood clamps, etc., *MoPar Dripless Penetrating Oil;* Door striker plates, dovetails and rotor wheels, *Stainless Stick Lubricant.*

10,000 Miles—Speedometer wick, MoPar Speedometer Oil; Speedometer cable shaft, *MoPar All-Weather Speedometer Cable Lubricant;* Door lock cylinders, *MoPar Lubriplate.* Also check fluid level in power cylinder reservoir of convertible top mechanism. If necessary, add MoPar Super Brake Fluid. Do not overfill.

15,000 Miles—Change air cleaner filter.

20,000 Miles—Propeller shaft splines (Imperial), clean and fill half full with *Multi-purpose Rear Axle Lubricant.*

RECOMMENDED TIRE PRESSURES

	MODEL	
Starting Pressure (tires cold)	LC-1 (Except Sub.)	Front 24 Rear 22
	LC-1 Suburban	Front 24 Rear 24
	LY-1, LC-2 & 3	Front and Rear 22
After Driving (tires warm)	LC-1 (Except Sub.)	Front 27 Rear 25
	LC-1 Suburban	Front 25 Rear 27
	LY-1, LC-2 & 3	Front and Rear 25

A pressure build-up of at least 3 pounds over starting pressure is normal, otherwise tires are underinflated.

After fast driving (tires hot)	LC-1 (Except Sub.)	Front 29 Rear 27
	LC-1 Suburban	Front 27 Rear 29
	LY-1, LC-2 & 3	Front and Rear 27

A pressure build-up of at least 5 pounds over starting pressure is normal, otherwise tires are underinflated.

NEVER REDUCE OR "BLEED" BUILT-IN PRESSURE IN TIRES

ENGINE OIL RECOMMENDATIONS

The following viscosity designations will indicate the correct engine oil to use at any anticipated atmospheric temperature.

Atmospheric Temperature	Recommended Viscosity No.	Multi-Grade Options
Above..32°F.	SAE 30	SAE 20W-40 SAE 10W-30
Above..10°F.	SAE 20W	SAE 20W-40 SAE 10W-30
Above—10°F.	SAE 10W	SAE 10W-30 SAE 5W-20
Below—10°F.	SAE 5W	SAE 5W-20

Retain original factory oil in crankcase during first 1,000 miles of operation.

If necessary to add oil during initial period, use recommended viscosity oil shown above for lowest anticipated temperature.

CAPACITIES

Engine Oil—LC-1 & 2	4 qts.
LC-3 & LY-1	5 qts.
(add 1 qt. when replacing filter element)	
Cooling System—New Yorker and Imperial	25 qts.
Windsor (with heater)	22 qts.
Torque-Flite Transmission (refill)	
New Yorker and Imperial	10½ qts.
Windsor and Saratoga	9 qts.
Rear Axle Differential	
Windsor (except Town & Country)	3½ pts.
New Yorker, all Town & Country and Imperial	3½ pts.
Fuel Tank (except Windsor, Town & Country	23 gals.
Town & Country	22 gals.
Windsor	20 gals.

57x398A

Fig. 1 — Chrysler Engineered Lubrication

the car should be driven at moderate speeds until the engine reaches normal operating temperature. Short trips, in which the engine does not reach normal operating temperature, may result in condensation forming in the oil pan. To protect the engine against this condition, the engine oil and the oil filter element should be changed more frequently than recommended in the regular service schedule. When driving over dusty roads for extended periods, the lubrication interval should be shortened and the carburetor air cleaner, crankcase ventilator air cleaner and oil filter should be serviced more frequently.

6. ENGINE OIL LEVEL INDICATOR

The engine oil level should be checked each time the car is refueled. The engine oil level indicator, as shown in Figure 2, has two markings: "Full" and "Add Oil." If the oil level is between the "Full" and "Add Oil" marks, it is not necessary to add oil. If the oil level drops to the "Add Oil" mark, or slightly below it, add not more than one quart of oil.

7. CARBURETOR AIR CLEANER

The carburetor air cleaner, as shown in Figure 3, is a heavy duty type air cleaner with a replaceable paper element and is used on all models. At 5,000 miles interval, remove the paper element, tap the dirt out with your hand gently and replace. **DO NOT WASH OR OIL.** When car is driven in dusty areas, the air cleaner may require more frequent servicing. Install a new MOPAR filter cartridge every 15,000 miles.

8. OIL FILTER

The full-flow oil filter with replaceable element is used on ALL Chrysler and Imperial models. The oil filter element should be changed every 5,000 miles to coincide with an engine oil change, after the initial engine oil change.

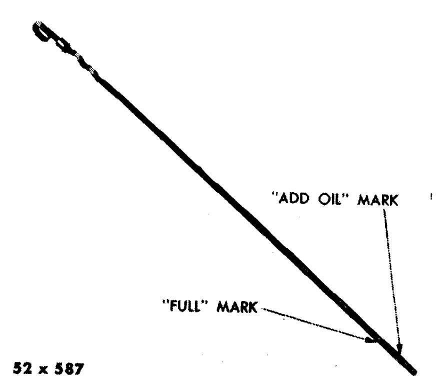


Fig. 2 — Typical Engine Oil Level Indicator

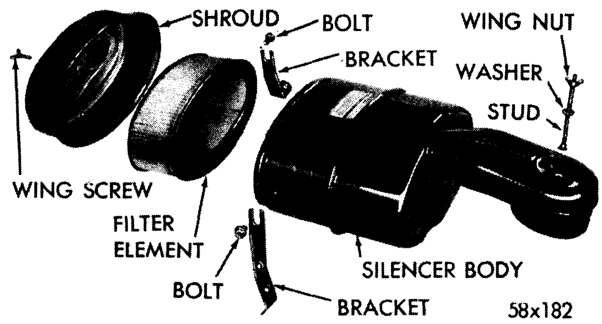


Fig. 3 — Carburetor Air Cleaner

During cold weather operation, or when the car is driven in dusty areas, more frequent replacement of the oil filter element may be necessary.

9. OIL FILTER PIPE CAP AIR CLEANER

At every 5,000 miles interval, the air cleaner should be removed, thoroughly cleaned in kerosene, and re-oiled with SAE 50 Engine Oil. (SAE 40 may be used if SAE 50 is not available). When car is driven in dusty areas, the air cleaner may require more frequent servicing.

10. MANIFOLD HEAT CONTROL VALVE

Use MOPAR Engine Care (Part Number 1643273) if control is frozen or is sticky. Apply one or two drops at each bushing. Let this penetrate a few minutes. Work valve back and forth until free.

11. BALL JOINT LUBRICATION

Lift the car at the outer ends of the lower control arms, leaving enough room for a grease gun to be used at the lower ball joint lubricant fitting. **CAUTION: Do not lift the car at the frame front crossmember since this will not unload the ball joints.** This can be done by using a two-pedestal hoist with the arms extended or by lifting with jacks placed under the lower control arms. As the car is lifted, the lower ball joint will be unloaded and the upper control arm (rebound) bumper will move away from its "stop" on the frame.

Apply grease generously to flush out the old lubricant from both the upper and lower ball joints. Grease should flush out completely around the lower ball joint and from one side of the upper ball joint seal; the upper ball joints are preloaded and, therefore, cannot be unloaded to reduce the restriction to lubricant flow. At the time the grease is being applied, turn the front wheels from side to side a number of times to work the lubricant into the ball joint better.

NOTE: When grease is applied, there will be an up-and-down movement of the wheel and tire assembly at the steering knuckle. This is evidence that the ball joints are separating under pressure and is not an indication of worn parts.

Lower the car to the floor and rock from side to side a number of times. Check for noises.

LUBRICATION RECOMMENDATIONS

12. EVERY 1,000 MILES

Refer to Lubrication Chart as shown in Figure 1, for lubrication points, lubrication procedures and lubricants ,also, refer to the following.

a. Manual Steering Gear

Check lubricant level at the above mileage and replenish when level is below filler hole. Do not use pressure gun! Use SAE 90 Multi-Purpose Gear Lubricant. In extremely cold weather, use SAE 80 Multi-Purpose Gear Lubricant, or dilute SAE 90 with small amount of SAE 10-W engine oil to ease steering.

b. Power Steering

The level of the oil in reservoir will vary according to the operating temperature of the pump. The normal operating temperature is approximately 175 degrees F. At 70 degrees F., the oil level will be approximately 3¼ inches below the top of the filler neck. The oil level should never be allowed to fall below the baffle on the reservoir.

Whenever the pump is drained or removed for servicing, the pump must be filled up to the "full" mark indicated on the filler neck of reservoir before and after the engine is started. Use Automatic Transmission Fluid, Type "A".

NOTE: Maintain fluid level in pump as recommended and replenish as necessary with specified lubricant. When reservoir cover is removed, do not permit dirt to fall into reservoir. It is not necessary to change the fluid for cold weather operation.

c. Rear Axle

Use Multi-Purpose Gear Lubricant SAE 90 for summer and winter above —10° F., or SAE 80 for extreme winter below —10° F. Remove filler and check level of lubricant. Replenish to level of filler hole. Do not overfill!

d. TorqueFlite Transmission— Checking Fluid Level

Apply parking brakes. Run engine at idle speed and operate the drive selector lever through all ranges and return to Neutral (N). Check level at transmission dipstick. Replenish to "L" mark if level is below the "L" mark when engine and transmission are cold; if, after operating the car for several miles, the level is below the "F" mark, replenish to the "F" mark. The oil level however should not be above the Full mark after the car has been driven sufficiently to bring the engine and transmission up to operating temperatures.

e. Special Low Temperature Recommendation

If it is anticipated that the average temperature range will be below (—10°) F., replace one quart of fluid with refined kerosene. This service need be performed once at the beginning of the low temperature season. Thereafter, necessary replenishment of TorqueFlite should be with Automatic Transmission Fluid, Type "A," until the next seasonal dilution or the 20,000 mile oil change.

CAUTION

To prevent dirt from entering the transmission, make sure the oil level indicator is properly seated in the filler tube.

f. Generator

There are two oil cups. Apply 5 to 10 drops of Light Engine Oil to each oil cup.

g. Distributor

Use 5 to 10 drops of Light Engine Oil in oil cup.

13. EVERY 5,000 MILES

Refer to Lubrication Chart, as shown in Figure 1, "Higher Mileage Services (5,000 Miles)." Also, refer to Paragraphs 3, 4, 5 and 6.

14. EVERY 10,000 MILES

Refer to Lubrication Chart as shown in Figure 1, "10,000 Miles Interval," and also to the following information:

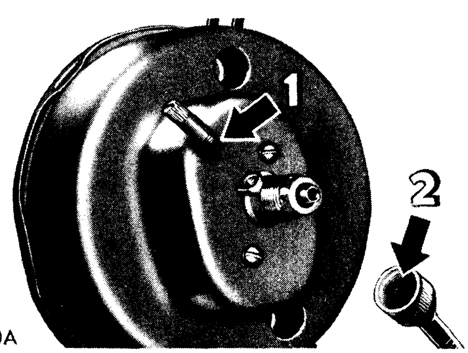
a. Front Wheel Bearings

Use Short Fiber Wheel Bearing Grease—Medium. Check quality and quantity of lubricant.

NOTE: DO NOT ADD GREASE TO WHEEL BEARINGS. If grease is emulsified or in short quantity, it should be replaced. All grease should be removed from the bearings and hub, and the assembly cleaned and repacked. Add 1¾ ounces of lubricant to inner surface of hub on model LC-1 only. Add 4 ounces of lubricant to inner surface of hub on models LC-2 and 3.

b. Speedometer Oil Tube Wick

UseMOPAR Speedometer Oil. Unscrew and remove oil tube with wick from speedometer housing (above speedometer cable flange). Saturate wick, as shown in Figure 4, with oil and replace.



52x590A

Fig. 4 — Speedometer and Cable Lubrication Points (Unit positioned to show Lubrication Points)

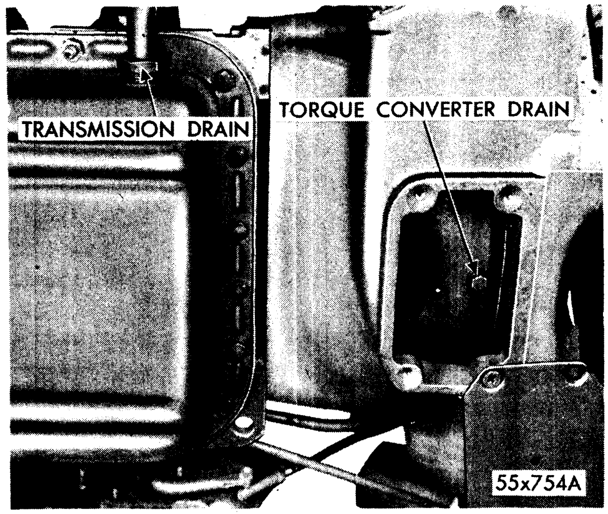


Fig. 5 — TorqueFlite Transmission and Torque Converter Drain Points

c. Speedometer Cable

Use MOPAR All-Weather Speedometer Cable Lubricant. Disconnect cable at speedometer housing, as shown in Figure 4, and remove shaft. Coat shaft with the specified lubricant and install.

d. Distributor

Use Light Engine Oil and MOPAR Cam Lubricant. Remove distributor rotor and apply 2 or 3 drops of Light Engine Oil to felt wick in top of cam. When replacing contact points, apply MOPAR Cam Lubricant to bumper block on distributor contact arm. Do not permit oil or lubricant to get on contact points!

15. EVERY 15,000 MILES

Refer to Lubrication Chart, as shown in Figure 1, "15,000 Miles Interval."

16. EVERY 20,000 MILES

Refer to Lubrication Chart, as shown in Figure 1, "20,000 Miles," and also to the information that follows:

a. TorqueFlite Transmission

Use Automatic Transmission Fluid, Type "A." To drain, remove the filler tube connector at the oil pan, as shown in Figure 5. Pull back on tube to drain. Retighten connector when drained. Remove access plate from bottom of housing and rotate torque converter until drain plug is accessible. Remove the plug and drain the fluid. Check the gasket on torque converter and install new gaskets, if necessary. Install drain plug and tighten. Install access plate on housing and tighten screws. To refill, apply parking brake. Add 5 quarts of Automatic Transmission Fluid, Type "A" through transmission oil pan filler tube. Start engine and add approximately 4 more quarts while engine is running. Allow engine to idle for 2 minutes. Operate the TorqueFlite Transmission drive selector push buttons through all speed ranges and push in the Neutral (N) push button. Add sufficient fluid to bring fluid level to Low mark on transmission dip stick.

CAUTION

To prevent dirt from entering transmission, make sure dip stick is properly seated in filler tube.

b. Rear Axle

Drain and refill to bottom of filler hole with Multi-Purpose Gear Lubricant SAE 90 for temperatures above —10° F., SAE 80 for temperatures below —10° F. and SAE 75 for temperatures below —30° F. Do not overfill.

17. PARTS REQUIRING NO LUBRICATION

Refer to Lubrication Chart, as shown in Figure 1, and to the following information:

a. Rubber Bushings

Do not lubricate these bushings. They are designed to grip the contracting metal parts firmly and operate as a flexible medium between these parts. The use of any lubricant will destroy the necessary friction and cause premature failure of these rubber parts.

b. Oilite Bearings

The bearings are self-lubricating and are used in locations where lubrication is difficult to maintain. When Oilite Bearings are subjected to heat or pressure, oil seeps to the surface of the bearings to provide necessary lubrication.

Oilite Bearings are available in standard sizes and can be burnished to a final running fit. They should not be reamed, filed or otherwise cut to size. If replacement is necessary, install a new Oilite Bearing of the same size.

Section XVI

RADIO AND HEATER

CONTENTS

RADIO

The Electro Touch-Tuner (Model 922) (Fig. 1) and (924) (Fig. 2), have six tubes and two transistors. It includes a variable tone control with manual tuning, push button tuning and automatic search tuning. The Music Master (Model 851) (Fig. 3) has five tubes and one transistor. It includes a variable tone control with manual tuning and push button tuning.

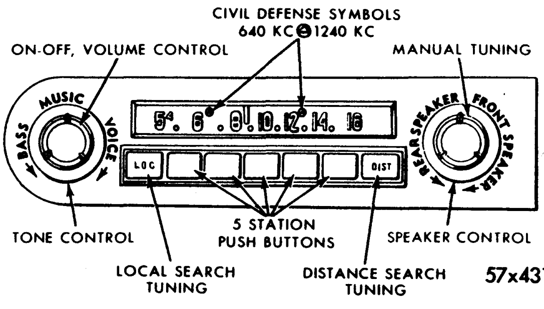


Fig. 1—Operating Controls 922

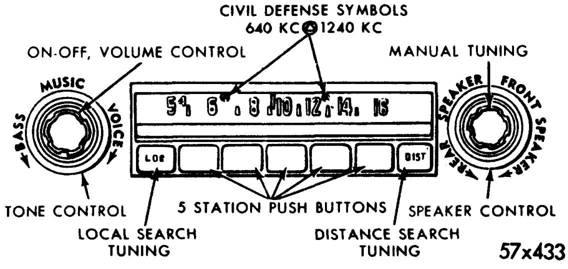


Fig. 2—Operating Controls 924

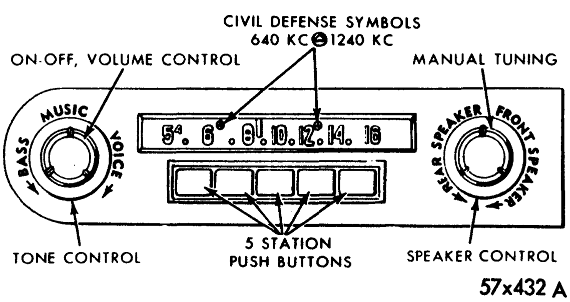


Fig. 3—Operating Controls 851

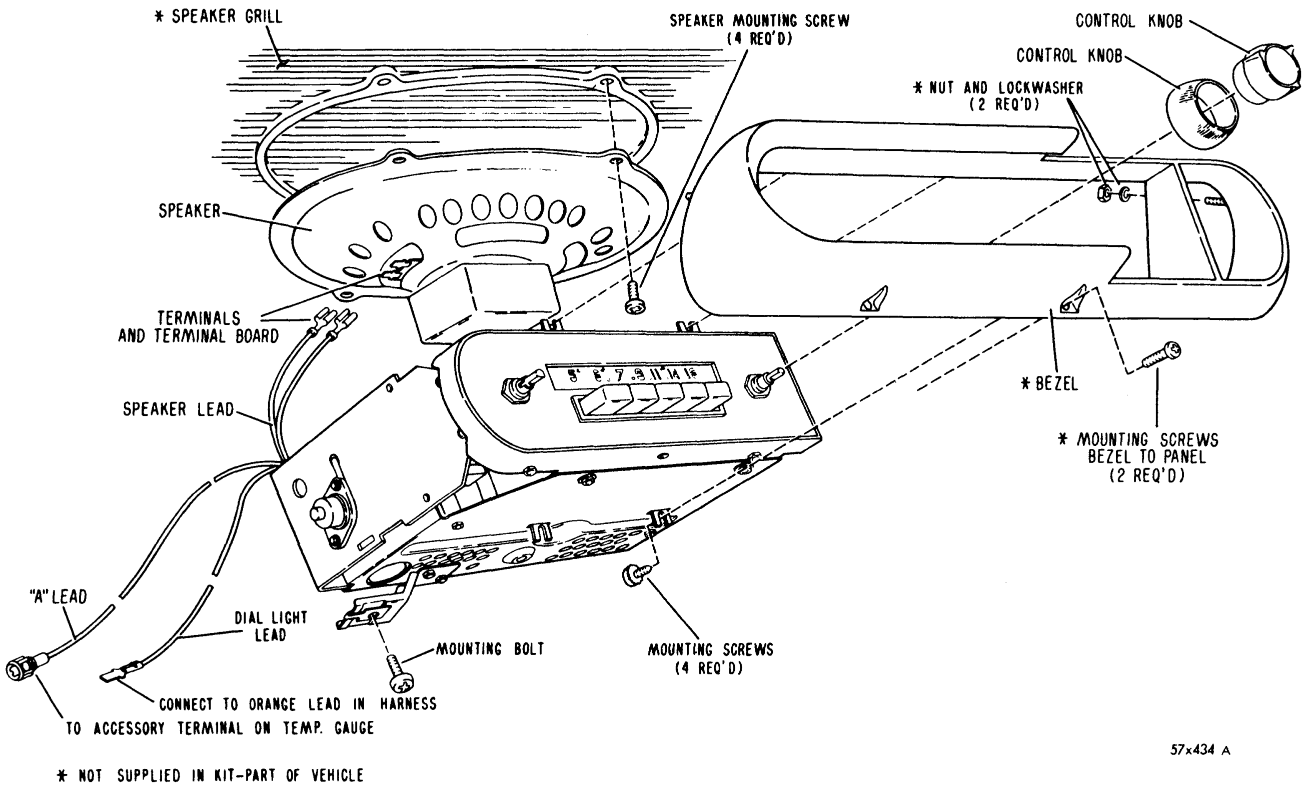


Fig. 4—Radio Model 851

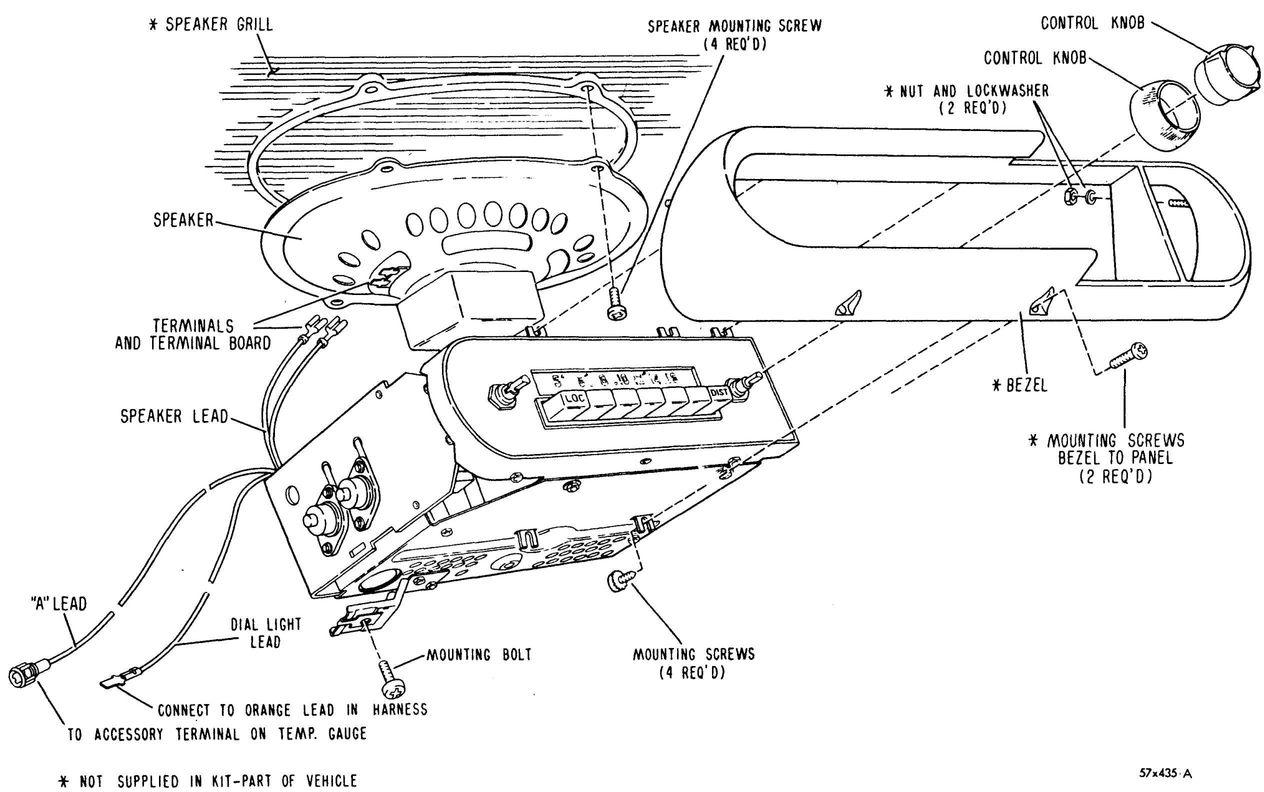


Fig. 5—Radio Model 922

SERVICE PROCEDURES

1. REMOVAL—MODELS LC-1-2-3

Remove speaker grill and speaker. Disconnect "A" lead, pilot light lead, and rear seat speaker plug. Remove mounting screw from lower instrument panel to bracket on radio. Remove nuts from studs on rear of radio and ash receiver housing. Remove two screws from bottom of radio and ash receiver housing. Remove from the front of the instrument panel the radio and ash receiver housing with radio attached. Radio then can be removed from housing.

CAUTION

Do not operate radio with speaker detached or damage to transistor will result. If rear seat speaker is disconnected from radio insert jumper wire in rear seat speaker, socket or receiver will not operate. (Fig. 9).

2. INSTALLATION (Figs. 4 and 5)

Mount radio to radio and ash receiver housing. Install radio and ash receiver housing in the panel. Attach radio mounting bracket to panel. Connect "A" lead to accessory terminal on the temperature gauge. Connect rear speaker wire plug. Connect pilot lamp lead to orange wire from harness. Plug in antenna lead, as shown in Figure 9. Install speaker to grill panel and connect speaker wires. Then fasten grill panel to dash. Turn on radio to warm up. Adjust antenna compensator.

CAUTION

Antenna compensator must be properly adjusted for satisfactory operation of radio.

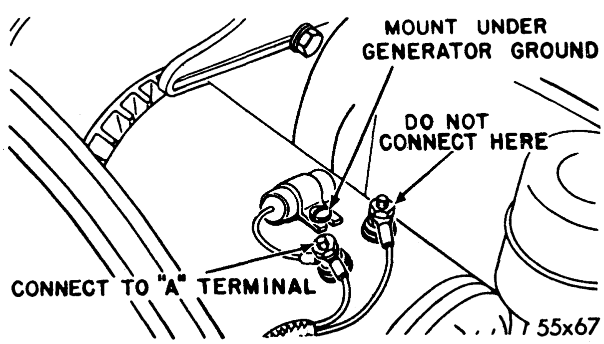


Fig. 6—Generator Condenser

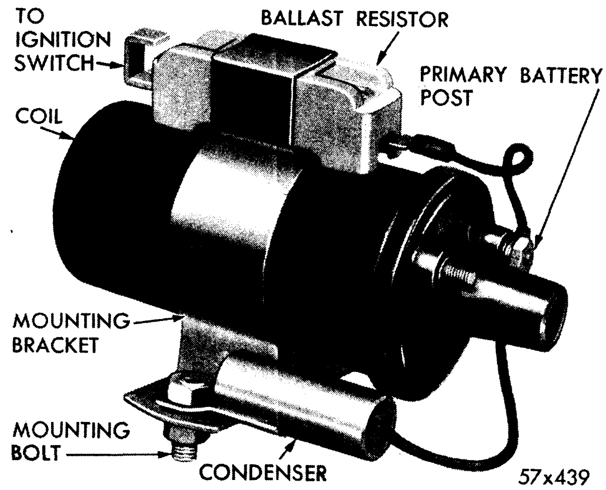


Fig. 7—Coil Condenser

3. REMOVAL—MODELS LY-1

Disconnect antenna, pilot lamp lead from orange wire on harness. Remove speaker grill and speaker, disconnect two wire lead from speaker. Disconnect "A" lead from accessory terminal on temperature gauge. Remove rear seat speaker wire plug. Remove mounting nut from lower instrument panel to bracket on radio. Remove radio control knobs. Remove radio from underneath instrument panel.

4. INSTALLATION

Mount radio to panel. Install control knobs. Attach radio mounting bracket and nut to panel.

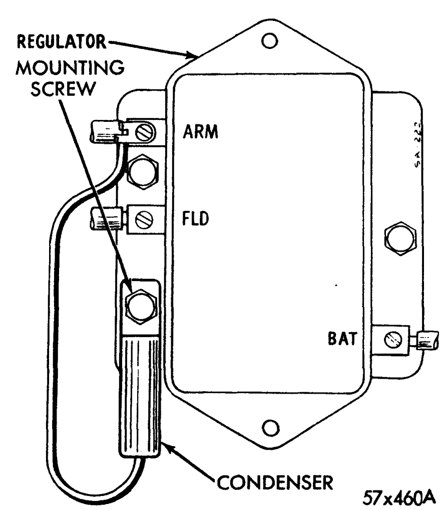


Fig. 8—Voltage Regulator Condenser

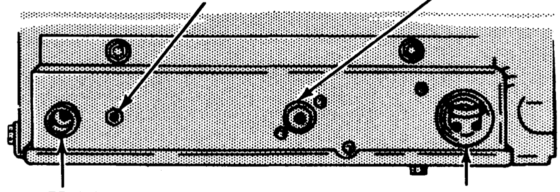


Fig. 9—Antenna Compensator Adjustment

Connect "A" lead to accessory terminal on the temperature gauge. Connect rear seat speaker wire plug. Connect pilot lamp lead to orange wire from harness. Plug in antenna lead, as shown in Figure 9. Install speaker to grill panel. Connect speaker wires and fasten grill panel to dash.

5. INTERFERENCE

Install suppression equipment for elimination of interference and tire static (Fig. 6, 7 and 8).

CAUTION

Antenna compensator must be properly adjusted for satisfactory operation of radio (Fig. 9).

6. ANTENNA COMPENSATOR

Extend antenna fully, tune radio manually to a weak station, 1,000 KC., turn antenna compensator, (Fig. 9) for maximum volume.
NOTE: It is important when adjusting the compensator that antenna is fully extended and compensator be trimmed at 1,000 KC.

7. PUSH BUTTON ADJUSTMENT—MODELS 922, 924 and 851 (Fig. 10)

Extend antenna fully and turn radio on for fifteen minutes. Unlock push buttons by pulling them out. Manually tune in desired station and relock push buttons. Repeat operation on other push buttons.

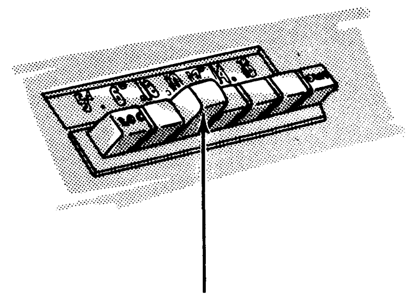


Fig. 10—Push Button Adjustment

8. LOCAL AND DISTANT PUSH BUTTONS

Local push button fill tune only strong stations. Distant push button will tune all stations within range of radio.

NOTE: Do not set end push buttons.

In order to obtain the best performance from search tuning, antenna should be extended.

9. FOOT SWITCH SEARCH TUNER

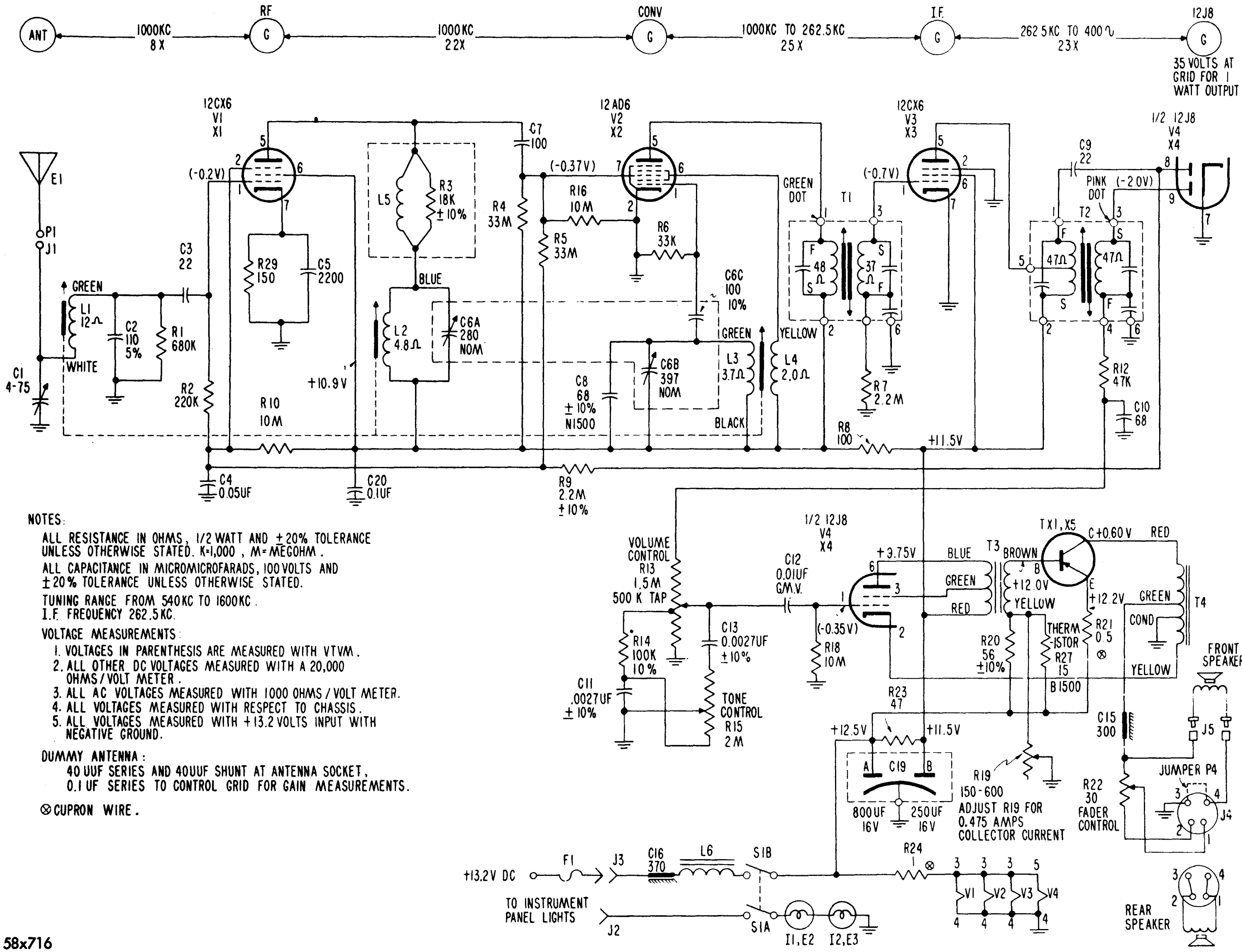
The foot switch search tuner, on Models 922 and 924, is located on the left forward end of the floor boards. By depressing with the foot, it will select a station on the radio.

The foot switch activates the touch-tuner mechansim in the same manner as the search-tuning buttons (LOC and DIST) except that the search sensitivity of the touch-tuner buttons was last depressed. Therefore, the foot switch will cause the search-tuner to operate at a sensitivity determined by which of the two search-tuning buttons was last depressed.

RADIO SERVICE DIAGNOSIS

CAUTION

If the radio is to be operated outside the car, it is imperative that the negative side of the pofer source be connected to the radio housing and the positive side to the "A" lead. If connected otherwise permanent damage to radio components will result.



NOTES:

ALL RESISTANCE IN OHMS, 1/2 WATT AND ±20% TOLERANCE UNLESS OTHERWISE STATED. K=1,000, M=MEGOHM.

ALL CAPACITANCE IN MICROMICROFARADS, 100 VOLTS AND ±20% TOLERANCE UNLESS OTHERWISE STATED.

TUNING RANGE FROM 540KC TO 1600KC.

I.F. FREQUENCY 262.5KC.

VOLTAGE MEASUREMENTS:

1. VOLTAGES IN PARENTHESIS ARE MEASURED WITH VTVM.
2. ALL OTHER DC VOLTAGES MEASURED WITH A 20,000 OHMS/VOLT METER.
3. ALL AC VOLTAGES MEASURED WITH 1000 OHMS/VOLT METER.
4. ALL VOLTAGES MEASURED WITH RESPECT TO CHASSIS.
5. ALL VOLTAGES MEASURED WITH +13.2 VOLTS INPUT WITH NEGATIVE GROUND.

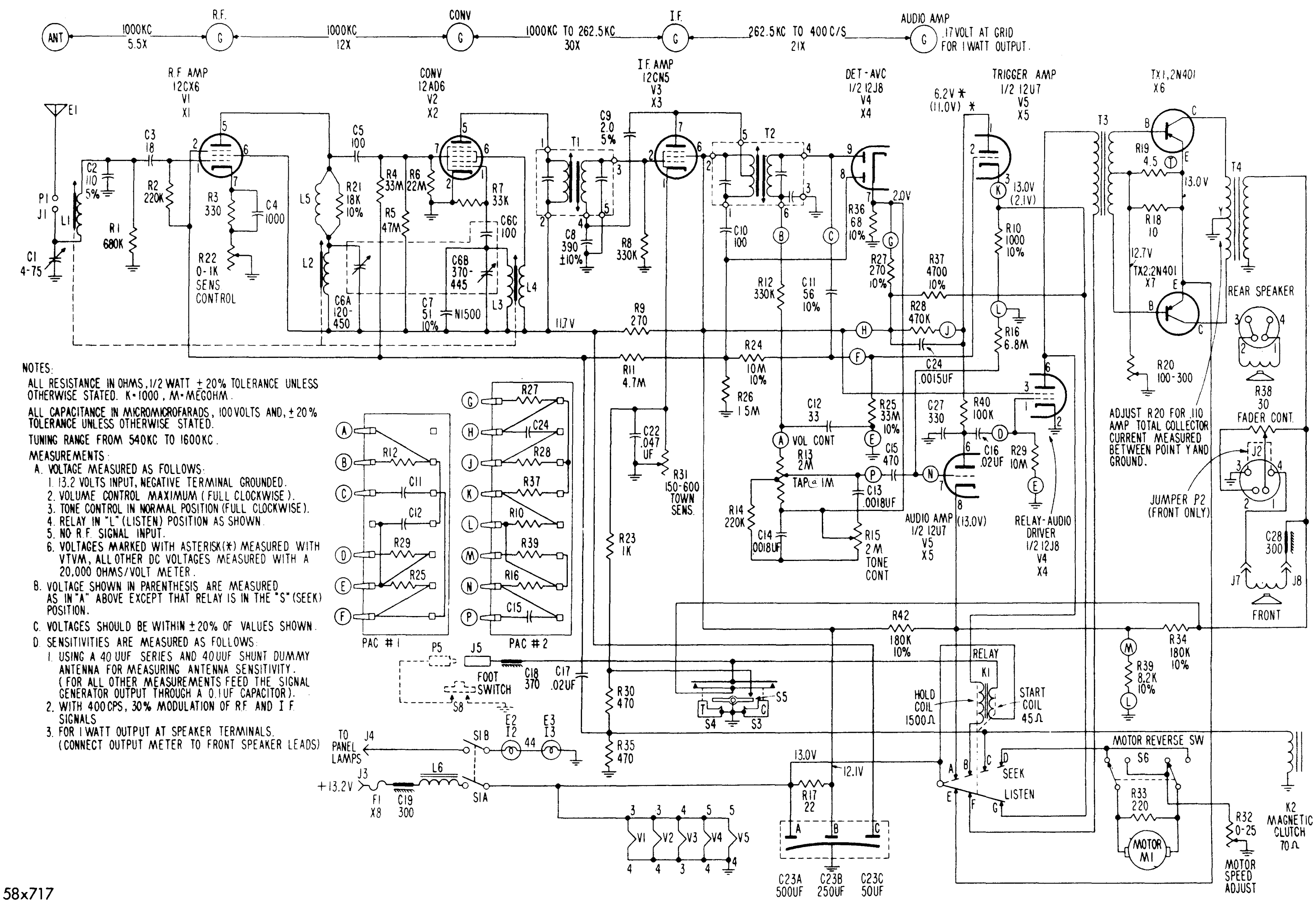
DUMMY ANTENNA:

40 UUF SERIES AND 40UUF SHUNT AT ANTENNA SOCKET, 0.1 UF SERIES TO CONTROL GRID FOR GAIN MEASUREMENTS.

⊗ CUPRON WIRE.

58x716

Fig. 11—Schematic Radio Model 851



NOTES:

ALL RESISTANCE IN OHMS, 1/2 WATT ± 20% TOLERANCE UNLESS OTHERWISE STATED. K=1000, M=MEGOHM.

ALL CAPACITANCE IN MICROMICROFARADS, 100 VOLTS AND, ± 20% TOLERANCE UNLESS OTHERWISE STATED.

TUNING RANGE FROM 540KC TO 1600KC.

MEASUREMENTS:

A. VOLTAGE MEASURED AS FOLLOWS:
   1. 13.2 VOLTS INPUT, NEGATIVE TERMINAL GROUNDED.
   2. VOLUME CONTROL MAXIMUM (FULL CLOCKWISE).
   3. TONE CONTROL IN NORMAL POSITION (FULL CLOCKWISE).
   4. RELAY IN "L" (LISTEN) POSITION AS SHOWN.
   5. NO R.F. SIGNAL INPUT.
   6. VOLTAGES MARKED WITH ASTERISK(*) MEASURED WITH VTVM, ALL OTHER DC VOLTAGES MEASURED WITH A 20,000 OHMS/VOLT METER.

B. VOLTAGE SHOWN IN PARENTHESIS ARE MEASURED AS IN "A" ABOVE EXCEPT THAT RELAY IS IN THE "S" (SEEK) POSITION.

C. VOLTAGES SHOULD BE WITHIN ± 20% OF VALUES SHOWN.

D. SENSITIVITIES ARE MEASURED AS FOLLOWS:
   1. USING A 40 UUF SERIES AND 40 UUF SHUNT DUMMY ANTENNA FOR MEASURING ANTENNA SENSITIVITY. (FOR ALL OTHER MEASUREMENTS FEED THE SIGNAL GENERATOR OUTPUT THROUGH A 0.1UF CAPACITOR).
   2. WITH 400 CPS, 30% MODULATION OF R.F. AND I.F. SIGNALS
   3. FOR 1 WATT OUTPUT AT SPEAKER TERMINALS. (CONNECT OUTPUT METER TO FRONT SPEAKER LEADS)

58x717

Fig. 12—Schematic Radio Model 922

Do not operate the radio without the front seat speaker connected and either the rear seat speaker or a jumper wire connected to the rear seat speaker socket; otherwise the receiver will not operate and damage to components may result.

10. RADIO IS INOPERATIVE OR DEAD

Turn on the radio. Check to see if the tubes light up. If the tubes are not lighted, disconnect the "A" lead cable and check the fuse located in the receptacle. If the fuse is not blown, follow procedures outlined in Paragraph B below.

a. Fuse is Blown—If the fuse is blown, install a new fuse and check to see if the tubes are lighted. Ignore the pilot light as it is fed by a separate lead. If the tubes do not light up, make certain that voltage is available at the "A" lead and if it is, or if the new fuse blows, remove the receiver for major repair.

b. Fuse is not Blown—Check for voltage at the "A" lead with a voltmeter. If 12 volts are available and the tubes are not lighted, remove the receiver for a major repair. If the tubes are lighted, connect the test antenna to the receiver and hold it so that it protrudes out of and away from the car. If the receiver operates, install a new antenna and lead-in. Make certain that the old antenna connector was clean and made a good connection before discarding it.

If the antenna is not at fault, disconnect the speaker and plug in the test speaker. If the receiver operates, replace the old speaker. If the speaker is not at fault, remove the receiver and substitute the test tubes for those in the receiver, one at a time, allowing enough time for each tube to heat up before going on to the next. If the receiver is still inoperative, it must be removed for a major repair.

NOTE: It will seldom be necessary to replace a transistor power output stage. Replacement and testing of transistors should be left to a competent radio service man. After performing all of the preceding checks, be sure to remove all parts marked for use in testing.

11. RADIO RECEPTION IS WEAK

When reception is limited to a few strong local stations, adjust the antenna trimmer to align the receiver to the antenna with antenna fully extended. If the reception is not improved, proceed with the following steps. Substitute a test antenna, remove the receiver and substitute test tubes as outlined in Paragraph 10(b).

12. RADIO RECEPTION IS NOISY OR ERRATIC

The cause of noisy or erratic reception can be isolated by finding out when the noise occurs. If it occurs while the vehicle is at a standstill with the engine not running, the trouble lies in the radio receiver. If the noise occurs only while the vehicle is standing with the motor running, it is probably caused by ignition or electrical units on the vehicle. If the noise occurs only while the vehicle is in motion, it is probably caused by wheel and tire static, or by intermittent shorting of the antenna. Power lines, electric road signs, etc., are another source of noise.

13. RADIO IS NOISY WITH CAR STANDING STILL—ENGINE NOT RUNNING

Tune in a local station, and jar the side of the receiver case with the hand. Make sure that the connector plugs are firmly seated. If the connectors are secure and the noisy reception continues as the receiver is jarred, remove the receiver and proceed with the following steps.

Tap the tubes gently with the finger tips, while holding the tubes in the socket to eliminate disturbing the tube contacts. If the receiver becomes noisy as any particular tube is tapped, replace the defective tube. If none of the tubes are noisy, a major repair is indicated.

14. RADIO IS NOISY WITH CAR STANDING STILL—ENGINE RUNNING

Close and securely latch hood before checking for noise. Start engine, turn on radio and tune to a spot between stations. Engine noise will usually appear in radio as a clicking sound that varies in frequency with speed of engine.

If noise is present, check voltage regulator, ignition coil, and generator capacitors for clean, tight connections; also check that antenna lead-in cable shield makes good around contact at receiver receptacle and that antenna mounting nut is tight. Check the receiver mounting for good ground contact both at the support bracket mounting and where the receiver contacts the instrument panel.

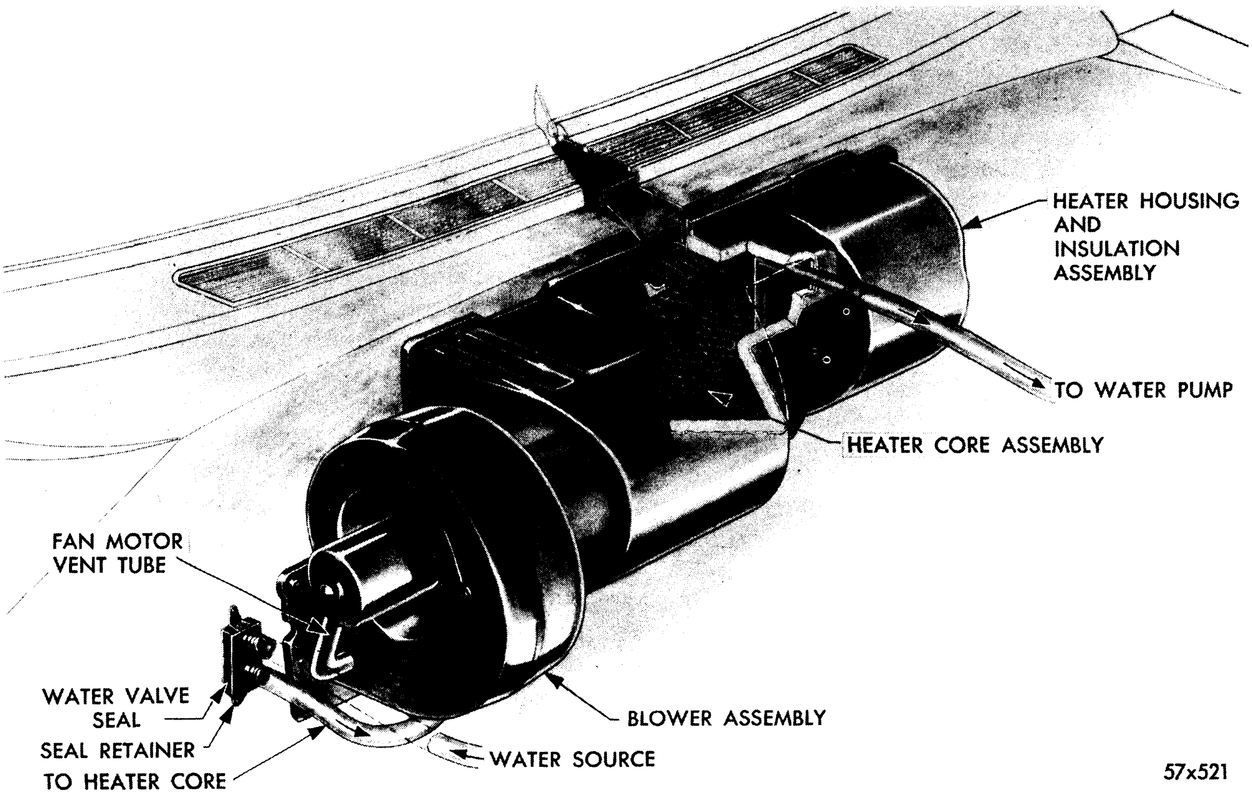


Fig. 13—Heater Installation (Engine Side)

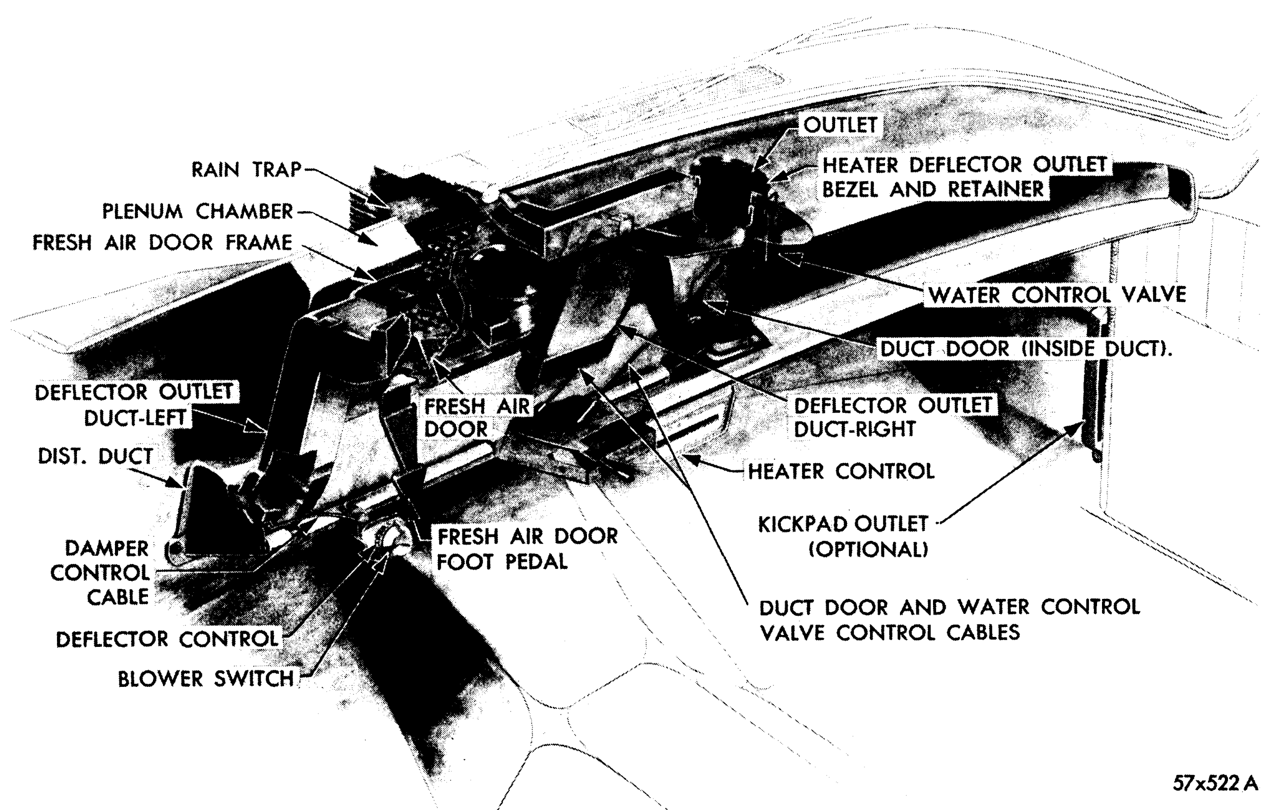


Fig. 14—Heater Installation (Driver Side)

If noise is still present, substitute the good suppression test parts one at a time.

15. RADIO IS NOISY WITH CAR IN MOTION

Turn on radio and check for engine noise as described in Paragraph 14 above. If engine noise is present, correct as outlined.

Retract the antenna and flex it slightly to let it vibrate. Move and twist the lead-in slightly. If noise occurs when this is done, replace the antenna.

16. RADIO IS NOISY WHEN CAR EQUIPMENT IS OPERATED

When excessive loud "clicks" and "pops" are heard in the radio due to the operation of directional signals, brake lights, power seats or power windows, all ground connections to the radio antenna and lead-in wire should be thoroughly checked. A poor ground connection at any point can produce the above trouble. A limited amount of noise from electrical apparatus may be considered normal.

17. RADIO RECEPTION IS DISTORTED OR GARBLED

Distorted or garbled sound may be caused by the voice coil rubbing on the center pole piece of the speaker magnet, by a torn speaker cone, by foreign material coming in contact with the cone, or by a defective tube in the receiver. The voice coil may be thrown out of alignment by a twisting or bending of the speaker frame if the speaker unit is improperly mounted in the speaker grille. To determine if the speaker is at fault, substitute the test speaker, tighten the attaching nuts finger tight only. If the reception is not corrected, substitute tubes as outlined in Paragraph 10(b) above.

18. RADIO TOUCH-TUNER MECHANISM RUNS CONTINUOUSLY

When checking the operation of the touch-tuner, first make certain that the manual portion of the receiver will tune in distant stations, that the antenna is fully extended, and that the antenna trimmer is adjusted. It may also be necessary to move the vehicle to a location where normal station signal strength is available (out of and away from steel reinforced buildings).

If the touch-tuner mechanism starts and runs continuously without the "LOC" and "DIST" buttons having been operated, remove the receiver for a major repair.

If the touch-tuner mechanism runs continuously after the "LOC" button is operated, depress the "DIST" button momentarily. If the tuner still runs continuously when the "DIST" button is operated, the receiver must be removed for a major repair.

HOT WATER HEATER

The Chrysler MOPAR All Weather Comfort System supplies fresh air through cowl vent for ventilating, heating and defrosting (Figs. 13 and 14).

For summer operation there is one fresh air door provided, which directs fresh air from cowl vent opening to bottom of driver compartment. Two drain tubes are provided in bottom of air duct below ventilator door in case water does come in through vent.

For winter operation, close fresh air door and turn blower on. The fresh air flows downward through heater case, heat exchanger blower, duct door and distributor duct. Temperature control is provided by a lever on instrument panel which opens the duct door on the right side of car to admit air to the distributor duct and also opens the heater water control valve. As the lever is moved toward warmer the water valve is opened further. The heater water valve will then maintain this temperature automatically.

Defrosting is provided by heated air flowing from distributor duct to defroster outlet on the top of instrument panel. The damper in the distributor duct divides the heater air to defroster outlet or floor as desired.

19. REMOVING AND INSTALLING CORE (Fig. 13)

Drain cooling system, remove hoses from engine side of firewall, remove heater housing (engine side) and remove core from housing. When installing housing and core be sure to draw bolts up evenly—alternate from top to bottom, working from center out. Fill cooling system, check for leaks with heater controls set at warmest position. Check blower and defroster for proper operation.

NOTE: In event an "air lock" condition occurs, remove heater outlet hose and turn temperature control to warmest position. Run engine until trapped air is forced out.

20. BLOWER MOTOR (REMOVAL AND INSTALLATION)

NOTE: Lack of air when blower is turned on can be caused by either blower not working or duct door not open.

Disconnect three electrical lead wires to blower motor. Remove mounting screws. Disengage rubber boot from heater housing. Remove blower motor mounting plate from blower housing and remove motor assembly.

When installing fan, adjust to ½ inch clearance between fan wheel and mounting plate.

21. REAR WINDOW DEFROSTER

The rear window defroster (optional on all Models) is located on and under the rear shelf panel of the car, and consists of a blower, flexible hose and nozzle. A switch, located on the instrument panel, controls the blower for defrosting the rear window. There is no connection with the heater in the car, with the rear window defroster, so that when air is drawn through the blower from inside the car, it is recirculated on the rear window glass.

INSTANT HEAT CONDITIONAIRE MODEL 803 HEATER

The heater assembly consists of a cylindrical stainless steel heat exchanger with a burner assembly mounted at one end. The burner is equipped with a nozzle to atomize the fuel, a mixer can to mix the atomized fuel with combustion air, and a spark plug to ignite the mixture. A solenoid-operated on-off valve is also mounted on the burner casting to control flow of the fuel.

The heat exchanger and burner assembly is enclosed in a case. The heater case surrounds the heater exchanger and provides a channel through which the fresh air flows into the distribution chamber. Fresh air is drawn from the cowl vent and forced through the heater into the car by a blower which is mounted on the firewall. A short rubber duct connects the outlet of the blower to the heater case.

An overheat switch is mounted inside the heater case. This switch contains a bimetal element which will open the electric circuit to the solenoid fuel valve and shut the heater off in the event the temperature should rise above a safe maximum. This switch will automatically reset itself when the heater cools.

22. BURNER BLOWER ASSEMBLY (Figs. 15 and 16)

a. Removal

Remove the combustion air hose, disconnect

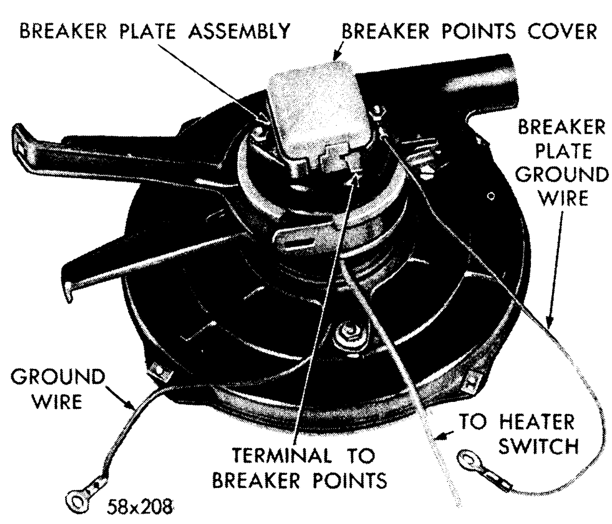


Fig. 15—Burner Blower Assembly

blower ground wire and the blower hot lead from the connector. Disconnect wire at breaker point. Loosen, but do not remove, the mounting bracket clamp. The blower assembly can then be removed by unhooking the clamps from the mounting bracket (Fig. 15).

b. Installation

Check the blower fan for clearance and freedom of movement. When tightening the nuts attaching the inner fan housing to the motor mounting bracket, try the fan on the motor shaft and tighten nuts so the rubber grommets will be compressed evenly but not too tightly.

c. Breaker Point Assembly

To replace the breaker points, remove the cover, being careful not to lose the small insulating grommet. Remove the nuts from the two studs on the motor, remove the two ground wires from the stud, and lift off the entire breaker points assembly. Remove the cam from the end of the motor shaft by holding the blower fan and turning the cam clockwise (this is a left-hand thread). Always install a new cam with new breaker points.

After installing the new cam, align the three studs on the back of the breaker points casting with the three eyelets in the end of the motor housing and fit the new breaker points over the motor studs. Replace the two ground wires on the stud and tighten the mounting nuts securely. Turn the fan until the points open to their widest gap and check width with an .018 feeler gauge. Turn the adjusting screw to obtain the proper gap and then seal the screw to the mounting bracket by soldering securely with 50-50 solder and resin flux (not acid). Replace the cover and insulating grommet and reinstall the blower assembly on the motor mounting bracket.

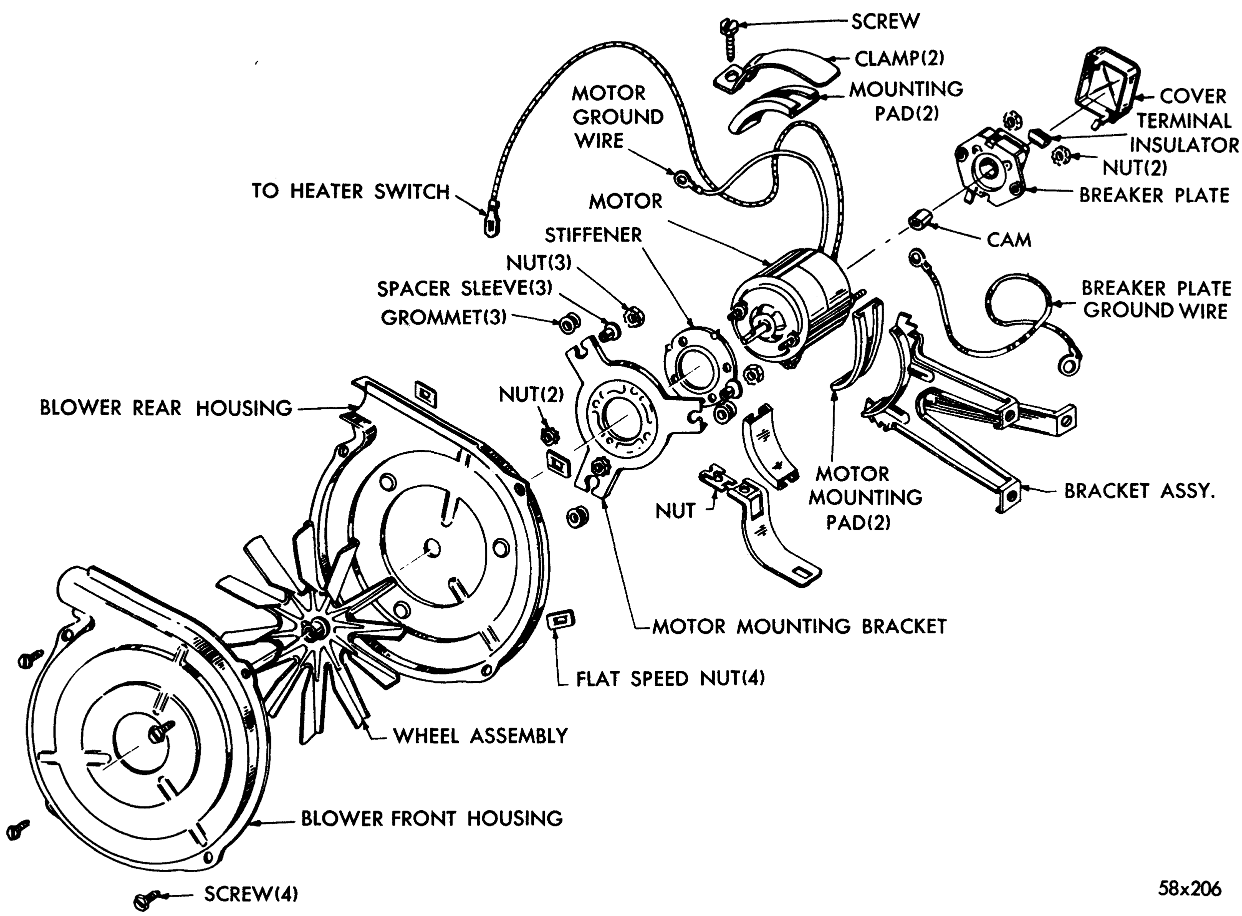


Fig. 16—Burner Blower—Disassembled View

23. HEATER ASSEMBLY (Fig. 17)

a. Removal

Disconnect the combustion air hose at the burner blower assembly. Remove the exhaust tube clamp and disconnect the heater exhaust tube. Remove the outlet adaptor clamp at the outlet of the heater. Remove the 4 screws which attach the cover of the heater case to the frame. The cover can now be removed with all the heater components attached.

b. Installation

Fasten the heater cover and burner assembly to the heater frame. Connect the heater outlet adapter to the heater cover. Fasten the exhaust tube to the bottom of the heater cover. Connect the combustion air hose to the inlet pipe on center of heater cover.

24. BURNER ASSEMBLY (Fig. 18)

a. Removal of Burner Assembly

Disconnect the white and black wires from the terminals of the solenoid fuel valve and pull the ignition cable off the spark plug. Disconnect the fuel line from the fitting on the burner casting. The fuel line should not be removed from the grommet in the cover unless it requires replacement. Remove the burner blower hose.

Loosen the clamp attaching the burner assembly to the heat exchanger and break the seal formed by the gasket. The burner assembly can then be removed with the rubber vent tube attached.

b. Inspection (Before Disassembly)

The nozzle and mixer assembly should receive special inspection before disassembly since the condition of these parts will give an indication of the cause of unsatisfactory operation. The nozzle and inside of mixer can, around the nozzle will normally be covered with a medium layer of black carbon and the nozzle should have a small gray opening at the orifice. The

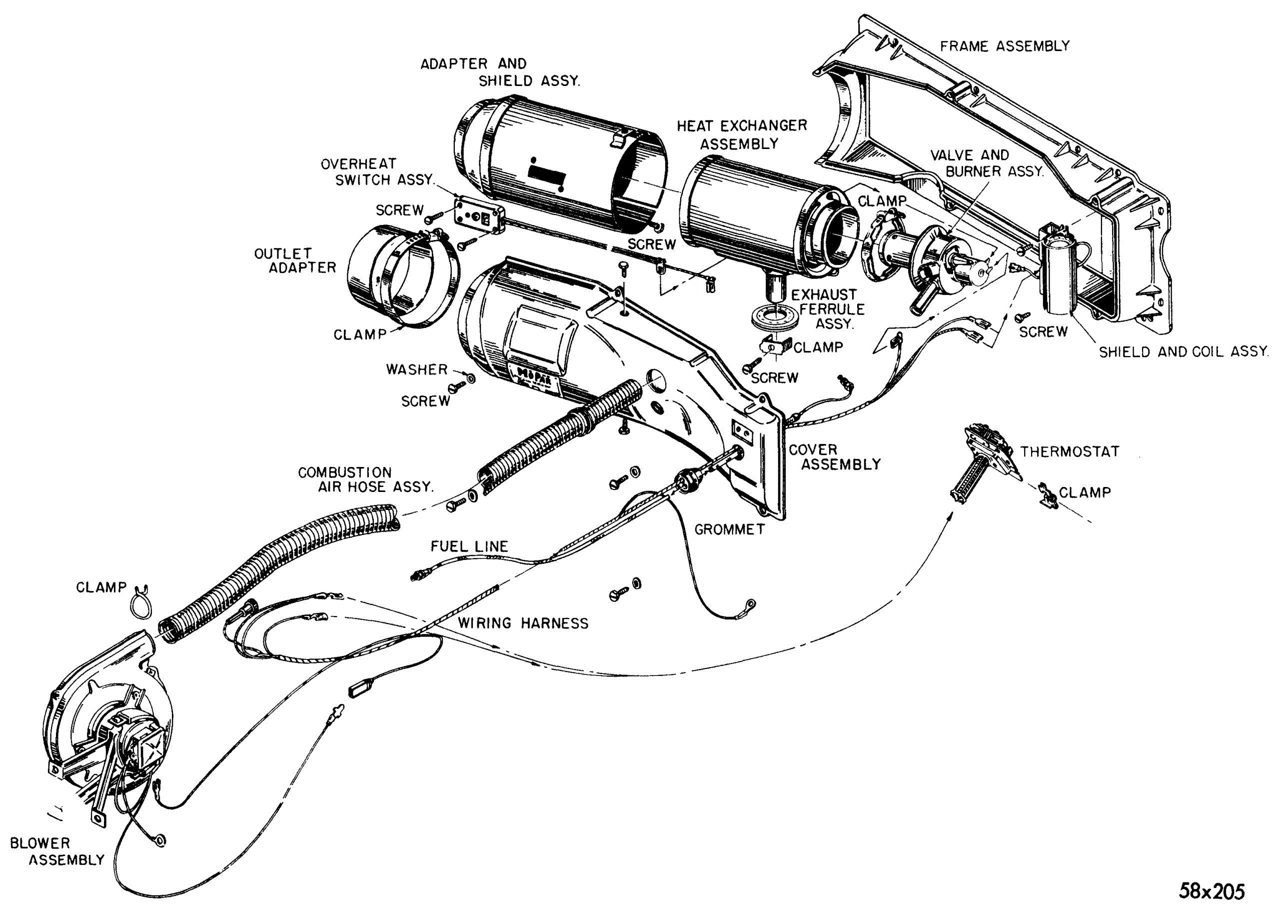


Fig. 17—Heater—Disassembled View

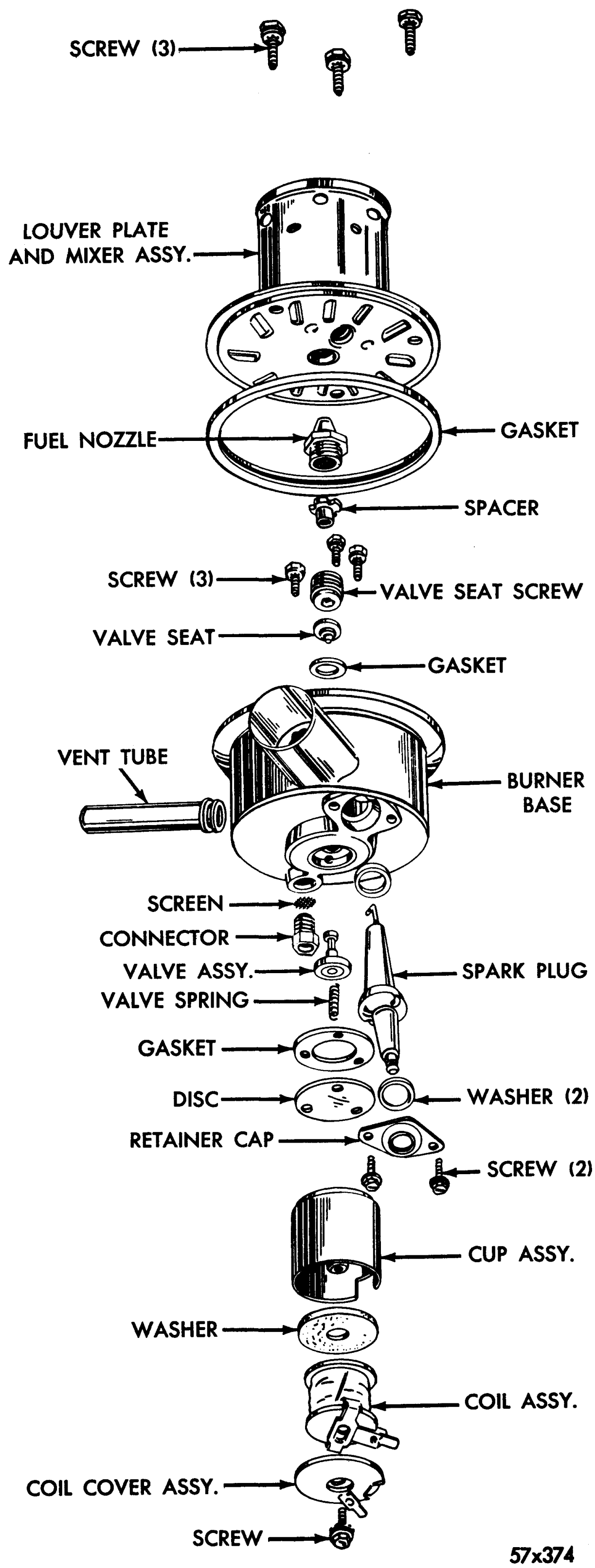


Fig. 18—Burner—Disassembled View

outer end of mixer will usually be burned to a gray or reddish color and some scaling or loose particles are usually present. These will do no harm

Indications of improper operation are an uneven build-up of black carbon, or an excessively burned or eroded spot on the mixer. The openings around nozzle must not be clogged with carbon since this will prevent entry of proper amount of combustion air. If these symptoms are present, the condition will not be remedied by cleaning, since it is caused by a one-sided spray from nozzle or by dripping or leakage around the nozzle seat, install a new nozzle.

The spark plug electrodes will operate properly with a considerable accumulation of carbon and lead but must not be shorted out. If the electrodes are burned, this indicates an improperly directed spray and nozzle or nozzle seat is at fault.

c. Disassembly of Burner Assembly (Fig. 18)

Remove the two screws from the plug retainer cap and remove the spark plug and gaskets. Unscrew the fuel inlet fitting and remove the screen from the casting. Remove the cover of the solenoid and lift out the solenoid coil and sponge rubber gasket. (Fig. 19)

Remove the mixer and louver plate assembly by removing the three screws which attach it to the burner casting. Unscrew the nozzle, using a ⅝-inch socket or box wrench. The spacer, or filler plug, directly behind the nozzle may now be lifted out.

Remove the valve seat retaining screw in the bottom of the nozzle opening, using an Allen wrench (¼-inch across flats) and turn the casting over. The valve seat and gasket will drop out.

Remove the three screws which attach the solenoid cup and remove the cup, sealing disc and gasket. Invert the casting, and the valve spring and plunger will drop out. (Fig. 18)

d. Reassembly of Burner

Refer to Figures 18, 19 and 20, if fuel line inlet screen was removed from the burner casting, install a new screen. Install the fuel inlet fitting. Install the valve seat gasket, the valve seat and the valve seat retainer in the order named, making sure the pointed side of the valve seat is toward the solenoid end of the casting. Tighten the retainer firmly but do not use force. Install a new spacer and nozzle. Tighten securely. Insert the valve plunger in the other end of the casting (Fig 20) and check for free movement. Place the spring, gasket, sealing disc and solenoid cup on the casting and reinstall the three screws from the burner side of casting. Tighten evenly to insure a good seal.

Insert coil retainer gasket in bottom of coil retainer. Insert the coil assembly so that the terminal fits down into the cut-out portion of the cup, and the ground terminal is directly over the screw hole at the top. Install the cover on the retainer and tighten screw securely. Position the gasket over the louver plate.

NOTE: The step on the inside portion of the gasket must contact the outer flange of the louver and the tapered portion of the gasket must face the mixer.

Position the louver plate and mixer assembly with gasket over the nozzle. Align the three screw holes and spark plug holes with their respective holes in the burner casting. Install the three lockwasher screws in the louver plate and tighten finger tight. Tighten screws to apply even pressure to the nozzle.

Install the spark plug gaskets on the spark plug, (concave side of gaskets against the ball portion). Carefully insert the spark plug through the opening in the housing and through the louver plate. Make cretain that the guide slot of the spark plug is in line with the guide on the casting. Tighten spark plug cap attaching screws evenly and securely. Using an .085" feeler gauge, adjust the spark plug gap by bending the ground electrode. **Do not bend**

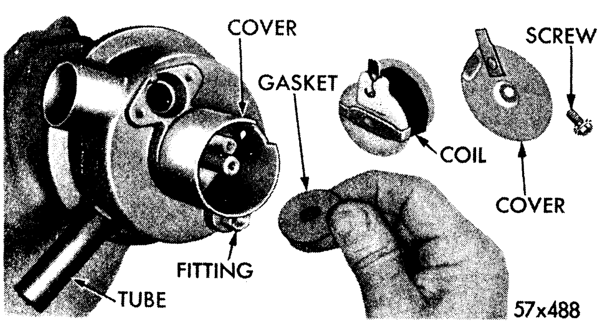


Fig. 19—Removing or Installing Coil and Gasket

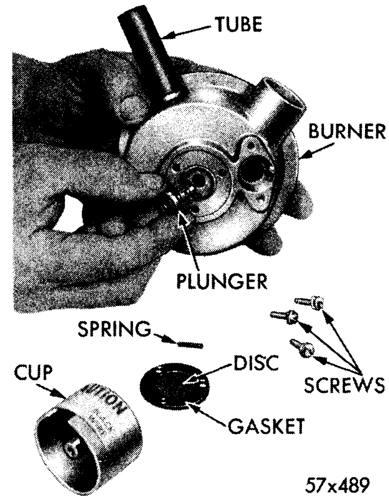


Fig. 20—Removing or Installing Plunger

spark plug electrode. Fit the rubber vent tube into the opening in the burner casting.

e. Heat Exchanger and Overheat Switch

Do not remove the heat exchanger unless it is defective and needs to be replaced or the overheat switch requires service. The heat exchanger has no operating parts and should only require replacement after prolonged use. If replacement should become necessary, it can be removed as follows: Remove the two screws that hold the shield to the cover. The heat exchanger and shield assembly can now be moved from the cover. Remove the metal screw that fastens the shield together and open up the shield wide enough to remove the heat exchanger from the shield.

The overheat switch is mounted on the outside of the heat shield. Inspect the heat exchanger for evidence of leakage, dents, loose seams and interior condition. The inside of the heat exchanger will normally contain a deposit of lead and other products of combustion but this should not be regarded as a defect unless the coating is sufficient to cause a noticeable increase in the warm-up period of the heater. When such is the case, the heater can be restored to its original efficiency by installing a new heat exchanger.

It is not recommended that any attempt be made to weld or otherwise repair the heat exchanger. Clean as much of the deposits from inside the exchanger as possible and blow it out with compressed air. Replace the entire unit if it appears unserviceable after cleaning.

f. Installation of Burner Assembly

Fasten the burner blower hose to the burner. Guide the rubber vent tube through the cover. Position the burner against the heat exchanger, making sure the gasket is seated and in place. Fasten the clamp that attaches the burner to the heat exchanger. Connect the spark plug wire and fuel line.

25. THERMOSTAT

If the thermostat fails to control the duct oulet temperature, it is usually an indication that the cam is loose on the helix shaft or the end of the helix has dropped out of the slot in the control shaft.

To correct this condition, adjust the thermostat as follows: Remove the thermostat and inspect the helix to make sure it is crimped tightly in the end of the control shaft. Fit the helix in the slot and crimp the shaft with pliers if necessary. With helix at room temperature, loosen the Allen set screw in the plastic cam on the base end of the control shaft, making sure the shaft is completely free to revolve and take its normal position at room temperature (about 75° to 85° F.).

With the plastic cam free on the shaft and the microswitch down, move the control cable linkage as far as it will go to the left and hold in this position. While holding the linkage, turn the plastic cam in a counter-clockwise direction until the microswitch just clicks, then tighten the set screw in the cam.

CAUTION

Do not disturb the two screws which attach the microswitch to the thermostat base.

When reinstalling the thermostat, insert the control cable and housing through the retainer clip located on the upper portion of the thermostat mounting plate. Insert the end of the cable through the swivel holes of the thermostat linkage, but do not tighten the screw. Move the temperature control to the extreme low heat position; then move the thermostat control linkage in a downward direction as far as it will go. Tighten swivel screw. When the thermostat cable is properly installed, the temperature con-

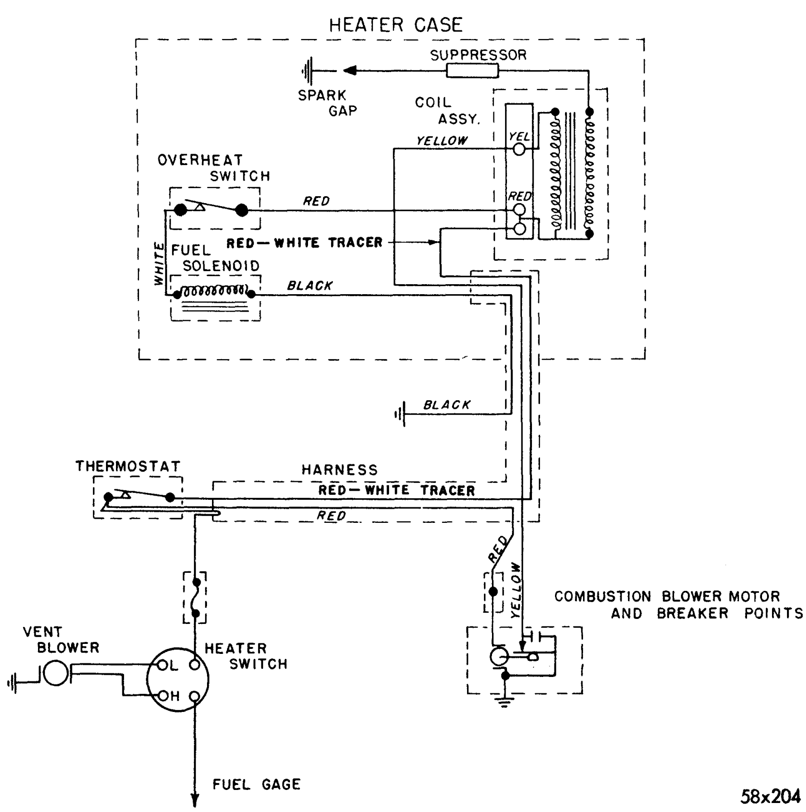


Fig. 21—Gas Heater Wiring Diagram

trol should move the thermostat linkage from one extreme to the other without interference from the cable housing. For gas heater wiring diagram refer to Figure 21.

INSTANT HEAT CONDITIONAIRE SERVICE DIAGNOSIS

26. NO HEAT OR INSUFFICIENT HEAT

Start the engine. Turn heater switch on. The fresh air blower and the burner blower motors should start immediately. Failure of the motors to start may be caused by a defective heater switch, fuse or wiring. Check the ground wires. Check with a test light at the wire connector of the burner blower motor. If the light goes on, replace the burner blower motor. If both blowers run, remove the four screws from heater cover and remove cover. Using a test light, check for current at red terminal of ignition coil. If test lamp fails to light, check thermostat and wiring. Replace if necessary.

If the test lamp lights at the red terminal of the coil, remove the white lead from the solenoid valve. Alternately touch the white lead to the solenoid valve white terminal, a click should be heard as the fuel control valve opens and closes (with temperature control in HIGH HEAT position). If the valve fails to click, install a jumper wire between the coil red terminal of the solenoid valve. If the valve clicks, replace the overheat switch. If there is no click, check solenoid ground wire. If ground wire is OK, replace solenoid.

If the solenoid valve is operating properly, check the ignition units. Remove the wire from the spark plug and connect it to a test plug. Ground plug to body. (Can use an automative type plug with plug gap set at .085 inches). Turn on ignition and heater switches and check the plug for a hot spark. If there is no spark, the coil or breaker points are bad.

If there is no spark at the test plug, it can be assumed that the nozzle is clogged or the spark plug shorted out and the burner assembly must be removed from the heater.

CAUTION

Be sure the burner is properly grounded and avoid touching any part of the assembly during the following tests.

Remove the burner assembly from the heat exchanger. Pull the fuel line out of the heater case and reconnect it to the burner assembly. Remove the coil from the heater duct and reconnect it to the spark plug. Remove the white wire from the solenoid valve. Ground the assembly to the body of the car and turn the heater switch on. Check for a spark at the spark plug electrodes.

If a hot spark appears at the electrodes of the spark plug, the nozzle is defective. If the spark is being shorted to ground or if there is no spark, replace the spark plug. If the plug is shorted out by an accumulation of carbon, the nozzle is probably at fault and the spray pattern should be checked.

To examine the spray pattern, connect a jumper wire from the coil red terminal to the white terminal of the solenoid valve. Disconnect the ignition cable from the spark plug. These wiring connections will energize the solenoid directly without going through the overheat switch. After making connection, start the engine and turn the heater switch on (temperature control in high position). The fuel valve will open and the spray from the nozzle can then be examined.

CAUTION

Have a fire extinguisher at hand and avoid any possibility of igniting the spray. NEVER attempt to burn this assembly in the open.

The spray pattern must consist of a fine mist of fuel which is symmetrical in shape and is centered in the mixer assembly. There must be no dripping or leakage around the nozzle seat. If the spray is coarse or uneven, or is directed at an angle in the mixer, the nozzle is defective.

Additional causes of burner failure are excessive clogging of the screen in the fuel inlet, clogging of fuel passages within the burner casting, or a defetcive valve plunger or seat.

27. HEATER GETS TOO HOT

This condition can be caused by a poorly adjusted thermostat or insufficient fresh air. To test the thermostat, connect a test light between the terminal of the thermostat that has ONE red wire running to it and ground. Start the heater with the engine running. After the heater warms up, the test light should go on and off as the thermostat cycles the heater on and off. If the heater cycles, but the test light remains on, it is an indication that the thermostat contacts are remaining closed and the heater is cycling on the overheat switch. Install a new thermostat. The fresh air supply should be checked before replacing the thermostat since proper thermostat action is dependent upon an adequate supply of fresh air through the heater system. Insufficient air flow can be caused by a defective fresh air blower motor or by an obstruction in the fresh air system. Fresh air door must be closed and temperature control arm moved to a position between "ON" and "WARMEST".

28. HEATER WORKS INTERMITTENTLY

If the heater gets very hot and shuts itself on and off in an intermittent way, the trouble is probably caused by insufficient fresh air flow. Check the fresh air blower and short coupling duct between the blower and heater.

29. HEATER CAUSES ODOR

If the odor is raw gasoline, the fuel connection at the burner casting is leaking or the solenoid valve is not tight on the casting. A slight odor when a new heater is first turned on should be disregarded. If the odor is burned gasoline, the exhaust tube under the heater is leaking and must be repaired.

30. TOO MUCH SMOKE FROM HEATER

Excessive smoking and carbon are caused by a slow combustion air motor or a defective nozzle. This condition could also be caused by delayed ignition, resulting from spark plug electrodes which are badly burned, out of adjustment or shorted with carbon. The plug gap should be .085 inches and the electrode should be clean and approximately centered in the insulator of the spark plug. Bend the ground electrode when making adjustment.

31. HEATER MAKES NOISE WHEN STARTING

If the heater "pops" or "spits" when starting or cycling, a leaking solenoid valve seat or plunger is permitting fuel to flow in the "off" position. Another cause is low fuel pressure from a defective pump, or a combination of low fuel pressure and insufficient combustion air caused by a slow burner motor. Check the fuel pressure first; if the pressure is satisfactory, (5 to 7 lbs.) remove the entire burner assembly from the heater. Disconnect the ignition cable and solenoid leads, but reconnect the fuel line. Examine the inside of the mixer can to make sure the nozzle is dry. Turn the heater switch on to start the burner blower. Start the engine which will apply fuel pressure to the solenoid valve. Watch the nozzle carefully for signs of leakage. The slightest amount of leakage through the nozzle will indicate a defective shut-off valve which must be repaired. This condition could also be caused by spark plug electrodes bent out of position, even though adjusted to the proper gap. The center electrode of the plug must be approximately straight to locate the spark gap in the proper position with respect to the spray. Install a new plug and adjust by bending only the ground electrode.

INSTANT HEAT CONDITIONAIRE TROUBLE SHOOTING CHART

32. HEATER FAILS TO START WHEN SWITCH IS TURNED ON. COMBUSTION AIR BLOWER DOES NOT RUN.

a. Burned out fuse.

b. Loose wire from ignition unit to combustion air blower.

c. Faulty combustion air blower motor.

d. Faulty heater switch.

33. COMBUSTION AIR BLOWER RUNS BUT HEATER FAILS TO IGNITE.

a. Faulty thermostat or wiring.

b. Faulty overheat switch.

c. Faulty coil.

d. Faulty spark plug.

e. Open circuit in solenoid valve.

f. Clogged fuel nozzle.

g. Comb. air hose disconnected, torn or kinked.

h. Faulty breaker points or cam.

34. HEATER IGNITES BUT GOES OUT LATER.

a. Fresh air blower not running.
b. Obstruction in fresh air passage.

c. Duct missing between fresh air blower and heater case.

35. HEATER BURNS INTERMITTENTLY, HEAT OUTPUT IS TOO LOW.

a. Thermostat out of adjustment.

b. Fuel line pinched or clogged.

36. HEATER BURNS INTERMITTENTLY, HEAT OUTPUT IS TOO GREAT.

a. Thermostat out of adjustment or shorted out.

37. HEATER BURNS CONTINUOUSLY, HEAT OUTPUT IS TOO LOW.

a. Clogged fuel nozzle.

b. Low fuel pressure.

38. ODOR OF BURNED GASOLINE IN CAR.

a. Leaking connection in exhaust tube.

b. Broken or loose burner clamp.

39. EXCESSIVE AMOUNT OF SMOKE FROM HEATER EXHAUST WHEN HEATER STARTS.

a. Leaking shut-off valve.

b. Insufficient combustion air.

c. Exhaust system partially obstructed.

40. POPPING NOISE WHEN HEATER STARTS OR CYCLES.

a. Leaking solenoid valve.

b. Loose, dripping nozzle.

c. Nozzle spray directed away from spark plug.

d. Intermittent spark caused by too wide gap.

e. Insufficient combustion air.

Section XVII

CHRYSLER HEATER-AIR CONDITIONING SYSTEM

CONTENTS

DATA AND SPECIFICATIONS

COMPRESSER

Location	Right Cylinder
Type	2 cyl. "V" Type
Bore	2$\frac{5}{16}$ inch
Stroke	1$\frac{1}{8}$ inch
Displacement	9.45 cubic inches
Type Valve	Reed Type
Speed (Depends on axle ratio and tire size)	Approx. 1250 r.p.m. at 25 m.p.h.
Oil Capacity (MOPAR Refrigerant Oil; Saybolt)	12 ounces
Clutch	Rotating Coil
Muffler	In Compressor Discharge Line

CONDENSER

Location	Front of Radiator

RECEIVER-STRAINER—DRIER

Type	Cylinderical Steel Container
Location	
LC-1	Under Fender
LC-2, LC-3 and LY-1	Front of Front Radiator Yoke
LC-1	Receiver Strainer-Drier
LC-2, LC-3 and LY-1	Moisture Indicator—Sight Glass

REFRIGERANT

Refrigerant	Refrigerant 12
Total Charge	2½ to 2¾ pounds

EVAPORATOR

Location	Dash Panel

BLOWERS

Type	Centrifugal
Location	Dash Panel
Capacity	250 to 300 cubic feet of air per minute at high speed
Current Draw	Approximately 14-17 amps. at 14 volts

SPECIAL TOOLS

Tool Number	Tool Name
C-3128	PLIERS—Drive Pulley Seal Retainer Snap Ring.
C-3355	GOGGLES—Safety (Pair).
C-3358	WRENCH—Flare Nut—Open End Box Type ⅞″ and 1⅛″ (two per set).
C-3361A	WRENCH—Ratchet Special Refrigeration Type—¼″ sq. Drive with ³⁄₁₆″ sq. and ½″ Hex. in Handle.
C-3362	BENDER SET—For ¼″, ⁵⁄₁₆″, ⅜″, ⁷⁄₁₆″, ½″ and ⅝″ Tubes.
C-3363	WRENCH SET—Flare Nut—Open End Box ¾″ and 1″ Openings (two per set).
C-3420	ADAPTOR—Refrigerant Cylinder Valve to Test Hose.
C-3421	CLIP—Set of two—Attaching Thermometer to Tube.
C-3429	SCALE—Refrigerant Weighing.
C-3473	SEAT PULLER and Installing Tool.
C-3478	CUTTER—Tube.
C-3616	PALM GRIP RATCHET.
C-3620	SCREW DRIVER BIT.
C-3621	SCREW DRIVER BIT.
C-3622	FLEXIBLE DRIVE.
C-3623	THERMOMETER SET—Two in separate pocket cases. (Calibrated from 0° to 220° F.)
C-3627	TESTING OUTFIT—Consisting of one manifold complete with two valves; one 30 x 300 lbs. compound gauge; and one 600 lbs. pressure gauge. (Use with C-3644 and C-3645 Test Hoses.)
C-3644	HOSE—Test with End Plugs—4 Feet Long (set of two) (use with C-3627).
C-3645	HOSE—Test with End Plugs—8 Feet Long (use with C-3627).
C-3652	PUMP—Refrigeration Vacuum (Pump charged with 75 Vis. Ref. Oil).
C-3659	TORCH—Leak Detector—Includes extra tank of liquid petroleum fluid.
C-744	TEST LAMP.
C-804	TOOL—Tube Flaring.
SP-2922	COMPRESSOR CAPACITY TEST VENT CAP.

Section XVII

CHRYSLER HEATER-AIR CONDITIONING SYSTEM

A combined Heater and Air Conditioning unit (Fig. 1) is available for 1958 Chrysler cars as special equipment. The new unit is located in the dash area and provides temperature control for all-weather driving.

Temperature control in the 1958 Air Conditioner is secured through a reheating process. For summer operation, the air is dehumidified and cooled as it passes through the evaporator coil and then reheated by the heater core to a temperature that is selected by the driver. The amount of reheat added to the air as it passes through the heater core is controlled by metering hot water through the heater core. The flow of hot water is regulated by a modulating valve. A reheat type temperature control gives dehumidification even when minimum cooling is desired.

During the heating cycle, outside air is introduced into system through a permanently open vent in the top of cowl section (Fig. 2). Passing through the open fresh air door, air is drawn through both the cooling and heating coils by the Centrifugal Blower (Fig. 3). The air, heated by the heating coil, is then forced into the distribution duct for temperature distribution.

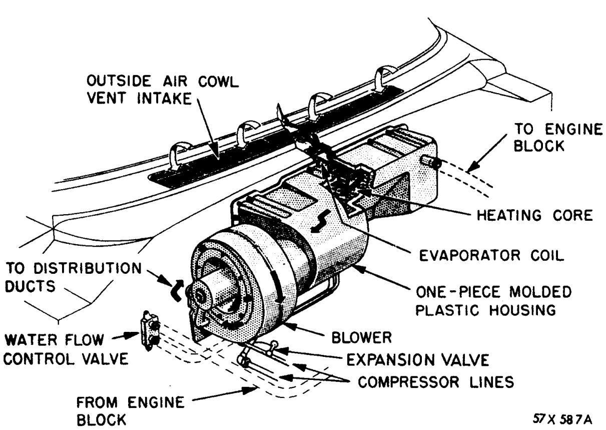


Fig. 1—Heater-Air Conditioning (Schematic Drawing Passenger Compartment Installation)

The cooling cycle is quite similar except that air may be brought from the outside or it may be recirculated through the recirculating door (Fig. 4). The controls are so arranged that the recirculation feature is only employed when maximum cooling capacity is required.

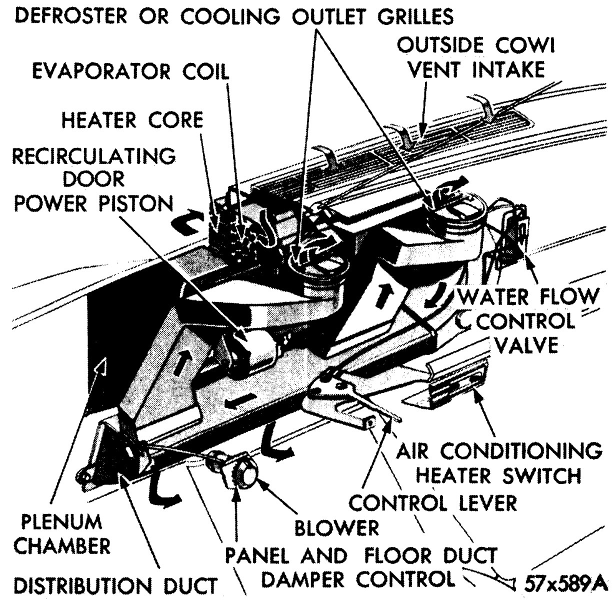


Fig. 2—Heater-Air Conditioning (Schematic Drawing Engine Compartment Installation)

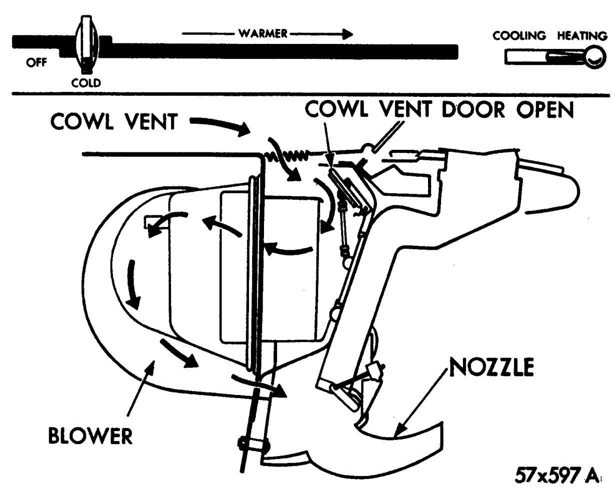


Fig. 3 — Blower Motor and Vent Door (Schematic Drawing)

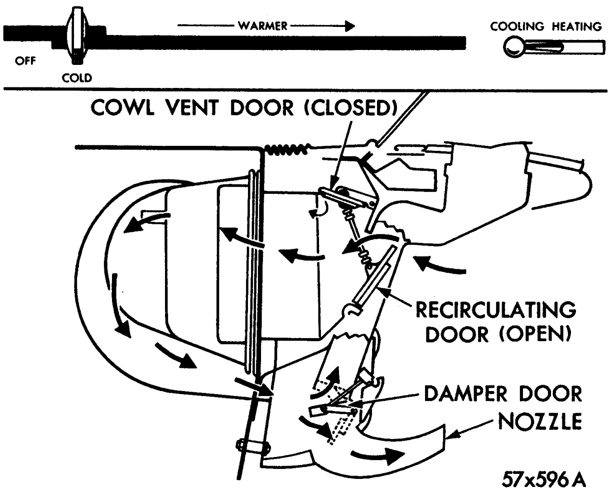


Fig. 4—Recirculating and Damper Door

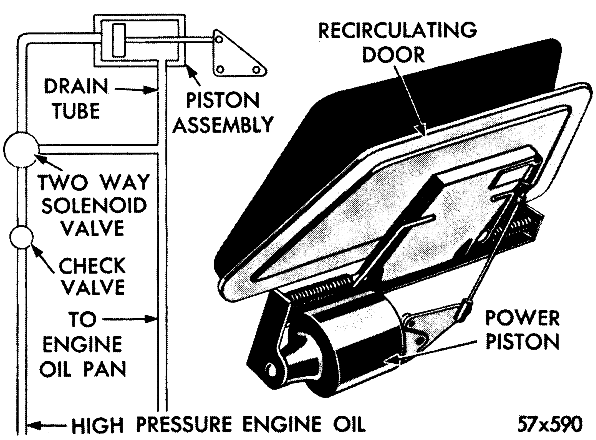


Fig. 5 — Power Piston and Recirculating Door

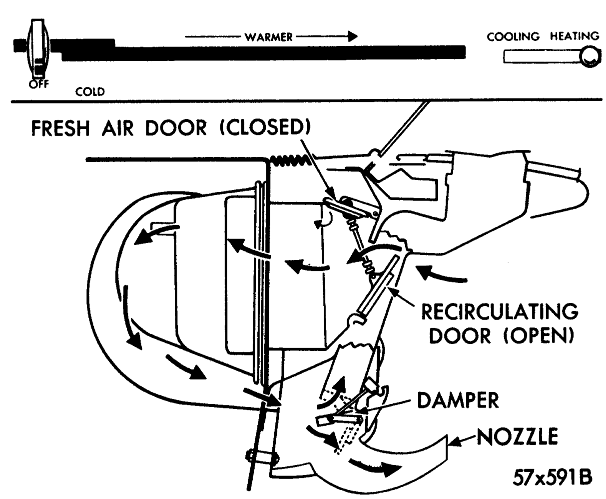


Fig. 6 — Recirculating and Fresh Air Door

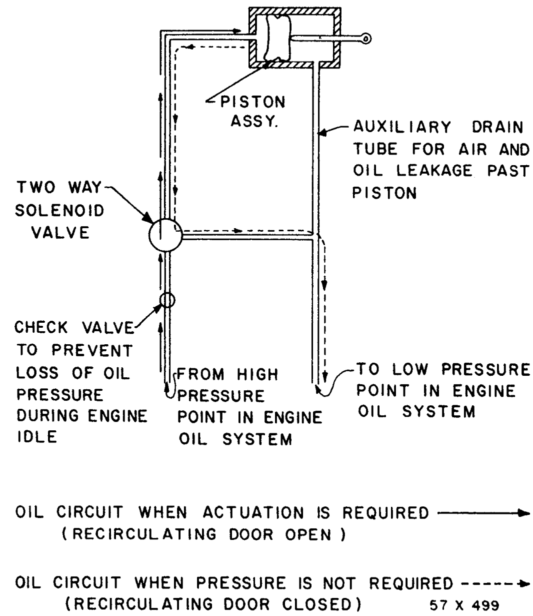


Fig. 7 — Hydraulic Circuit for Power Piston

1. OPERATING CONTROLS

The controls for the heater-air conditioner are partially power actuated.

The main control lever, operating through a cable, operates the water temperature valve and also the fresh air and recirculating door through two electric switches, the solenoid valve, and power piston assembly (Fig. 5). When the solenoid valve is energized, it permits engine oil pressure to act on the power piston, closing the cowl vent fresh air door and opening the recirculating door. Figure 6 shows fresh air and recirculating doors. Figure 7 shows schematic diagram hydraulic circuit for operating the power piston.

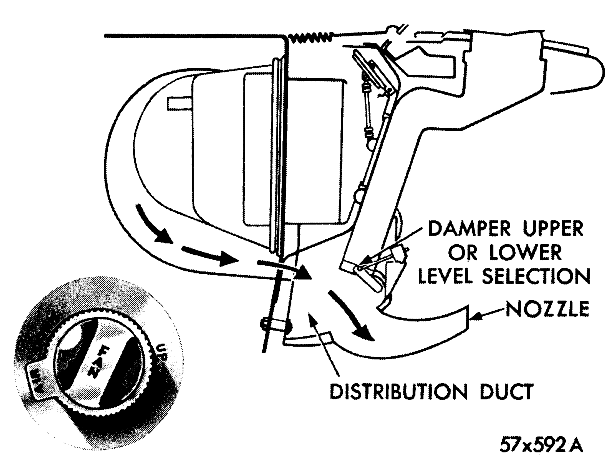


Fig. 8 — Distributing Duct and Control Compartments

Figure 8 illustrates the damper used in controlling the system, and control components that are mounted on the instrument panel.

The fresh air door and the recirculating door are linked together in such a manner that when one is closed the other is open.

The two air flow control dials are mounted on concentric shafts. The inner "Blower" switch controls the speed of the blower motor. Three speeds are available through the selection of wire taps in the motor fields.

The outer dial marked "Air" controls the positioning of distribution duct damper, and is used to proportion the air distribution between the instrument panel grilles and the distributor duct nozzle. The control is letterd "Up" and "Down" with arrows indicating the proper rotation for panel or floor discharge.

The toggle switch with positions marked "Cooling" and "Heating" permits the energizing of the compressor clutch circuit and the resistance coil of the water temperature control valve. This action occurs when the switch is placed in the "Cooling" position. In the "Heating" position, it insures that these circuits will not be energized. It should be noted that the main control lever must be in some position other than "Off" to permit the closing of the clutch and coil circuits by the toggle switch. The position of the toggle switch also has a bearing on the fresh air door and recirculating door.

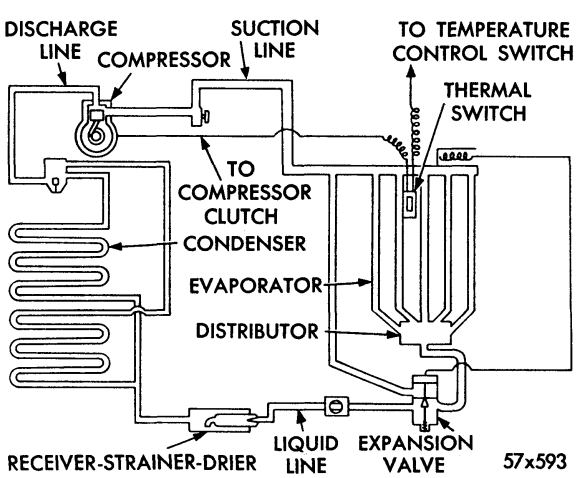


Fig. 9 — Heater-Air Conditioning (Schematic of Components)

2. POSITIONING CONTROL LEVER

a. Moving the main control lever from "Off" to "Cold" (No. 2) position, with the toggle switch in "Cooling" position, the following sequence of operation will result:

1. Compressor clutch and water valve heating element will be energized (Figs. 9 and 10).
2. Hot water shut off to heater core.
3. Fresh air door closed and recirculating door open resulting in 100% recirculation.
4. Maximum cooling will be obtained.

b. Moving the main control lever to the right from the "Cold" or No. 3 position with toggle switch on "Cooling" position, the following operational sequence will occur:

1. The fresh air door opens and recirculating door closes de-energizing the solenoid valve.
2. Full fresh air cooling obtained.
3. Lever mechanism picks up the cable controlling the water temperature control valve and prepares to open the valve.
4. Hot water shut off to heater core.

c. Moving the main control lever from No. 3 position through "Warmer" to No. 4 position opens the water temperature control valve. At the warmest point in the "Cooling" position, the water valve will allow the heater core to reheat the cooled air to approximately 75° F.

d. Moving the main control lever from "Off" to "Cold" or No. 2 position, (Fig. 6) with toggle switch in "Heating" position.

1. De-energizes the solenoid valve, allowing the recirculating door to close and the fresh air door to open.
2. Hot water shut off to heater core.
3. Total fresh air ventilation obtainable, proportioned as desired through instrument panel grilles and distributor duct slots.

e. As the main control lever is moved from the "Cold, No. 2 position to No. 3 position, with the toggle switch in "Heating" position:

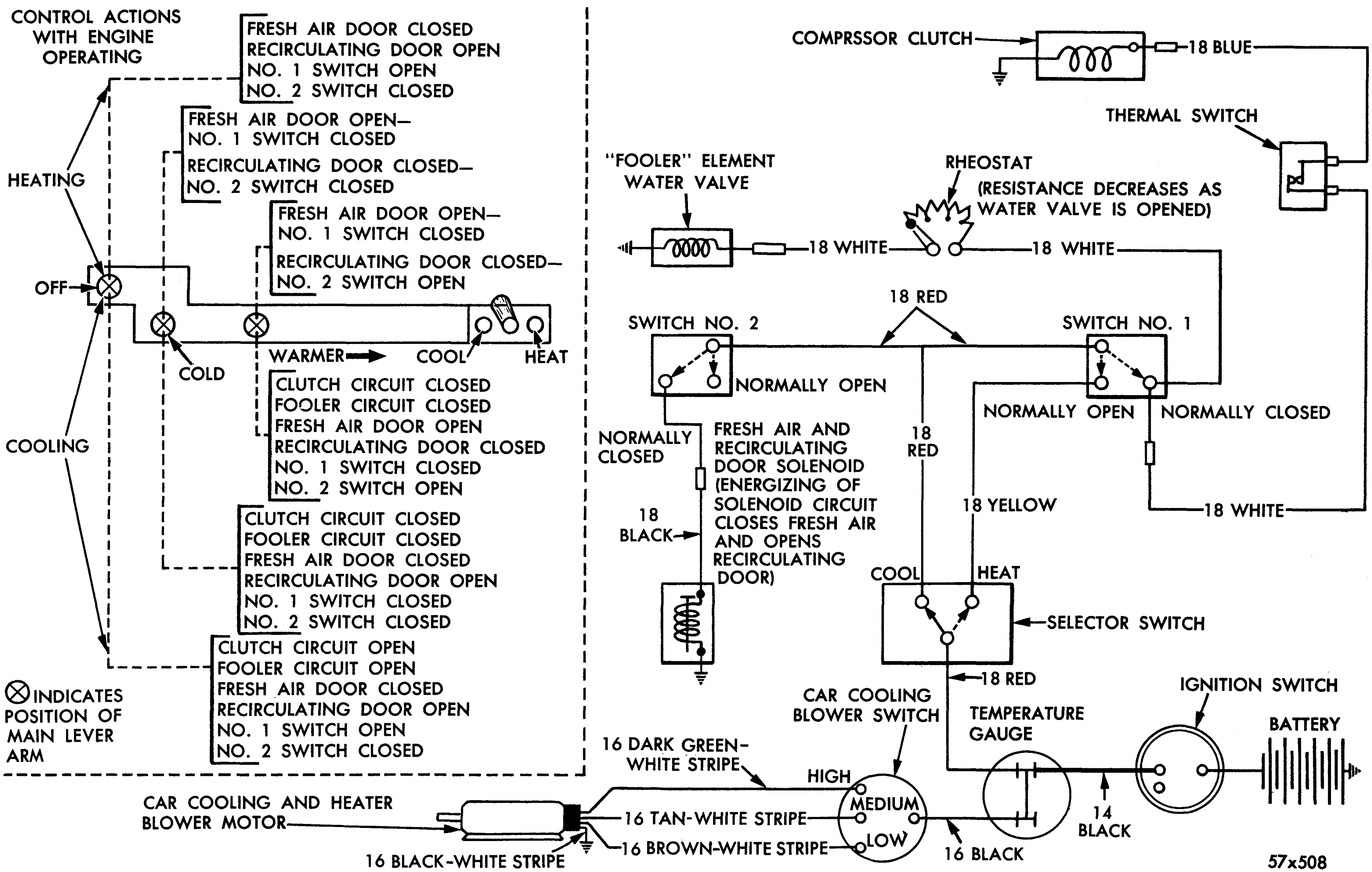


Fig. 10 — Wiring Diagram (Heater-Air Conditioning)

1. Lever mechanism picks up the cable controlling the water temperature control valve and prepares to open valve.

2. Hot water shut off to heater core.

3. Total fresh air ventilation is obtainable.

f. Moving the main control lever from No. 3 position through "Warmer" to No. 4 position opens the water temperature control valve. At the warmest point in the "Heating" position, the water valve allows the temperature of the discharge air to reach approximately 130° F.

The fresh air door will always open and the recirculating door will always close when car engine is stopped. This puts the system in a "safe" position for car washing, parking during a rainstorm, etc.

3. AIR DISCHARGE AND DISTRIBUTION

Cooled or heated air can be distributed to either upper or lower level of car and it can be proportioned between the upper and lower level.

Conditioned air is forced into the car by the blower that is mounted to dash. The air enters a distribution duct and can either be discharged toward the floor of car through holes in the distribution duct nozzle or it can be forced up to two discharge grilles in the top of instrument panel by means of a damper. In general, the air will be discharged to the lower level for heating and through upper grilles for defrosting (Figs 11 and 12) and air conditioning.

The discharge grilles in the top of the instrument panel can be rotated through a full circle. The grilles, also have hinged deflectors which can be used to direct air up along the roof or at the occupants of the front seat.

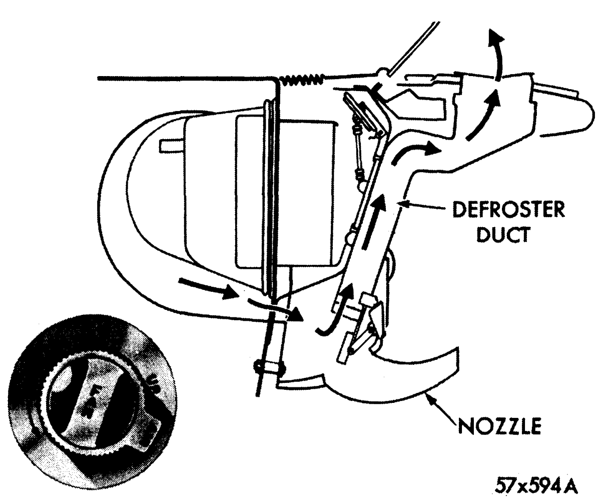


Fig. 11 — Defroster Duct (Schematic Drawing)

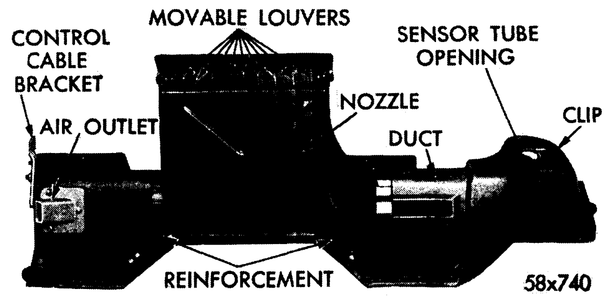


Fig. 12 — Lower Distribution Duct and Nozzle

4. TEMPERATURE CONTROL

For summer operation, the air will be dehumidified and cooled as it passes through the evaporator coil and then reheated by the heater core to a temperature that is selected by the operator. The amount of reheat added to the air as it passes through the heater core is controlled by metering hot water through the heater core. The flow of hot water is regulated by a modulating valve. A reheat type temperature control gives dehumidification even when minimum cooling is desired.

A thermostatic switch is used to prevent evaporator coil from frosting over. The thermal switch is installed in the evaporator to sense the fin temperature of the coil. As temperature of evaporator fins decreases to a point where frost-over might occur, the thermal switch will break the compressor clutch circuit, stopping refrigeration until fin temperature increases to a point above the freezing point of water.

The same modulating water valve is used for temperature control for both heating and cooling. The temperature range of the valve is changed by an electric resistance heating coil when cooling is selected by operator. The valve is designed to control the discharge air temperature. For the heating cycle this temperature range will be from about 75 to 130° F. The discharge range for the Air Conditioning or summer operation will be approximately 40 to 75° F. This shift in temperature range is accomplished by the heating of the valve's temperature sensitive secondary capillary tube with resistance heating coil which is wound around

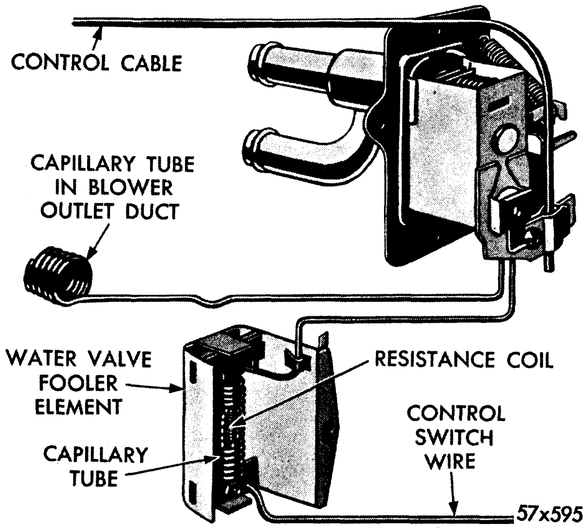


Fig. 13 — Capillary Tube and Water Valve

the secondary capillary tube. Heating the secondary tube, in effect, "tricks" the primary capillary tube, (Fig. 13) located in the distribution duct, by making it appear warmer than the discharge air flowing over it. The valve will then tend to close, thus reheating the air less and shifting the temperature to the desired cooler level.

5. INSPECTION AND TESTING OF COMPLETE AIR CONDITIONING SYSTEM

a. Preparation for Tests

Move car into a well ventilated area and shut off engine. Connect exhaust suction system to tail pipe. Inspect condenser and radiator for

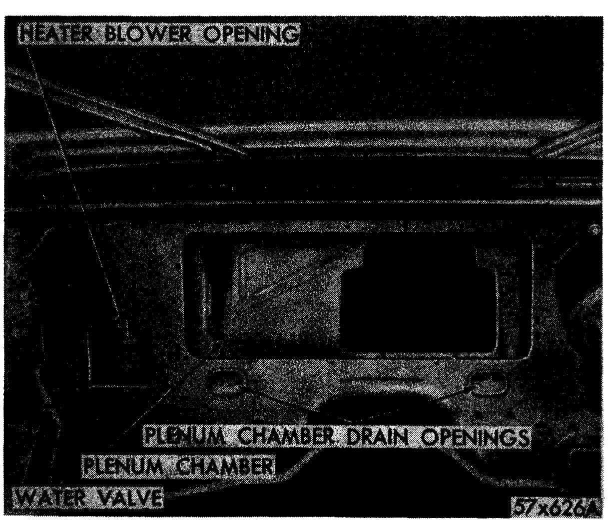


Fig. 14 — Plenum Chamber and Drain Openings (Typical)

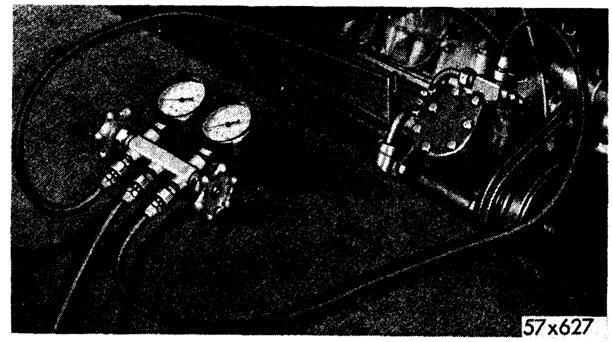


Fig. 15 — Gauge Set Installed (Tool C-3627) (Typical)

bugs, etc., and blow out from side opposite entrance with compressed air.

b. Radiator

Check radiator pressure cap. A 14 pound pressure cap and a 180° F. thermostat is used in all models. Check cooling system and add water or anti-freeze to maintain proper level. The cooling system should be protected to a temperature of 16° above zero for summer (lower for winter).

c. Compresosr Belt

Check compressor belt tension. Refer to Section IV, "Accessory Belt Drives".

NOTE: A belt having a minimum of ½ hour engine run is considered a used belt.

CAUTION

Always replace both belts. Never run a new belt with an old belt. Check compressor brackets and bracket attaching bolts for being tight.

d. Blower Motor

Check for loose or poor electrical connections. Check blower switch. Make a blower circulation check by operating the blower on each of its three operating positions: "Low", "Medium" and "High". Check for change in operational speeds, and circulation.

e. Drains

Check plenum chamber and air conditioner housing drains (Fig. 14) for being clear.

6. COMPRESSOR CAPACITY TEST

To make a compressor capacity test, the system must be isolated from the compressor. In isolating the compressor from the system, a .020″ test cap, Tool SP-2922 must be used to measure the amount of air pressure compressor delivers at given engine speed.

To make a compressor capacity test with a test cap, proceed as follows: Start engine, operate at 1200 r.p.m. Turn blower switch to "High" and temperature control lever to "Cold" position. Open car windows. Allow engine to operate until engine and compressor are up to normal operating temperature. Stop engine and remove the valve stem protective caps from suction and discharge valves. Use ratchet wrench, Tool C-3361A and back-seat both suction and discharge service valves by turning valves (counter-clockwise) all the way.

Remove service port caps from suction discharge service valve and attach hoses from gauge set manifold Tool C-3627 (Fig. 15). Attach hose from compound gauge on left of gauge assembly to the suction service port. Attach hose from right gauge to discharge service port. Close both right and left hand shut-off valves (clockwise) on gauge set manifold.

Start engine and with compressor operating, adjust engine speed to exactly 500 r.p.m. With ratchet wrench, Tool 3361A rotate valve stem of suction service valve (clockwise) until valve is completely front seated. Front seating the valves will cause suction pressure to drop to zero, and from a zero reading to a vacuum reading "pumping down" all of the refrigerant out of compressor. With compound gauge reading 20 to 25 inches of vacuum, rotate valve stem of discharge service valve (clockwise) until valve is completely front-seated. Open right hand shut-off valve (counter-clockwise) on the gauge manifold set.

NOTE: This will allow the small amount of gas trapped between compressor and discharge valve to vent down to zero reading through gauge manifold set center connection hose.

Open left hand shut-off valve on manifold, remove hose from center connection of gauge set. Attach capacity test cap, Tool SP-2922, to center connection of gauge set manifold. Disconnect manifold hose from suction service valve leaving service port open.

CAUTION

Test cap must be absolutely clean before installation on gauge set connection. Wash with solvent and blow dry. Test cap is meter drilled and wire or similar instrument should never be used to open the vented orifice. If this is done a doubtful gauge reading may result.

Close left hand shut-off valve on manifold while noticing the pressure rise reading on high pressure gauge.

Operating engine at exactly 500 r.p.m. the pressure reading on high gauge should read 190 to 210 psi. To make sure reading on gauge is correct, open and close the left hand shut-off valve on gauge set several times. If pressure readings rise on gauge and correspond to specified specifications, the compressor is functioning up to specifications.

NOTE: If pressure reading is below specifications and tachometer and guage is reading accurately, stop engine and check the compressor oil level since low oil level will cause a lower capacity test reading.

Add oil to compressor if necessary and recheck the compressor for capacity test readings. If compressor pressure is below the prescribed specifications with oil level at 2 inches at dip stick, the compressor valve plate assembly on both banks of compressor should be replaced.

After replacing valve plates on compressor, make a capacity test to again determine compressor pressure capacity. If compressor with oil level is corrected, and valve plates replaced, does not come up to specified pressure, remove suction service valve from compressor. Inspect suction screen (located in opening under valve) and see that it is clean, and gasket properly seated. If screen is clean, gasket not damaged, and compression test does not come up to specifications, the compressor should be replaced.

NOTE: When replacing compressor, an adjustment must be made to compensate for the oil remaining in system. Check and correct oil level in compressor to 2 inches (dipstick measurement). Start engine and run for approximately 15 minutes and check oil level again. Add or subtract to maintain spcified limit.

Remove compressor test vent cap from manifold and wrap cap in clean cloth to protect orifice from dirt and grit. Open right hand shut-off valve on manifold gauge set. Close left hand shut-off valve. Connect suction hose to service port of suction service port.

With engine running at 500 r.p.m. and compressor engaged, "pump down" the compressor by bleeding the air out of compressor through manifold gauge center connection. When 25 to 28 reading is indicated on vacuum gauge, turn suction service valve a fraction of a turn (counter-clockwise) for a few seconds and then front seat the valve. This will allow small amount of gas accumulated in suction line to flow into compressor and crankcase, mixing with and to be absorbed by the oil.

NOTE: This operation will also cause the gas to flow through the compressor's cylinder and out through the manifold gauge center connection.

Probe the gauge center connection with tip of finger. If probing with finger at connection indicates no more gas is flowing, close right hand valve on manifold gauge set. Stop engine

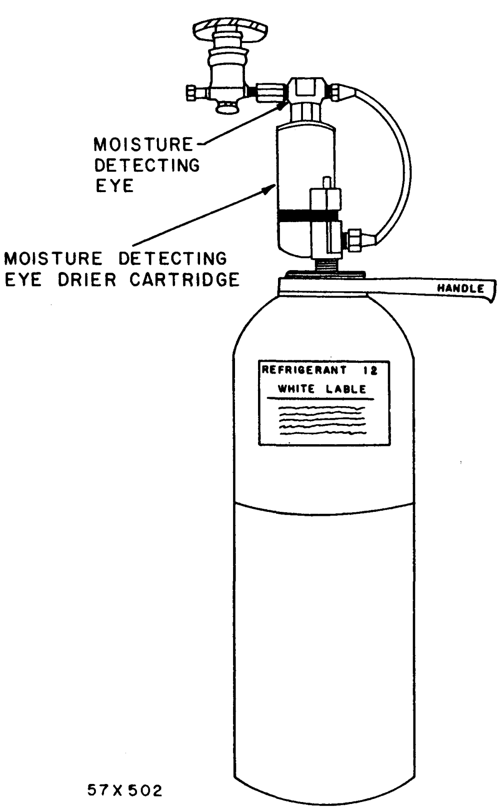


Fig. 16 — Refrigerant Tank, Detecting Eye, Drier Cartridge (Schematic View)

and turn both suction and discharge service valves (counter-clockwise) until they are completely back-seated. After back-seating each valve, turn each valve one turn (clockwise) to be in operating test position.

After completion of test, turn both suction and discharge service valves (counter-clockwise) until they are fully back-seated. Open both hand shut-off valves on manifold to release pressure on manifold gauge hoses. Disconnect and remove hoses from both service valves. Replace valve stem and service port caps and both service valves. Adjust fan belt. Check both cylinder head to compressor attaching bolts for tightness.

7. PRECAUTIONS TO OBSERVE IN HANDLING EQUIPMENT

WARNING

Safety Goggles, C-3355, should be worn to protect the eyes.

When properly used, refrigerant is harmless. A few simple precautions, however, should be observed to guard against injuries or sickness that might occur when refrigerant is improperly handled.

a. Precaution

Do not expose eyes to liquid. Do not rub eyes if splash of refrigerant hits them. Apply cold water immediately to area of eye to gradually raise the temperature above freezing point. The use of antiseptic oil is helpful since oil forms a protective film over eyeball until medical aid can be obtained.

b. Precaution

Do not discharge refrigerant in area where an open flame is present. The refrigerant normally is non-poisonous. A concentration of gas in a live flame, however, will produce a poisonous gas. Splashing refrigerant on bright metal or chrome should also be avoided because gas will tarnish bright metal.

c. Precaution

Do not leave charging tanks uncapped. Always replace cap after using charging tanks. A charging tank is shipped equipped with a heavy, protective cap which is used to protect valve and safety plug from damage. To avoid moisture getting into system, charging tanks should not be opened to the atmosphere.

CAUTION

Use care to avoid moisture entering system. It is imperative when sweeping or charging the system that the refrigerant be passed through a Drier and Dry-Eye Assembly before the refrigerant enters the Air Conditioning System. See Figure 16 for methods of attaching "Dry-Eye" and "Drier" to tank assembly.

8. INSTALLING GAUGE SET MANIFOLD

Remove valve stem protective caps from compressor discharge and suction service valves Using Tool C-3361A, make sure both valves are completely back-seated (counter-clockwise). The normal operating position is when valve is rotated in a (counter-clockwise) direction. This position also isolates service valve ports from system pressure.

Remove protective caps from both discharge and suction service port caps. Install four-foot test hose from 600 pound gauge fitting on Tool C-3627 to discharge service valve port fitting. Install the other four-foot test hose from 300 pound compound gauge fitting on Tool C-3627 to suction service valve port fitting. Turn both valve handles of gauge set, Tool C-3627 (clockwise) as far as they will go. This will completely seat valves and isolate gauge set manifold center outlet from test hoses. To admit pressure gauges, rotate valve stems of both suction and discharge service valves one turn, (clock-wise).

9. TESTING FOR LEAKS WITH DETECTOR

When system is found to be low in refrigerant, or following repairs on system that necessitated opening of connection, it is necessary to test for leaks and tighten connections, or to make repairs as required before system is charged and put in operation. If system has been discharged for making repairs or to eliminate moisture, system must be evacuated before partially charging to test for a leak.

Partially charge system with refrigerant, as outlined in Paragraph 10, and proceed as follows: (This is necessary only where supply in system is very low, or when system has been evacuated).

The Tool C-3569 (Test Torch) uses petroleum gas and does not require generating to light. Just turn valve on, light it, and adjust to small flame. Move leak detector sniffer tube over all connections. When leak is found, flame in burner will turn bright green. Move detector tube around connection to determine magnitude of leak. If larger leak is found, color of flame will turn from bright green to bright purple.

NOTE: If leak is found at flared connection, try tightening connection, using two wrenches. If leak cannot be eliminated by tightening, system must be discharged, connection or flare reseated or replaced, system evacuated and again partially charged, and re-tested. If no leaks are found, add to partial charge until system contains three pounds.

10. CHECKING REFRIGERANT BY SIGHT GLASS METHOD

In some cases, it may be necessary to add refrigerant to system to provide cooling without weighing, as is normally required.

Follow preliminary steps, "Installing Gauge Set Manifold", Paragraph 8, and Charging System 16, but eliminate those steps involving scale. Start engine and operate at 1200 r.p.m. Turn blower control switch to "High" position and temperature switch to "Cold". Rotate both suction and discharge service valves one turn (clockwise). Where discharge gauge hand fluctuates when engine is running, close discharge valve slowly (counter-clockwise) until gauge hand steadies. Charge through drier. Refer to Figure 15 and install drier as indicated.

Open tank valve one turn. Open suction valve on gauge manifold slightly (counter-clockwise). Control refrigerant entering system with this valve. **Do not allow suction pressure to exceed 60 psi.**

Carefully watch sight glass. Close gauge manifold suction valve (clockwise) the moment sight glass is clear of bubbles. Stopping flow of refrigerant into system as soon as sight glass is clear (free of bubbles) is important. Too much refrigerant in system can cause damage.

Operate system for five minutes and again observe sight glass for presence of bubbles. If there is still evidence of bubbles, continue to carefully charge until sight glass is clear, and repeat five minute run. Where no bubbles are present after five minutes of operation, charge system with an additional charge of refrigerant for 10 seconds.

Close tank valve and loosen hose connection at tank to gradually release gas from hose. Disconnect hose after gas has escaped. Backseat suction and discharge service valves (counterclockwise). Remove gauge manifold and install service valve stem and service port protective caps.

11. DISCHARGING THE SYSTEM

Install gauge set manifold Tool C-3627. Using Tool C-3361A, be sure both discharge and suction service valves are fully back-seated (counter-clockwise). Connect eight-foot test hose to gauge set manifold center fitting. Insert free end of eight-foot hose into exhaust suction system and turn exhaust blower on.

NOTE: Expelling the gas into the exhaust system is a recommended safety precaution.

Open discharge and suction service valves one turn. Crack manifold gauge set discharge hand valve a fraction of a turn (counter-clockwise) to allow gas to escape. Opening manifold discharge hand valve too much in order to more quickly discharge system will draw compressor lubricant off with the gas. As pressure on manifold discharge gauge drops near zero, open manifold suction hand valve.

NOTE: If brazing or some similar repair is to be made on system, leave system open to atmospheric pressure. After service work has been completed, system must be evacuated, partially charged, and leak tested before final charge.

12. EVACUATING AND SWEEPING SYSTEM

Whenever system has been open to atmosphere, it is absolutely essential that system be evacuated and swept with refrigerant to remove all air and moisture. Connect gauge set manifold, Tool C-3627, to compressor and condenser service valves. Discharge system (if not previously discharged), as outlined in Paragraph 11.

CAUTION

Be sure the pressure has dropped to zero before attaching hose to vacuum pump.

Connect eight-foot test hose to center fitting of gauge set manifold and to connection on vacuum pump (Tool C-3652). Open both discharge and suction service valves about one turn, rotating both valve stems (clockwise). Open both gauge set manifold hand valves turn (counter-clockwise). Start vacuum pump and observe compound gauge. Operate pump until gauge registers 26 to 28 inches of vacuum. Continue evacuating at 26 to 28 inches for five minutes. Failure to obtain 26 to 28 inches of vacuum would indicate a leak in system. Close both gauge set manifold hand valves (clockwise). Turn off vacuum pump and remove long test hose from pump. Charge system with refrigerant gas, as outlined in Paragraph 16.

Start engine and adjust speed to 1200 r.p.m. Turn blower control to "High" and temperature control to "Cold". Operate in this manner for five minutes and test for leaks. Discharge system to sweep out any remaining moisture, and again evacuate system at 26 to 28 inches of vacuum for 10 minutes. Recharge system with three pounds of refrigerant.

13. MOISTURE IN AIR CONDITIONING SYSTEM

Moisture in automotive air conditioning systems is directly or indirectly the real cause of many failures in air conditioning systems. Basically, moisture can be classified as visible and invisible. Visible moisture, such as rain, clouds, steam, etc., can be seen. Invisible moisture is water vapor which cannot be seen with the eye. This water vapor is everywhere—it is in all solids, liquids and gases. It is in the air, and the varying amount is expressed in terms of relative humidity. Withdrawal of refrigerant from a system that is experiencing freeze-ups at the expansion valve, does not ordinarily reveal visible liquid water in refrigerant, yet it is there in quantities sufficiently to stop refrigeration.

Moisture may enter the air conditioning system in following manner:

a. System left open during repair.

b. Condensation in tubing, leaky seal caps, wet driers, unsealed charging hose or manifolds.

c. Use of wet oil or refrigerant from improper field handling.

d. Charging system without drier.

The measurement of moisture content in a refrigerant is expressed in "Parts Per Million" (PPM). This can be illustrated by saying that one drop of water, in one million drops of water is one part per million. It can also be further illustrated by stating that one drop of water raises the moisture content of 25 pounds of "Refrigerant 12" about 5 (PPM), or 1 pound of "R-12" about 125 (PPM).

In order to be certain the moisture content of a "Refrigerant 12" Air Conditioning is kept out of the freeze-up range, acid producing and corrosion range, the moisture content should not exceed 10 (PPM). The progressive result of moisture in excess of 10 (PPM) in "Refrigerant 12" is as follows:

Refrigerant 12 plus moisture equals freeze-ups at expansion valve.

Refrigerant 12 plus moisture equals acid (Hydrochloric & Hydrofluoric).

Acid plus metals and refrigerant oil equals corrosive sludge.

Corrosive sludge plus expansion valves equals sticky or stuck valves.

Corrosive sludge plus screens and strainers equal plugged screens and strainers.

Corrosive sludge plus compressor reed valves equals corroded leaky valves.

Refrigerants such as Refrigerant 12 are known as auto-driers. In a closed container, moisture tends to leave the liquid and concentrate in the vapor. A full tank of "Refrigerant 12" when received from manufacturer, is as "dry" of moisture as the manufacturer can produce it. Yet it will still contain from 6 to 10 (PPM) moisture in the liquid phase. At room temperature, "Refrigerant 12" in the vapor phase (refrigerant gas above the liquid in a tank) can hold as much as seven times amount of moisture as it does in liquid phase.

This means starting with a full tank of "Refrigerant 12" containing 6 to 10 (PPM) moisture in the liquid phase, the vapor above the liquid can contain 42 to 70 (PPM).

As this vapor leaves the tank and is charged into the Air Conditioning System, the moisture enters the system with the vapor. As more and more refrigerant vapor leaves the tank, more and more liquid refrigerant boils into a vapor and the vapor can extract a 7 to 1 ratio of moisture from the liquid remaining in the tank. By the time the full tank of "Refrigerant 12" is down to about half full, the remaining half tank of refrigerant liquid and vapor will be very dry, as all of the moisture originally contained in the full tank of liquid has been extracted by vapor and charged into the Air Conditioning System.

CAUTION

Always insist on delivery of refrigerant in unopened tanks. Do not accept tanks refilled by anyone other than the manufacturer, because of the possibility of the tank containing free water.

For the above reasons it becomes imperative when charging a system, to pass the refrigerant vapor through an efficient drier before it enters the system. If this precaution is not taken, as much moisture may be induced back into the system as was removed during evacuation and sweeping.

See Figure 16 for method of attaching "Drier" and "Dry-Eye" to tank assembly. Refer to "Charging The System, Paragraph 16, for use of "Drier" and "Dry-Eye" equipment to eliminate moisture from system.

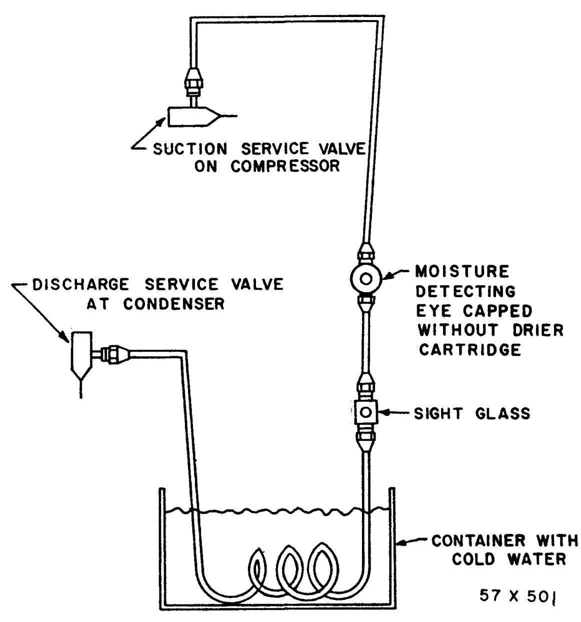


Fig. 17 — Moisture Detecting Eye (Schematic Drawing) (LC1)

NOTE: Drier cartridges are available in 8, 12, 20 and 30 cubic inches. A 12 cubic inch cartridge is recommended for use with refrigerant tank. On receival, make sure cartridge is sealed with white plastic seal cap. This cap is used to seal moisture from drier cartridge.

Used drier cartridges can be re-activated when saturated with moisture provided refrigerant containing oil has not flowed through the drier, by unsealing the cartridge and placing it in a heated oven for a given number of hours. For example, if the cartridge is placed in a 300 degree oven, it should remain there for 2 hours, 1½ hours in a 400 degree oven, or 1 hour in a 500 degree oven, etc. After heating, allow cartridge to cool, reseal with plastic cap and gasket, store in a dry area (at room temperature). To charge system refer to Paragraph 16.

14. CHECKING SYSTEM FOR MOISTURE

a. Windsor Models

With tubing coil, sight glass, moisture detecting eye and cap made up into an assembly, as shown in Figure 17, remove valve stem caps from suction and discharge service valves, back-seat and fully open (counter-clockwise) both valves. Remove caps from valve service ports and attach tubing and flare fitting assembly to the valve service ports, as shown in Figure 17.

Fill the container with cold water to allow for submersion of coil in water, as shown in Figure 17. Turn valve stem of discharge service valve two turns (clockwise). Purge air from tubing by slowly loosening up the tubing nut at suction service valve. After all the air has been bled from tubing, retighten nut. Test all connections for leaks. Start engine and adjust engine speed to 1200 r.p.m. Open car windows and move the operating lever to "Cold" position, and blower switch to "High".

Slwoly turn the valve stem of the suction service valve (clockwise) two full turns, and check sight glass for flow of refrigerant liquid through glass. After approximately 15 to 20 minutes of engine operation with liquid flowing through the moisture detecting eye and if the dot of eye shows **pink,** excessive moisture is present in system.

If system is "dry" or contains a minimum of moisture, the dot of eye will slowly change to **light blue** indicating the system contains 10 to 20 (PPM) of moisture. When dry eye shows a **dark blue** the same color as corresponds to the dot on eye, it is indicative that system contains less than 10 (PPM) of moisture and is now ready for safe, satisfactory operation.

NOTE: If moisture detecting eye shows pink, excessive moisture is present. Light blue will indicate the system is border line, and moisture content should be lowered.

To remove the moisture detecting eye and tubing assembly, proceed as follows: With air conditioning system operating, back-seat first the discharge service valve, and then suction service valve (counter-clockwise) and stop engine. Remove tubing coil, sight glass, moisture detecting eye and cap assembly from suction and discharge service valves.

NOTE: Install protective flare plugs in end of tubing fitting to keep moisture and other foreign matter from entering tubing.

b. Saratoga, New Yorker and Imperial Models

Make sure system is fully charged. Start engine and run for ½ hour. Check sight glass to determine moisture content.

15. CORRECTING A WET AIR CONDITIONING SYSTEM (WITHOUT DISCHARGING SYSTEM)

With tubing and 30 cubic inch drier cartridge and detecting eye made up into an assembly, as shown in Figure 17, proceed as follows: Remove valve stem caps from suction and discharge service valves and fully back-seat (counter-clockwise) both valves. Remove caps from valve service ports. Remove flare plugs from tubing and drier cartridge assembly and attach flare nuts of tubing to service valves, as shown in Figure 17.

NOTE: Elevate drier and cartridge assembly above compressor height to facilitate absorption.

Turn valve stem of discharge service valve two turns clockwise, and slowly loosen tubing nut at suction service port. Purge air from tubing and drier. Retighten tubing nut after purging air. Test all connections for leaks and correct if needed. Turn valve stem of suction service valve two turns (clockwise).

NOTE: With the vehicle located in an area where the air conditioning system can maintain room temperature, allow vehicle to set for approximately 24 hours, or sufficient time to allow the drier to absorb sufficient moisture.

When detecting eye has turned a **deep blue,** matching the comparison color dot on the dry eye unit, the system is now sufficiently dry to permit satisfactory air conditioning operation. The chemical action, involving a change from a moisture-laden refrigerant to non-moisture laden refrigerant, is as follows: The drier absorbs moisture from the refrigerant vapor. The vapor in turn absorbs moisture from the liquid refrigerant. In this conversion process, if the drier cartridge is allowed to remain in system long enough, it will also partially reactivate or dry-out the system's saturated drier.

To remove the drier cartridge, dry eye and tubing from compressor proceed as follows: Back-seat discharge and suction service valve stems (counter-clockwise). Remove tubing, and drier cartridge assembly from suction and discharge service valves. Replace service port caps. Install flare plugs in tubing ends to seal out moisture. Tighten all connections securely, and check compressor belts for correct tension.

16. CHARGING THE SYSTEM
(Using Moisture Detecting Eye With Drier Cartridge)

Refer to Figures 18 and 19 and proceed as follows: Assemble moisture detecting eye and drier cartridge to refrigerant tank. Make sure the arrow located on "Dry-Eye" unit, points in direction of flow from tank. Close refrigerant shut-off valve and open refrigerant tank valve. Purge air from drier by opening refrigerant tank shut-off valve for a few seconds. Install ¼ inch cap on outer end of valve and tighten cap securely.

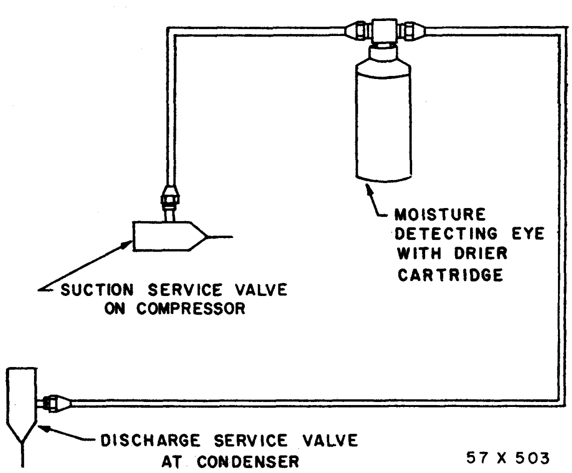


Fig. 18 — Moisture Detecting Eye and Drier Cartridge Installation (Schematic Drawing)

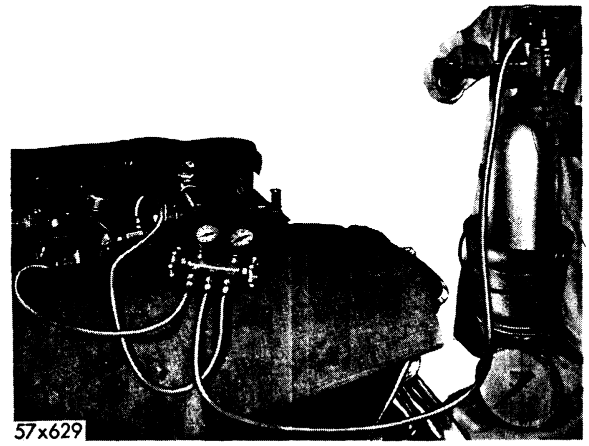


Fig. 19 — Charging the System (Typical)

NOTE: Test all connections with a leak detector torch to make sure all connections are tight.

Open refrigerant tank valve and allow moisture detecting eye and tank assembly to be at rest, permitting the drier to absorb any excessive moisture that may be present in refrigerant liquid.

NOTE: Always allow sufficient time for moisture detecting eye to change to a deep blue before attempting to charge or add refrigerant to system.

When Drier and Dry-Eye Cartridge assembly is coupled to a refrigerant tank for the absorbtion of moisture, the window of the moisture detecting eye will show a color dot indication, such as pink, if the refrigerant vapor in the charging tank is above 30 (PPM) of moisture. As the Drier Cartridge absorbs the excessive moisture detecting eye will gradually change to a **light blue,** indicating a lower moisture content, to 20 (PPM). The eye will change to a **deeper blue** as the vapor content is reduced. Refrigerant with a 10 (PPM) moisture content can be considered safe to use in the air conditioning system.

Connect eight-foot test hose to the center fitting of gauge manifold and to connection of refrigerant tank (Fig. 18). Be sure both gauge manifold valves are fully closed (clockwise). Open both discharge and suction service valves one turn (clockwise), if not previously done. If discharge gauge hand fluctuates when engine is running, close discharge valve slowly (counter-clockwise) until gauge hand steadies. Use "Charge through Drier". Refer to Figure 18 and install drier, as indicated.

Open valve tank one turn and loosen eight-foot test hose at gauge manifold. Leave connection loose for about a second to purge air from hose. Start engine and operate at 1200 r.p.m., with blower control set to "High" and temperature control set at "Cold".

Set tank upright in pail of warm water. The temperature of warm water must not exceed 125 degrees F. Set pail and tank on scale (Tool C-3429) and weigh assembly. Make note of combined weight.

WARNING

It is absolutely essential that an accurate scale, such as Tool C-3429, be used. Bath scales are not accurate below 100 lbs.

Open suction valve on gauge manifold slightly (counter-clockwise). Control refrigerant entering system with this valve. **Do NOT allow suction pressure to exceed 60 psi.** Be sure both discharge and suction pressure service valves are open about one turn (clockwise). Carefully watch scale and shut tank valve off when system has absorbed three pounds. If partial charge is desired for testing leaks, charge system with refrigerant gas charge until 100 pounds pressure is reached on discharge pressure gauge.

Close suction valve on gauge manifold (clockwise). To disconnect tank, loosen eight-foot test hose, allow refrigerant in hose to escape slowly, and remove hose from tank.

17. TESTING THERMAL SWITCH

Move temperature control lever to "Cold" position. The fresh air door should close and recirculation door should open. Turn blower switch to "Low" position; car windows and doors closed. Recheck the outlet air flow to assure blower is on low position.

Observe suction gauge pressure. As evaporator temperature lowers, suction pressure will gradually lower and fluctuate down to between 20 to 10 psi. The thermal switch contacts should be open and de-energize the clutch. When this happens, there will be a slight increase in the engine speed which can be noted by the ear or observed on the tachometer. Also, when the clutch de-energizes, there will be a sharp steady rise in the suction pressure.

Allow the system to continue to operate. The evaporator will warm up thereby closing the thermal switch contacts, which in turn, will re-energize the clutch—and again, when this happens, there will be a slight decrease in engine speed which can be noted by the ear or observed on the tachometer. Also the suction pressure will again start fluctuating to a lower pressure and the cycle will be repeated.

Should the suction pressure fluctuate down below 10 psi. and then release clutch, it is indicated the thermal switch sensing tube is not making a good contact with evaporator fin and coils. Should suction pressure fluctuate down and on into a vacuum without releasing the clutch, it indicates: The thermal switch wires are shorted together. There is moisture in the system. The thermal switch is defective. Check system for moisture. Perform the Overall Performance Test, Paragraph 32, before making thermal switch wiring or switch connections.

18. TESTING FOR PROPER SUPER HEAT

To test evaporator expansion valve for super heat, make sure the air conditioning system is fully charged with Refrigerant 12, and is dry. Make a compressor capacity check and check all the other components for proper operating condition.

Install a thermometer (completely insulated against outside temperature) in the expansion valve thermal bulb well, as outlined in "Testing Thermal Switch Test". Start engine and adjust engine speed to 1200 r.p.m. Turn toggle switch to cooling position. Place control lever in "Cold" position. This will close fresh air door and open recirculation door.

Turn blower switch to high. Open car windows. Feel the heater water valve to make sure no hot water is flowing through heater core. After operating engine for 10 minutes to allow

EXAMPLE OF CHART I FOR DETERMINING SUPER HEAT

A Observed Suction Pressure at Gauge	B Temperature Relation of Suction Pressure	C Observed Thermometer Temperature at Evaporator	D Corrected Evaporator Thermometer Temperature, 5 Degrees Subtracted	E Super Heat
25 lbs.	26°	41°	36°	10°
30 lbs.	32°	47°	42°	10°
35 lbs.	38°	53°	48°	10°
40 lbs.	43°	58°	53°	10°

CHART II—TEMPERATURE AND PRESSURE RELATION CHART FOR REFRIGERANT 12

Temp. F.	Press. of Refrig.	Temp. F.	Press. of Refrig.	Temp. F.	Press. of Refrig.	Temp. F.	Press. of Refrig.
0	9.1	43	,39.7	76	78.3	109	135.1
2	10.1	44	40.7	77	79.2	110	136.0
4	11.2	45	41.7	78	81.1	111	138.0
6	12.3	46	42.6	79	82.5	112	140.1
8	13.4	47	43.6	80	84.0	113	142.1
10	14.6	48	44.6	81	85.5	114	144.2
12	15.8	49	45.6	82	87.0	115	146.3
14	17.1	50	46.6	83	88.5	116	148.4
16	18.3	51	47.8	84	90.1	117	151.2
18	19.7	52	48.7	85	91.7	118	152.7
20	21.0	53	49.8	86	93.2	119	154.9
21	21.7	54	50.9	87	94.8	120	157.1
22	22.4	55	52.0	88	96.4	121	159.3
23	23.1	56	53.1	89	98.0	122	161.5
24	23.8	57	55.4	90	99.6	123	163.8
25	24.6	58	56.6	91	101.3	124	166.1
26	25.3	59	57.1	92	103.0	125	168.4
27	26.1	60	57.7	93	104.6	126	170.7
28	26.8	61	58.9	94	106.3	127	173.1
29	27.6	62	60.0	95	108.1	128	175.4
30	28.4	63	61.3	96	109.8	129	177.8
31	29.2	64	62.5	97	111.5	130	182.2
32	30.0	65	63.7	98	113.3	131	182.6
33	30.9	66	64.9	99	115.1	132	185.1
34	31.7	67	66.2	100	116.9	133	187.6
35	32.5	68	67.5	101	118.8	134	190.1
36	33.4	69	68.8	102	120.6	135	192.6
37	34.3	70	70.1	103	122.4	136	195.2
38	35.1	71	71.4	104	124.3	137	197.8
39	36.0	72	72.8	105	126.2	138	200.0
40	36.9	73	74.2	106	128.1	139	209.2
41	37.9	74	75.5	107	130.0	140	205.5
42	38.8	75	76.9	108	132.1		

system to normalize, take reading of suction gauge pressure, and check thermometer temperature.

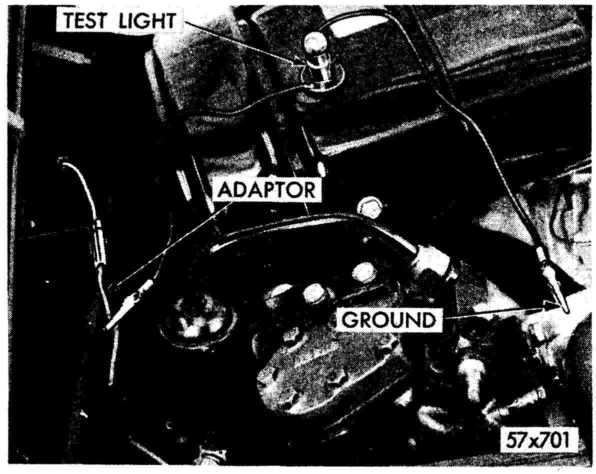
NOTE: The method used to determine whether the proper amount of refrigerant is metered into the evaporator coils is to determine the number of degrees of super heat the vapor has absorbed in the coils. The specifications are 8 to 15 degrees super heat. It is calculated for all models as follows: See Chart I for examples of Determining super heat.

Observe suction pressure at gauge and obtain the nearest temperature corresponding to this pressure from the Temperature-Pressure Relation Chart for Refrigerant 12, Chart II. From the observed temperature reading on thermometer, subtract 5 degrees to compensate for thermometer connection error and suction line pressure drop. The temperature difference between the suction pressure temperature relation and the corrected temperature should not be less than 8 degrees nor more than 15 degrees super heat.

NOTE: Subtracting "B" from "D" will equal super heat at "E".

19. TESTING ELECTRICAL SWITCHES AND CONTROL CIRCUITS

Refer to Figure 20 and Chart III, and proceed as follows: With test light, Tool C-744, located on windshield, attach one end of lead to solenoid valve terminal, and the other to ground. Start engine and adjust engine speed to 1200 r.p.m. Turn toggle switch to "Cool" position. Move air conditioning control lever to "Off" position. With lever located in this position test lamp should light (recirculation door open, fresh air door closed). With control lever to "Cold", position test lamp should light (recirculation door open, fresh air door closed).



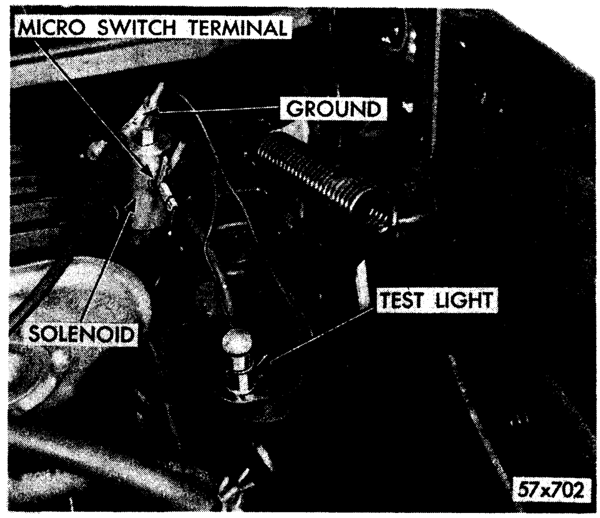


Fig. 20 — Testing Control Circuits (Typical)

Then with control lever to "Warmer" position test lamp should not light (recirculation door closed, fresh air door open). Turn toggle

CHART III—TEST CHART

Control Lever Position	Toggle Switch Position	Recirculating Door Position	Fresh Air Door Position	Test Light
Off	Cool	Open	Closed	Lights
Cool	Cool	Open	Closed	Lights
Warmer	Cool	Closed	Open	No Light
Off	Heat	Open	Closed	Lights
Cold	Heat	Closed	Open	No Light
Warmer	Heat	Closed	Open	No Light

switch to "Heat" position and move control lever to "Off" position (test lamp should light) —recirculation door open, fresh air door closed. Move control lever to "Cold" position (test lamp should now be out)—recirculation door closed, fresh air door open. Move control lever to "Warmer" position (test lamp should be out)—recirculation door closed, fresh air door open. Move control lever back to "Off" position. Re-locate test light, attaching one lead to water valve element circuit and the other lead to ground. With toggle switch in "Cold" position and control lever in "Off" position (test lamp should be off). Move control lever to "Cold" position (test lamp light dimly). Move control lever to "Warmer" position (test lamp should increase from dim to bright as resistance is decreased in rheostat. Feel the water valve element. Valve should go from warm to hot as control lever is moved to the "Warmer" position. Check the three blower motor connections for being tight in connector. Tighten if necessary.

20. PRECAUTIONS TO OBSERVE IN HANDLING TUBING

a. Cleanliness During Installation

A piece of tubing that has been cut, flared and prepared for installation should be clean and dry.

b. Cutting and Flaring

Use Tool C-3478 to cut, eliminate burrs, and ream tubing. The tube should be double-flared with tool.

Always inspect flared joint before installation to determine if there are any cracks or blemishes on flare that would cause a possible leak.

NOTE: Copper washers must be used where joint is steel-to-steel, steel-to-brass or brass-to-brass. Copper to steel or brass requires no washer. Use refrigerant oil on flared surface connections when installing or repairing leaky tube connections to improve sealing and reduce torque required. Never use any sort of sealing compound between tube flare and male surface.

c. Securing the Tubing

Copper tubing must be attached to car structure. A flexible connector (vibration eliminator) has been placed on the condenser side of compressor to guard against breakage at that point.

d. Brazing the Joints

Discharge system before using a torch to braze leaking joints. Avoid excessive heat when using an acetylene flame to solder or braze a joint. The usual precautions should be followed before repairing a sweat-type joint, such as cleaning thoroughly, applying sufficient flux, heating to temperature that will cause silver solder to flow freely, and testing joint after making repairs.

Only the following component parts of compressor are available for service: compressor unit valve plate assemblies, suction service valve, discharge service valve, cylinder head, gaskets, muffler, assemblies, shaft seal and support brackets. The compressor refrigerant oil may be replaced or corrected to proper level. Any damage to pistons, cylinders, crankshaft or connecting rods, requires replacement of complete compressor assembly.

21. MEASURING COMPRESSOR OIL LEVEL

NOTE: If the oil level is checked immediately after a long, fast trip, the oil level will be slightly lower than normal.

Locate the air condition operating lever on "Cold", blower "High", toggle switch "Cool", car windows open. Start engine and operate at 1200 r.p.m. for about 10 minutes to return any excessive oil in system to compressor crankcase. Stop engine and remove protective caps from discharge and suction service valves. Close both valves by turning valve stems clockwise with Tool C-3361 until valves are seated firmly.

NOTE: The engine should never be started with the discharge or suction service valve closed.

Clean area around the compressor filler plug and discharge service valve port cap with solvent and blow dry with compressed air. Carefully loosen the 1/4 inch flare cap fitting of the discharge service valve one-quarter of a turn and gradually release or purge the gas pressure from the compressor. When the pressure in compressor is completely purged, loosen (do not remove) the oil filler plug on side of compressor just enough to allow gas pressure (if any) in crankcase to escape.

When pressure has been released, remove filler plug and use a clean dry plunger type dipstick (1/8 inch round or similar rod) to measure oil level.

The correct oil level is from 2 to 2½ inches. Add MOPAR air conditioning compressor oil (300 Saybolt at 100 degrees F.), as required, or siphon off excess oil if necessary. After oil level has been checked and corrected, replace the filler oil plug.

To purge air out of the compressor cylinder and crankcase, make sure cap on the discharge valve service port is loosened approximately one-half turn. Using Tool 3361A, slightly open the suction service valve stem (counter-clockwise). Let gas drift slowly through compressor for about 10 seconds.

Tighten cap on the discharge service port. Back-seat both discharge and suction service valves by turning the valve stems (counter-clockwise). Replace protective caps on the discharge and suction service valves and tighten securely.

22. REMOVAL AND INSTALLATION OF AIR CONDITIONING UNIT

a. Removal

From the engine compartment, drain anti-freeze from radiator. Remove air cleaner. Remove ignition distributor cap and base assembly, if necessary. Disconnect upper and lower hot water heater hose from evaporator cover outlet. Disconnect blower and wires. Remove blower to dash attaching bolts and remove blower and assembly. Remove air conditioner evaporator cover to dash attaching bolts, and remove cover assembly.

Remove thermal switch capillary tube from core fins. "Discharge the System", as outlined in Paragraph 11. Disconnect suction and liquid line. Remove remaining evaporator housing flange to dash screws and remove evaporator by depressing fresh air door with screw driver as evaporator is rolled out of dash pocket.

NOTE: Whenever the air conditioning unit is removed from car, cooling coil fins should be cleaned and the water outlet drains should be checked for being open before reinstalling.

b. Installation

Install unit in the reverse order of removal. Evacuate, sweep and charge system, as indicated in Paragraphs 12 and 16. Install blower and heater hoses. Check system for leaks, the fan belt for proper tension and make certain radiator contains sufficient coolant.

23. REMOVAL OF HEATER CORE

Remove heater core to evaporator housing attaching screws. Carefully slide core assembly to left and remove core.

CAUTION

Use care when removing core to avoid damaging equalizer lines.

24. REPLACEMENT OF RECEIVER STRAINER-DRIER

Wherever the receiver strainer-drier unit is plugged and has to be removed from car, proceed as follows:

NOTE: The fusible plug on LC2-LC3 and LY1 units is not replaceable. Replace the complete moisture indicator—receiver strainer-drier—sight glass assembly.

a. Removal

Discharge the system, as outlined in Paragraph 11.

CAUTION

Protect eyes with goggles before disconnecting receiver flare connections.

Disconnect flared connections at both ends of receiver. Remove attaching bolt nuts from bracket and remove receiver. Cap open lines if new receiver is not to be installed immediately. Leave caps on connectors until ready to install.

b. Installation

Position receiver in place, install bracket attaching bolts, and tighten nuts securely. Remove caps, connect flared connector nuts and tighten securely. Charge system with partial charge and test for leaks. Correct any leaks and evacuate system, as outlined in Paragraph 12. Charge with three pounds of refrigerant, as outlined in Paragraph 16.

25. REPLACEMENT OF RECEIVER STRAINER-DRIER FUSIBLE PLUG (Without Removal From Car) (LC1 Only)

NOTE: The fusible plug on LC2, LC3 and LY1 units is not replaceable. Replace the complete moisture indicator—receiver strainer drier—sight glass assembly.

Replacement of damaged fusible plug can be made without removal of unit from bracket assembly. Discharge the system and remove the old fusible plug. Apply refrigerant oil to threads of new plug, and install plug in receiver. Tighten to 20 foot-pounds torque. Never replace a damaged fusible plug with a pipe plug.

Evacuate system, as outlined in Paragraph 12. Charge system with three pounds of refrigerant, as outlined in Paragraph 16.

26. REMOVAL AND INSTALLATION OF EXPANSION VALVE

a. Removal

Disconnect the 3/8 inch and 1/2 inch line flare fittings.

NOTE: Use two flare wrenches to loosen or tighten fittings. Remove the valve control bulb.

CAUTION

Cap or plug open lines to prevent moisture from entering system.

b. Testing Expansion Valve (Equipment Required) (Fig. 21)

Source of dry air 90 to 250 psi.

Moisture detecting eye with drier cartridge.

Air Conditioning gauge set manifold.

Transmission throttle pressure gauge.

Compressor capacity test cap with .020 inch bleed hole.

Container with ice and water to hold temperature at 32 degrees F. 1/4 inch copper tubing and fittings as used in attached drawing (Fig. 21).

c. Test Procedure

1. Direct source of dry air, 90 to 250 psi. through moisture detecting eye with drier cartridge attached to insure against any moist vapors or particles of dirt entering the valve.

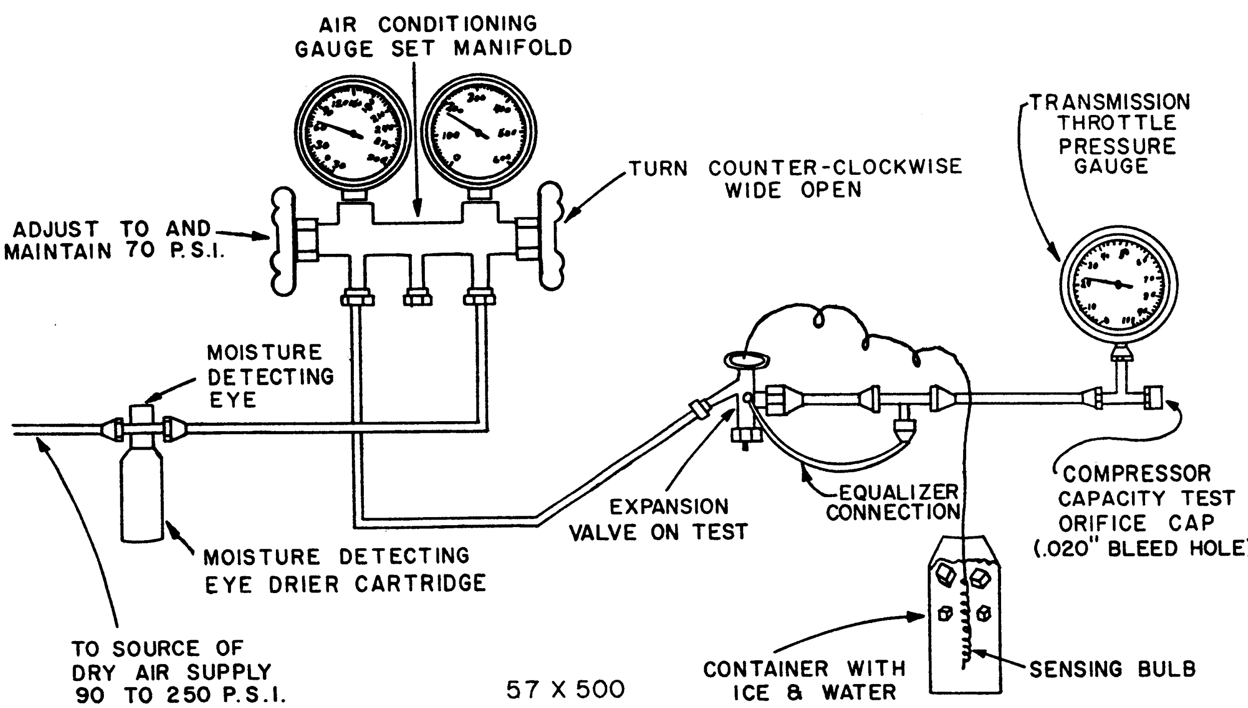


Fig. 21 — Testing Expansion Valve (Unit Removed from Car)

2. With the left hand shut-off valve on gauge set manifold closed and the right hand valve open, the right hand gauge will indicate the pressure of the air supplied. Slowly open the left hand shut-off valve (counter-clockwise) until left gauge indicates 70 psi.

3. Immerse the expansion valve sensing bulb into the water and ice bath (32 degrees F.).

4. With the expansion valve inlet pressure gauge (left hand gauge) reading 70 psi., the sensing bulb completely submerged in the 32 degree F. water bath, and the compressor set cap bleeding off pressure, the outlet pressure gauge should read between 23 and 26 psi.

5. Remove sensing bulb from water bath and warm bulb in hand. With expansion valve inlet pressure still reading 70 psi. (adjust if necessary), the outlet pressure should rise to a pressure of not less than 53 psi.

If expansion valve successfully passes these tests, it may be considered to have the proper super heat setting, a proper pressure limit valve, the rated capacity and that it has not lost its thermal charge. The valve should, therefore, give satisfactory performance. If expansion valve fails to pass either test No. 4 or No. 5, it should be rejected.

d. Installation

Reinstall expansion valve, control bulb, and equalizer lines in the reverse order of removal. Tighten all connections securely, and sweep and charge system, as indicated in Paragraphs 13 and 17.

NOTE: The expansion valve thermal bulb must be firmly held in the "well", otherwise the system will become flooded. Make sure the thermal tube is insulated correctly.

27. REMOVAL AND INSTALLATION OF COMPRESSOR (Fig. 22)

Discharge the system, as outlined in Paragraph 11. Remove the suction and discharge lines.

CAUTION

Plug or cap all lines as soon as they are disconnected to keep moisture out of the system.

Disconnect magnetic clutch to control unit

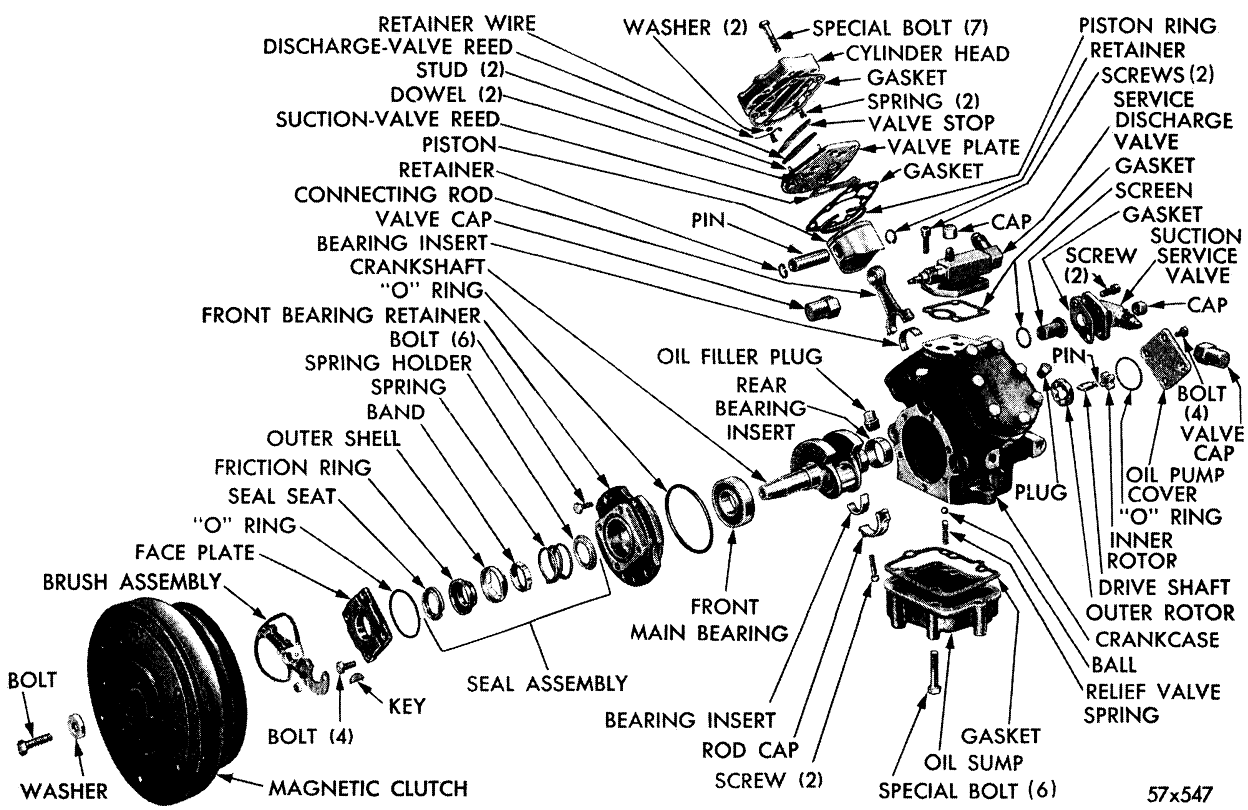


Fig. 22 — Disassembled View of Compressor

wire. Remove compressor pulley belts. Remove compressor to bracket attaching bolts and remove compressor.

NOTE: When replacing the compressor, it is imperative that the oil in the compressor be checked to the proper level (2 to 2½ inches). Refer to Paragraph 6 for measuring procedures.

Replace compressor in the reverse order of removal and adjust fan belt.

28. REMOVING COMPRESSOR CYLINDER HEAD

With gauge set installed as indicated in Paragraph 6, rotate discharge and suction service valve stems clockwise until both valves are fully front-seated. Slowly open the discharge gauge hand valve slightly to relieve compressor pressure through the center outlet hose and into an exhaust suction system. When pressure drops to zero on discharge gauge, open suction pressure gauge hand valve.

Remove compressor cylinder head bolts and tap the head off with a brass drift or plastic hammer.

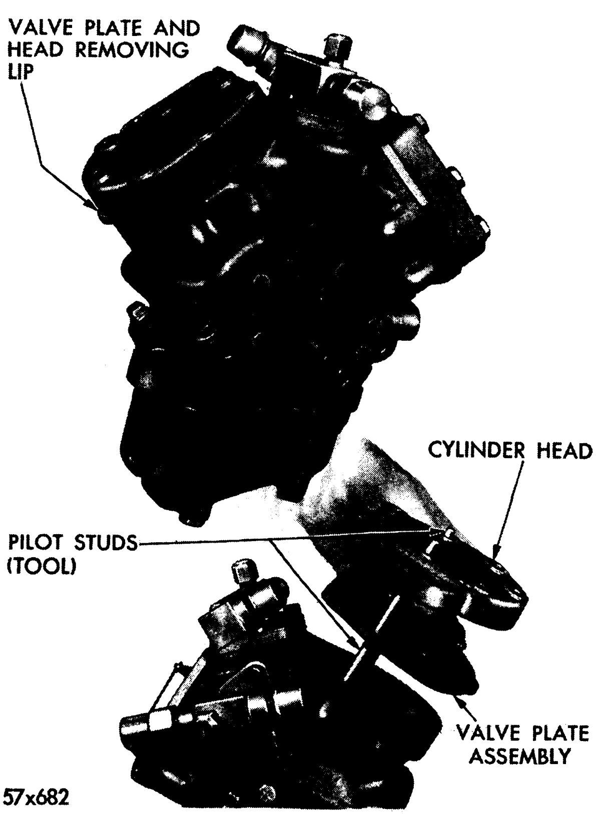


Fig. 23 — Removing Compressor Head

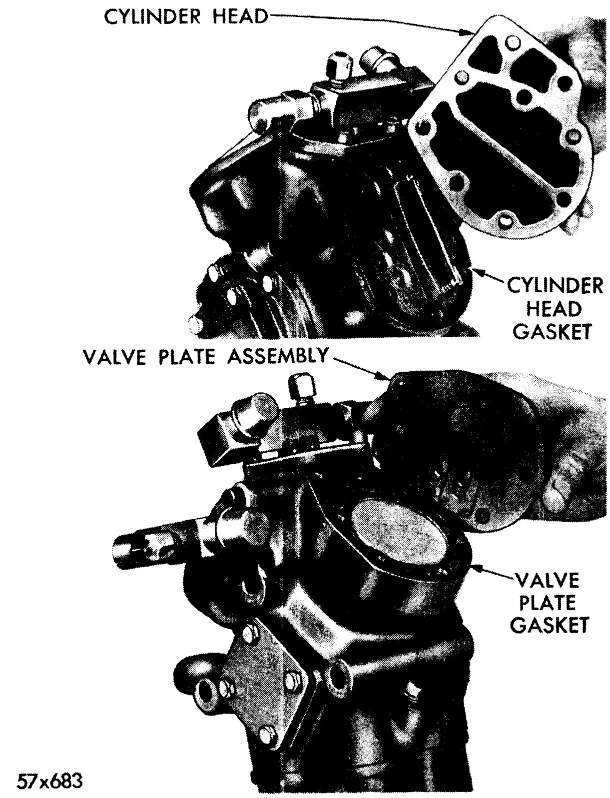


Fig. 24 — Replacing Head Gasket

NOTE: Use tab (Fig. 23) located at side of cylinder head to tap off head.

If when lifting the cylinder head the valve plate does not separate from head, separate head from plate by using a brass drift to tap against head and plate.

CAUTION

To avoid damaging the finished surfaces, do not tap the plate near the edge of plate or head.

After removal of head, plate, and gaskets, examine valves; if valves are broken and damage extends to cylinder bores, replace compressor. If compressor is not damaged, clean the surfaces of cylinder block, valve plate and head thoroughly. Use care to remove all shreds of old gasket from plate, block and head surfaces, clean attaching stud holes in block. Dip new gaskets in clean refrigerant oil. Handle new gaskets carefully.

NOTE: Both head and valve plate gasket can only be assembled in one position. See Figure 24 for method of correct assembly.

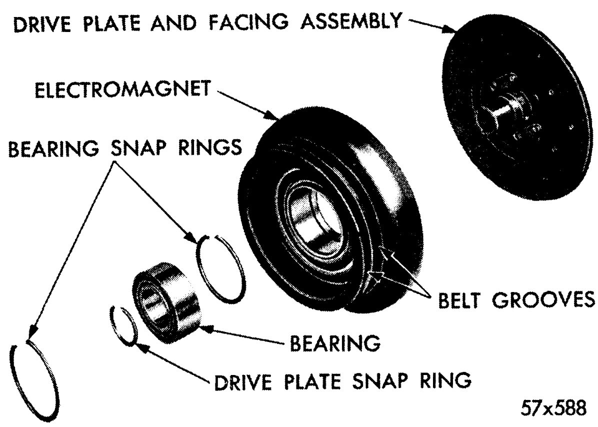


Fig. 25 — Magnetic Clutch (Disassembled View)

Install cylinder head gasket, valve plate and valve plate gasket and cylinder head. Place assembly on cylinder block and align the assembly to cylinder. Install attaching bolts, tighten each bolt alternately and evenly to 26 foot-pounds torque.

Purge air from the compressor by opening the suction service valve (counter-clockwise) slowly and loosening the discharge service port cap for a few turns for about 10 seconds. This will allow the gas to drift through the compressor and bleed air from the system. Rotate both discharge and suction service valves (counter-clockwise) until they are fully back-seated. Start engine and locate control lever on "Cold". Operate engine for five minutes, stop engine, and test for leaks, as outlined in Paragraph 9. If there are no leaks and the system is operating satisfactorily, remove gauge set and replace valve caps.

29. SERVICING THE MAGNETIC CLUTCH (Fig. 25)

Servicing the magnetic clutch assembly is limited to the drive plate, pulley and electro-magnet assembly, snap rings, bearings and brush holder assembly.

CAUTION

DO NOT attempt to remove the electro-magnet coil from the pulley assembly. The coil is held in place by a special adhesive material. Once this bond is broken the coil cannot be re-attached.

a. Testing Electro-Magnet Current Draw

To test the coil for a short or open circuit, connect an ammeter (0-10 Ampere Scale) in series with a fully charged 12-volt battery and the insulated brush lead. The current draw at 12 volts should be 1.5 to 2 amperes.

b. Removing Clutch Assembly from Compressor

Loosen and remove the belts. Remove the upper right shroud section. Remove special locking bolt and washer from compressor crankshaft at front center of clutch. **Do NOT damage brushes when removing or installing clutch.**

While supporting clutch assembly with one hand remove the pulley with 5/8 inch cap screw, screwed into end of clutch shaft.

c. Removing and Installing Drive Plate

Remove drive plate retaining snap ring hub (Fig. 25) with Tool C-3301. Place suitable sleeve against hub and remove drive plate by tapping against sleeve with a soft hammer.

Inspect springs for loss of tension and (or) cracks, and inspect liner on face of plate. Replace drive plate if liner is worn, springs are weak or broken, or if drive plate is warped. (A sintered iron liner impregnated with fibrous material is bonded to the drive plate.)

Start drive plate hub squarely into inner bearing race. Place a brass drift against the drive plate inner hub and tap plate hub into bearing by tapping on brass drift with a hammer while supporting the inside race. Install snap ring on drive plate hub. Use a long feeler that will reach into gap at hub and measure air gap between drive plate and electro-magnet. Air gap should measure .025 to .035 inch. Adjust air gap by turning the three screws on the front face of the drive plate. Adjust all three screws to obtain an evenly spaced air gap.

d. Removing Clutch Bearing

Remove drive plate, as outlined in Paragraph 28, "c". Remove snap ring and grease slinger (at outer race of bearing) from pulley assembly. Tap bearing from pulley assembly. Install bearing and snap ring and drive plate.

e. Installing Clutch Assembly on Compressor

Align key and keyway and push assembly over shaft and key. Install self-locking bolt and washer. Install upper right shroud section. Purge air from the compressor, back-seat both service valves, and tighten oil filler plug.

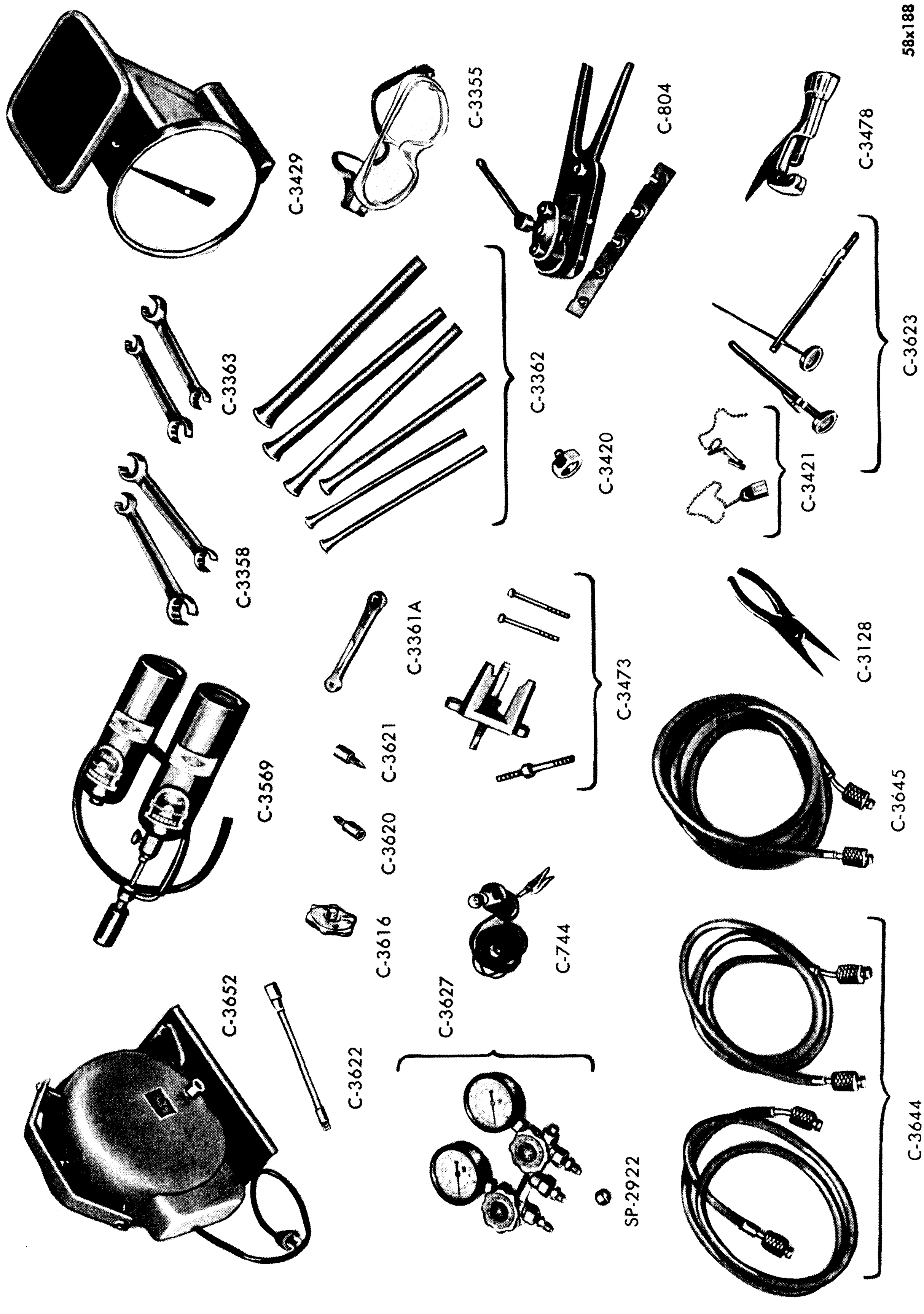


Fig. 26 — Air Conditioning Tools

f. Magnetic Clutch Capacity Test

Install gauge manifold to discharge service valve of compressor in order to read discharge or head pressure. Paint a 1″ wide white or yellow mark across the shoe and magnetic field of the clutch assembly. Disconnect feed wire from thermal switch to clutch and connect a jumper wire from the clutch wire directly to the battery. Start the engine and idle at 500 r.p.m. with the air conditioning blower on "High". Place a cover over the condenser to raise compressor discharge pressure to 300 psi. Connect an ignition timing light to the ignition coil.

At 300 psi. compressor head pressure and with engine idling at 500 r.p.m., observe the paint marks. If there is any relative motion between the marks on the clutch shoe and magnetic field, it indicates that the clutch is slipping and should be replaced.

NOTE: Paint marks will become separated when engine is started so only check for relative motion between marks while timing lights in use.

For Air Conditioning Service Tools refer to Figure 26.

30. TEST PROCEDURE

The following test procedure is an overall operation and performance test of the Air-Conditioning, Heating and Cooling System. The test brings into operation all the mechanical, electrical and chemical components involved in the system and should be performed in the following sequence:

Install gauge manifold set Tool C-3627. When gauge set is installed, suction and discharge service valves opened two turns, and no pressure is indicated on gauges, the system is empty and has a leak. Evacuate, charge with sweep test charge, locate and correct leak. Evacuate and charge with 3 pounds refrigerant 12.

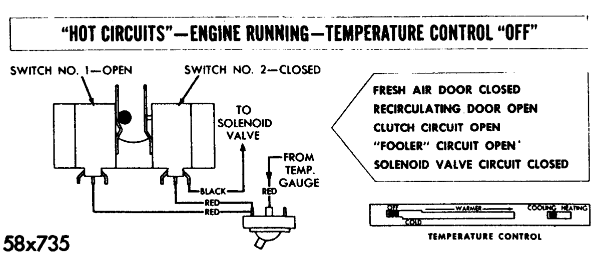


Fig. 27 — Checking the Fresh Air Door

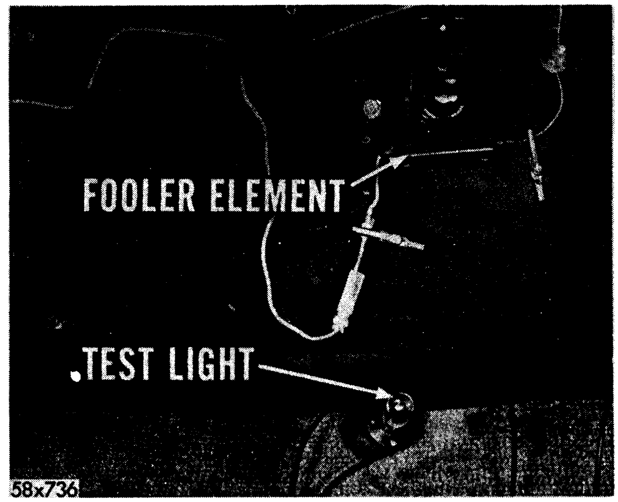


Fig. 28 — Checking the Water Valve Fooler Circuit

Set temperature control lever to "Off" position and selector switch to "Cooling" position. The temperature control lever is a multiple function lever. Any malfunction will be evident in later test.

Start engine, adjust to 1200 r.p.m. Check clutch (should be de-energized). If clutch is energized and solenoid valve circuit is open (see wiring diagram), black wire on switch No. 2 and white wire on switch No. 1 are reverse connected at control switch connections.

Check fresh air door. It should be closed and the recirculation door open (Fig. 27). If clutch is energized and solenoid valve circuit is open (see wiring diagram, Figure 10), black wire on switch No. 2 and white wire on switch No. 1 are reverse connected at control switch connections.

Check circuit to solenoid valve with test light.

CAUTION

Do not allow solenoid valve hot wire to ground, even momentarily will cause a burn out of No. 2 micro-switch if circuit is energized.

Check hydraulic circuit for proper connections at solenoid valve. Check power piston and linkage.

Check water valve fooler circuit with test light (Fig. 28). Circuit should be open. Attach test light across the "Fooler" element circuit.

Circuit should be open and light out. Check fooler element ground connection.

CAUTION

Do not allow fooler element hot wire to ground, even momentarily will cause a burn out of No. 1 micro-switch if circuit is energized.

Check water valve lever (Fig. 29). It should be in the "Closed" position. Check boden cable clip holding cable housing at water valve. Valve lever should be against its stop towards the spring, spring loose. Valve body should remain cold with no water flowing through. Check flow of water through water valve by momentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

Open instrument panel outlet grille doors to full open position, to direct the air up and toward the rear of the car.

Adjust the defroster control to direct all of the air up through the outlet grilles. Check boden cable clips (both ends) holding cable housing.

Operate the blower for the three speeds: "High", "Medium" and "Low". **Leave on "High" position.** Check circuit with test light if proper operation is not present. (See wiring diagram Fig. 10.)

Move the temperature control lever to the "Cold" position. Check clutch. It should be energized. Check clutch circuit at clutch with test light.

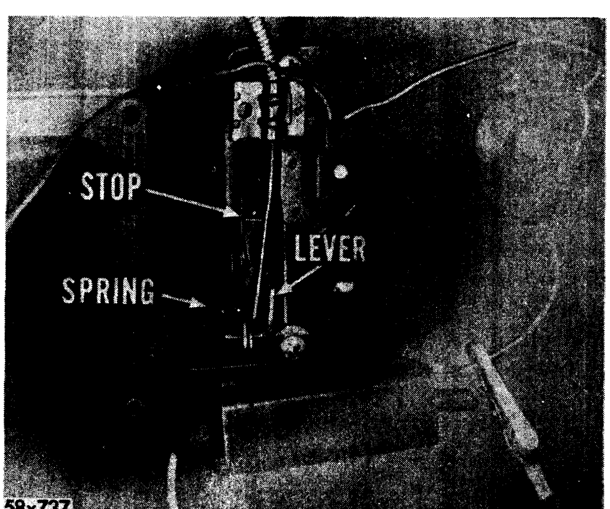


Fig. 29 — Checking the Water Valve Lever

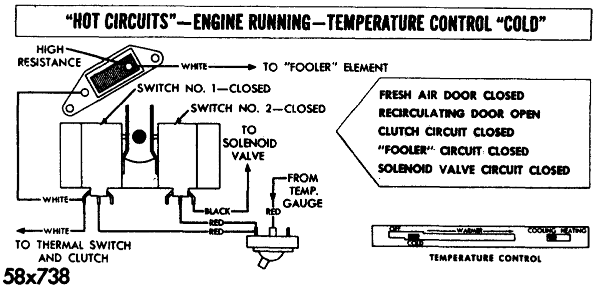


Fig. 30 — Checking the Clutch Circuit

CAUTION

Do not allow clutch hot wire to ground, even momentarily will cause a burn out of No. 1 micro-switch if circuit is energized.

Check clutch circuit at clutch (white wire) connector (Fig. 30). If hot, open circuit in thermal switch circuit as indicated. If cold, reach No. 1 micro-switch by hand (switch nearest "Off" position). With the control lever in the "Cold" position, move with fingers, the micro-switch actuating bar toward switch and release several times. A clicking sound should be heard as switch opens and closes contacts. If no clicking sound takes place, it indicates switch is burned out and must be replaced. If clicking sound takes place, trace circuit through selector switch to the opening in the wiring circuit.

Check fresh air door. It should be closed and the recirculating door open. Check circuit to solenoid valve with test light.

CAUTION

Do not allow solenoid valve hot wire to ground, even momentarily will cause a burn out of No. 2 micro-switch, if circuit is energized.

Check hydraulic circuit for proper connections at solenoid valve. Check piston and linkage.

Check water valve fooler circuit. It should be energized but test light will be dim. If test light remains out, trace open circuit back to rheostat connections on control. Check ground connection (see wiring diagram Fig. 10).

Check water valve lever. It should still be in the closed position and no water flowing through the valve. Check boden cable clip holding cable housing at water valve. Valve lever should be against its stop towards the spring, spring loose.

Valve body should remain cold with no water flowing through. Check flow of water through water valve by momentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

Move the temperature control lever about ⅜ of an inch to the right (Fig. 31) (down on Imperial) of the "Cold" position—just enough to actuate the No. 2 micro-switch, but not enough to move water valve lever.

Check fresh air door. It should be open and recirculation door closed. If recirculation door does not go completely closed, adjust bellcrank to door linkage.

Check water valve lever. It should still be in the closed position, cold, and no water flowing through the valve. Check boden cable clip holding cable housing at water valve. Valve lever should be against its stop towards the spring, spring loose.

Valve body should remain cold with no water flowing through. Check flow of water through water valve by momentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

Check water valve fooler circuit. It should be energized but test light will be dim. If light remains out, trace open circuit back to rheostat connections on control. Check ground connection (see wiring diagram Fig. 10).

Check clutch. It should be energized. Check clutch circuit at clutch with test light.

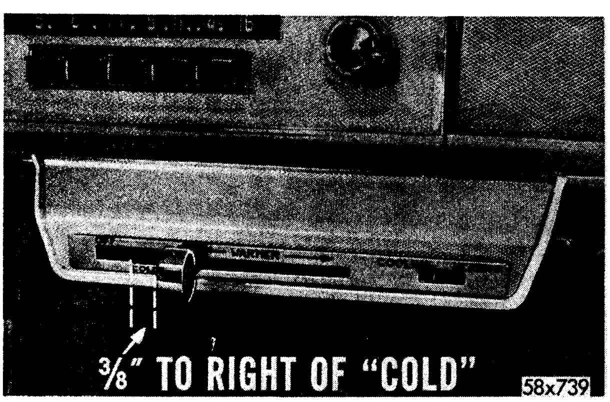


Fig. 31 — Checking the Temperature Control Lever

CAUTION

Do not allow clutch wire to ground, even momentarily will cause a burn out of No. 1 micro-switch if circuit is energized.

Check clutch circuit at clutch (white wire) connection. If hot, open circuit in thermal switch circuit as indicated. If cold, reach No. 1 micro-switch by hand (switch nearest "Off" position). With the control lever in the "Cold" position, move with fingers, the micro-switch actuating bar towards switch and release several times. A clicking sound should be heard as switch opens and closes contact. If no clicking sound takes place, it indicates switch is burned out and must be replaced. If clicking sound takes place, trace circuit through selector switch to the opening in the wiring circuit.

Check refrigerant sight glass. It should be clear, solid and free of gas bubbles after the clutch has been engaged for about five minutes. Add enough refrigerant 12 to completely clear sight glass. Check for leaks after this test is completed and correct.

Recheck engine r.p.m. and adjust to 1200 r.p.m., if necessary, to assure engine is off the fast idle cam.

Arrange gauge set manifold hoses and tachometer wires to the front of the grille so that gauge set and tachometer may be read with the hood closed but not locked. This will allow the under hood temperatures to build up and assure normal operating conditions.

Close hood to prevent the hot air from the engine compartment entering the cowl vent opening. These temperatures are far in excess (160-170) of noraml ambient temperatures.

31. THERMAL SWITCH OPERATION TEST

Move temperature control lever to "Cold" position. The fresh air door should close and recirculation door should open. Turn blower switch to "Low" position; car windows and doors closed. Recheck the outlet air flow to assure blower is on low position.

Observe suction gauge pressure. As evaporator temperature lowers, suction pressure will gradually lower and fluctuate down to between 20 to 10 psi. The thermal switch contacts should be open and de-energize the clutch. When this happens, there will be a slight increase in the engine speed which can be noted by the ear or observed on the tachometer. Also, when the clutch de-energizes, there will be a sharp steady rise in the suction pressure.

Allow the system to continue to operate. The evaporator will warm up thereby closing the thermal switch contacts, which in turn, will re-energize the clutch —and again, when this happens, there will be a slight decrease in engine speed which can be noted by the ear or observed on the tachometer. Also the suction pressure will again start fluctuating to a lower pressure and the cycle will be repeated.

Should the suction pressure fluctuate down below 10 psi. and then release clutch, it is indicated the thermal switch sensing tube is not making a good contact with evaporator fin and coils. Should suction pressure fluctuate down and on into a vacuum without releasing the clutch, it indicates: The thermal switch wires are shorted together. There is moisture in the system. The thermal switch is defective. Check system for moisture. Perform the Overall Performance Test, Paragraph 32, before making thermal switch wiring or switch connections.

32. OVERALL PERFORMANCE TEST

Move control lever about 3/8 of an inch to the right (down on Imperial) of the "Cold" position just enough to close No. 2 micro-switch but not enough to move the water valve control lever. Turn blower switch to "High" position.

Check water valve control lever to be sure it is still in the "Off" position and the valve is cold. Check boden cable clip holding cable housing at water valve. Valve lever should still be against its stop towards the spring, spring loose.

Valve body should remain cold with no water flowing through. Check flow of water through the water valve by momentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

Check water valve fooler circuit. It should be energized but test light will still be dim. If light remains out, trace open circuit back to rheostat connections on control. Check ground connection (see wiring diagram).

Check recirculating door to be sure it is closed and fresh air door is open. If recirculation door does not go completely closed, adjust bellcrank to door linkage.

All doors and windows must be closed to assimilate the operation of the air-conditioning system with 100% fresh air, on the street at 25 miles per hour.

Place one thermometer on the cowl vent opening near the center. Do not allow the lower end (bulb end) of the thermometer to rest on the metal grille. Place a small piece of wood, such as a pencil, under the body of the thermometer to hold the bulb end suspended in the air stream into the cowl vent. Place a second thermometer in the right hand discharge outlet grille in such a position that thermometer reading can be observed from outside the car. In order to eliminate fictitious reading, make sure the bulb end of the thermometer does not touch the metal grille of the inlet.

Operate air conditioning system until an equilibrium condition on the gauges and thermometer has been established. One of the most important factors in making the overall performance test is that the engine must be operated at 1200 rpm. with hood down for a sufficient time to build up to operating temperatures and allow all the under hood components of the cooling system to be subjected to the under hood operating temperatures for a time period.

Read discharge pressure on gauge set. This test should be performed with the discharge pressure of from 190 to 210 psi. Take the necessary steps to bring the discharge pressure within these limits. **To increase the pressure,** restrict the air flow across the condenser by blocking the air flow with cardboard, paper, etc.

190 to 210 pressures are for test purposes only. These pressures change according to ambient temperatures and efficiency of the entire system. If the 190-210 pressures cannot be obtained with ease, refer to Pressure Chart for necessary corrections.

Read the ambient wet bulb temperature. A wet bulb temperature reading can be produced by taking a dry bulb thermometer; wrap six layers of gauze bandage or clean, soft cotton cloth around the lower end of the thermometer, including the bulb, and secure the gauze or cotton cloth to the thermometer with a piece of string. Attach an 18 to 24″ length of twine to the upper end of the thermometer. Dip the wrapped end of the thermometer into ambient temperature water, soaking the wrapping. Using 18 to 24 inches of twine, swing the thermometer in a circle for several minutes until the thermometer reaches its lowest reading with the wrapping still wet. It may be necessary to wet and swing the thermometer the second or third time to assure its reading reaching its lowest point. With the wrapping still wet, observe and note this reading.

Observe and note the cowl vent inlet air temperature. Observe and note the instrument panel outlet grille discharge air temperature.

From the performance temperature chart, determine the maximum allowable discharge air temperature for the prevailing wet and dry bulb temperatures. If the car's discharge air temperature is at or below the temperature given on the chart, the cooling system may be deemed to be delivering its rated cooling capacity.

If the discharge air temperature is above the maximum allowable on the chart, a heat penetration into the cooling system through air leaks and/or insulation is indicated.

Move the control lever to the right (down on Imperial) to about the midway point. Check the water valve fooler circuit. It should be energized and the test light will become brighter. Check the water valve control lever. It should have moved from the "Off" position and the water valve will become hot. Check the outlet temperature. It should be increased.

Move selector switch to the "Heating" position. The compressor clutch should be de-energized. Check the water valve fooler circuit. It should be de-energized, and the light will be out. Check the outlet temperature. It should have increased still higher. Move the control lever to the "Off" position. Check the recirculation door. It should be open and fresh air door should be closed. If recirculation door remains closed, attach the yellow wire to the selector switch (see wiring diagram Fig. 10).

33. AIR LEAKS

a. Evaporator Housing

Remove the blower housing and pour approximately ½ pint of water into the evaporator housing. From inside of car check to see if there is any water leakage.

If necessary, seal the evaporator housing (on the inside of housing) at the point of leakage. After sealing the housing recheck for leaks.

b. Blower Housing

Remove the three bolts securing blower motor adaptor plate to blower housing. Lift out blower motor, plate and wheel. Lay a ¼ inch bead of body sealer around blower housing to form an air tight seal between adaptor plate and housing. Reinstall blower motor, plate and wheel. Tighten bolts evenly.

Lay a ½ inch bead of body sealer around blower motor at adaptor plate. Tamp into place with a small stick or pencil. Reattach blower motor breather hose.

c. Suction and Liquid Lines

Check grommet and seal of suction and liquid line opening into bottom center of housing. Use body sealer.

34. CHECKING WATER FLOW

Start engine and adjust speed to 1200 rpm. Turn blower to "High" and temperature control to "Cold". Operate in this manner to gain the coldest temperature possible.

NOTE: This is the time the "fooler" element will most likely fail to work.

Reduce the pressure at the radiator by loosening the radiator cap. **Do not remove the radiator cap.** Check the flow of water through the water valve by disconnecting the heater outlet hose at the upper left side of the heater—evaporator housing. A few drops of water may be expelled but this is a normal condition.

AMBIENT AIR TEMPERATURE CHART

AMBIENT INLET AIR WET BULB TEMPERATURE

AMBIENT INLET AIR DRY BULB TEMPERATURE

Inlet Air	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
70	40	40	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	X																				
71	41	41	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	54	X																			
72	41	41	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	X																		
73	41	41	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	55	X																	
74	41	41	42	42	42	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	55	56	X																
75	41	42	42	42	42	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	55	56	57	X															
76	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	55	56	57	58	X														
77	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	55	56	57	58	59	X													
78	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	X												
79	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	X											
80	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	X										
81	43	43	43	43	43	43	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	X									
82	43	43	43	43	43	43	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	X								
83	43	43	43	44	44	44	44	45	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	X							
84	44	44	44	44	44	44	44	45	46	46	47	47	48	49	50	51	52	53	54	55	56	56	57	58	59	10	61	62	63	64	65	66	X						
85	44	45	45	45	45	45	45	46	46	46	47	48	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	X					
86	45	45	45	45	45	45	46	46	47	47	48	48	49	50	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	68	X				
87	45	46	46	46	46	46	46	47	47	47	48	48	49	50	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	68	69	X			
88	46	47	47	47	47	47	47	47	48	48	49	49	49	50	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	68	69	71	X		
89	46	47	47	47	47	47	47	48	48	48	49	49	49	50	51	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	68	69	70	71	72	X	
90	X	47	47	47	48	48	48	49	49	49	50	50	50	50	51	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	67	68	69	70	71	72	73	X
91		X	47	47	48	48	48	49	49	49	50	50	50	50	51	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	66	67	68	69	70	71	72	73	74
92		X	47	48	48	48	49	49	49	50	50	50	50	51	52	52	52	53	54	55	56	56	57	58	59	60	61	62	63	65	66	67	68	69	70	71	72	73	74
93		X	47	48	49	49	49	50	50	50	50	50	51	51	52	52	52	53	54	55	56	56	57	58	59	60	61	62	64	65	66	67	68	69	70	71	72	73	74
94			X	49	49	49	49	50	50	50	50	51	51	51	52	52	53	53	54	55	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
95			X	49	49	49	49	50	50	50	51	51	51	52	52	53	53	53	54	55	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
96				X	49	50	51	51	51	51	51	51	52	52	53	53	54	54	55	56	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
97				X	49	50	51	51	52	52	52	52	52	52	53	53	54	54	55	56	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
98					X	51	52	52	52	52	52	52	52	53	53	54	54	54	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
99					X	51	52	52	53	53	53	53	53	53	54	54	54	54	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
100						X	53	53	53	53	53	53	53	54	54	54	54	55	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
101						X	53	53	53	54	54	54	54	54	54	54	54	55	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
102							X	53	54	54	54	54	54	54	55	55	55	55	56	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
103							X	54	54	54	54	54	55	55	55	55	55	56	56	56	57	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
104							X	54	54	55	55	55	55	55	55	56	56	56	56	57	57	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
105								X	55	55	55	55	55	55	56	56	56	56	57	57	57	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
106								X	55	55	55	55	56	56	56	56	56	57	57	57	57	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
107								X	55	56	56	56	56	56	56	56	57	57	57	57	57	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
108									X	56	56	56	56	56	56	57	57	57	57	57	58	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
109									X	56	56	56	56	56	56	57	57	57	57	58	58	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
110										X	56	56	56	56	56	57	57	57	58	58	58	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74

Example: Ambient Wet Bulb Temperature = 62° F.
Ambient Dry Bulb Temperature = 80° F.
Maximum Discharge Air Temperature = 46° F.

SERVICE DIAGNOSIS

No attempt should be made to use the diagnosis information as a method of trouble shooting or spot checking. When properly used (as an aid to the complete test procedure), the diagnosis will be of considerable value to the service man.

35. BLOWER NOT OPERATING

a. Test electrical circuit with point-to-point voltmeter test. Replace or repair broken wire.

b. Test motor, and repair or replace.

c. Test switch with voltmeter or jump wire. Replace faulty switch.

d. Test circuit with voltmeter for voltage drop. Clean and tighten all loose connections.

36. BLOWERS AND COMPRESSOR OPERATING—NO COOLING

a. Check for low refrigerant. Recheck system after testing and repairing all leaks.

b. Test for moisture with dry-eye.

c. Test compressor capacity.

d. Test for restriction in strainer-drier, as outlined in Paragraph 24. Inspect lines for kinks.

e. Test expansion valves, as outlined in Paragraph 26. Clean or replace valve.

37. BLOWERS OPERATING—PARTIAL COOLING

a. Check sight glass for indication of low refrigerant. Check for leaks, and charge system.

b. Test for moisture.

c. Test compressor capacity, as outlined in Paragraph 6.

d. Test thermal switch, as outlined in Paragraph 17.

e. Inspect condenser for kinks or obstructions. Clean with air or replace.

f. Clean air passages through condenser with warm water and compressed air applied from side next to engine.

g. Test temperature-pressure relation of refrigerant.

38. HIGH DISCHARGE PRESSURE

a. Too much refrigerant.

b. Air in system.

c. Dirty condenser.

d. High ambient temperature.

39. LOW DISCHARGE PRESSURE

a. Not enough refrigerant.

b. Moisture in system (Expansion valve stuck closed).

c. Expansion valve thermal bulb lost charge.

d. Too much oil.

e. Bad compressor reed valves.

40. HIGH SUCTION PRESSURE

a. Moisture in system (Expansion valve stuck open).

b. Expansion valve equalizer tube plugged.

c. Expansion valve thermal bulb loose in coil.

d. Not enough oil.

e. Bad compressor reed valves.

41. LOW SUCTION PRESSURE

a. Not enough refrigerant.

b. Moisture in system (Expansion valve stuck closed).

c. Expansion valve thermal bulb lost charge.

d. Restriction in liquid line.

e. Too much oil.

NOTE: Discharge and Suction pressures will vary with the ambient temperature and the heat load applied to the evaporator. Normal Suction pressure will vary between 25 to 40 psi. Normal Discharge pressure at 1200 engine rpm. as indicated below:

Ambient Temperature	*Discharge Pressure*
60° F.	100-150 psi.
80° F.	140-190 psi.
100° F.	190-240 psi.
110° F.	230-280 psi.